ENVIRONMENT, HEALTH & SAFETY
UNIVERSITY OF MICHIGAN

Scaffold, Ladder and Fall Protection Program

Guideline

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Applies To: University employees that work on any elevated work surface where there is a fall hazard of 4 feet or more. University units are required to implement the components of the Fall Protection Program as required by State and Federal regulations.

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Summary

The purpose of this Guideline is to outline a program for planning, procedures and training for University of Michigan employees' safety while working on elevated working surfaces and ladders. A Scaffold, Ladder and Fall Protection ("Fall Protection") Program is necessary for communicating fall hazards to employees. This Guideline identifies departmental responsibilities and the necessary administrative oversight for managing the Fall Protection Program.

Scope

This Guideline applies to all University employees that work on any elevated work surface where there is a fall hazard of 4 feet or more. University units are required to implement the components of the Fall Protection Program as required by State and Federal regulations.

Reference Regulations

- Aerial Work Platforms: MIOSHA Part 58
- Aerial Work Platforms – Construction: MIOSHA Part 32
- American National Standard for Ladders: Fixed – Safety Requirements (ANSI A14.3-2008)
- Fall Arrest Code: ANSI Z359-2012
- Fall Protection – Construction: MIOSHA Part 45
- Fixed and Portable Ladders – Construction: MIOSHA Part 11
- Floor and Wall Openings, Stairways, and Skylights: MIOSHA Part 2
- Guarding of Walking and Working Areas – Construction: MIOSHA Part 21
- Personal Protective Equipment: MIOSHA Part 33
- Personal Protective Equipment – Construction: MIOSHA Part 6
- Powered Platforms for Building Maintenance: OSHA 29 CFR 1910.66
- Scaffolding: MIOSHA Part 5
- Scaffolds and Scaffold Platforms – Construction: MIOSHA Part 12
- Walking-Working Surfaces: MIOSHA Part 2

Glossary of Terms

TERM	DEFINITION
Aerial Lift	A mobile device used to elevate workers to job sites above the ground. It includes extension boom platforms, aerial ladders, articulating boom platforms, scissors lift platforms, vertical towers, or any combination of these.
Authorized Person	A person who is approved and assigned to perform specific types of duties by the employer and who is qualified to perform those duties because of his or her training or experience.
Competent Person	A person who is experienced and capable of identifying an existing or potential hazard in surrounding, or under working conditions, that are hazardous or dangerous to an employee and who has the authority and knowledge to take prompt corrective measures to eliminate the hazards.
Controlled Access Zone	An area where access is controlled and certain work may take place (such as leading edge work or overhand bricklaying) without the use of guardrails, personal fall arrest systems or safety nets.
Coupler	A device which is made of drop-forged steel, malleable iron, structural grade aluminum, or a material of equivalent strength and which is used to lock or join component parts of a tubular scaffold.
Erecting and Disassembling Scaffolding	The process of building or taking down a scaffold to or from its completed state.
Fabricated Frame Scaffold (tubular welded frame scaffold)	A supported scaffold consisting of a platform supported on fabricated end frames with integral posts, horizontal bearers, and intermediate members.
Fall Protection Plan	An optional method of providing fall protection on construction sites during leading edge work, or precast concrete erection, when other means of fall protection are infeasible or create a greater hazard.
Formwork and Reinforcing Steel	The framing and steel reinforcing built in preparation for the pouring and setting of concrete.
Guard Rail System	A barrier erected to prevent employees from falling to a lower level.
Ladder Safety Device	A fall arrest system designed for use while ascending or descending a fixed ladder.
Leading Edge	The edge of a floor, roof, formwork, decking or other walking/working surface, which changes location as additional floor, roof, formwork, or decking is constructed.
Low Slope Roof	A roof with a slope less than or equal to 4 in 12 (vertical to horizontal) or $\leq$ 18.4 degrees.
Mobile Scaffold	A powered or un-powered, portable, caster or wheel mounted supported scaffold.
Outrigger	The structural member of a scaffold used to increase the base width and provide increased support and stability.
Personal Fall Arrest System	A system used to arrest an employee's fall, consisting of an anchorage, connectors, body harness, and may include a lanyard, deceleration device, life line, or combination of these.

TERM	DEFINITION
Positioning Device	A body belt or harness 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 back or in any direction.
Qualified Person	A person who possesses a recognized degree, certificate, professional standing, or skill and who, by knowledge, training, and experience, has demonstrated the ability to deal with problems relating to the subject matter, the work, or the project.
Rated Load	The manufacturer's specified maximum load to be lifted by a hoist or to be applied to a scaffold or scaffold component.
Safety Monitoring System	A system in which a properly trained person is responsible for recognizing and warning employees of fall hazards.
Safety Net System	A method of fall protection on construction sites where a net is erected around the work site where fall hazards exist. This net system must meet specifications outlined in the MIOSHA Fall Protection Standard.
Scaffold	A temporary elevated platform and its supporting structure, used to support employees or materials or both.
Supported Scaffold	A platform supported by outrigger beams, brackets, poles, legs, uprights, posts, frames, or similar rigid support.
Suspension Scaffold	A platform suspended by ropes or other non-rigid means from an overhead structure.
Toeboard	A horizontal barrier that is erected along the exposed edges of an elevated surface to prevent materials, tools, or equipment from falling.
Walking/Working Surface	Any surface, horizontal or vertical, on which an employee walks or works, including but not limited to, floors, roofs, ramps, bridges, runways, formwork, and concrete reinforcing steel; but not including ladders, vehicles, or trailers.
Warning Line System	A barrier erected to warn employees that they are approaching an unprotected side or edge.
Working Load	A load that is imposed by persons, materials, and equipment.
Unstable Object	Items whose strength, configuration, or lack of stability may allow them to become dislocated and shift and may not properly support the loads imposed on them, and cannot be used as a safe base support for scaffolds (includes but not limited to, barrels, boxes, loose brick and concrete blocks).

Responsibility

Deans, Directors and Department Heads

- Designate and empower supervisors who will prepare and implement of the Fall Protection Program within each work unit.
- Actively support this Guideline within individual units.
- Ensure an environment where all employees are encouraged to follow this Guideline.

EHS

- Provide technical assistance on fall protection, scaffold safety or ladder safety when called upon.
- Provide direct training, training guidance as required.
- Inspect fall protection, scaffolds, ladders, and the use of each pursuant to this Guideline, to ensure the safety of University employees.
- Review and revise the Fall Protection Guideline as necessary to comply with government regulations.

Supervisors

- Implement procedures in accordance with this Guideline.
- Ensure that staff is aware of this Guideline, instructed on the details of implementation, and provided with equipment and methods of control. Maintain documentation of the program and training as required.
- Ensure that the equipment required for compliance with this program is in proper working order and made available for use by their employees.
- Promptly investigate and report all on-the-job accidents or job related health problems. Refer to Work~Connections website for reporting information at: http://www.workconnections.umich.edu/employees/work-related-illness-injury/step-one/.
- Contact EHS to request technical assistance and to evaluate health and safety concerns within their unit.

Employees

- Comply with this Guideline and any further safety recommendations provided by supervisors and/or EHS regarding Fall Protection.
- Consult with their supervisor, EHS, or other knowledgeable personnel, when they have questions regarding their safety.
- Report any accidents or job-related injuries or illnesses to their supervisor and seek prompt medical treatment, if necessary.

General

- Employees must be protected from falling hazards on all elevated *walking/working surfaces*. The preferred method of fall protection in all situations is a *guardrail system*.
- All walking/working surfaces must be strong enough to hold the employees working on that surface, their equipment and materials.
- *Scaffolds* must have fall protection, preferably a guardrail system, whenever the scaffold is built higher than one flight or section. When a guardrail system is not used, either safety nets or *personal fall arrest systems* must be used and conform to the same standards required when used in non-scaffold situations.
- Employees using a boom supported or vehicle mounted *aerial lift* will use a personal fall arrest system in addition to the guardrail system designed into the lift.
- Safety belts are only allowed to be used with *positioning devices* and must have attachment rings on both sides of the belt. All other personal fall arrest systems will be used with a full body harness. All detachable hooks used on lanyards and tie-offs will be the locking type.

- Ladders and stairs are not considered walking/working surfaces, but have separate manufacturing and construction specifications for safety, as well as fall hazard safety precautions.
- Aerial work platforms shall not be field-modified for uses other than those intended by the manufacturer, unless the modification has been certified in writing by the manufacturer to be in compliance with applicable ANSI standard(s) and to be at least as safe as the equipment was before modification.

Fall Protection

Permanent Structures

For any permanently built structure, a guardrail system will be installed in areas where there are fall hazards of 4 feet or more and employees are present in the area on a regular basis.

Appendix A contains a fall protection safety checklist for permanent structures.

Temporary or Transient Work Situations

1. Workers must be protected from fall hazards when guardrail systems have been temporarily removed, or when workers are conducting repair, renovation, alteration, or custodial work and there is a fall hazard of 4 feet or more.
2. The three primary methods to protect workers from falls are:
   a. Guardrails.
   b. Safety nets.
   c. Personal fall arrest devices.
3. Other methods of fall protection can be used in specific situations:
   a. Positioning devices may be used when doing concrete *formwork and reinforcing steel* work.
   b. Fences or barricades can be used around excavations, wells, pits or shafts.
   c. Covers can be used over holes, wells, pits, or shafts.
   d. Warning lines with a *controlled access zone*, safety monitor system, or *fall protection plan* can be used during *leading edge* work, on *low slope roofs*, or when overhand brick laying work is being done.

      i. Appendix B contains a table summarizing methods of acceptable fall protection for different situations.

4. When the fall protection methods listed in paragraphs 1 and 2 above are not feasible or will create a greater hazard, then the lead worker/supervisor on the job will consult with EHS to determine a solution.

Protection from Falling Objects

When there is a falling object hazard from any elevated walking/working surface (including scaffolds), employees will wear head protection and use one of the following techniques to reduce the falling object hazard:

- *Toeboards* at least 3½ inches high will be installed on all elevated walking/working surfaces;
- A canopy of sufficient strength to catch all falling objects will be erected below all elevated walking/working surfaces;
- A barricade will be built to keep employees out of the falling object hazard area.

Scaffolds

All scaffolds erected or dismantled will be *supported scaffolds*. Suspended scaffolds will not be used without specific prior coordination with EHS.

Standard supported scaffolds will be the fabricated frame type or tube and *coupler* type. A different type scaffold will not be used without specific prior coordination with EHS.

Construction of Scaffolds

- In general, all supported scaffolds must be capable of supporting 4 times their *rated load*. All job-built or non-prefabricated scaffolds will be designed by a licensed professional engineer and built in accordance with the design.
- Planking will consist of specifically designed hook on platforms or scaffold grade lumber. Lumber planking will extend over the end support at least 6 inches, but not more than 12 inches. If planks are lapped, they will lap at least 6 inches to provide a minimum overlap of 12 inches. The surfaces of planking shall not be covered so as to obscure the surface from inspection.
- All working levels of scaffolds will be fully planked unless the work being done or other considerations preclude it. Any time the scaffold working level cannot be fully planked, personal fall arrest systems must be worn.
- Scaffold components made by different manufacturers will not be mixed together on a single scaffold unless specifically designed to be interchangeable. Scaffold components shall not be physically modified.
- All scaffold platforms and walkways will be at least 18 inches wide and have guardrails on all sides unless the work is being done or safety considerations preclude it. Personal fall arrest systems must be used when guardrails are not present.
- If plywood is used as a work platform, the plywood shall be supported by 2 inch by 10 inch planks. The planks shall support two parallel edges of the plywood and shall also be spaced not more than 24 inches center to center. The plywood work surface is a load-carrying member, it shall have a minimum thickness of ⅝ inches and be attached to the planks.
- Scaffolds higher than 4 base widths must be kept from tipping by using guy wires or attaching to a permanent structure. If *outriggers* are used, they count as part of the scaffold base. Vertically, guy wires or attachments will be placed at 4 times the width height and every 20 feet above or less (for a scaffold $\leq$ 3 feet wide) and every 26 feet above or less (for a scaffold > 3 feet wide) to at least 4 widths distance from the top of the scaffold. Horizontally, guy wires or attachments will be placed every 30 feet or less.
- The base of a scaffold will be on a level, rigid surface capable of supporting the weight of the scaffold and its work load without settling or moving. All legs, poles, posts, frames and uprights will be placed on and secured to an adequate firm foundation, e.g., base plates and mud sills or other weight distribution materials. *Unstable objects*, e.g., barrels, boxes, loose brick, concrete blocks, etc., will not be used as, or to support, a scaffold base or work platform.
- *Mobile scaffolds* will be locked or otherwise secured from moving while occupied. A mobile scaffold shall not be moved while occupied. Overhead clearance from power lines or other possible safety hazards must be checked before moving a mobile scaffold. Fork lifts, front loaders, or other heavy equipment will not be used as, or to support a scaffold unless specifically designed for it.
- Adjusting (leveling) screws will not extend more than 18 inches from the bottom of the base or frame and have at least 6 inches retained within the frame.

Erecting, Moving and Dismantling Scaffolds

- All scaffold *erecting and dismantling* activities will be done under the direct supervision of a *competent person* that has completed the training outlined in this Guideline. The competent person shall have the responsibility and knowledge to take prompt corrective action to eliminate hazards.
- All workers erecting, moving or dismantling a scaffold will be experienced and trained in these activities and protected from falling hazards. This protection will be the best feasible or practical as determined by the competent person in charge of the procedure.
- Standard scaffold access methods will be added to the scaffold as soon as safely possible during the erection process. Diagonal cross bracing will not be used to support workers or as access to the scaffold.
- The existing platform where the erectors/dismantlers are working from will be left in place and fully planked until the next level of vertical posts are placed, braced and fully platformed.
- Vertical cross bracing will be installed in both directions on both sides of the scaffold, so as to form an "X." Cross bracing will be installed as often as possible and in sufficient amount to insure the structural integrity of the scaffold. Mobile scaffolds will use horizontal diagonal bracing as needed to insure structural integrity.
- If portable ladders are used to access working levels of a scaffold they will be secured from moving by tying at the top and bottom of the ladder.
- Ladders, hand holds or railings will extend at least 36 inches above the landing where the worker gets off of the ladder or stairs.
- Integrated, prefabricated scaffold access frames, i.e. the vertical scaffold ends designed to be used as a ladder to climb the scaffold, can act as the access to the working levels of a scaffold as long as the ladder rungs are lined up on the same vertical line and rest platforms are supplied every 35 feet.

Use of Scaffolds.

- All scaffolds will be inspected by the competent person before each work shift, and after any incident that could affect the structural integrity of the scaffold. Any scaffold that has been weakened or damaged will be repaired or replaced before any workers are allowed to use it.
- While not required, use of the following tags or other similar tagging system is one method to document required scaffold inspections and convey to scaffold users the condition of a scaffold:
  - **Green** Tag – This scaffold was built to MIOSHA scaffold regulations; It is Safe to use.
  - **Yellow** Tag – This scaffold does not meet MIOSHA scaffold regulations; safety harness with shock absorbing lanyard shall be worn. All scaffolds that cannot be equipped with standard top rail, mid rail and toeboard because of interference with structures or equipment shall be marked with a yellow tag.
  - Red Tag – This scaffold is not complete; Do Not Use. Scaffolds being constructed, torn down or which are found to be defective shall be marked with a red tag.
- Scaffolds shall not be loaded beyond their capacity.
- Scaffolds shall be kept a safe working distance (at least 10 feet) from power lines. Safe working distances do not apply to situations where a scaffold is being used for work performed on electrical lines, but this work will only be done by certified electricians.
- Scaffolds shall be kept clean of debris, excessive amounts of materials or tools, ice, snow, or other slippery substances.
- Workers shall not be allowed on scaffolds during adverse weather conditions or when high winds are present. (Refer to manufacturer's documentation on potential limitations and prohibitions on scaffold use during adverse weather and high wind conditions.)

- Lean-to scaffolds shall not be used.
- Ladders or other similar devices shall not be used on scaffolds to increase the working level height of employees.
- Vertical cross bracing will not be used as a ladder or to access the working levels of the scaffold.
- Control or tag lines will be used to control swinging loads of materials or equipment being lifted to a scaffold with an overhead cable or rope.
- Scaffolds must be fully grounded when electric welding is being done. This grounding must also include possible current pathways through structures the scaffold is attached to, and any current pathways created through cables or other material/equipment hoisting operations.

Fall Protection on Scaffolds

- Unless specifically exempted by this Guideline, all workers must be protected from falling hazards any time they work on a scaffold higher than 10 feet. Standard fall protection on any scaffold will consist of a guardrail system with a top rail capable of supporting and protecting a weight of at least 200 lbs., a midrail, and toeboards.
- If using a guardrail system is not practical or would create an increased safety hazard, a personal fall arrest system (body harness and lanyard) may be used to protect employees from falling hazards. The use of personal fall arrest systems will be restricted to the specific areas of the scaffold where guardrails cannot be used, and guardrails will be used in all other areas.
- Body harnesses will be attached to the scaffold structure or vertical or horizontal lifeline. Vertical lifelines will be secured to a fixed safe point of anchorage independent of the scaffold, e.g. a building or other structure, and protected from sharp edges and abrasion. Horizontal lifelines will be secured to two separate points of the scaffold.
- Guardrail systems will be installed on all open sides of the scaffold. Vertical cross bracing may be used as a top rail only when the center crossing point of the two braces is 38-48 inches above the working surface.
- The front of a platform shall be not more than 14 inches from the face of the worker, unless a guardrail system is erected along the front edge or unless a personal fall arrest system is used. Except that the maximum distance from the face of work for plastering and latching operations shall be not more than 18 inches.

Stilts

- All stilts will be used and maintained as prescribed in the MIOSHA Part 12 Scaffolds and Scaffold Platforms.
- All stilts will be inspected by the employee before each work shift. Any stilts that has been weakened or damaged will be repaired or replaced before any workers are allowed to use it.
- The maximum height of a stilt (from the bottom of its base plate to the foot support) is 20 inches.
- Stilts will be kept clean and free of accumulation of paint, plaster and other debris.
- When an employee are using stilts near a guardrail, the top rail must be increased an amount equal to the height of the stilts.

Ladders and Stairs

Fixed Ladders

- All fixed ladders will be constructed and maintained as prescribed in the ANSI Standard A14.4 (Safety Requirements for Job-Made Wooden Ladders) and the Walking-Working Surfaces: MIOSHA Part 2.
- All fixed ladders longer than 20 feet will be constructed with the required cages, wells, *ladder safety devices*, or self-retracting lifelines. Ladders longer than 20 feet that are not equipped with a ladder safety device or self-retracting lifeline will have a landing at least every 30 feet.
- Fixed ladders will be inspected, (before use and periodically) for corrosion, wear, and broken parts. If a defect is found on a fixed ladder, it will be tagged, "do not use" so the defect is easily identified, or blocked from use and access until repaired to a serviceable condition.

Portable Ladders

- All portable ladders will conform to the applicable ANSI standard (A14.1, A14.2 or A14.5) and be marked as such on each ladder.
- All portable ladders shall be inspected before use and after it has fallen or been involved in an accident to determine its condition.
- The inspection will include, but not be limited to: rungs or steps, side rails, guides or spreaders, and locking devices. If any part of the ladder is damaged or unserviceable, it will be tagged "Dangerous – Do Not Use" and repaired or destroyed.
- Ladders will not be painted or otherwise defaced so that defects in the ladder would be covered.
- Extension ladders shall be placed so that the distance between the bottom of the ladder and supporting point is approximately one-fourth (¼) of the ladder length between supports.
- Work on ladders shall be arranged so that the employee is able to face the ladder and maintain "three points of contact" when climbing or working unless a fall protection system is in use.
- Stepladders shall not be used as a straight ladder. Employees using a stepladder shall not use the top two steps.

Permanent Stairs

All stairs built as a permanent part of a structure will be constructed and maintained as prescribed by the governing local building codes and the MIOSHA General Industry Standard (Part 2. Floor and Wall Openings, Stairways, and Skylights) including railings and hand rails.

Temporary Stairs

All stairs built as temporary structures on a construction site will be constructed and maintained as prescribed in the MIOSHA Construction Standard (Part 21. Guarding of Walking and Working Areas), including tread depth, riser height, stairway angle, doors, gates or landings, hand rails and guard rails, and will be dismantled when construction work is completed.

Aerial Lifts

All employees required to operate an aerial lift must be medically screened, trained and licensed to operate the aerial lift, in accordance with the Operator Permit Requirements as noted in EHS's Permitted Equipment Guideline.

Employee must stand firmly on the floor of the basket and will not sit or climb on the edge of the basket. Planks, ladders or other similar devices will not be used in an aerial lift to increase the working level height of employees.

Repairs

- Any aerial work platform found not to be in a safe operating condition shall be removed from service until repaired.
- All repairs shall be made by an *authorized person* in accordance with the manufacturer's or owner's operating or maintenance and repair manual or manuals.

Training

All employees whose duties require them to work at heights, i.e., at a fall hazard of 4 feet or more, must have the appropriate training. The training must be documented and records maintained for not less than 30 years. Retraining will be required when there are changes in the work site affecting work procedures or equipment covered by this Guideline, or when they cannot demonstrate adequate knowledge in the relevant topics of this Guideline.

Scaffold Training

Scaffold Training (Appendix C) will be conducted by EHS. Scaffold users and erector/dismantlers will be trained on the following areas, as well as Fall Protection Training:

- The proper use of the scaffold types used and the maximum intended load capacity of these scaffolds.
- The electrical, fall, and falling object hazards of erecting, working on, and dismantling scaffolds, and the procedures and equipment used to control these hazards.
- The procedures for erecting, dismantling, moving, operating, inspecting, maintaining and repairing the scaffold.
- The relevant parts of the scaffold standard

Fall Protection Training

Fall Protection Training (Appendix D) will be conducted by EHS and will cover the following areas:

- The nature of the fall hazards in the work area.
- The correct procedures for erecting, using, maintaining, disassembling and inspecting fall protection systems.
- The use and operation of guardrail systems, *safety net systems*, personal fall arrest systems, *warning line system*s, controlled access zones, *safety monitoring systems*, and any other fall protection used.
- The limitations for using mechanical equipment on roofs.
- The erection of overhead protection and protection from falling objects.
- The employee's role in safety monitoring systems, fall protection plans, and the contents of the MIOSHA Fall Protection Standard.

Ladders Safety Training

Ladder Safety Training will be conducted by the employee's Supervisor. Users of fixed ladders with working heights greater than 6 feet need training on how to inspect and properly use fixed ladders while construction workers need training in the following areas:

- How to recognize hazards related to ladder use, and procedures to minimize those hazards.
- Fall hazards: the correct procedures for inspecting, erecting, using, and maintaining ladders; the correct procedures for using and maintaining any fall protection required; the maximum load carrying capacities of the ladders to be used; and relevant details of the ladder standard.

Additional ladder safety training information can be found in Appendix E (Ladder Safety Training Program).

Aerial Platforms

Refer to EHS's Permitted Equipment Guideline.

Related Documents

- OSHA's Scaffold Use in the Construction Industry Guide
- OSHA's Stairways and Ladders Guide
- OSHA's Fall Protection in Construction
- OR's Department of Consumer & Business Services: Fall Protection Publications

Technical Support

All reference guidelines, regulations, and other documents are available through EHS (734) 647 1142.

Appendices

- Appendix A Fall Protection Safety Checklist for Permanent Structures
- Appendix B Quick Guide to Fall Protection Methods
- Appendix C Scaffold Safety Training Program
- Appendix D Fall Protection Training Program
- Appendix E Ladder Safety Training Program

Revision History

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