CONTENTS

1 INTRODUCTION

1.1 Purpose

The purpose of this Safety Work Instruction (SWI) is to define the minimum personal protective equipment (PPE) required for personnel at the Salt Lake City (SLC) refinery.

1.2 Scope

This SWI applies to all personnel, employee or contractor, and visitors, visiting or working in or on SLC refinery owned, operated, or maintained facilities.

1.3 Corporate References

The following sections describe references used to generate this Safe Work Instruction.

1.3.1 Government Regulations

- 29 CFR 1910.132 Personal Protective Equipment

1.3.2 Company Standards

- TSHS-010 Hazard Assessment and Additional PPE
- TSHS-008 Control of Hazardous Energy

1.4 Attachments

- HS-SWI-058F1 FRC Replacement Approval Form

2 ROLES AND RESPONSIBILITIES

2.1 Management and Supervision

When hazards are present or likely to be present that require the use of PPE, Management and Supervision shall:

- Determines when PPE use is necessary
- Selects the necessary PPE
- Ensures that the types of PPE used by the employee protects the employee from the hazards identified in the hazard assessment
- Ensures that the PPE is used as required
- Communicates the selection decisions to affected employees
- Ensures that the selected PPE properly fit affected employees, and
- Conducts and documents the appropriate employee training.

3 DEFINITIONS

Personal Protective Equipment (PPE)	Equipment worn to minimize exposure to hazards that can cause serious workplace injuries and illnesses.
Hazard Assessment	Process used to help identify physical and health hazards in the workplace.
Level D Prime	Level D Prime is a reference from other various documents. When other documents, such as operational procedures, reference "Level D Prime" requirements, users shall follow the PPE requirements listed in the applicable PPE Matrixes within this document.

4 PRACTICES

4.1 Hazard Assessments

Hazard Assessments as related to Personal Protective Equipment (PPE) have been conducted.

4.1.1 Chemical Hazard Assessments

Chemical Hazard Assessments have been conducted for the most common likely chemical hazards found in the refinery. This assessment can be found in Appendix A.

For chemicals not assessed refer to the SDS for further guidelines and or contact the Health and Safety Department for guidance.

4.1.2 Physical Hazard Assessments

Physical hazard assessments and PPE requirements for the most commonly occurring work tasks are listed in Exhibit B.

For tasks not listed in the appendix, contact the Health and Safety Department for additional guidance.

Note: *Flammability hazards are not specifically listed in Exhibit B, but must be individually evaluated for each work task and documented on the work permit.*

Note: *PPE listed in Appendices A and B, Hazard Assessment and PPE selection charts are for non-emergency situations.*

4.2 PPE Requirements

Minimum PPE requirements inside the refinery include at a minimum:

- Hard Hat. Must meet ANSI Z87.1. Type I, Class G or E at a minimum.
- Chemical splash goggles on the hard hat or person. Must meet ANSI Z87.1
- Safety Glasses with side-shields. Must meet ANSI Z87.1
- Hearing Protection Inside Battery Limits (ISBL)
- Personal gas monitor
  - All Operations employees shall wear a personal multi-gas monitor when ISBL
  - All other employees, guests, and contractors shall wear a personal H_2S monitor. A multi-gas monitor is required based upon the hazards of the task/location and is distributed by Operations
  - Not required if heading directly to operational shelter during shift change or for meetings (e.g. safety talks)
- Fire Resistant Clothing. Must meet NFPA 2112.
- Safety – toed work boots. Must meet ANSI
- Task specific gloves, or leather all other times on the person

The PPE Requirements map can be found in Appendix F at the back of this document.

4.3 Engineering or Work Practice Controls

PPE must not be used as a substitute for engineering or work practice controls. However, PPE may be required while waiting for other controls to be completed or when such controls are not feasible.

4.4 PPE Use and Inspection

Inspect PPE before each use to ensure that defective or damaged PPE is not used. Any defective or damaged PPE must be removed from service and either repaired or discarded if repairs cannot be made.

PPE must be maintained and stored in a clean and sanitary condition per the manufacturer's recommendations. Repairs to PPE must be made in accordance with manufacturer's recommendations and by a person trained to do so.

4.5 Decontamination and Disposal of PPE

Table 1 below describes the decontamination and disposal of PPE.

Table 1 PPE Decontamination and Disposal

Item	Description
Proper removal of PPE	Remove PPE in a manner that minimizes exposure to the worker using methods such as ➢ washing or vacuuming the PPE while worn by the worker, and ➢ removing protective garments while progressively turning the garments inside out.
Removal of contaminated PPE	If standard PPE, such as fire resistant clothing (FRC), becomes contaminated with hazardous chemicals, immediately remove the PPE and shower.
Decontaminating PPE in the field	If field personnel need to decontaminate PPE after use but before the PPE can be safely removed for disposal or thorough decontamination, rinse off the equipment to remove the visible contamination or more perform more specific procedures as needed.
Handling used PPE	➢ Do not leave used PPE on the ground or in other inappropriate locations. ➢ Place used PPE in plastic bags and seal them. ➢ Clean used PPE if it needs to be re-used before storage.
Reuse of contaminated PPE	➢ Completely decontaminate contaminated PPE before reuse. ➢ If the contaminated PPE will not be cleaned for reuse, properly manage it for disposal. Reference: For more information on the appropriate decontamination procedures for PPE, refer to the specific MSDS.
Visibly damaged PPE	Discard visibly damaged PPE.

4.6 Protective Clothing General Work Uniform

The general work uniform consists of:

- Flame resistant clothing, hard-hat, safety glasses w/side-shields, and safety toed footwear.

4.7 Work Clothing Materials

Work clothing material must be selected based on the material's ability to resist penetration and withstand the rigors of the job.

Table 2 describes possible clothing selections.

Table 2 Work Clothing Materials

Type of work clothing	Purpose
PVC raingear	Worn to minimize exposure from incidental splashes of liquid hydrocarbons with flash points above 130°F or non-corrosive liquid chemicals.
Acid suits	Worn for work that may involve exposure to corrosive substances such as acid, caustic or ammonia.
Nitrile suits	Worn for work that may involve significant exposure to hydrocarbons with flash points below 130°F, benzene-containing streams, or methanol.
Tyvek or other lightweight disposable garments	Worn when working in dusty environments or for work with asbestos, silica or heavy metal particulates.
Clothing for arc flash protection	Worn when the potential for arc flashes exists. **Reference**: For information on the calculation necessary to determine if flash protection is needed, refer to Corporate Procedure TSHP-004, Arc Flash.
Radiant heat flash suits	Worn when appropriate for high temperature work tasks, including some on-line heat exchanger or furnace work.

4.8 Decontamination Protective Clothing

Decontaminate or discard clothing that becomes contaminated with potentially hazardous materials according to the manufacturer recommendations.

Note: *Most disposable clothing is intended for one-time or limited use and cannot be effectively decontaminated for reuse without compromising integrity.*

4.9 Increased Heat Burden from PPE Usage

Using body protection PPE may increase the heat burden on workers. Therefore, workers must be acclimated to the use of protective clothing and precautions must be followed to prevent heat stress.

Note: *Ice vests and vortex tube coolers can be used to reduce body heat in some cases.*

4.10 Proper Wearing of Fire Retardant Clothing (FRC)

Proper wearing of FRC is demonstrated in Appendix G.

4.11 Cleaning and Repairing of FRC

Take soiled FRCs to their designed station to be laundered, and tag the FRCs for repair and take the FRC to their designed station to be repaired.

Additionally:

- The supplier or laundering contractor provides fitting and alterations of individual uniforms.
- The laundry should return the garments the following week.
- Patches affixed to the FRC must be made of fire retardant material if the total area of any patch exceeds four (4) square inches.

4.12 FRC for Contractors and Visitors

Salt Lake City Refinery contractors who visit the refinery on a routine basis must supply their own FRC.

Loaner FRC may be made available to one-time or very infrequent visitors who plan to enter areas of the refinery where FRC is required.

IMPORTANT: *Employees and visitors who do not comply with the Salt Lake City Refinery FRC policy will not be allowed to enter into the refinery and terminals.*

4.13 Process for Obtaining Replacement

Damaged or worn FRC must be replaced, including clothing that is torn or ripped beyond repair or chemically stained, or shows obvious thinning or facing of the material.

Table 3 describes the process for requesting and obtaining replacement FRC.

Table 3 FRC Replacement Process

Stage	Who is responsible	Description
1	Employee	Informs his/her Supervisor of the need for replacement FRC.
2	Employee	Submits a request for replacement FRC through the refinery EHS Manager, Safety Engineer, or the Health and Safety Representative.
3	EHS	If approved, completes an FRC approval slip and gives the slip to the employee. **Reference**: For a sample of the approval slip, refer to "Exhibit E: FRC Replacement Approval Form."
4	Employee	Gives the FRC approval slip to the storehouse for the order and the worn FRC.
5	Purchasing	Places the order.
6	Storehouse	➢ Receives the order in two to three weeks ➢ tags the FRC with the employee's name ➢ requests that the laundry place the employee's name on the FRC and FRC in the appropriate designated pickup station.
7	Laundry	Returns the FRC in a week.
8	Storehouse	Receives the order and calls the employee to pick-up the replacement FRC.

4.14 FRC Allotment

Table 4 list specific allotments of FRC dependent on the type of work the employee normally conducts.

Table 4 FRC Allotment

Personnel	# of CPC Coveralls	# of Welders Coveralls	# of FRC Coveralls	# of Jackets	# of Hard Hat Liners
Alky Operators	Any combination of CPC Coveralls and Regular FRC totaling 5		Any combination of CPC Coveralls and Regular FRC totaling 5	2	1
Operators	5		5	2	1
Operator Shift Supervisors			5	2	1
Mechanics	5		5	2	1
Welders		Any combination of Welder Coveralls and Regular FRC totaling 5	Any combination of Welder Coveralls and Regular FRC totaling 5		
Electricians			Arc Flash Rated FRC totaling 5		
Engineers			5	2	1
Managers			5	2	1
Superintendents			5	2	1
Clerical	(as needed)		2	2	1

4.15 Eye and Face Protection

Use appropriate eye or face protection when exposed to eye or face hazards from:

- Flying particles
- Molten metal
- Liquid chemicals
- Acids or caustic liquids
- Chemical gases or vapors
- Potentially injurious light radiation
- An employee's work requires the use of goggles, face shields, welding, and cutting helmets.

Note: *Eye protection is typically not required in areas such as offices, control rooms, warehouse areas, inside vehicles, or inside machinery with closed cabs.*

4.16 Requirements for Protective Eye and Face Devices

Protective eye and face devices must meet ANSI Z87.1.

Table 5 describes the requirements of eye and face protection.

Table 5 Requirements for Protective Eye and Face Devices

Device	Requirements
Goggles	Must provide chemical splash and dust protection and meet the requirements of ANSI Z87.1 and 29 CFR1910.133 and be kept on or about each employee to ensure that they are immediately available for use.
Safety Glasses (worn for eye protection)	Must have side shields or wrap around lenses that offer side protection.
Contact Lenses	Can be worn provided that the appropriate ANSI-approved eye protection is worn also in areas where required.

4.17 Required Protective Eye and Face Devices

Table 6 lists the required protective eye and face devices for certain operations:

Note: *Tinted glasses are not to be worn indoors unless needed for welding, burning, cutting, or brazing.*

Table 6 Required Protective Eye and Face Devices

Operation	Required Eyewear
Transfer of chemicals, acid, caustic	➢ Goggles *and* face shield, or ➢ If handling acids, caustics, or other corrosive material, splash (or chemical) goggles. **Note**: Dust goggles are not to be worn for splash protection as liquid could enter through ventilation holes.
Chemical release, immediate area	➢ Full face respirator, or ➢ Self-contained breathing apparatus (SCBA)
Welding or grinding, immediate area	➢ Spoggles or goggles *and* face shield, or ➢ Spoggles or goggles *and* welding hood
Welding or grinding, within 10 feet	Spoggles or goggles with ultraviolet UV-C protection (not provided by ordinary safety glasses)
Grinding, chipping, machining, painting, sanding, or drilling	Goggles and/or face shield
All overhead work, such as work ➢ on equipment where wash water or rain water are dripping or ➢ that could vibrate, knock or otherwise break loose debris which could fall into the eyes.	Goggles
Gas cutting and welding	Welding hood and cutting goggles with appropriately shaded lens **Note**: Eyeglasses with side shields must be worn underneath.
Welders helper	Flash goggles or safety glasses and welding and cutting hood
Cleaning parts using solvent	Safety glasses and face shield

4.17 Required Protective Eye and Face Devices (Continued)

Table 6 Required Protective Eye and Face Devices (continued)

Operation	Required Eyewear
Intense light and heat (boilers, furnaces)	➢ Flash goggles or IR protective glasses, combined with a face shield, or **a helmet or hood with appropriate shading**
Lab operations	Safety glasses, goggles, or face shield
Dusty conditions, such as buffing, woodworking, housekeeping operations, and catalyst dust	➢ Goggles or full face respirator with appropriate HEPA cartridges ➢ For activities that generate nuisance dust or flying particles from activities like sanding, grinding, or breaking hard materials, non-vented goggles
Outdoor use	➢ Facility-provided safety glasses, which block 90% or more of ultraviolet UV-A and UV-B light ➢ Safety glasses made of polycarbonate (exceeds the requirement), or ➢ Safety glasses made of other materials, which must be confirmed to offer UV protection

4.18 Process for Obtaining Prescription Safety Eyewear

Table 7 describes the process for obtaining prescription safety eyewear.

Table 7 Process for Obtaining Prescription Safety Eyewear

Stage	Who is Responsible	Description
1	Employee	Obtains an eye examination at his/her own expense.
2	Employee	If glasses are prescribed by the Eye Doctor, provides a copy of the prescription, and submits his/her request for prescription glasses, including replacement for glasses damaged or lost, to EHS.
3	EHS	Issues an Authorization for Industrial Safety Glasses Form to the employee.
4	Employee	Submits a signed authorization and prescription to an approved eyeglass vendor. **Note**: Unless prescribed by an Eye Doctor, no-line bifocals or trifocals, anti-glare, and any other extras can be paid for by the employee.

4.19 Employee Safety Eyewear Availability

Table 8 describes the available safety eyewear.

Table 8 Safety Eyewear Available

Type of Glasses	Required PPE
Employees who do not require prescription glasses	Plain (non-corrective) safety eye wear and side shields complying with ANSI Z87.1 ***Note**: Employees who desire phototropic lenses may be provided with these lenses at employee expense, the employee pays the difference between clear lens safety glasses and the phototropic lens safety glasses.*
Employees who require prescription glasses	Prescription safety glasses with side shields that may be removable for office work, complying with ANSI Z87.1, are provided through local vendor(s). **Note**: Employees who desire phototropic lenses may be provided with these lenses at employee expense. The employee pays the difference between prescription safety lenses and the phototropic prescription lenses.
Employees who require special prescription glasses for full face respirator use	Provide employees who require prescription glasses and are required to wear SCBA or air purifying respirators equipped with a full face piece with clear prescription lenses and frames that adapt to the respirator spectacle kit. ***Note**: Glasses with straps that wrap around the back of the head may only be used if approved by the respirator manufacturer.*

4.20 Face Shields

Face shields may be required:

- When an unexpected release of pressure may occur
- When collecting samples from pressurized systems
- When making hose connections on acid or caustic loading or unloading
- For protection from flying particles while grinding, machining or drilling
- For protection from splashing liquids, when combined with chemical goggles

Notes:

A face shield is not to be used as a substitute for eye protection such as chemical goggles, dust goggles, or safety glasses.

A full face piece respirator can be worn instead of a face shield when the possibility of inhalation exposure also exists.

4.21 Respiratory Protection

Reference Addendum C Respiratory Protection for Welding and Torch Cutting for more details

Reference HS-SWI-046 Respiratory Protection for the minimum expectations with regards to Respiratory Protection.

4.22 Head Protection Requirements

Head protection is required where there is a potential for impact or penetration from falling or flying objects, bumping a fixed object, or inadvertent contact of the head with an energized electrical component.

Hard hats must:

- Meet the safety requirements and specifications of the American National Standards Institute (ANSI) Z89.1-1997, and
- Be Class “E” (industrial utility service, high voltage helmet) for industrial head protection.

Notes:

- The use of metal hard hats and bump caps is prohibited.
- Only approved hardhats must be issued by the storehouse.

4.23 Hard Hat Use and Inspection

Reference Addendum E PPE Requirements Map for where hard hats are required to be worn.

Inspect hard hats according to manufacturer recommendations.

On a periodic basis:

- Visually inspect all components, the shell, suspension, headband, sweatband, and any accessories for signs of dents, cracks, penetration, or any other damage,
- Inspect the hard hat according to manufacturer recommendations.

IMPORTANT: Damaged components must be replaced.

4.24 Replacement of Hardhats

Replace hard hats according to manufacturer recommendations, one of which is to replace the suspension yearly and the hard hat after five years of service.

IMPORTANT: *Hard hats must be replaced if suspension straps become frayed, brittle, or weakened.*

Note: *Each hard hat has a date code stamped on the inside of the brim indicating when the hard hat was manufactured. However, the date of a hard hat's service life actually starts on the date the hard hat is put into service.*

4.25 Properly Wearing and Care of a Hardhat

4.25.1 To wear and care for a hard hat correctly:

- Place the hard hat squarely on the head with the brim facing in the forward position to provide maximum facial protection, or
- If the brim interferes with a task being performed, turn the hard hat around and reverse the suspension, if necessary, but be sure the hard hat is worn with the brim facing forward and the suspension reversed as soon as the task is completed

4.25.2 Do not:

- Tip a hard hat to either side or too far forward or backward
- Reverse the suspension for normal use or when wearing the hard hat with face shields or other accessories that are designed to be worn with the brim in front, and
- Place anything inside a hard hat while wearing the hard hat.
- Subject a hard hat to high heat or corrosive chemicals, which can make the shell brittle and structurally unsound.
- Paint hard hats as paint may conceal cracks
- Do not drill holes in the shell except for those required for mounting suspensions or manufacturer-approved accessories.

4.25.3 Prior to the first use of a new hard hat:

- read the manufacturer limitations and requirements, such as how the hard hat is to be worn, proper care, inspection, maintenance, and useful life, and
- follow all manufacturer requirements.

4.25 Properly Wearing and Care of a Hardhat (Continued)

4.25.4 Cleaning:

- Clean the shell using warm water and a mild detergent (such as liquid dish washing soap)
- rinse the shell in clean water, and
- dry the hard hat.

Note: *Clean for personal hygiene and improved appearance and inspection, since oil, dirt, or stains can hide cracks and defects in the shell.*

4.25.5 Attaching accessories:

- Use only the special slots with approved adapter lugs to attach accessories, such as ear muffs, face shield, or welding hoods.
- Use only the chin straps, sweat bands, and winter liners designed for the specific hard hat.

IMPORTANT: *Attaching anything to the hard hat with bolts, screws, nails, or glue voids the approval of the hard hat, and is prohibited.*

Note: *Self-sticking decals or tape can be used to identify special training and safety awards.*

4.26 Hard Hat Identification

For ERT and Security reasons, identify hard hats with the mandatory color codes in the Table 9 .

Table 9 Hard Hat Color Codes

Color Codes	Reason
White or Red	Fire, safety, and medical personnel
Grey	Engineers, EHS, and general administrative personnel
Blue	Operations Personnel
Green	Mechanical Personnel
Tan	Visitors

4.27 Foot Protection Requirement

Employees must wear protective footwear when working in areas outlined in Addendum F: PPE Requirements Map.

29 CFR 1910.136 requires that occupational footwear meet ANSI Z41 requirements.

4.28 Foot Protection Materials of Construction

Protective footwear must be constructed of leather or woven material specifically made for industrial environments with oil and slip-resistant soles.

Non-industrial fabric uppers must not be worn to work in industrial environments.

4.29 Required Types of Foot Protection

Required types of foot protection include:

- Safety shoes or boots with steel toe protection are required in shops and process areas, and for tasks with hazards from falling objects
- Chemical resistant boots with ANSI approved toe protection and shanks must be worn during activities that may expose feet to chemicals.
- Safety shoes must protect and support for the ankle, the shoe top must cover the ankle joint), and
- Safety shoes with a district heel to prevent slipping are required for tasks involving ladder climbing.

Note: Any exceptions must be cleared through the EHS Department.

4.30 Recommended Foot Protection

The following job specific protection is recommended but not required:

- Metatarsal guard for instep protection for machinists, pipe fitters, building trades, welders/welders helpers.
- Electrical hazard protection for high voltage electrical work.
- Neoprene or other fire/water resistant safety boots for Special Team (Fire Brigade).
- Neoprene or other chemical resistant safety boots for the HazMat Team; Light weight hiking style shoe with appropriate sole for work on steel structures for the Rescue Team.
- High top to prevent entry of hot sparks for welders and welder's helpers.

4.31 Safety Shoe Availability

Refinery and Terminal employees whose jobs involve work in a foot protection area are eligible per the current contract provision for a pair of ANSI Z41-1991 safety work shoes annually.

SLC Refinery provides, on a storehouse checkout basis, ANSI Z41-1991 approved chemical resistant boots for special applications such as tank cleaning and spill cleanup.

4.32 Responsibilities Relating to Foot Protection

The responsibilities relating to foot protections are listed in Table 10.

Table 10 Foot Protection

Role	Responsibility
Health and Safety Superintendent	➢ Maintaining the Safety Shoe program, and ➢ Monitoring contractor and vendor compliance with the OSHA PPE Rule.
Superintendents	Implementing the foot protection program within their division.
Employees	➢ Wearing the safety shoes ➢ following all manufacturer warnings and limitations, and ➢ caring for the safety shoes.

4.33 Requirement for Hand Protection

In Table 11 below, it provides the requirements for hand protection.

Table 11 Hand Protection

Role	Requirement
Employers	Selects, provides, and requires the use of appropriate hand protection when employees' hands are exposed to hazards, such as skin absorption of harmful substances, severe cuts or lacerations, severe abrasions, punctures, chemical or thermal burns, or harmful temperature extremes.
Contractors	Supplies and ensures that their employees wear appropriate protective gloves.
Employees	Wear required hand protection.

4.34 Glove Types and Uses

Table 12 contains information on the glove types and uses.

Table 12 Glove Types and Uses

Type of Glove	Description
Heavy duty PVC (black) gloves can	➢ Appropriate for normal operations with minimal hand exposure to hazardous materials. ➢ Provides ~ Protection against a variety of petrochemicals, hydrocarbons, oils, greases, acids, and caustics ~ The best protection against non-aromatic hydrocarbons and caustics ~ Resistance to punctures, cuts, snags, and abrasions, and ~ Low to moderate heat resistance, functioning well in temperatures between 25ºF and 150ºF.
Nitrile (green) gloves	➢ Made of a synthetic rubber. ➢ Used for tasks where the possibility exists for hand exposure to gasoline, naphtha, methanol, or benzene containing streams. ➢ Provides ~ Protection from many solvents, oils, greases, acids, and caustics (such as Sodium Hydroxide, Lye, Caustic Soda). ~ The best protection against hydrocarbons and chlorinated solvents ~ Resistance to punctures, cuts, snags, and abrasions, and ~ Moderate to good heat resistance, functioning well in temperature between 25ºF and 300ºF.
Chemical resistant gloves	Used for laboratory tasks that may result in chemical exposure to the hands.
Thermally-insulated gloves	Used for cold operations, such as working with LPG.
Protective gloves	Used to prevent thermal burns or exposure to radiant heat for work, such as working on furnaces.
High voltage gloves	Used by electricians working on high voltage systems where there is a potential for electrical arc flash.

4.34 Glove Types and Uses (Continued)

Table 12 Glove Types and Uses (continued)

Type of Glove	Description
Leather work gloves	➢ Used only for non-chemically related activities. ➢ Provides the best protection against abrasions from rough, as well as temperature extremes, but no protection against chemical hazards, or sharp tools. Notes: ➢ If used in a chemical service, use a chemically resistant inner glove, and properly dispose of the leather glove at the end of the work. ➢ Do not use leather or cloth work gloves for liquid chemical or hydrocarbon protection. ➢ Do not wear leather, cotton, or other shear-resistant gloves within 12" of rotating equipment, such as a rolling mill or close to shafts.
Cotton glove liner	➢ Made of a cotton/polyester. ➢ Used under impermeable gloves to absorb perspiration or provide insulation, and as an inner liner to any of the gloves listed in this table. **Note**: Glove liners are white in color.
PVA gloves	➢ Water sensitive. ➢ Provides ~ Protection against a broad range of organics ~ Poor protection against light alcohols ~ The best protection against polystyrenes, toluene, xylene, red dye, blue dye, aromatics, chlorinated solvents, and ketones, and ~ Low to moderate heat resistance, functioning well in temperatures between 25ºF and 150ºF.

4.34 Glove Types and Uses (Continued)

Table 12 Glove Types and Uses (continued)

Type of Glove	Description
Neoprene gloves, also made of synthetic rubber	Provides ~ Protection against ketones (such as Methyl Ethyl Ketone and Acetone), strong acids, alcohols, oils, and greases ~ The best protection against ketones and strong acids ~ resistance to punctures, cuts, snags, and abrasions, and ~ Good heat resistance, showing no degradation in continuous contact with temperatures up to 200ºF.
Impermeable, chemical resistant gloves	Used to protect against potential exposure to liquid chemicals and hydrocarbons. **Reference**: For information on the permeation times for various chemical resistant glove materials for selected hazardous materials, refer to "Exhibit D: Chemical Resistant Gloves: Breakthrough Times."
Corrosive-chemical resistant gloves with a minimum 10-inch cuff	Used for tasks where there is the possibility of exposure to acid or alkaline materials. **Note**: Cuffs may be rolled one turn when working in an overhead position to help prevent liquid material from running down the arms
Cut Resistant Gloves	Used to protect against cuts while using sharp tools or exposed to sharp objects.

4.35 Chemical Gloves

Table 13 below lists the appropriate gloves for different chemical and physical hazards.

Table 13 Chemical Gloves

Chemical/Physical Hazard	Nitrile Glove	Neoprene Glove	PVC/Nitrile Glove	Leather Glove	Cut Glove
Acetic Acid, Glacial	X	X	X		
Cyclohexane	X	X	X		
Diesel Fuel	X	X	X		
Di-ethanolamine (DEA)	X	X	X		
Ethylene Glycol	X	X	X		
Equipment Handling				X	
Gasoline			X		
Hydraulic Fluid	X	X	X		
Hydrocarbons (including Benzene)	X		X		
Hydrogen Peroxide 30%	X	X	X		
Kerosene	X	X	X		
Methanol	X	X	X		
Methyl Chloroform			X		
MTBE	X				
Naphtha VM&P	X	X	X		
Sharp Tools/Objects					X
Sodium Hydroxide 50%	X	X	X		
Sulfuric Acid 95%		X			
Xylene			X		

4.36 Extra Protection from Splash or Leak Exposure

Table 14 below provides extra protection from splash or leak exposure.

Table 14 Extra Protection from Splashes or Leaks

When …	Then …
performing work in an area with a high potential for chemical splash or leak exposure	Duct tape the protective gloves to the sleeve of the protective suit.
working overhead	Leave enough slack to prevent pulling the taped gloves and sleeves apart.
duct taping pant legs over work boots	Tab or fold it over at the end to make it easier to remove.

4.37 Hand Protection Availability

Table 15 below describes the available hand protection.

Table 15 Hand Protection Availability

Hazard	Glove Type	Recommended Glove(s)
Material handling, valve turning, stair and ladder use, temperature extremes, and general abrasion protection.	Leather/insulated leather	Majestic Buck Skin leather/leather insulated
Use of sharp tools or handling sharp objects	Cut resistant Kevlar	Ansell gold knit 100% Kevlar
Polystyrenes, toluene, xylene, red dye, blue dye, aromatics, chlorinated solvents, and ketones.	Polyvinyl alcohols – PVA	Ansell 4H or North Silver Shield.
Strong acids and bases, other water solutions, and alcohols	Polyvinyl chloride – PVC	Ansell PVC, Best Black Knight PVC
Oils, grease, aliphatic chemicals, xylene, trichloroethane, and toluene	Nitrile, Buna N	PTI Armor Tuff Buna-N or Ansell Sol-Vex Nitrile
Oils, grease, aliphatic chemicals, xylene, trichloroethane, and toluene	Nitrile, medical exam gloves	Best Ultimate N-Dex nitrile medical exam glove
Oxidizing acids, anilines, phenol, glycol and ethers	Neoprene	Ansell Black Neoprene
Limited thermal protection	Nylon/cotton liner	Nylon/cotton liner, various manufacturers

4.38 Removing Gloves

Follow the steps in the Table 16 below to remove gloves.

Table 16 Removing Gloves

Step	Action
1	If gloves are contaminated, rinse the gloves with water to remove excess chemical residue and dirt prior to removing the contaminated gloves. **Note**: Glove wash down ➢ must occur in an area where runoff is collected into the plant oily water sewer, and ➢ is not allowed on non-paved or non-contained surfaces.
2	➢ Remove one glove by pulling from the inside cuff down, so that the glove is pulled off from the inside out, and ➢ repeat the procedure to remove the other glove, making sure that the hand does not come into contact with the contaminated glove surface.
3	Wash hands thoroughly with soap and water after each use of gloves.

IMPORTANT: *Never remove gloves by pulling on the fingers.*

4.39 Disposal or Reuse of Gloves

Table 17 below describes the proper disposal or reuse of gloves.

Table 17 Disposal or Reuse of Gloves

Condition/type of glove	Proper disposal/reuse
Nitrile gloves	➢ Single-use gloves that must always be disposed of at the end of a job or before taking a break in regular trash, unless grossly contaminated. ➢ Place contaminated gloves in a bag labeled with the contaminant and dispose as Hazardous Waste (contact the Environmental Waste Coordinator on channel 3A). ***Note**: This is also true for disposable PPE, such as Tyvek suits used in cleanup.*
Gloves soaked with flammable or combustible liquids	Dispose gloves soaked with flammable or combustible liquids in flammable storage containers equipped with lids; not in regular trashcans or dumpsters.
Gloves contaminated with asbestos	➢ Place gloves contaminated with asbestos in an asbestos-labeled disposal bag. ➢ Double bag the bag and place it into a designated asbestos disposal bin for hazardous waste disposal.

4.40 Maintenance of Gloves

Gloves must:

- Fit closely and properly, as determined by the employee, without binding the hands or restricting movement
- Be inspected for damage before each use, and
- Be disposed of and replaced with a new pair it there are any cracks, tears, holes, or any irregularity in the glove surface such as discoloration, bubbling or thinning.

***IMPORTANT:** Using gloves that are worn or defective may result in possible skin contact with the contaminant, resulting in such symptoms as moderate to severely dry and irritated skin, allergic reactions, or rashes. Immediately inform your supervisor if these symptoms occur.*

5 TRAINING

5.1 Training on PPE

Employees must be trained to properly use and correctly fit and adjust any PPE required by the hazard assessment.

Include information on the following during PPE training:

- When PPE is necessary
- What PPE is necessary
- How to size, put on, remove, adjust, and wear PPE
- The limitations of PPE, and
- The care, inspection, maintenance, useful life, and disposal of PPE.

IMPORTANT: *Each employer must maintain a written record indicating that all such employees have been properly trained in the use of required PPE.*

Note: *Retain records of employee training on PPE for the current year plus 10 years.*

5.2 Re-Training on PPE

Retraining of employees on PPE must be done if there are:

- Changes in the workplace that make previous training obsolete
- Changes in the type of PPE that make previous training obsolete, or
- Observed inadequacies in employee knowledge or use of assigned PPE.

6 PROGRAM REVIEW

6.1 Procedure Review

The Safe Work Instruction will be reviewed every 3 years.

7 REVIEW AND REVISION HISTORY

7.1 History of Revisions

The Table below provides the revision history for this Safety Regulation.

Table 18 Revision History

Revision	Date	Change Author	Reason for Change
1.0		---	Original Issue
2.0	07/20/2015	---	Revised
3.0	03/31/2016		Updated to the new SWI format
4.0	6/6/2018	J. Moffitt	Updated personal gas monitor requirement

8 APPENDIX A: CHEMICAL HAZARD ASSESSMENTS WITH PPE SELECTION

With safety procedures and MSDSs, this chart documents chemical hazard assessments. See Appendix B and work permits for physical hazard assessments.

Table 19 Chemical Hazard Assessments with PPE Selection

Chemical Agent	Activity	Additional Personal Protective Equipment	Location	Hazards	Direct Reading Methods	Concentration Detected	Respiratory Equipment Requirements
Coal Tar Pitch Volatiles (CTPV) Poly Aromatic Hydrocarbons (PAH) Poly Nuclear Aromatic Hydrocarbons (PNA)	Cleaning, picking up, off-loading or on-loading of petroleum coke. Working on Equipment containing Fuels oils or residual oils.	**EYES** - Glasses with side shields, face shield and/or goggles when conditions are extreme **HANDS** - PVC/Nitrile gloves **BODY** - Tyvek coveralls if needed to prevent contamination of clothing or skin.	Facility specific process areas.	Irritant. Exposure to sun may enhance the irritating effect of CTPVs and lead to burns. Repeated or prolonged contact on skin may cause dermatitis and hyper-pigmentation of skin. Some CTPVs are listed as skin cancer hazards with prolongs and repeated skin contact. Washing contaminated clothing and skin with soap and water can prevent or reduce this possibility.	Judgement based on previously obtained industrial hygiene sample results	0 to 0.2 mg/m^3	None required.
						0.2 to 2.0 mg/m^3	Half-face cartridge respirator with combination purple and yellow or purple and black cartridges.
						2.0 to 10.0 mg/m^3	Full-face cartridge respirator with combination purple and yellow or purple and black cartridges.
						> 10.0 mg/m^3	Supplied air (self-contained breathing apparatus or air line with emergency escape pack).
Dust Including catalyst, coke, dirt, sand, etc.	Buffing, general dusty conditions, catalyst handling	**EYES** - Glasses with side shields, face shield and/or goggles when conditions are extreme **HANDS** - Leather or any "rubber type" gloves. **BODY** - Disposable coveralls over flame retardant clothing.	Could occur in any facility areas.	Respiratory hazard. May cause respiratory tract irritation or toxicity.	RAM particulate monitor or judgement based on previously obtained industrial hygiene sample results.	0 to 5.0 mg/m^3	None required.
						5.0 to 50.0 mg/m^3	Half-face HEPA filter respiratory (purple cartridges)
						50.0 to 250 mg/m^3	Full-face HEPA filter respiratory (purple cartridges
						> 250.0 mg/m^3	Supplied air (self-contained breathing apparatus or air line with emergency escape pack).
Flare Gases	Opening Flare Lines, Changing Blinds	**EYES** - Goggles and Face shield. **HANDS** - Neoprene or nitrile gloves **BODY** - Rubber clothing. Acid hood if acid may be present. **FEET** - PVC or Neoprene Boots.	Facility - specific process areas.	Respiratory hazard. Skin irritation or burn hazard. May contain H_2S, NH3 acid, and hydrocarbons with benzene.	Multi-Gas Meter Detector Tubes	Depends on variable composition of hazardous materials inside flare lines	Full facepiece supplied air respiratory protection if exposure to flare gases may occur.
Hydrocarbons	Sampling, vessel entry, un-flanging lines, removing blind flanges, installing or removing isolation blinds, breaking exchanger piping or heads, removing valve packing.	**EYES** - Face shield with glasses or splash proof goggles, if potential for splash. **HANDS** - Nitrile gloves **BODY** - Rubber suit or rubber pants and jacket if needed to prevent skin contact.	Facility - specific process areas.	Hydrocarbons - irritation and respiratory hazard. Repeated skin contact with liquid may cause dermatitis. Prolonged and repeated over-exposure may cause liver and kidney damage.	Hydrocarbons: Instruments such as UltraRAE and Multi-Gas Meters.	< 100 ppm or 0% LFL	No respirator required unless benzene above 1 ppm.
						100 to 1000 ppm	Respirator with black cartridges or supplied-air respiratory.
						> 10% LFL:	No entry.

Table 19 Chemical Hazard Assessments with PPE Selection

Chemical Agent	Activity	Additional Personal Protective Equipment	Location	Hazards	Direct Reading Methods	Concentration Detected	Respiratory Equipment Requirements
Hydrocarbons that contain benzene including: Naphtha Gasoline Crude Oil	Sampling, vessel entry, un-flanging lines, removing blind flanges, installing or removing isolation blinds, breaking exchanger piping or heads, removing valve packing.	**EYES** - Face shield with glasses or splash proof goggles, if potential for splash. **HANDS** - Nitrile or PVC / Nitrile gloves **BODY** - Rubber Suit or rubber pants and jacket if needed to prevent skin contact.	Facility-specific process areas.	Repeated skin contact with liquid may cause dermatitis. Prolonged and repeated over-exposure can damage liver and kidneys and may cause blood cancer. Danger: Contains Benzene Cancer Hazard.	Benzene: Detector Rube-Benzene, UltraRAE, or Gas Chromatograph	1.0 to 10.0 ppm	Half-face organic vapor cartridge respirator (black)
						10.0 to 50.0 ppm	Full-face organic vapor cartridge respirator(black)
						> 50% LFL:	Supplied air (self-contained breathing apparatus or air line with emergency escape pack).
Hydrogen Fluoride (HF) Or Hydrofluoric Acid	PPE required for entry into process areas where HF is used or stored - potential for exposure affects PPE requirements.	For entry into HF areas, minimum PPE is chemical goggles, and neoprene or nitrile rubber gloves. Face shield, slicker suite and acid hood may be required	Facility-specific process areas if HF is used.	Corrosive to human tissue. Can cause delayed chemical burns. Systemic poison - can damage blood, heart, lungs, bone and cause death.	Detector Tube - Hydrogen Fluoride.	< 3 ppm	If any airborne HF present, respirator with yellow acid gas cartridges recommended.
						3 to 30 ppm	Full face-piece respirator with yellow cartridges.
						> 30 ppm	Supplied air respiratory protection such as SCBA. If airline used, must have emergency escape pack.
Hydrogen Peroxide	Sampling, off-loading trucks.	**EYES** - Face shield with glasses or splash proof goggles. **HANDS** - Nitrile, neoprene or PVC/neoprene gloves	Facility specific process areas.	Irritation and respiratory hazard.	Detector Tube - Hydrogen Peroxide.	0 to 1.0 ppm	None required.
						> 1.0 ppm	Supplied air (self-contained breathing apparatus or airline with emergency escape pack).
Hydrogen Sulfide (H_2S)	Sampling, vessel entry, searching for leaks, opening equipment.	PPE other than respiratory protection determined for hazards of other materials present. Personal H_2S alarm if H_2S exposure might exceed 10 ppm	Facility-specific process areas.	Respiratory hazard - can cause symptoms ranging from coughing and headache to respiratory paralysis and death.	Detector Tube - Hydrogen Sulfide Personal H_2S Alarm or Multi-gas meter.	0 to 10 ppm	None required
						> 10 ppm	Supplied air (self-contained breathing apparatus or airline with emergency escape pack).
Lab Solvents	Lab testing and sample or equipment preparation	**EYES** - Safety Glasses with side shields. **HANDS** - Nitrile Gloves **BODY** - Nomex clothing or lab coat.	Labs	Repeated skin contact with liquid may cause dermatitis. Repeated and prolonged over-exposure may damage liver and kidneys.	Detector Tubes. Multi-gas meters	Depends on solvent.	Respirators are not needed if lab hood is used for controlling solvent vapor concentrations.
Liquid Petroleum Gas (LPG)	Sampling	Hands - Nitrile/PVC gloves. Insulated gloves for cold liquid protection.	Facility-specific process areas.	Very flammable and may be explosive. Displaces oxygen and may cause death by suffocation. May cause skin burns similar to freeze burns due to cold temperature.	Combustible gases - IS LTX 310, ATX 612	< 1%	None required.
						1 to 10%	Supplied air (SCBA or airline with 5-minute escape pack)
						> 10%	No entry.
Lead, Inorganic	Removing lead-based paint (only approved Lead abatement Contractors)	**EYES** - Face shield with glasses or goggles **HANDS** - Leather or cotton gloves **BODY** - Disposable coveralls **FEET**- Disposable booties	Facility-specific process areas.	Irritation and Respiratory hazard.	Lead indicating swabs	< 0.5 mg/m^3	Half-face HEPA filter respirator (pink)
						> 0.5 mg/m^3	Supplied air (SCBA or air line with 5-minute escape pack)

Table 19 Chemical Hazard Assessments with PPE Selection

Chemical Agent	Activity	Additional Personal Protective Equipment	Location	Hazards	Direct Reading Methods	Concentration Detected	Respiratory Equipment Requirements
Mercury	Opening some process equipment when mercury is present, or cleaning up mercury spills from instrumentation.	**EYES** - Face Shield with glasses or goggles if needed to prevent eye and face contact. **HANDS** - Nitrile gloves. **BODY** - PVC suit or polyethylene coated Tyvek and rubber boots if needed to prevent skin contact. **FEET** - Rubber boots if needed to prevent contamination of leather shoes.	Facility-specific process areas.	Short-term exposure to high concentrations can damage lungs and cause nausea, diarrhea, and tissue burns. Repeated exposure can damage nervous system and brain.	Detector Tube - Mercury Colorimetric Badges Jerome Mercury Vapor Monitors Mercury Check Swabs.	< 0.1 mg/m^3	None Required
						0.1 to 1 mg/m^3	Respirator with orange mercury cartridges.
						1 to 10 mg/m^3	Full face-piece respirator with orange mercury cartridges.
						> 10 mg/m^3	Supplied air (SCBA or airline with 5-minute escape pack)
Molten Sulfur	Molten sulfur handling, Roding tubes in sulfur units.	**EYES** - Face Shield with glasses **HANDS** - Thermal protection gloves if needed to prevent skin contact **BODY** - Thermal protection clothing is skin contact possible.	Sulfur Recovery Units	High temperature burns.	N/A	N/A	If H_2S or SO^2 is present, see PPE requirements for those materials.
Perchloroethylene	Adding chemical to process equipment.	**EYES** - Face shield with glasses. **HANDS** - Nitrile or neoprene gloves. **BODY** - Rubber clothing and boots if needed to prevent skin contact.	Facility-specific process areas.	Repeated contact with skin can cause drying and dermatitis. Repeated inhalation over-exposure can damage liver.	Detector Tubes - Perchloroethylene.	0 to 100 ppm	No respirator required.
						200 to 1000 ppm	Respirator with black organic vapor cartridges.
						> 1000 ppm	Supplied air respirator.
Sour Water	Sampling, opening process equipment.	**EYES** - Face shield with glasses. **HANDS** - Nitrile gloves **BODY** - rubber clothing and boots if needed to prevent liquid contact.	Facility-specific process areas.	Can release hydrogen sulfide gas. Can release ammonia. Skin irritation from liquid contact possible.	Detector Tubes - Hydrogen Sulfide Ammonia. Direct reading instruments such as multi-gas meters.	> 10 ppm H_2S	Supplied air respirator protection such as SCBA. If airline used, must have emergency escape pack. (See ammonia and Hydrogen Sulfide assessments.)
Sulfur Dioxide (SO_2)	Sampling, vessel entry, sulfur pit fires.	**EYES -** Chemical goggles of full facepiece respirator if needed to prevent eye irritation.	Facility specific process areas.	Irritation and respiratory system hazard.	Detector Rube - Sulfur Dioxide Multi-gas meter such as IS ATX-612.	0 to 2.0 ppm	None.
						2.0 to 20.0 ppm	Half-face Acid-gas respirator (yellow)
						20.0 - 100 ppm	Full-face Acid-gas respirator (yellow)
						> 100.0	Supplied air (SBCA or airline with 5-minute escape pack).
Sulfuric Acid (H_2SO_4)	All activities involving sulfuric acid		Facility-specific process areas.	Irritation or tissue destruction resulting from corrosive acid contacting skin, eye, and respiratory tract.	pH Paper	0 to 1.0 mg/m^3	None required.
						0 to 10 mg/m^3	Half-face organic vapor/acid cartridge respirator (yellow)
					Sulfuric Acid Detector Tubes	10 to 50 mg/m^3	Full-race organic vapor/acid cartridge respirator (yellow)
						> 50 mg/m^3	Supplied air (self-contained breathing apparatus or air line with emergency escape pack).

Table 19 Chemical Hazard Assessments with PPE Selection

Chemical Agent	Activity	Additional Personal Protective Equipment	Location	Hazards	Direct Reading Methods	Concentration Detected	Respiratory Equipment Requirements
	Sampling Sulfuric Acid	**EYES** – Chemical Splash Goggles, and face shield or acid hood. **HANDS** - Neoprene gloves during activities where chemical present. **BODY** Apron (if high pressure sample point)	Facility-specific process areas.	Same as above.	Same as above.	Same as above.	Full face piece respirators provide eye and face protection equal to or exceeding goggles and face shield.
	Responding to sulfuric acid leaks and releases, first opening of equipment.	**EYES** - Chemical Splash Goggles, and face shield or acid hood.. **HANDS** - Neoprene gloves during activities where chemical present. **BODY** Apron (if high pressure sample point)	Facility-specific process areas.	Same as above.	Same as above.	Same as above.	Full face piece respirators provide eye and face protection equal to or exceeding goggles and face shield.
	Preparing equipment for maintenance. Operator performed maintenance tasks such as emptying pump cases, tightening packings, flanges, etc.	**EYES** - Chemical Splash Goggles, and face shield or acid hood. **HANDS** - Neoprene Gloves.	Facility-specific process areas.	Same as above.	Same as above.	Same as above.	Full face piece respirators provide eye and face protection equal to or exceeding goggles and face shield.
	Maintenance activities such as un-flanging lines, removing blind flanges, installing or removing isolation blinds, breaking exchanger piping or heads, removing valve packing or connects, opening vessels or tank manways, disconnecting manifold piping.	IF the equipment has been completely water-washed or decontaminated: **HANDS** - Neoprene gloves IF the equipment has NOT been water-washed or decontaminated or it is the first opening: **EYES** - Chemical Splash Goggles, and face shield or acid hood. **HANDS** - Neoprene gloves **BODY** - Rubber suit. **FEET** - Rubber boots.	Facility-specific process areas.	Same as above.	Same as above.	Same as above.	Full face piece respirators provide eye and face protection equal to or exceeding goggles and face shield.
	Truck loading tasks such as off-loading or on-loading.	**EYES** - Chemical Splash Goggles, and face shield or acid hood. **BODY** - rubber suit or rubber pants and jacket **FEET** - Rubber boots	Facility-specific process areas.	Same as above.	Same as above.	Same as above.	Full face piece respirators provide eye and face protection equal to or exceeding goggles and face shield.
Vanadium	Entering oil-fired boiler or furnace.	**EYES** - Dust goggles. **HANDS** - Nitrile or neoprene gloves. **BODY** - FR Tyvek suit with hood. **FEET** - Rubber boots.	Facility-specific process areas.	Greenish to black discoloration of tongue. Throat, stomach and skin irritation	Judgement based on previously obtained industrial hygiene sample results.	Respiratory protection required unless cleaned to remove all dust and ash.	Half facepiece dust respirator or purple HEPA cartridge respirator.

Table 19 Chemical Hazard Assessments with PPE Selection

Chemical Agent	Activity	Additional Personal Protective Equipment	Location	Hazards	Direct Reading Methods	Concentration Detected	Respiratory Equipment Requirements
Welding Fumes Hexavalent Chromium may be present if allow steel welding or cutting is done.	Welding, torch cutting, grinding on metal. Alloy steel work not done with local exhaust ventilation can cause airborne hexavalent chrome above exposure limit.	**EYES** - For welding, welder's hood and safety glasses. Burn goggles for torch cutting. Face shield for grinding. **HAND** - Leather gloves. **BODY** - Long sleeves that protect against slag and sparks.	Any area where welding, grinding, or torch cutting is done.	UV light can burn eyes. Prolonged and repeated over-exposure to metal fumes and dust can damage lungs. Prolonged over-exposure to hexavalent chromium may cause lung cancer.	Judgement based on previously obtained industrial hygiene sample results.	Requirements of Appendix C based on Industry historic and on-going exposure monitoring data for this type of work.	See Appendix C - Respiratory Protection and Ventilation Recommendations for Welding and Torch Cutting.

9 APPENDIX B: PHYSICAL HAZARD ASSESSMENTS WITH PPE SELECTION

Work permits, safety procedures for specific hazardous materials and this chart document physical hazard assessments. See Appendix A, Table 19, for chemical assessments.

Table 20 Physical Hazard Assessments with PPE Selection

Task	Process Material or Chemical (See Appendix A for Chemical Assessments)	Physical Hazards (Flammability hazard from hydrocarbons)	Precautions & Additional PPE
Abrasive Blasting	➢ Copper Slag or other abrasive ➢ Dust ➢ Lead and other metal dusts	➢ Tripping over hose ➢ Lifting heavy objects ➢ Noise ➢ Abrasive and injection hazard to skin ➢ lifting heavy objects ➢ working at heights	➢ Crane ➢ Hearing Protection ➢ Heavy Leather Gloves ➢ Fall Protection Equipment ➢ Blasting hood (with positive pressure supplied air half-mask if lead paint.
Arc gouging (air arc cutting): Done for alloy steels and for pieces where depth of cut must be controlled. Carbon rod at maximum amperage with air blowing slag out of puddle.	➢ Fumes may contain nickel, chromium, and zinc. ➢ Welding gases which may contain CO, CO2, NOx, acetylene argon, and helium.	➢ Heat from hot pipes, steam tracing and slag ➢ Noise from grinders ➢ Sparks and dust from grinders ➢ Fall from height ➢ Awkward posture and heavy objects ➢ Electric shock ➢ Pinch points, crushing.	➢ Ventilation fans & exhaust systems ➢ Cranes and jigs for parts positioning ➢ Welding hood & gloves ➢ Face shield or goggles ➢ Ear plugs if noise exceeds 85 dBA
Carpentry Work: Jointers, planers, table saw, circular saw, band saw, saber saw, hammers	None.	➢ Eye and face hazard from dust & wood chips ➢ Sharp edges, wood, Plexiglas ➢ Noise from tools	➢ Gloves ➢ Eye protection ➢ Hearing protection
Changing Transmitters	Any process stream in the refinery.	➢ Pressure ➢ Heat from hot pipes and steam tracing ➢ Heavy and awkward objects Fall from height.	➢ PPE is from the work permit ➢ Facility transmitter procedures
Compressor Work	H_2S	➢ Heavy objects pinch and smash	➢ Procedures ➢ Gloves with Pneumatic wrench
Computer use in office: Enter data to databases, take notes.	None.	➢ Posture, repetitiveness	➢ Ergonomic office ➢ Equipment and personal habits
Driver: Cranes, trucks, backhoes, tractors (soil farm), vacuum trucks.	➢ Process chemicals on vacuum truck ➢ Process chemicals in soil farm (3 mo. yr.)	➢ Falls while climbing on equipment ➢ Nosie in units and for some equipment ➢ Lifting pads for crane and outriggers	➢ Ear plus in units and for noisy equipment ➢ Leather gloves for some equipment.
Electrical Work: Pulling breakers, disconnecting motors, lighting, heat tracing.	➢ Process chemicals may be on equipment	➢ Electrical shock hazards ➢ Heat from pipes and tracing	➢ Test equipment ➢ Electric insulating PPE ➢ Thermal gloves

Table 20 Physical Hazard Assessments with PPE Selection

Task	Process Material or Chemical (See Appendix A for Chemical Assessments)	Physical Hazards (Flammability hazard from hydrocarbons)	Precautions & Additional PPE
Electrical Work with Arc Flash Potential	See TSHA-004 Arc Flash Tesoro Safety and Health Standards.	See TSHA-004 Arc Flash Tesoro Safety and Health Standards.	➢ Full leather work gloves ➢ Voltage rated rubber insulating gloves/sleeves/blankets ➢ FRC such as 4.5 oz. coveralls ➢ Flame retardant hood/helmet for electrical hazards.
Furnaces Inspection, and Lighting	➢ Fuel gas or fuel oil ➢ Material to be heated	➢ Heat - hot equipment and process stream ➢ Flames can flash out of heater/furnace ➢ Explosion ➢ IR radiation from operating burners	➢ Goggles, glasses or face shield with IR protection rating ➢ Bunker gear or other flash-resistant clothing ➢ Follow lighting procedures! ➢ No shortcuts!
Forklift Operation	➢ None	➢ Falling objects ➢ Drive off Dock edge ➢ If truck rolls forward, falling between dock and truck	➢ Overhead rack on forklift ➢ Slope grade down to dock to prevent accidental rolling forward ➢ Chock truck wheels ➢ Guard Rails.
Heat Exchanger Bundle Work	➢ Any process stream in the refinery.	➢ Heat from hot equipment and steam tracing ➢ Acid, caustic and HC splash ➢ Awkward position and heavy objects (1 1/2" impact wrench) ➢ Elevated location	➢ Chemical Gloves ➢ Respirator ➢ For acid work: chemical suit, boots, and face shield ➢ Sleeve or Gauntlet for Steam tracing.
Inspection: X-ray, ultrasonic, dry mag wet fluorescent mag, die penetrant. Do not use x-ray equipment, just coordinate the crew's work.	➢ Die penetrants and developers, ultrasonic coupling agents	➢ Fall from height ➢ Heat from hot processes and steam tracing ➢ Ionizing radiation if x-raying equipment	➢ Respirator ➢ Hard hat ➢ Goggles ➢ Gloves, PVC gear
Loading Transport Vessels	➢ Release of loading material may occur	➢ Fall from height ➢ Pressurized flexible lines ➢ Moving heavy lines	➢ Fall Protection if needed ➢ Goggles and face shield
Machine Tool Operations: Lathes, boring mills, grinders, drill presses, bead blaster.	➢ Cutting oils and coolants	➢ Flying Chips ➢ Sharp chips and shavings ➢ Rotating Parts	➢ Glasses ➢ Gloves ➢ Hearing Protection

Table 20 Physical Hazard Assessments with PPE Selection

Task	Process Material or Chemical (See Appendix A for Chemical Assessments)	Physical Hazards (Flammability hazard from hydrocarbons)	Precautions & Additional PPE
Mechanic, Automotive and Vehicle: Engine, electrical brake and tire maintenance and repair.	➢ Spray cans - solvents and penetrants ➢ Parts cleaner ➢ Paints and thinners ➢ Antifreeze	➢ Pressurized fuel systems on fuel injected engines is fire hazard and spray hazard ➢ Tires and batteries are awkward lifting hazard ➢ Split rim wheels exploding ➢ Electric shock from coil ➢ Battery exploding ➢ Grinder ➢ Crushing hazard - heavy weights on jacks	➢ Pressure relief valve on fuel injection tool ➢ Tire cage ➢ Face Shield and goggles
Metal Working Tools: Shear, brake, rollers, drill press, large grinders.	➢ None	➢ Heavy objects ➢ Pinch points, crushing ➢ Sharp edges	➢ Cranes ➢ Cut-resistant gloves if needed
Motor Valve Work:	➢ Process chemical residual may be on or in equipment	➢ Spring-loaded parts ➢ Heavy objects	➢ Chemical gloves could be needed for chemical residual
Noise	Steam leaks, arc gouging, vibration, high pressure releases can add to noise levels.	➢ Temporary/permanent hearing loss.	➢ < 85.0 dBA - None Required ➢ > 85.0 - ≤109 dBA – Ear plugs or ear muffs. ➢ ≥110 dBA – Double hearing protection and independent evaluation by IH.
Opening Process Equipment Blinding, temporary piping to drain piping and equipment, PSV replacement.	➢ Any process stream in the Refinery.	➢ Heat from hot equipment and steam tracing ➢ Acid, caustic and HC splash ➢ Awkward position and heavy objects ➢ Elevated location	➢ Chemical gloves ➢ Respirator ➢ Chemical suit, boots, and face shield if acid ➢ Sleeve or gauntlet for steam tracing
Painting: Inside shop using hood or booth	➢ Solvent based paints and epoxies ➢ Leaks or releases from nearby or upwind process equipment.	➢ Solvent and paint splash hazard ➢ Inhalation of paint vapor or mist ➢ Tripping over hose ➢ Falling form Height	➢ Spray booth ➢ Respirator (yellow and purple cartridge) ➢ Disposable coveralls, hood, and boots ➢ Chemical gloves
Painting: **Equipment in Process areas**	➢ Solvent-based paints and epoxies ➢ Leaks or releases from nearby or upwind process equipment	➢ Solvent and paint splash hazard ➢ Inhalation of paint vapor or mist ➢ Tripping over hose	➢ Respirator (yellow and purple cartridge) ➢ Disposable coveralls, hood, and boots ➢ Chemical gloves
Plasma Arc Cutting: High frequency, precise arc with air or argon done on table.	➢ Fumes may contain nickel, chromium, and zinc. ➢ Welding gases which may contain CO, CO_2, NOx, acetylene, argon, and helium.	➢ Heat from hot pipes, steam tracing and slag ➢ Noise from grinders ➢ Sparks and dust from grinders ➢ Fall from Height ➢ Awkward posture and heavy objects ➢ Electric Shock ➢ Pinch Points, crushing	➢ Ventilation fans and exhaust systems ➢ Cranes and jigs for parts positioning ➢ Welding hood and gloves. ➢ Face shield or goggles ➢ Ear plugs if noise exceeds 85 dBA ➢ Respirator - See Appendix C.

Table 20 Physical Hazard Assessments with PPE Selection

Task	Process Material or Chemical (See Appendix A for Chemical Assessments)	Physical Hazards (Flammability hazard from hydrocarbons)	Precautions & Additional PPE
Preventive Maintenance Hoist inspection, Manlift inspection, PSV maintenance and testing, and turbine inspection.	➢ Grease	➢ Fall from Height ➢ Turbine may come apart during over-speed trip inspection	➢ Fall Protection if needed ➢ Work practices
Pulling Pumps and Turbines: These should already be electrically disconnected, blinded, drained, and flushed.	➢ Any process stream in the refinery. ➢ Process chemical residual may be on or in equipment.	➢ Heave objects ➢ Turbine may come apart during restart	➢ Crane or hoist ➢ Work practices ➢ PPE if needed to prevent exposure
Rebuilding Motors	➢ Process chemical residual may be on or in equipment.	➢ Heavy objects ➢ Rotating parts ➢ Electricity ➢ Heated bearings	➢ Gloves or hot gloves ➢ Hearing protection ➢ Glasses or goggles
Rebuilding Pumps and Turbines: Dismantle equipment clean equipment, and reassemble.	➢ Any process stream in the refinery ➢ Coke dust ➢ Kerosene for parts cleaning	➢ Sharp edges ➢ Heavy objects ➢ Heat from hot water and steam cleaning	➢ Employee chooses non-standard PPE ➢ Cranes ➢ Chemical or thermal gloves as needed ➢ Glasses
Receiving, Shipping, and Delivering	➢ None	➢ Lifting boxes and equipment throughout the day ➢ Box knife,: cut hazard ➢ Overhead storage items could be dropped ➢ Fall from rolling ladders	➢ Leather gloves ➢ Use forklift for heavy items and to lift pallets of boxes to easier lifting height. ➢ Use dollies where appropriate.
Sampling Process Streams	➢ Any process stream in the refinery.	➢ Hand and skin contact may occur.	➢ Impermeable gloves - nitrile, PVC/Neoprene ➢ Impermeable clothing as needed to prevent skin contact. ➢ Goggles and face shield as needed to prevent eye and face contact
Removal of Asbestos Containing Materials (ACM)	➢ Asbestos ➢	➢ Knife and wall board saw to cut insulation ➢ Sharp edges of sheet metal and strapping ➢ Fall hazard from elevated work ➢ Heat hazard from steam tracing	➢ Respirator ➢ Insulator gloves or leather gloves ➢ Scaffold or harness ➢ Forearm gauntlet for steam tracing

Table 20 Physical Hazard Assessments with PPE Selection

Task	Process Material or Chemical (See Appendix A for Chemical Assessments)	Physical Hazards (Flammability hazard from hydrocarbons)	Precautions & Additional PPE
Insulation Removal or Installation	➢ Fiberglass ➢ Foam glass ➢ Ectotherm	➢ Knife and wall board saw to cut insulation ➢ Sharp edges of sheet metal and strapping ➢ Fall hazard from elevated work ➢ Heat hazard from steam tracing	➢ Negative Exposure Assessment (NEA) ➢ Standard Operating Procedure ➢ Glove bag ➢ Wet methods ➢ HEPA vacuum ➢ Protective clothing ➢ Respirator ➢ Insulator gloves or leather gloves ➢ Scaffold or harness ➢ Forearm gauntlet for steam tracing
Scaffold Building and Dismantling Dismantling is more hazardous due to residuals of chemical, welding rod, and welding slag which falls while dismantling.	➢ None	➢ Fall from Height ➢ Heat from steam tracing and hot pipes ➢ Lifting heavy objects ➢ Eye and skin hazard from chemical welding rod and welding slag while dismantling.	➢ Gloves ➢ Eye protection
Spotter and Rigger for Cranes	➢ None	➢ Lifting heavy objects ➢ Falling objects ➢ Pinch points ➢ Cuts and abrasions from sings and wire ropes	➢ Gloves ➢ Hard hats ➢ Eye protection
Transferring Chemicals/Additives	➢ Release of chemical may occur	➢ Contact with material being transferred.	➢ See Appendix A, MSDS, or safe handling procedure.
Trenching and Shoring	➢ None (except for potential soil contamination	➢ Fall from Height ➢ Lifting heavy objects ➢ Entrapment (case-in) ➢ Eye hazard from dust, debris	➢ Gloves ➢ Proper shoring ➢ Eye protection
Tool Room	➢ Residual chemical occasionally on returned tools	➢ Heavy objects on overhead shelves ➢ Sharp tool bits, knives and chisels	➢ Gloves
Visual Inspection of equipment and piping, including daily walk through of unit.	➢ Any process stream in the refinery	➢ Fall from Height ➢ Heat from hot processes and steam tracing leaks from equipment of any process chemical may be found.	➢ Respirator if releases or leaks occur ➢ Hard hat ➢ Goggles ➢ Fall Protection may be required ➢ Gloves, PVC gear ➢ Hearing Protection

Table 20 Physical Hazard Assessments with PPE Selection

Task	Process Material or Chemical (See Appendix A for Chemical Assessments)	Physical Hazards (Flammability hazard from hydrocarbons)	Precautions & Additional PPE
Welding: Carbon steel, stainless, chrome, nickel, (Hastelloy, Inconel), cast iron, galvanized. Includes the acetylene cutting and hand-tool grinding always done with welding.	➢ Welding fumes which may contain nickel, chromium, and zinc. ➢ Welding gases which may contain CO, CO2, NOx, Acetylene, argon, and helium.	➢ Heat from hot pipes and steam tracing ➢ Molten slag ➢ Noise from grinders ➢ Sparks and dust from grinders ➢ Fall from height ➢ Awkward posture and heavy objects ➢ Electric Shock ➢ Pinch points, crushing	➢ Fire and molten slag resistant clothing ➢ Ventilation fans and exhaust systems ➢ Cranes and jibs for parts positioning ➢ Welding hood and gloves ➢ Face Shield or goggles ➢ Ear plugs if noise exceeds 85 dBA ➢ Respirator - See Appendix C.

10 APPENDIX C: RESPIRATORY PROTECTION FOR WELDING AND TORCH CUTTING

Table 21 Respiratory Protection for Welding and Torch Cutting

Environment	Open areas[1]		Enclosed[2] or Confined Spaces[3] (all metals)		Partial Enclosures		
Ventilation	Natural Ventilation		Mechanical Ventilation		Ventilation Unknown		
Welding Process[4]	Carbon Steel [5,6]	Alloy Metals	≥ 2000 CFM/welder	< 2000 CFM/welder	Carbon Steel - Less than 2-sided enclosure	Carbon Steel - More than 2-sided enclosure	Alloy Metals - More than 2-sided enclosure
Stick	No respiratory protection required.	Half Face with P-100 or HEPA filters	Half Face with P-100 or HEPA filters	Half Face with P-100 or HEPA filters with local exhaust ventilation, or use Supplied Air.	No respiratory protection required.	Half Face with P-100 or HEPA filters	Supplied Air
MIG	No respiratory protection required.	Half Face with P-100 or HEPA filters	Half Face with P-100 or HEPA filters	Half Face with P-100 or HEPA filters with local exhaust ventilation, or use Supplied Air.	No respiratory protection required.	Half Face with P-100 or HEPA filters	Supplied Air
TIG	No respiratory protection required.	Half Face with P-100 or HEPA filters	Half Face with P-100 or HEPA filters	Half Face with P-100 or HEPA filters with local exhaust ventilation, or use Supplied Air.	No respiratory protection required.	Half Face with P-100 or HEPA filters	Supplied Air
Arc Gouging	No respiratory protection required.	Half Face with P-100 or HEPA filters	Supplied Air (for gouger only unless CO exceeds PEL)	With local exhaust ventilation, Half Face with P-100 or HEPA filters provided CO remains below PEL, or use Supplied Air for all inside confined space with ongoing gouging.	No respiratory protection required.	Half Face with P-100 or HEPA filters	Supplied Air
Torch Gouging	No respiratory protection required.	No respiratory protection required.	Half Face with P-100 or HEPA filters	Half Face with P-100 or HEPA filters with local exhaust ventilation, or use Supplied Air.	No respiratory protection required.	No respiratory protection required.	Supplied Air

Note 1: Hot work inside shops requires local exhaust ventilation or dilution ventilation > 2000 CFM per welder

Note 2: Enclosures are spaces with a volume <10,000 ft^3/welder, ceiling height, 16 feet, or barriers that obstruct adequate cross-ventilation (moving fumes horizontally away from the welder's breathing zone.)

Note 3: Confined spaces are small, restricted spaces, such as those inside vessels or equipment

Note 4: Recommendations based on previous removal of surface coating such as paint for primer.

Note 5: Half face respirators should be used for open air welding on galvanized metals.

Note 6: Use of alloy steel welding rods or wire must be considered as alloy metal welding, even if the base metal is carbon steel.

11 APPENDIX D: CHEMICAL RESISTANT GLOVES: BREAKTHROUGH TIMES

Breakthrough time is the amount of time from first contact to detection of chemical inside glove material. Gloves that become contaminated should be washed off or discarded. Gloves visibly degraded by chemical contact should be discarded.

Glove Material (Confirm specific Manufacturer ratings)	**Amine (MEA)**	**Sulfuric Acid**	**Hydro-fluoric Acid**	**Methyl Alcohol**	**BTX Aromatics**	**Caustic**	**Naphtha**	**Gasoline**	**Jet/Kerosene**
Neoprene	400 minutes	20 minutes 95% strength 360 minutes 47% strength	> 480 minutes	70 minutes	DO NOT USE	250 minutes	No test information	DO NOT USE	185 minutes
Neoprene-coated knit cotton lining	> 360 minutes	360 minutes regardless of strength	No test information	15 minutes	DO NOT USE	360 minutes	No test information	DO NOT USE	> 360 minutes
Nitrile	>240 minutes	180 minutes 97% strength	330 minutes 48% hydrofluoric acid < 15minutes HF gas	25 minutes	15 to 100 minutes (varies with exposure level)	240 minutes 29% ammonium hydroxide >480 minutes 50% sodium hydroxide	> 480 minutes	> 480 minutes	> 480 minutes
PVC and nitrile-coated jersey liner	> 360 minutes	150 minutes 95% strength > 480 minutes 47% strength	No test information	45 minutes	DO NOT USE	240 minutes	DO NOT USE	DO NOT USE	No test information
PVC	No test information	150 minutes 95% strength >480 minutes 47% strength	155 minutes	50 minutes	15 minutes	45 minutes 29% ammonium hydroxide >240 minutes 50% sodium hydroxide	Several minutes	20 minutes	No test information
Nitrile Liners (Use only for splash protection or as glove liners with more durable outer gloves.)	No test information	DO NOT USE	DO NOT USE	5 minutes	3 minutes	>480 minutes	No test information	No test information	> 480 minutes
Leather or Uncoated Cloth	DO NOT USE	DO NOT USE	DO NOT USE	DO NOT USE	DO NOT USE	DO NOT USE	DO NOT USE	DO NOT USE	DO NOT USE

12 APPENDIX E: FRC REPLACEMENT APPROVAL FORM

Example: A usable Form is provided in the attachment HS-SWI-058F1.

To be completed by EHSS

Date: _____

Recipient's Name: _____

Type of FRC Requested (check):

Coverall:	☐	Quantity: _____
Jacket/Coat:	☐	Quantity: _____
CPC (Alky Operator Only):	☐	Quantity: _____
Welder Overall:	☐	Quantity: _____
Hard Hat Liner:	☐	Quantity: _____
Lab Coat:	☐	Quantity: _____

Reason for Replacement: _____

_____

_____

_____

_____

_____

_____

_____

EHS Signature

White Copy to EHS

Yellow to Purchasing

13 APPENDIX F: PPE REQUIREMENTS MAP (POSTED AROUND REFINERY)

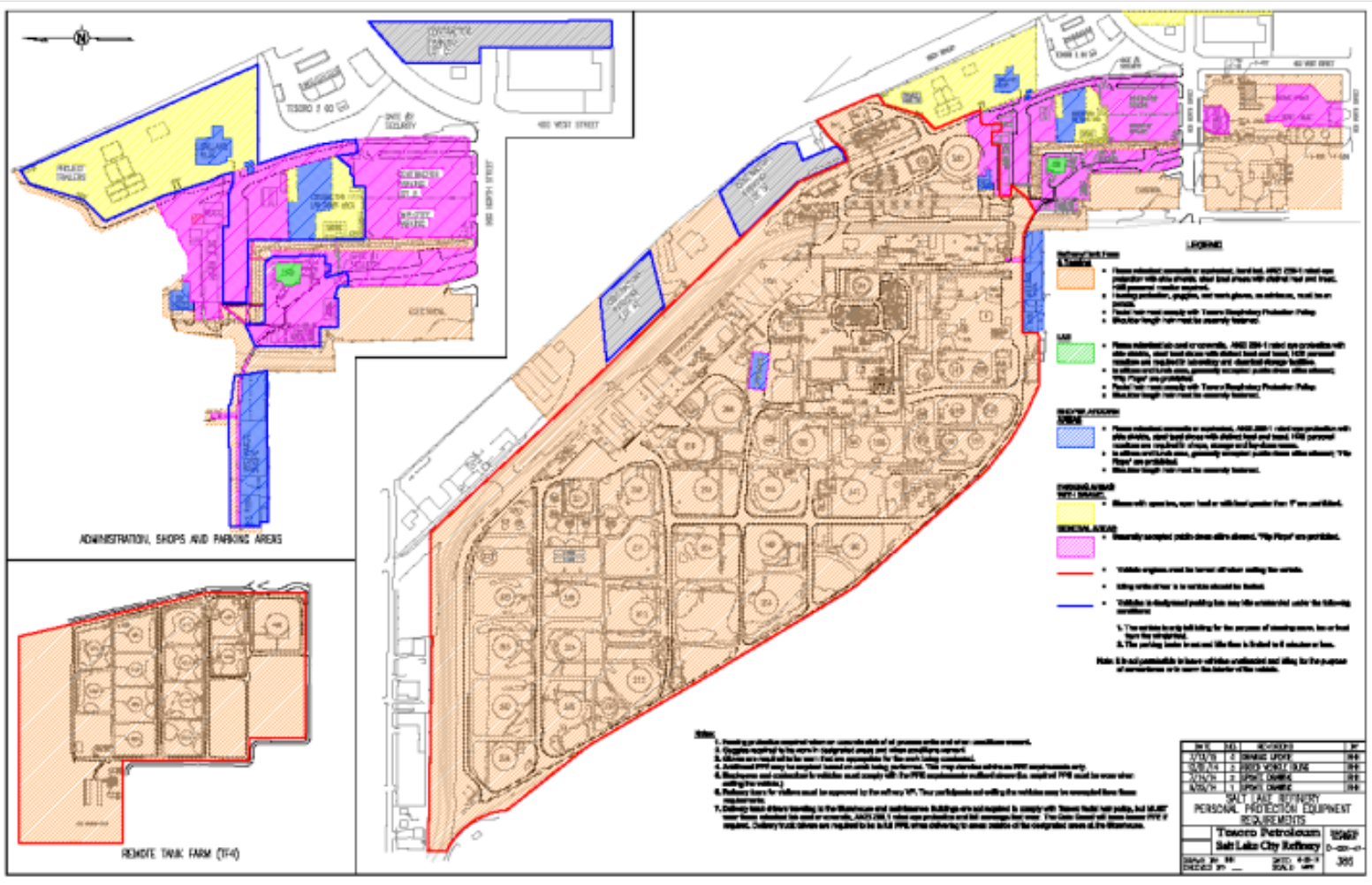

Figure 1 Protective Personal Equipment (PPE) Requirements Map

14 APPENDIX G: PROPER WEARING OF PPE

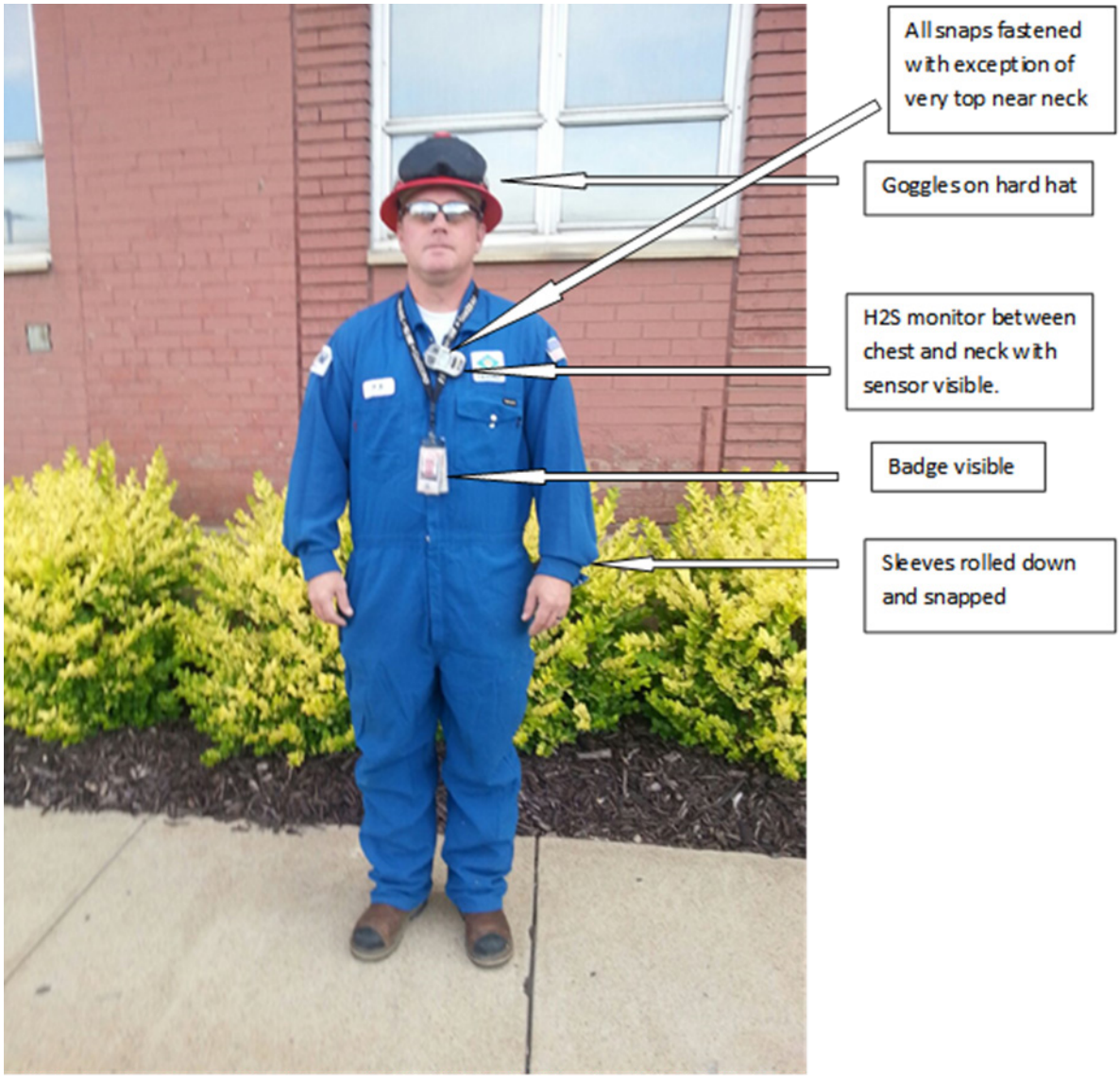

Figure 2 Proper Wearing of Protective Personal Equipment (PPE)