PERSONAL PROTECTIVE EQUIPMENT

Appendix A

Temple University
Environmental Health and Radiation Safety

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1: Eye and Face Protection OSHA 1910.133, ANSI 287.1

1a) Requirements

Employees must wear appropriate eye and face protection when exposed to potential eye or face hazards at work. Examples of hazards include dust, flying objects, molten metal, liquid chemicals, corrosive liquids, chemical gases or vapors, or potentially injurious light radiation.

Considerations

- Face shields must be used in combination with safety spectacles or goggles.
- Users who wear contact lenses must also wear appropriate eye and face protection as contact lenses do not protect the eyes from hazards.
- For Users who wear prescription glasses, the prescription must be incorporated into the safety glasses or goggles, or safety glasses or goggles must be selected to fit properly over the prescription lenses.
- For work with injurious light (e.g., welding, arc cutting), each employee must use eye and face protection with filter lenses that have a shade number appropriate for the work being performed. Reference table for selection below.

Eye and Face Protection Selection Chart

Hazard Class	Examples	Body Part Protected	PPE Required
Chemical splash	Acid and chemical handling, transfer, or application. Degreasing and plating of materials.	Eyes Only	Vented or enclosed chemical rated goggles
		Full Face	Chemical rated face shield over chemical rated goggles.
Chemical Mists	Aerosol application, off gassing of chemical reactions, spraying of chemicals.	Eyes Only	Enclosed Chemical rated goggles
		Full Face	Chemical rated face shield over enclosed chemical rated goggles
Biological Exposure to biohazardous, infectious, or bloodborne pathogenetic materials.	Patient sample handling, direct patient interaction where communicable disease is suspected.	Full Face	Fluid resistant face shield.
Dust	Woodworking, buffing, general industry conditions.	Eyes Only	Sealed impact rated safety goggles.
Impact Flying fragments, objects, large chips, particles of sand, dirt or metal.	Chipping, grinding, machining, masonry work, woodworking, sawing, drilling, chiseling, sanding.	Eyes Only	Impact rated safety glasses or goggles.
	Wire brushing, grinding, rotary cutting.	Full Face	Impact rated face shield over impact rated safety glasses or impact goggles.
Non-Ionizing Radiation Class 1-4 lasers	Laser cutting, experimental applications, laser pointers and levels.	Eyes Only	Laser safety glasses or goggles, see section 1e for optical density by task.
Non-Ionizing Radiation IR	Oxygen cutting, shielded metal arc welding, gas welding, plasma arc cutting and welding, torch brazing and soldering.	Eyes Only	Infrared rated glasses or goggles, see section 1e for optical density by task.
		Full Face	Infrared rated helmet or face shield, see section 1e for optical density by task.
Non-Ionizing Radiation UV	3D Printing curing, bactericidal applications,	Eyes Only	UV rated glasses or goggles, see section 1e for optical density by task.
		Full Face	UV rated helmet or face shield, see section 1e for optical density by task.

1b) Use and Limitations

Proper eye and face protection is rated for a specific hazard so safety glasses rated for impact may not protect against chemicals. Users must always inspect their eye and face protection before use. This inspection should focus on the structural and hygienic condition of the PPE. Do not use the eye or face protection if a defect is found such as missing or broken components, cuts, large scratches, or gouges. If the lenses of eye or face protection become marred through scratches, cuts, etc. and limit the visibility of the lenses they must be replaced. Always reinspect eye and face protection if exposed to chemicals or an impact.

1c) Cleaning and Storage

As there are variations between types of eye and face protection, always follow the manufacturer's recommendations and ensure they are stored in a cool, dry, and clean place out of direct sunlight.

1d) Fit Guide

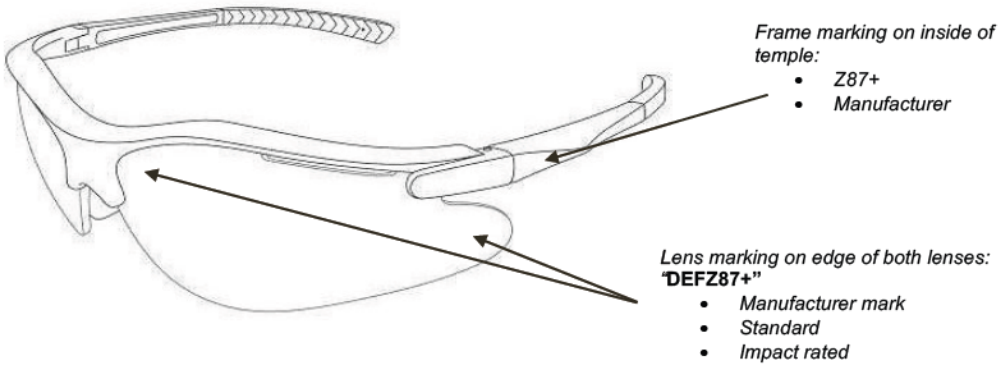
If PPE is uncomfortable or prevents the User from performing their work, the likelihood of use is reduced. Manufacturers take this into consideration and offer a wide variety of styles and materials for User comfort. Areas where material type choice play a large role are on the bridge of the nose and the temples. Once a type of eye and or face protection has been identified, User comfort should be considered when selecting the model to provide.

1e) Extra Information

Where and how to check for eye protection ratings. Example manufacturer is called DEF in picture.

Impact	Liquid splash/droplet	Optical Radiation
Spectacle lens: **+** All other lens: **Z87+** Plano frame: **Z87+** Rx frame: **Z87-2+**	Splash/droplet: **D3** Dust: **D4** Fine dust: **D5**	IR: **R** and scale number Visible: **L** and scale number UV: **U** and scale number Welding: **W** shade number Variable tint: **V** Special purpose: **S**

Example of Distinct Marking for ANSI Z87.1-2015
(For fictitious manufacturer: DEF)



DEFZ87+W3	Impact rated, Welding (shade 3) Face shield
DEFZ87+	Impact rated Goggle
DEFZ87	Non-impact rated Goggle or Face shield
DEFZ87+	Impact rated Plano Spectacle
DEFZ87-2+	Impact rated prescription Spectacle
DEFZ87+D3	Impact rated, Splash rated, Goggle or Face shield
DEFZ87+D3D4D5	Impact rated, Goggle or Full Face Piece Respirator, splash, dust and fine dust rated
DEFZ87U3	Non-impact rated, UV protective, Goggle or Face shield

Filter Lenses for Protection Against Radiant Energy

Operations	Electrode Size 1/32 inch	Arc Current	Minimum Protective Shade
Shielded metal arc welding	Less than 3	<60	7
	3-5	60-160	8
	5-8	160-250	10
	More than 8	250-550	11
Gas metal arc welding and flux cored arc welding	Not specified	<60	7
		60-160	10
		160-250	10
		250-500	10
Gas tungsten arc welding	Not specified	<50	8
		50-150	8

		150-500	10
Air carbon	Light	<500	10
Arc cutting	Heavy	50-1000	11
Plasma arc welding	Not specified	<20	6
		20-100	8
		100-400	10
		400-800	11
Plasma arc cutting	Light	<300	8
	Medium	300-400	9
	Heavy	400-800	10
Torch brazing	Not specified	Not specified	3
Torch soldering	Not specified	Not specified	2
Carbon arc welding	Not specified	Not specified	14

Protective Lenses for Protection Against Radiant Energy – Gas Welding

Operations	Plate thickness – inches	Plate thickness – mm	Minimum Protective Shade
Light gas welding	< 1/8	<3.2	4
Medium gas welding	1/8 – ½	3.2-12.7	5
Heavy gas welding	> 1/2	>12.7	6

Protective Lenses for Protection Against Radiant Energy – Oxygen Cutting

Operations	Plate thickness – inches	Plate thickness – mm	Minimum protective shade
Light oxygen cutting	<1	>25	3
Medium oxygen cutting	1-6	25-150	4
Heavy Oxygen cutting	>6	>150	5

When selecting optical density, start with a shade that is too dark to see the weld zone, then go to a lighter shade which gives sufficient view of the weld zone without going below the minimum listed above.

2: Head Protection OSHA 1910.135, ANSI Z89.1

2a) Requirements

Employees must wear head protection when working in areas where there is the potential for injury from falling objects, burns or exposed energized electrical conductors that could contact the head.

Considerations:

- When performing welding or cutting operations a welding cap should be worn under a welder's shield or mask.
- ANSI standards establish two types, and three classes of hard hats based on force of impact and the level of electrical hazard protection provided.

Head Protection Selection Chart

Hazard Class	Examples	Body Part Protected	PPE Required
Impact Strikes to top or sides of the head	Working or traveling under overhead work, climbing ladders with imminent obstacles that could strike head.	Top of head only	Type I hard hat class G, E, or C
		Top and sides of head	Type II hard hat class G, E or C
Impact Minor abrasion to the top of the head	Overhead of light rough material, working under abrasive or sharp surfaces.	Top of head only	Bump cap
Heat Burns	Welding, torch soldering or cutting, spark producing processes,	Top of head and neck	Welding cap
Electrical Contact of head with electricity. Class C (conductive) can NOT be used.	Climbing to heights where power lines are present or other sources of dangerous electricity.	Head up to 2,000 volts	Class G hard hat
		Head up to 20,000 volts	Class E hard hat

2b) Use and Limitations

Before using head protection, such as a hard hat, it must be inspected by the User. During the inspection check for signs of damage such as dents, cracks, penetration, or wear due to rough treatment or normal wear and tear. Always ensure the proper class and category of hard hat is being selected based on job hazard. Always consult the manufacturer's user manual for the life span of the hard hat or bump cap. Replace the PPE when end of life is reached, or a failed inspection occurs. Once a hard hat sustains an impact, even if damage is not noticeable, it must be replaced. Never drill holes, modify components, paint, color, attach stickers, or dye hard hats or bump caps unless allowed by the manufacturer. Do not wear hard hats or bump caps backwards unless allowed by the manufacturer.

2c) Cleaning and Storage

Users must follow manufacturer's recommendations for cleaning of head protection. Generally, using a mild detergent and warm water followed by a thorough rinse in clean water is recommended. Wipe all parts dry and allow to air dry thoroughly. Avoid using chemicals such as bleach, ammonia, etc. as they may degrade the material of the hard hat. Always ensure they are stored in a cool, dry, and clean place out of direct sunlight.

2d) Fit Guide

As with all PPE, if it is uncomfortable or prevents the User from completing their work it will not be used. A proper fitting hard hat or bump cap will meet the following checks.

- When donned and adjusted to the User's head it will not shift, lean, or fall off when looking up, down and side to side or when the User runs.
- Head protection should be as light as possible. Older hard hats and bump caps are typically made from thick materials due to stronger and lighter alternatives not being available.
- Head protection should be the correct size for the User and job. A hard hat with a larger shell than is needed will obstruct vision and add additional weight.

- Have adjustable suspensions. This typically presents in a single pin lock, ratchet or tab and lock adjustment in the rear. Newer styles of hard hats offer multiple adjustment points for additional comfort.
- Sweatband material should be considered for comfort and sweat absorption quantity as well as its ability to quickly evaporate moisture.
    - Hypoallergenic sweatbands reduce dermatitis and allow for the sweatband to easily be removed, washed, and replaced.
- Combinations with other PPE should be considered. Typically, a hard hat or bump cap will be worn with eye protection or hearing protection. By picking head protection that accommodates other types of PPE to be worn simultaneously it will be much more likely to be used and easier to wear.

2e) Extra Information

Type	Hazard	Purpose
I	Impact	Helmet with full brim. Intended to reduce force of impact to only top of head
II	Impact	Brimless helmet with peak extending forward from crown. Intended to reduce force of lateral impact resulting from a blow which may be received off-center, from the side or top of the head.
Class	Hazard	Voltage Rating
G (general)	Electrical	2,200
E (electrical)	Electrical	20,000
C (Conductive)	Electrical	No electrical protection

Markings	Designation
2 arrows curved to form a circle	Hard hat can be worn forwards or backwards
LT	Can be used in low temperatures. Check specific temperature rating by manufacturer.
HV	Helmet meets all requirements for high visibility.

Type	Hazard	Designation
Bump cap	Cuts	Intended for protection against minor bumps to head or laceration hazards. Does not offer impact protection.

Welding cap	Heat	Intended to be worn under welding helmet or shield. Offers fire retardation, synthetic material free, to prevent burns to scalp, hair, and neck while welding. This cap is designed to be worn with the bill facing backwards.

3: Foot Protection OSHA 1910.136, ANSI Z41.1

3a) Requirements

Employees must wear protective footwear at work where there is the potential for foot injuries from falling or rolling objects, from objects piercing the sole, or from exposed energized electrical conductors that could contact the feet.

Foot and Leg Protection Selection Chart

Specific Hazard	Examples	Body Part Protected	PPE Required
Chemical Chemicals or acids	Chemical spill on floor, chemical transfer where spills could occur.	Foot, ankle, lower leg	Chemical protective or resistant shoes, boots or covers.
		Foot and leg	Chemical resistant waders over chemical protective or resistant shoes, boots or covers.
	Laboratory work with small chemical volumes	Foot	Closed toe non permeable shoes.
Biological Exposure to biohazardous, infectious, or bloodborne pathogen materials.	Vomitus, blood or other bodily fluids on walking surface where shoe contamination is a concern	Foot	Disposable non permeable shoe covers or booties.
Impact, Compression, Penetration Crushing by heavy loads or machinery, piercing by sharps, cutting by powered or non-powered bladed tools.	Use of powered industrial trucks or non-powered machinery that hold heavy loads such as pallet jacks, hand trucks, etc.	Foot	Crush resistant shoes or boots or covers. Can be steel or composite toe.
	Jack hammering, steel or ironwork, skid trucks, pavement breaking, heavy material handling	Foot	Crush resistant shoes or boots or covers with metatarsal protection. Can be steel or composite toe.
	Tree work, use of chainsaws, axes or hatchets	Foot	Cut resistant safety toe boots or shoes.
		Foot and Leg	Leg guards or cut resistant chaps with cut resistant safety toe boots or shoes.
Heat Extreme heat causing burns	Furnace work, welding, torch work, etc.	Foot	Heat resistant boots such as leather.
		Foot and leg	Welding chaps with heat resistant boots such as leather.
Cold Extreme cold causing frostbite	Work outdoors in the winter such as ice or snow removal.	Foot	Insulated, water resistant or proof shoes or boots
Slippery Surfaces Slips and falls	Walking on ice, surfaces that are perpetually wet, oil covered surfaces such as kitchens.	Foot	Nonslip or slip resistant shoes or boots.
Electrical Electrical shock	Working in areas where energized lines are on walking surface	Foot	Non-conductive footwear.

3b) Use and Limitations

The protective quality of footwear is highly dependent on the materials it is constructed of so a material used for chemical resistance may have low heat tolerance, as an example. Protective footwear must be selected and used for its specified hazards only. The limitations of foot or leg protection will be easily exceeded if the wrong type is selected.

3c) Cleaning and Storage

As with all PPE, before foot or leg protection is used it must be inspected. This inspection should focus on cuts, tears, and rips on all sides. Ensure hardware isn't missing or damaged as well. If defects are found immediately discontinue use as the foot or leg protection will no longer provide adequate protection. Store foot and leg protection in a clean environment with adequate ventilation for sweat and moisture dissipation. Follow manufacturer's recommendations for cleaning. As foot and leg protection are made of different materials for different hazards, some chemicals may destroy or degrade the materials they are comprised of. Always ensure they are stored in a cool, dry, and clean place out of direct sunlight.

3d) Fit Guide

Protective footwear sizing should be selected based on normal shoe size. Most safety footwear manufacturers offer wide, narrow, and regular variants of sizes. The shoe should not pinch the User's toes, be too loose to create a tripping hazard or overly restrict their movement. Shoelaces should always be tied snuggly, wearing footwear unlaced or untied may create slip, trip, and fall hazards. Always check the packaging for the protective footwear codes listed in section 3e.

3e) Extra Information

Protective footwear codes

Code	Meaning
M	Male
F	Female
I	Rated for impact protection
C	Rated for compression protection
Mt	Rated for metatarsal protection
CD	Rated for conductive protection
EH	Rated for electrical hazards
PR	Rated for puncture resistance
SD	Rated for static dissipation
WR	Rated for water resistance

4: Hand Protection OSHA 1910.138, No ANSI Standard

4a) Requirements

Employees must wear hand protection at work to protect against hazards to their hands. Examples include skin absorption of harmful substances, biological agents, cuts or lacerations, abrasions, punctures, chemical burns, or temperature extremes. Hand protection should never be worn when working with moving parts such as rotary equipment like drills, lathes, circular saws, etc., where the user's hand may become caught.

Hand Protection Selection Chart

Hazard Class	Examples	Body Part Protected	Required PPE
Chemical Chemicals or acids.	Laboratory work, transfer or transportation of chemicals.	Hand	Chemical rated gloves, check table XX for example chemical compatibility
Biological Exposure to biohazardous, infectious, or bloodborne pathogen materials.	Bodily fluids of humans or animals, laboratory work including experimentation and research.	Hand	Disposable impervious gloves such as nitrile.
Impact Crushing of hand.	Hand tools, Non-rotary power tools.	Hand	Reinforced impact, or leather work gloves.
Heat Burns	Hot work including welding, torch soldering, foundry work.	Hand	Aluminized, Kevlar, or leather gloves.
Cold Frostbite	Dry ice, liquid nitrogen, -40 or -80 freezers.	Hand	Cryogenic gloves.
Cuts Lacerations, abrasion, or punctures to top or bottom of hand.	Work with bladed instruments, rough materials or working with needles.	Hand	Chainmail, Kevlar, leather, palm coated, or puncture resistant gloves.

4b) Use and Limitations

Glove selection for chemical protection must be based on performance characteristics such as breakthrough time and permeation rate, conditions of use, and duration of use. One type of glove will not protect against all chemical hazards. Consult EHRS for a risk assessment before selecting hand protection, if not already established. Most gloves are intended to be single use as they will degrade or become hygienically unacceptable after use. Always inspect all parts of a glove, paying particular attention to fingers for tears, rips, holes, or damage before use. Always follow manufacturer's specifications for how long a glove can remain in service when handling chemicals. Never use a glove that hasn't been specified for the task being performed.

Glove selection for physical protection shall be based on performance characteristics necessary to protect the hand against cuts, lacerations, abrasions, punctures, or temperature extremes as appropriate for anticipated contacts and upset conditions during an individual's job tasks. Never use hand protection when working with tools or machinery in motion as they may be caught in moving parts, unless otherwise indicated.

4c) Cleaning and Storage

Most rubber, nitrile, latex, and PVC gloves are single use disposable, and as such, cleaning of disposable gloves is not recommended. Cleaning agents may degrade gloves leaving the User susceptible. Instead, dispose of single use gloves and grab a new pair. For leather, fabric, cotton, Kevlar, and aluminized gloves, cleaning may be possible based on manufacturer's specifications. Always follow manufacturer's instructions and allow time for gloves to properly dry before use. Always ensure they are stored in a cool, dry, and clean place out of direct sunlight.

4d) Fit Guide

Gloves should fit snug around the wearer's hand. If gloves are too large excess material will lead to a degradation in dexterity. If gloves are too tight, they may break or tear when the wearer performs their work. For recommended fit refer to section 4e.

4e) Extra Information

Glove material rating by chemical exposure

Legend: *=limited service, VG=very good, G=good, F=fair, P=poor (not recommended)				
Chemical	Neoprene	Natural Latex or Rubber	Butyl	Nitrile or Latex
Acetaldehyde*	VG	G	VG	G
Acetic Acid	VG	VG	VG	VG
Acetone*	G	VG	VG	P
Ammonium hydroxide	VG	VG	VG	VG
Amyl acetate*	F	P	F	P
Aniline	G	F	F	P
Benzaldehyde*	F	F	G	G

Benzene*	F	F	F	P
Butyl acetate	G	F	F	P
Butyl alcohol	VG	VG	VG	VG
Carbon disulfide	F	F	F	F
Carbon tetrachloride*	F	P	P	G
Castor Oil	F	P	F	VG
Chlorobenzene*	F	P	F	P
Chloroform*	G	P	P	P
Chloronaphthalene	F	P	F	F
Chromic Acid (50%)	F	P	F	F
Citric acid (10%)	VG	VG	VG	VG
Cyclohexanol	G	F	G	VG
Dibutyl phthalate	G	P	G	G
Diesel fuel	G	P	P	VG
Diisobutyl ketone	P	F	G	P
Dimethylformamide	F	F	G	G
Dioctyl phthalate	G	P	F	VG
Dioxane	VG	G	G	G
Epoxy resins, dry	VG	VG	VG	VG
Ethyl acetate*	G	F	G	F
Ethyl alcohol	VG	VG	VG	VG
Ethyl ether	VG	G	VG	G
Ethylene dichloride*	F	P	F	P
Ethylene glycol	VG	VG	VG	VG
Formaldehyde	VG	VG	VG	VG
Formic acid	VG	VG	VG	VG
Freon 11	G	P	F	G
Freon 12	G	P	F	G
Freon 21	G	P	F	G
Freon 22	G	P	F	G
Furfural*	G	G	G	G
Gasoline, leaded	G	P	F	VG
Gasoline, unleaded	G	P	F	VG
Glycerine	VG	VG	VG	VG
Hexane	F	P	P	G
Hydrochloric acid	VG	G	G	G

Hydrofluoric acid (48%)	VG	G	G	G
Hydrogen peroxide (30%)	G	G	G	G
Hydroquinone	G	G	G	F
Isooctane	F	P	P	VG
Isopropyl alcohol	VG	VG	VG	VG
Kerosene	VG	F	F	VG
Ketones	G	VG	VG	P
Lacquer thinners	G	F	F	P
Lactic acid (85%)	VG	VG	VG	VG
Lactic acid (36%)	VG	F	VG	VG
Lineolic acid	VG	P	F	G
Linseed oil	VG	P	F	VG
Maleic acid	VG	VG	VG	VG
Methyl alcohol	VG	VG	VG	VG
Methylamine	F	F	G	G
Methyl bromide	G	F	G	F
Methyl chloride*	P	P	P	P
Methyl ethyl ketone*	G	G	VG	P
Methyl isobutyl ketone*	F	F	VG	P
Methyl methacrylate	G	G	VG	F
Monoethanolamine	VG	G	VG	VG
Morpholine	VG	VG	VG	G
Naphthalene	G	F	F	G
Naphthas, aliphatic	VG	F	F	VG
Naphthas, aromatic	G	P	P	G
Nitric acid*	G	F	F	F
Nitromethane (95.5%)	F	P	F	F
Nitropropane (95.5%)	F	P	F	F
Octyl alcohol	VG	VG	VG	VG
Oleic acid	VG	F	G	VG
Oxalic acid	VG	VG	VG	VG
Palmitric acid	VG	VG	VG	VG

Perchloric acid (60%)	VG	F	G	G
Perchloroethylene	F	P	P	G
Petroleum distillates (naphtha)	G	P	P	VG
Phenol	VG	F	G	F
Phosphoric acid	VG	G	VG	VG
Potassium hydroxide	VG	VG	VG	VG
Propyl acetate	G	F	G	F
Propyl alcohol	VG	VG	VG	VG
Sodium hydroxide	VG	VG	VG	VG
Stryene (100%)	P	P	P	F
Sulfuric acid	G	G	G	G
Tannic acid (65%)	VG	VG	VG	VG
Tetrahydrofuran	P	F	F	F
Toluene*	F	P	P	F
Toluene diisocyanate	F	G	G	F
Trichloroethylene*	F	F	P	G
Triethanolamine	VG	G	G	VG
Tung oil	VG	P	F	VG
Turpentine	G	F	F	VG
Xylene*	P	P	P	F

5) Fall Protection OSHA 1910.140 ANSI Z359.1

Employees are required to use fall protection when there is a chance of free fall of 4 feet or greater in height to a lower surface for general industry if a parapet or guardrail system is not present. Fall protection must meet all requirements outlined under 1910.140. Fall protection systems are covered under Temple's Fall Protection Program, due to the requirements of Fall Protection systems a Qualified or Competent person in Fall Protection must be consulted. Contact EHRS for guidance.

6) Respiratory Protection OSHA 1910.134, ANSI Z88

Respirator selection and use is addressed through Temple's Respiratory Protection Program. Temple's Respiratory Protection Program requires medical clearance to wear a respirator, annual fit testing and in-person training. Due to the requirements of this program EHRS must be contacted for a hazard assessment and based on the findings, enrollment into the Respiratory Protection Program may be required.

7) Hearing Protection OSHA 29 CFR 1910.95

Hearing protection falls under Temple's Hearing Conservation Program. Under this program, area noise level monitoring, employee dosimetry, and audiometric testing is performed by EHRS. Recommended PPE for hearing protection, its use, limitations and care also falls under this program and will not be covered in this document.

8) Electrical Protection NFPA 70E

Electrical protection is required when work is being performed on or around a live, isolated, or unknown electrical source. The scope of these requirements exceeds the coverage of this policy. Electrical work can only be performed by trained professionals in accordance with NFPA70E and required PPE is not covered in this guide. Contact EHRS for guidance in electrical protection equipment.