1.0 PURPOSE

The purpose of this program is to set forth uniform policies and procedures concerning the use of respirators for the City of Tucson and its employees. All use of respirators by City of Tucson employees shall conform to these policies and procedures.

The policies and procedures contained in this section are intended to assist in identifying and complying with OSHA Safety Standards. In all cases where there is a difference between specific OSHA standards and the Respiratory Protection policies set forth in this chapter, the stricter of the two shall apply.

2.0 SCOPE

The guidelines in this program are designed to help reduce employee occupational exposure to particulate matter, radionuclides, gases, vapors and/or oxygen deficiency.

A. <u>Administrative Controls</u>

Where feasible, exposure to contaminants will be eliminated or reduced by engineering controls (i.e., general and local ventilation, enclosure, isolation, or substitution of a less hazardous process or material).

B. <u>Engineering Controls</u>

If engineering controls are not feasible, the use of administrative controls (i.e., rotating jobs, shift changes) may be used, where not prohibited by law, to control exposures to contaminants.

C. <u>Personal Protective Equipment</u>

The use of respiratory protective equipment is required when engineering or administrative controls are not feasible or while engineering controls are being initiated.

3.0 DEFINITIONS

Abrasive blasting respirator: Means a respirator designed to protect the wearer from inhalation, impact and abrasion of materials used or generated in abrasive blasting.

Aerosol: Particles, solid or liquid, suspended in air.

Airline respirator: An atmosphere supplying respirator in which the respirable gas is not designed to be carried by the wearer.

APR - Air purifying respirator: A respirator in which ambient air is passed through an air purifying element which removes the contaminant. Air is passed through the air purifying element either by means of breathing action or by a blower.

APF - Assigned Protection Factor: The expected workplace level of respiratory protection that would be provided by a properly functioning respirator or a class of respirators to properly fitted and trained users.

Canister/Cartridge: A container with a filter, sorbent, or catalyst, or combination which removes specific contaminants from the air passed through it.

Ceiling concentration: Means the concentration of an airborne substance that shall not be exceeded during any part of the working exposure.

Certified: Means evaluated and listed as permissible by the National Institute for Occupational Safety and Health (NIOSH), the Mine Safety and Health Administration (MSHA), or Bureau of Mines (BM).

Confined Space: An enclosed space that has the following characteristics: it is not designed for continuous human occupancy; has restricted entry and egress; and may contain potential or known hazards.

Contaminant**:** A harmful, irritating, or nuisance airborne material.

Continuous flow respirator: An atmosphere supplying respirator which provides a continuous flow of respirable gas to the respiratory inlet covering.

Demand respirator: An atmosphere supplying respirator which releases respirable air to the face piece only when a negative pressure is created by inhalation.

Disposable respirator: A respirator for which maintenance is not intended and which is designed to be discarded after excessive resistance, sorbent exhaustion, physical damage or end of service life renders it unsuitable for use. Refer Appendix C.

Dust: An aerosol consisting of mechanically produced solid particles derived from the breaking up of larger particles. Dusts are generally larger particles then fumes.

Employee Disclosure of Respiratory Health: After an initial medical evaluation prior to wearing a respirator in the workplace, employees will be required to complete a disclosure of respiratory health prior to annual respirator fit-testing. The form can be located in Appendix D of this procedure.

End of service life indicator: A system that warns the user of the approach of the end of adequate respiratory protection.

Escape only respirator: Means a respirator intended only for use during emergency egress from a hazardous atmosphere.

Exposure limit: The maximum allowable concentration of a contaminant in the air to which an individual may be exposed. These may be time weighted averages, short term limits or ceiling limits.

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

Fit check: A test conducted by the wearer to determine when the respirator is properly seated to the face.

Fit Factor: A quantitative measure of the fit of a particular respirator to a particular individual.

Fit test: The use of a challenge agent or air pressure to evaluate the fit of a respirator on an individual.

Fume: Solid aerosols formed by condensation of heated metals. Fumes generally have a smaller particle size when compared to dusts.

Gas: A fluid that has neither independent shape nor volume and tends to expand indefinitely.

Hazardous atmosphere: An atmosphere that contains contaminants in excess of exposure limits or is oxygen deficient.

Hazard ratio**:** A number obtained by dividing the concentration of a contaminant by its exposure limit.

Helmet: A hood that offers head protection against impact and penetration.

High efficiency filter: A filter which removes from air 99.97% or more of aerosols having a diameter of 0.3 micrometers.

Hood: A respiratory inlet covering which completely covers the head, neck, and may cover portions of the shoulders.

IDLH - Immediately Dangerous to Life or Health: Any atmosphere that poses an immediate hazard to life or poses immediate irreversible debilitating effects on health.

LC-50: The lethal concentration of a chemical in air to kill 50% of the test subjects (i.e. mammals, insects, fish, etc.)

LD-50: The lethal dose of a chemical or drug required to kill 50% of the test subjects. Typically the dose is injected into the animal or given in its food.

Loose fitting facepiece: A respiratory inlet covering that is designed to form a partial seal with the face, does not cover the neck and shoulders and may or may not offer head protection against impact and penetration. Refer to Appendix E.

Maximum use concentration (MUC): means the maximum atmospheric concentration of a hazardous substance from which an employee can be expected to be protected when wearing a respirator, and is determined by the assigned protection factor of the respirator or class of respirators and the exposure limit of the hazardous substance. The MUC can be determined mathematically by multiplying the assigned protection factor specified for a respirator by the required OSHA permissible exposure limit, short-term exposure limit, or ceiling limit. When no OSHA exposure limit is available for a hazardous substance, an employer must determine an MUC on the basis of relevant available information and informed professional judgment.

Mist: An aerosol composed of liquid particles.

Mouth piece and nose clamp assembly: Means a respiratory inlet covering that is held in the wearer's mouth and must be used in conjunction with a nose clip.

N95 Respirator: (Also N, P, R - designations from 95-100). A paper type respirator that may or may not contain and exhalation port or valve. The letter designation signifies the protection type, while the following number designation signifies the protection factor. Refer to Appendix F.

Negative pressure respirator: Means a respirator in which the air pressure inside the respiratory inlet covering is negative during inhalation with respect to the ambient air pressure.

Occupational Health Professional: An individual whom, by experience and education, is competent at recognizing, evaluating and controlling health hazards in the workplace.

Poor warning properties: A substance is said to have poor warning properties when its odor, taste or irritation effects are not detectable or not persistent at concentrations at or below recommended exposure limits.

Positive pressure respirator: A respirator in which the pressure inside the respiratory inlet covering is normally positive with respect to ambient air pressure.

PAPR - Powered air purifying respirator: An air purifying respirator that uses a blower to force ambient air through purifying elements, canisters, cartridges, etc.

Pressure demand respirator: A positive pressure respirator that releases respirable air when the positive pressure is reduced inside the facepiece by inhalation.

Qualified Employee: An employee who has successfully passes a medical exam, received respirator training, and has been fit tested.

Qualitative fit test: A pass/fail test that relies on the subjects sensory response to detect the challenge agent.
Quantitative fit test: A fit test that uses an instrument to measure a challenge agent or pressure differential inside and outside the respirator.

Radionuclide*:* An atom which spontaneously emits particles, gamma, or X radiation.

Respirator: A personal device designed to protect the wearer from the inhalation of hazardous atmospheres.

Respiratory inlet covering: The portion of a respirator that connects the wearer's respiratory tract to an air purifying device or respirable gas source, or both. It may be a facepiece, helmet, hood, suit or mouth piece/nose clamp.

Sanitization: Is the removal of contaminants and the inhibiting of the action of the agents that cause infection of disease.

SCBA - Self-contained breathing apparatus: An atmosphere supplying respirator in which the respirable gas source is designed to be carried by the wearer.

Service Life: Means the period of time that a respirator provides adequate protection to the wearer.

Sorbent: A material that is contained in a cartridge or canister and removes specific gases and vapors from the inhaled air.

STEL - Short Term Exposure Limit: The average concentration of a contaminant in air during a specific time period. Usually STELs are calculated for 30 minutes.

Suit: Is a respiratory inlet covering designed to cover the entire body. Does not include protective clothing that only provides skin protection.

SAR - Supplied Air Respirator: An atmosphere supplying respirator in which the respirable gas source is supplied to the user via a hose. The breathing air supply can come from compressed gas cylinders, air compressor, or air pump.

Tight fitting facepiece: A respiratory inlet covering that is designed to form a complete seal with the face. A half facepiece (includes quarter masks, disposable masks, and masks with elastomeric facepieces) covers the nose and mouth; a full facepiece covers the nose, mouth, and eyes.

TWA - Time-weighted average: The average concentration of a contaminant in air during a specific time period. Usually TWAs are calculated for 8 hours.

Vapor: The gaseous phase of matter that normally exists in a liquid or solid state at standard temperature and pressure.

Voluntary Use: Use of a respirator to avoid exposures to hazards, even if the amount of hazardous substance does not exceed the limits set by OSHA standards. A respirator can be provided for voluntary use, or an employee may provide their own respirator. Certain precautions must be considered to be sure that the respirator is adequate for the conditions and the respirator itself does not present a hazard. Refer to Appendix C.

4.0 RESPONSIBILITIES

A. Department Director/Administrator

1. The Director and/or Administrator of each department that utilizes respirators shall be responsible for the following:

    a. Assigning an individual responsible for implementation of the respiratory protection program in their department. This individual shall be afforded adequate time and resources to implement the requirements of this program.

    b. Responsible for the enforcement of compliance with this program, which includes appropriate disciplinary action for any City employee failing to follow this policy and program.

B. Division/Department

1. Each Department or Division will designate an individual to be responsible for the general administration of the Respiratory Protection Program. The designated individual, Respiratory Program Coordinator (Competent Person), in each department will be responsible for and will facilitate the following:

a. Coordinate all aspects of this program;
b. Develop standard operating procedures for employees who are required to wear respirators. (Appendix D);
c. Participate with Central Safety Services in annual evaluation of this program;
d. Coordinate, through Central Safety Services, baseline and periodic air monitoring to evaluate the level of employee exposure;
e. Coordinate, through Central Safety Services, appropriate respiratory protection required for maximum employee protection;
f. Assure that employees receive an initial medical evaluation prior to attending training and wearing of any respirator;
g. Assure that employees shall receive a follow-up medical evaluation and/or medical examination based upon a positive response to questions posed in the OSHA medical evaluation respirator questionnaire *or* whose initial medical evaluation or changes in the employee's medical health demonstrates the need for continuing medical monitoring regarding an employee's ability to wear a respirator;
h. Coordinate, through Central Safety Services, training for employees required to wear respirators;
i. Authorize departmental purchases of Central Safety Services approved respiratory equipment;
j. Perform and document periodic audits of respirator use, maintenance, and storage consistent with manufacturers' guidelines. Perform monthly inspections of SCBAs;
k. Authorize purchase, at City expense, spectacle kits and prescription lenses for employees requiring prescription eyewear while wearing full face respirators.

C. Supervisors

1. Lead personnel, such as Supervisors, shall be responsible for:

a. The implementation of this program including enforcement of employee compliance;
b. Providing time for employees to obtain medical exams, respirator training, completing of the Employee's Disclosure of Respiratory Health documentation (Appendix F) and respirator fit-testing;
c. Communicate to the Program Coordinator any medical conditions, signs or symptoms observed in employees that may be related to their ability to use a respirator.

D. Employees

1. City of Tucson employees shall be responsible for the following:

a. Use the provided respiratory protection in accordance with instruction and training. Employees shall not provide and/or use non City of Tucson issued respirators;
b. Guard against damage to issued respirators;
c. Report any respirator malfunctions to the department's designated program administrator or supervisor;
d. Follow the direction of the City Physician regarding any limitations on the use of the respirator under certain conditions and complete any follow-up medical evaluations as directed by the City Physician during initial medical evaluation;
e. Immediately report any medical conditions, signs or symptoms that may be related to their ability to use a respirator;
f. Complete the Employee's Disclosure of Respiratory Health (Appendix F) documentation prior to annual respirator fit-testing.

E. Central Safety Services

1. Central Safety Services shall be responsible for the following:

a. Administrate and annually evaluate this program.
b. Perform initial and periodic air monitoring to evaluate potential exposure;
c. Review standard operating procedures submitted by individual departments/divisions for approval;
d. Approve respiratory protective equipment for department/employee use;
e. Coordinate training for all employees required to wear respirators and administer parts of this program.
f. Perform qualitative and/or quantitative fit testing on an annual basis for all Departments, appropriate to the respirators selected and issued;
g. Maintain air monitoring records, employee training records, employee fit-testing records according to OSHA Standard.

F. City Physician

1. The Physician shall determine whether or not a person may be assigned to a task requiring the use of a respirator. Initial medical evaluations of employees covered by this program shall be conducted by the City Physician, or licensed physician under contract to the Tucson Fire Department for commissioned personnel.

5.0 EDUCATION AND TRAINING

A. Employee Training

1. Employees required to wear respirators and supervisors required to oversee the work activities of employees required to wear respirators shall be given information and annual training which includes the following:

a. Respiratory hazards and the consequences of improper respirator use;

b. Engineering and administrative control measures;
c. Respirator selection process;
d. Capabilities and limitations of the respirator;
e. Methods of donning the respirator and checking its fit and operation;
f. Proper wearing of the respirator;
g. Respirator maintenance and storage;
h. Recognition and response to emergency situations.

B. <u>Respirator Program Administrator (Competent Person)</u>

1. The Respiratory Program Administrator will receive additional training which will include annual refresher training to be provided by the City's Industrial Hygienist or a designated trainer.

6.0 General

A. <u>Medical Determination</u>

1. <u>Initial Evaluation</u>
   a) The City shall provide a medical evaluation to determine the employee's ability to use a respirator, before the employee is fit tested or required to use the respirator in the workplace.
   b) In determining the employee's ability to use a respirator, the City shall obtain a written recommendation from the City Physician. The recommendation shall include only the following information:
      - Any limitations on respirator use related to medical condition of the employee, or relating to the workplace conditions in which the respirator will be used, including whether or not the employee is medically able to use the respirator;
      - The need, if any, for follow-up medical evaluations; and
      - A statement from the City Physician that the employee has received a copy of the City Physician's written recommendations.
2. <u>Additional Evaluations</u>
   a) The department shall conduct an additional fit test whenever the employee reports, or the employer, city physician, supervisor, or program administrator makes visual observations of, changes in the employee's physical condition that could affect respirator fit. Such conditions include, but are not limited to:
      - facial scarring;
      - dental changes;
      - cosmetic surgery;
      - obvious change in body weight.
   b) The City shall provide additional employee medical evaluations for respirator use when:

- An employee reports medical signs or symptoms that are related to the use of a respirator while being fit-tested;
- Information from the Employee Disclosure of Respiratory Health, or direct observations made during fit testing and indicate a need for employee reevaluation;
- A change occurs in workplace conditions (e.g. physical work effort, protective clothing, temperature) that may result in a substantial increase in the physiological burden placed on an employee.
- An employee is specifically assigned to the work operations involving Asbestos Mitigation/Abatement, or who are potentially exposed to asbestos while obtaining samples for testing, where engineering and work practice controls are not feasible and require the assignment to wear a respirator with a protection factor equivalent to the class of abatement performed. Employees under this assignment shall comply with all medical testing and surveillance as required by OSHA 1910.1001or 1926.1101 – Asbestos.

B. <u>Respirator Selection</u>

1. The selection of the proper type of respirator shall be based on the following:

   a. Type of work being done;
   b. Respiratory hazard;
   c. Location of worksite;
   d. Duration of tasks requiring respiratory protection;
   e. The activities of workers in the hazardous area;
   f. Physical and functional capabilities of respirators; and
   g. Respiratory protection factors.

2. Questions to utilize in determining the Respiratory Hazard:

   a. What is the oxygen concentration?
   b. What contaminant may be present in the workplace?
   c. What is the exposure limit or toxicity of the contaminant? (i.e. OSHA - Permissible Exposure Limit, ACGIH - Threshold Limit Value, NIOSH - Relative Exposure Limit, LD-50, LC-50, etc.)
   d. Does a comprehensive standard exist for the contaminant? (i.e. lead, asbestos, cadmium)
   e. What is the concentration of contaminants?
   f. What are the physical characteristics of the contaminant? (i.e. particle size, vapor pressure, boiling point, specific gravity).
   g. Can the contaminant be absorbed through the skin, produce skin sensitization or be corrosive to the skin or eyes?
   h. Does the contaminant have a known odor, taste or irritation effect?

Appendix C includes a classification of respiratory hazards according to biological effect, physical properties, and a description of the various types of respirator classifications.

3. Respirators are specifically designed to protect against specific air contaminants. Different respirators protect against different contaminants. Use of an improper respirator may reduce or eliminate the intended protection. Injury or illness may result from the use of an improperly chosen respirator.

4. The City of Tucson has selected respirators which provide protection for their intended use. All respirators used by City of Tucson employees have been approved by the National Institute for Occupational Safety and Health (NIOSH) and/or the Mine Safety and Health Administration (MSHA).

5. The City of Tucson is specifying and providing the appropriate respirator for jobs where respirators are necessary.

   a. Employees shall not substitute other respirators.
   b. Employees shall not supply their own respirators.

C. Fit Testing

1. A qualitative and/or quantitative respirator fit test shall be used for all negative pressure respirators to determine the ability of each respirator wearer to obtain a satisfactory fit. Fit testing shall be conducted annually. Fit testing shall be conducted every 6 months for employees working with asbestos.

   a. Qualitative fit testing
   The respirator wearer is challenged with irritant smoke, an odorous vapor, or other suitable agent. An appropriate filter cartridge is used to remove the challenge agent. If the respirator wearer cannot detect the challenge agent, then the respirator fits. This test is either pass or fail.

2. Quantitative fit testing
   a. The respirator fit is tested by instrumentation that measures either:

      - The relationship between the concentration of a challenge material inside the respirator verses outside the respirator; or,
      - The respirator leak rate related to the difference of pressure between inspiration and expiration.
      - The respirator wearer shall be required to perform a series of exercises during the fit test.

D. Assigned Protection Factors (APFs)

1. Employers must use the assigned protection factors listed in Table 1 to select a respirator that meets or exceeds the required level of employee protection. When using a combination respirator (e.g., airline respirators with an air-purifying filter), employers must ensure that the assigned protection factor is appropriate to the mode of operation in which the respirator is being used.

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 (PAPR)	.....	50	1,000	[4]25/1,000	25
3. Supplied-Air Respirator (SAR) or Airline Respirator					
• Demand mode	.....	10	50	.....	.....
• Continuous flow mode	.....	50	1,000	[4]25/1,000	25
• Pressure-demand or other positive-pressure mode	.....	50	1,000	.....	.....
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 CFR 1910.134 (d)(2)(ii).

E. Cartridge Selection and End of Service Life Indicator

1. For protection against gases and vapors, the department shall provide:

   a. atmosphere-supplying respirator, or
   b. an air purifying respirator, provided that:

   The respirator is equipped with an end-of-service-life indicator (ESLI) certified by NIOSH for the contaminant.

2. If there is no ESLI appropriate for conditions in the department workplace, the department shall implements a change schedule for canisters and cartridges that is based on objective information or data that will ensure that canisters and cartridges are changed before the end of their service life. The employer shall describe in the respirator program the information and data relied upon and the basis for the canister and cartridge change schedule and the basis for reliance on the data. The department shall select and develop a cartridge change out schedule based upon:

   a. Experimental Test;
   b. Manufacturer's Recommendation;
   c. Math Model.

F. Facial hair

1. Respirators shall **NOT** be worn if facial hair contacts any portion of the face piece. Beards, long sideburns, or long mustaches shall not be worn by respirator users or may require trimming to afford the proper fit.

G. Respirator Assignment

1. Only those employees who have been medically qualified, received training, and have been fit tested will be allowed to wear respirators, other than for voluntary use of an N95 Respirator.

H. Identification Cards

1. Employees who have completed the medical exam, respirator training, and pertinent respirator fit testing will be issued a color-coded Identification Card. The Respirator ID Card and a photo ID must be presented prior to receiving a respirator for work. Employees will only receive the type of respirator for which they qualify (i.e., trained and fit tested).

I. Stores and Vendors

1. Stores personnel will require employees to show their respirator ID prior to receiving new respirators or cartridges. Respirator Program Coordinators will have the authority to draw respirators from stores for groups of qualified employees.

J. Respirator Storage

1. All respirators must be stored in a clean, uncontaminated area when not in use. Zip-lock or other type plastic bags are available for storing reusable respirators. Disposable-type respirators will be stored in plastic bags prior to use.

K. Respirator Maintenance

1. Disposable Respirators
   Disposable respirators will be disposed of with other contaminated material at the end of each shift or use.

2. Reusable Respirators
   Reusable respirators must be inspected and cleaned after each use. Particular attention should be given to the rubber or plastic parts which can deteriorate. Respirator face pieces must be cleaned with soap and water. Shared reusable respirators will be sanitized prior to use.

3. SCBAs (Self Contained Breathing Apparatus)
   SCBAs will be inspected at least monthly or after each use. Regulator and warning devices must be checked to ensure their proper function. All other maintenance will be conducted according to manufacturers' requirements.

4. Emergency-use Respirators
   Emergency rescue equipment must be cleaned and disinfected immediately after each use. Records must be kept of inspection dates and findings. The respirator manufacturer's instructions must be followed for any repair. Repair or replacement of parts shall meet the manufacturer's recommendations. Regulator repair shall only be performed by factory certified technicians.

L. Program and Work Area Surveillance

1. Central Safety Services
   a. The Central Safety Service's Industrial Hygienist will periodically evaluate the respirator program to ensure that it is effectively protecting the employees' health. The evaluation will include a survey of employee complaints, suggestions, and periodic air monitoring to evaluate the effectiveness of controls and current work practices.

2. IDLH Atmospheres
   a. Persons wearing SCBAs or Supplied Air Respirators (SARs) in Immediately Dangerous to Life and Health (IDLH) atmospheres must be accompanied by an attendant, or second person, equipped with the appropriate personal protective equipment. This attendant shall be present in the event of an emergency and maintain constant communication with the first employee. Employees using SCBAs or SARs or a combination of both in confined spaces must wear retrieval equipment (e.g., safety harness and lifeline). See the Permit-Required Confined Space Program for more information.

M. Breathing Air Quality

1. All breathing air systems used for SCBAs and SARs shall meet the requirements for Grade D breathing air as described in Compressed Gas Association Commodity Specifications.

7.0 ADVICE AND COUNSEL

A. Respirator Program Administrator

1. It is the Respirator Program Administrator's responsibility to monitor this program and to recommend changes to the Central Safety Services Industrial Hygienist.

B. Program Review

2. The Respirator Program Administrator will review this program annually.

APPENDIX A

Classification of Respiratory Hazards According to Biological Effect

The purpose of this section is to list and briefly describe various categories of respiratory hazards.

OXYGEN DEFICIENCY
Minimum oxygen requirement = 19.5%

Conc.	Physiological Effects
16-12%	Loss of peripheral vision, increased breathing volume, accelerated heartbeat, impaired attention and thinking, impaired coordination.
12-10%	Very faulty judgment, very poor muscular coordination, muscular exertion causes fatigue that may cause permanent heart damage, intermittent respiration.
10-6%	Nausea, vomiting, inability to perform vigorous movement, unconsciousness followed by death.
< 6%	Spastic breathing, convulsive movements, death in minutes.

GAS AND VAPOR CONTAMINANTS

Asphyxiants interfere with utilization of oxygen in the body.
Simple asphyxiants Physiologically inert substances that dilute oxygen in the air. (e.g. nitrogen, methane, hydrogen, helium).
Chemical asphyxiants Low concentrations interfere with supply or utilization of oxygen in the body (e.g. carbon monoxide, hydrogen cyanide, nitrides).
Irritants are corrosive in action and typically result in irritation and inflammation of the respiratory tract, eyes, and skin (e.g. ammonia, formaldehyde, sulfur dioxide, chlorine, ozone, nitrogen dioxide).
Anesthetics cause loss of feeling and sensation with unconsciousness and possible death (e.g. nitrous oxide, hydrocarbons, ethers, carbon tetrachloride, benzene).
Sensitizers cause increased probability of physiological reactions (e.g. isocyanates, epoxy resins).
Systemic Poisons damage organs and systems in the body (e.g. mercury, phosphorus, hydrogen sulfide).

Carcinogens produce cancer in some individuals after a latent period (e.g. vinyl chloride, benzene).

PARTICULATE CONTAMINANTS

Relatively inert May cause discomfort and minor irritation, but generally without injury at reasonable concentrations (e.g. marble, gypsum).
Pulmonary-fibrosis Produces nodulation and fibrosis in the lung, possibly leading to complications (e.g. asbestos, silica).
Carcinogens Produce cancer in some individuals after latent period (e.g. asbestos, chromates, radioactive particles).
Chemical irritants Produce irritation, inflammation, and ulceration in upper respiratory tract (e.g. acid mists, basic mists).
Systemic Poisons Produce pathologic reactions in various systems of the body (e.g. lead, manganese, cadmium).
Allergy Produce reactions such as itching, sneezing, and asthmas (e.g. pollens, spices, animal fur).
Febrile-reactions Produces chills followed by fever (e.g. fumes of zinc and copper).

Appendix B

Classification of Respiratory Hazards According to Their Properties Which Influence Respirator Selection

The purpose of this section is to provide basic information on the physical and chemical properties of chemicals which influence choice of respirator.

GAS AND VAPOR CONTAMINANTS

Inert Substances that do not react with other substances under most conditions, but create a respiratory hazard by displacing air and producing oxygen deficiency (e.g. helium, neon, argon, nitrogen).
Acidic Substances that are acids (pH <7) or that react with water to produce an acid (e.g. hydrogen chloride, acetic acid, carbon dioxide, hydrogen cyanide).
Alkaline Substances that are basic (pH >7) or that react with water to produce an alkali (e.g. ammonia, amines, phosphine, arsine).
Organic Compounds that contain carbon. Classifications include aliphatic hydrocarbons (e.g. methane, ethane, propane, butane, hexane) aromatic hydrocarbons (e.g. benzene, toluene, xylene, phenol) alcohols (e.g. isopropyl alcohol) ketones (e.g. MEK) halides (e.g. chloroform, carbon tetrachloride) aldehydes (e.g. formaldehyde), etc.
Organometallic Compounds in which metals are chemically bonded to organic groups (e.g. ethyl silicate, tetraethyl lead).
Hydrides Compounds which hydrogen is chemically bonded to metals and certain other elements (e.g. diborane, tetraborane).

PARTICULATE CONTAMINANTS

Particles produced by mechanical means and disintegration processes such as grinding, crushing, drilling, blasting, and spraying; or by physiochemical reactions such as combustion, vaporization, distillation, sublimation, calcination and condensation.

Dust A solid, mechanically produced particle with sizes varying from submicroscopic to visible or macroscopic (e.g. metal dust from sanding operations, nuisance dust).
Spray A liquid, mechanically produced particle with sizes generally in the visible or macroscopic range (e.g. paint overspray).
Fume A solid condensation particle of extremely small particle size, generally less that one micrometer in diameter (e.g. zinc oxide fumes formed during welding operations).
Mist A liquid condensation particle with sizes ranging from submicroscopic to visible or macroscopic (e.g. oil mist in metal tooling operations)
Fog A mist of sufficient concentration to perceptibly obscure vision.
Smoke A system which includes 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 air. Smoke is usually of sufficient concentration to perceptibly obscure vision.

Appendix C

Classification, Capabilities, And Limitations Of Respirator

Self Contained Breathing Apparatus (SCBA)

A supply of air, oxygen, or oxygen-generating material carried by the wearer. Normally equipped with a full facepiece, but may be equipped with a quarter-mask facepiece, half-mask facepiece, helmet, hood, or mouthpiece and nose clamp.

1. Open-Circuit SCBA
   A. Demand type.
   B. Pressure Demand type.

The amount of time a user is protected is limited by the volume of air that can be supplied by the system and the rate of air usage. Factors such as cylinder size, rebreather capacities, atmospheric pressure, and physical activity of the wearer all affect the length of time a SCBA may last. Limitations of SCBAs are their weight, bulk, service life, and training required for their maintenance and safe use.

Supplied Air Respirator (SAR)
A supply of air is provided to the wearer by a hose connected to the source of breathing air.

2. Air-Line Respirator.
   A. Continuous flow class.
   B. Demand type.
   C. Pressure demand type.

The respirable air supply is not limited. The devices are lightweight and simple to operate. Limited to use in atmospheres that are **NOT** Immediately Dangerous to Life and Health (IDLH). The wearer is restricted in movement by the length and weight of the hose.

Combination Air-Line/Auxiliary Self-Contained Air Supply
Primarily an air-line system equipped with an emergency escape bottle.

Air-Purifying Respirators (APR)
Ambient air passes through a filter, cartridge, or canister, which removes particles, vapors, gases, or a combination of these contaminants prior to being inhaled by the wearer.

1. Negative Pressure
   Breathing action filters air. Includes disposable dust, mist, fume respirators.

2. Powered Air Purifying Respirator (PAPR)
   Blower provides filtered air to user.

NOTE: Under certain conditions, PAPRs may be provided to employees required to wear negative pressure respirators for long periods of time. Air-purifying respirators do **NOT** protect against oxygen-deficient atmospheres. Protection from airborne contaminants is **LIMITED** to design of the filtering devices and face seal. Labels on cartridges used for gases and vapors indicate the maximum airborne concentration for their approved use. Particulate filters have a life expectancy dependent on air concentration, duration of use, and efficiency of filter media.

Combination SAR/APR and SCBA/APR

1. Supplied-air respirator supplied with an air- purifying respirator for added protection in the event the SAR should fail.
2. Air-purifying respirator supplied with an escape bottle for added protection when the atmosphere may exceed safe conditions.

APPENDIX D

STANDARD OPERATION PROCEDURES

Dept. _____

Phone _____

1) Selection of Respirators

The following areas where respirators are used;

1)

2)

3)

2) In the areas listed above, the following chemical and/or hazards exist;

Area	Chemical and/or Hazard
1)	
2)	
3)	

3) The respirator selected for the employees in those areas are:

Area	Chemical and/or Hazard
1)	
2)	
3)	

4) Procedures for routine respirator use;

5) Respirator cleaning requirements;

6) Emergency procedures and/or potential dangerous atmospheres;

Program Administrator_____Date_____

Industrial Hygienist_____Date_____

Example - Standard Operation Procedures

Dept. Safety
Phone -4728

1) Selection of Respirators

The following areas where respirators are used;

1) FD&M asbestos team (Air Monitoring)
2) Solid Waste - Landfill operations (Air Monitoring)

2) In the areas listed above, the following chemical and/or hazards exist;

	Area	Chemical and/or Hazard
1)	Asbestos Team	Asbestos
2)	Solid Waste (Landfill)	Nuisance Dust

3) The respirator selected for the employees in those areas are:

	Area	Chemical and/or Hazard
1)	Asbestos Team	MSA ½ face w/HEPA filter
2)	Sanitation	3-M 9920 dust, mist, fume

4) Procedures for routine respirator use;

1) ½ face HEPA respirators worn during all operations involving exposures to less than 10X the asbestos PEL.
2) Dust, mist, fume respirators worn during all operations at the Los Reales landfill.

5) Respirator cleaning requirements;

1) MSA ½ face HEPA respirators are dismantled, used filters are discarded, rubber and plastic parts are washed in soap and water, parts are air dried prior to re-assembly.
2) 3-M Dust, mist, fume respirators are discarded after use.

6) Emergency procedures and/or potential dangerous atmospheres;

1) In the event of an emergency call 911. In the event of changing atmospheric conditions additional respiratory protection will be evaluated for added protection.
2) In the event of an emergency call 911. No additional respiratory hazards are expected at the landfill.

Program Administrator_____Date_____

Industrial Hygienist_____Date_____

APPENDIX E
Voluntary Use of Disposable Respirators
Voluntary Use of N95 Respirators

Voluntary Use of Disposable Respirators

You have voluntarily chosen to wear a disposable respirator provided through City of Tucson Stores. OSHA requires the City of Tucson to provide to anyone voluntarily using such a respirator the following information:

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 you respirator into atmospheres containing contaminants for which your respirator is not designated 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.*

In addition, voluntary N95 disposable respirator users should understand the following:

- Respirators should be disposed of and replaced with a new one each time they are removed.
- Talking while wearing a respirator may limit its effectiveness.
- Use of an N95 type disposable respirator will limit exposure to non-oily particulate hazardous substances but can not guarantee exposure prevention.
- Central Safety Services (791-4343 x221) should be contacted prior to the use of a respirator if you have any questions or concerns.

I, _____, hereby agree that I have received, read, understood and had an opportunity to ask questions about City of Tucson safety policies and procedures. Any additional questions I may have may be directed to Central Safety Services (791-4343 x214).

By signing this form, you are acknowledging that you have read and understand all of its content.

_____	_____	_____
Signature	Employee #	Date

SAFETY FIRST

Voluntary Use of an N95 Disposable Respirator

You have voluntarily chosen to wear an N95 disposable respirator. OSHA requires the City of Tucson to provide to anyone voluntarily using such a respirator the following information:

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:

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

6. *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.*

7. *Do not wear you respirator into atmospheres containing contaminants for which your respirator is not designated 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.*

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

In addition, voluntary N95 disposable respirator users should understand the following:

- Respirators should be disposed of and replaced with a new one each time they are removed.
- Talking while wearing a respirator may limit its effectiveness.
- Use of an N95 type disposable respirator will limit exposure to non-oily particulate hazardous substances but can not guarantee exposure prevention.
- Central Safety Services (791-4343 x221) should be contacted prior to the use of a respirator if you have any questions or concerns.

I, _____, hereby agree that I have received, read, understood and had an opportunity to ask questions about City of Tucson safety policies and procedures. Any additional questions I may have may be directed to Central Safety Services (791-4343 x221).

By signing this form, you are acknowledging that you have read and understand all of its content.

_____	_____	_____
Signature	Employee #	Date

SAFETY FIRST

Appendix F
Employee's Disclosure of Respiratory Health

The City shall provide a medical evaluation to determine the employee's ability to use a respirator, before the employee is initially fit tested or required to use the respirator in the workplace.

The City shall provide additional employee medical evaluations conducted by the City Physician for respirator use when employees voluntarily disclose a medical condition occurring within the past calendar year since the previous respirator fit test.

Wearing a respirator of any type is physically demanding. To ensure employees are physically able to work under the demands of respiratory protection, employees are encouraged to report changes in their respiratory health since a previous respirator fit-test that may affect their ability to wear a respirator. Those health changes include, but are not limited to:

- Change in cardiac health or development of a cardiac related condition;
- Development of a disease affecting the respiratory system;
- Viral infection of the respiratory system;
- Bacterial infection of the respiratory system;
- Fungal infection of the respiratory system;
- Surgery involving the heart, respiratory or circulatory systems;
- An invasive injury to the respiratory system, including fractures to the ribs or sternum.

☐ I have read the Employee's Disclosure of Respiratory Health and have not experienced any changes to my health during the previous year that will affect my ability to wear a respirator.

☐ I have read the Employee's Disclosure of Respiratory Health and have or may have experienced a change in my health during the past year. I request a formal medical evaluation prior to respirator fit-testing.

Employee Name: _____ Employee Number: _____

Signature: _____ Date: _____