CENTER FOR HEALTH SCIENCES

RESPIRATORY PROTECTION MANUAL

(Revision February 2013)

Oklahoma State University
Center for Health Sciences

RESPIRATORY PROTECTION MANUAL

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OKLAHOMA STATE UNIVERSITY
CENTER FOR HEALTH SCIENCES
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1.0 INTRODUCTION

NOTE: Additional information and assistance may be found on the internet at OSHA Respiratory Guidance.

The use of respiratory protection at Oklahoma State University Center for Health Sciences (OSUCHS) is intended to prevent adverse exposure from inhalation of airborne contaminants. The protection will contribute to the control of illness and diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, vapors, and other particles. The airborne contaminants may be encountered in such activities as laboratory work with airborne chemicals and biological materials, teaching in anatomy laboratories, and animal care.

Contaminants are classified as particulates and vapors or gases. Particulates may be dusts such as animal litter, clays, limestone, gypsum, or aluminum oxides; inert pulmonary reaction producing substances such as silicates; minimal pulmonary fibrosis producing substances such as iron oxide or tin oxide; extensive pulmonary fibrosis producing substances such as free silica or asbestos; chemical irritants such as acids or alkalies; systemic poisons such as pesticides, hydrogen cyanide or lead; allergy producing substances such as animal dander, cotton, isocyanates, or vegetable fibers; and febrile-reaction producing agents such as bagasse, or copper and zinc oxide; and biological materials. The gaseous air contaminants include extreme irritants such as nitrogen dioxide, phosgene, and arsenic trichloride; asphyxiants such as carbon monoxide, and hydrogen cyanide; anesthetics such as nitrous oxide, hydrocarbons, and ethyl and isopropyl ether; systemic poisons such as carbon tetrachloride, aniline, hydrazine; and carcinogens such as benzene, chloroform, formaldehyde and methylene chloride. Many chemicals may produce combinations of adverse effects.

The manual is based on the Occupational Safety and Health Administration (OSHA), Title 29, Code of Federal Regulations (CFR) 1910.134, "Respiratory Protection Standard" and 42 CFR 84, "Approval of Respiratory Protective Devices."

The Laboratory Safety Coordinator (LSC) is the Respiratory Protection standard “Program Administrator,” acting as the representative of the office of research, who has overall responsibility for the research laboratories and supporting entities. The LSC will review and update the manual, as necessary. Supervisors of persons who use respirators shall have a copy of this written Respiratory Protection Manual, have it available for review by respirator users and implement the manual. Additional copies of the written manual may be obtained from the LSC or online at the research training and information web site.

2.0 APPLICABILITY

NOTE: All references to "employee" apply as defined in Section 4.0 "Definitions"

The Respiratory Protection Manual applies to all employees and students at OSUCHS who are required to wear respirators in their activities while working under the direction of OSUCHS research employees. The respirators and any costs incurred from following the manual shall be paid for by OSUCHS for employees. Responsibility for payment of cost of student respiratory equipment shall be determined by instructors.

Respirators are **required** to be worn, wherever necessary, to protect health or prevent serious illness or injury from atmospheric contaminants in the work or study area. Respirators are required where contaminants exceed OSHA Permissible Exposure Level (PEL), the ACGIH Threshold Limit Value (TLV), or the Time Weighted Average (TWA) as listed in Safety Data Sheet (SDS) or other applicable sources for the material(s) as determined by the supervisor. Where no PEL, TLV, or TWA exist, an exposure level shall be determined by the supervisor using available information. Atmospheric sampling may be necessary to determine requirements for respirator use, where the contaminant concentration is not known, cannot be characterized, or has the potential to exceed the exposure limits (see section 6.1 "Hazard Evaluation"). Supervisors shall determine where concentrations of extremely hazardous contaminants may be considered "immediately dangerous to life and health" (IDLH). University employees or students shall not work in oxygen deficient atmospheres or atmospheres which are classifies as IDLH, and thus not be required to use air supplied respirators.

For OSUCHS activities, the term respirator applies to all negative pressure air purifying respirators including cartridge half and full-face respirators and all particulate masks, including filtering facepieces (dust masks.)

Contractors working in OSUCHS laboratories shall follow their own respiratory protection manuals, as applicable, which shall be consistent with OSHA guidelines. Prior to contractors wearing respirators in OSUCHS laboratories approval must be obtained from the LSC.

2.1 Voluntary Respirator Use

If a person is not required to wear a respirator and personally chooses to do so **voluntarily**, the employee may use their own respirator and incur costs associated with care and maintenance or the employer may choose to supply the respirator. The respirator use shall not in itself create a hazard and:

If voluntary respirator use only involves filtering facepieces (dust masks) OSUCHS is required to:

- supply information contained in Appendix A, and
- ensure that dust masks are not dirty or contaminated and they do not interfere with an employee or student's ability to work safely.

If voluntary use involves using cartridge or canister respirator, OSUCHS is required to:

- supply information contained in Appendix A
- ensure that respirator is not dirty or contaminated and it does not interfere with employee's/student's ability to work safely, and

- have the respirator user obtain a written statement that they are medically able to use the respirator from a PLHCP at the OSU Health Care Center or other such facility

All persons who wear respirators voluntarily shall sign that they have the read the briefing "Voluntary Respirator Use" in Appendix A and return a copy to the LSC. This briefing includes watching the video online at the research training and information web site entitled "Voluntary Use of Respirators."

With the exceptions listed above, the remainder of this manual does not apply to voluntary users of respirators.

3.0 ABBREVIATIONS

CFR	Code of Federal Regulations
ESLI	end-of-service-life indicator
HEPA	high efficiency particulate absolute (filter)
IDLH	Immediately Dangerous to Life or Health
LSC	Laboratory Safety Coordinator
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PEL	permissible exposure limit
PLHCP	physician or other licensed health care professional
SDS	safety data sheet
SOP	standard operating procedure
TLV	threshold limit value
OSUCHS	Oklahoma State University Center for Health Sciences
TWA	time weighted average

4.0 DEFINITIONS

air purifying respirators: a respirator which is designed to remove air contaminants from the air surrounding the respirator user, includes filtering facepieces (dust masks).

cartridge: the element of a gas and vapor or particulate air purifying respirator which contains the sorbent, filter and/or catalyst which removes specific contaminants from air drawn through it.

employee: all full-time and part-time faculty, administrative/professional, and hourly staff*;* includes students on the OSUCHS payroll (e.g. graduate assistants, teaching assistants, work studies.)

end-of-service-life indicator: 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.

hazardous chemical: any chemical which is a physical hazard or a health hazard. Physical hazard means a chemical for which there is scientifically valid evidence that it is a combustible liquid, compressed gas, explosive, flammable liquid or solid, organic peroxide, oxidizer, pyrophoric, unstable (reactive), or water-reactive. Health hazard means a chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that

acute or chronic health effects may occur in exposed persons. The term "health hazard" includes chemicals which are carcinogens, toxic or highly toxic agents, reproductive toxins, irritants, corrosives, sensitizers, hepatotoxins (liver toxins), nephrotoxins (kidney toxins), neurotoxins (nerve toxins), agents which act on the hematopoietic (blood forming) system, and agents which damage the lungs, skin, eyes, or mucous membranes.

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

safety data sheet: written or printed material which provides information regarding the characteristics of hazardous products and materials and the appropriate safety measures to be observed when using them.

permissible exposure limit, time weighted average, or threshold limit value: the permissible exposure limit adopted by OSHA in 29 CFR 1910.1000 or the American Conference of Governmental Industrial Hygienists, a concentration usually expressed as a time-weighted average in units of mg/m3 or parts per million based on an 8-hour day, 40-hour week during which nearly all workers may be repeatedly exposed without adverse effects.

supervisor: those employees of OSUCHS who have responsibility to direct the work of others. The first line supervisors are, in general, those persons who are the principal investigator (PI) of the projects for the laboratory. The responsibilities (Section 5.0) outlined in this manual for "supervisors" are directed toward the first line supervisor but may be delegated by the first line supervisor to others in the department or group who have supervisory roles.

5.0 RESPONSIBILITIES

Director of Regulatory Compliance:

- Support OSUCHS efforts to provide a safe and healthy work environment for all employees and students, in compliance with OSHA standards
- Provide for budget resources for equipment and safety supplies intended to protect employees and students from hazards of air contaminants in the workplace

Laboratory Safety Coordinator:

- Act as the "Program Administrator"
- Develop, coordinate implementation, and review the OSUCHS Respiratory Protection Manual
- Assess implementation during routine inspections
- Provide materials, including videos, to be used by supervisors for Respiratory Protection training and maintain training documentation database
- Respond to or assist supervisors in responding to employee or student concerns regarding potential exposure to air contaminants and follow with a written reply within 15 days
- Retain a record of training attendance

Supervisor:

- Identify all work activities where there is airborne contaminant exposure or potential for exposure to hazardous chemicals and determine necessary control methods, including providing respirators where controls are not feasible
- Provide information and training to employees and students on respirator use and chemical hazards
- Ensure required medical evaluations and fit testing are performed
- Write a standard operating procedure (SOP) for each respiratory use activity by completing a copy of form in Appendix B or other similar SOP
- Respond promptly to employee and student concerns regarding chemical hazards or potential chemical exposures, follow with a written reply within 15 days, and inform LSC in a timely manner
- Retain a record of:
    a. all medical certification exam information returned from the PLHCP
    b. the respirator use SOP for each user or work area
    c. annual fit testing records
- Periodically audit for compliance with respiratory use policies including:
    a. Work area conditions and degree of employee or student exposure or stress
    b. Proper fit and use
    c. Maintenance and care of assigned respirators

Employee and Student:

- Know the potential hazards of any air contaminants in breathing zone in work area
- Wear and maintain assigned respirators if required by supervisor and follow OSUCHS Respiratory Protection Manual policies and instructions provided during training

6.0 MANUAL ELEMENTS

Breathing air contamination shall be controlled where at all possible and feasible by engineering controls or administrative controls to levels which do not require the use of respirators. When effective engineering controls are not feasible, or while they are being instituted, appropriate respirators shall be used according to this written Respiratory Protection Manual. The basic elements of the manual in order of action to be taken are:

1. evaluation and appropriate selection of respirators with documentation
2. hazard training
3. medical evaluation
4. fit testing and use requirements
5. maintenance and care of respirators
6. record keeping

6.1 Hazard Evaluation and Respirator Selection

All respirators used shall be approved by the National Institute for Occupational Safety and Health (NIOSH) with supporting documentation from the product supplier. Where supervisors require respirators to be worn - required where PEL, TLV, TWA or supervisor determined

exposure limit may potentially be exceeded - the type to be used shall be determined according to hazards to which worker is exposed.

a. OSUCHS employees and students shall not work or wear respirators in potential IDLH or oxygen deficient (less than 19.5% oxygen) atmospheres nor enter such areas;

b. **Evaluation –** Supervisors shall evaluate the conditions of exposure, such as length of time the worker will be exposed to the hazard, is the work strenuous, is area well ventilated, what will be the temperature of work area, what other hazards may be present, the physical state of the contaminant (gas, mist, fume, liquid, solid, etc.), toxicity, exposure concentration of the contaminant, if the contaminant causes eye irritation or skin absorption, and the process (will contaminant be combined, heated, treated or applied). **Where an extremely hazardous contaminant concentration cannot be estimated by objective data or sampling results, the atmosphere must be assumed to be IDLH.**

c. **Selection –** Supervisors shall select appropriate tight fitting negative pressure "air purifying respirator" based on above evaluation. There may be a number of respirators which are adequate for the same use situation. Supervisors shall consult respirator suppliers or manufacturers for information on exact specifications for use, including recommended service life of each respirator prior to purchase. The following information may be used as general guidelines:

- Filtering facepieces, half-face or full-face respirators may be used at concentrations of contaminant equal to or less than 10 X PEL, TLV, TWA, short-term exposure limit, ceiling limit or if not available then on relevant available information and informed professional judgment. Full-face respirators may be used at concentrations of contaminant equal to or less than 50 X limits listed above. Where "air purifying respirators" are being used, activities shall not be conducted by OSUCHS employees or students where the concentration of a contaminant is greater than 50 X limits listed above.

- **Mechanical-filter (particulate) respirators** (air purifying) - removes particles from the air such as dust, fumes, mist, aerosols and smoke; may be disposable paper (filtering facepiece), disposable or reusable half-mask or full-face mask respirators. Disposable paper masks may use the mask material or a non-replaceable HEPA (High Efficiency Particulate Absolute) device as filtering media. Half-face or full-mask respirators use a cartridge as a filtering media. If breathing difficulty occurs, it generally indicates that the filtering media is saturated and must be replaced. NIOSH revised regulations have only approved particulate filters with the following designations/labeling:

  30 CFR part 11: high efficiency particulate air (HEPA) filter

  42 CFR part 84: filters with the following labeling -

    N Series: For workplaces free of oil and aerosols which might degrade filter performance; may be used for solid and aerosols particulates

R Series: For solid and aerosols particulates with possible time-use limitations, may be used with oil aerosols for one shift only

P Series: For respirator filters tested to provide the highest level of resistance to penetration after loading. These respirators are suitable for use with both solid and aerosols particulates, may be used with oil aerosols
(Each series has filters with 95, 99, and 99.97% efficiency)

If particulates are at least 2 micrometers in diameter, any filter certified by NIOSH may be used.

All current "supply on hand" particulate respirators, which are not labeled according to the above listed requirements shall be replaced.

- **Chemical (gases and vapors) cartridge and canister respirators** (air purifying) - used for hazardous gases; organic, pesticide and paint vapors below the IDLH or 50 X PEL/TLV/TWA, whichever is less. Cartridges and canisters shall be color coded and labeled according to contaminant(s) being protected against and degree of protection the cartridge or canister will provide. An odor, taste, or irritation experienced during respirator use generally indicates that the filter media is saturated.

- **Change schedules** - must be determined by supervisor for each filtering facepiece, chemical cartridge or canister respirator. This information must be included in the SOP for use of the respirator and may be based on the "end-of-service-life indicator" (ESLI) from the manufacturer or objective data. The SOP must describe the information and data relied upon and the basis for the canister or cartridge change schedule and the basis for reliance on the data. Warning properties for detecting breakthrough (saturation of filter, adsorbent or absorbent material in cartridge or canister); such as odor, taste, or irritation which would be present below the regulatory exposure level, and exposure at these low levels does not cause olfactory fatigue, may be included in change determination; but cannot be used as the sole criteria for change out. Some methods for development of change out schedules are listed in Appendix C.

- **Other Types of Respirators** - must be provided according to the maximum use concentration of the contaminant and using the "Assigned Protection Factors" in Appendix D multiplied by the air contaminant PEL, TLV, TWA, short-term exposure limit, ceiling limit or if not available then on relevant available information and informed professional judgment.

6.2 Training

Prior to initial use (and medical evaluation and fit testing), training shall be provided by the supervisor to each person who is required to use a respirator. Persons shall be retrained **annually** and whenever the work activity requiring the use of a respirator change or incorrect work practices are observed by the supervisor. OSHA has developed a set of videos that provide the basic training. The videos can be found on the internet at OSHA Respiratory Guidance. Click on "training videos" under the title of the page. Watch each of the following short videos:

1. Respiratory Protection in General Industry

2. Respirator Types
3. Respiratory Fit Testing
4. Maintenance and Care of Respirators
5. Medical Evaluation for Workers Who Use Respirators
6. Respiratory Protection Training Requirements
7. Voluntary Use of Respirators (only for those to whom this applies)
8. Respirator Safety. Donning (Putting On) and Doffing (Taking Off) and User Seal Checks

Following the watching of the videos by the trainee, the supervisor shall complete the training by:

a. assisting the worker in determining what type of respiratory will be worn, determined by the proposed working conditions and the capabilities and limitations of the respirator
b. providing procedures to follow in possible emergency situations
c. ensuring the worker knows how to inspect, put on and remove, use; and check the seals of the respirator according to the information that accompanied the respirator, Appendix B and/or OSHA instructions
d. ensuring the worker knows how to maintain and care for the respirator according to the information that accompanied the respirator, Appendixes B and F or OSHA instructions
e. watching for and ensuring that the worker knows how to recognize medical signs and symptoms that may limit or prevent the effective use of the respirator
f. providing a copy of this manual and sign off that it has been studied along with the above material

The LSC can provide training completion forms. Training completion forms shall be completed by the supervisor once the above training has been completed and a copy sent to the LSC; who will maintain a central training database.

Where employees/students wear respirators when not required to, they shall be provided with the information in Appendix A.

6.3 Medical Evaluation and Fit Testing

Note: Respirator use cannot begin without medical evaluation and fit testing.

Prior to work involving use of a respirator the supervisor shall ensure that each employee/student (on OSUCHS payroll), at no cost to the employee/student, has a PLHCP determine that they are physically able to perform the work and use the equipment.

The supervisor shall ensure that each person required to wear a respirator (including filtering facepiece) be properly fit tested according to OSHA guidelines to test face-to-face seal using a challenge agent to detect leakage, receive demonstration and practice in how the respirator should be worn, how to adjust it, and how to determine if it fits properly. Fit testing is required to be repeated **annually**.

a. The supervisor shall arrange an appointment for employee/student with the Safety Manager at the OSU Health Care Center, 918-561-8391, to provide fit testing and direction to obtain medical certification. (bring the work respirator planned for use to the fit testing)

b. The Safety Manager and/or PLHCP shall return a recommendation regarding fitness to wear respirator, any restrictions, and fit testing results to the supervisor.
c. Further medical evaluations shall be performed where a respirator user is experiencing adverse effects from wearing the respirator or the respirator use conditions change outside the scope of the original determination.
d. Fit testing shall be repeated and scheduled **annually** by the supervisor. Additional fit testing shall be repeated as necessary; for example, when a different respirator is used, facial features change, or the seal is failing during use conditions.

Students (who are not on the OSUCHS payroll) may have such a medical evaluation made by a physician of their choice at their own expense. Supervisors should require a medical surveillance of their students who are required to wear respirators or monitor their physical state carefully during respirator use.

6.4 Respirator Use Requirements

a. A standard operating procedure (SOP) for respirator use shall be written by the supervisor for each area in which respirators are routinely used or for each respirator user where the respirator is used non-routinely. Appendix B contains a SOP form which can be copied and completed to fulfill the above requirement. A copy shall be sent to the Program Administrator, LSC.

b. Beards, sideburns, temple pieces on glasses, or anything else that will not permit a good face seal shall not be allowed for respirator use. Soft contact lenses may be worn with a respirator except with a full facemask. Corrective spectacles must be fitted into the mask where a full facemask is worn.

c. Respirator users shall check the facepiece fit each time he/she dons the respirator by performing one of the following tests 1) cover exhalation valve and exhale gently into facepiece, if air leaks around the seal adjust straps, repeat until no air leakage is detected (may require the wearer to first remove the exhalation valve cover before closing off the exhalation valve and then carefully replacing valve); 2) cover inhalation mechanism(s) and inhale gently and hold breath for 10 seconds, if mask does not collapse slightly-adjust straps, repeat until mask collapses slightly; 3) use manufacturer's recommended user seal check procedures, provided that the manufacturer's procedures can be demonstrated as being equally effective as 1 and 2 above.

d. Respirator change schedules shall be followed as determined in the evaluation process for respirator selection (see section 6.1(c))

e. Respirator users shall leave the contaminant area if they should experience any adverse physical symptoms, such as dizziness, blurred vision, headache, difficulty breathing or claustrophobia. They shall leave the area to wash their faces or respirators as necessary to prevent skin or eye irritation associated with respirator use. If breakthrough is detected, such as odor, taste, or irritation the user shall leave the contaminant area immediately. The user shall not return to the contaminated area until such conditions are evaluated and corrected.

f. The supervisor shall maintain a routine surveillance of work area conditions and degree of employee or student exposure or stress. Frequent random inspections shall be used to ensure that respirators are properly selected, used, cleaned, and maintained.

6.5 Maintenance and Care

Disposable respirators shall be disposed after each use or at the end of the workday. Respirators shall be cleaned and disinfected as often as necessary to be maintained in a sanitary condition. If a respirator is used by more than one person, it shall be cleaned at least after each use or at the end of the day using the instructions in Appendix F. The employee as an alternative may use the cleaning recommendations provided by the manufacturer of the respirators provided such procedures are as effective as those listed in Appendix F.

The respirator shall be inspected for defects and repair as needed after each use, check for tightness of connections and the condition of the facepiece, headbands, valves, and cartridges. Rubber or elastomer parts shall be inspected for pliability and signs of deterioration. Stretching and manipulating rubber or elastomer parts with a massaging action will keep them pliable and flexible and prevent them from taking a set during storage.

The respirator shall be stored in a plastic sealed bag in a safe area such as a locker or sturdy box, protected from physical stress, dust, sunlight, heat, extreme cold, excessive moisture, or damaging chemicals.

6.6 Record Keeping

The supervisor shall retain all records that they receive to determine that the employee has passed the respirator medical certification exam and annual fit testing completed by the Safety Manager and the PLHCP. The supervisor shall have available for review the respirator use SOP for each user or work area. The LSC shall retain a record of annual respiratory protection training.

7.0 EMPLOYEE RIGHTS AND RESPONSIBILITIES

Each employee has the right to be informed of the hazards of the materials in use in the work area and the conditions under which respiratory protection is required. The employee shall receive all instructions and preparations outlined in this manual before using a respirator. If any employee has requested the above information, and the request has not been met, the employee may then refuse to work in the area where respiratory protection is required. An employer/supervisor may not discharge or initiate any adverse personnel action against any employee because the employee has exercised his/her rights under this provision.

Employees working in areas where exposures to hazardous substances exist shall be required to perform their jobs in accordance with safety and health requirements communicated to them during training and education sessions, including on the job training. Respirators shall be worn where required by supervisors. OSUCHS may take appropriate disciplinary action when an employee does not comply with OSUCHS's precautionary measures.

In addition, employees should use good judgement in maintaining a high level of safety and reducing potential risk factors. Employees are required to stop work if any unsafe condition exists and report the unsafe condition to their supervisor, department head, or any level of authority necessary to elicit prompt response.

APPENDIX A

VOLUNTARY RESPIRATOR USE

Oklahoma State University Center for Health Sciences

Voluntary Respirator Use

Respiratory Protection Standard, OSHA 29 CFR 1910.134
(Mandatory) Information for Using Respirators Voluntarily When Not Required Under the Standard

Respirators are an effective method of protection against designated hazards when properly selected and worn. Respirator use is encouraged, even when exposures are below the exposure limit, to provide an additional level of comfort and protection for workers. However, if a respirator is used improperly or not kept clean, the respirator itself can become a hazard to the worker. Sometimes, workers may wear respirators to avoid exposures to hazards, even if the amount of hazardous substance does not exceed the limits set by OSHA standards. If your employer provides respirators for your voluntary use, or if you provide your own respirator, you need to take certain precautions to be sure that the respirator itself does not present a hazard.

You should do the following:

1. Read and heed all instructions provided by the manufacturer on use, maintenance, cleaning and care, and warnings regarding the respirators limitations.

2. Choose respirators certified for use to protect against the contaminant of concern. NIOSH, the National Institute for Occupational Safety and Health of the U.S. Department of Health and Human Services, certifies respirators. A label or statement of certification should appear on the respirator or respirator packaging. It will tell you what the respirator is designed for and how much it will protect you.

3. Do not wear your respirator into atmospheres containing contaminants for which your respirator is not designed to protect against. For example, a respirator designed to filter dust particles will not protect you against gases, vapors, or very small solid particles of fumes or smoke.

4. Keep track of your respirator so that you do not mistakenly use someone else's respirator.

5. Watch the video entitled “Voluntary Use of Respirators” online at the OSHA Respiratory Protection web site at https://www.osha.gov/SLTC/respiratoryprotection/training_videos.html.

Signature below indicates the above information has been read and understood.

Worker_____ Date _____

Print Name _____

Copies: 1) Worker, 2) Principal Investigator, 3) Laboratory Safety Coordinator

APPENDIX B

SAFE OPERATING PROCEDURE FORM

SAFE OPERATING PROCEDURE – RESPIRATOR USE

SOP # _____ Organization/Department_____
Date _____ Revision Date _____

(NOTE: add additional pages as necessary)
Description of work area:

Potential hazardous air contaminants. List physical form (e.g. gas, vapor, mist, fume, dust or combination) and reasonable estimate of exposure to each:

Conditions under which respirators are required:

Temperature: Humidity: Work Rate (light, moderate, heavy):
Expected Time Use:

Type of respirator to be used (use of air-supplied respirators not approved for OSUCHS employees or students):

End-of-Service-Life Indicator (certified by manufacturer or NIOSH) or Change Schedule (describe data relied upon and basis for change schedule):

Checklist of conditions required before respirator use:

☐ evaluation of work conditions by supervisor and proper choice of respirator

☐ annual training

☐ medical evaluation of user

☐ annual respirator fit testing for user

☐ oxygen in air not deficient, $\geq$ 19.5%

☐ air not immediately dangerous to life or health

☐ beards, sideburns, temple pieces on glasses not allowed

General Procedures:

1. Check respirator for any damage or deterioration; if damaged, repair if possible, otherwise do not wear and report to supervisor.
2. Put on respirator using instructions given during training and fit testing, tighten straps
3. Respirator must have a complete seal, self test each time respirator is put on: 1) cover exhalation valve with hand and exhale, if air leaks around the seal adjust straps, repeat until no air leakage is detected; 2) cover inhalation mechanism(s) and inhale, if mask does not contract, adjust straps, repeat until mask contracts slightly.
4. During respirator use, leave the contaminated area at once if 1) end-of-service-life indicator or change schedule is reached for filtering mechanism; 2) you feel ill, disoriented, or claustrophobic; 3) you detect, irritation, odor or taste; or 4) breathing becomes difficult. If situation cannot be fixed by changing filters, masks, or by repairing respirator, report to supervisor.
5. After respirator use or at end of workday, throw disposable respirators away and filtering media (e.g. cartridges) in respirators used by more than one person.
6. For reusable respirators used by one person as necessary to keep sanitary and each day for those use by more than one person 1) take apart where parts can be removed, 2) clean and disinfect all parts (except filters and cartridges) by scrubbing with soap and water and wiping with rubbing alcohol (if other disinfectant not used), 3) rinse in fresh warm water and air dry, 4) check for tightness of connections and the condition of the facepiece, headbands, valves, and cartridges, 5) check rubber or elastomer parts for pliability and signs of deterioration, stretch and manipulate parts with a massaging action to keep them pliable and flexible, and 6) after dry, store in plastic sealed bag in a safe area such as a locker or sturdy box, protected from physical stress, dust, sunlight, heat, extreme cold, excessive moisture, or damaging chemicals.

Job Specific Procedures (add additional pages if necessary):

Supervisor signature _____ Date_____

(Train respirator users on safe operating procedures and post in use area)

APPENDIX C

CHANGE SCHEDULE FOR RESPIRATOR CARTRIDGES AND CANISTERS

CHANGE SCHEDULES GUIDE – A LISTING OF METHODS

Data and information relied upon to establish the schedule must be included in the respirator program (include in the SOP). The requirements for several of OSHA's chemical specific standards already address this issue and are listed below:

a. Acrylonitrile 1910.1045(h)(2)(ii) end-of-service life or end of shift (whichever occurs first)
b. Benzene 1910.1028(g)(2)(ii) end-of-service life or beginning of shift (whichever occurs first)
c. Butadiene 1910.1051 (h)(2)(ii) every 1, 2 or 4 hours dependent on concentration according to Table 1, 1910.1051 (h)(3)(i) and at beginning of each shift
d. Formaldehyde 1910.1048 (g)(2)(ii) -for cartridges every three hours or end of shift (whichever is sooner); for canisters, every 2 or 4 hours according to the schedule in (g)(3)(iv)
e. Vinyl chloride 1910.1017(g)(3)(ii) end-of-service life or end of shift which they are first used (whichever occurs first)
f. Methylene chloride - 1910.1052 (g)(2)(ii) canisters may only be used for emergency escape and must be replaced after use.

Change schedules for all other contaminants must be established and implemented. A brief description of some currently available approaches or methods for respirator cartridge change schedules is presented below. This is not intended to be an exhaustive list, but a summary of some reasonable methods that a supervisor may take in creating a change schedule. No matter which method is used, the supervisor must maintain any data used in making their decision as part of their program (include in the SOP). Additional information and assistance on the following methods may be found at OSHA's Respiratory Protection eTools.

Manufacturers Objective Data: Respirator cartridge model-specific objective data that is available from the manufacturer or through a distributor may be used to establish change schedules. Objective data may be presented in tabular or graphical format or simply provided verbally over a manufacturer's telephone help line. Some manufacturers have developed elaborate computer programs available on the Internet that provide the necessary objective data to the user.

Experimental Methods: Experimental breakthrough-time data from a laboratory based on worst case testing of simulated workplace conditions. This method can provide fairly accurate service life data compared to other available methods.

Mathematical Predictive Modeling: One tool that has demonstrated value is the use of mathematical modeling based on predictive equations. These models are typically complex and require considerable expertise to apply. They also require proprietary information from the respirator manufacturer. OSHA fully supports the further development and validation of these models. The agency believes that respirator manufacturers may be in the best position to apply them to their products.

Analogous Chemical Structures: Employer would rely on service life values from other chemicals having analogous chemical structure to the contaminant under evaluation for breakthrough. Or in some cases a chemical with known migration may reasonably be anticipated to act as a surrogate for a similar chemical that would have less rapid migration (e.g., an employer could assume that a heavier, less volatile compound than another in the same chemical

series that had been tested for breakthrough would breakthrough no faster than the latter compound, such as benzene versus toluene.) The use of this method requires a substantial amount of judgement and assumption of similar chemical properties. The use of analogous chemical structures should be infallible as long as objective data or information for lower molecular weight compounds is used to predict the breakthrough times for higher molecular weight analogues containing only additional methyl or phenyl groups. Data from higher molecular weight groups should not be used to predict the behavior of analogous substances with lower molecular weight. This approach relies heavily on experimental data and expert analysis. This method may be less accurate than others and should be used only when better information is not available.

Workplace Simulations: Invalidated methods exist or are under development where the respirator cartridge is tested in workplace in "real time" and under actual conditions of use. Simple designs have been informally described to the agency. Workplace air during representative conditions is drawn over the cartridge at a rate approximating normal breathing at a higher work rate. An air sampling/analytic device would be placed on the other side of the filter to measure the time of breakthrough. Employers could incorporate this type of testing into their air monitoring program using sampling strategies established in their workplace. In theory, these approaches should be an accurate method for determining change schedules and could accommodate fluctuating conditions of humidity, concentration, etc., to allow less conservative schedules that utilize a larger fraction of the true service life.

Rules of Thumb: Generalized rules or guidance can be generated from experimental work. Presented below is a rule of thumb for estimating organic vapor service life found in Chapter 36 of the American Industrial Hygiene Association publication

"The Occupational Environment Evaluation and Control".

*If a chemical's boiling point is >70 C and the concentration is less than 200 ppm you can expect a service life of 8 hours at a normal work rate.

Note: This first rule of thumb needs further review.

* Service life is inversely proportional to work rate.

* Reducing concentration by a factor of ten will increase service life by a factor of five.

* Humidity above 85% will reduce service life by 50%.

These generalizations should only be used in concert with one of the other methods of predicting service life for specific contaminants.

APPENDIX D

ASSIGNED PROTECTION FACTORS

Assigned Protection Factors

Table 1. Assigned Protection Factors \5\					
Type of Respirator \1,\\2\	Quarter Mask	Half Mask	Full Facepiece	Helmet/Hood	Loose-fitting Facepiece
1. Air Purifying Respirator	5	\3\ 10	50	----------	----------
2. Powered Air Purifying Respirator	----------	50	1000	\4\ 25/1000	1000
3. Supplied-Air or Airline Respirator					
Demand Mode	----------	10	50	----------	----------
Continuous Flow Mode	----------	50	1000	\4\ 25/1000	1000
Pressure Demand or Other Positive Pressure	----------	50	1000	----------	----------
4. Self-Contained Breathing Apparatus (SCBA)					
Demand mode	----------	10	50	50	----------
Pressure-demand or other positive- pressure mode (e.g., open/closed circuit).	----------	--------	10,000	10,000	----------

Notes:
\1\ Employers may select respirators assigned for use in higher workplace concentrations of a hazardous substance for use at lower concentrations of that substance, or when required respirator use is independent of concentration.

\2\ The assigned protection factors in Table 1 are only effective when the employer implements a continuing, effective respirator program as required by this section (29 CFR 1910.134), including training, fit testing, maintenance, and use requirements.

\3\ This APF category includes filtering facepieces, and half masks with elastomeric facepieces.

\4\ The employer must have evidence provided by the respirator manufacturer that testing of these respirators demonstrates performance at a level of protection of 1,000 or greater to receive an APF of 1,000. This level of performance can best be demonstrated by performing a WPF or SWPF study or equivalent testing. Absent such testing, all other PAPRs and SARs with helmets/hoods are to be treated as loose-fitting facepiece respirators, and receive an APF of 25.

\5\ These APFs do not apply to respirators used solely for escape. For escape respirators used in association with specific substances covered by 29 CFR 1910 subpart Z, employers must refer to the appropriate substance-specific standards in that subpart.

Escape respirators for other IDLH atmospheres are specified by 29 CFR1910.134 d)(2)(ii).

APPENDIX E

BASIC REQUIREMENTS for RESPIRATOR USE

Basic Requirements for Respirator Use

Filtering Facepiece (known as dust mask) or Cartridge Respirator (face mask) - if there is a possibility of exceeding permissible exposure limit (PEL) for contaminant; see safety data sheet for PEL (all of OSUCHS's Respiratory Protection Manual applies)

	employee/faculty	student on OSUCHS payroll	student not on OSUCHS payroll
medical evaluation (OSU Health Care Center)	yes	yes	yes (payer dept. determined)
fit testing (annual-contact Safety Manager (1))	yes	yes	yes (payer dept. determined)
training (annual-section 6.2)	yes	yes	yes
employer supplied	yes	yes	yes (payer dept. determined)
employer maintained	yes	yes	yes (payer dept. determined)

(1) Safety Manager: 918-561-8391, OSU Health Care Center

Filtering Facepiece (known as dust mask) voluntary use for comfort only

	employee/faculty	student on OSUCHS payroll	student not on OSUCHS payroll
medical evaluation	supervisor(1)	supervisor(1)	supervisor(1)
fit testing (annual)	no	no	no
briefing (Appendix A) (2)	yes	yes	yes
employer supplied	recommended	recommended	recommended
employer maintained	recommended	recommended	recommended

(1) supervisor needs to observe user to determine if user is not in distress
(2) ensure user reads and is provided a copy of Appendix A of the OSUCHS "Respiratory Protection Manual"

Cartridge Respirator (face mask) - voluntary use for comfort only

	employee/faculty	student on OSUCHS payroll	student not on OSUCHS payroll
medical evaluation (1)	yes	yes	recommended (payer dept. determined)
fit testing (annual)	no	no	no
briefing (Appendix A) (2)	yes	yes	yes
employer supplied	recommended	recommended	recommended
employer maintained	recommended	recommended	recommended

(1) ensure that user is medically able to wear respirator - this can be attested to by Alexander Health Center or any physician or other licensed health care professional
(2) ensure user reads and is provided a copy of Appendix A of the OSUCHS "Respiratory Protection Manual"

APPENDIX F

RESPIRATOR CLEANING PROCEDURES

Respirator Cleaning Procedures

I. Procedures for Cleaning Respirators

A. Remove filters, cartridges, or canisters. Disassemble facepieces by removing speaking diaphragms, demand and pressure- demand valve assemblies, hoses, or any components recommended by the manufacturer. Discard or repair any defective parts.

B. Wash components in warm (43 deg. C [110 deg. F] maximum) water with a mild detergent or with a cleaner recommended by the manufacturer. A stiff bristle (not wire) brush may be used to facilitate the removal of dirt.

C. Rinse components thoroughly in clean, warm (43 deg. C [110 deg. F] maximum), preferably running water. Drain.

D. When the cleaner used does not contain a disinfecting agent, respirator components should be immersed for two minutes in one of the following:

1. Hypochlorite solution (50 ppm of chlorine) made by adding approximately one milliliter of laundry bleach to one liter of water at 43 deg. C (110 deg. F); or,

2. Aqueous solution of iodine (50 ppm iodine) made by adding approximately 0.8 milliliters of tincture of iodine (6-8 grams ammonium and/or potassium iodide/100 cc of 45% alcohol) to one liter of water at 43 deg. C (110 deg. F); or,

3. Other commercially available cleansers of equivalent disinfectant quality when used as directed, if their use is recommended or approved by the respirator manufacturer.

E. Rinse components thoroughly in clean, warm (43 deg. C [110 deg. F] maximum), preferably running water. Drain. The importance of thorough rinsing cannot be overemphasized. Detergents or disinfectants that dry on facepieces may result in dermatitis. In addition, some disinfectants may cause deterioration of rubber or corrosion of metal parts if not completely removed.

F. Components should be hand-dried with a clean lint-free cloth or air-dried.

G. Reassemble facepiece, replacing filters, cartridges, and canisters where necessary.

H. Test the respirator to ensure that all components work properly.