

## **RESPIRATORY PROTECTION PROGRAM**

Date program this instituted: \_\_\_\_\_

Program Last revised: \_\_\_\_\_

Original program written by: Monona Rossol, M.S., M.F.A., Industrial Hygienist,  
Health & Safety Officer, United Scenic Artists Local 829

### **I. Scope**

This program was developed to protect the employees of \_\_\_\_\_ from exposure to toxic airborne substances associated with their jobs and to comply with 29 CFR 1910.134. This program also will be applied to any volunteers and other non-employee personnel who may be at risk from airborne substances. It does not apply to outside contractors.

### **II. Assessing Respiratory Risk**

The first step in assessing respiratory risk is through our hazard communication program (29 CFR 1910.1200). This program includes training our employees to interpreting hazard data on materials safety data sheets(MSDSs). This enables employees and their supervisors to review the MSDS(s) associated with the product(s) with which he or she will work to determine if protection is needed. (See APPENDIX A)

The second step is to assess the type of protection that is needed. There are two primary methods of protection from airborne toxic substances: ventilation and respiratory protection. OSHA requires ventilation to be used as protection whenever feasible. Projects that can be accommodated by existing ventilation systems will be done in them.

Ventilation is not required for the non-routine, occasional tasks that vary with the different projects that are done in the shop. OSHA allows respiratory protection to be used in such cases. Respirators also are used as an adjunct (back up) to ventilation when there is reason to believe the system will not prevent all exposure.

If there is any question about whether respiratory protection or ventilation is required, free advice can obtain by telephone from an industrial hygienist, Monona Rossol (212/777-0062), Health and Safety Officer for the United Scenic Artists. Ms. Rossol has surveyed this shop on

\_\_\_\_\_ (date) and is acquainted with it's ventilation systems and equipment.

### **III. Types of Respiratory Protection**

Types of respiratory protection include:

- A. Half face disposable masks
- B. Half face cartridge air-purifying respirators
- C. Full face cartridge air-purifying respirators
- D. Full face powered air purifying respirators
- E. Full face air line respirators
- F. Full face self-contained breathing apparatus

At present, our shop uses (list types)

\_\_\_\_\_  
\_\_\_\_\_

Determining the type of respirator that is appropriate for each task is essential. The wrong kind of respirator will not be protective. Respirators must be selected based on the nature of the material causing the respiratory risk. If there are

questions about which type of respirator to use, review MSDSs, talk to the respirator manufacture or distributor, or call the U.S.A.'s Health and Safety Officer, Monona Rossol (212-777-0062).

No respirator should be used that does not have a NIOSH certification number. See APPENDIX B for additional information.

#### **IV. Supervision**

Every workplace must have one individual responsible for assuring that the respiratory protection measures outlined in this practice are followed. In this shop,

\_\_\_\_\_ is responsible.

#### **V. Training**

Every employee who engages in work for which respiratory protection is indicated must be trained in the proper use of the respirators appropriate for that job. Employees must be retrained if they change or add to the types of equipment they use. Training updates shall be conducted annually. Training shall be the responsibility of

\_\_\_\_\_.

(See APPENDIX C for further information)

#### **VI. Medical Testing**

All respiratory protection devices impose some kind of physiological stress on the user. Air-purifying respirators, for example, make breathing more difficult. People with heart or lung diseases or other health problems may be harmed by wearing a respirator. Many physicians also counsel pregnant patients against wearing respirators.

At this shop, the procedures in APPENDIX D will be used to assure the employer that the employee can safely wear a respirator. All medical records will be kept confidential, but each worker can see their own test results on request.

#### **VII. Fit Test Requirement**

Once an employee has passed the medical exam, a fit-test must be done before the staff member uses a respirator. The purpose of the fit test is to ensure that the mask fits securely and does not allow vapors, fumes, etc. to enter and be inhaled by the staff member. This test will be performed by a qualified fit tester. The current qualified fit tester(s):

\_\_\_\_\_

A record of the fit test will be kept on file (APPENDIX E).

#### **VIII. Shaving Requirement**

In order to assure that the respirator fits properly, all employees required to wear a respirator must be clean shaven. (Optional: Moustaches that do not extend below the lower lip and do not interfere with the respirator fit may be worn.) Employees required to wear respirators as part of his job must remain clean shaven. Clean shaven means that the employee has no beard or shadow that will prevent the respirator to make a smooth seal with the face. No employee will be allowed to wear a respirator or be fit tested unless the shaving requirement has been met.

#### **IX. Maintenance, Cleaning, and Storage**

**A. Integrity of Mask**—Before each use, employees should check to see if there is any deterioration or damage to the mask. This includes a check for:

- Excessive dirt
- Cracks, tears, or holes

- Distortion from improper storage
- Cracked, scratched or loose lens (for full face-type)
- Broken or missing mounting clips
- Deterioration of rubber straps, hoses, nose clips, etc.
- Inhalation/exhalation valve damage
- Filter/canister and housing damage: gaskets, worn threads,
- housing, dents, corrosion, expired or spent.

Employees should never alter or repair a respirator. Only replacement parts from the manufacturer of the equipment can be used.

**B. Integrity of Filters and Cartridges**—Staff should be aware of the expiration time of cartridges. Even when unused, cartridges expire and must be discarded. The time it takes cartridges or dust masks to be spent during work is dependant on the concentration of the contaminant in air the wearer breathes. In general, dust masks should be disposed of after eight hours of use or when it becomes difficult to breathe through them. Cartridges usually are considered spent after eight hour of consecutive use, after two weeks (even without much use), or when break-through is detected by the wearer—which ever comes first.

### **C. Fit of Mask**

In addition to the required formal fit testing by a qualified person, the snug fit of the mask should be checked before each use. There are two primary systems for checking fit when donning the mask, the positive pressure and the negative pressure test, both of which should be conducted each time the mask is donned:

#### **1. The positive pressure fit test.**

- Creates a positive pressure in the mask. Block off the exhalation valve in the chin area at the front of the mask, by placing the heel of the hand over the hole in valve. Exhale gently into the mask. If the respirator face piece bulges slightly and no air leaks between face and face piece are felt, a proper fit has been obtained.

#### **2. The negative pressure fit test.**

- Creates a negative pressure in the mask. Place the palms of the hands over the attached filters. Inhale for five to ten seconds. The face piece of the respirator should collapse slightly; if no air is felt coming into the edges of the mask, a proper fit has been obtained.

### **D. Storage of the Mask**

After the respirator has been removed, the staff member should place it in a plastic bag provided by the supervisor and store it in a secure location. The respirator should be protected from dust, light, heat, cold, moisture or chemicals. Respirators should not be placed in such a position that soft parts made of rubber and plastic deform.

### **E. Cleaning of Respirator**

Periodically, respirators should be cleaned and disinfected. Most can be washed in a detergent solution and immersed in a sanitary solution. However, rubber and plastic can be damaged by strong cleaning agents. Please check the manufacturer's materials concerning cleaning.

## **X. Evaluation of Respirator Program Effectiveness**

Annually, the employer will consider the effectiveness of the program and meet with employees to discuss any problems or changes that should be made in it. Plans for updating of training and fit testing should also be done annually.

## APPENDIX A—USING THE MSDS

The primary method of determining whether respiratory hazards exist is through the hazard communication program. Before working with any potentially hazardous material, the employee should have had the Right to Know training provided by the employer. Employees and Supervisors then should review the Material Safety Data Sheet (MSDS) for the substance being used. In order to do this, workers must be familiar with the terminology of respiratory risk and protection used on the MSDS. The most common MSDS terms that apply to respiratory issues are:

- **Asphyxiant**—A vapor or gas that can cause unconsciousness or death by suffocation (lack of oxygen). Most simple asphyxiants are harmful to the body only when they become so concentrated that they reduce oxygen in the air (normally about 21 percent) to dangerous levels (18 percent or lower). Asphyxiation is one of the principal potential hazards of working in confined or enclosed spaces.
- **Ceiling Limit (PEL or TLV)**—The maximum allowable human exposure limit for an airborne substance which is not to be exceeded even momentarily.
- **Confined Space**—Any area that has limited openings for entry or exit that would make escape difficult in an emergency, has a lack of ventilation, contains known and potential hazards, and is not intended nor designated for continuous human occupancy. Even if your job does not have any confined space issues, it is still important to recognize the issue. It is conceivable that a scene shop could contract to do a project in which the worker would have to work inside a project. Examples might include magician's trunk illusions or the inside of a man-eating (Audrey) plant.
- **Dust**—Solid particles generated by handling, crushing or grinding.
- **F/cc**—Fibers per cubic centimeter, a measurement used to assess the number air-borne fibers of substances such as asbestos.
- **Fibrosis**—An abnormal thickening of fibrous connective tissue, usually in the lungs.
- **Fume**—A solid condensation particle of extremely small diameter, commonly generated from molten metal as metal fume.
- **Inhalation**—Breathing in of a substance in the form of a gas, vapor, fume, mist or dust.
- **Local Exhaust**—A system for capturing and exhausting contaminants from the air at the point where contaminants are produced (welding, grinding, sanding, etc.)
- **mg/m<sup>3</sup>**—Milligrams per cubic meter is a unit for expressing concentrations of dusts, gases or mists in air.
- **Mist**—Suspended liquid droplets generated by condensation from the gaseous to the liquid state, or by breaking up a liquid into a dispersion, such as splashing, foaming or atomizing. Mist is formed when a finely divided liquid is suspended in air.
- **mppcf**—Million particles per cubic foot is a unit for expressing concentration of particles of a substance suspended in air. Exposure limits for mineral dusts (silica, graphite, Portland cement, nuisance dusts, and others) formerly expressed as mppcf, are now more commonly expressed in mg/m<sup>3</sup>.
- **Odor threshold**—The lowest concentration of a substance's vapor that can be smelled by most people.
- **Pneumoconiosis**—A condition of the lung in which there is permanent deposition of particulate matter and the tissue reaction to its presence. It may range from relatively harmless forms of iron oxide deposition to destructive forms of silicosis.
- **ppb and ppm**—Parts per billion and parts per million. Expresses volume concentration by parts of gas or vapor in a billion or million parts of air.

- **Pulmonary edema**—fluid in the lungs
- **REL**—The NIOSH Recommended Exposure Limit is the highest allowable airborne concentration which is not expected to injure most healthy adult workers. It may be expressed as a ceiling limit or as a time-weighted average.
- **Respiratory System**—The breathing system that includes the lungs and the air passages (trachea or “windpipe,” larynx, mouth and nose) to the air outside the body, plus the associated nervous and circulatory supply.
- **Routes of Entry**—The means by which material may gain access to the body of which there are four: inhalation, ingestion, skin contact and injection.
- **Silicosis**—A disease of the lungs (fibrosis) caused by the inhalation of silica dust.
- **Smoke**—A dense mixture of many gases, vapors, fumes, and carbon particles resulting from incomplete combustion.
- **Target Organ Effects, Target Organ Toxins**—Substance may have an effect or be a toxic with respect to a particular organ group. For example, the predominant target organ for asbestos and silica is the lung.
- **TCL**—Toxic Concentration Low—Lowest concentration of a gas or vapor capable of producing a defined toxic effect in a specified test species over a specified time.
- **TLV**—Threshold Limit Value is a term used by ACGIH to express the airborne concentration of material to which nearly all healthy adult workers can be exposed day after day without adverse effects. ACGIH expresses TLV three ways:
  1. **TLV-TWA:** The allowable Time-Weighted Average concentration for a normal 8-hour workday or 80-hour workweek.
  2. **TLV-STEL:** The Short-Term Exposure Limit, or maximum concentration for a continuous 15-minute exposure period (maximum of four such periods per day, with at least 60 minutes between exposure periods, and provided the daily TLV-TWA is not exceeded).
  3. **TLV-C:** The Ceiling Exposure Limit—the concentration that should not be exceeded even instantaneously.
- **TWA**—Time-Weighted Average exposure is the airborne concentration of a material to which a person is exposed, averaged over the total exposure time—generally the total workday (8 to 12 hours).
- **Vapor**—The gaseous form of a solid or liquid substance as it evaporates.

## APPENDIX B: TYPES OF RESPIRATORS

There are two primary kinds of mask respirators, air-purifying respirators and atmosphere-supplying devices.

### **A) Air-purifying respirators**

Air-purifying respirators remove contaminants from the air. They do not supply oxygen. Do not use an air-purifying respirator in an oxygen deficient atmosphere. There are four kinds of air-purifying respirators: mechanical filter, chemical cartridge, combination and gas mask.

1. **Mechanical filter**—Can protect wearer from both solid and liquid particles. These include dusts, mists, fumes, smokes and aerosols. Can be a disposable type made with laminated filter (a dust mask), or a face piece with a filter holder. Mechanical filters do not protect wearers from gases or vapors.
2. **Chemical cartridge respirators**—Designed to protect wearer from hazardous substances such as acid gases, organic vapors, ammonia, formaldehyde, and certain pesticides. Cartridges usually contain activated or chemically treated charcoal. There are many organic chemicals for which there are no NIOSH approved chemical cartridges. Some which may be encountered in scene shops include methanol, methylene chloride, carbon monoxide, isocyanates, hydrogen sulfide, ozone, nitrogen oxides, nitric acid, acrolein, aniline and dimethylaniline, formaldehyde, nitrobenzene, perchloroethylene, phosgene, and more (see SCBA, below).
3. **Combination respirator**—Combines both mechanical and cartridge elements to protect against multiple contaminants.
4. **Gas mask**—Similar to a cartridge respirator, but a canister contains a bed of filters for use with higher concentrations of contaminants.

### **B) Atmosphere-supplying Respirators**

An atmosphere-supplying respirator supplies air that is independent of the air surrounding the wearer. Two main types: self-contained breathing apparatus, and the air-supplying respirator.

1. **Self-contained breathing apparatus**—Or SCBA provides its own air, which the wearer carries. Provides a wide variety of contaminants at almost any concentration. When substances cannot be captured by a cartridge respirator, SCBA can be a method for respiratory protection. Some substances that would be involved are: Acrolein, Acrylonitrile, Aniline, Arsine, Boron hydrides, Bromine, Carbon dioxide, Carbon disulfide, Carbon monoxide, Carbonyls, Cyanogen, Dimethylaniline, Dimethylsulfate, Ethyl cyanide, Fluorine, Formaldehyde gas, Hydrofluoric acid, Hydrogen cyanide, Hydrogen fluoride, Hydrogen selenide, Hydrogen sulfide, Methane, Methyl bromide, Methylene chloride, Methyl iodide, Nickel carbonyl, Nitrobenzene, Nitrogen oxides, Nitroglycerine, Nitro-methane, Ozone, Perchloroethylene, Phosgene, Phosphine, Phosphorus trichloride, Stibine, Sulfuryl fluoride.
2. **Supplied-air respirator**—Provides air from a stationary source that is remote from the wearer. Are not acceptable in atmospheres that are immediately dangerous to life and health.

### **Proper Use of Respirator**

Respirators are for use only when necessary, and it is not recommended that they be worn constantly when not necessary. Staff should understand the purpose and limitations of a respirator before using one.

**APPENDIX C—TRAINING**

Every employee who engages in work with which there is a respiratory risk associated must be trained in the proper use of the respiratory protection appropriate for that job. Such training must include at least a half hour session going through the substance of this Program and a test which assesses the comprehension of the essential factors of respiratory protection. An employee who takes on additional or different responsibilities with different respiratory risks must be retrained in the appropriate types of respiratory protection.

Issues which must be covered in training and testing are:

1. When a respirator must be used, generally, and for the specific tasks undertaken by this employee with this respirator.
2. How to properly wear and adjust for proper fit this particular respirator.
3. The substance(s) for which the respirator will protect the employee and what limitations the respirator has, including its useful life.
4. The proper maintenance, care and storage of the respirator.

A record of the training must be kept. The following form can be used:

**Record of Respiratory Protection Training**

This form should be filled out in the employee's hand writing.

Employee \_\_\_\_\_ Date: \_\_\_\_\_

Employee Job Title/Description: \_\_\_\_\_

Please describe the job(s) you will be doing, including listing all substances involved with respiratory risks:

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Please describe the type of respiratory protection provided for the job(s) in the previous paragraph. If you are using ventilation as protection, please describe the ventilation. If you are using a respirator, continue with the specific questions regarding respirators below.

Respirator model selected: \_\_\_\_\_

Manufacturer: \_\_\_\_\_

NIOSH Approval Number: \_\_\_\_\_

Effective life of respirator: \_\_\_\_\_

Proper storage and care of respirator: \_\_\_\_\_

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Proper fit and adjustment of respirator: \_\_\_\_\_

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Any other limits of respirator: \_\_\_\_\_

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Employee Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Training and Test Conducted by: \_\_\_\_\_ Date: \_\_\_\_\_

**APPENDIX D—MEDICAL REQUIREMENTS**

Insert here a medical history questionnaire or the name of the physician or clinic that will make the medical determination.

## **APPENDIX E—FIT-TEST REQUIREMENT**

The purpose of the fit test is to insure that the mask seals to the face and does not allow air contaminants to enter the mask between the skin and the respirator. An improperly fitting respirator does not protect the wearer.

The fit test must be performed by a qualified person. Respirator distributors and manufacturers sell fit-testing equipment and usually have programs for training workers to do fit tests.

There are three basic types of fit tests:

1. amyl acetate (for respirators with organic vapor cartridges)
2. saccharine (for dust and fume masks or cartridges)
3. irritant smoke (for dust and fume masks or cartridges)

If the primary method of fit-testing will be the banana oil test (amyl acetate). It will be conducted in the following manner.

A Sensitivity Test should be conducted to insure that the test subject can detect the test solution. The test subject should not eat, drink or chew gum for at least 15 minutes before the test. The subject should enter the test hood or test tent without a respirator. A very diluted amount of the test vapor should be injected into the booth or hood. Ask the test subject if he or she can smell the odor. If not, inject a comparable amount again. If the subject can smell the banana like odor, the fit-test can proceed. If the subject cannot smell the odor, another method of fit-test such as irritant smoke or saccharine should be used.

Once the test subject has successfully completed the Sensitivity Test, he or she can go on to be fit-tested. If the test subject does not already know which respirator is most likely to fit their face, three different sizes of respirator should be provided from which to choose. The selected respirator then will be fitted with an organic vapor cartridge. The test subject should put on the respirator and adjust the straps until an adequate fit is achieved. The negative and positive pressure fit-tests should be performed. A mirror should be provided so that the subject can visually check the fit.

The subject should enter the test tent or put on the test hood. The Amyl acetate solution should be injected into the tent or hood. The test subject should then perform the following six functions, each for 60 seconds:

1. Normal breathing.
2. Deep breathing—breaths should be deep and regular.
3. Turning head side to side, about one turn every second. Do not hit respirator cartridges against shoulders or chest.
4. Nodding head up and down, about one movement every second. Do not bump respirator against chest.
5. Reading the Rainbow Passage (this passage was designed to incorporate all common facial movements made during speech):

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond his reach, his friends say he is looking for the pot of gold at the end of the rainbow.

6. Normal breathing.

(There are additional requirements when fit testing for asbestos, benzene and formaldehyde.)

If at any time during any of these activities the test subject detects the odor of the amyl acetate solution, the fit is inadequate. A subject may begin the test again only after a fifteen minute interval. A second failure of the test indicates serious fit problems. Another fit-test with another mask may be undertaken, but there must be at least a 24-hour interval between the twice failed test and a subsequent test.

In the event the banana oil test, in the opinion of the person conducting the test, is for any reason untrustworthy, the irritant smoke test will be conducted.

A record of the fit-test will be kept on the form below.

**Respirator Fit Test Record**

Employee: \_\_\_\_\_ Date: \_\_\_\_\_

Employee Job Title/Description: \_\_\_\_\_

Date of medical exam: \_\_\_\_\_

Respirator model selected: \_\_\_\_\_

Manufacturer: \_\_\_\_\_

NIOSH Approval Number: \_\_\_\_\_

Type of fit test: \_\_\_\_\_ Irritant smoke \_\_\_\_\_ Saccharine \_\_\_\_\_ Amyl acetate

Fit Testing Results: Pass \_\_\_\_\_ Fail \_\_\_\_\_

Comments: (Note here all factors affecting fit results, including presence of facial hair, dentures, glasses, etc.):

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Employee Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Test Conducted by: \_\_\_\_\_ Date: \_\_\_\_\_

**Please complete one form for each respirator model chosen.**

## **REFERENCES**

Regulations/standards complied with in each section:

### Sec. I. Scope.

General provisions regarding respirators are in the OSHA General Industry Standards at 29 CFR 1910.134. and in the OSHA Construction Standards at 29 CFR 1926.103.

### Sec. II. Determining respiratory risk.

29 CFR 1910.1200 contains hazard communication standard,  
29 CFR 1910.1200(g)(8) and (h)(1) info to employees

### Sec. III. Types of Respirators.

NIOSH Certification of Respiratory Equipment

### Sec. IV. Supervision.

29 CFR 1910.134(b)(8) supervision  
29 CFR 1910.134(e)(4) supervision and inspection

### Sec. V. Training.

29 CFR 1910.134(a)(3) and (b)(3), (e)(5)  
29 CFR 1910.1200(h)(2)

### Sec. VI. Medical

29 CFR 1910.134(b)(10)  
29 CFR 1910.20 (access to records)

### Sec. VII. Fit testing requirement

29 CFR 1910.134(e)(5)  
29 CFR 1910.1001 (asbestos)  
1910.1028, App. E (benzene )  
1910.1048, App. E (formaldehyde)

### Sec. VIII. Shaving requirement

29 CFR 1910.134(e)(5)(i)

### Sec. IX. Maintenance, cleaning and storage

29 CFR 1910.132(a) & 1910.134(f) Maintenance and cleaning  
29 CFR 1910.134(b)(6) & (f)(5) storage

### Sec. X. Evaluation of Respirator Program

29 CFR 1910.134(a)(9)