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Personal Protective Equipment Program

REVISION

Rev No.	DCN No.	Change Summary Changed items are in blue font.	Release Date	DCN Initiator	Document Owner
4	DCN0360	Section 6.3 added, and changes to Sections 6.2, 8.5.1, and Appendix C.	11/29/07	J. Trodden	R. Segura

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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. 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-contractor 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 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 or Equipment Engineers or Professors are responsible for performing a job hazard analysis for each of the jobs that are performed by personnel in their departments/area. A Job Hazard

Analysis 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 "Job Hazard Analysis Guidelines"(Attachment A) and the "Job Hazard Analysis" form (EHS-00010-F1) shall be used to perform a Job Hazard Analysis. Equivalent forms may be used provided the hazard assessment include all above listed hazards, forms are dated and signed, the location evaluated is specified and PPE requirements are identified.

- 3.2.1 Multiple hazards and multiple body parts for each job can be recorded on the same job hazard analysis form provided it is clear how the hazard is eliminated by the use of PPE. The Supervisor, in conjunction with the EH&S Department shall determine the appropriate PPE for the hazards identified during the hazard analysis.
- 3.2.2 The Supervisor will forward the completed Job Hazard Analysis forms to the EH&S Department for review, approval and record keeping.
- 3.2.3 The Supervisor shall repeat the Hazard Analysis 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.
- 3.2.4 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.
- 3.2.5 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:
 - 3.2.5.1 Changes in the work area render prior training obsolete, or
 - 3.2.5.2 Changes in the types of PPE to be used render previous training obsolete, or
 - 3.2.5.3 Inadequacies in an employee's knowledge or use of assigned PPE indicate that the employee has not retained the required understanding or skill.
- 3.2.6 Supervisors are responsible for enforcing the use of and proper care of PPE for all employees within their department.
- 3.3 The EH&S Department shall direct all PPE uses at this site.

- 3.3.1 The EH&S Department shall maintain the accuracy of information within this specification.
- 3.3.2 The EH&S Department shall create and maintain the PPE Training Program for this site.
- 3.3.3 The EH&S Department shall review the hazard analysis data provided by the Supervisors and ensure the accuracy of the job hazard analysis submitted by Supervisors.
- 3.3.4 The EH&S Department shall verify that each employee, who is required to wear PPE, received and understood the required training through a written certification that contains:
 - 3.3.4.1 The name of each employee trained,
 - 3.3.4.2 The date(s) of training, and
 - 3.3.4.3 Identifies the subject of the training
- 3.4 The Purchasing Department will be responsible for purchasing PPE that applicable, current ANSI Standards. The ANSI standards that apply are as follows:
 - 3.4.1 Eye Protection - ANSI Z87.1-1989, "American National Standard Practice for Occupational Eye and Face Protection."
 - 3.4.2 Face Protection - ANSI Z87.1-1989, "American National Standard Practice for Occupational Eye and Face Protection."
 - 3.4.3 Head Protection -ANSI Z89.1-1986, protective helmets, "American National Standard for Personal Protective Headwear for Industrial Workers Requirements."
 - 3.4.4 Foot Protection - ANSI Z41-1991, "American National Standard for Personal Protective Footwear".
- 3.5 All employees shall be responsible for wearing PPE as indicated by identified hazards.
 - 3.5.1 Employees, who are required to wear PPE, shall complete and pass PPE training, and make his/her Supervisor aware if additional training is indicated.
 - 3.5.2 Employees shall inspect, maintain and clean PPE on an assigned basis, and will report/replace deficiencies.
 - 3.5.3 Employee shall not use damaged or defective PPE.

4. ASSOCIATED DOCUMENTS

EHS-00010-F1 Job Hazard Analyss (JHA) 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 be stored and maintained in a clean, dry, sanitary manner and kept in good repair.

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

5.1.5 All PPE shall be inspected prior to use. Defective and/or damaged equipment shall not be used.

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

5.1.7 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 Attachment C shall be shall be followed.

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

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 any of the cleanrooms and/or laboratories and/or chemical storage/use \(HPM\) areas and/or UPW/WWT areas located at the CNSE facility.](#)

6.3 As also listed in Appendix C of this procedure, eye protection in the form of safety glasses are always required to be worn while performing the following activities:

- 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: decontaminated equipment, ductwork, corrosive gas cabinets, and flammable/corrosive cabinets.
- While handling/storing/receiving/ transporting unboxed, unsealed or uncrated 1 gallon, 5 gallon, or 55 gallon containers of chemicals/hazardous waste.
- While handling or working on vacuum pumps or abatement/treatment units that have had previous contact with chemicals or gases.
- While transferring, pouring, dispensing, mixing, aspirating, loading or unloading chemicals or wastes where there exists the potential for skin, eye and/or respiratory exposure. Tool sets where this is required include: Photolithography, Wet Etching, CMP and Copper Plating Operations.
- While working or conducting maintenance with equipment where chemical contact or vapors are possible.
- 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.
- Performing any work inside of a liquid Chemical Dispense Unit (CDU), Liquid Valve Manifold Box (VMB) or T-Box.
- Performing work inside of a gas Valve Manifold Box (VMB), Gas Cabinet, or Gas Interface Box (GIB) that involves breaking a fitting (Flammable/Pyrophoric).
- Use/maintenance of Class 3b and 4 Lasers (safety glasses must be of laser protective type, see Attachment E). See Laser Safety procedure for a list of all engineering and administrative controls that also must be utilized.
- Receiving, transporting and installing compressed gases.

6.3.1 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.

- 6.3.2 Additionally, eye protection must be worn while working where dust and/or particles are disturbed and may be a hazard.
- 6.3.3 Eye and face protection shall meet the minimum performance and design specifications established by the manufacturer and be in compliance with ANSI Z87.1-1989.
- 6.3.4 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.
- 6.4 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.
- 6.4.1 Prescription safety eyewear shall be provided through EH&S Department to all CNSE employees who need corrective lenses and are required to wear safety glasses. EH&S Department must approve the purchase of all university subsidized prescription safety glasses.
- 6.4.2 Tenant, contractor or sub-contractor employees that are required to wear prescription safety eyewear shall be provided to them through their respective EH&S Departments.
- 6.5 Non-prescription type safety glasses shall be provided for employees requiring their use and shall be available in the stock room.
- 6.6 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.
- 6.7 When face shields are required, approved safety glasses or goggles must also be worn.
- 6.8 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 Attachment D "Filter Lenses for Protection Against Radiation Energy Chart".

7. HEAD PROTECTION

- 7.1 Employees shall wear head protection when working in areas where there is the potential of injury to the head from falling objects.
- 7.2 Head protection shall also be worn in areas where an employee is working near exposed electrical conductors which could come into contact with the head.
- 7.2.1 Head protection shall meet or exceed the ANSI standard for industrial head protection, ANSI Z89.1-1986.
- 7.3 In areas where there is the potential for nuisance bumps of the head bump caps are recommended. Bump caps shall not be used in areas and situations outlined in section 6.1

8. FOOT PROTECTION

- 8.1 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.
- 8.2 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.
- 8.3 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.
- 8.4 General Cleanroom and Laboratory Areas
- Employees working in cleanroom and laboratory areas shall wear footwear conforming to the following requirements:
- 8.4.1 Shoes must have closed heels and toes with the toes completely covered, sandals and similar type of footwear are not permitted.
- 8.4.2 Shoes must have heels constructed of rubber or similar non-skid material.
- 8.4.3 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").

8.5 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:

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

8.6 Chemical and Gas Cylinder Handling

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:

- 8.6.1 ANSI approved safety shoes with steel toe boxes.
- 8.7 Employees working in machining operations, facilities maintenance, shipping and receiving, chemical handling, gas cylinder handling, and any other area designated by EH&S as having high potential for foot injury, shall wear ANSI approved safety shoes with steel toe boxes.
- 8.7.1 ANSI approved safety shoes/boots shall be provided through EH&S 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.
- 8.7.2 Tenant, contractor or sub-contractor employees that are required to wear safety shoes/boots shall be provided to them through their respective EH&S Departments.

9. HAND PROTECTION

- 9.1 When working with chemicals, protective gloves suitable for protection against chemicals must be worn.
- 9.2 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.
- 9.3 For work involving the handling of cryogenic liquids and gases and their associated piping, the use of cryogenic-rated insulated gloves shall be worn.

- 9.4 Tear resistant gloves shall be worn when hand protection during material handling is necessary.
- 9.5 Protective gloves shall meet the minimum requirements established by the manufacturer.
- 9.6 Protective gloves shall be made available to all employees requiring their use and inventoried in the stock room.
- 9.7 Finger cots shall not be substituted for gloves as protection against chemical contact.
- 9.8 Chemical resistant protective gloves must be inspected and tested by the wearer for defects before being used. By partially inflating the glove with air and immersing it in water and examining for the release of bubbles or placing the glove close to the face feeling and inspecting for air loss will identify a defective new glove. If bubbles are observed or loss of air is detected then the glove shall be discarded.
- 9.9 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.
- 9.10 Jewelry, such as rings should not be worn since they may puncture or tear the glove.
- 9.11 Fingernails should be trimmed to a reasonable length for the same reason.
- 9.12 After contacting chemical solution, the gloves must be rinsed in water and dried before removing.
- 9.13 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.
- 9.14 Gloves shall be thoroughly rinsed with water before removal and must always be removed before touching equipment or station controls, etc.

10. TRAINING

- 10.1 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.

11. RECORDS

- 11.1 Copies of job hazard analyses and PPE training records shall also be kept on file by the EH&S Department.

12. APPENDICES

- 12.1 Appendix A – Job Hazard Assessment Analysis Guidelines
- 12.2 Appendix B – Job Hazard Analysis and PPE Selection (Shown for Illustrative Purposes Only-Use EHS-00010-F1 as blank form)
- 12.3 Appendix C – Minimum Personal Protective Equipment (PPE) Requirements for Areas/Operations/Activities
- 12.4 Appendix D – Filter Lenses for Protection against Radiant Energy Chart
- 12.5 Appendix E – Selecting Laser Safety Glasses

APPENDIX A

JOB HAZARD ANALYSIS GUIDELINES

The objective of the Hazard Analysis 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: Job Hazard Analysis 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

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

SECTION 4: JOB HAZARD ANALYSIS

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	FLAME RETARDANT COAT	STEEL TOE SAFETY SHOES	SAFETY GLASSES	FACESHIELD	FLAME RETARDANT HOOD	DUST MASK	CARTRIDGE	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: CESTM, Physics and Chemistry Buildings,, WWT plants: CUB and NFN, Chemical/Gas Storage Rooms: NFN HPM corridor, HPM Building, Hazardous Waste Storage Building and CUB HPM rooms.										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, All Facilities Mechanical Spaces, All Grounds Keeping Activities. See Hearing Conservation Program for a complete listing of such areas.		X													
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									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	FLAME RETARDANT COAT	STEEL TOE SAFETY SHOES	SAFETY GLASSES	FACESHIELD	FLAME RETARDANT HOOD	DUST MASK	CARTRIDGE	SUPPLIED AIR
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 cleanroom, on loading docks during tool move in, working in a pit or confined space.	X														
Direct manual handling/storing/receiving/ transporting (not for driving fork trucks) of boxes, cases or crates of chemicals (1 gallon, 5 gallon, or 55 gallon containers)									X						
Handling/storing/receiving/ transporting unboxed or unsealed or uncrated 1 gallon, 5 gallon, or 55 gallon containers of chemicals/hazardous waste			X						X	X					
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: decontaminated equipment, ductwork, corrosive gas cabinets, and flammable/corrosive cabinets (sleeve aprons should be worn if there is a potential of front torso or arm contact).			X				X			X	X				
While handling or working on vacuum pumps or abatement/treatment units that have had previous contact with chemicals or gases.			X				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	FLAME RETARDENT COAT	STEEL TOE SAFETY SHOES	SAFETY GLASSES	FACESHIELD	FLAME RETARDANT HOOD	DUST MASK	CARTRIDGE	SUPPLIED AIR
<p>While transferring, pouring, dispensing, mixing, aspirating, or loading or unloading chemicals or 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,</p> <p>Within glove box or fume hood</p> <p>With local exhaust</p> <p>Without local exhaust</p>			X				X			X					
<p>While working or conducting maintenance in equipment where chemical contact or vapors are possible. PPE MUST still be worn if equipment has been drained and rinsed.</p> <p>Respiratory protection will be required if local exhaust ventilation is not available.</p>			X				X			X	X			X	
<p>Handling broken mercury-filled containers (i.e. thermometers, mercury vapor lamps) Area must be roped off and posted with signage</p>			X							X			X		
<p>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) Area must be roped off and posted with signage</p>			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	FLAME RETARDANT COAT	STEEL TOE SAFETY SHOES	SAFETY GLASSES	FACESHIELD	FLAME RETARDANT HOOD	DUST MASK	CARTRIDGE	SUPPLIED AIR
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. Area must be roped off and posted with signage			X				X			X	X				
Performing work inside of a gas Valve Manifold Box (VMB), Gas Cabinet, or Gas Interface Box (GIB) that involves breaking a fitting (Corrosive or Toxic) Area must be roped off and posted with signage			X				X								X ^{*1}
Performing work inside of a gas Valve Manifold Box (VMB), Gas Cabinet, or Gas Interface Box (GIB) that involves breaking a fitting (Flammable/Pyrophoric) 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 Attachment 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, etc. Note: Tyvek suits should be worn for Arsenic contaminated work.			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	FLAME RETARDENT COAT	STEEL TOE SAFETY SHOES	SAFETY GLASSES	FACESHIELD	FLAME RETARDANT HOOD	DUST MASK	CARTRIDGE	SUPPLIED AIR
Maintenance/cleanouts of tool chambers or vacuum pumps containing toxic, corrosive or oxidizing gaseous materials or harmful vapors. Chamber must be cycle purged 10 times before the open and air monitoring to prove the effectiveness of the purge must be performed.			X				X								X ^{1*}
Receiving Compressed Gases															
Inert/Non-Toxic/Oxidizer				X					X	X					
Corrosive/Flammable/Toxic				X					X	X					
Cryogenic liquids/gases				X					X	X					
Transporting Compressed Gases															
Inert/ Non-Toxic/ Oxidizer									X	X					
Corrosive/Flammable/Toxic									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	FLAME RETARDENT COAT	STEEL TOE SAFETY SHOES	SAFETY GLASSES	FACESHIELD	FLAME RETARDANT HOOD	DUST MASK	CARTRIDGE	SUPPLIED AIR
Cryogenic liquids/gases									X	X					
Installing Compressed Gases															
Inert/ Non-Toxic/ Oxidizer									X	X					
Corrosive/ Toxic			X				X		X						X
Flammable/ Pyrophoric (PPE is flame retardant)					X			X	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.

*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.

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 1 inch	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