FESHM 4130: PERSONAL PROTECTIVE EQUIPMENT (PPE)

Revision History

Author	Description of Change	Revision Date
Tom Gibbs	Five-year review of chapter 4130. • Section 2.0 Hazard Assessment and Certification statement revised to reflect current work planning procedures. Training updated from ESH&Q Section's Safety & Environmental Protection Group to ES&H Section. • Section 12.0 Appendix I PPE training #FN000199 reference deleted. This training is given during New Employee Orientation. • Added the hierarchy of controls to the introduction. • Added verbiage regarding Safety Eyewear	August 2021
Tom Gibbs	Five-year review of chapter 4130. Added new FESHM template. • Section 6.2.a updated to reflect that non-prescription safety eyewear can be obtained from the stockroom. • Section 6.2.c updated to include procedural information available on the ES&H webpage.	February 2015
John P. Cassidy	The following changes have been made to FESHM 4130 Personal Protective Equipment Technical Appendix 4130TA • Section 3.2e has been updated to "working below machinery or processes that might cause material or objects to fall, including overhead lifts involving a crane or hoist" • Section 3 has been updated to "Each employee shall wear protective footwear while working in areas where there is a danger of foot injuries due to falling and rolling objects, objects piercing the sole and electrical hazards, including overhead lifts involving a crane or hoist."	May 2012

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1.0 INTRODUCTION

Per OSHA 29 CFR 1910.132 personal protective equipment (PPE) shall be provided, maintained, and used whenever the workplace poses a hazard to the head, eyes, hands or feet. To determine if these hazards exist, and what PPE is necessary, a hazard assessment of the workplace shall be conducted and documented. Following the hierarchy of controls, PPE should be used only when it is impossible/impractical to eliminate a hazard through engineering design or administrative controls. In addition, each employee required to use PPE addressed herein, shall be trained in its use. Training shall be documented as well.

NOTE: For PPE requirements against hazards not addressed in this chapter refer to other chapters in this manual that deal with specific risks such as noise, radiation and sources of ignition from electric arcs, welding, open flames, radiant heat and sparks. The referenced standards in those chapters will address the PPE requirement that matches the exposure.

2.0 PROGRAM DESCRIPTION

Hazard Assessment and Certification:

Division/Section supervisors are required to plan work and the associated PPE for that work (Work Planning and Control, FESHM 2060). Supervisors will work with their Division Safety Officer to ensure work is planned with the appropriate PPE and that the users of the PPE are trained in the use and limitations. PPE for the work can be documented via work plans, procedures, or other methods.

Training:

Divisions/Sections shall provide their employees with PPE training. Training methods used shall be determined by each division/section. Training tools can be obtained through the ES&H Section. Minimally, employees shall know:

- When PPE is necessary,
- What PPE is necessary,
- How to properly don, doff, adjust, and wear PPE,
- The limitations of the PPE, and
- The proper care, maintenance, useful life and disposal of the PPE.

All training shall be documented in the TRAIN database.

Non-Mandatory use of PPE:

Divisions/Sections may, at their discretion, distribute PPE to employees not required to use such PPE. However, Fermilab does not approve the personal use of Fermilab supplied PPE for uses other than Fermilab approved activities.

Technical Appendix:

The attached technical standard contains guidance on the following:

- The need for PPE
- Selection of PPE
- Maintenance of PPE
- How to obtain PPE
- Training tools
- PPE Hazard Assessment Checklist

3.0 TECHNICAL APPENDIX A – WHEN MUST PPE BE USED?

3.1 Eye & Face Protection:

a. Each employee shall wear eye or face protection when exposed to eye or face hazards from:

- "Desktop" soldering iron operations,
- Torch soldering or debrazing,
- Welding,
- Oxygen cutting,
- Flying particles or objects,
- Molten metal,
- Hazardous, liquid chemicals,
- Acids,
- Caustic liquids,
- Hazardous gases, vapors or fumes,
- Cryogenic liquids,
- Potentially injurious light radiation, and
- For other work conditions posing a hazard to the face and/or eyes, consult the applicable chapter (e.g., Electrical Safety Program, 9100, 9180).

3.2 Head Protection:

Each employee shall wear protective helmets (hard hats) while:

a. Working in areas where there is a potential for injury to the head from falling objects,
b. Working near electrical conductors -- these helmets must be designed to reduce electrical shock, See FESHM Chapter 9180 for further guidance.
c. Working below other workers who are using tools and materials which could fall,
d. Working around or under conveyor belts which are carrying parts or materials,
e. Working below machinery or processes that might cause material or objects to fall, including overhead lifts involving a crane or hoist, as well as forklift operations.

NOTE: This appendix contains a list of helpful guidelines to be used as a reference when determining the need for head protection (see Guidelines for Selecting Protection).

3.3 Foot Protection:

a. Each employee shall wear protective footwear while working in areas where there is a danger of foot injuries due to falling and rolling objects (including overhead lifts involving a crane or hoist), and objects piercing the sole. For electrical hazards, see FESHM Chapter 9180 for further guidance.

NOTE: This appendix contains a list of helpful guidelines to be used as a reference when determining the need for foot protection (see Guidelines for Selecting Foot Protection).

NOTE: See Fermilab's request form for safety shoes.

3.4 Hand Protection:

a. Each employee shall wear the appropriate hand protection while their hands are exposed to hazards such as those from:

- Skin absorption from harmful substances
- Cuts or lacerations
- Abrasions
- Punctures
- Chemical burns
- Thermal burns and harmful temperature extremes
- For other work conditions posing a hazard to the hands, consult the applicable chapter (e.g., Electrical Safety Program, 9100, 9180)

NOTE: This appendix contains a list of helpful guidelines to be used as a reference when determining the need for hand protection (see Guidelines for Selecting Hand Protection).

4.0 TECHNICAL APPENDIX B – SELECTING PPE

Where foot, head, eye and face, and hand hazards exist, appropriate expertise must be applied to select the proper PPE to be used.

Minimally, the selected PPE shall:

a. Provide adequate protection against the particular hazards for which they are designed,
b. Be reasonably comfortable during use,
c. Fit snugly and shall not interfere with the wearer's movements,
d. Be durable,
e. Where feasible, be capable of being disinfected (for PPE that is not capable of being disinfected, e.g., disposable PPE, the PPE, if contaminated, shall be disposed of in a manner that protects employees from exposure to hazards),
f. Unless disposable, be easily cleanable, and
g. Not present a hazard due to use.

NOTE: Guidelines for selecting PPE are included at the end of this appendix.

Other things to consider when selecting PPE are:

a. Eye protection equipped with side shields shall be worn during exposure to flying particles,
b. Employees requiring prescription lenses shall wear eye protection that incorporates the prescription into its design, or shall wear eye protection that can be worn over the prescription lenses without disturbing the proper position of the prescription lenses or the protective lenses,
c. Eye and face PPE shall be distinctly marked to facilitate identification of the manufacturer,
d. For exposure to injurious light radiation, employees shall use filter lenses that have a shade number appropriate for the work being performed.

5.0 TECHNICAL APPENDIX C – MAINTENANCE OF PPE

All PPE shall be inspected, cleaned, and maintained at regular intervals so that it provides the required protection. Defective and/or damaged PPE shall not be used. This is particularly important for eye and face protection where dirty or fogged lenses could impair vision.

Also, contaminated PPE that cannot be decontaminated shall be disposed of in a manner that protects employees from exposure to associated hazards.

6.0 TECHNICAL APPENDIX D – OBTAINING PPE – Eye and Face Protection

6.1 Non-Prescription Eye & Face Protection:

a. The Laboratory Stockroom provides safety eyewear (wrap-arounds only), safety goggles and face shields. Welding goggles and helmets must be purchased through outside vendors and must comply with ANSI Z87.1 standards.

6.2 Prescription Eyewear:

a. The ES&H Section coordinates the dispensing of prescription safety eyewear and the stockroom has a limited supply of safety eyewear with plano (A lens that does not incorporate a corrective prescription; this lens is not necessarily flat) plastic polycarbonate lenses. Other divisions/sections also supply approved safety eyewear. Contact your Division Safety Officer for more details.

b. The division/section Division Safety Officer (DSO) and pertinent supervisor must approve all prescription safety lenses containing "glass lenses." This practice is strongly discouraged since their use presents an unacceptable risk of injury in some work situations.

c. Procedures for obtaining prescription safety eyewear are described in this appendix. The latest version of the "Fermilab Optical Prescription Safety Eyewear Request" form can be obtained from the web. Below are some points to remember when obtaining prescription safety eyewear.

- In general, not more than one pair of prescription safety eyewear will be provided to an employee within any 12-month period. Exceptions may be granted by the employee's supervisor.

- The Fermilab optics technician contractor cannot determine an eyeglass prescription from an existing pair of eyeglasses. A prescription from your physician must accompany your request when placing your order for safety eyewear. Prescriptions shall not be more than 12 months old.

- When appropriate, lens tinting is used to limit exposure to visible, ultraviolet and/or infrared radiations. This may include sunlight, welding arc radiation, or laser radiation.

- Contact lenses are not protective eyewear. They may in some cases be worn in conjunction with protective eye and face devices.

- Employees about to Retire: Supervisors are not to approve/grant employees who are about to retire. They do not qualify as this is a Fermilab-funded program in support of those working on-site only.

- Retirees do not qualify for this service with exception given to in-warranty repairs to frames only as follows: Retirees who need to exercise in-warranty repairs for their most recently purchased frames (Subcontractor verification mandatory), may do so by visiting the site where they made their purchase. Any repairs beyond initial warranty will be via their personal eye care professional and at Retiree's expense.

- Deviations from these procedures and those posted on the ES&H webpage will be allowed only on the written permission of the employee's Division Safety Officer and the Occupational Medicine Office with advice from the employee's optometrist or ophthalmologist.

7.0 TECHNICAL APPENDIX E – Protective Eye and Face Selection Chart

SOURCE	HAZARD ASSESSMENT	PROTECTION
IMPACT - Chipping, grinding, machining, masonry work, woodworking, sawing, drilling, chiseling, powered fastening, riveting, sanding, etc.	Flying fragments, objects, large chips, particle, sand, dirt, etc.	Spectacles with side protection, goggles, face shields. See notes 1, 3, 5, 6, & 10. For severe exposures, use face shield.
HEAT - Furnace operations, pouring, casting, hot dipping, and welding.	Hot sparks Splash from molten metals High temperature exposure	Face shields, goggles, spectacles with side protection. For severe exposure use face shield. See notes 1, 2, & 3. Face shields worn over goggles. See notes 1, 2, & 3. Screen face shields, reflective face shields. See notes 1, 2, & 3.
CHEMICALS - Acid and chemicals handling, degreasing, plating, etc.	Splash Irritating mists	Goggles, eyecup and cover types. For severe exposure, use face shield. See notes 3 & 11. Special-purpose goggles.
DUST – Woodworking, buffing, general dusty conditions	Nuisance dust	Goggles, eyecup and cover types. See note 8.
LIGHT and/or RADIATION Welding: Electric arc Welding: Gas Cutting, Torch brazing, Torch soldering Glare	 Optical radiation Optical radiation Optical radiation Poor vision	 Welding helmets or welding shields. Typical shades: 10-14. See notes 9 & 12. Welding goggles or welding face shield. Typical shades: gas welding 4-8, cutting 3-6, brazing 3-4. See note 9. Spectacles or welding face-shield. Typical shades, 1.5-3. See notes 3 & 9. Spectacles with shaded or special-purpose lenses, as suitable. See notes 9 & 10.

NOTE: For hazard sources not listed, refer to pertinent safety person or review Material Safety Data Sheet for proper PP

Notes to Eye & Face Protection Selection Chart:

1. Care should be taken to recognize the possibility of multiple and simultaneous exposure to a variety of hazards. Adequate protection against the highest level of each of the hazards should be provided. Protective devices do not provide unlimited protection.

2. Operations involving heat may also involve light radiation. As required by the standard, protection from both hazards must be provided.

3. Face shields should only be worn over primary eye protection (spectacles or goggles).

4. As required by the standard, filter lenses must meet the requirements for shade designations in Table 1 below. Tinted and shaded lenses are *not* filter lenses unless they are marked or identified as such.

5. As required by the standard, persons whose vision requires the use of prescription (Rx) lenses must wear either protective devices fitted with prescription (Rx) lenses or protective devices designed to be worn over regular prescription (Rx) eyewear.

6. Wearers of contact lenses must also wear appropriate eye and face protection devices in a hazardous environment. It should be recognized that dusty and/or chemical environments may represent an additional hazard to contact lens wearers.

7. Caution should be exercised in the use of metal frame protective devices in electrical hazards areas.

8. Atmospheric conditions and the restricted ventilation of the protector can cause lenses to fog. Frequent cleansing may be necessary.

9. Welding helmets or face shields should be used only over primary eye protection (spectacles or goggles).

10. Non-side shield spectacles are available for frontal protection only, but are not acceptable eye protection for the sources and operations listed for “impact.”

11. Ventilation should be adequate, but well protected from splash entry. Eye and face protection should be designed and used so that it provides both adequate ventilation and protects the wearer from splash entry.

12. Protection from light radiation is directly related to filter lens density. See note (4). Select the darkest shade that allows task performance.

8.0 Table 1 – Filter Lenses for Protection Against Radiant Energy

OPERATIONS	ELECTRODE SIZE 1/32 IN.	ARC CURRENT	MINIMUM* PROTECTIVE SHADE
Shielded metal arc welding	Less than 3 ..... 3-5 ..... 5-8 ..... More than 8	Less than 60 ..... 60-160 ..... 160-250 ..... 250-550	7 8 10 11
Gas metal arc welding and flux cored arc welding		Less than 60 ..... 60-160 ..... 160-250 ..... 250-500	7 10 10 10
Gas Tungsten arc welding		Less than 50 ..... 50-150 ..... 150-500	8 8 10
Air Carbon Arc Cutting	(Light) ..... (Heavy)	Less than 500 ..... 500-1000	10 11
Plasma arc welding		Less than 20 ..... 20-100 100-400 400-800	6 8 10 11
Plasma arc cutting	(Light)** ..... (Medium)** ..... (Heavy)**	Less than 300 ..... 300-400 ..... 400-800	8 9 10
Torch brazing Torch soldering Carbon arc welding			3 2 14

Filter Lenses for Protection Against Radiation Energy - Continued

OPERATIONS	PLATE THICKNESS -- INCHES	PLATE THICKNESS --MM	MINIMUM* PROTECTIVE SHADE
Gas welding:			
Light	Under 1/8	Under 3.2	4
Medium	1/8 to 1/2	3.2 to 12.7	5
Heavy	Over 1/2	Over 12.7	6
Oxygen cutting:			
Light	Under 1	Under 25	3
Medium	1 to 6	25 to 150	4
Heavy	Over 6	Over 150	5

* As a rule of thumb, 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. In oxyfuel

gas welding or cutting where the torch produces a high yellow light, it is desirable to use a filter lens that absorbs the yellow or sodium line in the visible light of the (spectrum) operation.

** These values apply where the actual arc is clearly seen. Experience has shown that lighter filters may be used when the arc is hidden by the workpiece.

9.0 APPENDIX F – Guidelines for Selecting Head Protection

The context below provides guidance for selecting the appropriate safety helmet for a given hazard. Safety helmets may be obtained through the Laboratory Stockroom or purchased through outside vendors. All helmets shall meet ANSI Z89.1 standard.

1. Types of Helmets

   a. **Class G (General)** helmets intended to reduce the danger of exposure to low voltage electrical conductors, proof tested at 2,200 volts. Class G is tested at 2,200 volts for 1 minute, with 3 milliamps max. leakage. (formerly Class A)

   b. **Class E (Electrical)** helmets intended to reduce the danger of exposure to high voltage electrical conductors, proof tested at 20,000 volts. Class E is tested for force transmission first, then tested at 20,000 volts for 3 minutes, with 9 milliamps maximum current leakage; then tested at 30,000 volts, with no burn-through permitted. (formerly Class B)

   c. **Class C (Conductive)** helmets not intended to provide protection from electrical conductors. Class C is not tested for electrical resistance. (no change in class designation)

2. When Should Helmets be Worn?

   Protective helmets must be worn where falling objects present hazards. Some examples include:

   a. working below other workers who are using tools and materials which could fall,
   b. working around or under conveyor belts which are carrying parts or materials,
   c. working below machinery or processes which might cause material or objects to fall, including overhead lifts involving a crane or hoist, and
   d. working on exposed energized conductors, See FESHM Chapter 9180 for further guidance.

3. Occupations Requiring Head Protection:

Some examples of occupations for which the use of head protection should be considered include:

a. carpenters	f. linemen	k. packers
b. electricians	g. mechanics	l. handlers
c. pipe fitters	h. repairers	m. stock handlers
d. assemblers	i. plumbers	n. warehouse laborers
e. timber cutters	j. loggers	o. crane operators and riggers

10.0 APPENDIX G – Guidelines for Selecting Foot Protection

The context below contains guidance for selecting the appropriate safety footwear for a given hazard. To order safety footwear, the Safety Toe Footwear Request form must be properly completed. The latest version of the "Fermilab Safety Toe Footwear Request" form can be obtained from the web. Always use the latest version of the form, otherwise there may be a delay in processing the request.

1. Types of Foot Protection:

a. Safety shoes or boots with impact protection would be required for carrying or handling materials such as packages, objects, parts or heavy tools, and for other activities where objects might fall onto the feet.

b. Safety shoes or boots with compression protection would be required for work activities involving skid truck (manual material handling carts) around bulk rolls (such as paper rolls) and heavy pipes, all of which could roll over an employee's feet.

c. Safety shoes or boots with puncture protection would be required where sharp objects such as nails, wire, tacks, screws, large staples, scrap metal, etc., could be stepped on by employees causing a foot injury.

2. Occupations Requiring Foot Protection:

Some examples of occupations for which the use of foot protection should be considered include:

a. shipping and receiving clerks	m. stock clerks
b. punch and stamping press operators	n. welders
c. carpenters	o. laborers

d. electricians	p. mechanics
e. machinists	q. repairers
f. gardeners and grounds-keepers	r. plumbers
g. timber cutting and logging workers	s. lathers
h. pipe fitters	t. packers
i. stock handlers and warehouse laborers	u. wrappers
j. structural metal workers	v. craters
k. technicians	w. sawyers
l. drywall installers	x. assemblers
	y. crane operators/riggers

11.0 APPENDIX H – Guidelines for Selecting Hand Protection

The context below provides guidance for determining the appropriate hand protection for a given hazard. Gloves may be obtained through the Laboratory Stockroom or purchased through outside vendors.

1. General Hand Protection Information:

   a. Selection of the appropriate hand protection shall be based on an evaluation of:
      - The task(s) to be performed,
      - Conditions present,
      - Duration of use, and
      - The hazards and potential hazards identified.

   b. Generally, any "chemical resistant" glove can be used for dry powders.

   c. For mixtures and formulated products (unless specific test data are available), a glove should be selected on the basis of the chemical component with the shortest breakthrough time, since it is possible for solvents to carry active ingredients through polymetric materials.

   d. Employees must be able to remove gloves in such a manner as to prevent skin contamination.

Additionally, the selection of protective gloves should be determined based on the type of hazard -- the duration, frequency, and degree of the exposure, and the physical stresses that will be applied. Also to be considered are toxic properties and potential health effects of the chemical(s) present.

NOTE: Employees are urged to wash their hands with soap and water after removing personal protective gloves.