University of Illinois at Chicago
Environmental Health & Safety Office

Respiratory Protection Program
1. **OBJECTIVE**

To reduce or prevent harmful exposure to hazardous airborne materials and infectious substances (i.e., harmful dusts, fumes, mists, gases, smoke, sprays, bioaerosols, vapors, etc.) through the administration of a comprehensive Respiratory Protection Program for all facilities at the University of Illinois at Chicago (UIC).

2. **SCOPE**


Where applicable, exposure to inhalation hazards must be reduced to acceptable levels or eliminated through the use of engineering and administrative controls.

*Engineering controls* eliminate or reduce exposure to a chemical or physical hazard through the use or substitution of engineered machinery or equipment. Primary engineering controls against inhalation hazards at UIC are ventilation systems (e.g., local exhaust, chemical fume hoods, isolation rooms, etc.).

*Administrative controls* (or work practice controls) are changes in work procedures with the goal of reducing the duration, frequency, and severity of exposure to hazardous chemicals or operations. Such work practices may include:

- Substitution of less or non-hazardous materials/procedures
- Rotating workers through various job assignments
- Limiting worker exposure time
- Providing source-control (e.g., have potentially infectious patients wear facemasks)

Personal protective equipment (PPE), such as respirators, shall always be the *last means of protection* for harmful airborne contaminants. When engineering and administrative controls are not feasible or cannot reduce exposure to acceptable levels alone, or while engineering controls are being implemented, respiratory protection may be required to protect the worker from inhalation hazards.
3. POLICY

The UIC Environmental Health & Safety Office (EHSO) shall administer and maintain an effective Respiratory Protection Program. Elements of this Respiratory Protection Program include:

- A written plan detailing how the program will be administered
- Procedures for selecting respirators for use in the workplace
- Medical evaluation and/or surveillance program requirements for workers required to use respirators
- Procedures for use of respirators in reasonably foreseeable emergency situations or for voluntary usage
- Procedures for industrial hygiene assessments and monitoring/testing for potential respiratory hazards
- Respiratory protective equipment training to include hazard recognition & the dangers associated with respiratory hazards, proper care and use of respiratory PPE
- Fit-testing procedures for tight-fitting respirators
- Procedures for inspection, maintenance, and repair of respiratory protective equipment

4. APPLICABILITY

The Respiratory Protection Program requirements shall apply to all UIC faculty, staff, students, visiting faculty/researchers, volunteers, and outside contractors who utilize respiratory protective equipment on UIC campus sites. The Respiratory Protection Program also addresses voluntary users of respirators by workers whose risk assessments do not require the mandatory use of respirators.

5. AUTHORITY

Occupational Health & Safety Administration (OSHA).

Center for Disease Control (CDC).

5. PROCEDURE

5.1. Each UIC department and applicable college shall designate a Program Administrator or Coordinator, qualified by appropriate training or experience to commensurate with the complexity of this program.
5.2 Respiratory protection shall be provided at no cost for workers by their department/college based on known or suspected potential respiratory exposure. Criteria include:

- areas known to have contaminant levels identified through a risk assessment and industrial hygiene monitoring/testing.
- situations where contaminant levels requiring the use of respiratory protection may be created without warning (e.g., emergency purposes such as hazardous material spill responses).
- areas or operations suspected of posing a respiratory hazard, but adequate sampling data has not yet been obtained.
- areas or operations suspected of posing a respiratory hazard in which adequate exposure limits, such as PELs or TLVs have not yet been established.
- having direct contact with patients or other persons posing a potential risk of infectious exposure.
- having potential exposure to non-infectious bioaerosols, such as mold, prior to or during remediation or clean-up.

5.3. Selection of Respiratory Protection Devices

5.3.1. Selection of the proper respirator(s) to be used in any work area or operation at UIC shall be performed only after a determination as to the real and/or potential exposure of employees to harmful concentrations of contaminants/biological agents in the workplace atmosphere has been made.

5.3.2. This evaluation will be performed prior to the start of any routine or non-routine task(s) in areas with exposure concerns, when a process or task is significantly changed, or when employees express potential exposure concerns, signs, or symptoms.

5.3.3. Respirators will be selected by an EHSO Respiratory Protection Program Administrator/Industrial Hygienist in accordance OSHA, CDC, NIOSH, and/or ANSI recommendations and requirements.

5.3.4. The following items will be considered in the selection of respirators:
• Identification of contaminant’s chemical state and physical form (gas, mist, vapor, dust, etc.)
• Effectiveness of the device against the substance of concern
• Estimated maximum concentration of the substance in the area
• General environment (open shop, confined space, etc.)
• Properly functioning local ventilation and chemical fume hoods
• Known limitations and APFs of the respiratory protective device
• Comfort, fit, and worker acceptance
• Other contaminants in the environment
• Unknown levels of concentration in spills prior to area monitoring
• Potential for oxygen deficiency
• IDLH conditions
• Potential and known infectious substances or patients

5.3.5. Gas and vapor chemical cartridges shall be equipped with an End of Service Life Indicator (ESLI) certified by NIOSH for the contaminant, if available, and replaced when indicated by the ESLI.

5.3.6. When there is no NIOSH approved ESLI appropriate for a contaminant, consult manufacturer of the respirator cartridge model shall be consulted for objective data to establish a change schedule. This advisory may be in the form of a telephone help line. Some manufacturers have computer programs available on the Internet that provide the objective data needed.

Supervisors shall contact the Respiratory Protection Program Administrator prior to non-routine work which may expose employees to hazardous substances or oxygen deficient atmospheres. Examples of work which may require the use of respirators includes, but are not limited to:

• Asbestos abatement activities
• Abrasive blasting
• Cutting or melting lead
• Stripping lead-based paints from surfaces
• Welding or burning outside designated shop areas
• Painting, especially with epoxy or non-latex coatings
• Non-routine tasks using solvents, thinners, or degreasers
• Any work which generates large amounts of dust
• A permitted confined space requiring respirators

5.3.9. When a Program Administrator or ERT Incident Commander
cannot identify or reasonably estimate the employee exposure, the employer shall consider the atmosphere to be IDLH.

5.3.10. All areas suspected of being oxygen deficient shall be tested for oxygen concentration prior to respirator selection and personnel entry.

5.3.11. All oxygen-deficient atmospheres less than 19.5% or oxygen-enriched greater than 23.5% atmospheres shall be considered IDLH.

5.3.12. The following respirators are mandatory for employee use in IDLH atmospheres:

- A full facepiece pressure demand SCBA certified by NIOSH for a minimum service life of thirty minutes, or
- A combination full facepiece pressure demand supplied-air respirator (SAR) with auxiliary self-contained air supply.
- Respirators provided only for escape from IDLH atmospheres shall be NIOSH-certified for escape from the atmosphere in which they will be used.

5.3.13. A review of the real and/or potential exposures shall be made at least annually by the site Program Administrator to determine if respiratory protection continues to be required, and if so, if the previously chosen respirators still provide adequate protection.

5.4. Medical Evaluation

5.4.1. The UIC University Health Service (UHS) and the Physician or Other Licensed Health Care Professional (PLHCP), initially, and as deemed necessary thereafter by HS, shall make a determination as to whether or not an employee can wear the required respirator without physical or psychological risk.

4. Specific medical tests and procedures will be determined by the UIC University Health Services and will be in accordance with OSHA medical surveillance requirements. At a minimum, the respirator certification will consist of the mandatory OSHA Questionnaire (29 CFR 1910.134 Appendix C) to be filled out by the employee.

5.4.5. Medical Questionnaires shall be administered in a manner that ensures that the employee understands its contents and the information remains confidential between the employee and UHS.
5.4.2. Based on the overall health of the individual and special medical tests (pulmonary function studies, EKG, etc.) as appropriate, the UIC University Health Service determines any individual restrictions in wearing respiratory protective equipment.

5.4.3. If a medical restriction is applied, the employee, his/her supervisor and EHSO are notified of the restriction by the UHS.

5.5. Approved Types of Respirators

5.5.1. Only NIOSH certified respirators, cartridges, and attachments shall be used; NIOSH labels/stamps must be legible.

5.5.2. Particulate Filters will be of the Series 95, 99 or 100, with the N, R, or P classification according to oil mist atmosphere evaluation.

5.5.3. Dust Masks or non-elastomeric non-powered Air-Purifying Respirators (APR) may only be used with evaluation and approval from the Program Administrator.

5.5.4. Surgical or medical masks do not afford adequate respiratory protection in UIC environments and are not to be used for this purpose. The sole exception is the CPR face mask in Cardiopulmonary Resuscitation.

5.5.5. Interior structural firefighting is not permitted by UIC employees. Consequently, no firefighting is permitted that would require specialized personal protective equipment, including SCBAs.

5.6. Respirator Fit Testing

5.6.1. An initial fit test, and subsequent tests repeated annually thereafter, shall be used to determine the ability of each individual respirator wearer to obtain a satisfactory fit with any air-purifying and/or supplied air (including SCBA) respirator.

5.6.2. Fit testing shall be performed only after initial or annual medical respirator approval/restrictions have been provided.

5.6.3. No UIC- supervised temporary employee or UIC employee is
permitted to wear a negative-pressure and/or supplied air tight-fitting respirator in a work situation until he or she has demonstrated that an acceptable fit can be obtained.

5.6.4. Fit testing will be conducted in accordance with OSHA 29 CFR 1910.134 mandatory Appendix A fit testing protocols by personnel properly trained in the testing method. Either quantitative and qualitative fit tests may be performed.

5.6.5. Tight-fitting positive pressure APRs may be fit tested by shutting off the power unit. Powered loose-fitting positive pressure APRs, such as helmets or hoods, do not require fit testing.

5.6.6. SCBA face masks shall be tested using a negative-pressure cartridge attachment specific to the make and model of the SCBA unit. This mask and attachment may be used for non-SCBA respiratory protection.

5.6.7. Test results will be the determining factor in selecting the type, model, and size of respirator for use by each individual respirator wearer. An adequate selection of manufacturers, types, models and sizes of test respirators will be made available to ensure a successful fit test.

5.6.8. No attempt is made to fit a respirator on an employee who has facial hair which comes between the sealing periphery of the facepiece and the face, or if facial hair interferes with normal functioning of the exhalation valve of the respirator.

5.6.9. Proper fitting of a respiratory protective device facepiece for individuals wearing corrective eyeglasses or goggles, with the exception of N-95 respirators, may not be established if temple bars or straps extend through the sealing edge of the facepiece. If eyeglasses, goggles, face shield or welding helmet must be worn with a respirator, they must be worn so as not to adversely affect the seal of the facepiece. Special prescription glasses inserts shall be provided at UIC’s expense, if needed.

5.7. User Seal Checks

5.7.1. Respirator users must be properly trained in the performance of positive and negative pressure seal checks and understand their limitations.

5.7.2. Respirator seal checks shall be performed in accordance with the

5.7.3. Each time a respirator is donned, the user will perform positive and negative pressure seal checks.

5.8. Maintenance of Routine-Use Respirators

5.8.1. Respirators shall be maintained in a clean, sanitary and working order, with each individual employee being assigned an exclusive APR respirator.

5.8.2. Respirators used exclusively by one employee shall be cleaned and disinfected, using the OSHA mandatory respirator cleaning procedures 29 CFR 1910.134 Appendix B-2, as often as necessary to maintain a sanitary condition.

5.8.3. Respirators used by more than one employee (such as SCBAs in emergency response) shall be cleaned and disinfected, using the OSHA mandatory respirator cleaning procedures 29 CFR 1910.134 Appendix B-2, before being worn by different individuals.

5.8.4. Respirators used for fit testing shall be cleaned and disinfected, using the OSHA mandatory respirator cleaning procedures 29 CFR 1910.134 Appendix C, after each use.

5.8.5. A visual inspection for cleanliness, tightness of connections, proper function, defects (i.e., cracking rubber, deterioration of straps, defective exhalation and inhalation valves, broken or cracked lenses, etc.) shall be conducted before each use and during cleaning.

5.8.6. Worn or deteriorated parts will be replaced prior to use. No respirator with a known defect will be used.

5.8.7. No attempt may be made to replace components, make adjustments or make repairs on any respirator beyond those recommended by the manufacturer. Only the manufacturer's NIOSH-approved parts will be used.

5.8.8. Any repair to reducing or admission valves, regulators, or alarms will be conducted only by the manufacturer or their authorized representative.

5.8.9. Respirators, filters and cartridges shall be stored in sealed plastic bags that protect from contamination, dust, sunlight, excessive moisture and damaging chemicals, in locations convenient to the
work area away from extreme temperatures, and in such a way as to prevent deformation of the facepiece and exhalation valve.

5.8.10 Disposable respirators shall be rendered nonfunctional and destroyed at the end of the work shift in which they were worn.

5.9. Emergency Response Respirator Maintenance

5.9.1. Emergency response units (SCBAs, PAPRs and escape units) shall be inspected monthly and before and after each use in accordance with the manufacturer's instructions and for proper function, including regulator, filter, battery and warning devices.

5.9.2. Self Containing Breathing Apparatus (SCBA) shall be stored and maintained in a fully charged state with Type 1 Grade D Breathing-Quality Air only and shall be recharged when the pressure falls to 90% of the manufacturer rated pressure level.

5.9.3. Emergency use respirators shall be stored according to manufacturer instructions in a sturdy compartment that is quickly accessible and clearly marked as containing emergency respirators.

5.9.4. Emergency escape-only respirators shall be inspected before being carried into the workplace.

5.9.5. Emergency respirators shall be certified by documenting the following on an in-house tag or a commercially available equivalent tag:

- Date of the inspection
- Name and signature of the inspector
- Findings and any required remedial action
- Respirator serial number or UIC unit identification number

5.9.6. The certification information document shall be attached to the storage compartment for that respirator or to the respirator itself, and in an easily retrievable report file in either paper or electronic form.

5.9.7. Cylinders shall be hydrostatically tested and maintained according to manufacturer's recommendations and as prescribed in the Shipping Container Specification Regulations of the Department of Transportation 49 CFR part 173 and part 178. No refilling of cylinders is permitted if the hydrostatic test is not current.
5.9.8. Only purchased or cascade-filled cylinders may be provided by UIC. Compressor-filled cylinders from a supplier, such as a local fire department, must be accompanied by a certificate of analysis that the breathing air meets the requirements for Type 1 Grade D breathing air.

5.10. Respirator Training

5.10.1. Respirator users and their supervisors will receive training initially, and annually thereafter, on the contents of the UIC Respiratory Protection Program and their responsibilities under it.

5.10.2. Training shall be repeated and documented when changes in the worksite or required respirator render previous training obsolete or inadequate, observations indicate inadequacies in an employee's knowledge or use of the respirator, and/or other situations arise that require retraining to ensure safe use.

5.10.3. Training shall include:

- Nature and degree of respiratory hazard
- Why the respirator is necessary; the dangers of non-use or misuse.
- The proper selection, wear and use
- The capabilities and limitations of the respirator
- How to put on and remove the respirator
- How to perform and ensure a proper seal check before use
- How to determine when a respirator is no longer providing the protection intended
- Change out schedules and when to replace cartridges
- How to inspect the respirator
- Cleaning, storage, replacement and maintenance procedures
- Emergency situations, including a respirator malfunction
- Medical signs and symptoms that may limit or prevent the effective use of that respirator

5.10.4. Understanding of training shall be verified by written test and performance demonstration of each of the training elements.

5.10.5. Respirator training will be properly documented and will include the type and model of respirator for which the individual has been trained.
5.10.6. Employees who are authorized to enter IDLH atmospheres shall be trained in Procedures for IDLH; refer to this document for additional information/requirements.

5.10.7 Training documentation shall be maintained by respirator user and/or the user’s department/college.

5.11 Respirator Issuance/ Respirator Certification Forms

5.11.1. No respirator will be issued to an employee who has not been properly medically evaluated, fit tested and trained according to the initial, annual and as-needed schedule requirements.

5.11.3. A Respirator Certification Form must include, at minimum:

- Name and identification number of the worker (UIN #)
- The statement: " (name) has been trained, fitted and medically evaluated to use the respirator(s) indicated."
- The type(s), model(s), and size(s) of respirator(s) that the respirator wearer was issued
- Location where authorized
- Verification that training & fit-testing was completed/passsed
- Signature of Respiratory Protection Program Administrator and/or a qualified respirator trainer/fit-tester their

5.11.4. Temporary employees directly supervised by UIC must be issued a certification form only for the specific UIC facility and department where working. The name of the supervising UIC employee must be provided on the form.

5.12. Voluntary Non-Required Respirator Use

5.12.1. Voluntary elastomeric respirator use is only permissible at a UIC facility where a Respiratory Protection Program is in effect.

5.12.2. An employee's request for voluntary respiratory use may indicate the need for personal monitoring. Careful evaluation shall be made to ensure that any potential hazardous respiratory exposures have been identified.

5.12.3. Employees electing to wear non-mandatory respiratory protection
shall be included in the site Respiratory Protection Program, and be provided with awareness training which will provided advisory information on respirators as outlined in Appendix D of 29 CFR 1910.134. A copy of this Appendix is found at the end of this document.


5.13. Program Surveillance and Evaluation

5.13.1. At least annually, and when necessary (e.g. employee input, changes in the workplace or type of respirator used) the Respiratory Protection Program Administrator shall conduct an evaluation to ensure that the site written respiratory protection program is being properly implemented and to consult employees to ensure that they are using the respirators properly.

5.13.2. This evaluation shall include (but is not limited to):

- Results of medical evaluation provided as a result of employee illness
- Observations of respirator use, care and storage during site walk-throughs.
- Observations of respirator selection and change out during site walk-throughs and record reviews.
- Consultation with employees for views on program effectiveness and any problems, including respirator fit without interfering with job performance.
- Consultation with employees on appropriate respirator selection for the hazards involved.
- Consultation with employees for ability for proper use under workplace conditions.
- Consultation with employees for proper respirator maintenance.
- Review of injury reports relevant to the use of respirators.

5.13.3. A UIC EHSO survey may include this evaluation but not serve as a substitute for it.

5.13.4. Action shall be taken to correct defects found in the program. Evidence of excessive exposure of respirator wearers to respiratory hazards will be followed up by an investigation to determine why inadequate respiratory protection was provided.

5.13.5. The findings of the respirator program evaluation will be documented and will list corrective action plans target dates for the implementation of the plans. A copy of this form shall be forwarded
to the Program Administrator/Coordinator.

6.0 DOCUMENTATION

6.1. 29 CFR 1910.134 Mandatory Appendix C: "OSHA Respirator Mandatory Respiratory Questionnaire" to be retained by the UIC University Health Service and/or the Physician or Other Licensed Health Care Professional (PLHCP) with other medical records.

6.2. Individual Fit Testing Record, to be retained at UIC until the next successful fit test.

6.3. Respirator Training Certification, to be retained at UIC indefinitely via hard copy file by the Respiratory Protection Program Administrator.

6.4. Request for Medical Clearance for Respirator Use, to be provided to the licensed health care professional on initial and subsequent medical evaluations for respirator use.

6.5. Medical Approval/Restriction for Respirator Use (issued by UIC University Health Service), to be retained at UIC indefinitely.

6.10. Access to the UIC Respiratory Protection Program to be readily available to all applicable UIC personnel and units via hardcopy or electronic file (e.g., EHSO website-wwuic.edu/depts.envh, CD-ROM, bookmarked on a PC, etc.)

6.11. Respiratory Protection Program Evaluation, to be retained indefinitely by EHSO/the Program Administrator.

7.0 RESPONSIBILITIES

7.1. UIC Environmental, Health and Safety Office is responsible for establishing and maintaining a respiratory protection program consistent with the goal of protecting UIC personnel, meeting state and federal regulatory standards (29 CFR 1910.134 and 1910.120) and industry accepted standards (e.g. NIOSH, ACGIH, ANSI, etc.).

7.2. Department Managers and Laboratory Administrators are responsible for ensuring this policy is implemented at their work areas.

7.3. Program Administrators/Coordinators are responsible for the implementation, purchase, maintenance and coordination of the
department respiratory protection program with EHSO assistance.

7.4. UHS is responsible for defining medical evaluation and surveillance procedures and reviewing the health status of all personnel who may be required to wear respiratory protective equipment in the completion of their assigned tasks.

7.5. Supervisors are responsible to ensure each employee under his or her supervision using a respirator has a current Respirator User Approval/Card, to ensure the availability of appropriate respirators and accessories, to provide adequate storage facilities, and to enforce proper respirator use, storage and equipment maintenance.

7.6. Respirator Wearers are responsible to wear, care for, and store his/her respirator when and where required and in the manner in which trained. Respirator wearers must guard against mechanical damage to the respirator and report any malfunctions of the respirator to his/her supervisor, Program Administrator or EHSO immediately.

7.7. Contractors are required to develop and implement a respiratory protection program for their employees who must enter into or work in areas where exposure to hazardous materials cannot be controlled or avoided. This program must meet OSHA 29 CFR 1910.134 and other OSHA regulations and include issuance of respirators, medical evaluations, fit testing and training.

6. DEFINITIONS

**Aerosol**: A system consisting of particles, solid or liquid, suspended in air.

**Air-purifying respirator**: A respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants by passing ambient air through the air-purifying element.

**ANSI**: American National Standards Institute.

**Assigned Protection Factor (APF)**: The workplace level of respiratory protection that respirator [class] is expected to provide to employees when the employer implements a continuous, effective Respiratory Protection Program.

**Canister or cartridge**: A container with a filter, sorbent, or catalyst, or combination of these items, which removes specific contaminants from the air passed through the container.
CDC: Center for Disease Control.

Confined Space: An enclosure such as a storage tank, process vessel, boiler, silo, tank car, pipeline, tube, duct, sewer, underground utility vault, tunnel or pit having limited means of egress and poor natural ventilation that may contain hazardous contaminants or be oxygen deficient.

Dust: A solid, mechanically produced particle with size varying from submicroscopic to visible.

Emergency situation: Any occurrence such as, but not limited to, equipment failure, rupture of containers, or failure of control equipment that may or does result in an uncontrolled significant release of an airborne contaminant.

Employee exposure: Exposure to a concentration of an airborne contaminant that would occur if the employee were not using respiratory protection.

End-of-Service-Life Indicator (ESLI): A system that warns the respirator user of the approach of the end of adequate respiratory protection, for example, that the sorbent is approaching saturation or is no longer effective.

Escape-only respirator: A respirator intended to be used only for emergency exit.

Filter or air purifying element: A component used in respirators to remove solid or liquid aerosols from the inspired air.

Filtering facepiece (dust mask): A negative pressure particulate respirator with a filter as an integral part of the facepiece or with the entire facepiece composed of the filtering medium.

Fume: A solid condensation particle of extremely small size, generally less than one micrometer in diameter.

Gas: An air-like fluid which is in the gaseous state at ordinary temperature and pressure.

Helmet: A rigid respiratory inlet covering that also provides head protection against impact and penetration.

High efficiency particulate air [filter] (HEPA): A filter that is at least 99.97% efficient in removing airbourne particles of 0.3 micrometers in diameter.

Hood: A respiratory inlet covering that completely covers the head and neck and
may also cover portions of the shoulders and torso.

**Immediately dangerous to life or health (IDLH):** An atmosphere that poses an immediate threat to life, would cause irreversible adverse health effect, or would impair an individual's ability to escape from a dangerous atmosphere.

**Loose-fitting facepiece:** A respiratory inlet covering that is designed to form a partial seal with the face.

**Maximum Use Concentration (MUC):** The maximum concentration of a contaminant for which an air-purifying filter, cartridge or canister is approved for use.

**Mist:** A liquid condensation particle with sizes ranging from submicroscopic to visible.

**Negative pressure respirator:** A respirator in which the air pressure inside the facepiece is negative during inhalation with respect to the ambient air pressure outside the respirator.

**NIOSH:** National Institute for Occupational Safety and Health, United States Department of Health, Education and Welfare.

**OSHA:** Occupational Safety and Health Administration, United States Department of Labor.

**Oxygen deficient atmosphere:** An atmosphere with an oxygen content below 19.5% by volume.

**Permissible Exposure Limit (PEL):** The legally established time-weighted average (TWA) concentration or ceiling concentration of a contaminant that shall not be exceeded.

**Physician or other licensed health care professional (PLHCP):** An individual whose legally permitted scope of practice (i.e., license, registration, or certification) allows him or her to provide, or be delegated the responsibility to provide, some or all of the health care services required by this policy.

**Positive pressure respirator:** A respirator in which the pressure inside the respiratory inlet covering exceeds the ambient air pressure outside the respirator.

**Powered Air-Purifying Respirator (PAPR):** An air-purifying respirator that uses a blower to force the ambient air through air-purifying elements to the inlet covering.
**Qualitative fit test (QLFT):** A pass/fail fit test to assess the adequacy of respirator fit that relies on the individual's response to the test agent.

**Quantitative Pit test (QNFT):** An assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.

**Respirator:** A device designed to protect the wearer from the inhalation of harmful atmospheres.

**Respiratory inlet covering:** The portion of a respirator that forms the protective barrier between the user's respiratory tract and an air-purifying device or breathing air source, or both. It may be a facepiece, helmet, hood, suit, or a mouthpiece respirator with nose clamp.

**Self-Contained Breathing Apparatus (SCBA):** An atmosphere-supplying respirator for which the breathing air source is designed to be carried by the user.

**Service life:** The period of time that a respirator, filter or sorbent, or other respiratory equipment provides adequate protection to the wearer.

**Smoke:** The products of combustion, pyrolysis or chemical reaction of substances in the form of visible and invisible solid and liquid particles and gaseous products in the air.

**Spray:** A liquid, mechanically produced particle with sizes varying from submicroscopic to visible.

**Supplied-Air (or Airline) Respirator (SAR):** An atmosphere supplying respirator for which the source of breathing air is not designed to be carried by the user.

**Tight-fitting facepiece:** A respiratory inlet covering that forms a complete seal with the face.

**TLV (Threshold Limit Value):** A level to which it is believed a worker can be exposed to a chemical substance day after day for a working lifetime without adverse health effects.

**User seal check/test:** An action conducted by the respirator user to determine if the respirator is properly seated and sealed to the face.

**Vapor:** The gaseous state of a substance that is solid or liquid at ordinary temperature and pressure.
Appendix A

AIRBORNE (OR RESPIRATORY) HAZARDS may result from either an oxygen deficient atmosphere or breathing air contaminated with toxic particles, vapors, gases, fumes or mists. The proper selection and use of a respirator depend upon an initial determination of the concentration of the hazard or hazards present in the workplace, or the presence of an oxygen deficient atmosphere.

Airborne hazards generally fall into the following basic categories:

1. **Dusts.** Particles that are formed or generated from solid organic or inorganic materials by reducing their size through mechanical processes such as crushing, grinding, drilling, abrading, or blasting.

2. **Fumes.** Particles formed when a volatilized solid, such as a metal, condenses in cool air. This physical change is often accompanied by a chemical reaction, such as oxidation. Examples are lead oxide fumes from smelting, and iron oxide fumes from arc-welding. A fume can also be formed when a material such as magnesium metal is burned or when welding or gas cutting is done on galvanized metal.

3. **Mists.** A mist is formed when a finely divided liquid is suspended in the air. These suspended liquid droplets can be generated by condensation from the gaseous to the liquid state or by breaking up a liquid into a dispersed state, such as by splashing, foaming, or atomizing. Examples are the oil mist produced during cutting and grinding operations, acid mists from electroplating, acid or alkali mists from pickling operations, paint spray mist from spraying operations, and the condensation of water vapor to form a fog or rain.

4. **Gases.** Gases are formless fluids that occupy the space or enclosure and which can be changed to the liquid or solid state only by the combined effect of increased pressure and decreased temperature. Examples are welding gases such as acetylene, nitrogen, helium and argon; and carbon monoxide generated from the operation of internal combustion engines. Another example is hydrogen sulfide, which is formed wherever there is decomposition of materials containing sulfur under reducing conditions.

5. **Vapors.** Vapors are the gaseous form of substances that are normally in the solid or liquid state at room temperature and pressure. They are formed by evaporation from a liquid or solid, and can be found where parts cleaning and painting takes place and where solvents are used.
6. **Smoke.** Smoke consists of carbon or soot particles resulting from the incomplete combustion of carbonaceous materials such as coal or oil. Smoke generally contains droplets as well as dry particles.

7. **Oxygen deficiency.** An oxygen deficient atmosphere has an oxygen content below 19.5% by volume. Oxygen deficiency may occur in confined spaces, which include, but are not limited to, storage tanks, process vessels, towers, drums, tank cars, bins, sewers, septic tanks, underground utility tunnels, manholes, and pits.

8. **Bioaerosols/Infectious Substances.** Airborne particles up to 100μm in diameter consisting of living organisms, such as microorganisms (e.g., viruses, bacteria, molds, protozoa), or originating from living organisms (e.g., toxins, dead microorganisms or fragments of microorganisms) that capable of remaining airborne long enough to be observed or measured as aerosols (or droplets) and hence, able to transmit infectious agents.
Appendix B

Respirator Filter Classes & Level of Protection

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<th>CLASS</th>
<th>DESCRIPTION</th>
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<tbody>
<tr>
<td>N95</td>
<td>Filters <em>at least</em> 95% of airborne particles. <em>Not</em> resistant to oil.</td>
</tr>
<tr>
<td>N99</td>
<td>Filters <em>at least</em> 99% of airborne particles. <em>Not</em> resistant to oil.</td>
</tr>
<tr>
<td>N100</td>
<td>Filters <em>at least</em> 99.97% of airborne particles. <em>Not</em> resistant to oil.</td>
</tr>
<tr>
<td>R95</td>
<td>Filters <em>at least</em> 95% of airborne particles. Somewhat <em>resistant</em> to oil.</td>
</tr>
<tr>
<td>P95</td>
<td>Filters <em>at least</em> 95% of airborne particles. <em>Oil proof</em>.</td>
</tr>
<tr>
<td>P99</td>
<td>Filters <em>at least</em> 99% of airborne particles. <em>Oil proof</em>.</td>
</tr>
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<td>P100</td>
<td>Filters <em>at least</em> 99.97% of airborne particles. <em>Oil proof</em>.</td>
</tr>
</tbody>
</table>