APPENDIX A

# JOINT NIOSH/OSHA STANDARDS COMPLETION PROGRAM
# RESPIRATOR DECISION LOGIC

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Step 3 – Assemble a Table of Permissible Respiratory Protection for Substance

This is done using the material from Step 1 and the appropriate Specific Decision Logic Chart from Part III of this Logic and the Respirator Protection Factors in Appendix I.

Classes of respirators are only included where at least one device has been approved.

## III. SPECIFIC DECISION LOGIC CHARTS

### A. Specific Decision Logic Chart for Respiratory Protection Against Gases or Vapors

| Condition | Selection Sequence |
|---|---|
| Routine Use | a) Consider skin irritation and sorption of the material through the skin – (See IV A).<br>b) Poor warning properties – Eliminate all air purifying respirators (See IV B).<br>c) Eye irritation – Eliminate or restrict use of half mask respirators (See IV D).<br>d) IDLH or LFL – Above this concentration eliminate all but positive pressure self-contained breathing apparatus and combination positive pressure supplied-air respirator with auxiliary positive pressure self-contained breathing apparatus (See IV E and F).<br>e) List all allowed respirators by condition of use and type. |
| Entry and escape from unknown concentrations | Use positive pressure self-contained breathing apparatus or combination positive pressure supplied air respirator with auxiliary positive pressure self-contained breathing apparatus. |
| Firefighting | Use positive pressure self-contained breathing apparatus. |
| Escape | Gas mask or escape self-contained breathing apparatus (See IV C). |

### B. Specific Decision Logic Chart for Respiratory Protection Against Particulates

| Condition | Selection Sequence |
|---|---|
| Routine Use | a) Consider skin irritation or sorption of the material through the skin –(See IV A).<br>b) Eye irritation – Eliminate or restrict use of half mask respirators (See IV D).<br>c) Systemic poison – Eliminate single-use respirators.<br>d) For permissible exposures less than 0.05 mg/cu.m. – Eliminate DFM respirators except with high efficiency particulate filter. |

## IV. DECISION LOGIC CRITERIA

### A. Skin Absorption and Irritation

Personal protection requirements for protection against exposure to substances which may cause injury by absorption through the skin from materials splashed or spilled on the skin are covered in Section (f) of each substance standard. Respirator selection criteria are based primarily on the inhalation hazard of the substance. A supplied-air suit may provide skin protection for extremely toxic substances which may be absorbed through the skin, or for substances which may cause severe skin irritation or injury.

Supplied-air suits are not covered in 30 CFR 11. Data are not available upon which to make recommendations for supplied-air suits for all types of exposures.

Where information is available indicating systemic injury or death resulting from absorbance of a gas or vapor through the skin or where severe skin irritation or infury may occur from exposure to a gas, corrosive vapor, or particulate, the following statement is included as a footnote to the respirator tables and both the employee and employer are cautioned in the appendices concerning their use:

> "Use of supplied-air suit may be necessary to prevent skin contact and respiratory exposure from airborne concentrations of (specific substance). Supplied-air suits should be selected, used, and maintained under the immediate supervision of persons knowledgeable in the limitations and potential life endangering characteristics of supplied-air suits. Where supplied-air suits are used above a concentration which may be immediately dangerous to life and health, (concentration) an auxiliary positive-pressure self-contained breathing apparatus must also be worn."

The supplied-air suit statement is an advisory footnote. The decision whether or not to include the footnote is made by the NIOSH/OSHA Review Committees based on available information. Since most information concerning skin irritation is not quantative, but rather presented in commonly used descriptive terms, such as "a strong skin irritant, highly irritating to the skin," "corrosive to the skin," etc., the decision made by the committees concerning skin irritation is a judgmental decision often based on non-quantitative information. As a quideline for inclusion of the supplied-air suit statement for substances which are sorbed through the skin, a single skin penetration $LD_{50}$ of 2 grams/kilogram for any species is used.

The footnote is advisory in nature and its inclusion does not make the use of supplied-air suits mandatory. Further, employers may use supplied-air suits in any situation where they provide adequate protection, whether there is an advisory footnote in the respirator table or not. To assure the health and safety of persons using supplied-air suits, it is imperative that they be used under the immediate supervision of persons knowledgeable in the limitations and potential life endangering characteristics of supplied-air suits.

### B. Poor Warning Properties

It is important to realize that 30 CFR 11 NIOSH/MESA approvals for air-purifying (organic vapor) devices prohibit use against organic vapors with poor warning properties. Specifically, 30 CFR 11.90(b) (note 4) covers gas masks (canister respirators) and 30 CFR 11.150 (Note 7) covers chemical cartridge respirators. Thus these approvals are only for those organic vapors with adequate warning properties and not all organic vapors.

Warning properties include odor, eye irritation, and respiratory irritation. Warning properties relying upon human senses are not foolproof. However, they provide some indication to the employee of possible sorbent exhaustion or of poor facepiece fit or other respirator malfunction.

irritation is permissible if it is determined that such irritation would not inhibit escape and such irritation is reversible.

Where quantitative eye irritation data cannot be found in literature references, and theoretical considerations indicate the substance should not be an eye irritant, half facepiece respirators are allowed.

Where a review of the literature indicates a substance causes eye irritation but no eye irritation threshold is specified, the data will be evaluated to determine whether quarter or half-facepiece respirators are to be included in the respirator tables. When a table is developed for such substances, the respirators with quarter and half-facepieces shall be footnoted as follows: When an employee informs his employer that he is experiencing eye irritation from ** Name ** while wearing a respirator allowed in Table 2, the employer shall provide and ensure that the employee use an equivalent respirator with a full facepiece, helmet or hood.

E. IDLH

The definition of IDLH provided in 30 CFR 11.3(t) is as follows:

> "Immediately dangerous to life or health" means conditions that pose an immediate threat to life or health or conditions that pose an immediate threat of severe exposure to contaminants, such as radioactive materials, which are likely to have adverse cumulative or delayed effects on health.

The purpose of establishing an IDLH exposure concentration is to insure that the worker can escape without injury or irreversible health effects from an IDLH concentration in the event of failure of the respiratory protective equipment. The IDLH is considered a maximum concentration above which only highly reliable breathing apparatus providing maximum worker protection is permitted. Since IDLH values are conservatively set, any approved respirator may be used up to its maximum use concentration below the IDLH.

In establishing the IDLH concentration the following factors are considered:

1. Escape without loss of life or irreversible health effects. Thirty minutes is considered the maximum permissible exposure time for escape.
2. Severe eye or respiratory irritation or other reactions which would prevent escape without injury.

IDLH should be determined from the following sources:

1. Specific IDLH provided in the literature such as the AIHA Hygienic Guides.
2. Human exposure data,
3. Acute animal exposure data,
4. Where such data are lacking acute toxicologic data from analogous substances may be considered.

The following guidelines should be used to interpret toxicologic data reported in the literature for animal species:

1. Where acute exposure animal data are available (30 minutes to 4-hour exposures), the lowest exposure concentration causing death or irreversible health effects in any species is determined to be the IDLH concentration.
2. Chronic exposure data may have no relevance to the acute effects and should be used in determining the IDLH concentration only upon competent toxicologic judgment.
3. Where there is no toxicologic evidence of an IDLH concentration, 500 times the permissible exposure limit shall determine the upper limit above which only highly reliable breathing apparatus providing maximum worker protection is used.

F. Lower Flammable Limit and Firefighting

Contaminant concentrations in excess of the LFL are considered to be immediately

## APPENDIX I

### A. PROTECTION FACTORS FOR PARTICULATE FILTER RESPIRATORS

| Protection Factor | Permissible Respiratory Protection |
|---|---|
| 5X | Any dust and mist respirator (30 CFR 11.130) |
| 5X | Any dust and mist respirator, except single use (30 CFR 11.130). |
| 10X | Any dust and mist respirator, except single-use or quarter-mask respirator (30 CFR 11.130). |
| 10X | Any fume respirator (30 CFR 11.130). |
| 10X | Any high efficiency particulate filter respirator (30 CFR 11.130). |
| 50X | A high efficiency particulate filter respirator with a full facepiece (30 CFR 11.130). |
| 1000X | A powered air-purifying respirator with a high efficiency particulate filter (30 CFR 11.130). |

### B. PROTECTION FACTORS FOR CHEMICAL CARTRIDGES AND GAS MASKS

| Protection Factor | Permissible Respiratory Protection |
|---|---|
| 10X | Any chemical cartridge respirator with an **Name** cartridge(s) (30 CFR 11.150). |
| 50X | A chemical cartridge respirator with full facepiece and **Name** cartridge(s) (30 CFR 11.150). |
| 50X | A gas mask with a full facepiece and **Name** canister (30 CFR 11.90(a)). |
| 1000X | A powered air-purifying chemical cartridge respirator with a **Name** cartridge (unlisted device).* |
| Escape | Any gas mask providing protection against **Name** vapors (30 CFR 11.90). |

*Classes of respirators are only included where at least one device has been approved.

NOTE: The approval **Name** may consist of acid gases or organic vapors as a class or specific acid gases, ammonia, or organic vapors. It may also consist of combinations of acid gases, organic vapors, and other gases and vapors.

### C. PROTECTION FACTORS FOR COMBINATION CHEMICAL CARTRIDGES AND PARTICULATE FILTERS AND GAS MASKS AND PARTICULATE FILTERS

| Protection Factors | Permissible Respiratory Protection |
|---|---|
| 10X | Any chemical cartridge respirator with **Name** cartridge(s) and **Name** filter(s) (30 CFR 11.150 and 11.130). |
| 50X | A chemical cartridge respirator with a full facepiece, **Name** cartridge(s), and high efficiency filter(s) (30 CFR 11.150 and 11.130). |
| 50X | A gas mask with a full facepiece and **Name** canister and high efficiency filter (30 CFR 11.90(a) and 11.130). |
| 1000X | A powered air purifying chemical cartridge respirator with a **Name** cartridge and high efficiency particulate filter. |

APPENDIX B

ASARCO INCORPORATED

EL PASO PLANT

APPROVED RESPIRATOR GUIDE

| Department | Contaminant(s) and Conc'n Range | Respirator Type(s) | Cartridges |
|---|---|---|---|
| Transportation | Arsenic, silica & lead-bearing dust > PEL (OSHA) | MSA Comfo II L+M<br>North 7500-30 L+M<br>North 7700-30 L+M<br>Survivair 2300-00 L+M | Type H<br>GMB-H, GMC-H<br>7500-83<br>1093-00 |
| Sinter Plant | Arsenic & lead-bearing dust & fume, $SO_2$ > PEL (OSHA) | MSA Comfo II L+M<br>North 7500-30 L+M<br>North 7700-30 L+M<br>Survivair 2300-00 L+M | GMB-H, GMC-H<br>7500-83<br>7500-83<br>1093-00 |
| Sinter Plant Ventilation | Arsenic & lead-bearing dust & fume, $SO_2$ > 10 x PEL (OSHA) | Air Line | |
| Blast Furnace & Dross Reverb | Arsenic & lead-bearing dust & fume, $SO_2$ (fugitive) > PEL (OSHA)<br>CO < 50 ppm TWA<br>CO > 200 ppm (peak) | MSA Comfo II L+M<br>North 7500-30 L+M<br>North 7700-30 L+M<br>Survivair 2300-00 L+M<br>None<br>MSA Gas Mask<br>Air Line | GMB-H, GMC-H<br>7500-83<br>7500-83<br>1093-00<br><br>Type N Canister |
| Blast Furnace Baghouse | Arsenic & lead-bearing dust & fume, $SO_2$, CO > 10 x PEL (OSHA) | Air Line | |
| Cottrell | Arsenic & lead-bearing dust $SO_2$ > PEL (OSHA)<br>$SO_2$ > 10 x PEL (OSHA) | MSA Comfo II L+M<br>North 7500-30 L+M<br>North 7700-30 L+M<br>Survivair 2300-00 L+M<br>MSA Gas Mask | GMB-H, GMC-H<br>7500-83<br>7500-83<br>1093-00<br>Type N Canister |

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| Department | Contaminant(s) and Conc'n Range | Respirator Type(s) | Cartridges |
|---|---|---|---|
| Wedge Roasters | Arsenic & lead-bearing dust & fume, $SO_2$ > PEL (OSHA) | MSA Comfo II L+M<br>North 7500-30 L+M<br>North 7700-30 L+M<br>Survivair 2300-00 L+M | GMB-H, GMC-H<br>7500-83<br>7500-83<br>1093-00 |
| | $SO_2$ > 10 x PEL (OSHA) | MSA Gas Mask | Type N Canister |
| Copper Reverb | Arsenic & lead-bearing dust & fume, $SO_2$ > PEL (OSHA) | MSA Comfo II L+M<br>North 7500-30 L+M<br>North 7700-30 L+M<br>Survivair 2300-00 L+M | GMB-H, GMC-H<br>7500-83<br>7500-83<br>1093-00 |
| Copper Converters | Arsenic & lead-bearing dust & fume, $SO_2$ > PEL (OSHA)<br>$SO_2$ (cranemen) > 10 x PEL (OSHA) | MSA Comfo II L+M<br>North 7500-30 L+M<br>North 7700-30 L+M<br>Survivair 2300-00 L+M<br>Bio-Pak 45 | GMB-H, GMC-H<br>7500-83<br>7500-83<br>1093-00 |
| Copper Anodes | Arsenic & lead-bearing dust & fume, $SO_2$ > PEL (OSHA) | MSA Comfo II L+M<br>North 7500-30 L+M<br>North 7700-30 L+M<br>Survivair 2300-00 L+M | GMB-H, GMC-H<br>7500-83<br>7500-83<br>1093-00 |
| Cadmium | Arsenic, lead & cadmium-bearing dust & fume, $SO_2$ (fugitive) | MSA Comfo II L+M<br>North 7500-30 L+M<br>North 7700-30 L+M<br>Survivair 2300-00 L+M | GMB-H, GMC-H<br>7500-83<br>7500-83<br>1093-00 |
| Acid | Arsenic & lead-bearing dust (fugitive) < PEL (OSHA)<br>$SO_2$ (fugitive) > PEL (OSHA) | MSA Comfo II L+M<br>North 7500-30 L+M<br>North 7700-30 L+M<br>Survivair 2300-00 L+M | GMB-H, GBC-H<br>7500-83<br>7500-83<br>1093-00 |
| Antimony | Arsenic & lead-bearing dust & fume > PEL (OSHA)<br>$AsH_3$, $H_2S$ | MSA Comfo II L+M<br>North 7500-30 L+M<br>North 7700-30 L+M<br>Survivair 2300-00 L+M<br>S.C.B.A. | GMB-H, GMC-H<br>7500-83<br>7500-83<br>1093-00 |
| Maintenance | Respirator selection depends on department where work is to be performed. Consult department listing. | | |

APPENDIX C

ASARCO INCORPORATED

EL PASO PLANT

## RESPIRATOR INSPECTION, CLEANING, MAINTENANCE, AND STORAGE

HALF-MASK RESPIRATORS ARE IN GENERAL USE THROUGHOUT THE EL PASO PLANT. THE OBJECTIVE OF RESPIRATOR ROOM PERSONNEL MUST BE TO GIVE EACH EMPLOYEE A CLEAN RESPIRATOR WHICH HAS BEEN INSPECTED AND REPAIRED TO INSURE PROPER OPERATION. RESPIRATOR ROOM PERSONNEL SHOULD REMEMBER THAT THEY PLAY A KEY ROLE IN PROTECTING THE HEALTH OF THEIR FELLOW EMPLOYEES.

When half-mask respirators are turned in at the Respirator Room for cleaning, the following procedures will be followed:

1. Record Keeping:

   Respirator room personnel must record the frequency of repairs, and replacement for every employee on the monthly computerized ledger sheets. The computer sheets will be collected monthly and will be retained in the Environmental Sciences office.

2. Cleaning and Replacement of Filters and Cartridges:

   A. High efficiency fume cartridges and combination high efficiency/chemical cartridges will be changed as necessary or at the employee's request.

      Employees wanting new cartridges can request them verbally at the Respirator Room or at the Industrial Hygiene office.

   B. A thorough and complete visual inspection of the exterior of the cartridge must be made. If cracks, tears, holes, or any change in the physical shape of the cartridge are present, the cartridge must be replaced. Oftentimes, the respirator cartridge is exposed to excess amounts of water while being worn by the employee. If any moisture is seen on the filter medium of cartridge, it must be replaced. Because some respirator cartridges seat on to a gasket in the filter holder, particular care must be given to this seating surface to insure that it is free of damage, dust, rust, and any other distortion that may cause a leak around the cartridge. The other surfaces of filter cartridges must be cleaned.

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3. Initial Inspection of Respirator Body:

The entire respiratory body (less the cartridges) must be inspected. If any obvious defects are noted in the respirator body, straps, inhalation valve, exhalation valve, filter holder or valve seats, corrective repairs will be undertaken.

4. Cleaning of Respirator Body and Replacement of Body Parts:

Respirator body, straps, inhalation valve, exhalation valve, filter holder and valve seats must be cleaned. The following procedures will be used:

A. Washing

a. The temperature of the cleaning solution will be kept in the range of 120° to 140° (NOTE: excessive heat may deform respirator parts, in particular the respirator body.)

b. The ultrasonic cleaning solution will consist of 100ml of Ivory cleaning solution per sinkful of water. (Through experimental use, we have found that Ivory provides the best means of cleaning the respirator body while still minimizing the amount of employee skin irritation.)

c. Respirators will be placed loosely into the ultrasonic basket (no more than 10 half-mask respirators.)

d. The basket full of respirators will be submerged in the ultrasonic solution and left until cleaned (about 5 minutes).

e. The ultrasonic cleaning solution will be changed after a maximum of five batches of respirators have been cleaned. The ultrasonic sink will also be cleaned. Depending upon the severity of the dirt buildup on the respirator bodies, the respirator room personnel have the discretion of changing the ultrasonic cleaning solution more often.

f. The respirators will then be submerged in the next solution of 100ml Nancol cleaner and disinfectant.

B. First Rinse

All respirators must be throughly rinsed in warm, clean water (100°F maximum) to remove all traces of cleaning solution. In some cases, soapy residue may have to be rinsed out using water from a pressure tap. The rinse water will be changed after a maximum of 5 batches of respirators have been rinsed.

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C. Second Rinse

The procedure for the second rinse is similar to that of the first rinse. The temperature of the rinse water will be reduced to about 40°F.

D. Drying

Excess water will be drained from each respirator. The respirators are placed on a clean, dry towel to further dry. Place the respirators in the commercial-type clothes dryer that has had the tumbling baffles removed (20 at a time) for about 20 minutes or until the facepiece straps are dry. The temperature on the dryer must be on the "warm" setting (maximum drying heat 140°F). Make sure respirator is thoroughly dry before replacing cartridges and storing!!

Personnel on day shift must clean the drying unit by wiping the interior surface with a clean towel dampened with Nancol.

5. Final Inspection of Respirator Body:

The clean respirator body will be inspected as follows:

A. Inspect for any dirt, soap residue, cracks, tears or distortion. Replace face pieces if they have holes, cracks, tears or are distorted. Particularly check the top of the nose bridge for holes or cracks.

B. Examine the head straps for breaks, burns, loss of elasticity, and broken or malfunctioning buckles and attachments. Replace straps as needed.

C. Remove exhalation valve cover and examine the valve and sealing area for the following:

a. Foreign material, such as detergent residue, dust particles, burns or human hair under the valve.

b. Cracks, tears, or distortion in the valve.

c. Improper installation of the valve into the valve body.

d. Distortion of the valve body (due to exposure to excess heat from washing or drying or due to normal wear, the valve seat may warp and not allow the valve to make good contact).

e. Improper insertion of the valve body in the face piece.

APPENDIX C (cont'd)

f. Cracks, breaks, burns, or chips in the valve body, particularly on the sealing surface.

g. Missing or defective valve cover.

Replace valve parts as needed. Reinstall the valve cover and make sure the cover is secure.

D. Check the cartridge holders for breaks, cracks, or cross-threading. Replace as needed. Make sure that each cartridge holder has a gasket (if it was original equipment).

E. The inhalation valves must be inspected. The valves should be in place, not warped or otherwise deformed, work correctly (not stuck to the sealing surface), and pliable. Replace the valves as needed.

F. Reinstall the cartridges. Make sure that the cartridges are screwed down tightly to prevent air leaks.

6. Storage:

After thorough cleaning, drying, inspection and replacement of any defective parts, respirators will be wrapped in new plastic bags and placed in cubicles with the employee's corresponding number. Monthly, the respirator cubicles will be wiped out with a clean dust glove.

FULL FACEPIECE RESPIRATORS, POWERED AIR PURIFYING RESPIRATORS, AND GAS MASKS MAY BE REQUIRED ON JOBS BECAUSE OF HIGH EXPOSURE.

BECAUSE OF THE DIVERSITY OF THIS PROTECTIVE EQUIPMENT, SPECIAL TRAINING ON INSPECTION, CLEANING, AND STORAGE WILL BE GIVEN TO EACH EMPLOYEE WHO HAS TO USE THIS EQUIPMENT. HOWEVER, THE FOLLOWING GENERAL PRACTICE WILL BE OBSERVED:

1. All issuing, maintenance, record keeping, inspection, and storing of full facepiece respirators and self-contained breathing apparatus will be the responsibility of the Safety Office.

2. The Respirator Room will be responsible for the cleaning of these respirators.

A. Only two full facepiece respirators and connecting hoses can be cleaned at one time. The basket must be removed from the

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ultrasonic cleaner. Place the respirators into the ultrasonic cleaner with the lens surface up. Take particular care to make sure that the lens does not touch any portion of the metal interior of the sink or connecting hose adaptors.

B. Follow half-mask respirator instructions for washing, initial rinse, final rinse, and drying.

APPENDIX D

ASARCO INCORPORATED

EL PASO PLANT

## RESPIRATOR TRAINING PROGRAM

1. This training program is designed to acquaint you with the provisions of the El Paso Plant respirator program.

2. The OSHA standard for respiratory protection is contained in the "Federal Register" (29 CFR 1910.134). The plant respirator program is taken from the OSHA regulations.

3. Respirator use in the workplace is determined by:
   - extent of your exposure to various air contaminants, such as lead, arsenic, cadmium and sulfur dioxide, and
   - blood or urine samples which indicate excessive absorption as outlined in OSHA's lead standard and ASARCO's biological monitoring program.

4. Under current OSHA standards for arsenic and lead, air sampling is conducted on a regular basis to maintain surveillance of work area conditions and to keep track of employee exposures.

5. In work areas where air contaminant levels are excessive, OSHA requires that engineering and workpractice controls be implemented to reduce employee exposures to acceptable levels. Where these controls are inadequate, respirators should be worn.

6. OSHA also sanctions respirator use under the following conditions:
   - during installation of engineering controls
   - in maintenance or repair work
   - in emergencies

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7. Selection of the appropriate respirator is based in part on results of air samples for arsenic and lead.

8. The OSHA standards for arsenic and lead prescribe the following respirator types, depending on extent of exposure:

   - a half mask respirator with high-efficiency filters is required, if exposure is less than 10 times OSHA's permissible exposure limit, or PEL, for arsenic and lead
   - a full face-piece respirator with high-efficiency filters is required, if exposure is less than 50 times OSHA's PEL for arsenic and lead
   - a powered air-purifying respirator, or PAPR, is required, if exposure exceeds 50 times OSHA's PEL for arsenic and lead.

9. Of course, the sum of all air contaminants present in the workplace must be considered before a respirator can be prescribed.

10. For example, in the copper department a worker will likely encounter sulfur dioxide, an irritant gas, in the same air containing arsenic and lead.

11. For this reason, high-efficiency cartridges have been selected which offer additional protection against light concentrations of $SO_2$. For most applications this cartridge is adequate.

12. Another air contaminant to be considered is carbon monoxide. It is a toxic gas present in the lead department at the blast furnace feed floor and at the baghouse. CO has no warning properties. It can't be seen, tasted or smelled.

13. The combination cartridges which protect you from arsenic and lead dust and fume and sulfur dioxide will not provide protection against toxic gases, such as CO.

14. In the presence of carbon monoxide a suitable substitute for the half mask respirator should be used, such as a gas mask, a supplied air or airline respirator with constant flow, or a self-contained breathing apparatus or SCBA, which provides positive pressure in the facepiece.

APPENDIX D (cont'd)

24. One of these factors is the size of the respirator itself. In the same way that size 10 shoes do not fit all people, neither does one size of respirator fit all workers. For this reason, the company stocks facepieces from several respirator manufacturers. Some manufacturers offer small, medium and large sizes in half masks. It is intended that you be fit with a respirator that is properly sized, based on your facial features.

25. Other factors which affect facial fit of your respirator are as follows:

- beards, or excessive facial hair
- facelets or bandanas worn between face and respirator
- chewing gum, tobacco
- not wearing straps properly
- dentures not worn

26. ASARCO Plant policy specifically prohibits beards, excessive facial hair or any material coming between the face and respirator. Also, chewing gum or smoking is prohibited except in designated places.

27. Be sure to wear both sets of straps of your respirator. If you use the top ~~two~~ straps only, the respirator merely hangs on your face, and does not form a good seal. This is best dramatized when you walk, move your head from side to side, or bow your head. The respirator moves away from your face and the ~~desired~~ necessary seal is broken.

28. On the other hand, when these actions are repeated with all ~~four~~ straps secured, a good face-to-respirator seal is achieved and maintained during movement. If your respirator is lacking any straps, replace them as soon as possible.

29. Your respirator's performance may be hindered in several ways.

30. One way is a faulty exhalation valve. A valve that will not seat properly, or one that has holes will allow contaminated air to enter the facepiece. The exhalation valve should be checked each time you pick up your cleaned respirator, and faulty parts replaced immediately.

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31. By the way, the exhalation valve cover is there for a purpose. It protects the rubber flap from being damaged by sharp objects, or hot metal spatters. Make sure your respirator always has an exhalation valve cover.

32. Another way that your respirator's performance may be adversely affected includes cracks, nicks, cuts or burns in the facepiece sealing edge or body.

33. In addition, a facepiece that has seen extended service may lose its rigidity. With rigidity gone, a good seal is difficult to achieve.

34. There are various ways to test the adequacy of your respirator fit.

35. One of these is the negative pressure test. With your respirator on and inlet valves blocked, breathe in or inhale. Breathing in tends to collapse the respirator body because of the negative pressure, if there is no in-leakage of air into the facepiece. If in-leakage is detected, adjust the suspension system of the respirator and try the test again until a good seal is achieved.

36. Another way to check your respirator fit is through the positive pressure test. With your respirator on and exhalation valve port blocked after removing the cover, breathe out or exhale lightly. Breathing out tends to positive-pressurize the facepiece, if there is no out-leakage of air from the respirator body. If out-leakage is detected, adjust the suspension system of the respirator and repeat the test until a good seal is achieved.

37. You should use both positive and negative pressure tests to check your respirator fit each day at the beginning of the shift.

38. The company uses two other tests to assure you of a good respirator fit.

39. One is called the irritant smoke, or qualitative fit test. In this test an irritant "smoke" is used to challenge the integrity of your respirator fit. The smoke is released around the exhalation valve and sealing edges of the

APPENDIX D (cont'd)

respirator to detect leaks. Any leakage into the facepiece results in a tickling sensation in the throat. If you cough or clear your throat, this reveals that your respirator fit is not adequate. Straps are adjusted and the test repeated until a good fit is achieved.

40. A second means used by the company is the aerosol generation, or quantitative fit test. In this test an aerosol consisting of corn oil droplets is generated and released inside an enclosure occupied by you. You will be wearing a respirator that is probed, so that the concentration of aerosol which may leak into the facepiece can be measured. The aerosol concentration inside the booth is also measured. By comparing the two concentrations, a protection factor for your type of respirator can be established.

41. One method the company relies on to measure the respirator program's effectiveness is through biological monitoring. Periodic blood and urine samples are collected from all employees and analyzed for lead and other metals. Individual and collective biological monitoring data provide an indicator of the effectiveness of the plant respirator program.

42. Some employees may be physically unfit to wear a respirator on the job. During your periodic physical examination, the company doctor makes a determination based on your health history and test results as to your ability to wear a respirator while performing your work.

43. To summarize, the company is obligated to provide you with adequate respiratory protection in the workplace, to supply adequate training, and to provide for cleaning and servicing of your respirator.

44. Your obligation is to wear your respirator as instructed and to make sure it works and fits properly. A properly working and fitting respirator helps to safeguard your health. And nothing is more important than your health.

## APPENDIX E

ASARCO INCORPORATED
EL PASO PLANT

## QUANTITATIVE FIT TEST PROCEDURE

I. Testing Requirements

A. All new employees must be fit tested prior to being assigned a job in the plant.

B. All plant employees required to wear half mask respirators must be fit tested semiannually.

C. The QNFT will consist of six test exercises.

D. Two tests will be conducted for each employee.

E. The protection factor assigned to that respirator will be the lowest of the two tests.

II. Testing Equipment

All QNFT's will be done on an Air Technique-50 Quantitative Fit Tester using USP corn oil as the challenge aerosol.

III. Startup Procedure

A. Check corn oil level on the clear plastic hose attached to the nebulizer in the rear of the unit. Corn oil container should be half full. Fill, if necessary, by removing the cap on the top of the nebulizer container and opening filler valve. Make sure the filler valve is closed before running booth or the mist will not sufficiently nebulize to fill the booth properly.

B. Check all hose connections on the fit test booth. All connections must be tight.

C. Set the range on the selector switch to "zero" and the selector valve to "clear."

D. Adjust the meter to "zero" if necessary.

E. Turn booth power switch "on."

F. Turn recorder power switch "on."

G. Allow 10-15 minutes for the circuits to warm up.

H. Turn generator pressure "on." Set pressure on 7.5 PSI.

I. Turn diluent blower "on." Set flow 4.5 to 6.5 on the magnehelic gauge.

J. Turn pump switch "on." Set sample flow rotometer to "21" SCFH.

K. Allow 30 to 40 minutes for the aerosol to build up in the booth.

L. Turn recorder to "servo" and set zero on the chart by adjusting the "zero" knob under the recorder power switch, and zero on the meter by adjusting the "meter zero" knob.

M. Set range to "100%" and set selector to "chamber."

N. When aerosol concentration has built up in the booth, adjust "gain" to hold meter reading stable at 95%.

O. Set selector switch to "zero" and selector and selector valve to "clear."

P. Set selector switch to ".1%" and adjust the stray light knob to read and hold stable between 0 and 5 on the meter reading and chart.

Q. Return selector switch range to "zero."

IV. Pre-Testing Procedure

A. The employee will be tested with the size and type of respirator selected for his specific job. The employee will wear his hard hat, safety glasses,and adjust the facepiece straps as he normally wears them.

B. All respirator tests will be conducted with high efficiency fume-type cartridges or the equivalent.

C. Prior to entering the test chamber, the employee must satisfactorily complete the following tests:

1. Preliminary fit will be checked using the positive or negative pressure test.

2. The employee will wear the adjusted facepiece no less than two minutes, so the facepiece can warm up and conform better to the wearer's face.

3. In some cases (such as an employee wanting to try a different respirator brand), facial fit will then be checked again using the irritant smoke test. Employees will be instructed to close their eyes.

V. Quantitative Testing Procedures

A. An evaluation of a respirator on an employee shall consist of two independent test chamber tests. "Independent" means that, between tests, the respirator has been removed and the straps loosened. For the second test, the employee will then re-don the respirator and readjust his straps.

B. Each test will be recorded on a strip chart and shall be annotated with the following information:

1. Name of the employee tested.

2. The respirator used, including brand name and model.

3. Date of test.

4. Name of the person administering the test.

C. The employee dons a probed respirator and adjusts straps for the way he normally wears his respirator.

D. Instruct the employee on the positive/negative pressure test. Have employee demonstrate.

E. If the employee passes this test, he may enter the booth and connect the hose to the respirator readout connector.

F. Set selector switch to "100%" and selector valve to "chamber." Because the employee has allowed clean air to enter the chamber, the aerosol concentration in the booth has been diluted. Allow five-six minutes for the aerosol to build up.

G. Check the initial respirator fit by setting the selector valve to "respirator" and switching the range on the selector switch to various lower scales until a good mid range chart reading between 10% and 80% penetration is measured.

*Note: If the lowest scale you can use is 10%, set the range to "zero" and the selector valve to "clear," then have the employee readjust his respirator and check the adjustment on the straps. Recheck fit. The respirator fit is considered poor when any single peak on the strip chart exceeds 50% when the selector switch is set on the 10% range scale.

H. Observe the sample flow rotometer after the employee connects his respirator probe line to the fitting in the booth.

I. Set the range on the selector switch to "100%" and adjust gain so that it reads a steady "95%."

J. Set the range on selector switch to ".1%" and adjust the stray light knob so that the chart reading is between 0 lines and 5 lines. If both meters have steady reading, the booth is ready for the fit test.

K. Set strip chart recorder to "chart" and check that the pen is recording on "0" lines.

L. Set range on selector switch to "100%" and selector valve to "chamber."

M. Mark "A1" on the chart which denotes "first ambient test."

N. Set selector valve to "clear." Press chart advance for five lines.

O. Set selector valve to "respirator."

O* — ADJUST RANGE SELECTOR TO GIVE A READING BETWEEN 20% TO 80% OF CHART RANGE.
NOTE: HIGHER SENSITIVITY

P. Test exercises - each employee must do six exercises. Proceed to the next exercise when several representative breaths are recorded. Mark each exercise with the abbreviation shown. All employees shall perform the following exercises:

1. Normal Breathing (BN) - The employee shall breathe normally without talking.

2. Deep Breathing (DB) - The employee shall breathe deeply, being careful not to hyperventilate.

3. Side to Side (SS) - The employee shall turn his head slowly from right to left and back, as if he were looking over each shoulder. Caution - respirator seal may be broken if employee hits his shoulder with his respirator.

4. Up and Down (UD) - The employee shall move his head up and down. Caution - Respirator seal may be broken if exhalation valve hits the employees chest.

5. Talk (T) - The employee shall talk out loud inside his respirator, counting up to the number 15.

6. Normal Breathing (BN) - Same as No. 1 above.

Q. Set the selector valve to "chamber" and the range on the selector switch to "100%" and mark the chart for "$A_2$" denoting second ambient test.

R. Set the range on selector switch to "zero," selector valve to clear, and recorder to "servo."

S. While still inside the booth, have the employee relax and unstrap the respirator from his face for one minute, then readjust to his face and test with positive/negative test. Repeat entire test sequence, steps A to R.

T. Have employee disconnect his respirator and exit booth.

V. Calculation of Protection Factor

A. Read the maximum peak for each exercise and remember to note the range on the selector switch used. Ignore extreme spikes if the spikes were caused by the employee breaking the respirator seal. This may occur if the employee bumps his respirator against his chest during the up and down or side to side exercise.

*Note: It is highly desirable, though not absolutely necessary, to measure all breathing exercises on the same range.

B. The Protection Factor can be calculated by using the following:

$$PF = \frac{\frac{A_1 + A2}{2}}{\frac{BN + DB + SS + UD + T + BN}{6.}}$$

where $A_1$ = Initial Ambient Reading (# of lines on chart)
$A_2$ = Final Ambient
BN = First Normal Breathing
DB = Deep Breathing
SS = Side to Side
UD = Up and Down
T = Talking
BN = BN

C. The calculated protection factor shall be the lowest of the two independent chamber tests.

D. A respirator program training and fitting documentation sheet will be completed. This form and the recorder strip chart will be filed. Each sheet will contain the following information:

1. Employee name and payroll number.

2. Date of the fit test.

3. Respirator type, size, and cartridge.

4. The protection factor.

5. The signature of the employee.