



ELECTRICAL SAFETY PROGRAM

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Applicability

This program is applicable to all Tufts buildings both on and off campus where Facility personnel or contractors perform work on or near exposed energized electrical conductors or circuit parts. This program establishes a means to analyze electrical work tasks and determine appropriate safe work practices to protect personnel.

Overview

Conformance to this Program will aid Tufts University in preventing injuries from electric shock, arc flash or associated arc blast by avoiding work on or near exposed energized electrical equipment. This program applies to Tufts Facilities Department and contractors working on or near exposed energized equipment.

It is expected that all electrical work shall be performed on de-energized electrical circuits and equipment unless de-energizing introduces additional or increased hazards or is infeasible due to equipment design, operational limitations, or maintenance requirements.

The purpose of this program is to protect Facilities Department personnel from injuries associated with working on or near energized circuits and comply with OSHA 29 CFR 1910 Subpart S, NEC and NFPA 70E.

Definitions

Arc Fault Current	A fault current flowing through an electrical arc plasma, also called an arc current.
Arc Flash Hazard	A dangerous condition associated with the release of energy caused by an electric arc.
Arc Flash Hazard Analysis	A study investigating a worker's potential exposure to arc flash
Arc Flash Boundary	When an arc flash hazard exists, an approach limit at a distance from energized electrical conductors or circuit parts within which a person could receive a second degree burn (e.g. 1.2 cal/cm ² or 5.0 joules/cm ² of incident energy exposure).
Arc Flash Suit	A complete arc rated clothing system that covers the entire body except for the hands and feet.
Arc Rating	The value attributed to materials that describe their performance on exposure to an electrical arc discharge. The arc rating is expressed in cal/cm ² or

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joules/cm² and is derived from the determined value of the Arc Thermal Performance Value (ATPV) or energy of breakopen threshold (E_{BT}) (if a material system exhibits a breakopen response below the ATPV value).

Arc Resistant Switchgear

Switchgear designed and built to provide maximum safety in the event of an Internal Arcing Fault. Designed to withstand the high pressure explosion of an electric arc event and provide a high degree of protection to personal in the vicinity of the switchgear.

Arc Thermal Performance Value (ATPV)

Defined in ASTM F1959 as the incident energy on a material or a multilayer system of materials that results in 50% probability that sufficient heat transfer through the tested specimen is predicted to cause the onset of a second degree skin burn injury based on the Stoll curve.

Barricade

A physical obstruction, (e.g. tape, cones, or an A-frame-type wood or metal structure) intended to provide a warning about and to limit access to a hazardous area.

Barrier

A physical obstruction that is intended to prevent contact with equipment or energized electrical conductors and circuit parts, or to prevent unauthorized access to a work area.

Bolt Fault Current

A short circuit or electrical contact between two conductors at different potentials in which the impedance or resistance between the conductors is essentially zero.

Breakopen

In electric arc testing, a material response evidenced by the formation of one or more holes in the material which may allow thermal energy to pass through the material. Breakopen is defined as a hole with an area of 0.5 in² or an opening with a 1.0 in dimension in any direction.

Circuit Breaker

A device designed to open and close a circuit by non-automatic means and to open the circuit automatically on a predetermined overcurrent without damage to itself when properly applied within its ratings.

Conductor

A wire, cable, or other form of metal installed for the purpose of conveying electric current from one piece of electrical equipment to another or to ground.

Current-limiting Overcurrent Protective Device

Device that, when interrupting currents in its current-limiting range, reduces the current flowing in the faulted circuit to a magnitude substantially less than that which would be obtainable in the same circuit if the device were replaced with a solid conductor having comparable impedance.

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De-Energized	Free from any electrical connection to a source of potential difference and from electrical charge; not having a potential different from that of the earth.
Electric Hazard	A dangerous condition such that contact or equipment failure can result in electric shock, arc flash burn, thermal burn, or blast.
Electrically Safe Work Condition	A state in which an electrical conductor or circuit part has been disconnected from energized parts, locked out in accordance with established standards, tested to ensure the absence of voltage, and grounded (if grounding is determined to be necessary).
Energized Electrical Work Permit	A written document that ensures that a work task requiring increased exposure to electrocution or thermal injury provides notification to the equipment owner, the electrical supervisor and the worker(s) that the risk of injury is increased. It provides the opportunity to re-evaluate the necessity for the increased risk of injury.
Energized Parts	Electrically energized conductive components.
Exposed	Capable of being inadvertently touched or approached nearer than a safe distance by a person. This term is applied to electrical conductors or circuit parts that are not suitably guarded, isolated, or insulated.
Flame Resistant	The property of a material whereby combustion is prevented, terminated, or inhibited following the application of a flaming or non-flaming source of ignition, with or without subsequent removal of the ignition source.
Ground Fault Circuit Interruptor	A device intended for the protection of personnel that functions to de-energize a circuit or portion thereof within an established period of time when a current to ground exceeds the values established.
Guarded	Covered, shielded, fenced, enclosed, or otherwise protected by suitable covers, casings, barriers, rails, screens, mats, or platforms to remove the likelihood of approach or contact by persons or objects to a point of danger.
Incident Energy	The amount of energy impressed on a surface, a certain distance from the source, generated during an electrical arc event. Incident energy is measured in calories/cm ² or joules/cm ² .
Incident Energy Analysis	A component of an arc flash risk assessment used to predict the incident energy of an arc flash for a specified set of conditions.
Limited Approach Boundary	An approach limit at a distance from an exposed energized electrical conductor or circuit part within which a shock hazard exists.

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Lockout

Placement of a lock on an energy-isolating device in accordance with an established procedure, thereby indicating that the energy-isolating device is not to be operated until removal of the lock or in accordance with an established procedure.

Qualified Electrical Person

A person (i.e. Electrician, HVAC Technician, Boiler Mechanic) who has skills and knowledge related to the construction and operation of electrical equipment and installations and has received safety training to recognize and avoid the hazards involved.

Restricted Approach Boundary

An approach limit at a distance from an exposed energized electrical conductor or circuit part within which there is an increased risk of shock, due to electrical arc over combined with inadvertent movement, for personnel working in close proximity to the energized electrical conductor or circuit part.

Unqualified Electrical Person

A person (i.e. Plumbers, Carpenter's) who is not a qualified person to perform a particular task or function.

Working On

Coming in contact with energized electrical conductors or circuit parts with the hands, feet, or other body parts, with tools, probes, or with test equipment, regardless of the personal protective equipment a person is wearing.

Responsibilities

Director of Facilities Operations:

1. Responsible for the overall development, implementation and compliance with Electrical Safety Program;
2. Provides resources to Facilities Department for tools, training and equipment;
3. Approves work on energized equipment after review and determination that equipment cannot be de-energized.

Facilities Engineer/Manager:

1. Ensures all Facilities personnel and contractors are in compliance with Electrical Safety Program;
2. Ensure those employees exposed to energize electrical equipment are trained, qualified and authorized to perform those tasks;
3. Ensures applicable training records are maintained;
4. Ensures electrical hazards are corrected in a timely manner;
5. Responsible for ensuring that all electrical incidents are reported and investigated;
6. Manages the arc flash hazard and incident energy analysis surveys;
7. Maintains all electrical drawings, files, surveys used for electrical safety analysis;
8. Communicates all known hazards associated with scope of work to contractors.

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Qualified Electrical Person:

1. Knows how to select, maintain, care and inspect electrical equipment including personal protective equipment;
2. Reports all electrical incidents, injury or no injury;
3. Trained in methods to release victims from contact with energized electrical equipment as well as first aid, CPR and AED;
4. Ensures that all electrical work is done in a de-energized state unless reviewed and approved by Director of Facilities;
5. Participates in writing and reviewing safe work procedures;
6. Participates in hazard and risk assessment as required;
7. Complies with safe work procedures;
8. Establishes, maintains shock and arc flash boundaries as required by task;
9. Maintains competency as required to maintain Qualified Electrical Persons designation.

Unqualified Electrical Person:

1. Knows how to select, maintain, care and inspect electrical equipment including personal protective equipment;
2. Reports all electrical incidents, injury or no injury;
3. Knows how to read and interpret Arc Flash and Shock warning labels;
4. Participates in required electrical safety training.

Contractors shall:

1. Comply with the requirements outlined in this program;
2. Attend Tufts contractor safety orientation;
3. Submit site specific electrical safety plan for review by persons with authorized oversight;
4. Wear electrical safety protection consistent with the requirements outlined in this document and all other applicable regulations;
5. Provide training documentation for employees working on or near energized electrical equipment.

General Requirements

This section outline the general requirements for Tufts Facility Department personnel who may work on or near energized exposed electrical conductors or circuit parts. The goal is to eliminate the risk of electrical shock or arc flash that may cause injury to personnel.

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1. All attempts shall be made to work on de-energized electrical conductors and circuit parts unless de-energizing poses increased hazards or is infeasible due to equipment design, operational limitations or maintenance requirements and approved by Director of Facilities Operations.
2. Working on or near energized electrical parts below 50 volts which poses no significant burn or arc flash hazard are not required to be de-energized to satisfy electrically safe work condition.
3. All entrances on Tufts campus to switchyards, substations, buildings, rooms, vaults, manholes, and enclosures with exposed energized conductors or circuit parts shall remain locked with a sign stating "DANGER -- HIGH VOLTAGE -- KEEP OUT."
4. All Tufts Facility Department personnel working on or near energized exposed conductors or circuit parts shall be trained in accordance with their job function and have the ability to identify and control electrical hazards.
5. PPE, tools and equipment shall be appropriate for the task.
6. Shock and flash protection boundaries must be established where exposed energized conductors or circuit parts are present during maintenance, inspection or repairs.
7. Clear access shall be made to all switchgear, electric panels, disconnect switches, motor control centers at all times. **Attachment 1.2**
8. New or modified electrical equipment shall be designed and installed in accordance with most recent editions of NEC, state, local building codes and NFPA 70E.
9. Ladders used on or near exposed electrical conductors or circuit parts shall be non-conductive type.
10. Electrical incidents shall be reported by Tufts Facility Department to their supervisors and fully investigated.
11. No work with incident energy greater than 40 cal/cm² will be performed by Tufts Facility Department personnel.
12. Conductive articles of jewelry and clothing must not be worn when working on or near electrical exposed conductors or circuit parts.
13. Review Energized Electrical work flow **Attachment 1.4** for energized work over 50V to determine if permit is needed.

Electrical Installations

Tufts Facilities Department requires all electrical installations to be designed and constructed to be safe at all times, inspected and tested to prove their safety. It is required that all electrical installations meet requirements of the applicable Codes adopted by local jurisdiction, the State

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of Massachusetts, National Electric Code, 29 CFR Subpart S and NFPA 70E. Also equipment must be installed in accordance with manufacturers' specifications.

All live parts of electric equipment operating at 50 volts or more shall be guarded against accidental contact by use of approved cabinets or other forms of approved enclosures or by any of the following means:

- By location in a room, vault, or similar enclosure that is accessible only to qualified persons;
- By suitable permanent, substantial partitions or screens so arranged so that only qualified persons will have access to the space within reach of the live parts;
- By elevation of 8.0 ft or more above the floor or other working surface.

Illumination

Illumination shall be provided for all working spaces about service equipment, switchboards, panelboards, and motor control centers. Minimum of 5 foot candles (fc) for work on or near energized exposed electrical conductors or circuit parts.

Incident Energy Analysis

Incident energy analysis shall be conducted for the purpose of protecting workers from injuries associated with the risk of arc flash events due to electric faults. The incident energy analysis is used to predict the incident energy of an arc flash for a specified set of conditions that identifies flash protection boundaries, information needed for labeling and the appropriate level of PPE that must be worn.

Motor control centers, switch gear, electric panels boards and disconnects shall have a detailed engineering incident energy analysis performed as follows:

- New electrical equipment shall be completed before installed
- Existing electrical equipment shall be completed over the next 5 years (2015-2020) or when major modification is performed whichever occurs first.

There are currently two acceptable methods used to estimate incident energy:

1. Detailed engineering based incident energy analysis (29 CFR 1910.296 Appendix E, NFPA 70E Annex D), and
2. Alternative method and should only be used until a detailed engineering analysis can be performed (NFPA 70E tables 130.7(C)(15)(A)(a) and 130.7(C)(15)(A)(b).

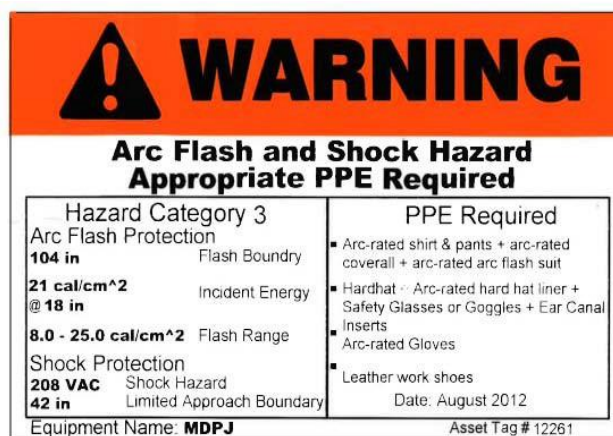
Labeling

Electrical equipment such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers shall be marked with a label containing all the following information:

- (1) Nominal system voltage
- (2) Arc flash boundary
- (3) At least one of the following:
 - a. Available incident energy and the corresponding working distance, or the arc flash PPE category in Table 130.7(C)(15)(A)(b) or Table 130.7(C)(15)(B) for the equipment, but not both
 - b. Minimum arc rating of clothing
 - c. Site-specific level of PPE



Sample labels



Electrical PPE, Tools and Equipment

PPE should only be considered after risk management process has determined elimination and engineering control of electric shock/arc flash risk was not possible. When working on or near exposed electrical conductors or circuit parts applicable persons shall protect themselves from electric shock and arc flash. All electrical PPE, tools and equipment shall be of safe design and constructed for their intended use.

Personnel shall NOT wear any clothing made from combustible synthetic materials such as acetate, nylon, polyester, or rayon, either alone or in blends unless it has been tested in accordance with ASTM and noted on the manufacturers clothing tag.

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Any undergarments worn underneath PPE, shall consist of Non-melting or Untreated Natural Fiber (i.e., untreated cotton, wool, rayon, or silk, or blends of these materials).

Once incident energy analysis is completed Qualified Electrical workers can then identify the PPE Category found on the equipment labels. In lieu of the incident energy analysis Qualified Electrical Person can utilize NFPA 70E **Table 130.7**.

Attachment 1.3 lists PPE category by clothing type, body part and incident energy.

When working within the Limited Approach or Restricted Approach Boundaries all tools and equipment shall be rated for the energized electrical tasks. The manufacturers' written instructions must be followed for care, use and maintenance of tools and equipment. Failure to do so will result in compromising the integrity and safety performance of the equipment.

Shock Approach Boundaries

These boundaries are determined based on system voltage and phase to phase arrangements. The purpose of these boundaries are to protect both qualified and unqualified electrical persons from electric shock.

Unqualified electrical persons may only enter limited approach boundary if escorted by a qualified worker. Unqualified electrical person may not enter the restricted approach boundary under any circumstances.

Qualified electrical person enters these boundaries as follows:

- Limited Approach Boundary – Trained and utilizing PPE in accordance with risk assessment.
- Restricted Approach Boundary – Trained and competent for the job. Use of proper PPE as defined in risk assessment and use of non-conductive tools and or equipment.

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Condition	Nominal System Voltage Range, Phase to Phase	Limited Approach Boundary		Restricted Approach Boundary
		Exposed Movable Conductor	Exposed Fixed Circuit Part	Includes Inadvertent Movement Adder
1	0 to 50	Not Specified	Not Specified	Not Specified
2	51 to 150	10 ft. 0 in.	3 ft. 6 in.	Avoid Contact
3	151 to 750	10 ft. 0 in.	3 ft. 6 in.	1 ft.
4	751 to 15kV	10 ft. 0 in.	5 ft. 0 in.	2 ft. 2 in.

Reference NFPA 70E Table 130.4(D)(a)

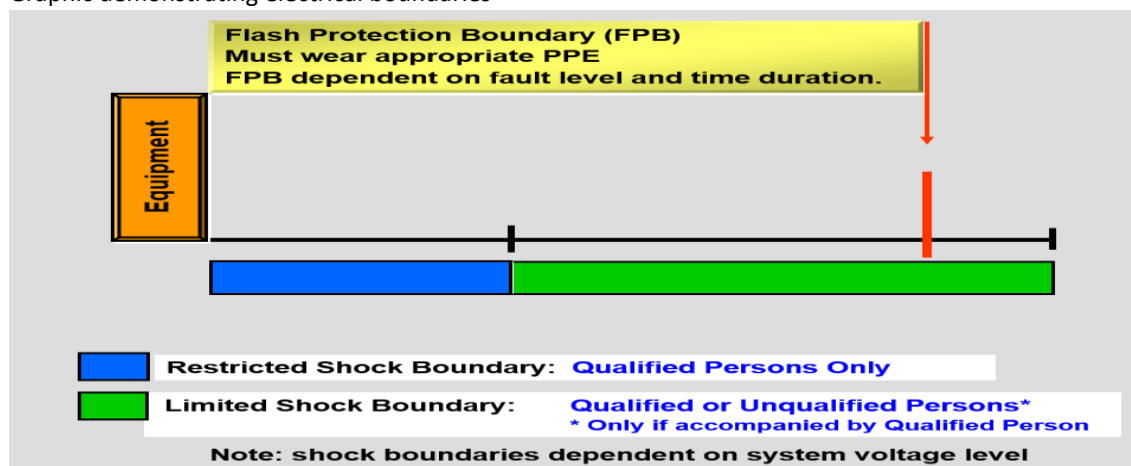
Arc Flash Boundary

Arc flash boundary is the approach limit at a distance from the energized electrical conductor or circuit part where an arcing fault could cause injury to personnel resulting in a 2nd degree burn or worst. This is the boundary where everyone who enters is required to wear appropriate arc flash protective equipment.

Incident energy analysis will determine flash protective boundary distance from arcing fault and list appropriate PPE to use once inside this boundary.

In lieu of an incident energy analysis Qualified Electrical Person can utilize determine arc flash boundaries found in NFPA 70E Table 130.7(C)(15)(A)(b) Arc-Flash Hazard PPE Categories for Alternating Current (ac) Systems or Table 130.7(C)(15)(B) Arc-Flash Hazard PPE Categories for Direct Current (dc) Systems.

Graphic demonstrating electrical boundaries



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Establishing Boundaries

When establishing boundaries several methods to provide security and safe zones are available. Portable handrails, barricades or stanchions could be used to set the boundary lines but if they are within the limited approach boundary they must be non-conductive. Safety cones, danger tape or a dedicated safety attendant (for duration of work) could be used to establish boundaries.

Risk Assessment

All work on or near energized conductors or circuit parts shall be assessed initially and upon any task changes by a Qualified Electrical Person prior to the work (**Attachment 1.1**) commencing to identify if there is a risk of electric shock or arc flash and which control measures need to be implemented.

This risk assessment can be done as part of a site-wide risk assessment for all routine tasks. For non-routine or modified tasks, the risk assessment shall be done prior to the task being undertaken.

Risk Management

Where the risk of electric shock or arc flash is identified, a hazard identification and risk assessment shall be documented for the intended task(s) and the following hierarchy of risk control measures shall be applied (in descending order) to either eliminate the risk or reduce the chance of an incident to as low as reasonably practicable. Only where it is not reasonably practical to use a higher order control may you then use a control at the next lower level:

Elimination

Eliminate the risk of energized work completely, e.g. de-energize prior to task by locking out.

Engineering or Guarding

If it is not reasonably practical to eliminate the risk of electric shock or arc flash, reduce the risk by utilizing rubber insulating guards and or barriers. Also available are remote racking devices that remove the worker from the shock/arc flash hazard.

Administrative Controls

If none of the above measures are reasonably practical, or the risk of a shock or arc flash still remains, the risk shall be reduced by the use of documented administrative controls that specify the procedures to be used to mitigate the risk, such as Energized Electrical Work Permit or Job Safety Analysis.

Personal Protective Equipment

If it is not reasonably practical to use the above options, the use of Personal Protective Equipment along with Administrative Controls to protect a worker from

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shock of arc flash shall be used. Selection shall be in accordance with **Attachment 1.3** of this program.

Minor & Moderate risk tasks - examples

Work task	Energized Electric Work Permit	Electrical Risk Assessment
Working on or near exposed energized circuits or parts less than 50V	No	No
Performing inspections such as infrared thermography or ultrasound outside of the Arc Flash Protection boundary less than 600VAC.	No	No
Operations of a circuit breaker or disconnect switch with covers on and all panels properly secured.	No	No
Troubleshooting or testing on exposed energized electrical conductors of circuit parts, $\geq 50V$ and $\leq 600 VAC$.	No	Yes
Racking in or out MCC buckets $\geq 480V$ doors closed and panels properly secured.	No	Yes

Major risk tasks - examples

Work task	Energized Electric Work Permit	Electrical Risk Assessment
Racking in or out MCC buckets $\geq 480V$ doors open.	Yes	Yes
Operations of a circuit breaker or disconnect switch with covers off inside the arc flash protection boundary.	Yes	Yes
Troubleshooting or testing on exposed energized electrical conductors of circuit parts, $\geq 600 VAC$.	No	Yes
Entry into confined space with exposed energized electrical conductors or circuit parts.	Yes	Yes

Job Briefing

Before starting each electrical job the employee in charge shall conduct a job briefing with the employees involved. The briefing must include a discussion of the following:

- Review risk assessment

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- Procedures that must be followed
- Any special precautions that are required by the working conditions
- Emergency response and communications
- Other work in the area that may pose a hazard

If the work is performed during the work day is repetitive and similar at least one job briefing should be conducted before the start of the first job of the day. If significant changes that might affect the safety of employees during the day, a new job briefing should be conducted.

If the work involved is routine and if the employees can reasonably be expected to recognize and avoid the hazards a brief discussion would be satisfactory.

Working Alone

Workers must not work alone when performing work that is determined to be a major risk. When working alone on or near energized electrical conductors or circuit parts considered minor or moderate risk, the worker and supervisor shall establish a means of communicating.


Energizing and Re-energizing Electrical Equipment

Prior to energizing newly installed equipment or re-energizing equipment that was tagged out for maintenance a start-up plan should be established by commissioning manager or authorized employee and Qualified Electrical persons.

Procurement

The purpose of this section is to provide a process to identify and control electrical equipment, material and appliance purchases. The scope of this section is to assure electrical equipment, material, appliances and tools used onsite are manufactured to recognized industry standards and are consistent with Tuft's safety program.

All electrical equipment, test instruments, materials, appliances and tools shall be UL listed or its equivalent. Other non-appliance type manufactured devices that are not UL listed, but are built according to recognized industry standards (NEMA, ANSI, ASTM, etc.) will be considered acceptable for use.

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Portable Electrical Equipment and Extension Cords

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The following requirements apply to the use of cord-and-plug-connected equipment and flexible cord sets (extension cords):

- Extension cords may only be used to provide temporary power.
- Portable cord-and-plug connected equipment and extension cords must be visually inspected by the user for external defects such as loose parts, deformed and missing pins, or damage to outer jacket or insulation, and for possible internal damage such as pinched or crushed outer jacket.
- Cord-and-plug-connected equipment must be removed from service and no person may use it until it is repaired and tested to ensure it is safe for use.
- Extension cords must be of the three-wire type. Extension cords and flexible cords must be designed for usage.
- Job-made extension cords are forbidden per the electrical code. Only UL/ANSI approved cords are acceptable for use.
- Personnel performing work on renovation or construction sites using extension cords or where work is performed in damp or wet locations must be provided, and must use, a ground-fault circuit interrupter (GFCI).
- Extension cords must be protected from damage. Sharp corners and projects must be avoided. Flexible cords may not be run through windows or doors unless protected from damage, and then only on a temporary basis. Flexible cords may not be run above ceilings or inside or through walls, ceilings or floors, and may not be fastened with staples or otherwise hung in such a fashion as to damage the outer jacket or insulation.
- Cords must be covered by a cord protector or other device when they extend into a walkway or other path of travel to avoid creating a trip hazard.
- Extension cords used with grounding-type equipment must contain an equipment-grounding conductor (i.e., the cord must accept a three-prong, or grounded, plug).
- Attachment plugs and receptacles may not be connected or altered in any way that would interrupt the continuity of the equipment grounding conductor. Additionally, these devices may not be altered to allow the grounding pole to be inserted into current connector slots. Clipping the grounding prong from an electrical plug is prohibited.
- Flexible cords may only be plugged into grounded receptacles. Adapters that interrupt the continuity of the equipment grounding connection may not be used.

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- All portable electric equipment and flexible cords used in highly conductive work locations, such as those with water or other conductive liquids, or in places where employees are likely to contact water or conductive liquids, must be approved for those locations.
- If the connection could provide a conducting path to employees hands (for example, if a cord connector is wet from being immersed in water), the energized plug and receptacle connections must be handled only with insulating protective equipment.
- Locking-type connectors must be properly locked into the connector.
- Lamps for general illumination must be protected from breakage, and metal shell sockets must be grounded.
- Temporary lights must not be suspended by their cords unless they have been designed for this purpose.
- Portable lighting used in wet or conductive locations, such as tanks or boilers, must be operated at less than 50 volts or must be protected by GFCI's.
- Extension cords are considered to be temporary wiring, and must also comply with the section on "Requirements for Temporary Wiring" in this program.
- When selecting extension cords consider the following:
 - 16 Gauge Cords - Any 16 gauge cord between 0 and 100 feet long will adequately handle tool loads up to 10 amps.
 - 14 Gauge Cords - Any 14 gauge cord between 0 and 50 feet long will adequately handle loads between 10 and 15 amps.
 - 12 Gauge Cords - If your tool load is between 10 and 15 amps and the length of the cord is 50 to 100 feet, you need a 12 gauge cord to safely power any tool.

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Requirements for Temporary Wiring

Temporary electrical power and lighting installations 600 volts or less, including flexible cords, cables and extension cords, may only be used during and for renovation, maintenance, repair, or experimental work. The duration for temporary wiring used for decorative lighting for special events and similar purposes may not exceed 90 days. The following additional requirements apply:

- Ground-fault protection (e.g., ground-fault circuit interrupters, or GFCI) must be provided on all temporary-wiring circuits, including extension cords, used on construction sites.
- In general, all equipment and tools connected by cord and plug must be grounded. Listed or labeled double insulated tools and appliances need not be grounded.
- Feeders must originate in an approved distribution center, such as a panel board, that is rated for the voltages and currents the system is expected to carry.
- Branch circuits must originate in an approved power outlet or panel board.
- Neither bare conductors nor earth returns may be used for the wiring of any temporary circuit.
- Receptacles must be of the grounding type. Unless installed in a complete metallic raceway, each branch circuit must contain a separate equipment-grounding conductor, and all receptacles must be electrically connected to the grounding conductor.
- Flexible cords and cables must be of an approved type and suitable for the location and intended use. They may only be used for pendants, wiring of fixtures, connection of portable lamps or appliances, elevators, hoists, connection of stationary equipment where frequently interchanged, prevention of transmission of noise or vibration, data processing cables, or where needed to permit maintenance or repair. They may not be used as a substitute for the fixed wiring, where run through holes in walls, ceilings or floors, where run through doorways, windows or similar openings, where attached to building surfaces, or where concealed behind building walls, ceilings or floors.
- Suitable disconnecting switches or plug connects must be installed to permit the disconnection of all ungrounded conductors of each temporary circuit.
- Lamps for general illumination must be protected from accidental contact or damage, either by elevating the fixture or by providing a suitable guard. Hand lamps supplied by flexible cord must be equipped with a handle of molded

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composition or other approved material and must be equipped with a substantial bulb guard.

- Flexible cords and cables must be protected from accidental damage. Sharp corners and projections are to be avoided. Flexible cords and cables must be protected from damage when they pass through doorways or other pinch points.

Wet or Damp Locations

Work in wet or damp work locations (i.e., areas surrounded or near water or other liquids) should not be performed unless it is absolutely critical. Electrical work should be postponed until the liquid can be cleaned up. The following special precautions must be incorporated while performing work in damp locations:

- Only use electrical cords that have Ground Fault Circuit Interrupters (GFCIs);
- Place a dry barrier over any wet or damp work surface;
- Remove standing water before beginning work. Work is prohibited in areas where there is standing water; and
- Keep electrical cords away from standing water.

Confined Space

Where work may be performed on or near exposed electrical conductors or circuit parts confined space entry shall be performed as a permit required confined space. Qualified Electrical Person shall assess the risk and ensure appropriate PPE is provided. All attempts should be made to de-energize the equipment and/or insulation, barricades or shields should be used to protect workers.

Working Near Overhead Power Lines and Buried Power Lines

It is important that workers understand and acknowledge the presence of power lines or buried cables when performing work that may put them in contact with energized conductors.

Prior to any excavation or ground disturbance it is imperative that checks are conducted to ensure buried facilities such as electric, communication lines, gas lines, steam lines, etc. are clearly identified. Prior to any ground disturbance activities Tuft's personnel will contact Dig Safe or hire a contractor to locate utilities in the area.

Overhead power lines may present a challenge when work is conducted in close proximity to them. It is critical that workers understand that even getting close to a power line may result in

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serious or fatal electric shock or arc flash. Minimum approach distance to energized overhead lines is listed in **Attachment 1.2**.

Elevated Equipment

Where any vehicle or mechanical equipment structure will be elevated near energized overhead conductors, they shall be operated so that the Limited Approach Boundary is maintained. However, if work is within the limited Approach Boundary all attempts will be made to de-energize. If it is not possible, the following steps must be followed:

- Insulated barriers, rated for the voltages involved are installed and they are not part of the vehicle.

Contractors

All contractors conducting electrical work at Tufts will be required to meet with Facilities Qualified Electrical Person and review scope of work for electrical shock and arc flash hazards. Upon request by Tuft's Facilities personnel contractor will present electrical safety training documentation for applicable workers.

Tuft's Qualified Electrical Person will review the scope of work and document potential hazards contractor may be exposed to while performing their scope for work. See **Attachment 1.5** for contractor communication form. Tuft's personnel will report any violations of the Electrical Safety Program to Contractor supervisor.

Contractor is required to disclose electrical safety procedures that will be used while on campus, share their risk assessment or similar document and any potential hazards generated by them while performing services on campus.

Contractor must supply their personnel with required tools, equipment and PPE.

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Maintenance and Inspection

Electrical equipment and tools shall be inspected before each use and as required by manufacturer and or 29 CFR 1910 Subpart S, NFPA 70E or other governing body. If equipment or tool is found to be defected it should be taken out of service and given to immediate manager. (See **Attachment 1.6** for equipment and inspection frequency)

- Inspections shall be conducted in accordance with manufacturer's instruction and documented.
- Defective or out of date equipment shall be immediately removed from service and tagged.

Training

Personnel who may be exposed to energized electrical conductors or circuit parts must receive both technical and electrical safety training for the work they are expected to perform. The training shall give them technical ability to demonstrate the knowledge in the construction and operation of the equipment and the safety training to be able to identify and avoid electrical hazards. Employees shall demonstrate an understanding of the training and use of the equipment.

All electrical safety training instructors shall be approved by the Director of Facilities Operations. All training shall be documented and maintained for the duration of employee's employment. Attendance records shall be kept with sign-in sheets showing the name of attendees, date, instructor, and type of training.

Qualified Electrical Person

- Shall be familiar with the proper use of the special precautionary techniques, applicable electrical policies and procedures, , lock out-tag out, de-energizing and knowledge of submitting live work permits, PPE, insulating and shielding materials, and insulated tools and test equipment.
- A person can be considered qualified with respect to certain equipment and methods but still be unqualified for others. For example, an HVAC Technician may be qualified to work on HVAC controller but not qualified to work on MCC in Central Heating Plant.
- Such persons permitted to work within the limited approach boundary shall, at a minimum, be additionally trained in all of the following:
 - (1) Skills and techniques necessary to distinguish exposed energized electrical conductors and circuit parts from other parts of electrical equipment.

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(2) Skills and techniques necessary to determine the nominal voltage of exposed energized electrical conductors and circuit parts.

(3) Approach distances and the corresponding voltages to which the qualified person will be exposed.

- Must be trained in recognizing signs and symptoms of electric shock, electric burns and proper first aid measures for these conditions. Training shall consist of Cardio Pulmonary Resuscitation (CPR), Automatic External Defibrillator (AED) and basic first aid.
- Electrical Preventive Maintenance - Individuals responsible for the maintenance and installation of existing or new equipment shall be trained. The extent of the training depends upon the type of involvement.
- Code Compliance and Inspection - All personnel responsible for design, installation or maintenance of electrical systems shall be trained in the requirements of the National Electric Code.
- An employee who is undergoing on-the-job training and who, in the course of such training, has demonstrated an ability to perform duties safely at his or her level of training and who is under the direct supervision of a qualified person shall be considered to be a qualified person for the performance of those duties.
- Employees shall be trained to select an appropriate UL Cat III and/or Cat IV voltage detector (and/or multi-meter) and shall demonstrate how to use a device to verify the absence of voltage, including interpreting indications provided by the device. The training shall include information that enables the employee to understand all limitations of each specific voltage detector that may be used. Proper use/understanding of a voltage and/or multi-meter is **imperative** prior to use when working on live electrical equipment.

Unqualified Electrical Person

Unqualified persons shall be trained in, and be familiar with, any electrical safety-related practices necessary for their safety to include:

- The ability to recognize potentially hazardous energy and its impact on workplace conditions.
- Skills and techniques necessary to distinguish exposed energized components and how to avoid them.
- How to report electrical related injuries.

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Refresher training shall be provided;

- At minimum every three years or when;
- The annual inspections indicate that an employee is not complying with the safety-related work practices,
- If new technology, new types of equipment, or changes in procedures necessitate the use of safety-related work practices that are different from those that the employee would normally use,
- If he or she must employ safety-related work practices that are not normally used during his or her regular job duties.

Program Audit

Tufts shall perform a documented annual evaluation of the Electrical Safety Program. The annual evaluation shall include a thorough review of electrical risk assessments, energized electrical work permits, and include observation of electrical work methods and verification that procedures are appropriate, see **Attachment 1.7** for audit form.

Revision Log

Revision #	Date	Description of Change	Written by

Document Responsibility

Owner			
Approved by			

References:

NFPA 70E 2015

29 CFR 1910 Subpart S

29 CFR 1926 Subpart K and V

Attachments

1.1 Risk Assessment Form

1.2 Electrical Clearance

1.3 PPE Clothing Chart

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1.4 Energized Electrical Work Flow and Permit

1.5 Contractor Form

1.6 Equipment and Tool Inspection

1.7 Audit Form



FALL PROTECTION PROGRAM

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Attachments

Risk Assessment Form 1.1

Maintenance and Inspection 1.2

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I. Applicability

This program establishes a means to analyze elevated work tasks and determine appropriate personal protection against falls in accordance with Occupational Safety and Health Administration (OSHA) Construction and General Industry regulations:

- "Fall Protection," 29 CFR 1926 Subpart M
- "Walking and Working Surfaces," 29 CFR 1910 Subpart D
- "Powered Platform, Man lifts, & Vehicle-Mounted Platforms," 29 CFR 1910 Subpart F

II. Overview

Conformance to this Procedure will aid Tufts University in preventing falls by avoiding work at heights where possible; use work equipment or other controls to prevent falls; and minimize the consequences if a fall should occur. This procedure applies to Tufts employees and contractors working at heights above 4 feet or 6 feet for construction related activities.

Employees will not be required, nor allowed to perform any duties which require the employee to get closer than fifteen feet to an unprotected edge, platform, and walkway of any building or utilize elevated equipment unless the employee is properly secured from falling.

Warning systems must be in place on a roof 15 feet from the edge to warn employees that they are approaching an unprotected opening (including skylights), roof side or edge, and which designates an area in where roofing work may take place without the use of guardrails, fall arrest, or safety net systems to protect employees in the area.

Employees working from a mobile elevated work structure (i.e. scissor lift, boom, etc.) must wear a harness and lanyard, which is tied off to the platform of the elevated work structure.

Falls from roofs are generally fatal or can result in serious injury and permanent disability. Hence actions must be taken to prevent faculty, students, contractors and visitors from sustaining injury or death as a result of a fall from a roof at Tufts University.

Members of Tufts community, their guests and visitors, are prohibited from accessing areas of the campus which are not designed for regular access, such as roofs. Exceptions to this policy are specifically allowed by applicable policy, and for roofs, only after a person needing access to a roof has been trained and authorized to access roofs.

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Tufts University roofs are restricted area and not accessible to any person unless that person received specific authorization and training by Tufts Facility Services personnel regarding the safety requirements of accessing and performing work on university roofs.

All access doors and hatches to roofs will be secured from unauthorized access.

In accordance with Facilities Services, all persons accessing Tufts roofs will complete a risk assessment using attachment 1.1 each time the operation on the roof is conducted.

The hazards associated with work on roofs includes falling through openings and falling off edges. The protection of openings is discussed in the Risk Management section of this program.

III. Definitions

Anchorage	A secure point of attachment for lifelines, lanyards or deceleration devices.
Competent Person	A person who is capable of identifying existing and predictable hazards in the surroundings or working conditions associated with the work at height which are hazardous, or dangerous to employees and who has authorization to take prompt corrective measures to solve work at height problems. (for example – supervisor or team leader of authorized person)
Construction Related Activities	Activities that involve building, erecting new structures or processes, relocation of equipment or processes, installation of new processes, etc. This does not include typical maintenance activities such as painting, changing of light bulbs or related fixtures, electrical work, preventive maintenance activities, etc.
Fall Arrest System	A fall arrest system includes the proper anchorage, body support (harness), and connecting means (lanyards/lifelines) interconnected and rigged to arrest a free fall. The primary function of a fall arrest system is to minimize the consequences of a fall rather than preventing its occurrence. The use of fall arrest equipment should be recognized as a means of minimizing injuries sustained from a fall. It does not prevent the fall.
Full Body Harness	An engineered design of straps which are secured about the employee in a manner that will distribute the fall arrest forces over the thighs, pelvis, waist, chest and shoulders with means of attaching it to other components of a personal fall arrest system.
Guard Rail System	A barrier erected to prevent employees from falling to lower levels. Design requirements must meet local engineering codes and applicable OSHA

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regulations.

High Angle Rescue

A situation where a victim is elevated above ground greater than 10 feet or below ground and must be moved and/or rescued by the use of rope and/or mechanical advantage systems and rigging.

Leading Edge

Means the edge of a floor or roof.

Low-Slope Roof

A roof having a slope less than or equal to 4:12 (vertical to horizontal).

Mobile Elevated Work Platforms

Vehicle mounted aerial devices, elevating rolling work platform, boom-type elevating work platform, or self-propelled elevating work platform.

Personal Fall Arrest System

An approved system used to arrest an employee in a fall from a working level. It consists of an anchor point, anchorage devices, connectors, full body harness, and may include a lanyard, deceleration device, lifeline, or suitable combinations of these.

Personal Fall Restraint System

System that prevents a worker from reaching an unprotected leading edge on a horizontal surface, such as a roof. May include guard rails, cable systems, and fixed anchor points.

Program Administrator

Responsible for all phases of the fall protection plan, including its development, implementation and ongoing monitoring. Additionally, the administrator must have a working knowledge of fall protection regulations, standards, equipment and systems.

Qualified Person

A person who, by extensive knowledge, training and experience, has successfully demonstrated to the organization or the organization's designee the ability to resolve problems relating to work at height or the project. (for example - EHS professional, Engineer, Subject Matter Expert, 3rd Party)

Self-Rescue

Reach the fallen worker from the structure and pull the victim back to the safety of the structure.

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 42 inches (105 cm) high.

Warning Line System

A physical warning on a roof 15 feet from the edge to warn employees that they are approaching an unprotected opening (including skylights), roof side or edge, and which designates an area in where roofing work may take place without the use of guardrails, fall arrest, or safety net systems to protect employees in the area.

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Work At Heights

Work performed at a height equal to or greater than 4 feet or 6 feet for construction related activities in terms of risk assessment and risk management.

IV. Responsibilities

Competent Persons shall:

1. Implement all aspects of the program for work areas under their control;
2. Receive training for "competent person" as defined by OSHA for fall protection;
3. Act as the "competent person" for job sites under their control that contain fall hazards;
4. Evaluate fall hazards in work areas under their control; and
5. Ensure that employees are informed, trained, and provided with the appropriate fall protection systems and equipment to be protected from potential fall hazards associated with job tasks.

Qualified Persons shall:

1. Maintain professional certification or other requirements in their subject field;
2. Provide design, analysis, evaluation and specification in their subject field;
3. Maintain records of their designs, analyses, evaluations, and specifications according to the requirements of the *Fall Protection Program*.

Supervisors shall:

1. Ensure that employees are informed, trained, and provided with the appropriate fall protection systems and equipment to be protected from potential fall hazards associated with job tasks; and
2. Coordinate the correction of fall hazards brought to their attention by employees.

Employees shall:

1. Use a means of fall protection (guardrails, personal fall arrest/restraint systems, or safety monitor) for all work from elevated heights greater than 6 feet for construction work and 4 feet for industrial maintenance work;
2. Alert their supervisors when requested to work from heights without a means of fall protection;
3. Alert their supervisor about the level of fall protection training they have or have not received when requested to work from elevated heights;
4. Report incidents relating to fall hazards to their supervisor.

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Contractors shall:

1. Be aware of the requirements outlined in this program,
2. Provide all personal fall arrest systems to their employees,
3. Submit site specific fall protection plan for review by persons with authorized oversight,
4. Wear fall protection consistent with the requirements outlined in this document and all other applicable regulations.
5. Provide a competent person for fall protection onsite when providing constructions services while working on roofs or contact Tufts EHS or Facilities Services for guidance.

V. Risk Assessment

All work at height tasks being performed shall be assessed initially and upon any task changes by a Competent Person prior to the work (using attachment 1.1) commencing to identify if there is a risk of a fall and the control measures to be implemented.

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VI. Risk Management

This risk assessment can be done as part of a site-wide risk assessment for all routine tasks. For non-routine or modified tasks, the risk assessment shall be done prior to the task being undertaken.

Where the risk of a fall from work at height is identified, a hazard identification and risk assessment shall be documented for the intended task(s) and the following hierarchy of risk control measures shall be applied (in descending order) to either eliminate the risk or reduce the chance of a fall to as low as reasonably practicable. Only where it is not reasonably practical to use a higher order control may you then use a control at the next lower level:

Elimination

Eliminate the risk of a fall completely, e.g. relocate the work to a safe working height, to the ground or existing solid construction with guardrail/walls, etc.

Engineering or Substitution

If it is not reasonably practical to eliminate the risk of a fall, reduce the risk by the use of passive fall protection equipment e.g. guard-railing, scissor lifts, elevated work platforms, scaffolds, etc. Work from any mobile elevated work structure, shall require the additional use of a Personal Fall Arrest System.

Work Positioning System

If it is not reasonably practical to eliminate the risk or use passive fall protection, use work positioning systems to physically prevent a fall from occurring.

Personal Fall Arrest System

If it is not reasonably practical to use the above options, the use of Personal Fall Arrest Systems to arrest a fall after it occurs shall be used. Body belts are not permitted for use as part of a Personal Fall Arrest System.

Administrative Controls

If none of the above measures are reasonably practical, or the risk of a fall still remains, the risk shall be reduced by the use of documented administrative controls that specify the procedures to be used to mitigate the risk, such as Warning Line System, Fall Protection Plan, Work at Heights Permit, Job Safety Analysis, etc.

Personal Protective Equipment

Personal protective equipment shall be used to minimize fall hazards where engineering controls do not eliminate the hazard or in conjunction with engineering controls.

Personal Fall Arrest System

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The use of a personal fall arrest system is the required personal protective equipment for fall hazards at Tufts University. A personal fall arrest system consists of a full-body harness, lanyard, and anchor point OR a full-body harness, lanyard, lifeline, anchor point, and deceleration/grabbing device. All fall protection equipment shall meet or exceed appropriate American National Standards Institute (ANSI) standards. Tufts employees shall use only commercially manufactured equipment specifically designed for fall protection and certified by a nationally recognized testing laboratory. All fall protection equipment must bear the marking of the manufacturer and approvals for specified use. Requirements for a personal fall arrest system include but are not limited to the following:

A. Body Harness - Only full-body harnesses shall be used. The use of a body belt as fall protection is prohibited.

B. Connecting Device - Shock-absorbing lanyards and lifelines

1. Lanyards and lifelines shall have a minimum breaking strength of 5000 pounds;
2. Lanyards shall not exceed six feet in length. Lanyards used on aerial lift devices should not exceed 4 feet in length to reduce slack;
3. Ropes and straps (webbing) used in lanyards, lifelines, and strength components of body harnesses shall be made from synthetic fibers;
4. Connecting assemblies shall have a minimum tensile strength of 5,000 pounds;
5. The maximum free fall distance is six feet for all systems;
6. The maximum deceleration distance is 3.5 feet;
7. Personal fall arrest systems shall have sufficient strength to withstand twice the potential impact energy of the falling employee;

C. Anchorage - Anchorage point and anchorage connector

1. Anchorages used for personal fall arrest systems shall be independent of any anchorage being used to support or suspend platforms and be capable of supporting at least 5000 pounds per employee attached;
2. A qualified person shall determine all anchor points, both temporary and permanent. Permanent anchor points shall be properly marked;
3. Personal fall arrest systems shall not be attached to guardrail systems, nor shall they be attached to hoists except as specified in other regulations.

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Maintenance and Inspection

Personal Fall Arrest Systems and associated devices/equipment shall be visually inspected prior to each use, and periodically per manufacturers' specifications, for excessive wear, damage and other sign of deterioration. (see attachment 1.2)

- Periodic inspections (attachment 1.2) shall be documented.
- Defective or out of date equipment shall be immediately removed from service and tagged.
- Personal Fall Arrest Systems that are involved in a fall arrest incident must be taken out of service immediately and permanently. Retractable lifelines must be sent back to the manufacturer for repair and re-certification or destroyed.
- Harnesses, lanyards, and retractable devices must have a legible tag or data plate attached to the device or it must be taken out of service.
- Fall protection equipment must be replaced as required per the manufacturer's instructions.

Fall protection equipment must be used in accordance with the manufacturer's instructions. This includes weight and size limitations, and must not be altered in any way without the manufacturer's written authorization.

VII. Roof Access Procedure

Tufts limits the access to roofs to those individuals who have a specific purpose on the roof and when work can be performed safely, under lighting and weather conditions that exist at the time of the operation. Facilities Service staff and/or their contractors are the primary users of roofs at Tufts, therefore Facilities Service personnel are responsible for training and authorizing personnel before roof access is permitted.

1. All Facilities Service staff whose job requires roof access will participate in annual training on the requirements of the Fall Protection Program and how to use the information in the posted Risk Assessment for each building.
2. All non-Facilities Service employees requiring access to a roof will contact Facilities Services work control and arrange for a Facilities Service staff member to meet at the access point with a copy of the risk assessment for that building and roof.

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3. Limitations to access due to inclement weather i.e. wind, rain, ice, snow will be noted on the risk assessment form. Roof access may have to be postponed until weather and roof conditions improve.
4. In some cases, access to roof areas with slate or extreme pitch will be denied and access will require the use of scaffolding or aerial lifts.

Effective roof work fall protection techniques are intended to protect workers while providing the mobility and comfort necessary to perform work tasks. Several techniques are available and are described below.

I. Low-slope or Flat Roofs (slope less than or equal to 4:12 vertical to horizontal)

Each employee engaged in roofing activities on low-slope roofs, with unprotected sides and edges 6 feet or more above lower levels shall be protected from falling by guardrail systems, parapets (minimum height 39 inches and able to support 200 pounds), safety net systems, personal fall arrest systems, or a combination of warning line system and guardrail system, warning line system and safety net system, or warning line system and personal fall arrest system, or warning line system and safety monitoring system. Or, on roofs 50-feet or less in width the use of a safety monitoring system alone [i.e. without the warning line system] is permitted.

II. Steep roofs (slope greater than 4:12 vertical to horizontal)

Each employee on a steep roof with unprotected sides and edges 6 feet or more above lower levels shall be protected from falling by guardrail systems with toe boards, safety net systems, or personal fall arrest systems.

III. Slate roofs Tufts University has slate roofs that area easily damaged by foot traffic, climbing devices and scaffolding. A mechanical lift shall be used to inspect and repair slate roofs.

IV. Personal Fall Arrest System

- A. The system of choice for fall protection on roofs is a standard handrail, in the absence of a handrail the preferred protection is a personal fall arrest system;
- B. Requirements for personal fall arrest systems are found in the Fall Protection Personal Protection Equipment section of this program; and
- C. Personal fall arrest systems for roof work must be designed by a qualified person.

V. Designated Areas

As an alternative to installing guardrails, a designated area may be established. Designated areas are of a temporary nature only. The following condition and requirements must be met in order to use designated areas in lieu of other fall protection measures:

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- A. The work must be of a temporary nature, such as maintenance on roof top equipment;
- B. Designated areas shall be established only on surfaces that have a slope from horizontal of 10 degrees or less; and
- C. The designated area shall consist of an area surrounded by a rope, wire, or chain and supporting stanchions.
 - 1. Shall be constructed with ropes, wires or chains of 500-lb tensile strength. Barrier tape is strictly prohibited;
 - 2. The warning line system of the designated area will have uprights capable of withstanding withstand 16-lb force at 30-in. height. The line will be of rope, wire, chain of 500-lb tensile strength. The line shall be flagged at 6-ft intervals. Height of the warning line shall be 34-39 inches. The line will be attached to uprights with no line slip;
 - 3. After being erected with the line attached, stanchions shall be capable or resisting, without tipping over, a force of at least 16 pounds applied 30 inches above the base;
 - 4. The line shall be attached at each stanchion in such a way that pulling on one section of the line between stanchions will not result in slack being taken up in adjacent sections before the stanchion tips over;
 - 5. The line forming the designated area shall be clearly visible from any unobstructed location within the designated area up to 25 feet away;
 - 6. The stanchions shall be erected as close to the work area as is permitted by the task;
 - 7. The perimeter of the designated area shall be erected no less than 15 feet from the unprotected side or edge; and
 - 8. Access to the designated area shall be by a clear path formed by two lines attached to stanchions.

VIII. Rescue

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Qualified personnel must ensure that appropriate emergency procedures are established, documented, and communicated to all affected employees, before any work at height is undertaken.

Qualified personnel must ensure that emergency procedures:

- enable the rescue of an employee in the event of a fall, and
- provide for first aid to an employee who has fallen

Qualified personnel must ensure that emergency response shall commence within 15 minutes.

The following are examples of emergency response that can be used:

- self-rescue
- assisted rescue
- self-descent device
- high-angle rescue

IV. Ariel Lifts

Aerial lifts include the following types of vehicle mounted aerial devices used to elevate personnel to job sites above ground:

- **Articulating boom platforms** are designed to reach up and over obstacles.
- **Extensible or telescoping boom platforms** may extend over one hundred feet.
- **Vehicle mounted bucket lifts** are used to repair utility lines.
- **Scissor lifts** extend into the air via a series of crisscross supports.
- **Personal man lifts** are lightweight and designed for one person to use indoor.

I. Specific requirements

- A. Aerial lifts shall be secured in the lower traveling position before the truck is moved for highway travel;
- B. Lift controls shall be tested each day prior to use;
- C. Only personnel authorized by a fall protection competent person and trained in the operations of the lift shall operate an aerial lift:
- D. Employees shall always stand firmly on the floor of the basket and shall not sit or climb on the edge of the basket or use planks, ladders, or other devices for a work position;
- E. A full-body harness shall be worn and a lanyard attached to the engineered anchor point in the basket when working from an aerial lift (exception: a harness is not required in a scissor lift or personal man lift with surrounding guardrail system and closing gate or latch chain);
- F. Belting off to an adjacent pole structure, or equipment while working from an aerial lift shall not be permitted;

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- G. Boom and basket load limits specified by the manufacturer shall not be exceeded;
- H. The brakes shall be set and when outriggers are used, they shall be positioned on pads or other solid surface. Wheel chocks shall be installed when using an aerial lift on an incline;
- I. An aerial lift truck shall not be moved when the boom is elevated in a working position, except for equipment which is specifically designed for this type of operation;
- J. Articulating and extensible boom platforms shall have both platform and ground controls; and
- K. Before moving an aerial lift for travel, the boom shall be inspected to ensure that it is properly cradled and outriggers are in the stowed position.

IX. Training

Personnel performing work at height shall be trained in site-specific fall protection procedures, and any task specific procedures that are established, prior to performing any work at height.

Employees shall demonstrate an understanding of the training and use of the equipment. This shall be accomplished through a documented exam and documented practical demonstration.

Refresher training shall be provided when;

- Changes in the workplace render previous training obsolete,
- Changes in the types of Fall Protection equipment to be used render previous training obsolete, Workplace observations indicate that employees have not retained an understanding of the skills acquired through their initial training,
- Changes are made to the Fall Protection Program, or
- Qualified or competent personnel identify the need.

Personnel who maintain and inspect Personal Fall Arrest Systems must receive formal training on how to properly maintain and inspect Personal Fall Arrest Systems. The training shall be conducted by a Qualified person, a Competent person, or outside resource. Tufts EHS will provide advice and guidance on required training for personnel involved with working at heights.

X. Program Audit

Tufts shall perform a documented annual evaluation of the entire Fall Protection Program. The annual evaluation shall include a thorough review of the following:

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- The Fall Protection Program to determine if it is complete and up to date.
- Fall protection risk assessments to evaluate the thoroughness and completeness of the assessment.
- Equipment inspection checklists to evaluate the thoroughness and completeness.
- Training records to determine if all required training was appropriately conducted and attended.

Revision Log

Revision #	Date	Description of Change	Written by

Document Responsibility

Owner			
Approved by			