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CNSE Personal Protective Equipment Requirements

REVISION

Rev No.	DCN No.	Change Summary **Changed items are in blue font.**	Release Date	DCN Initiator	Document Owner
14	DCN0947	Eye protection is now required when micro pipetting, aligned policy with OSHA standard, identified location of PPE cabinets, identified when body protection is required and proper cleaning & maintenance of PPE. Added New Logo.	9-4-13	C. Boisclair	R. Segura

Prior revision history, if applicable, is available from the Document Control Office.

1. PURPOSE

1.1 To provide minimum guidelines for the use of personal protective equipment (PPE) within specified hazard areas and/or during designated procedures, to adequately protect persons from potential chemical, physical, or mechanical hazards.

1.2 This Personal Protective Equipment Program provides procedures to be followed in accordance with the Occupational Safety and Health Administration's (OSHA) Part 29 Code of Federal Regulations (CFR) 1910.132 to 1910.140.

2. SCOPE

2.1 This program applies to the College of Nanoscale Science and Engineering (CNSE) employees/students, tenant employees, contractors and sub-contractors who may be performing an activity or operation within the facility that requires the use of Personal Protective Equipment (PPE). Tenant employees, contractors and sub-contractors may comply with their own organization's program provided that it meets and/or exceeds the minimum requirements set forth in this procedure.

2.2 CNSE employees/students, tenant employees, contractors and sub-contractors will be notified of the requirement to follow this program and are required to comply with the restrictions and limitations imposed upon them by CNSE during site activities.

2.3 This specification refers to the following types of PPE: Eye Protection, Face Protection, Head Protection, Foot Protection, Hand Protection, and Body Protection.

2.4 Information regarding respiratory protection is located in the CNSE Respiratory Protection Program, Specification EHS-00015.

3. RESPONSIBILITY

3.1 CNSE shall make conveniently available to all employees, at no cost, the specified PPE during the performance of identified tasks. The supervisor shall be responsible for providing the required equipment, for training the employee in the proper use of such equipment, and for ensuring that the employee wears the equipment.

3.2 **Department Supervisors, Equipment Engineers, and Professors**

3.2.1 Department Supervisors or Equipment Engineers or Professors are responsible for performing hazard assessments. Hazard assessments

must be completed for each of the jobs that are performed by personnel in their departments/area to determine if hazards are present, or are likely to be present, which necessitates the use of PPE. A hazard assessment is performed to identify at a minimum the following general types of hazards: Impact, Penetration, Compression, Chemical, Heat/Cold, Harmful Dust, Light (optical), Radiation, and Electrical. The "Hazard Assessment Guidelines"(Appendix A) and the "Hazard Assessment" form (EHS-00010-F1) shall be used to perform a hazard assessment. Equivalent forms may be used provided the hazard assessment includes all of the above listed hazards, forms are dated and signed, the location that was evaluated is specified, and PPE requirements are identified.

3.2.2 Multiple hazards and multiple body parts for each job can be recorded on the same hazard assessment form provided it is clear how the hazard is eliminated by the use of PPE. The Supervisor, in conjunction with the EHS Department shall determine the appropriate PPE for the hazards identified during the hazard assessment and communicate the results of the assessment to the affected employees.

3.2.3 The Supervisor will forward the completed hazard assessment forms to the EHS Department for review, approval and record keeping. Results of hazard assessments are rolled up in Appendix C.

3.2.4 The Supervisor shall repeat the hazard assessment whenever changes in the work area render prior assessment obsolete, or changes in the types of PPE to be used render the previous assessment obsolete. Completion of the Equipment Installation and Commissioning Procedures, EHS-00016 and EHS-00017 respectively, will fulfill this requirement.

3.2.5 The Supervisor will be responsible for making sure that all employees receive and understand the various components of PPE training as is appropriate for their job prior to being allowed to perform work requiring the use of PPE.

3.2.6 If the Supervisor has reason to believe that any employee who has already been trained does not have the understanding and skill required, the supervisor shall make arrangements to retrain that employee. Circumstances where retraining is required include, but are not limited to:

3.2.6.1 Changes in the work area render prior training obsolete, or

3.2.6.2 Changes in the types of PPE to be used render previous training obsolete, or

3.2.6.3 Inadequacies in an employee's knowledge or use of assigned PPE indicate that the employee has not retained the required understanding or skill.

3.2.7 Supervisors are responsible for enforcing the use of and proper care of PPE for all employees within their department.

3.3 **EHS Department**

3.3.1 The EHS Department shall direct all PPE uses at this site.

3.3.2 The EHS Department shall maintain the accuracy of information within this specification.

3.3.3 The EHS Department shall create and maintain the PPE Training Program for this site.

3.3.4 The EHS Department shall review the hazard analysis data provided by the Supervisors and ensure the accuracy of the hazard assessment submitted by Supervisors.

3.3.5 The EHS Department shall verify that each employee, who is required to wear PPE, received and understood the required training through a written certification that contains:

3.3.5.1 The name of each employee trained,

3.3.5.2 The date(s) of training, and

3.3.5.3 Identifies the subject of the training

3.4 **Purchasing**

3.4.1 The Purchasing Department will be responsible for purchasing PPE that applicable, current ANSI Standards. The ANSI standards that apply are as follows:

3.4.2 Eye Protection - ANSI Z87.1-2003, "American National Standard Practice for Occupational Eye and Face Protection."

3.4.3 Face Protection - ANSI Z87.1-2003, "American National Standard Practice for Occupational Eye and Face Protection."

3.4.4 Head Protection -ANSI Z89.1-2009, protective helmets, "American National Standard for Personal Protective Headwear for Industrial Workers Requirements."

3.4.5 Foot Protection - ANSI Z41-1999, "American National Standard for Personal Protection - Protective Footwear”.

3.5 Employees

3.5.1 All employees shall be responsible for wearing PPE as indicated by identified hazards.

3.5.2 Employees, who are required to wear PPE, shall complete and pass PPE training, and make his/her Supervisor aware if additional training is indicated.

3.5.3 Employees shall inspect, maintain and clean PPE on an assigned basis, and will report/replace deficiencies.

3.5.4 Employee shall not use damaged or defective PPE.

4. ASSOCIATED DOCUMENTS

EHS-00010-F1 Hazard Assessment (HA) and PPE Selection Form.

5. PERSONAL PROTECTIVE EQUIPMENT

5.1 General

5.1.1 PPE shall provide adequate protection against the particular hazards for which it was designed and shall meet applicable ANSI Standards.

5.1.2 PPE shall be durable, fit snugly, and not impede upon or duly interfere with the movements of the wearer.

5.1.3 PPE shall properly fit each affected employee

5.1.4 PPE shall be stored and maintained in a clean, dry, sanitary manner and kept in good repair.

5.1.5 At no time shall any person be allowed to enter a work area or perform an assigned task without the required PPE.

5.1.6 All PPE shall be inspected prior to use. Defective and/or damaged equipment shall not be used and shall be replaced with new, not-damaged PPE.

5.1.7 Contaminated protective clothing shall be thoroughly washed and wiped dry prior to removal.

5.1.8 PPE shall not be altered or changed in any way, and must be worn in the prescribed manner.

5.2 The minimum PPE requirements listed in Appendix C shall be followed.

5.3 All designated areas requiring the use of PPE shall be appropriately posted.

5.4 PPE cabinets are located throughout the facility that contain gloves, aprons and face shields, etc. for use by CNSE employees:

PPE Cabinet Location	MAPA Trionic Gloves	Nitrile Gloves	Acid Gloves (orange)	Glove Liners	Sleeve Apron	Coat Apron	Goggles	Face Shield
*CESTM – 2nd floor hall	X	X			X		X	X
*CESTM – 1st floor hall	X	X	X	X				
*NFE 4th floor hall	X	X			X		X	X
HPM Corridor	X	X			X	X		X
NFC 4th floor – outside chemical dispense rooms	X	X			X	X		X
NFE 2nd floor hall	X	X			X	X	X	X
CMP Waste Room NFS/NFSX	X	X			X	X		X
NFS/NFSX Cleanroom	X	X			X	X		X
CUB	X	X			X	X		X
NFX Subfab	X	X			X	X		X
NFX- 300mm, 450mm, Air Liquide areas	X	X			X	X		X
NFX 2nd floor- outside air chase, 450mm cleanroom by loading dock, office by loading dock	X	X			X	X		X
NFC FAB- LAM	X	X			X	X		X
Link between NFN & NFC FAB	X	X			X	X		X
NFN Sematech Entrance	X	X			X	X		X
NFN – AMAT	X	X			X	X		X
NFN Subfab – FOUP storage area	X	X			X	X		X
NFN Subfab – Air Liquide storage area	X	X			X	X		X

*Maintained by Academic Engineering Support Group for use by CNSE Staff and Students. All other cabinets are maintained by Site Services.

6. EYE AND FACE PROTECTION

6.1 Employees shall use appropriate eye and/or face protection where there is potential exposure to eye or face hazards from flying particles, molten metal, liquid chemicals, acids or caustic liquids, chemical gases or vapors, or potentially injurious light radiation.

6.2 Eye protection in the form of safety glasses are required to be worn while working in all of the cleanrooms, laboratories, chemical storage/use (HPM) areas and/or UPW/WWT areas at the CNSE facility.

6.3 Although safety glasses should always be worn in the areas listed in Section 6.2, the following is a list of tasks that are considered exempt from the CNSE safety glasses requirement. The intention of this exemption is to permit those that are performing such tasks to temporarily allow them to remove their safety glasses:

- Performing administrative duties such as writing in a laboratory notebook or looking at a computer screen.
- Using a microscope.

6.3.1 Please note that safety glasses are required for any of the aforementioned exempt tasks if corrosive, toxic or infectious materials will be used.

6.4 As listed in Appendix C of this procedure, eye protection in the form of safety glasses is also always required to be worn if there is a possibility of splashing, spraying, or misting of hazardous corrosive chemicals, if a class 3b or 4 laser is in use or maintenance is being performed on such laser, and if the employee is receiving, transporting, or installing compressed gases.

6.4.1 Activities where there is the potential for eye injury due to flying particles; including but not limited to:

- Machining, grinding, drilling, cutting, soldering, welding,
- All facilities maintenance activities,
- All ground keeping activities, and
- All contractor and sub-contractor activities.

6.4.2 Additionally, eye protection must be worn while working where dust and/or particles are disturbed and may be a hazard.

6.4.3 Eye and face protection shall meet the minimum performance and design specifications established by the manufacturer and be in compliance with ANSI Z87.1-2003.

6.4.4 All safety glasses shall have side shields permanently affixed to their frames. Detachable side protectors (clip on or slide on side shields) which meet the ANSI requirements are acceptable.

6.5 Employees who wear prescription lenses while engaged in operations that involve eye hazards shall wear eye protection that incorporates the prescription in its design or shall wear eye protection that can be worn over their prescription lenses.

6.5.1 Prescription safety eyewear shall be provided through the EHS Department to all CNSE employees who need corrective lenses and are required to wear safety glasses. The EHS Department must approve the purchase of all CNSE subsidized prescription safety glasses.

6.5.1.1 To obtain prescription safety eyewear, the employee shall report to the EHS Office Administrator. Upon confirmation that they work for CNSE, the employee will be given a voucher to take to Empire Vision. Empire Vision will then submit a “request to pay” invoice to EHS from Empire Vision and EHS will ok the purchase for the employee. Employees must present a voucher at the time of service.

6.5.2 Tenant, contractor or sub-contractor employees that are required to wear prescription safety eyewear shall be provided to them through their respective EHS Departments.

6.6 Non-prescription type safety glasses shall be provided for employees requiring their use and shall be available in the stock room.

6.7 Eye and face PPE shall be distinctly marked to facilitate identification of the manufacturer and shall also identify the eyewear as having met the ANSI Z87 standard.

6.8 When face shields are required, approved safety glasses or goggles must also be worn. Face shields are available to employees who require their use and are inventoried in PPE cabinets.

6.9 Each affected employee shall use equipment with filter lenses that have a shade number appropriate for the work being performed for protection from harmful light radiation. See Appendix D "Filter Lenses for Protection Against Radiation Energy Chart".

7. RESPIRATORY PROTECTION

7.1 Please see Respiratory Protection Program, EHS-00015 for further information regarding the use of respiratory protection at the CNSE facility.

8. HEAD PROTECTION

8.1 Employees shall wear head protection when working in areas where there is the potential of injury to the head from falling objects.

8.2 A protective helmet designed to reduce electrical shock hazard must be worn in areas where an employee is working near exposed electrical conductors which could come into contact with the head.

8.2.1 Head protection shall meet or exceed the ANSI standard for industrial head protection, ANSI Z89.1-2009.

8.3 In areas where there is the potential for nuisance bumps of the head, bump caps may be recommended. Bump caps shall not be used in areas and situations outlined in section 8.1

9. FOOT PROTECTION

9.1 Employees shall wear protective footwear when working in areas where there is danger of foot injuries due to falling and rolling objects or objects piercing the sole and where such employees' feet are exposed to electrical hazards. The footwear required shall depend on the nature of the work being performed by the employee, the material that is being handled by the employee, and/or the area in which the employee works.

9.1.1 Foot protection shall meet or exceed the ANSI standard for protective footwear, ANSI Z41-1999.

9.2 Safety footwear with impact protection are required for carrying or handling materials over 50 pounds such as packages, objects, parts or heavy tools, gas and chemical handling, and for other activities where objects might fall onto the feet.

9.3 Safety footwear with puncture protection are required where sharp objects such as nails, wire, tacks, screws, large staples, could be stepped on by employees causing a foot injury.

9.4 **General Cleanroom and Laboratory Areas**

Employees working in cleanroom and laboratory areas shall wear footwear conforming to the following requirements:

9.4.1 Shoes must have closed heels and toes with the toes completely covered; sandals, crocs, flip flops, and similar types of footwear are not permitted.

9.4.2 Shoes must have heels constructed of rubber or similar non-skid material.

9.4.3 Heel height must not exceed two inches (2") from the back of the heel, and have a base of at least one-half inch (1/2").

9.5 Chemical Areas

In addition to the requirements for footwear in general cleanroom and laboratory areas, employees working in areas where chemicals are used, or in areas where wet conditions may exist shall wear footwear that conforms to the following:

9.5.1 Shoes must have a separate sole constructed of a non-porous, impervious material. Soft leather moccasins, sandals or ballerina type slippers are not permitted.

9.6 Chemical and Gas Cylinder Handling

9.6.1 In addition to the requirements listed for both general production and chemical areas, employees required to handle chemicals (drums, boxes, bottles, etc.) and/or compressed gas cylinders shall wear footwear that conforms to the following:

9.6.2 ANSI approved safety shoes with steel toe boxes.

9.7 Employees working in machining operations, facilities maintenance, shipping and receiving, chemical handling, gas cylinder handling, and any other area designated by EHS as having high potential for foot injury, shall wear ANSI approved safety shoes with steel toe boxes.

9.7.1 ANSI approved safety shoes/boots shall be provided through EHS Department to all CNSE employees who are required to wear safety shoes/boots. Use of safety shoes/boots is required only when handling or transporting materials or equipment over 50 pounds (lbs) in weight or if the employee conducts the task once or less per month. See the EHS Safety Engineer to obtain information on how to order safety shoes/boots if they're required for your job position.

9.7.2 Tenant, contractor or sub-contractor employees that are required to wear safety shoes/boots shall be provided to them through their respective EHS Departments.

10. HAND PROTECTION

10.1 Employees must wear appropriate hand protection when employees' hands are exposed to hazards such as possible skin absorption of harmful substances, cuts or lacerations, abrasions, punctures, chemical or thermal burns, and extreme temperatures. Glove selection shall be decided relative to the task, conditions, duration of use and potential hazards as identified in section 10 of EHS-00010.

10.2 When working with chemicals, protective gloves suitable for protection against chemicals must be worn.

10.3 For work involving the handling of hot parts or contact with heated surfaces, the use of heat resistant gloves shall be worn. These gloves shall not be constructed of asbestos.

10.4 For work involving the handling of cryogenic liquids and gases and their associated piping, the use of cryogenic-rated insulated gloves shall be worn.

10.5 Cut resistant gloves shall be worn when hand protection during material handling is necessary or when a cut is expected.

10.6 Protective gloves shall meet the minimum requirements established by the manufacturer.

10.7 Protective gloves shall be made available to all employees requiring their use and inventoried in the PPE cabinets.

10.8 Finger cots shall not be substituted for gloves as protection against chemical contact.

10.9 Chemical resistant protective gloves must be inspected and tested by the wearer for defects before use. This inspection can be done by visualization or by partially inflating the glove with air and placing the glove close to the face while feeling and inspecting for air loss to identify a defective glove. If a loss of air is detected then the glove shall be discarded.

10.10 When working with liquids, the tops of the protective gloves should be turned down about one inch to form a cuff, which will prevent the liquid from running down the glove and inside to the hand and arm.

10.11 Jewelry, such as rings should not be worn since they may puncture or tear the glove.

10.12 Fingernails should be trimmed to a reasonable length for the same reason.

10.13 Chemical protective gloves shall not be shared between operators and must be changed, whenever there is a question of the gloves integrity, or whenever it appears that the gloves are wet on the inside.

10.14 Gloves must always be removed before touching equipment or station controls, etc. Contaminated gloves need to be discarded in the appropriate waste container before exiting the lab.

11. BODY PROTECTION

11.1 Body protection in the form of chemical-resistant aprons, tyvek suits, or laboratory coats may be required when working with chemicals. To determine if body protection is required, a hazard assessment must be performed and reviewed with EHS, as discussed in section 3.2. Some tasks already determined to require body protection are outlined in Appendix C.

11.2 Body protection is always required when working with chemicals having a health rating of 3 or higher, when mixing chemicals and when there is potential for splashing or misting of chemicals.

11.3 Chemical-resistant aprons shall be available for use to all employees requiring their use and available in PPE cabinets.

12. CLEANING AND MAINTENANCE

12.1 All PPE must be properly cleaned before use and maintained.

12.2 If PPE is found to be defective or damaged, it shall not be used and shall be replaced immediately.

13. TRAINING

13.1 The Supervisor/Department Manager must ensure that those involved in these types of activity are trained that require the use of PPE are aware of the types that are available for use and what is required for the job they are doing.

13.2 The Supervisor/Department Manager must ensure those involved in activities requiring PPE know when PPE is necessary, what PPE is necessary, how to properly don, doff, adjust and wear PPE, the limitations of PPE, how to properly care, maintain and dispose of PPE.

13.3 Before being allowed to perform work requiring the use of PPE, the employee must demonstrate an understanding of the concepts described in section 12.2

13.4 If changes in the workplace or changes in the type of PPE to be used occur that render previous training to be obsolete, then the employee must be re-trained by their supervisor/department manager.

14. RECORDS

14.1 Copies of hazard assessments and PPE training records shall also be kept on file by the EHS Department.

15. APPENDICES

15.1 **Appendix A** – Hazard Assessment Analysis Guidelines

15.2 **Appendix B** – Hazard Assessment and PPE Selection (Shown for Illustrative Purposes Only-Use EHS-00010-F1 as blank form)

15.3 **Appendix C** – Minimum Personal Protective Equipment (PPE) Requirements for Areas/Operations/Activities

15.4 **Appendix D** – Filter Lenses for Protection against Radiant Energy Chart

15.5 **Appendix E** – Selecting Laser Safety Glasses

APPENDIX A

HAZARD ASSESSMENT GUIDELINES

The objective of the Hazard Assessment is to assess jobs in the work place for hazards and potential hazards that will require workers to wear Personal Protective Equipment (PPE). PPE devices should not be relied on to provide protection against hazards, but should be used in conjunction with engineering controls, administrative controls and sound manufacturing practices.

1. Conduct a walk-through survey of the job/task to be performed and document as such under Section 1: Job Description.

2. As you perform the survey, don't try to rationalize if a hazard exists – instead just ask a simple yes or no question such as, "Are impact hazards present?" If yes, make a note in the box in Section 2: Basic Hazard Assessment and continue with the assessment.

3. During the walk-through consider the following:
   - Sources of impact such as flying chips, objects, dirt, particles, collisions, motion hazard, etc.
   - Sources of compression/motion: machinery or processes where any movement of tools, machine elements or particles could exist, or movement of a person could result in a collision with stationary objects.
   - Sources of heat: that could result in burns, eye injury, or ignition of protective equipment such as sparks, splashes from molten materials, burns from high or low temps, ovens.
   - Sources of chemical exposures: inhalation, eye contact, skin contact, ingestion through splashing, burns, fumes, PPE incompatibility.
   - Sources of harmful dust: asbestos, dirt, lead and/or arsenic.
   - Sources of light radiation: welding, brazing, cutting, furnaces, heat reacting, high intensity lights, ultra-violet, infra-red and laser light
   - Sources of falling objects or potential falling objects: overhead shelving, construction, overhead work
   - Sources of sharp objects which might pierce or cut the hands
   - Sources of rolling or pinching objects which could crush the feet
   - Layout of workplace and location of co-workers
   - Any electrical hazards

4. Complete Section 3: Hazard Assessment and PPE Selection. While completing this section consideration should also be given to the following:
   - Sequence of steps required to complete the task being evaluated
   - Possible injuries caused by impact, penetration, compression, etc.
   - Possible risk for each hazard
   - Seriousness of potential work injury for each hazard
   - Types of controls/PPE needed to control the hazards identified and reduce the risk

APPENDIX B

Hazard Assessment (HA) and PPE Selection

(Shown for Illustrative Purposes Only-Use **EHS-00010-F1** as blank form)

SECTION 1: JOB DESCRIPTION

Job/Task Being Evaluated: _____

Location/Area/Department: _____ Date: _____

HA Completed By: _____

Signature of Person Completing Evaluation:_____

Environmental, Health and Safety Approval: _____ Date: _____

New ☐ Review ☐

SECTION 2: BASIC HAZARD ASSESSMENT

This form may be used for multiple hazards that affect multiple body parts. For each hazard place an "X" in the "Basic Hazard" columns below.

BODY PART AFFECTED	Impact	Penetration	Compression	Chemical	Heat/Cold	Harmful Dust	Light Radiation	Other
Eyes								
Face								
Hands								
Body								
Head								
Other								

SECTION 3: SAFETY PRECAUTIONS/EQUIPMENT REQUIRED (circle all that apply)

A. Fire extinguisher (Type_____)
B. Fire shield/curtain
C. Foot Protection
D. Gloves (Type_____)
E. Safety glasses/face shield
F. Body protection (Type_____)
G. Hearing protection (Type _____)
H. Fall protection
I. Respiratory protection (Type_____)
J. Gas/oxygen detection
K. Warning Signs/Barricade
L. Standby Observer
M. Spill Containment
N. Lockout/Tagout
O. Odor advisory
P. Hot Work Permit
Q. Energized Electrical Work Permit
R. Confined Space Entry Permit
S. Notify Security
T. Other: _____

SECTION 4: HAZARD ASSESSMENT

Sequence of Job Steps	Potential Hazards	Choose Recommended Safety Precautions/Equipment Required from Above (List by Letter)

APPENDIX C

Minimum Personal Protective Equipment (PPE) Requirements for Areas/Operations/Activities

MINIMUM PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIREMENTS FOR SELECT AREAS/OPERATION ACTIVITIES	HEAD	EAR	GLOVES				APPAREL		SHOES	EYE/ FACE			RESPIRATOR		
	HARD HATS	PLUGS/MUFFS	CHEMICAL RESISTANT	TEAR RESISTANT	FLAME/HEAT RETARDANT	COLD RESISTANT	APRONS/SLEEVE APRON/LAB COAT	FLAME RETARDENT COVERALL	STEEL TOE SAFETY SHOES	SAFETY GLASSES	FACESHIELD	FLAME RETARDANT HOOD	N95Filtering Facepiece	AIR PURIFYING CARTRIDGE (Full facepiece)	SUPPLIED AIR
All areas/operations/activities where there is a potential for eye injury due to liquid chemicals, gases or their vapors including but not limited to: CNSE Laboratories UPW/WWT plants: CNSE cleanrooms, Chemical/Gas Storage Rooms: HPM rooms, HPM Building, Hazardous Waste Storage Building and CUB.										X					
All activities where there is a potential for eye injury due to liquid chemicals, gases or their vapors including but not limited to: Chemical users and waste generators/handlers, janitorial staff.										X					
All areas/operations/activities where there is the potential for eye injury due to flying particles; including but not limited to: Machining, Grinding, Drilling, Cutting, Soldering, Welding, All Facilities Maintenance Activities, All Grounds keeping Activities, all contractor and sub-contractor activities.										X					
All areas/operations/activities identified as potential risk for hearing loss: including but not limited to CUB Bldg., D.I. Water Room, wastewater treatment plants, Boiler rooms. Process Support rooms, Chiller rooms, Scrubber rooms, Grounds Keeping Activities and while operating the emergency generators See Hearing Conservation Program for a complete listing of such areas.		X													

MINIMUM PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIREMENTS FOR SELECT AREAS/OPERATION ACTIVITIES	HEAD	EAR	GLOVES				APPAREL		SHOES	EYE/ FACE			RESPIRATOR		
	HARD HATS	PLUGS/MUFFS	CHEMICAL RESISTANT	TEAR RESISTANT	FLAME/HEAT RETARDANT	COLD RESISTANT	APRONS/SLEEVE APRON/LAB COAT	FLAME RETARDENT COVERALL	STEEL TOE SAFETY SHOES	SAFETY GLASSES	FACESHIELD	FLAME RETARDANT HOOD	N95Filtering Facepiece	AIR PURIFYING CARTRIDGE (Full facepiece)	SUPPLIED AIR
All areas/operations/activities where there is the potential for foot injury due to lifting or transfer of chemicals, compressed gases, machine and/or equipment parts over 50 lbs; and/or use of powered industrial equipment: All Gas/Chemical handling Activities, All Cleanroom Maintenance Activities, All Facilities and Engineering Maintenance Activities, All Grounds Keeping Activities, Shipping and Receiving (S&R)									X						
All areas/operations/activities where there is the potential for leg injury due to chemical splashing; flying debris and/or use of powered industrial equipment: All Gas/Chemical handling Activities, All Cleanroom Maintenance Activities, All Facilities and Engineering Maintenance Activities, All Grounds Keeping Activities; all construction areas, S&R *NOTE: Apparel needed is long pants.							X*								
All areas/operations/activities where there is the potential for a head injury due to falling objects such as in construction areas, sub-fab floor in NFN, NFC & NFX cleanrooms, on loading docks during tool move in, working in a pit or confined space.	X														
Manual handling/storing/receiving/ transporting (not for driving fork trucks) of unopened or unused boxes, cases or crates of chemicals or hazardous waste (1 gallon, 5 gallon, or 55 gallon containers)			X						X	X					
Unpacking or opening of boxes, cases or crates.				X											

MINIMUM PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIREMENTS FOR SELECT AREAS/OPERATION ACTIVITIES	HEAD	EAR	GLOVES				APPAREL		SHOES	EYE/ FACE			RESPIRATOR		
	HARD HATS	PLUGS/MUFFS	CHEMICAL RESISTANT	TEAR RESISTANT	FLAME/HEAT RETARDANT	COLD RESISTANT	APRONS/SLEEVE APRON/LAB COAT	FLAME RETARDENT COVERALL	STEEL TOE SAFETY SHOES	SAFETY GLASSES	FACESHIELD	FLAME RETARDANT HOOD	N95Filtering Facepiece	AIR PURIFYING CARTRIDGE (Full facepiece)	SUPPLIED AIR
While handling empty "triple rinsed" chemical bottles, cleaned wet quartz and any other equipment that has had previous contact with chemicals where the risk of chemical residue is present. This includes, but not limited to: decontaminating equipment; ductwork; chemical dispense units/cabinets and/or valve manifold boxes.															
With local exhaust ventilation..			X				XX			XX	X				
Without local exhaust ventilation			X								X			X	
While transferring, pouring, dispensing, mixing, aspirating, or loading or unloading hazardous (health rating of 4) liquid chemicals, or liquid wastes where there exists the potential for skin, eye and/or respiratory exposure. Tool sets include: photolithography, wet etching, CMP operations, Copper plating operations; stripping, dipping, cleaning of wafers/ parts/ equipment.										X					
Within glove box or fume hood			X				X			X					
With local exhaust			X				X								
Without local exhaust			X				X				X				X*[1]

MINIMUM PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIREMENTS FOR SELECT AREAS/OPERATION ACTIVITIES	HEAD	EAR	GLOVES				APPAREL		SHOES	EYE/ FACE			RESPIRATOR		
	HARD HATS	PLUGS/MUFFS	CHEMICAL RESISTANT	TEAR RESISTANT	FLAME/HEAT RETARDANT	COLD RESISTANT	APRONS/SLEEVE APRON/LAB COAT	FLAME RETARDENT COVERALL	STEEL TOE SAFETY SHOES	SAFETY GLASSES	FACESHIELD	FLAME RETARDANT HOOD	N95Filtering Facepiece	AIR PURIFYING CARTRIDGE (Full facepiece)	SUPPLIED AIR
While transferring, pouring, dispensing, mixing, aspirating, or loading or unloading hazardous (health rating of 3) liquid chemicals, or liquid wastes where there exists the potential for skin, eye and/or respiratory exposure. Tool sets include: photolithography, wet etching, CMP operations, Copper plating operations; stripping, dipping, cleaning of wafers/ parts/ equipment.															
Within glove box or fume hood			X				X			X					
With local exhaust			X				X			X					
Without local exhaust			X				X				X			X	
While transferring, pouring, dispensing, mixing, aspirating, or loading or unloading non-hazardous (health rating of 2 or less) chemicals, or wastes where there exists the potential for skin, eye and/or respiratory exposure. Tool sets include: CMP operations, and lithography			X				X			X	X				
While loading, working with, cleaning up or conducting maintenance in equipment where TMAH (<2.38%) contact or vapors are possible; with local exhaust ventilation.			X				X			X	X				
Without local exhaust ventilation NOTE: PPE MUST still be worn if equipment has been drained and rinsed.			X				X							X	

MINIMUM PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIREMENTS FOR SELECT AREAS/OPERATION ACTIVITIES	HEAD	EAR	GLOVES				APPAREL		SHOES	EYE/ FACE			RESPIRATOR		
	HARD HATS	PLUGS/MUFFS	CHEMICAL RESISTANT	TEAR RESISTANT	FLAME/HEAT RETARDANT	COLD RESISTANT	APRONS/SLEEVE APRON/LAB COAT	FLAME RETARDENT COVERALL	STEEL TOE SAFETY SHOES	SAFETY GLASSES	FACESHIELD	FLAME RETARDANT HOOD	N95Filtering Facepiece	AIR PURIFYING CARTRIDGE (Full facepiece)	SUPPLIED AIR
While loading, working with, cleaning up or conducting maintenance in equipment where TMAH (>2.38%) contact or vapors are possible; with splash protection and local exhaust ventilation.			X				X*7							X	
Without local exhaust ventilation. NOTE: PPE MUST still be worn if equipment has been drained and rinsed. Full level B chemical resistant suit must be worn			X				X*7							X	
While working or conducting maintenance on equipment where liquid chemical contact (health rating of *4) or gaseous vapors are possible. PPE MUST still be worn if equipment has been drained and rinsed.			X				X			X	X				
With local exhaust ventilation			X				X								X*1
Without local exhaust ventilation.															
While working or conducting maintenance on equipment where liquid chemical contact (health rating of 3) or gaseous vapors are possible. PPE MUST still be worn if equipment has been drained and rinsed.			X				X			X	X				
With local exhaust ventilation			X				X								X*1
Without local exhaust ventilation.															
While working or conducting maintenance on equipment where liquid chemical contact (health rating of 2 or less) or vapors are possible. PPE MUST still be worn if equipment has been drained and rinsed.			X				X			X	X				
Handling broken mercury-filled containers (i.e. thermometers, mercury vapor lamps) Area must be roped off and posted with signage			X											X	

MINIMUM PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIREMENTS FOR SELECT AREAS/OPERATION ACTIVITIES	HEAD	EAR	GLOVES				APPAREL		SHOES	EYE/ FACE			RESPIRATOR		
	HARD HATS	PLUGS/MUFFS	CHEMICAL RESISTANT	TEAR RESISTANT	FLAME/HEAT RETARDANT	COLD RESISTANT	APRONS/SLEEVE APRON/LAB COAT	FLAME RETARDENT COVERALL	STEEL TOE SAFETY SHOES	SAFETY GLASSES	FACESHIELD	FLAME RETARDANT HOOD	N95Filtering Facepiece	AIR PURIFYING CARTRIDGE (Full facepiece)	SUPPLIED AIR
Performing any work inside a glove bag/glove box while handling nano sized or ultra-fine particles. NOTE: Double gloves must be worn.															
With local exhaust ventilation				X*6	X*		X			X					
Without local exhaust ventilation				6			X			X			X		
Conducting work/maintenance/cleaning or decontamination of on chemical drains, vent lines, scrubbers or duct work (may require full body suit and supplied air under certain circumstances)			X				X							X	X *1
Opening Valve Manifold Box (VMB), Gas Box, Gas Cabinet, or Gas Interface Box (GIB) door but not breaking a fitting nor loading a chemical/gas.										X					
Performing any work inside of a liquid Chemical Dispense Unit (CDU), Liquid Valve Manifold Box (VMB) or T-Box with lines flushed; drained and front cover **ON**. Area must be roped off and posted with signage.			X				X			X	X				
Performing any work inside of a liquid Chemical Dispense Unit (CDU), Liquid Valve Manifold Box (VMB) or T-Box with lines flushed, drained and front cover **OFF**. Area must be roped off and posted with signage.			X				X							X	
Performing maintenance on process gas lines (which breaks the gas line integrity) within a secondary regulator box, Tool Gas Box, VMB, Gas Cabinet, Purifier Cabinet, or GIB (Highly Toxic*4) with local exhaust ventilation. Area must be roped off and posted with signage.			X				X								X

MINIMUM PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIREMENTS FOR SELECT AREAS/OPERATION ACTIVITIES	HEAD	EAR	GLOVES				APPAREL		SHOES	EYE/ FACE			RESPIRATOR		
	HARD HATS	PLUGS/MUFFS	CHEMICAL RESISTANT	TEAR RESISTANT	FLAME/HEAT RETARDANT	COLD RESISTANT	APRONS/SLEEVE APRON/LAB COAT	FLAME RETARDENT COVERALL	STEEL TOE SAFETY SHOES	SAFETY GLASSES	FACESHIELD	FLAME RETARDANT HOOD	N95Filtering Facepiece	AIR PURIFYING CARTRIDGE (Full facepiece)	SUPPLIED AIR
Performing maintenance on process gas lines (which breaks the gas line integrity) within a secondary regulator box, Tool Gas Box, VMB, Gas Cabinet, Purifier Cabinet, or GIB (Corrosive or Toxic*3) with local exhaust ventilation. Area must be roped off and posted with signage.			X				X							X	
Performing maintenance on process gas lines (which breaks the gas line integrity) within a secondary regulator box, Tool Gas Box, VMB, Gas Cabinet, Purifier Cabinet, or GIB (Flammable) with local exhaust ventilation. Area must be roped off and posted with signage.					X			X		X	X	X			
Performing maintenance on process gas lines (which breaks the gas line integrity) within a secondary regulator box, Tool Gas Box, VMB, Gas Cabinet, Purifier Cabinet, or GIB (Pyrophoric) with local exhaust ventilation. Area must be roped off and posted with signage.		X			X			X				X			X
Use/maintenance of Class 3b and 4 Lasers (safety glasses must be of laser protective type, see Appendix E). See Laser Safety procedure for a list of all engineering and administrative controls that also must be utilized.										X					
Maintenance/cleanouts of tool chambers containing toxic solid materials or harmful dusts such as Arsenic, Boron, Phosphorus etc. Note: Tyvek suits, hood and booties should also be worn for such solid contaminated work.			X				X*2							X	

MINIMUM PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIREMENTS FOR SELECT AREAS/OPERATION ACTIVITIES	HEAD	EAR	GLOVES				APPAREL		SHOES	EYE/ FACE			RESPIRATOR		
	HARD HATS	PLUGS/MUFFS	CHEMICAL RESISTANT	TEAR RESISTANT	FLAME/HEAT RETARDANT	COLD RESISTANT	APRONS/SLEEVE APRON/LAB COAT	FLAME RETARDENT COVERALL	STEEL TOE SAFETY SHOES	SAFETY GLASSES	FACESHIELD	FLAME RETARDANT HOOD	N95Filtering Facepiece	AIR PURIFYING CARTRIDGE (Full facepiece)	SUPPLIED AIR
Maintenance/cleanouts of tool chambers, vacuum pumps, forelines or scrubbers containing toxic*3, corrosive or oxidizing gaseous materials or harmful vapors. Chamber/pump/scrubber/foreline must be cycle purged in accordance with manufacturer's recommendation prior to open.			X				X							X	
Maintenance/cleanouts of tool chambers, vacuum pumps, forelines or scrubbers containing highly toxic *4 gaseous materials or harmful vapors. Chamber/pump/scrubber/foreline must be cycle purged in accordance with manufacturer's recommendation prior to open.			X				X								X *1
Maintenance/cleanouts of tool chambers, vacuum pumps, forelines or scrubbers containing liquid pyrophoric or water reactive 3 materials. Chamber/pump/scrubber/foreline must be cycle purged in accordance with manufacturer's recommendation prior to open.					X *8			X *9							X *1
Maintenance/cleanouts of reactant tanks or WWT pumps involving potential HF exposure and/or work with other toxics/corrosives (*3)			X				X*2		X*10	X					
Chemical Spill of Unknown Substance															
Gas leak															X

MINIMUM PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIREMENTS FOR SELECT AREAS/OPERATION ACTIVITIES	HEAD	EAR	GLOVES				APPAREL		SHOES	EYE/ FACE			RESPIRATOR		
	HARD HATS	PLUGS/MUFFS	CHEMICAL RESISTANT	TEAR RESISTANT	FLAME/HEAT RETARDANT	COLD RESISTANT	APRONS/SLEEVE APRON/LAB COAT	FLAME RETARDENT COVERALL	STEEL TOE SAFETY SHOES	SAFETY GLASSES	FACESHIELD	FLAME RETARDANT HOOD	N95Filtering Facepiece	AIR PURIFYING CARTRIDGE (Full facepiece)	SUPPLIED AIR
Small chemical spill of unknown substance			X				X							X *1	
Receiving Compressed Gases, Bubblers or Pre-cursors															
Inert/ Non-Toxic/ Oxidizer									X	X					
Corrosive/Flammable/Toxic									X	X					
Cryogenic liquids/gases									X	X					
Installing or Removing Compressed Gases, Bubblers, or Pre-Cursors															
Inert/ Non-Toxic/ Oxidizer									X	X					
Corrosive/ Toxic*3/Highly Toxic*4			X				X		X						X
Flammable (PPE is flame retardant)					X			X	X	X					X

MINIMUM PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIREMENTS FOR SELECT AREAS/OPERATION ACTIVITIES	HEAD	EAR	GLOVES				APPAREL		SHOES	EYE/ FACE			RESPIRATOR		
	HARD HATS	PLUGS/MUFFS	CHEMICAL RESISTANT	TEAR RESISTANT	FLAME/HEAT RETARDANT	COLD RESISTANT	APRONS/SLEEVE APRON/LAB COAT	FLAME RETARDENT COVERALL	STEEL TOE SAFETY SHOES	SAFETY GLASSES	FACESHIELD	FLAME RETARDANT HOOD	N95Filtering Facepiece	AIR PURIFYING CARTRIDGE (Full facepiece)	SUPPLIED AIR
Pyrophoric/Water Reactive3 (PPE is flame retardant)		X			X*8			X*9	X						X
Cryogenic liquids/gases (Apron should be cryogenic rated)						X	X			X	X				
Connecting liquid nitrogen/ cryogenic hoses/ lines (Apron should be cryogenic rated)						X	X			X	X				

NOTE: All PPE required for activities associated with emergency response are covered in ERT Organization and Charter Specification EHS-00019.

* = Apparel needed is long pants

*1= Respiratory protection not required or can be downgraded if air monitoring has been performed to prove the effectiveness of the purging procedure or to declassify the inhalation hazard. Respiratory requirements may remain unchanged if the task and/or person performing the task changes or if EHS determine that the risk is unchanged. Please see Respiratory Protection Program, EHS-00015 for further information.

*2= Tyvek suit must be worn; with hood and booties.

*3= Toxics and corrosives include: Hydrogen fluoride, hydrogen bromide, chlorine, hydrogen chloride, sulfuric acid, particulates, nitrogen trifluoride, ammonia, C5F8/C4F6, sulfur dioxide, sodium hydroxide, boron trifluoride, silicon trifluoride, boron trichloride, silicon trichloride, carbonyl sulfide

*4= Highly toxics include: Arsine, Fluorine, Diborane, Dichlorosilane, Germane, Phoshine, Silane, Ozone, Carbon Monoxide and Nitrogen Monoxide.

*5= Where chemical loading, cylinder changing, maintenance or cleaning is being performed the area must be roped off and posted with signage.

*6= Those handling nano-sized or ultra-fine particles should be wearing double gloves during the operation. Use of glove bags or glove boxes for handling are preferred, if not available or cannot be used, P100 cartridge respirator should be worn.

*7= Chemical resistant Level B suit must be worn to cover head, neck and back

*8= Leather gloves with cotton liner should be worn

*9= Leather coat with cotton undergarments must be worn or DuPont ThermoPro suit

*10 = splash resistant boots

APPENDIX D

Filter Lenses for Protection Against Radiant Energy Chart

Welding Operation	Shade No.
Shielded metal-arc welding - 1/16-, 3/32-,1/8-, 5/32-,inch electrodes	10
Gas-shielded arc welding (non-ferrous) - 1/16-, 3/32-,1/8-, 5/32-inch electrodes	11
Gas-shielded arc welding (ferrous) - 1/16-, 3/32-,1/8-, 5/32-inch electrodes	12
Shielded metal-arc welding:	
3/16-, 7/32-, 1/4-inch electrodes	12
5/16-, 3/8- inch electrodes	14
Atomic hydrogen welding	10-14
Carbon arc welding	14
Soldering	2
Torch Brazing	3 or 4
Light cutting up to 1inch	3 or 4
Medium cutting, 1 inch - 6 inches	4 or 5
Heavy cutting, 6 inches and over	5 or 6
Gas welding (light) up to 1/8 inch	4 or 5
Gas welding (medium) 1/8 inch to 1/2 inch	5 or 6
Gas welding (heavy) 1/2 inch and over	6 or 8

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

APPENDIX E

Selecting Laser Safety Glasses

INTENSITY	ATTENUATION	
CW maximum power density (watts/cm^2)	**Optical density (O.D.)**	**Attenuation Factor**
10^{-2}	5	10^5
10^{-1}	6	10^6
1.0	7	10^7
10.0	8	10^8