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TEXAS WOMAN'S UNIVERSITY

FALL PROTECTION PROGRAM

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Appendix A – TWU Fall Protection Standards for New Construction/Renovations

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1.0 Program Introduction

Texas Woman's University (TWU) is dedicated to the protection of its employees and students from all on-the-job injuries. All employees of TWU have the responsibility to work safely on the job. The goals of the Fall Protection Program are to (a) supplement the University's standard of safety, by providing additional safety standards designed to cover fall protection on the job, and; (b) to ensure that each employee is trained and made aware of the requisite safety provisions, prior to the start of work.

1.1. Scope

This Fall Protection Program establishes the precautions, training, responsibilities, requirements and methods, which are to be used by all TWU employees and students while working or operating in an elevated workspace.

1.2. Purpose

This program is designed to enable employees and students to recognize the fall hazards at TWU and to establish the procedures that are to be followed in order to prevent falls to lower levels or through holes and openings in walking or working surfaces. Each employee exposed to fall hazards will be trained in these procedures and will strictly adhere to them, except when doing so would expose the employee to a greater hazard. In such a situation, the employee is to notify Risk Management of his or her concerns; these will be addressed before proceeding.

1.3. Review of Program

The Fall Protection Program will be reviewed at least once a year by Risk Management. This review will encompass changes in regulations, newly identified safety hazards related to fall protection, changing demands of the program for the campus, and changes in technology.

1.4. References

29 CFR 1926.501 – Construction Industry Rules for Duty to Have Fall Protection. This standard

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establishes the requirements of when to use fall protection.

29 CFR 1926.502 – Construction Industry Rules for Fall Protection Systems Criteria and Practices. This standard establishes specific methods of fall protection.

29 CFR 1926.503 – Construction Industry Rules for Training Requirements. This standard establishes the requirements for fall protection training.

29 CFR 1910.23, 66, 67 – Applicable General Industry Rules for Walking/Working Surfaces, Powered Building Maintenance Platforms, and Aerial Lifts

ANSI A10.14-1991 – American National Standard for Construction and Demolition Operations. This establishes the requirements for harnesses, lanyards and lifelines for construction and demolition use.

1.5. Definitions

Anchorage – A secure point of attachment to which lifeline, lanyards or deceleration devices are affixed. An anchorage is often a beam, girder, column, floor, etc.

Body Belt/Safety Belt – A strap with means both for securing it about the waist and for attaching it to a lanyard, lifeline, or deceleration device. The use of a body belt is for positioning or carrying tools only and **NEVER** to be used for fall arrest.

Carabiner – A trapezoid or oval shaped connector component with a gate or similar arrangement that remains closed until it is intentionally opened for connection or disconnection. Only self-locking carabiners may be used with fall protection equipment systems at TWU.

Competent Person – A person who is capable of identifying hazardous or dangerous conditions in the personal fall arrest system or any component thereof, as well as in their application and use with related equipment.

Deceleration Device – Any mechanism, such as a rope grab, rip-stitch lanyard, automatic self-retracting lifelines or lanyards etc., which serves to dissipate a substantial amount of energy during

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a fall arrest, or otherwise limit energy imposed on an employee during fall arrest.

Descent Device – A device or piece of equipment used to escape from an elevated structure such as a work platform, tower, column, etc.

Energy Shock Absorber – a device that limits shock-load forces on the body. Some lanyards have built-in shock absorbers. Most energy shock absorbers are made of a webbing material with tear away stitching designed to gradually absorb the fall arrest load.

Fall Arrest System – A system specifically designed to secure, suspend, or assist in retrieving a worker in or from a hazardous work area. A fall arrest system may not prevent a fall, but it will reduce the fall distance and prevent or reduce injury. The basic components of a fall arrest system include an anchorage, anchorage connector, lanyard, shock absorber, full body harness and self-locking snap hook.

Fall Hazard – A condition or situation that could result in a fall.

Fall Prevention – Eliminating fall hazards during all phases of work at heights, including access and egress. Examples of fall prevention measures include the use of complete scaffolds, aerial lifts, etc.

Fall Protection Systems – will normally consist of one or a combination of the following three systems: Guardrail Systems, Safety Net Systems, and Personal Fall Arrest Systems.

Free Fall – The act of falling before the personal fall arrest system begins to react by applying force to arrest the fall.

Full-Body Harness – A device with straps that can be attached to a fall arrest system. The straps are fastened around a person's body to contain the torso and distribute fall arrest forces over at least the

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upper thighs, pelvis, chest and shoulders.

Guardrail/Handrail System – A barrier erected to prevent employees from falling to lower levels.

Lanyard – A flexible line that secures a person wearing a harness to an anchorage, anchorage connector, or dropline. A lanyard must have a minimum breaking strength of 5,000 pounds.

Lifeline – A flexible vertical or horizontal line, secures to an anchorage or between two anchorages, to which a lanyards or harness can be attached.

One-Hundred Percent Fall Protection – A fall arrest system that utilizes a continuous connection to an anchorage point. “Y” type lanyards, double lanyards, retractable lifelines, ladder climbing devices, rope grabs, horizontal lifeline systems, etc. are typically used to maintain a continuous connection.

Qualified Person – One who, by possession of a recognized degree or professional certificate, or by extensive knowledge and experience in the subject field who is capable of design, analysis, evaluation and specifications in the subject work, project or product.

Retractable Fall Limiting Lifeline – A fall arrest-device that allows free travel without slack rope, but locks instantly when a fall begins. Retractable lifelines may be used when vertical movement is required but must be limited, such as in tanks, manholes, or on roofs.

Rollout – A process by which a snap hook or carabiner unintentionally disengages from another connector or object.

Self-locking Snap Hook – A hook-shaped connector with a gate or latch that remains closed and locked until it is intentionally opened for connection or disconnection. When the latch is released, it automatically closes.

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Self-Retracting Lifeline – A fall arrest-device that allows free travel without slack rope, but expands to the full length before the Energy Shock Absorber is activated. This is opposed to a Retractable Fall Limiting Lifeline which allows free travel without slack rope, but also locks when a fall begins.

Skylight Screens – adequate guards for skylights must be of such construction and mounting that they are capable of withstanding a load of at least 200 pounds applied perpendicularly at any one area on the screen. They shall also be of such construction and mounting that under ordinary loads or impacts, they will not deflect downward sufficiently to break the glass or plastic below them. The construction shall be of grillwork with openings not more than 4 inches long or of slatwork with openings not more than 2 inches wide with length unrestricted.

Standard Railing – consist of top rail, intermediate rail, and posts, and shall have a vertical height of 42 inches nominal from upper surface of top rail to floor, platform, runway, or ramp level. The top rail shall be smooth-surfaced throughout the length of the railing. The intermediate rail shall be approximately halfway between the top rail and the floor, platform, runway, or ramp. The ends of the rails shall not overhang the terminal posts except where such overhang does not constitute a projection hazard. These are the minimum requirements for railings in areas not accessible to the general public. For railings in areas that are potentially accessible to members of the public, railings shall comply with all applicable building codes and standards.

Standard Toeboard – shall be 4 inches nominal in vertical height from its top edge to the level of the floor, platform, runway, or ramp. It shall be securely fastened in place and with not more than 1/4-inch clearance above floor level. It may be made of any substantial material either solid or with openings not over 1 inch in greatest dimension.

Unprotected sides or edge – A walking or working surface six feet or greater in height above another

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surface without means to protect employees from falling to the surface below

2.0 Responsibilities

- a) **Management** – It is the responsibility of TWU management to implement this Fall Protection Program. TWU is responsible for continual observational safety checks of their work operations and to enforce the safety policy and procedures.
- b) **The Immediate Supervisor** – It is the responsibility of the immediate supervisor of employees, or the staff or faculty member overseeing students, to assure compliance with this Fall Protection Program. The immediate supervisor is responsible for the continual observational safety checks of the work, enforcement of safety policies and procedures and correction of any unsafe acts or conditions immediately.
- c) **Employee** – It is the responsibility of the employee to understand and adhere to the work plan and to follow the instructions of their immediate supervisor. It is also the responsibility of the employee to bring to management's attention any unsafe or hazardous conditions or acts that may cause injury to either themselves or any other employee, student or visitor to TWU.

3.0 Procedure

This Fall Protection Program will utilize a three-step systematic approach for protecting people from falls.

- a) **Elimination of fall hazards** is the first and best line of defense against falls from heights. A careful assessment of the work and the workplace in the early stages of design/engineering and during all phases of work planning is essential. Questions should be raised about fall protection by a competent and or a qualified person regarding the worksite and the work itself (this responsibility will generally fall to Risk Management). It is imperative that fall protection

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design be considered for the safety of employees that must work at heights, which also includes their safety during access and egress from elevated work sites. Addressing fall protection in the early phases of a project means that safety can be designed into the work process, not added as an afterthought. An example might include mounting equipment that requires service where there are no fall hazards, e.g. not on the roof of a building.

- b) **Prevention of falls** is the second line of defense when fall hazards cannot be entirely eliminated. This also requires an assessment of the workplace and process. It involves making changes to the workplace so as to preclude the need to rely on the worker's behavior and personal protective equipment to prevent falls. Examples include the use of stairs (versus ladders, etc.), guardrails, articulate booms, complete scaffolds, and hole covers. The techniques deal with preventing the fall before it happens.
- c) **Control of falls** is the last line of defense and incorporates the use of fall arrest equipment. This step should only be considered after determining that the fall hazard cannot be eliminated or the possibility of falling prevented. It includes such equipment as full body harnesses, lanyards, shock absorbers, lifelines, and anchorage connectors. Fall protection necessitates a careful assessment of the workplace in order to select the most appropriate equipment and to install and use it properly.

3.1. Tasks Requiring Fall Protection

- o Any task that requires an employee or student to be within 6 feet of an edge that is 4 feet or more above a lower level is to be protected from falls to the lower level via a standard railing or parapet wall (meeting the minimum standards for a standard railing) or personal fall restraint or fall arrest system.
 - a. Skylights or any other roof surface not designed to support personnel must be treated the same

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as an unguarded edge under these procedures.

- b. Excavation and holes in walking/working surfaces greater in depth than 4 feet are also subject to this procedure, but may also use a cover capable of supporting the expected weight of traffic as fall protection where required. Whenever the cover is out of place, the excavation or hole must be continuously attended by someone outside of the 6 foot perimeter, or one of the other fall protection methods must be used.
- o At heights less than 4 feet, fall protection might also be required if there is a significant risk of personal injury considering the work environment, working conditions, good footing etc. For example, work near an unprotected edge where dangerous equipment is present below, or where the walking surface is slippery may require use of a personal fall arrest system. Supervisors should work with Risk Management to identify such situations.
- o If a fall hazard is not eliminated through standard railings or parapet walls, then a personal fall restraint or fall arrest system shall be required as per the following:
 - c. Fall restraint or personal fall arrest systems will provide 100% tie off within 6 feet of the edge, and ANYWHERE on roofs with a slope of four inches to twelve inches or greater (vertical to horizontal). In other words, employees or students need to be connected to an anchorage point 100% of the time. This will require the use of dual leg lanyards or a horizontal fall protection system if the task requires employees or students to move within the 6 foot boundary farther than a single lanyard will allow.
 - d. Any task on aerial lifts, articulate booms, order pickers, scissor lifts and similar equipment. For scissor lifts and similar work platforms that only travel straight up and down are equipped with standard railings, and are used on solid/stable surfaces, no further fall protection is required. Other lifts will require the use of a retractable fall limiting lifeline even with full

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standard railings. Personal fall arrest systems will be used with all equipment for which the manufacturer requires it, including scissor lifts.

- Work involving scaffolding does not require fall protection if the scaffolding is properly assembled in accordance with OSHA requirements (e.g. full decking, railings, toeboards, proper ladder or stairs for access to each level of decking, etc.). Employees and students should contact Risk Management for approval of any scaffolding use. OSHA requires inspection and approval of scaffolding on a daily basis prior to use. These inspections will be conducted by Risk Management.
- Ladders also do not require fall protection as long as three points of contact are maintained at all times (i.e. both feet and one hand, both feet and midsection, both hands and one foot while climbing, etc.). However, use of fall protection is recommended if there is an increased risk of falls/injury due to the task in question. For example, working from a ladder that is adjacent an edge that an employee or student would fall off if they fell from the ladder.

3.2. Workplace Assessments for Equipment Selection

Prior to selecting fall protection equipment for each task, the user shall make an assessment of workplace conditions where the equipment is required. The assessment shall, as a minimum, identify the presence of hazards including but not limited to, hot objects, sparks, flames and heat producing operations, chemicals, electrical hazards, sharp and abrasive edges, unguarded opening, sand blasting, and weather factors. The equipment must match the work situation and workplace environmental factors.

The workplace assessment shall identify all paths of intended user movement and all fall hazards along such paths. The user shall note the location and distances to all obstructions in the potential fall paths.

3.3. Equipment Attachment and Use

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Fall protection equipment shall be rigged in a way that minimizes the free-fall distance should a fall occur and preclude the presence of vertical and lateral obstructions in the potential fall path. The rigging shall take into consideration the rescue plan and rescue equipment provision for retrieval of the user of the fall protection equipment.

- The attachment point of the full body harness (the “D” ring) shall be located in the center of the wearer’s back near shoulder level.
- The anchorage point should be located directly above the user’s head whenever possible to prevent a pendular swinging effect during the fall arrest. Hazards must be eliminated in the potential swing arc if this is not possible.
- Anchorages selected shall be stable and substantial enough to withstand a minimum of 5,000 lbs, or shall be specifically designed to meet OSHA and ANSI standards by a competent person. When more than one fall arrest device is attached to an anchorage point, the above strengths shall be multiplied by the number of devices attached to that particular anchorage. Examples of potentially acceptable anchorage points include: beams, girders, columns, other building steel, floors, or other designed anchorage points.
- DO NOT TIE OFF TO CONDUIT, CABLE TRAYS, DUCTWORK, COPPER PIPING, SMALL DIAMETER PIPE, CAST IRON PIPE, PLASTIC PIPE OR ANY PIPE HANGARS.
- Do not tie off around “H” or “I” beams unless a webbing beam-strap, cross arm strap or other equivalent connector is used. Avoid tying off around rough or sharp edges. Do not tie a knot in lanyards, lifelines or anchorage connectors. The use of knots will reduce their strength.
- **Only** self-locking snap hooks and carabiners will be used with fall protection equipment at TWU.
- Self-locking snap hooks and carabiners shall be compatibly matched to their associated connector to reduce the possibility of a roll out. e.g. carabiners will not be connected to carabiners and snap hooks will not be connected to snap hooks, or other incompatible connections.

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- A suitable anchorage connector such as a cross arm strap, eye bolt, mounted d-ring, beam clamp, beam trolley etc. must be used for attaching the connection of lanyards and lifelines to structural members. The exception to this are lanyards that are specifically designed to be connected back to themselves.
- Lanyards and lifelines with shock absorbers shall be installed in a manner that prevents structural interference with the absorber's function. Shock absorbers must all be used as per all manufacturer instructions, including which end of the lanyard connects to the harness and which connects to the anchorage point!
- When vertical lifelines are used, each employee shall be provided with a separate lifeline.
- Any component of a fall arrest system that has been exposed to a fall shall be **taken out of service immediately!**
- Fall arrest equipment is not to be used for any other purpose other than fall arrest. Examples of improper usage include rigging and hoisting.
- Employees shall not alter fall protection equipment without Risk Management approval. An incident investigation shall be conducted if fall arrest equipment is found to have been altered and disciplinary action may be taken.

4.0 Training

Prior to work requiring fall protection equipment, users shall be trained by a competent person to select, inspect, use, store, and maintain the equipment. Training should include the following:

- Selection of equipment, how to use fall protection equipment, and its limitations.
- Proper methods of donning, adjusting, and interconnecting of the equipment
- Proper attachment methods including compatibility of the size of the snap hooks, d-rings, and other connections to reduce the probability of accidental disengagement
- How to determine total fall distance to prevent striking a lower level

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- Environmental and workplace factors in the selection of equipment such as sharp or abrasive edges on a beam or girder to which an individual would tie off, hot objects, or other hazards that might be present
- Inspections of the work environment and the equipment prior to the use of fall protection equipment
- Proper storage techniques

Refresher training shall be conducted for employees or students as required due to unfamiliarity with the equipment, or if the employee or student does not have the necessary skills to use the fall protection equipment, or to follow mandated procedures. Refresher training shall also be conducted for employees if previous training or equipment is rendered obsolete.

4.1. Inspection and Identification of Equipment

The USER shall inspect fall protection equipment BEFORE each use for the following:

- Webbing fabrics for cuts, tears, mildew, enlarged eyeholes, or other signs of wear that might affect strength stitching for breaks, ragged strands, loose or rotted threads, and for other signs of weakening
- Metal hardware for breaks, cracks, fractures, loose anchorage, or other signs of wear or deterioration which might affect the strength of the equipment or the action of the fastening devices
- Lifelines and lanyards for frayed or broken strands, cuts, and abrasions. Inner fibers should be examined for breaks, discoloration, and deterioration. Particular attention should be given to snap hooks and the splices connecting them to the lanyard
- Any fall arrest system that has been altered shall be placed out of service and an incident investigation must be conducted.

4.2. Annual Inspection

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Annually a competent person designated by Risk Management shall inspect full body harnesses, energy shock absorbing lanyards, anchorage connector straps, permanent anchorage points, and lifelines (including permanently installed horizontal lifelines) for the following:

- Absence or illegibility of marking
- Absence of any elements affecting the equipment form, fit or function
- Evidence of defects in or damage to hardware elements, including cracks, sharp edges, deformation, corrosion, alteration, excessive wear, and any other defects
- Evidence of defects in or damage to straps or ropes including fraying, unsplicing, kinking, knotting, broken or pulled stitches, excessive elongation, excessive soiling, abrasion, alteration, mildew, excessive aging, and excessive wear
- Absence of parts or evidence of defects in, damage to, or improper function of mechanical device and connector
- Inspections shall be recorded by Risk Management and shall be marked or tagged on an inspection, card if the equipment is so equipped, indicating the date of inspection. When equipment reveals defects in, damage to, or inadequate maintenance of equipment, the equipment shall be permanently removed from service and destroyed.
- Equipment shall be sent to the manufacturer for inspection if required by the specific manufacturer of the equipment.

4.3. Care, Service Life, and Storage of Equipment

- Fall protection equipment subjected to a fall, shock, or any drop loading shall be taken out of service and either evaluated by the manufacturer or destroyed.
- Fall protection equipment shall be kept in a clean condition and stored in a clean, dry area at normal temperature so as not to be damaged from environmental factors such as heat, light, excessive

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moisture, oil or other degrading elements.

- All fabric webbing harnesses, lanyards, and anchorage connecting straps can be washed in mild detergent, rinsed, and dried in a warm area when they become dirty.
- When hanging a harness up, use the D-ring to put the harness on the hook. This will help to eliminate the wear and tear on the harness.

4.4. Personal Fall Arrest Systems

A personal fall arrest system is fall protection equipment which attaches a person to a rigid structural member through a system of harnesses, lanyards, lifelines and anchorage points to arrest and limit the fall of a worker. Requirements for using a personal fall arrest system are detailed as follows:

- Connecting devices shall be purchased from a reputable source and shall be forged, pressed or formed steel, or made of equivalent materials. These connectors shall have a corrosion resistant finish, and all surfaces and edges shall be smooth to prevent damage to interfacing parts of the system.
- The manufacturer will certify that the D-rings and snap hooks shall have a minimum tensile strength of 5,000 pounds. The D-rings and snap hooks shall be proof tested to a minimum tensile load of 3,600 pounds without cracking, breaking, or taking permanent deformation. Only locking type snap hooks and carabiners shall be used.
- On suspended scaffolds, or similar work platforms with horizontal lifelines (which may become vertical lifelines), the devices used to connect to a horizontal lifeline shall be capable of locking in both directions on the lifeline. Horizontal lifelines shall be designed, installed, and used, under the supervision of a qualified person, as part of a complete Personal Fall Arrest System, which maintains a safety factor of at least two.
- Vertical lifelines shall have a minimum breaking strength of 5,000 pounds and shall be protected against being cut or abraded. Self-retracting lifelines, which automatically limit free fall distance to

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2 feet or less, shall be capable of sustaining a minimum tensile load of 3,000 pounds applied to the device, with the lifeline or lanyard in the fully extended position. Self-retracting lifelines that do not limit free fall distance to 2 feet shall be capable of sustaining a minimum tensile strength of 5,000 pounds applied to the device with the lifeline in the fully extended position. Ropes and straps (webbing) used in lifelines shall be made from synthetic fibers. Each employee shall be attached to a separate lifeline.

- Lanyards shall have a minimum breaking strength of 5,000 pounds. Self-retracting lanyards which automatically limit free fall distance to 2 feet or less shall be capable of sustaining a minimum tensile load of 3,000 pounds applied to the device with the lanyard fully extended. Self-retracting lanyards which do not limit free fall distance to 2 feet or less, rip-stitch lanyards, and tearing and deforming lanyards shall be capable of sustaining a minimum tensile load of 5,000 pounds applied to the device with the lanyard in the fully extended position. Ropes and straps (webbing) used in lanyards and strength components of body belts and body harnesses shall be made from synthetic fibers.
- Anchorages used for attachment of personal fall arrest equipment shall be independent of any anchorage being used to support or suspend platforms and capable of supporting at least 5,000 pounds per employee attached, or shall be designed, installed, and used as part of a complete personal fall arrest system which maintains a safety factor of at least two and under the supervision of a qualified person.
- Personal fall arrest systems, when stopping a fall, shall limit maximum arresting force on an employee to 1,800 pounds when used with a body harness. The personal fall arrest system shall be rigged such that an employee can neither free fall more than 6 feet nor contact any lower level and bring an employee to a complete stop and limit the maximum deceleration distance an employee travels to 3.5 feet. The Personal Fall Arrest System shall also have sufficient strength to withstand the potential impact energy of an employee free falling a distance of 6 feet, or the free fall distance permitted by the system, whichever is less.

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- Body belts are NOT acceptable as part of a personal fall arrest system.
- These guidelines and procedures are good practice for workers with combined body and tool weight less than 310 pounds. If the system is used by an employee having a combined tool and body weight of 310 pounds or more, then the system must be appropriately modified according to the manufactures' standards to provide the proper protection.
- The attachment point of the body harness shall be located in the center of the wearer's back near shoulder level, or above the wearer's head. Body harnesses and components shall be used only for employee protection (as part of a personal fall arrest system) and not to hoist materials.
- Personal fall arrest systems and components subjected to impact loading shall be immediately removed from service and shall not be used again for employee protection.
- The employer shall provide for prompt rescue of employees in the event of a fall or shall assure that employees are able to rescue themselves.
- Personal fall arrest systems shall be inspected before each use for wear, damage and other deterioration, and defective components shall be removed from service.
- Personal fall arrest systems shall not be attached to guardrail systems, nor shall they be attached to hoists.

4.5. Guardrail Systems

A guardrail system utilizes a horizontal rigid structural device along with toe-boards, webbing or mid rails to restrict personnel from a fall hazard. Guardrail systems and their use shall comply with the following provisions:

- Top edge height of top rails, or equivalent guardrail system members, shall be 42 inches (1.1 m) plus or minus 3 inches (8 cm) above the floor or walking area. When conditions warrant, the height of the top edge may exceed the 45-inch height, provided the guardrail system meets all other criteria of this section.

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- When employees are using stilts, the top edge height of the top rail, or equivalent member, shall be increased an amount equal to the height of the stilts or the employee will be required to utilize fall protection equipment.
- Mid-rails, screens, mesh, intermediate vertical members, or equivalent intermediate structural members shall be installed between the top edge of the guardrail system and the walking/working surface when there is no wall or parapet wall at least 21 inches (53 cm) high. Mid-rails, when used, shall be installed at a height midway between the top edge of the guardrail system and the walking or working level. Screens and mesh, when used, shall extend from the top rail to the walking or working surface level and along the entire opening between top rail supports. Intermediate members (such as balusters) when used between posts, shall be not more than 19 inches (48 cm) apart. Other structural members (such as additional mid-rails and architectural panels) shall be installed such that there are no openings in the guardrail system that are more than 19 inches (.5 m) wide.
- Guardrail systems shall be capable of withstanding, without failure, a force of at least 200 pounds applied within 2 inches on the top edge, in any outward or downward direction, at any point along the top edge. When the 200 pound test load is applied in a downward direction, the top edge of the guardrail shall not deflect to a height less than 39 inches above the walking or working level.
- Midrails, screens, mesh, intermediate vertical members, solid panels, and equivalent structural members shall be capable of withstanding, without failure, a force at least 150 pounds applied in any downward or outward direction at any point along the midrail or other member.
- Guardrail systems shall be so surfaced as to prevent injury to an employee from punctures or lacerations, and to prevent snagging of clothing.
- Top rails and mid-rails shall be at least one-quarter inch nominal diameter or thickness to prevent cuts and lacerations. If wire rope is used for top rails, it shall be flagged at not more than 6-foot intervals with high visibility material. Manila, plastic or synthetic rope being used for top rails or mid-rails shall be inspected as frequently as necessary to ensure that it continues to meet the

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strength requirements of this section.

- When guardrail systems are used at hoisting areas, a chain, gate or removable guardrail section shall be placed across the access opening between guardrail sections when hoisting operations are not taking place.
- When guardrail systems are used at holes, they shall be erected on all unprotected sides or edges of the hole.
- When guardrail systems are used around holes used for the passage of materials, the hole shall have not more than two sides provided with removable guardrail sections to allow the passage of materials. When the hole is not in use, it shall be covered over with a cover, or a guardrail system shall be provided along all unprotected sides or edges.
- When guardrail systems are used around holes, which are used as points of access (such as ladder ways), they shall be provided with a gate, or be so offset that a person cannot walk directly into the hole.
- Guardrail systems used on ramps and runways shall be erected along each unprotected side or edge.
- Toeboards are required around walking or working surfaces if persons below are exposed to hazards from being struck by falling tools or equipment that are kicked off or dropped from above.

5.0 Emergency Response Plan

TWU requires all employees or students who are using fall protection equipment to have a second person present who has been trained as per this program. A method to summon rescue assistance (e.g. mobile phone) must be carried by the attendant or by both persons if they are both using fall protection equipment. The attendant will call DPS, provide detailed information of incident, and instruct DPS to notify the local fire department immediately for assistance.

Specially trained employees designated by Risk Management will be permitted to begin rescue procedures using specialized retrieval equipment. DPS will be made aware of what capabilities TWU

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employees have so they can be notified as is appropriate in emergency situations.

5.1. Variances

Any variance from the requirements of this Fall Protection Program must be approved by Risk Management. Risk Management will only approve variances for situations where complying with this program is impossible, and where alternate safety measures can be implemented to protect employees, students and TWU visitors.

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FALL ARREST SYSTEM CHECKLIST

ANCHORAGE POINTS

- ✓ Do fall arrest system users know appropriate anchorage points for each task that requires a fall arrest or restraint system?
- ✓ Are all anchorage points stable, substantial, and have sufficient strength to withstand twice the potential impact energy of the free-fall or 5,000 lbs minimum?
- ✓ If the lifeline, lanyard, or self-retracting lifeline is not permanently attached to an anchorage point at the elevated work area, is the first person up or the last person down protected while climbing and traversing?

VERTICAL LIFELINES

- ✓ Does the lifeline have a minimum breaking strength of 5,000 pounds (2,268 kilograms)?
- ✓ Is the lifeline protected from abrasive or cutting edges?
- ✓ Does the system provide fall protection as the worker connects to and releases from the lifeline?
- ✓ Is the lifeline arranged so workers never have to hold it for balance? (A lifeline should never be used for balance.)
- ✓ Is the vertical segment integrated with the horizontal segment (if present) to provide continuous fall protection?

HORIZONTAL LIFELINES

- ✓ Has the entire horizontal lifeline system been designed and approved by a competent person?
- ✓ Have the anchorages to which the lifeline is attached been designed and evaluated specifically for a horizontal lifeline?
- ✓ Has the designer of the system approved the number of workers who will be using it?
- ✓ Is the rope or cable free from signs of wear or abrasion?

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- ✓ Does the rope or cable have the required initial sag as per manufacturer?
- ✓ Have the clearances been checked?
- ✓ Is the hardware riding on the horizontal lifeline made of steel? (Aluminum is not permitted because it wears excessively.)

LANYARDS

- ✓ Is the lanyard length as short as possible and in no case greater than 6 feet (1.8 meters)?
- ✓ Are manually adjustable or self-retracting lanyards used when it is desirable to be able to take slack out of the lanyard?
- ✓ Does the lanyard have a shock-absorbing feature to limit the arresting forces to 500-600 pounds (227-272 kilograms)?
- ✓ If the lanyard has a shock absorber, is it obvious to the user that the shock absorber has been deployed (e.g., a warning label, broken pouch)?
- ✓ No knots tied in lifelines or lanyards? Lifelines and lanyards are not connected by tying knots? (Mechanical rope grabs or fall arresters must be used.)

SNAP HOOKS AND CARABINERS

- ✓ Are only double-locking snap hooks and carabiners used?
- ✓ Are snap hooks and carbiners attached to the D-ring, eye bolt, or other hardware in a manner approved by the manufacturer of the snap hook?
- ✓ Are snap hooks and carabiners inspected prior to each use for stress, wear, distortion, and spring failure?
- ✓ Are snap hooks arranged so they are never connected to each other? i.e. are they only connected to D-rings, eye bolts, carabiners, etc. to prevent gate loading or roll out?

BODY HARNESES

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- ✓ Are full-body harnesses selected for a particular job equipped with all necessary attachment points (for fall arresting, work positioning, descent control, rescue, or ladder fall-protection systems)?
- ✓ Are body harnesses inspected prior to each use for wear, abrasion, broken stitching, and missing hardware?
- ✓ Is the Velcro type of closure prohibited from all load bearing connections?
- ✓ Have workers been instructed in the use and care of body harnesses?

OTHER CONSIDERATIONS

- ✓ Has the free-fall distance been considered, so that a worker will not strike a lower surface or object before the fall is arrested?
- ✓ Have pendulum-swing fall hazards been eliminated?
- ✓ Have safe methods to retrieve fallen workers been planned?
- ✓ Is all of the fall-arrest equipment free of potential damage from welding, chemical corrosion, or sandblasts?
- ✓ Are all components of the system compatible according to the manufacture's instruction?
- ✓ Have employees been properly trained in the following issues?
 - Manufacturer's recommendations, restrictions, instructions, and warning?
 - Location of appropriate anchorage points and attachment techniques?
 - Problems associated with elongation, deceleration distance, method of use, inspection, and storage?
- ✓ Are all regular inspections performed by trained inspectors?
- ✓ Are written reports maintained?

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Appendix A

TWU Fall Protection Standards for New Construction/Renovations

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TWU Fall Protection Standards for New Construction/Renovations

Fall protection structures must be provided for all new or renovated portions of Texas Woman's University (TWU) buildings wherever there is the potential for persons to be exposed to falls **four feet or greater** in height from unprotected edges, including all building roofs. TWU considers "unprotected edges" to be any edge or skylight that is not protected by a standard railing (defined below) or parapet wall of at least 42 inches in height.

Fall protection structures must consist of one of the following, or combination thereof, providing full protection (listed in order of preference):

1. Full guard rails meeting the definition below of a standard railing, and equipped with standard toeboards (also defined below) if any persons could be walking below the edge; or
2. Personal fall protection system anchorage points installed parallel to the unprotected edge, located approximately six feet from the unprotected edge, spaced no more than six feet apart; or
3. Personal fall protection system anchorage points installed greater than six feet from the unprotected edge, but no more than 100 feet from any point along the unprotected edge, and positioned so that if a person wearing a self-retracting lifeline or using a vertical lifeline were to fall off the unprotected edge at any point, that person would not strike any obstruction or portion of the building due to swinging; or
4. Horizontal lifeline systems capable of supporting two persons, installed approximately six feet from the unprotected edge (or as per manufacturer specifications).

Skylights must either be provided with standard railings or a skylight screen (defined below).

Anchorage points must be able to support at least 5,000 lbs. Alternately, with prior TWU approval, anchorages may be designed or selected by a qualified person as part of a complete personal fall arrest system which maintains a **safety factor of at least two**. A "qualified person" in this case is someone with a recognized degree or professional certificate and extensive knowledge and experience in the fall protection field who is capable of design, analysis, evaluation and specifying fall protection equipment.

If anchorage points or horizontal lifeline systems must be placed closer than six feet to an unprotected edge due to the layout of the building or structure, additional anchorage points must be provided allowing connection of personal fall protection prior to approaching closer to six feet of the unprotected edge. An example of this would be a building with a narrow roof (less than six foot) surrounding a mechanical room

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with a footprint smaller than the rest of the building. The anchorage points or horizontal lifeline system would necessarily be within six feet of the edge, but an additional anchorage point would be required inside or adjacent the door leading from the mechanical room so that the person on the roof is connected to an anchorage point whenever within six feet of the edge.

A “**standard railing**” shall consist of top rail, intermediate rail, and posts, and shall have a vertical height of 42 inches nominal from upper surface of top rail to floor, platform, runway, or ramp level. The top rail shall be smooth-surfaced throughout the length of the railing. The intermediate rail shall be approximately halfway between the top rail and the floor, platform, runway, or ramp. The ends of the rails shall not overhang the terminal posts except where such overhang does not constitute a projection hazard. These are the minimum requirements for railings in areas not accessible to the general public. For railings in areas that are potentially accessible to members of the public, railings shall comply with all applicable building codes and standards.

A “**standard toeboard**” shall be 4 inches nominal in vertical height from its top edge to the level of the floor, platform, runway, or ramp. It shall be securely fastened in place and with not more than 1/4-inch clearance above floor level. It may be made of any substantial material either solid or with openings not over 1 inch in greatest dimension.

“**Skylight screens**” shall be of such construction and mounting that they are capable of withstanding a load of at least 200 pounds applied perpendicularly at any one area on the screen. They shall also be of such construction and mounting that under ordinary loads or impacts, they will not deflect downward sufficiently to break the glass or plastic below them. The construction shall be of grillwork with openings not more than 4 inches long or of slatwork with openings not more than 2 inches wide with length unrestricted.