



Lusail Real Estate Development Company

Health, Safety, Security, Environment, Logistics & Quality Department

Lusail Construction Safety Management Procedure – Fall Protection

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1. Description

This element of the LCSMP provides guidelines for fall protection. This element applies to all Lusail personnel, Contractors, Developers, Consultants, and subcontractors working on the Lusail projects.

This element provides an overview. Each work area within the project may require different and specialized fall protection planning and equipment.

This element does not cover specific fall protection for ladders, scaffolds, or aerial lifts, which are covered in [LUS-HSE-WG3-446-019](#) , Ladders; [LUS-HSE-WG3-446-020](#), Scaffolding Systems; and [LUS-HSE-WG3-446-021](#) , Aerial Lifts. Also, this element does not cover requirements for floors, platforms, and walkways including guardrail and toeboard systems, which are included in [LUS-HSE-WG3-446-018](#), Walking/ Working Surfaces.

2. Definitions

Term	Description
100% Fall Protection	The design and use of a fall protection system so that no exposure to an elevated fall occurs at any time. This may require more than one fall protection system, lanyard, or combination of preventive or protective measures.
Job Hazard Analysis (JHA)	A process used to identify the hazards or potential hazards associated with each step of a particular job or work plan and eliminate, control, or remove them before work is started.
Anchor Point	A secure point of attachment for lifelines, lanyards, or deceleration devices that is capable of withstanding forces specified in Section 6.6 “Anchor Points.”
Body Belt (Safety Belt)	A strap with means both to secure it about the waist and to attach it to a lanyard, lifeline, or deceleration device. The use of a body belt as part of a personal fall arrest system or positioning system is prohibited.
Body Harness	A system of interlaced straps that may be secured about the employee in a manner that distributes the fall arrest forces over at least the thighs, pelvis, waist, chest, and withers with means to attach it to other components of a personal fall protection system.
Competent Person	An individual who has successfully demonstrated through experience and training, a superior knowledge of the types, use of and limitations of fall protection systems, and who has the authority to take prompt corrective action when systems are deficient.
Connector	A device that is used to connect parts of a personal fall arrest or restraint system to lifelines, lanyards or anchorages (e.g., carabiner, buckle, D-ring, and snap hook).
Deceleration Device	Any mechanism (e.g., a rope grab, rip stitch lanyard, or automatic self-retracting lanyard) that dissipates a substantial amount of energy experienced during a fall or otherwise limits the maximum arresting energy imposed on a person during a fall.
Fall Restraint System	A system composed of lifelines and fall arrest/ restraint components intended to physically prevent an employee from accessing locations where they are exposed to a fall.
Free Fall	The period of time during a fall before a fall arrest system begins to apply force to decelerate or stop the fall.

Term	Description
Free Fall Distance	The vertical distance a worker falls during free fall prior to any component of a fall protection system engaging.
Guardrail System	A physical barrier erected to prevent employees from being exposed to falls to lower levels..
Horizontal Lifeline	A rail, rope, wire, or synthetic cable that is installed in a horizontal plane between two anchorage points and is used as an anchor point for personal fall arrest or restraint systems. Also referred to as a Cantenary Line.
Infeasible	Not possible; that is, it is impossible to perform the required activity using a conventional fall protection system (i.e., guardrail system, safety net system, or personal fall arrest/ restraint system), or it is technologically impossible to use any one of these systems to provide fall protection.
Lanyard	A flexible line of webbing, rope, or cable used to secure a full-body harness to an anchor point. Lanyards are usually 2, 4, or 6 feet in length. Generally combined with a deceleration device from the manufacturer.
Leading edge	The edge of a floor, roof, or formwork for a floor or other walking/ working surface (such as the deck) that changes location as additional floor, roof, decking, or formwork sections are placed, formed, or constructed. A leading edge is considered to be an “unprotected side and edge” during periods when it is not actively and continuously under construction.
Locking Snap Hook	A snap hook that requires two separate actions to open the gate: one to deactivate the gatekeeper and a second to depress and open the gate, which automatically closes when the hook is released. Locking snap hooks are used to minimize roll-out or accidental disengagement.
Lower Levels	Areas or surfaces to which an employee can fall, including ground levels, floors, platforms, ramps, runways, excavations, pits, tanks, material, water, equipment, and structures (or portions thereof).
Low Pitched Roofs	Roof slopes greater than 4:12 (vertical to horizontal).
Personal Fall Arrest System	The system used to arrest an employee experiencing a fall from a working level. It consists of an anchorage, connectors, and body harness and may include a lanyard, deceleration device, lifeline, or suitable combinations thereof.
Positioning Device System	A body belt or full body harness system rigged to allow an employee to be supported on an elevated vertical surface such as a wall and work with both hands free while leaning. Limits fall distance to < 12” (30.5 cm).
Qualified Person	A person with a recognized degree or professional certificate with extensive experience in the field of fall protection and arrest systems (e.g., an engineer or representative from a company specializing in fall protection).
Restraint Line	The line from a fixed anchorage or between two anchorages to which an employee is secured in such a way to prevent him from accessing areas where he would be exposed to falls to lower levels.

Term	Description
Retractable Lifeline (Lanyard)	A deceleration device that contains a drum-wound line (lanyard) that may be slowly extracted from, or retracted onto, the drum under slight tension during normal employee movement, but which automatically locks the drum and arrests the fall when rapid, violent tension is applied..
Rope Grab	A deceleration device that travels on a lifeline and automatically, by friction, engages the lifeline and locks to halt further travel of personnel attached to the rope grab.
Roof	The exterior surface on the top of a structure. The roof does not include floors or formwork which, because a structure has not been completed, temporarily becomes the top surface of a structure.
Roofing Work	The hoisting, storage, application, and removal of roofing materials and equipment, including related insulation, sheet metal, and vapor barrier work, but not including the construction of the roof deck.
Safety Monitoring System	A safety system in which a competent person is responsible for recognizing and warning employees of fall hazards. No other fall protection system is utilized. Safety monitoring systems are prohibited on the Lusail Project.
Steep Roof	A roof having a slope greater than 4:12 (vertical to horizontal).
Toeboard	A low protective barrier that prevents the fall of materials and equipment to lower levels and protects personnel from falls.
Unprotected Sides and Edges	Any side or edge (except at entrances to points of access) of a walking/working surface (e.g., floor, roof, ramp, or runway) where there is no wall or guardrail system at least 39 inches (1.0 m) high.
Vertical Lifeline	A rail, rope, wire, or synthetic cable that is installed in a vertical plane between two anchorage points and is used as an anchor point for personal fall arrest or restraint systems.
Wall Opening	A gap or void > 30" (> 76 cm) high and > 18" (> 48 cm) wide in a wall or partition, through which employees can fall to a lower level.
Walking/ Working Surface	Any surface, horizontal or vertical, on which an employee walks or works, including floors, roofs, ramps, bridges, runways, formwork, beams, columns, trusses, and concrete reinforcing steel. Walking/ working surfaces do not include ladders, vehicles, or trailers on which employees must be located in order to perform job duties.
Warning Line System	A physical barrier erected on a roof to warn employees that they are approaching an unprotected side or edge, and that designates an area in which roofing work may take place without the use of a fall protection system. Warning lines are typically placed 6' or greater off the unprotected side or edge.

3. Responsibilities

The Contractor is fully responsible for the pre-planning, development of Method Statements, Job Hazard Analyses, and overall safe work planning and implementation. The Contractor's Project Management is responsible for the assurance that all work is planned and conducted according to the pre-planning document, Contractor and Lusail Health Safety &

Environment (HSE) procedures and the Qatar Construction Specifications 2010. Should a conflict occur between procedures/ standards or requirements the more stringent shall apply.

4. Lusail Fall Protection Guidance

Thorough planning and total dedication is required to meet Lusail's 100% fall protection goal.

All work at height is considered a high risk activity. At the start of each project the Contractor identifies all activities which involve work at height and decides, by risk assessment, a strategy for prevention of injury. Subsequently, each work activity is reviewed; requirements for work at height assessed and additional precautions are included in the method statement for the work.

Work at height requires that such work is:

- (a) avoided if it is reasonably practicable to do the job another way
- (b) carried out using appropriate equipment to prevent falls
- (c) organized so that the distance and possible consequence of any fall are minimized
- (d) risk-assessment based
- (e) properly planned and supervised by a competent person(s)
- (f) carried out by competent operatives.

All employees exposed to a fall hazard greater than 6' (1.8 m) shall be protected by a conventional fall protection system, which is defined as a guardrail system, fall restraint system, personal fall arrest system, or safety nets to protect employees from the consequences of a fall. Fall protection is also required for employees working in the following areas:

- At the edge of vertically cut excavations greater than 6' (1.8 m) in depth where the excavation is not readily visible because of plant growth or other visual barrier, or that require employees to enter and work on the vertical wall of the excavation, on the protective system, or on any other structure in the excavation
- On accessways or work platforms over water, machinery, or dangerous operations
- On walkways/ runways from which personnel may fall 4' (1.2 m) or more.

The Project Manager ensures that fall hazards are considered in all aspects of the scope of work and mitigated or controlled via the design of any new equipment and facilities. Known and potential fall hazards are identified in JHAs.

The HSE Representative selects appropriate personal fall protection systems and equipment based on the type of work, the work environment, physical dimensions and capabilities of the worker, anchorages available; and all potential fall distances.

Before allowing employees into areas where fall hazards exist, the Contractor shall ensure that all workers who are/ will be exposed to fall hazards are provided with training and complete instruction on the hazard(s), fall protection system(s) planned, how to use fall protection systems and the limitations of those selected systems. Please refer to Section 14.

5. Project Fall Protection Plan

The Contractor shall provide a written site-specific Fall Protection Plan (Plan) identifying how fall hazards will be managed in all work areas under his scope of work. The Plan shall meet or exceed requirements set forth in this Lusail Construction Safety Management Procedure and QCS 2010.

A qualified person who is familiar with the scope of work, work processes planned, and conventional fall protection methods must develop the Plan. This will generally involve participation from the HSE Manager. Where non-conventional means are required or where systems must be engineered to meet requirements, registered engineers must be utilized.

The Project Manager and HSE Representative facilitate implementation and compliance with the Plan once developed. Field Supervision, as well as the HSE Representatives must monitor employees and subcontractors to ensure compliance with all aspects of the Plan.

At a minimum, the Fall Protection Plan shall include the following information:

- Name of the person(s) responsible for implementation and monitoring of all activities affected by Plan requirements
- Name of qualified person(s) who have engineered or designed fall protection systems
- A description of all site activities and/ or work areas where fall protection is required, including but not limited to:
 - Walking/ working surfaces containing holes or openings
 - Elevated walking/ working surfaces 4' (1.2 m) or more above a lower level
 - Roof work around skylights and smoke domes
 - Work near wall openings such as those for windows or doors which are less than 39" (1 m) above the walking/ working surface
 - Inside or near vertically cut trenches and other excavations deeper than 6' (1.8 m)
 - On walking/ working surfaces from which workers could fall onto dangerous equipment
 - At loading areas on scaffolds and structures where guardrails have been removed to receive materials
 - Along unprotected sides and edges (leading edges) of walking/ working surfaces which are 6' or more above a lower level and not protected by guardrails
 - Ramps and runways greater than 4' above lower levels that are not protected by guardrails
 - Work adjacent to wells, pits, or shafts not protected by guardrails, fences, barricades, or covers
 - On tank tops which are greater than 6' (1.8 m) above lower levels
- The types of fall protection which will be employed. This must be specific to each work area. Engineered systems will require additional documentation approved and signed by registered engineers.
- The manner by which the Contractor will ensure worker fall protection where primary fall protection systems must be removed to complete the work
- Types of fall prevention systems which will be employed, specific to work areas and activities
- Process for developing a Fall Protection Plan for activities where use of conventional means of fall protection are infeasible
- Program by which the Contractor will assess fall protection systems in use, and their effectiveness. This will include inspection processes for equipment.
- Provisions for transferring ownership and responsibility of fall protection systems from one Contractor to another upon vacating work areas
- Provisions for employee training on this Plan and its requirements
- Emergency and employee retrieval procedures for fall events

The Plan shall be made available for review by a Lusail Representative prior to commencing the work. Approved Plans must be retained in project files and made available to workers exposed to fall hazards upon request.

6. Fall Protection Equipment

Fall protection equipment must be designed specifically for fall protection purposes and must meet all international standards

Fall protection equipment must be purchased from a licensed and certified fall protection equipment manufacturer. Equipment must be used according to the manufacturer's specifications. Equipment modified from manufacturer's specifications shall not be used at the Lusail Project site, unless the manufacturer has approved the modifications in writing.

Fall protection equipment shall be used only for its intended purpose. Equipment used to hoist or tow materials, equipment or vehicles must be immediately taken out of service. Equipment which has been involved in a fall event or shock loaded in any other way shall be immediately destroyed and removed from service.

All equipment must be regularly inspected and properly cleaned, stored and maintained. Use the following guidelines:

-
- Wash synthetic rope and body harnesses in soapy water to remove dirt and rinse them with clean water.
 - Air-dry at room temperature. Hang harnesses to dry.
 - Do not use solvents for cleaning equipment as it may damage synthetic materials and other components.
 - Lubricants attract dirt: do not lubricate moving parts unless the manufacturer recommends it.
 - Do not remove information and warning labels or inspection tags, and make sure inspection tags remain legible after cleaning.
 - Store equipment in an area that is clean, dry, and moisture-free; avoid excessive heat, light, oil, and corrosive chemicals. Follow the manufacturer's instructions for additional storage requirements.

6.1 Full Body Harnesses

- Full body harnesses ONLY shall be used for fall arrest. Personnel shall not use a body belt for fall arrest.
- Users must be properly trained on the correct use of the harness.
- The harness must be the proper size and be worn correctly in order to avoid additional injury during a fall event.
- The D-ring attachment point for lanyards or restraints must be located between the user's shoulder blades.
- Harnesses must be inspected by the user prior to each use, and shall be used for a period not to exceed five (5) years.

6.2 Connectors

- Connectors must be inspected by the user prior to each use.
- Connectors which are bent, corroded or damaged in any other way shall warrant removal of the device containing the connector from service.
- Connectors must be corrosion resistant and made of formed steel or equivalent materials.
- Snap hooks shall be double-locking type. Non-locking snap hooks are prohibited.
- Unless so designed, snap hooks cannot be attached:
 - Directly to webbing, nylon or synthetic rope, or wire rope
 - To each other
 - To a D-ring or ring which already has a connector attached to it

6.3 Lifelines

The Contractor determines proper performance requirements and considerations in the selection, location, and erection of semi-permanent horizontal lifelines.

- All lifelines intended for use as fall arrest anchorage must be designed by a registered engineer who has computed load capacities of the design for the number of workers to be anchored to the lifeline at any given time.
- Horizontal lifelines are designed and installed to maintain a safety factor of at least two.
- Lifelines shall be capable of providing a minimum 5,000 lbs. capacity per worker attached to the lifeline.
- Only one worker may be anchored to a vertical lifeline. Each worker shall have an independent vertical lifeline provided with separate anchorage.
- Horizontal lifelines that may become vertical lifelines must have connectors capable of locking in both directions on the lifeline.
- Use of horizontal lifelines shall be avoided where accidental collisions with crane suspended loads are foreseeable.
- When erecting semi-permanent horizontal lifelines, consider the following:
 - Work area and location of energized electrical circuits.
 - Length of lifeline and span distances. How much line sag will be permissible?
 - Can lifelines be installed on structural beams prior to beam erection to avoid the fall exposure?

- How many employees will use the lifeline simultaneously, and to what load capacities do anchorage points need to be rated?
- Will multiple lanyards be required to maintain 100% fall protection when travelling a horizontal lifeline?

Refer to Section 6.5 for information pertaining to retractable lifelines (lanyards).

6.4 Safety Nets

Contractors are advised to utilize safety net systems only when all other fall protection options have been exhausted and/ or are infeasible.

Safety nets must be installed as close as practicable under the walking/working surface on which employees are working, but in no case more than 30' (9.1 m) below that level. Safety nets shall extend outward from the outermost projection of the work surface according to the following schedule:

Vertical distance (ft) from walking/ working surface to safety net	Minimum permissible horizontal extension of net from edge of walking/ working surface
≤ 5'	8' (2.4 m)
> 5' to 10'	10' (3.0 m)
> 10'	13' (4.0 m)

Safety net systems shall be designed by a qualified person. Only safety net systems manufactured by licensed and certified safety net systems manufacturers shall be used at Lusail.

Safety nets must be clearly marked with their load impact capacities. The Contractor's competent person must conduct a drop test on each safety net system prior to initial use and every six (6) months thereafter.

Safety nets shall be installed with sufficient clearance provided underneath them to ensure that the net and fall victim will not strike lower levels or structures below the net upon being impacted.

Openings between inter-lacing netting cannot be larger than 6" (15 cm) on a side, center to center. Lusail recommends that Contractors use nets having the smallest openings available to limit the further fall of debris which may fall into the nets.

The Contractor is responsible for inspecting the safety net systems on a daily basis. Debris identified in the netting shall be removed prior to the start of the next work shift. Damaged nets shall warrant a temporary stop work order in that work area or location until the netting can be repaired by a qualified person. Contractors may implement other approved forms of fall protection in lieu of safety nets during this time.

Safety nets which have been involved in a fall event shall warrant a temporary stop work in that work area or location. The HSE Representative and qualified person shall immediately inspect the netting for signs of stress failure or weakening of connections.

Work may resume in this area when inspection determined the safety nets were not impacted by the fall event, or following repair by the qualified person.

6.5 Lanyards

Lusail requires that all non-retractable lanyards used as a component of fall arrest systems be equipped with a shock absorbing device. The shock absorbing device is intended to minimize the arresting forces applied to a fall victim by gradually slowing the descent.

Shock absorbing lanyards, once engaged, will extend or "rip out" an additional 3.5' (1.1 m). In no case shall shock absorbing lanyards rip out to greater distances. Persons calculating fall distances must remember to include the rip out distance in their calculation of total fall distance.

All lanyards must be capable of sustaining a minimum tensile load of 5,000 lbs. without failure.

Retractable lanyards (lifelines) employ a varying length lifeline wound around a drum. Retractable lanyards vary in length from 6' (1.8 m) to 30' (9.1 m). Under slow, controlled movements, the drum will allow continual unrestricted

movement. This allows the worker a larger range work area. However, upon a rapid or violent motion (such as a fall), the drum will lock preventing further movement of the lifeline.

Retractable lanyards are designed to limit free fall distance to less than 18" (46 cm). Lanyards meeting these design criteria shall be capable of sustaining a minimum tensile load 3000 lbs. However, should the lanyard not meet these criteria, they shall be capable of sustaining the minimum 5,000 lbs. tensile load capacity.

Under no circumstances shall workers attach lanyards to anchors in any way other than by use of the connector or double locking snap hook. Workers shall not tie the lanyard around the anchor or choker the lanyard to itself. The practice of shortening the lanyard length by tying knots into the lanyard is strictly prohibited.

Lanyards shall be inspected by the user prior to each use. Damaged lanyards must be removed from service immediately and destroyed. Workers must never use lanyards as hoisting devices or material restraints.

6.6 Anchorage Points

Lusail advises all Contractors to consider fall arrest/ restraint anchorages in the design phase of their work areas and/ or structures. Waiting until fall protection is needed to identify an acceptable anchorage point will generally result in no anchorage available or anchorage which does not meet load capacity requirements.

Anchorage points (including lifelines) must be capable of supporting at least 5,000 lbs. per worker attached to the anchorage, or they must be part of a fall protection system that maintains a safety factor of at least two and is designed and installed under the supervision of a qualified person. Anchors for fall arrest systems must be dedicated as such, and shall not serve as anchorage or support for work platforms.

Anchorage should be selected to minimize to the extent possible the free fall distance of the worker. This infers that only overhead anchors should be selected. At no time should a worker be permitted to free fall greater than 6' (1.8 m) or to strike a lower level or structure in a fall event. Workers must also select an anchor which would limit lateral swinging in a fall event. Direct overhead anchorage must be sought. Where this is not provided, a qualified person may implement a horizontal lifeline anchor suspended from two separate anchors which would allow lateral lanyard travel upon the anchor. Anchorage must be carefully selected or created to ensure these criteria are met.

Lusail advocates the use of anchorage straps (beam straps) where the lanyard connector is too small to attach to any approved connector on the selected anchor. Anchorage straps must be capable of sustaining a minimum tensile load capacity of 5,000 lbs. The fall protection user must be sure to include anchorage strap drop/ sag length in their calculation of total fall distance.

The Contractor must ensure that only qualified persons are assessing fall arrest anchor points.

7. Personal Fall Restraint Systems

The most effective method to ensure falls from heights do not occur is to eliminate worker exposure to the fall. To physically prevent a worker from exposure to falls is to utilize personal fall restraint.

Fall restraint is similar to fall arrest in that workers will use a full body harness and an approved anchorage point. The difference lies in the lanyard or lifeline. Fall restraint acts by limiting the length of a workers lanyard or lifeline to a length which prevents the worker from traveling to and over the unprotected side, edge, or leading edge, or into a hole, pit, etc.

With this in mind, the use of shock absorbing lanyards is not necessary. Workers may use a static length synthetic rope lanyard or pre-determined length lifeline. Unlike fall arrest, workers may use body belts with fall restraint systems; however, their use is highly discouraged as a worker may forget the requirements for fall arrest.

Only the Contractor qualified persons shall design fall restraint systems. The Contractor shall ensure that the length of worker restraint lines/ lanyards are checked and re-checked with comparison to the distance between anchors and the fall area.

Anchorage points for fall restraint must meet all requirements as specified in Section 6.6 of this Procedure.

8. Personal Fall Arrest Systems

Personal fall arrest systems are to be implemented where guard railings, barriers, and personal fall restraint options are infeasible. Use of personal fall arrest infers that the Contractor will knowingly expose workers to fall hazards. Given this, Contractors must ensure that all program requirements (equipment, training, anchorage, monitoring, and fall response) are addressed.

Of critical importance in the use of personal fall arrest is the requirement for the qualified person, HSE Representative and worker to calculate potential fall distances in all work areas. Use of equipment which will allow a worker to fall, for example 12' (3.7 m), will be useless if the distance to the lower level is only 11' (3.4 m).

Given this, workers must calculate the total possible fall distance by summing the following:

- Height of the worker
- Location of full body harness D-ring in relation to the workers height
- Length of the lanyard (include rip out distance)
- Length/ sag of anchorage attachment straps/ chokers/ etc. (if applicable)

The sum of these measurements must then be subtracted from the distance between the anchorage point and the ground, work level, or structure located below the work area. The math will determine if the equipment and anchor point planned for use is proper for the particular fall height. Remember: no portion (toes) of the worker's body shall contact a lower level.

The Contractor's Plan shall ensure that this process is completed for all work areas where workers will utilize personal fall arrest. The Contractor will ensure that the necessary varieties of fall arrest equipment are provided for and available to workers to ensure that workers are wearing fall arrest equipment which will prevent them from contacting the ground or lower level.

General requirements for fall arrest equipment include the following:

- Limit the maximum arresting force on an employee to 1,800 lbs. when used with a full body harness.
- Have sufficient strength to withstand twice the potential impact energy of a worker free fall distance of 6', or the free fall distance permitted by the system, whichever is less.
- The fall arrest system must be rigged so that the wearer cannot free fall more than 6' or contact any lower level. To limit the free fall distance, the tie off point must be at or above the D-ring on the harness.
- Body belts shall not be used as part of a personal fall arrest.
- Attach only compatible components together. A qualified person must evaluate and approve any substitution or change in system components (e.g., a lanyard and harness made by different manufacturers). Testing may be required in such cases.
- The qualified person must approve use of personal fall arrest systems for employees who have a combined body and tool weight greater than 310 lbs. This condition will require additional measures be implemented.

9. Positioning Device Systems

Positioning devices are intended to provide the worker with fall protection while allowing for greater mobility on walls and other structures under construction where use of a scaffold or work platform is infeasible.

The Contractor shall ensure that full body harnesses intended to be used with positioning devices are equipped with side D-rings along the users' hips. Positioners (lanyards) must be connected to the side D-rings and anchored to proper anchorage. Body belt use in positioning device systems is not permitted at the Lusail Project site.

Lanyards used as components of a positioning device system are typically 12" (0.3 m) - 18" (0.5 m) in length and are typically forged link chain in construction. Positioners shall be rigged such that an employee cannot free fall more than 2' (.6 m).

Positioning devices shall be secured to an anchorage capable of supporting at least twice the potential impact load of a worker's fall, or 3,000 lbs, whichever is greater. Connecting assemblies shall have a minimum tensile strength of 5,000 lbs.

Workers may travel up to a maximum height of 24' (7.3 m) on vertical walls under construction using a positioning device system as the only form of fall protection. At heights exceeding 24' (7.3 m), workers shall implement a shock absorbing or retractable lanyard attached to the center D-ring of the full body harness and using suitable anchorage above (5,000 lbs. per worker).

Positioning device systems shall be inspected prior to each use by the user for wear, damage, and other deterioration. Damaged, heavily worn, or defective components shall be immediately removed from service and destroyed.

10. Fall Prevention Systems

10.1 Warning Lines

A warning line system may be used by Contractors to prevent falls by warning personnel that they are near an unprotected edge. Warning line systems are typically used on rooftops of structures during installation of roofing materials, eaves, drains, etc. (post-structural roofing work).

The warning line system is made up of a rope, chain or wire erected upon supporting stanchions along all open sides of the roof. The height of the line should be between 34" (.86 m) and 39" (1 m). The warning line shall be marked at minimum 6' (1.8 m) intervals with high visibility flagging. Warning lines shall have a minimum tensile strength of 500 lbs. and be capable of resisting a force of 16 lbs. applied perpendicularly at a height of 30" (.8 m).

Warning lines must be set back from the leading edge a minimum of 6' (1.8 m). Where mobile equipment is in use on the roof, the warning line shall be set back a minimum of 10' (3.1 m) on the side's perpendicular to the direction of travel.

Personnel working inside the areas demarcated by warning lines may do so without the use of additional fall protection systems. However, workers accessing the area between a roof leading edge and a warning line must be protected by a personal fall arrest or restraint system, guardrail system, or safety net system. The Contractor should post signs on the warning line indicating that additional means of fall protection is required beyond the line.

Points of access, materials handling areas and storage areas in the work area shall be provided with a clear access path formed by two warning lines. When the path to a point of access is not in use, place a barrier (gate) equal in specifications to the warning line system along the adjacent leading edges.

10.2 Safety Monitoring Systems

The use of safety monitoring systems is prohibited on the Lusail Real Estate Development site.

10.3 Controlled Access Zones (CAZ)

A controlled access zone (CAZ) is similar to a warning line system and is used predominantly along leading edges. When CAZ's are used, they shall be defined by a control line erected not less than 6' (1.8 m) or more than 25' (7.7 m) from the unprotected or leading edge. Control lines shall consist of rope, or wire rope with supporting stanchions.

When erecting precast concrete members, the control line shall be erected up to 60' (18 m) or half the length of the member being erected, whichever is less, from the leading edge.

When used to control access to areas where masonry work is occurring the control line shall be erected not less than 10' (3.1 m) or more than 15' (4.5 m) from the active working edge.

Each control line shall be erected to ensure that the line is between 39" (1 m) and 45" (1.3 m) above the floor, deck, or platform. The control line shall have a minimum tensile breaking strength of 200 lbs. and shall be provided with high visibility flagging or other suitable material at not more than 6' (1.8 m) intervals.

The control line shall extend along the entire length of the leading edge and should be erected as parallel as possible to the leading edge. The control line shall be connected on each side to a guardrail system, wall, structural column, or rated stanchion.

Only those persons required to work in the CAZ shall enter the CAZ. The Contractor shall post signs to this effect along the entire length of the control line(s). Workers entering the CAZ shall be protected by additional means of fall protection in the form of personal fall arrest or restraint, guard rail systems, or safety nets. Signage posted along the control line shall clearly state these requirements in all languages relevant to the work force.

The Contractor must ensure that workers entering the CAZ are provided with adequate fall arrest or restraint anchors. Anchors must meet all requirements as specified in Section 6.6.

11. Non-Conventional Methods

Conventional methods of fall protection may not always be feasible in some work areas. Depending upon the nature of the work activity, work area configuration, or design of the structure, the Contractor's qualified person may determine that conventional methods of fall protection may not be feasible or may create a greater hazard to the worker.

This determination; however, does not relieve the Contractor from providing fall protection for all workers exposed to falls in excess of 6' (1.8 m). In such cases, non-conventional methods may be employed under the following conditions:

- Rationale for the use of non-conventional methods of fall protection is submitted to Lusail with explanation of why conventional methods are infeasible or create greater danger to workers.
- The system employed must be designed and approved by a registered Engineer as being capable of meeting or exceeding applicable specifications of conventional fall protection methods. The system must be engineered to accommodate the maximum number of workers anticipated as requiring fall protection.
- The Contractor qualified person has provided documentation, data, schematics, etc. to the Lusail which support the system proposed as meeting conventional fall protection systems specifications.

Only those workers trained on the specific non-conventional method(s) of fall protection in use in any particular work area shall be permitted to enter that area. The Contractor must post signs to this effect.

Prior to resorting to non-conventional methods of fall protection Contractors are advised to consider whether construction means and methods may be modified to use aerial lifts, or scaffolding. Any and all activities which can be performed at ground level will minimize the overall extent to which workers are required to use non-conventional methods of fall protection.

In addition to the above conditions, a Contractor “Fall Protection Plan” should be written to identify each location on the project site where fall protection methods (conventional and non-conventional) cannot be used (areas must be specifically designated in some manner). The plan must identify each worker, by name, who is authorized and trained to work in those areas. The Fall Protection Plan shall be implemented in accordance with QCS 2010 and international best practices.

12. Inspection and Testing

Prior to use of any fall protection device, the user/ owner shall be required to perform a thorough visual inspection. Defective equipment identified during visual inspections shall be immediately taken out of service and destroyed by the Contractor. Such instances shall be reported to the HSE Representative or competent person.

On no less than a monthly basis, the Contractor shall perform and document inspection of fall protection equipment using Form (Attachment [LUS-HSE-FM4-446-044](#)) “Fall Protection Equipment Inspection Form” or the inspection record attached to the fall protection device (i.e., full body harness). Inspection records shall be retained on site by the HSE Representative or competent person.

Only fall protection equipment manufactured by a registered and licensed fall protection equipment manufacturer shall be used on that Lusail Project. The HSE Representative or competent person is responsible for oversight of fall protection equipment procurement. Equipment must be ANSI or EU listed.

Equipment will arrive from the manufacturer with certification testing documentation. Documentation of certification testing shall be provided with the equipment upon arrival on site. Equipment mobilized from another Contractor project or warehouse shall be accompanied by documentation certifying the equipment as meeting manufacturer’s specifications. This documentation is to be filed on site and managed by the competent person.

Personal fall arrest equipment, or fall protection equipment used for purposes other than fall protection shall be immediately removed from service and destroyed by the Contractor.

13. Emergency Rescue Planning

The Contractor shall be adequately prepared to respond to worker falls from height. Be it provided by internal rescue teams and equipment or by use of an external response agency, a means of emergency rescue must be identified and used for workers using personal fall arrest systems on site.

The response plan and responders must be capable of responding to falls which occur in all potential work areas and at all potential heights above the ground. This plan shall be determined and detailed in the Contractors fall protection plan (Plan).

Ideally, workers who have fallen in their personal fall arrest system will be able to rescue themselves; however, this is not always possible. The Contractors plan will stress the need for expedient response as extended duration suspension may cause the worker to lose adequate blood flow to the legs. This situation can result in serious medical issues.

Rescue service options may include use of aerial lifts and scissor lifts, or crane-suspended man baskets. The Contractor shall conduct regular drills (at least annually) to ensure the effectiveness of their response plan and the response techniques available and planned.

14. Training

All personnel who will be exposed to fall hazards in excess of 6' (1.8 m) shall be provided with comprehensive training by the Contractor on the Contractors and Lusail's requirements for fall protection at the Lusail Project site.

Training will identify areas and work activities on site where fall protection methods will be required and implemented. The training will instruct workers on techniques to avoid fall exposure and the limitations of fall protection methods in use.

The Contractor HSE Representative will ensure fall protection training is provided to workers at the time of initial assignment, annually at a minimum, when a new or modified method of fall protection is to be employed, and following violation of fall protection policy.

Lusail's fall protection policies are ZERO tolerance policies. Worker violation of fall protection requirements shall warrant immediate retraining and disciplinary action as necessary. Repeat violation of fall protection policy shall warrant disciplinary action up to and including termination.

Fall protection training shall be conducted by a competent person only who is well versed and knowledgeable in fall protection systems, their applicability, limitations of fall protection systems, and Lusail's fall protection policies.

15. Documentation

The HSE Representative documents and retains all training and inspection records, certification testing documentation, manufacturer's specifications for fall protection systems and Engineer's specifications for non-conventional fall protection system and archives them for a minimum retention time of 10 years from creation date.

The project fall protection plan (Plan) shall be retained on site, in the office and made available to all personnel exposed to fall hazards.

16. References

Qatar Construction Specifications 2010 Section 1 Part 10.3.13 "Working at Height"

Qatar Construction Specifications 2010 Section 1 Part 10.7 "Welfare of Workmen"

Qatar Construction Specifications 2010 Section 11 Part 1.3 "Working at Heights"

17. Attachments

[LUS-HSE-FM4-446-044](#)

Fall Protection Equipment Inspection Form