SM-32 (REV. 5-78)

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PLAINTIFF'S EXHIBIT

SH-3476

Shell Oil Company
Interoffice Memorandum

JANUARY 29, 1981

FROM: J. L. RIVARD

TO: D. P. ATWOOD
R. L. BRUNNER
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SUBJECT: RESPIRATORY PROTECTION REFERENCE MANUAL

Attached is a revised draft of Respiratory Protection Program Guidelines.

The revisions include the various minor suggestions for improvements, plus changes in the physical capability section in response to input from Corporate Medical. While the basic approach to determining physical capability remains the same, the role of the voluntary physical examination has been deemphasized. This change was made to protect the confidential physician/patient relationship which is fundamental to the success of the voluntary physical examination program. Dr. Simpson has agreed with this revised approach.

The section on facial hair remains (for the moment) essentially as proposed, with the second (less stringent) alternative still included. As you are aware, it has been proposed that the second alternative (top of page 7) be deleted. This amounts to "biting the bullet", and adopting the "no established facial hair" position. This position apparently is supported by Pipe Line, Marketing Distribution, R&D, and E&P. Manufacturing and IR are requested to give serious consideration to this position.

Comments should be returned by February 12. We will discuss this item again at the February 24 S G meeting.

JLR/kdw

Attachment

cc - W. B. Austin
B. F. Aurelius
D. L. Buffington
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HUT - 082589

ABS-046232

c. Provisions for contractor personnel as appropriate.
d. Provisions for casual visitors, allowing for immediate exit from the affected area as an alternative (i.e., casual visitors are defined as not subject to the use of respirators).

- Alternatively, locations that use respirators may develop the following approach into a procedure.

  a. Instruct employees regarding the effect of facial hair in defeating the protection provided by respirators.
  b. Encourage employees to alter established facial hair such that there is no interference with the respirator seal.
  c. Require all employees who do not alter facial hair to wear only air-supplied breathing apparatus with positive pressure (i.e., pressure demand mode).

  For some locations, alternative 2 may be a satisfactory long-term approach. For others, alternative 2 may be an effective interim approach (i.e., for several years), particularly if coupled with quantitative fit testing which effectively demonstrates the defeat of respiratory protection by facial hair.

4. Corrective eyeglasses wear
Eyeglasses also cause leakage where the respirator seal passes over the temple bar. For this reason, plano safety glasses should always be removed when using a full-face piece respirator.

Persons requiring corrective eye wear to safely perform work must, of course, wear such eye wear when using a respirator. For tasks where the respiratory hazard does not affect the eyes, a half-face piece respirator (which does not interfere with standard corrective eyewear) may be used. Alternatively, or where the respiratory hazards does ~~not~~ affect the eyes, a supplied air respirator should be used in pressure demand mode.

Locations are encouraged to provide specially framed corrective lenses, which fit inside the respirator, for those employees who prefer them.

Wearing of contact lenses under respirators is not permitted.

The references below provide further information for identifying health and physical conditions which can affect an individual's ability to wear respirators.

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RESPIRATOR SELECTION

To assist in respirator selection, this section includes:

1. Chapter 6 of NIOSH's "A Guide To Industrial Respiratory Protection". This chapter introduces basic considerations for establishing respirator use. In addition, several examples of respirator selection using the OSHA/NIOSH Respirator Decision Logic are explained.

2. Joint OSHA/NIOSH Respirator Decision Logic, Appendix F of NIOSH's "A Guide to Industrial Respiratory Protection". The OSHA/NIOSH Respirator Decision Logic is a step-by-step process of selecting respirators. It was developed as a mechanism for establishing respirator requirements for individual OSHA health standards. It sets a number of conventions including conservative protection factors. Compliance is not required by law.

3. Several tables from ANSI Z88.2 (1980). The Table of Respirator Protection Factors, in combination with the OSHA/NIOSH Respirator Decision Logic, can guide respirator selection. (See Appendix C of this manual.)

4. Several references related to respirator cartridge efficiency.

   The following references are not included in this guide, but can also provide additional information. Each guide user may want to have the following routinely-used references.

   1. NIOSH Certified Equipment List

      This manual lists those respirators tested and certified by NIOSH. The latest issue is dated June 1, 1980. The manual is updated approximately annually. The next issue is due in the last quarter of 1981. Contact the Testing and Certification Branch (304/599-7331) for information on certified products that are not listed in this publication. (The publication does not list any devices formerly approved by the Bureau of Mines.).

   2. OSHA Standards 1910 (Asbestos, 1910; Vinyl Chloride, 1910; Lead 1910)

      These specific health standards define respirator selection requirements.

   3. The AIHA, "Respiratory Protection, A Manual and Guideline"

   4. OSHA/NIOSH "Pocket Guide to Chemical Hazards", NIOSH Pub. No. 78-210

      This reference recommends respirator types for substances found in 29 CFR 1910.1000 Tables Z-1, Z-2, and Z-3 as of 1977. In addition, it quotes IDLH levels for these same substances.

RESPIRATOR SELECTION

OSHA STANDARDS

OSHA 1910.134 states that respirators shall be selected on the basis of the hazards to which workers are exposed and that ANSI Z88.2-1969 shall be used for guidance in their selection. OSHA also requires that approved or accepted respirators be used when available. For certain respiratory hazards, specific instructions about respirator use are given in other OSHA regulations. The trend seems to be toward regulations that specify the conditions of respirator use for each task. OSHA 1910.134 is then consulted for general instructions. Regardless of the regulations, respirators must be selected with the environment in which they will be used in mind. To do so requires certain basic information, so one should always ask the following questions before selecting a respirator.

1. What is the estimated contaminant concentration where the respirator will be used?
2. What is the permissible exposure limit to the contaminant?
3. Is the contaminant a gas, vapor, mist, dust, or fume?
4. Could the contaminant concentration be termed immediately hazardous to life or health?
5. If the contaminant is flammable, does the estimated concentration approach the lower explosive limit?
6. Does the contaminant have adequate warning properties?
7. Will the contaminant irritate the eyes at the estimated concentration?
8. If the contaminant is a gas or vapor, is there an available sorbent that traps it efficiently?
9. Can the contaminant be absorbed through the skin as a vapor or liquid? If so, will it cause serious injury?

The answers to these questions can provide enough information for choosing a respirator for routine use. There is nothing strange or unique about these questions. They represent the factors that a good industrial hygiene program would incorporate for respirator selection or any other type of control and form the basis for the Respirator Decision Logic (incorporated verbatim as Appendix F) used in the Joint NIOSH and OSHA Standards Completion Program.

You should review the Decision Logic when considering respirator selection because it incorporates the above questions in an orderly sequence. By following this logic, you will be able to choose a respirator that is satisfactory for the situation at hand and be assured that you have not overlooked any important factor.

The Decision Logic is being used (in 1975) in development of detailed work practices for the material listed in 29CFR Part 1910.1000, Tables Z-1, 2, and 3. It will be useful to you in developing your own respirator program until standards are listed for the particular materials in which you are interested. Before proceeding to examples of how to use the Decision Logic, we would like to point out four criteria of particular interest.

- When respirators are used for protection against gases and vapor, it is commonly recommended that cartridges be changed when the wearer smells the vapor. This indicates that there must be some smell or irritation to alert the wearer. Section IV B of the Decision Logic states that a substance should be considered to have warning properties if the odor or irritation threshold is not more than three times the exposure limit, and there is no ceiling limit. Consideration is given to whether undetected exposure in this concentration range could cause serious or irreversible health effects. If not, the substance is considered to have adequate warning properties.
- Section IV C states that where there is supporting evidence of vapor breakthrough in less than three minutes at concentrations immediately dangerous to life or health or below, a cartridge or canister sorbent air purifying device should not be allowed for any use. The principal sources of information on sorbent efficiencies are Lawrence Livermore Laboratory and 30 CFR-11 on certain specific materials on which cartridge tests are run. Users should be alert to any future information on sorbent efficiency, as it will definitely affect choice of air purifying respirators.

("A Guide to Respiratory Protection", NIOSH, June 1976)

In the NIOSH Decision Logic, emergency use is mentioned under respirator protection factors.

RESPIRATOR PROTECTION FACTORS

Definition

The respirator protection factor indicates how much protection a respirator provides. It is the ratio of the contaminant concentrations outside and inside the respirator. Determination of the protection factor requires quantitative performance tests of the respirator worn in a test atmosphere during exercise simulating motions made by workers, or worn by workers carrying out tasks in contaminated work areas (see Chapter 8).

Assignment

Much research has been done recently on assigning protection factors to various types of respirators. Table 6-1, reproduced verbatim from the LASL protection factor document, lists assigned respirator protection factors resulting from this research. When using Table 6-1, pay strict attention to its footnotes as they are essential in interpreting the table and assist in application of protection factors. The protection factors listed in the Decision Logic are taken from Table 6-1.

Application

To apply an assigned protection factor for a particular type of respirator, one must know both the actual contaminant concentration in the work area and the established time-weighted average concentration. Multiplying the time-weighted average concentration by the respirator protection factor gives the maximum concentration of the contaminant against which the particular type of respirator may be used. If the actual concentration is less than the calculated maximum use concentration, the respirator may be used.

In describing use of protection factors in respirator selection, it is assumed that a complete respirator program is in force. A protection factor is not applicable if the wearer cannot satisfactorily seal the respirator to his face or head. Anything such as facial hair or spectacles that prevents satisfactory sealing of a respirator nullifies application of a respirator protection factor. A protection factor can be used only if the respirator is in good operating condition, so the respirator must be properly maintained. Other limitations of various types of respirators discussed in Chapter Eight must also be considered in applying protection factors.

EXAMPLES OF RESPIRATOR SELECTION

The following are hypothetical but typical examples of the respirator selection process. They should not be used as cookbook models, but as guides to the rationale for selecting particular respirators, and, equally important, to the industrial hygiene aspects of the hazards. In these examples, we assume that regular use of respirators is permissible.

1. A muller operator in a foundry complains of dust in the air, and the superintendent supplies him a single-use, disposable respirator. The steward tells the superintendent that this is a violation of the OSHA Regulations as the particular respirator does not have NIOSH and MESA approval. Who is right, and what should be done?

Answer: Nothing bans the sale or use of unapproved devices in areas where respirators are not required. Before deciding about use of this respirator, we need information about the dust concentration in the air. Samples were taken in the muller's breathing zone, and the dust concentration was found to be 5 mg/m^3. The amount of crystalline silica (quartz) in the dust was 48%. The permissible quartz dust exposure limit in such conditions is 1.5 mg/m^3.

Now refer to Section II of the Respirator Decision Logic, Appendix F. Because the material is a particulate, statements 2, 4, and 6 are not pertinent. As to the other statements: 3) Silica is not known to be an eye irritant, 5) the IDLH concentration is far above the 5-mg/m^3 dust level found in this case, and 7) to date, there is no evidence of injury from silica through skin absorption. As the material is a particulate, we can proceed to Section III B, the specific decision logic chart for respiratory protection against particulates. The restrictions under Routine Use do not apply, so we can proceed to Appendix 1, Section A, "Protection Factors for Particulate Filter Respirators." As the dust concentration is less than five times the permissible limit, we can choose any respirator from this list. A single-use respirator with a protection factor of 5 or a half-mask respirator with a protection factor of 10 probably would be chosen.

2. A woman doing silk screening without any local exhaust ventilation complained of headaches and nausea from the vapors and fumes. She was given a dust respirator customarily used by a sandblaster's helper. (Obviously a dust respirator for use against

[1] The overall protection afforded by a given respirator design (and mode of operation) may be defined in terms of its protection factor (PF). The PF is a measure of the degree of protection afforded by a respirator, defined as the ratio of the concentration of contaminant in the ambient atmosphere to that inside the enclosure (usually inside the facepiece) under conditions of use. Respirators should be selected so that the concentration inhaled by the wearer will not exceed the appropriate limit. The recommended respirator PF's are selection and use guides, and should only be used when the employer has established a minimal acceptable respirator program as defined in Section 3 of the ANSI Z88.2-1969 Standard.

[2] In addition to facepieces, this includes any type of enclosure or covering of the wearer's breathing zone, such as supplied-air hoods helmets, or suits.

[3] Includes dusts, mists, and fumes only. Does not apply when gases or vapors are absorbed on particulates and may be volatilized or for particulates volatile at room temperature. Example: Coke oven emissions.

[4] Any single-use dust respirator (with or without valve) not specifically tested against a specified contaminant.

[5] Single-use dust respirators have been tested against asbestos and cotton dust and could be assigned a PF of 10 for these particulates.

[6] Dust filter refers to a dust respirator approved by the silica dust test, and includes all types of media, that is, both nondegradable mechanical type media and degradable resin-impregnated wool felt or combination wool-synthetic felt media.

[7] Fume filter refers to a fume respirator approved by the lead fume test. All types of media are included.

[8] High-efficiency filter refers to a high-efficiency particulate respirator. The filter must be at least 99.97% efficient against 0.3 μm DOP to be approved.

[9] To be assigned, based on dust or fume filter efficiency for specific contaminant.

[10] For gases and vapors, a PF should only be assigned when published test data indicate the cartridge or canister has adequate sorbent efficiency and service life for a specific gas or vapor. In addition, the PF should not be applied in gas or vapor concentrations that are: 1) immediately dangerous to life, 2) above the lower explosive limit, and 3) cause eye irritation when using a half-mask.

[11] A positive pressure supplied-air respirator equipped with a half-mask facepiece may not be as stable on the face as a full facepiece. Therefore, the PF recommended is half that for a similar device equipped with a full facepiece.

[12] A positive pressure supplied-air respirator equipped with a full facepiece provides eye protection but is not approved for use in atmospheres immediately dangerous to life. It is recognized that the facepiece leakage, when a positive pressure is maintained, should be the same as an SCBA operated in the positive pressure mode. However, to emphasize that it basically is not for emergency use, the PF is limited to 2,000.

can be used. If this is impossible, the only recourse is to provide the helper the same protection as the sandblaster. Remember, the air supply system must meet the requirements for Grade D or better compressed air.

The point illustrated in this example is that it is not enough to abide only by the requirements of 29 CFR Part 1910.134 which is concerned with general use of respirators. There are other requirements within the OSHA regulations which may also affect respirator selection and use.

Use of the Decision Logic was not mentioned in this example. The regulations requiring use of a supplied air hood were made before assembly of the Decision Logic. You will note that the Decision Logic Protection Factor Table lists a PF of 2000 for the supplied air hood. Considering the unknown concentration of silica dust to which the sandblaster can be exposed, the protection required is consistent with the Decision Logic.

4. A man assigned to clean a large degreaser must occasionally go into the degreaser pit. He complains that the odor of trichloroethylene (trichlor) is so strong that it comes through his respirator cartridges after only a short time. Should he be assigned another type of respirator?

Answer: The fact that the worker complains about the short lifetime of the sorbent cartridges warns that the trichlor concentrations may be high. This brings up the dual hazards of toxicity and oxygen deficiency. Degreaser pits are places where vapors may collect and, unless ventilated, actually reduce the oxygen below safe levels. Unless the pit is ventilated to prevent oxygen depletion, a positive pressure SCBA must be used. If the pit is ventilated, it will not be necessary to wear a respirator if tests show that the trichlor concentration is below the exposure limit and that the oxygen has not been depleted.

Again, the Decision Logic Section III A shows that for entry and escape from unknown concentrations the only type of device that can be used is positive pressure self-contained breathing apparatus.

5. A flagman for an aerial crop duster using Phosdrin dust is supplied a single-use disposable dust respirator. Is this adequate?

Answer: Several points listed in the Decision Logic flow chart are pertinent here. Pesticides such as Phosdrin are noted for their ability to kill by absorbtion through the skin. The single-use respirator certainly does not provide complete skin protection. In such cases, protective clothing is as important as a proper respirator.

The pesticide is mixed with the dust; however, some of it may vaporize from dust. This is one reason why the only respirators approved for pesticide use have organic charcoal in back of the dust filter.

The Phosdrin concentration to which the flagman is exposed is not stated. Before a respirator can be assigned, we must know the approximate concentration expected. If the concentration cannot be estimated, the flagman will have to be provided with a self-contained breathing apparatus.

6. Hydrocyanic acid is used in a fumigation chamber. By state regulation, a full-face respirator or gas mask with a hydrocyanic acid canister is required. Is such protection satisfactory?

Answer: To decide whether the respirator is adequate, one must have some knowledge of the toxicity and potential concentration of the hydrocyanic acid. The TLV for hydrocyanic acid is listed as 10 ppm, with a warning that skin absorption is a problem. Regardless of the respiratory protection provided, there must be some protection for the skin in such an atmosphere.

A review of the toxicity of hydrocyanic acid will show that a concentration of 270 ppm is immediately fatal and concentrations of 110 ppm are fatal within half an hour. Concentrations of hydrocyanic acid in fumigation chambers usually exceed 1% (10,000 ppm). The full-face gas mask is accorded a protection factor of only 50 in Table 6-1. Therefore, it would not be useful in concentrations above 500 ppm. Such a mask would not be satisfactory in this case. The Decision Logic offers a quicker solution. Section III A notes that when the contaminant concentration exceeds that immediately dangerous to life or health, only positive pressure self-contained breathing apparatus is acceptable respiratory protection.

7. A salvage company is to demolish a large open-framework steel structure built in 1910 in a southern city. The job will require extensive use of cutting torches. Will respirators be required, and if so, of what type?

Answer: Respirators definitely must be used. As the structure was built in 1910, it undoubtedly has many coats of lead-base paint, which when heated by the cutting torches will create a severe airborne lead problem. Therefore a respirator approved for protection against metal fumes can be used. Whether this will be a quarter- or half-mask or full-facepiece respirator can be determined only after air samples are taken in the wearers' breathing zones. Because this is an outdoor operation, the concentrations will vary widely. However, similar operations have shown that concentrations of 2 mg/m^3 are not unusual. Considering the low protection factors for air-purifying respirators, the high temperatures in this climate, and the added heat

JOINT NIOSH/OSHA STANDARDS COMPLETION PROGRAM

RESPIRATOR DECISION LOGIC

18 AUGUST 1975

I. INTRODUCTION

THE PURPOSE OF THE RESPIRATOR DECISION LOGIC IS TO ASSURE TECHNICAL ACCURACY AND UNIFORMITY BETWEEN SUBSTANCES IN THE SELECTION OF RESPIRATORS AND TO PROVIDE NECESSARY CRITERIA TO SUPPORT THIS SELECTION. THE DECISION LOGIC IS A STEP-BY-STEP ELIMINATION OF INAPPROPRIATE RESPIRATORS UNTIL ONLY THOSE WHICH ARE ACCEPTABLE REMAIN. JUDGEMENT BY PERSONS KNOWLEDGEABLE OF INHALATION HAZARDS AND RESPIRATORY PROTECTION EQUIPMENT IS ESSENTIAL TO ENSURE APPROPRIATE SELECTION OF RESPIRATORS.

THE PRIMARY TECHNICAL CRITERIA FOR WHAT CONSTITUTES A PERMISSIBLE RESPIRATOR IS BASED ON THE TECHNICAL REQUIREMENTS OF 30 CFR PART 11 (DEPARTMENT OF THE INTERIOR, BUREAU OF MINES, RESPIRATORY PROTECTIVE DEVICES AND TESTS FOR PERMISSIBILITY). THE PROPOSED SUBSTANCE HEALTH STANDARDS WILL ALLOW ONLY RESPIRATORS APPROVED BY THE BUREAU OF MINES (OR MINING ENFORCEMENT AND SAFETY ADMINISTRATION (MESA)) AND NIOSH UNDER 30 CFR 11.

PROTECTION FACTORS ARE CRITERIA USED IN DETERMINING WHAT LIMITING CONCENTRATIONS ARE TO BE PERMITTED FOR EACH RESPIRATOR TYPE THAT WILL AFFORD ADEQUATE PROTECTION TO THE WEARER. THE REFERENCED SUBPARTS OF 30 CFR 11 GIVE TECHNICAL DESCRIPTIONS CONCERNING EACH TYPE OR CLASS OF RESPIRATORS REFERENCED IN THE DECISION LOGIC. 30 CFR 11 SHOULD BE USED WITH THE DECISION LOGIC IN ORDER TO PROPERLY UNDERSTAND THE CRITERIA FOR THE SPECIFICATION OF ALLOWABLE RESPIRATORS.

II. GENERAL DECISION LOGIC FLOWCHART

STEP 1 - ASSEMBLE INFORMATION ON SUBSTANCE

ASSEMBLE NECESSARY TOXICOLOGICAL SAFETY, AND RESEARCH INFORMATION FOR THE PARTICULAR CONTAMINANT, TYPICALLY THE FOLLOWING ARE REQUIRED:

1) PERMISSIBLE EXPOSURE LIMITS SPECIFIED IN 29 CFR 1910.1000 (TABLES Z-1, Z-2, AND Z-3). THESE ARE THE FORMER 29 CFR 1910.93 TABLES.

2) WARNING PROPERTIES IF THE SUBSTANCE IS A GAS OR A VAPOR, REFER TO PART IV(B) OF THIS LOGIC.

3) EYE IRRITATION POTENTIAL OF THE SUBSTANCE. REFER TO PART IV(D) OF THIS LOGIC.

4) LFL (LOWER FLAMMABLE LIMIT) FOR THE SUBSTANCE. REFER TO PART IV(F) OF THIS LOGIC.

5) IDLH CONCENTRATION FOR THE SUBSTANCE. REFER TO PART IV(E) OF THIS LOGIC.

6) POSSIBILITY OF POOR SORBENT EFFICIENCY AT IDLH CONCENTRATION AND BELOW. REFER TO PART IV(C) OF THIS LOGIC.

7) ANY EVIDENCE OF POSSIBLE SYSTEMIC INJURY OR DEATH RESULTING FROM ABSORBANCE OF THE SUBSTANCE (AS A GAS OR VAPOR) THROUGH THE SKIN. REFER TO PART IV(A) OF THIS LOGIC.

8) THE VAPOR PRESSURE OF THE SUBSTANCE (AND EQUIVALENT PPM).

STEP 2 - DETERMINE PHYSICAL STATE OF SUBSTANCE

DETERMINE THE PHYSICAL STATE(S) OF THE SUBSTANCE AS IT IS LIKELY TO BE ENCOUNTERED IN THE OCCUPATIONAL ENVIRONMENT. IT WILL BE EITHER:
A) GAS OR VAPOR.
B) PARTICULATE (DUST, FUME OR MIST), OR
C) COMBINATION OF (A) AND (B).

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 THE LOGIC AND THE RESPIRATOR PROTECTION FACTORS IN APPENDIX I.

III.A. SPECIFIC DECISION LOGIC CHART FOR RESPIRATORY PROTECTION AGAINST GASES OR VAPORS

CONDITION	SELECTION SEQUENCE
ROUTINE USE	A) CONSIDER SKIN SORPTION - (SEE IV A). B) POOR WARNING PROPERTIES - ELIMINATE ALL AIR PURIFYING RESPIRATORS (SEE IV B). C) EYE IRRITATION - ELIMINATE OR RESTRICT USE OF HALF MASK RESPIRATOR (SEE IV D). D) IDLH OR LFL - ABOVE THIS CONCENTRATION ELIMINATE ALL BUT POSITIVE PRESSURE SELF-CONTAINED BREATHING APPARATUS AND COMBINATION POSITIVE PRESSURE SELF-CONTAINED BREATHING APPARATUS (SEE IV E AND F). F) 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 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).

III.B. SPECIFIC DECISION LOGIC CHART FOR RESPIRATORY PROTECTION AGAINST PARTICULATES

CONDITION	SELECTION SEQUENCE
ROUTINE USE	A) CONSIDER SKIN SORPTION - (SEE IV A). B) EYE IRRITATION - ELIMINATE OR RESTRICT USE OF HALF MASK RESPIRATOR (SEE IV D).

C) SYSTEMIC POISON - ELIMINATE SINGLE-USE RESPIRATOR.

D) FOR PERMISSIBLE EXPOSURE LESS THAN 0.05 MG/CU.M. - ELIMINATE DFM RESPIRATORS EXCEPT WITH HIGH EFFICIENCY PARTICULATE FILTER.

E) IDLH OR LFL - ABOVE THIS CONCENTRATION ELIMINATE ALL BUT POSITIVE PRESSURE SELF-CONTAINED BREATHING APPARATUS AND COMBINATION POSITIVE PRESSURE SELF-CONTAINED BREATHING APPARATUS (SEE IV E).

F) LIST ALL ALLOWED RESPIRATORS BY CONDITON OF USE AND TYPE.

ENTRY AND ESCAPE FROM UNKNOWN CONCENTRATION — USE POSITIVE PRESSURE SELF-CONTAINED BREATHING APPARATUS OR COMBINTAION POSITIVE PRESSURE SUPPLIED AIR RESPIRATOR WITH POSITIVE PRESSURE SELF-CONTAINED BREATHING APPARATUS.

FIREFIGHTING — USE POSITIVE PRESSURE SELF-CONTAINED BREATHING APPARATUS (SEE IV F).

III.C. SPECIFIC DECISIONS LOGIC CHART FOR RESPIRATOR PROTECTION AGAINST COMBINATION OF GAS OR VAPORS AND PARTICULATES

CONDITION	SELECTION SEQUENCE
ROUTINE USE	A) CONSIDER SKIN SORPTION - (SEE IV A). B) POOR WARNING PROPERTIES OR INADEQUATE SORBENT EFFICIENCY - ELIMINATE ALL AIR PURIFYING RESPIRATORS (SEE IV B & C). C) ELIMINATE ALL RESPIRATORS EXCEPT WITH COMBINATION SORBENT/PARTICULATE FILTER. D) EYE IRRITATION - ELIMINATE OR RESTRICT USE OF HALF MARK RESPIRATOR (SEE IV D). E) FOR PERMISSIBLE EXPOSURES LESS THAN 0.05 MG/CU.M. - ELIMINATE ALL RESPIRATORS EXCEPT WITH SORBENT/HIGH EFFICIENCY PARTICULATE FILTER. F) IDLH OR LFL - ABOVE THIS CONCENTRATION ELIMINATE ALL BUT POSITIVE PRESSURE SELF-CONTAINED BREATHING APPARATUS AND COMBINATION POSITIVE PRESSURE SELF-CONTAINED BREATHING APPARATUS (SEE IV E). G) LIST ALL ALLOWED RESPIRATORS BY CONDITION OF USE AND TYPE.
ENTRY AND ESCAPE FROM UNKNOWN CONCENTRATION	USE POSITIVE PRESSURE SELF-CONTAINED BREATHING APPARATUS OR COMBINATION POSITIVE PRESSURE SUPPLIED AIR RESPIRATOR WITH POSITIVE PRESSURE SELF-CONTAINED BREATHING APPARATUS.
FIREFIGHTING	USE POSITIVE PRESSURE SELF-CONTAINED BREATHING APPARATUS (SEE IV F).
ESCAPE	GAS MASK OR ESCAPE SELF-CONTAINED BREATHING APPARATUS (SEE IV C).

IV. A. SKIN ABSORPTION

PERSONAL PROTECTION REQUIREMENTS FOR PROTECTION AGAINST EXPOSURE TO SUBSTANCES WHICH MAY CAUSE INJURY OR 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 BOTH SKIN AND RESPIRATORY PROTECTION FOR EXTREMELY TOXIC SUBSTANCES WHICH MAY BE ABSORBED THROUGH THE SKIN.

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, THE FOLLOWING STATEMENT IS INCLUDED IN APPENDIX B, SECTION (V) OF THE SUBSTANCE STANDARD:

"USE OF SUPPLIED-AIR SUITS OR OTHER IMPERVIOUS COVERINGS MAY BE NECESSARY TO PREVENT SKIN CONTACT WITH * WHEN THE CONCENTRATION OF * IS UNKNOWN OR GREATER THAN ** (IDLH). 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."

A SENTENCE IS ADDED TO THE RESPIRATOR TABLE IN THE ENTRY AND ESCAPE FROM UNKNOW CONCENTRATIONS SECTION AS SHOWN BELOW:

SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE. A COMBINATION RESPIRATOR WHICH INCLUDES A TYPE C SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE OR CONTINUOUS FLOW MODE AND AN AUXILIARY SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE-DEMAND MODE OR OTHER POSITIVE PRESSURE MODE. (SUPPLIED-AIR SUITS MAY BE NECESSARY.)

IV. 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, SEPCIFICALLY, 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 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, WARNING PROPERTIES INCLUDE ODOR, EYE IRRITATION, AND RESPIRATORY IRRITATION.

ADEQUATE WARNING PROPERTIES CAN BE ASSUMED WHEN THE SUBSTANCE ODOR, TASTE, OR IRRITATION EFFECTS ARE DETECTABLE AND PERSISTENT AT CONCENTRATIONS "AT" OR "BELOW" THE PERMISSIBLE EXPOSURE LIMIT.

IF THE ODOR OR IRRITATION THRESHOLD OF A SUBSTANCE IS MANY TIMES GREATER THAN THE PERMISSIBLE EXPOSURE LIMIT, THIS SUBSTANCE SHOULD BE CONSIDERED TO HAVE POOR WARNING PROPERTIES. IF THE SUBSTANCE ODOR OR IRRITATION THRESHOLD IS SOMEWHAT ABOVE THE PERMISSIBLE EXPOSURE LIMIT (NOT IN EXCESS OF THREE TIMES THE LIMIT) AND THERE IS NO CEILING LIMIT, CONSIDERATION IS GIVEN AS TO WHETHER OR NOT UNDETECTED EXPOSURE IN THIS CONCENTRATION RANGE COULD CAUSE SERIOUS OR IRREVERSIBLE HEALTH EFFECTS. IF NOT, THE SUBSTANCE IS CONSIDERED TO HAVE ADEQUATE WARNING PROPERTIES.

IT IS EXPECTED THAT ENVIRONMENTAL CONCENTRATIONS WILL VARY CONSIDERABLY AND, THEREFORE, WARNING OF A RESPIRATOR FAILURE WOULD SOON BE PERCEIVED AT CONTAIMINANT CONCENTRATIONS SOMEWHAT ABOVE THE PERMISSIBLE EXPOSURE LIMIT.

IV. C. SORBENT EFFICIENCIES

WHERE SUPPORTING EVIDENCE EXISTS ON IMMEDIATE (LESS THAN THREE MINUTES) BREAKTHROUGH TIME AT THE IDLH CONCENTRATION AND BELOW FOR A CARTRIDGE OR CANISTER SORBENT, AIR-PURIFYING DEVICES SHALL NOT BE ALLOWED FOR ANY USE, ESCAPE OR OTHERWISE.

IV. D. EYE IRRITATION

FOR ROUTINE WORK OPERATIONS, ANY PERCEPTIBLE EYE IRRITATION IS CONSIDERED UNACCEPTABLE, THEREFORE, ONLY FULL FACEPIECE RESPIRATORS ARE PERMISSIBLE IN CONTAMINATION CONCENTRATIONS WHICH PRODUCE EYE IRRITATION. NOTE THAT 30 CFR 11.90(B) (NOTE 6) SPECIFIES THAT EYE PROTECTION MAY BE REQUIRED IN CERTAIN CONCENTRATIONS OF ACID GASES AND ORGANIC VAPORS. FOR ESCAPE, SOME EYE 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 IRRIYANT, HALF FACEPIECE RESPIRATORS ARE ALLOWED.

IV. E. IDLH

THE DEFINITION OF IDLH PROVIDED IN 30 CFR 11.3(T) IS AS FOLLOWS:

> "IMMEDIATLEY 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 AN IDLH EXPOSURE 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 INHIBIT 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 TOXICOLOGICAL DATA FROM ANALOGOUS SUBSTANCES, AND CHRONIC ANIMAL EXPOSURE DATA MAY BE CONSIDERED.

THE FOLLOWING GUIDELINES SHOULD BE USED TO INTERPRET TOXICOLOGICAL 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. WHERE ONLY CHRONIC EXPOSURE DATA ARE AVAILABLE AND THESE DATA DO NOT REVEAL ANY EXPOSURE CONCENTRATION WHICH WOULD RESULT IN IRREVERSIBLE HEALTH EFFECTS, THEN THESE DATA HAVE NO RELEVANCE AND SHOULD NOT BE USED IN DETERMINING THE IDLH CONCENTRATION.

WHERE THERE IS EVIDENCE OF AN IDLH CONCENTRATION ABOVE THAT ALLOWED ON THE BASIS OF A PROTECTION FACTOR, RESPIRATORS SHOULD BE SELECTED ON THE BASIS OF THE PROTECTION FACTOR AFFORDED BY EACH DEVICE WITHIN THE LIMITATIONS OF THE DEVICE.

IV. E. LOWER FLAMMABLE LIMIT AND FIREFIGHTING

CONTAIMINANT CONCENTRATIONS IN EXCESS OF THE LFL ARE CONSIDERED TO BE IMMEDIATELY DANGEROUS TO LIFE OR HEALTH. AT OR ABOVE THE LFL, THE USE OF RESPIRATORS IS LIMITED TO THOSE DEVICES WHICH PROVIDE THE MAXIMUM PROTECTION, I.E., POSITIVE-PRESSURE SCBA, AND COMBINATION POSITIVE-PRESSURE SUPPLIED-AIR RESPIRATOR WITH POSITIVE PRESSURE SCBA.

FIREFIGHTING IS DEFINED BY ANSI Z88.5-1971 AS BEING IMMEDIATELY DANGEROUS TO LIFE. FOR FIREFIGHTING, THE ONLY DEVICE PROVIDING ADEQUATE PROTECTION IS THE POSITIVE PRESSURE SELF-CONTAINED BREATHING APPARATUS.

IV. G PROTECTION FACTORS

PROTECTION FACTORS ARE A MEASURE OF THE OVERALL EFFECTIVENESS OF A RESPIRATOR. FILTERING EFFICIENCY IS A PART OF THE PROTECTION FACTOR AND BECOMES A SIGNIFICANT CONSIDERATION FOR LESS EFFICIENT AIR PURIFYING RESPIRATORS.

THE PROTECTION FACTORS USED IN THE PREPARATION OF THE STANDARDS ARE BASED ON QUANTITATIVE FIT TESTS PERFORMED AT LOS ALAMOS AND ELSEWHERE, AND IN SOME INSTANCES ON PROFESSIONAL JUDGMENT. IN APPENDIX I, THE PROTECTION FACTORS FOR EACH CLASS OF RESPIRATORS LISTED IN THE CHECKLISTS ARE SHOWN. THE ENTRIES IN EACH LIST ARE FOR AN ENTIRE CLASS OF RESPIRATORS, AND ARE ASSIGNED THE PROTECTION FACTOR OF THE LOWEST PERFORMING DEVICE WITHIN EACH CLASS.

IV. H. VARIATIONS WITH 30 CFR 11

1. THE TYPE A SUPPLIED-AIR RESPIRATOR IS ALLOWED IN 30 CFR11 FOR USE IN IMMEDIATELY DANGEROUS TO LIFE AND HEALTH ATMOSPHERES. HOWEVER, AIR SUPPLY REQUIREMENTS OF 50 L/MIN. IS INSUFFICIENT TO MAINTAIN A POSITIVE PRESSURE IN THE FACEPIECE UNDER ALL WORKING CONDITIONS. THEREFORE, THIS DEVICE SHOULD HAVE THE SAME PROTECTION FACTOR AS APPLIED TO OTHER AIR-PURIFYING AND ATMOSPHERE SUPPLYING RESPIRATORS HAVING A NEGATIVE PRESSURE IN THE FACEPIECE (SEE APPENDIX I), 30 CFR

11 WILL REQUIRE A REVISION TO ELIMINATE APPROVAL OF TYPE A FOR IDLH ATMOSPHERES.

2. AN AMENDMENT TO 30 CFR 11 IS BEING PROCESSED WHICH WILL DELETE USE OF GAS MASKS FOR ENTRY AND USE IN ISLH ATMOSPHERES. THEREFORE, IN THIS DECISION LOGIC GAS MASK ARE NOT ALLOWED IN CONCENTRATIONS GREATER THAN THE ISLH OR ENTRY AND ESCAPE FROM UNKNOWN CONCENTRATIONS.

3. IN THE SAME AMENDMENT DESCRIBED ABOVE, MAXIMUM USE CONCENTRATIONS (MUC) FOR GAS MASKS ARE BEINGING DELETED. THIS DECISION LOGIC IS CONSISTENT WITH THIS AMENDMENT. HOWEVER, CANISTERS APPROVED PRIOR TO THIS AMENDMENT WILL HAVE THE MUC SPECIFIED ON THE LABEL WHICH WILL BE INCONSISTENT WITH THE SUBSTANCE STANDARDS FOR MOST SUBSTANCES.

4. 30 CFR 11 DOES NOT CONTAIN PROTECTION FACTOR REQUIREMENTS. PROTECTION FACTORS ARE USED IN THE DECISION LOGIC. AN AMENDMENT TO 30 CFR 11 IS PLANNED TO INCLUDE PROTECTION FACTOR REQUIREMENTS FOR DFM RESPIRATORS. FUTURE AMENDMENTS ARE CONTEMPLATED FOR OTHER TYPES OF RESPIRATORS.

5. 30 CFR 11 DOES NOT PERMIT THE USE AN ESCAPE GAS MASK AGAINST ACID GASES OR ORGANIC VAPORS WITH POOR WARNING PROPERTIES. A CHANGE TO 30 CFR 11 IS NECESSARY TO PERMIT THE USE OF AN ESCAPE GAS MASK AGAINST SUBSTANCES WITH POOR WARNING PROPERTIES.

IV. I ESCAPE

WHERE ESCAPE RESPIRATORS ARE PROVIDED THEY SHALL BE SELECTED FROM THE ESCAPE CATEGORY IN TABLE 2. THE EMPLOYER SHALL PROVIDE AND ENSURE EMPLOYEES CARRY AN ESCAPE RESPIRATOR WHERE EXPOSURE MAY OCCUR TO EXTREMELY TOXIC SUBSTANCES (AN EXTREMELY TOXIC SUBSTANCE IS DEFINED AS A GAS OR VAPOR HAVING A RAT EXPOSURE MORTALITY LC50 OF LESS THAN 10 PPM.

THE FOLLOWING STATEMENT IS ADDED TO THE INTRODUCTION TO THE RESPIRATOR TABLE FOR THESE SUBSTANCES:

> EMPLOYERS SHALL PROVIDE EACH EMPLOYEE WORKING IN AREAS WHERE **NAME** MAY BE RELEASED INTO THE WORKPLACE AIR WITH AN APPROVED ESCAPE RESPIRATOR AS SPECIFIED IN TABLE 2. THE EMPLOYER SHALL ENSURE THAT EACH EMPLOYEE CARRY THE ESCAPE RESPIRATOR IN THE AREA WHERE **NAME** MAY BE RELEASED INTO THE WORKPLACE.

IV. J. "ENTRY INTO TANKS OR CLOSED VESSELS, OR . . ."
ITEM (D)(4)(IV) IS A VARIABLE PROVISION IN THE INTRODUCTORY STATEMENTS TO THE RESPIRATOR TABLES WHICH LISTS THE SPECIFIC OPERATIONS WHERE A RESPIRATOR IS CONSIDERED TO BE AN ACCEPTABLE MEANS OF CONTROL. EXAMPLES OF WHERE THIS MAY OCCUR ARE FOR OPERATIONS WHICH REQUIRE OCCASIONAL ENTRY INTO TANKS OR OTHER CLOSED VESSELS.

APPENDIX I

A. PROTECTION FACTORS FOR PARTICULATE FILTER RESPIRATORS

PROTECTION FACTOR (MINIMAL)	PERMISSIBLE RESPIRATORY PROTECTION
5X	ANY DUST AND MIST RESPIRATOR (30 CFW 11.130)
5X	ANY DUST AND MIST RESPIRATOR, EXCEPT SINGLE USE (30 CFR 11.120).

10X	ANY DUST AND MIST RESPIRATOR, EXCEPT SINGLE-USE OR QUARTER-MASK RESPIRATOR (30 CFR 11,130).
10X	ANY FUME RESPIRATOR OR HIGH EFFICIENCY PARTICULATE FILTER 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 (MINIMAL)	PERMISSIBLE RESPIRATORY PROTECTION
10X	ANY CHEMICAL CARTRIDGE RESPIRATOR WITH AN ** NAME ** CARTRIDGES(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 CHIN-STYLE ** NAME ** CANISTER (30 CFR 11, 90(A))
50X	A GAS MASK WITH A FRONT OR BACK-MOUNTED ** 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).

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 (MINIMAL)	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 ** TYPE ** FILTER(S) (30 CFR 11, 150 and 11, 130)
50X	A GAS MASK WITH A CHIN-STYLE ** NAME ** CANISTER AND ** TYPE ** FILTER (30 CFR 11, 90(A) AND 11,130)
50X	A GAS MASK WITH A FRONT OR BACK MOUNTED ** NAME ** CANISTER AND ** TYPE ** 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.
ESCAPE	ANY GAS MASK PROVIDING PROTECTION AGAINST ** NAME ** AND PARTICULATES (30 CFR 11.90 AND 11, 130)

** NAME ** REFERS TO ANY ACID GAS, AKALINE GAS, ORGANIC VAPOR, OR OTHER SPECIFIC GAS OR VAPOR.
** TYPE ** REFERS TO DUST AND MIST, FUME, OR HIGH EFFICIENCY PARTICULATE.

D. PROTECTION FACTORS FOR SUPPLIED-AIR RESPIRATORS

PROTECTION FACTOR (MINIMAL)	PERMISSIBLE RESPIRATORY PROTECTION
10X	ANY SUPPLIED AIR-RESPIRATOR (30 CFR 11.110(A))
50X	ANY SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE, HELMET, OR HOOD. (30 CFR 11.110(A))
1000X	*A TYPE C SUPPLIED-AIR RESPIRATOR OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE OR CONTINUOUS FLOW MODE (30 CFR 11, 110(A))
2000X	A TYPE C SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE OR WITH A FULL FACEPIECE, HOOD, OR HELMET OPERATED IN CONTINUOUS FLOW MODE (30 CFR 11,110(A))

*THIS CATEGORY IS NOT FULLY COVERED BY PRECEDING CATEGORY.

E. PROTECTION FACTORS FOR SELF-CONTAINED BREATHING APPARATUS

PROTECTION FACTOR (MINIMAL)	PERMISSIBLE RESPIRATORY PROTECTION
10X	ANY SELF-CONTAINED BREATHING APPARATUS (30 CFR 11,70(A))
50X	ANY SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE (30 CFR 11,70(A))
10,000+X OR FIRE-FIGHTING	SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE (30 CFR 11,70(A))
10,000+X	A COMBINATION RESPIRATOR WHICH INCLUDES A TYPE C SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE OR CONTINUOUS FLOW MODE AND AN AUXILIARY SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE-DEMAND OR POSITIVE PRESSURE MODE (30 CFR 11,70(B))
ESCAPE	ANY ESCAPE SELF-CONTAINED BREATHING APPARATUS (30 CFR 11,70(A))

APPENDIX II - LITERATURE REFERENCES

THE FOLLOWING ARE THE PRIMARY REFERENCE SOURCES USED IN THIS DECISION LOGIC.

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   C) DOW CHEMICAL
   D) EASTMAN KODAK
   E) EXXON
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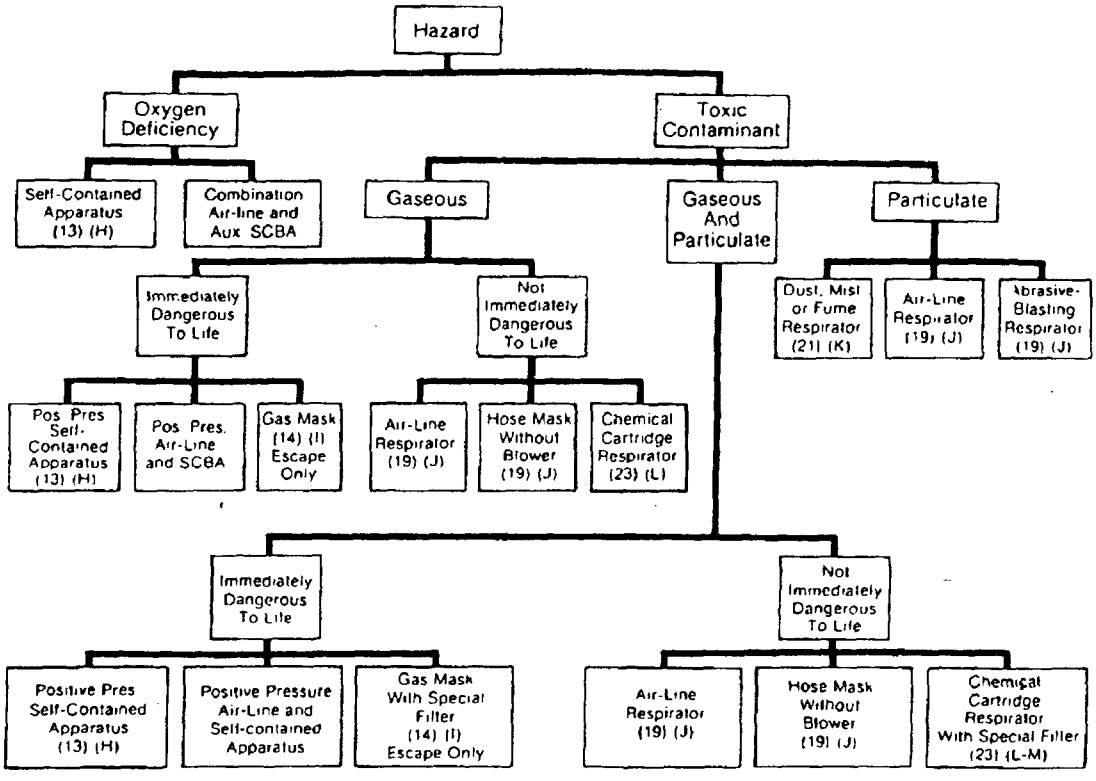
Outline for selecting respiratory protective devices.



Based on Bureau of Mines Information Circular 7992

Numbers in parentheses refer to Bureau of Mines Schedules (letters in parentheses refer to Subpart of NIOSH MESA 30 CFR Part 11

Respirator Protection Factors[a]

Type of Respirator	Permitted for Use in Oxygen-Deficient Atmosphere	Permitted for Use in Immediately-Dangerous-to-Life-or-Health Atmosphere[f]	Respirator Protection Factor	
			Qualitative Test	Quantitative Test
Particulate-filter, quarter-mask or half-mask face-piece[b,c]	No	No	10	As measured on each person with maximum of 100
Vapor- or gas-removing, quarter-mask or half-mask facepiece[b]	No	No	10, or maximum use limit of cartridge or canister for vapor or gas, whichever is less	As measured on each person with maximum of 100, or maximum use limit of cartridge or canister for vapor or gas[g,j], whichever is less.
Combination particulate-filter and vapor- or gas-removing, quarter-mask or half-mask facepiece[b,c]	No	No	10, or maximum use limit of cartridge or canister for vapor or gas, whichever is less.	As measured on each person with maximum of 100, or maximum use limit of cartridge or canister for vapor or gas[g,j], whichever is less.
Particulate-filter, full face-piece[b]	No	No	100	As measured on each person with maximum of 1000 of dust, fume, or mist filter is used, or maximum of 1000 of high-efficiency filter is used
Vapor- or gas-removing, full facepiece	No	No	100, or maximum use limit of cartridge or canister for vapor or gas, whichever is less.	As measured on each person with maximum of 1000, or maximum use limit of cartridge or canister for vapor or gas[g,j], whichever is less
Combination particulate-filter and vapor- or gas-removing, full facepiece[b]	No	No	100, or maximum use limit of cartridge or canister for vapor or gas, whichever is less	As measured on each person with maximum of 1000 of dust, fume, or mist filter is used and maximum of 5000 if high efficiency filter is used, or maximum use limit of cartridge or canister for vapor or gas[g,j], whichever is less.
Powered particulate-filter, any respiratory-inlet cover-ing[b,c,d]	No	No (yes, if escape provi-sions are provided[d,j])	N/A	N/A
			No tests are required due to positive-pressure operation of respirator. The maximum protection factor is 1000 if dust, fume, or mist filter is used and 5000 if high-efficiency filter is used.	
Powered vapor- or gas-removing, any respiratory-inlet covering[c,d]	No	No (yes, if escape provi-sions are provided[d,j])	N/A	N/A
			No tests are required due to positive pressure operation of respirator. The maximum protection factor is 5000, or maximum use limit of cartridge or canister for vapor or gas[g,j], whichever is less.	
Powered combination parti-culate-filter and vapor- or gas-removing, any respirator-inlet covering[b,c,d]	No	No (yes, if escape provi-sions are provided[d,j])	N/A	N/A
			No tests are required due to positive pressure operation of respirator. The maximum protection factor is 1000 if dust, fume, or mist filter is used and 5000 if high-efficiency filter is used, or maximum use limit of cartridge or canister for vapor or gas[g,j], whichever is less.	

(See also Section IV of this manual)

Respirator Protection Factors[a]

Type of Respirator	Permitted for Use in Oxygen-Deficient Atmosphere	Permitted for Use in Immediately-Dangerous-to-Life-or-Health Atmosphere[f]	Respirator Protection Factor	
			Qualitative Test	Quantitative Test
Air-line, demand, quarter-mask or half-mask facepiece, with or without escape provisions[c,e]	Yes[f]	No	10	As measured on each person, but limited to the use of the respirator in concentrations of contaminants below the immediately-dangerous-to-life-or-health (IDLH) values
Air-line, demand, full facepiece, with or without escape provisions[d]	Yes[f]	No	100	As measured on each person, but limited to the use of the respirator in concentrations of contaminants below the immediately-dangerous-to-life-or-health (IDLH) values.
Air-line, continuous-flow or pressure-demand type, no facepiece, without escape provisions[c]	Yes[f]	No	N/A	N/A
			No tests are required due to positive-pressure operation of respirator. The protection factor provided by the respirator is limited to use of the respirator in concentrations of contaminants below the immediately-dangerous-to-life-or-health (IDLH) values.	
Air-line, continuous-flow or pressure-demand type, no facepiece, with escape provisions[c,e]	Yes[f]	Yes	N/A	N/A
			No tests are required due to positive-pressure operation of respirator. The maximum protection factor is 10 000 plus.[b]	
Air-line, continuous-flow, helmet, hood, or suit, without escape provisions	Yes[f]	No	N/A	N/A
			No tests are required due to positive pressure operation of respirator. The protection factor provided by the respirator is limited to the use of the respirator in concentrations of contaminants below the immediately-dangerous-to-life-or-health (IDLH) values.	
Air-line, continuous-flow, helmet, hood, or suit, with escape provisions[e]	Yes[f]	Yes	N/A	N/A
			No tests are required due to positive-pressure operation of respirator. The maximum protection factor is 10 000 plus.[b]	
Hose mask, with or without blower, full facepiece	Yes[f]	No	10	As measured on each person, but limited to the use of the respirator in concentrations of contaminants below the immediately-dangerous-to-life-or-health (IDLH) values
Self-contained breathing apparatus, demand-type open-circuit or negative-pressure-type closed-circuit, quarter-mask or half-mask facepiece[c]	Yes[f]	No	10	As measured on each person, but limited to the use of the respirator in concentrations of contaminants below the immediately-dangerous-to-life-or-health (IDLH) values
Self-contained breathing apparatus, demand-type open-circuit or negative-pressure-type closed-circuit, full facepiece or mouthpiece, nose clamp[c]	Yes[f] (Yes[g], if respirator is used for mine rescue and mine recovery operations.)	No (yes, if respirator is used for mine rescue and mine recovery operations.)	100	As measured on each person, but limited to the use of the respirator in concentrations of contaminants below the immediately-dangerous-to-life-or-health (IDLH) values, except when the respirator is used for mine rescue and mine recovery operations

Self-contained breathing apparatus, pressure-demand-type open-circuit or positive-pressure-type closed-circuit, quarter-mask or half-mask facepiece, full facepiece, or mouthpiece/nose clamp[c]	Yes[g]	Yes	N/A No tests are required due to positive pressure operation of respirator. The maximum protection factor is 10,000 plus.[h]	N/A
Combination respirators not listed.	The type and mode of operation having the lowest respirator protection factor shall be applied to the combination respirator			

N/A means not applicable since a respirator-fitting test is not carried out

[a]A respirator protection factor is a measure of the degree of protection provided by a respirator to a respirator wearer. Multiplying the permissible time-weighted average concentration or the permissible ceiling concentration, whichever is applicable, for a toxic substance, or the maximum permissible airborne concentration for a radionuclide, by a protection factor assigned to a respirator gives the maximum concentration of the hazardous substance for which the respirator can be used. Limitations of filters, cartridges, and canisters used in air-purifying respirators shall be considered in determining protection factors.

[b]When the respirator is used for protection against airborne particulate matter having a permissible time-weighted average concentration less than 0.05 milligram particulate matter per cubic meter of air or less than 2 million particles per cubic foot of air, or for protection against airborne radionuclide particulate matter, the respirator shall be equipped with a high-efficiency filter(s).

[c]If the air contaminant causes eye irritation, the wearer of a respirator equipped with a quarter-mask or half-mask facepiece or mouthpiece and nose clamp shall be permitted to use a protective goggle or to use a respirator equipped with a full facepiece.

[d]If the powered air-purifying respirator is equipped with a facepiece, the escape provision means that the wearer is able to breathe through the filter, cartridge, or canister and through the pump. If the powered air-purifying respirator is equipped with a helmet, hood, or suit, the escape provision shall be an auxiliary self-contained supply of respirable air.

[e]The escape provision shall be an auxiliary self-contained supply of respirable air.

[f]For definition of "oxygen deficiency — not immediately dangerous to life or health" see Section 2.

[g]For definition of "oxygen deficiency — immediately dangerous to life or health" see Section 2 and Ap. A10.

[h]The protection factor measurement exceeds the limit of sensitivity of the test apparatus. Therefore, the respirator has been classified for use in atmospheres having unknown concentrations of contaminants.

[i]The service life of a vapor- or gas-removing cartridge or canister depends on the specific vapor or gas, the concentration of the vapor or gas in air, the temperature and humidity of the air, the type and quantity of the sorbent in the cartridge or canister, and the activity of the respirator wearer. Cartridges and canisters may provide only very short service lives for certain vapors and gases. Vapor/gas service life testing is recommended to ensure that cartridges and canisters provide adequate service lives. Reference should be made to published reports which give vapor/gas life data for cartridges and canisters.

[j]Vapor- and gas-removing respirators are not approved for contaminants that lack adequate warning properties of odor, irritation, or taste at concentrations in air at or above the permissible exposure limits.

NOTE: Respirator protection factors for air-purifying-type respirators equipped with a mouthpiece, nose clamp, form of respirator-inlet covering are not given since such respirators are approved only for escape purposes.

CLASSIFICATION OF RESPIRATORS AND THEIR LIMITATIONS

AIR PURIFYING RESPIRATORS

Mode Of Operation	Limitations
Ambient air, prior to being inhaled, is passed through a filter, cartridge, or canister which removes particles, vapors, gases, or a combination of these contaminants. Breathing action of the wearer operates the non-powered type. Powered type contains a blower, stationary or carried by wearer, which passes ambient air through an air-purifying component and then supplies purified air to the respiratory-inlet covering. Nonpowered type is equipped with a facepiece or mouthpiece, and nose clamp. Powered type is equipped with a facepiece, helmet, hood, or suit.	Air-purifying respirators do not protect against oxygen-deficient atmospheres nor against skin irritations by airborne contaminants, or sorption through the skin. The maximum contaminant concentration against which an air-purifying respirator will protect is determined by the design efficiency and capacity of the cartridge, canister or filter, and the facepiece-to-face seal on the user. For gases and vapors, the maximum concentration for which the air-purifying element is designed is specified by the manufacturer, or is listed on labels of cartridges and canisters. The type of facepiece used may be limited by its protection factor. Nonpowered air-purifying respirators will not provide the maximum design protection specified unless the facepiece or mouthpiece/nose clamp is carefully fitted to the wearer's face to prevent inward leakage. The time period over which protection is provided is dependent on canister, cartridge or filter type, concentration of contaminant, humidity levels in the ambient atmosphere, and the wearer's respiratory rate. The proper type of canister, cartridge, or filter must be selected for the particular atmosphere and conditions. Nonpowered air-purifying respirators may cause discomfort due to a noticeable resistance to inhalation. This problem is minimized in powered respirators. Respirator facepieces present special problems to individuals required to wear prescription lenses. These devices do have the advantage of being small, light, and simple in operation. Use of air-purifying respirators in atmospheres immediately dangerous to life or health is limited to specific devices under specified conditions.

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(Copied from the latest update of the ANSI Z88.2 (1980) Standard, "Respiratory Protection Practices".)

There are three types of air purifying respirators: (1) particulate-removing respirators (2) vapor and gas-removing respirators and (3) combinations of 1 and 2.

Mode of Operation	Limitations
1) Particulate-Removing Respirators	Particulate-Removing Respirators
Equipped with filter(s) to remove a single type of particulate matter (e.g., dust) or a combination of two or more types of particulate matter (e.g., dust and fume) from air. Filter may be a single-use type or reusable type.	Protection against nonvolatile particulates only. No protection against gases and vapors. Not for use in atmospheres immediately dangerous to life or health unless a powered-type respirator with escape provisions.
2) Vapor-and Gas-Removing Respirators	Vapor-and Gas-Removing Respirators
Equipped with a cartridge(s) or canister(s) to remove a single vapor or gas (e.g., chlorine gas), a single class of vapors or gases (e.g., organic vapors), or a combination of two or more classes of vapors or gases (e.g., organic vapors and acidic gases) from air.	No protection is provided against particulate contaminants. A rise in canister or cartridge temperature indicates that a gas or vapor is being removed from the inspired air. An uncomfortably high temperature indicates a high concentration of gas or vapor and requires an immediate return to fresh air. Should avoid use in atmospheres where the contaminant(s) lacks sufficient warning properties (i.e., odor, taste, or irritation) unless equipped with an end-of-service life indicator. Not for use in atmospheres immediately dangerous to life or health unless a powered-type respirator with escape provisions.
3) Combination Particulate-Vapor-and Gas-Removing Respirators	Combination Particulate - Vapor-and Gas-Removing Respirators
Equipped with cartridge(s) or canister(s) to remove particulate matter, vapors and gases from air. The filter may be a permanent part or a replaceable part of a cartridge or canister.	The advantages and disadvantages of the component sections of the combination respirator as described before apply.

ATMOSPHERE SUPPLYING RESPIRATORS

Mode of Operation	LIMITATIONS
Uncontaminated breathing air or oxygen is supplied to the respirator wearer by means of a hose, airline, or from a bottle of compressed air that is carried by the user.	Except for some air-line suits, no protection is provided against skin irritation by materials such as ammonia and hydrogen chloride, or against sorption of materials such as hydrogen cyanide, tritium, or organic phosphate pesticides through the skin. Facepieces present special problems to individuals required to wear prescription lenses. Use of atmosphere-supplying respirators in atmospheres immediately dangerous to life or health is limited to specific devices under specified conditions.

There are three basic types of atmosphere supplying respirators; hose masks, airline respirators and self-contained breathing apparatus (SCBA).

Mode of Operation	Limitations
1) Hose Mask	1) Hose Mask
Equipped with a facepiece, breathing tube, rugged safety harness and a large diameter heavy/duty nonkinking air supply hose. The breathing tube and air supply hose are securely attached to the harness. A facepiece is equipped with an exhalation valve. The harness has provision for attaching a safety line.	The hose inlet or blower must be located and secured in a respirable atmosphere. The respirable air supply is not limited to the quantity the individual can carry. However, the wearer is restricted in movement by the hose and must return to a respirable atmosphere by retracing his route of entry. The hose is subject to being severed or pinched off.
a) Hose Mask with Blower	a) Hose Mask with Blower
Air is supplied by a motor/driven or hand-operated blower. The wearer can continue to inhale through the hose if the blower fails. Up to 300 feet (91 meters) of hose length is permissible.	If the blower fails, the unit still provides protection, although a negative pressure exists in the facepiece during inhalation.

Mode of Operation	Limitations
b) Demand Type Equipped with a facepiece only. The demand valve permits flow of air only during inhalation.	b) Demand Type Subject to leakage due to negative pressure in mask during inhalation.
c) Pressure-Demand-Type Equipped with a facepiece only. A positive pressure is maintained in the facepiece.	
d) Combination Air-Line Respirator with Auxiliary Self-Contained Air Supply Includes an air-line respirator with an auxiliary self-contained air supply. To escape from a hazardous atmosphere in the event the primary air supply fails to operate, the wearer switches to the auxiliary self-contained air supply.	d) Combination Air-Line Respirator with Auxiliary Self-Contained Air Supply The auxiliary self-contained air supply on this type device allows the wearer to escape from a dangerous atmosphere. This device with auxiliary self-contained air supply is approved for use in atmospheres that are immediately dangerous to life or health.
3) Self-Contained Breathing Apparatus (SCBA) Supply of air, oxygen, or oxygen generating material carried by wearer. Normally equipped with full facepiece, but may be equipped with a quarter-mask facepiece, half-mask, helmet, hood, or mouthpiece and nose clamp.	3) Self-Contained Breathing Apparatus (SCBA) The wearer carries his own breathing atmosphere. The period over which the device will provide protection is limited by the amount of air or oxygen in the apparatus, the ambient atmospheric pressure (service life is cut in half by a doubling of the atmospheric pressure), and work. Some SCBA devices have a short service life (less than 15 minutes) and are suitable only for escape (self-rescue) from an irrespirable atmosphere.

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3) Self-Contained Breathing Apparatus (SCBA) - Continued

Chief limitations of SCBA devices are their weight or bulk or both, limited service life, and the training required for their maintenance and safe use.

Mode of Operation	Limitation
1) Closed-Circuit SCBA	1) Closed-Circuit SCBA
a) Compressed or Liquid Oxygen Type	
Equipped with a facepiece or mouthpiece and nose clamp. High-pressure oxygen from a gas cylinder passes through a high-pressure reducing valve and, in some designs, through a low-pressure admission valve to a breathing bag or container. Liquid oxygen is converted to a low-pressure gaseous oxygen and delivered to the breathing bag through a corrugated tube connected to a mouthpiece or facepiece and a one-way check valve. Exhaled air passes through another check valve and tube into a container of carbon dioxide removing chemical and re-enters the breathing bag. Make up oxygen enters the bag continuously or as the bag deflates sufficiently to actuate an admission valve. A pressure relief system is provided and a manual bypass system and saliva trap may be provided depending upon the design.	The closed-circuit operation conserves oxygen and permits longer service life at reduced weight. The closed circuit SCBA can not be used in an immediately hazardous atmosphere because negative pressure is created in the facepiece during inhalation. In addition, the oxygen can lead to an explosion if it comes in contact with oil or grease. Oxygen should never be used in a device unless it is specifically designed for that purpose.

Mode of Operation	Limitations
b) Oxygen-Generating Type	
Equipped with a facepiece or mouthpiece and nose clamp. Water vapor in the exhaled breath reacts with chemical in the canister to release oxygen to the breathing bag. The wearer inhales from the bag through a corrugated tube and one-way check valve at the facepiece. Exhaled air passes through a second check valve/breathing tube assembly into the canister. The oxygen release rate is governed by the volume of exhaled air. Carbon dioxide in the exhaled breath is removed by the canister fill.	1. Limitations are the same as the oxygen supplying type described in 1.a. This unit is generally lighter, simpler, and cheaper than oxygen supplying closed circuit SCBA.
2) Open-Circuit SCBA	2) Open-circuit SCBA
A bypass system is provided in case of regulator failure except on escape-type units.	The demand type produces a negative pressure in the respiratory-inlet covering during inhalation, whereas the pressure-demand type maintains a positive pressure in the respiratory-inlet covering during inhalation and is less apt to permit inward leakage of contaminants.
a) Demand Type	
Equipped with a facepiece or mouthpiece and nose clamp. The demand valve permits oxygen or air flow only during inhalation. Exhaled breath passes to ambient atmosphere through a valve(s) in the facepiece.	
b) Pressure-Demand Type	
Equipped with a facepiece only. Positive pressure is maintained in the facepiece. The apparatus may have provision for the wearer to select the demand or pressure-demand mode of operation and in which case the demand mode should be used only when donning or removing the apparatus.	

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Contractor
Safety

SM-32 (REV. 5-78)

Shell Oil Company
Interoffice Memorandum

December 7, 1981

FROM: Industrial Hygienist

TO: See Distribution

SUBJECT: Contractor Respirator Programs

The attached guideline on Contractor Respiratory Protection Programs is provided for your information. Please note that the guideline specifically applies to those contractor employees working at DPMC and are required to use respiratory protection during planned activities. The guideline as written offers clarification and formalizes many current practices.

If you have any questions concerning this, please let me know.

P. J. Snyder

PJS:sdm

Attachment

HUT - 081867

ABS-013523

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HUT - 081868

ABS-013524

GUIDELINES FOR CONTRACTOR RESPIRATORY PROTECTION PROGRAMS AT DPMC

PREAMBLE

The following guideline outlines the general requirements for contractor performance in establishing acceptable respirator programs. To assist contractors in fulfilling this obligation, Shell will make available certain technical resources as outlined below. It is the intent of Shell Management however, that each contractor retain responsibility for program development and compliance with applicable Health and Safety Standards.

Scope: The requirements of this guideline apply to only those contractors who have an anticipated (planned) use of respiratory protection at the Shell Deer Park Manufacturing Complex.

1. GENERAL

All contractors working at Shell DPMC are to comply with applicable OSHA regulations including 29 CFR 1910.134, Respiratory Protection.

Where respiratory protection is required, respiratory programs which comply with the above regulation generally include:

Employee Training

- Potential Health Hazards of Exposure
- Proper Respirator Selection

Proper Respirator Selection

- Air-Supplied vs. Dust Mask vs. Full-Face Air-Purifying Respirators

Determinations of Medical Suitability to Use Respiratory Protection

Proper Respirator Maintenance

- Cleaning
- Inspection

Qualitative or Quantitative Fit Testing of Air-Purifying Respirators

- Removal of Facial Hair in the Respirator-Sealing Surface

Responsibility for contractor employee protection and OSHA compliance rests with the management of the contractor. To assist the contractor to meet these obligations, Shell will make available to the contractor certain equipment and manpower resources. Regardless of the contractors utilization of these Shell resources, all contractors required to use respiratory protection at DPMC will be expected to have in place an acceptable respirator program.

2. AVAILABILITY OF RESPIRATORY PROTECTION EQUIPMENT

With the exception of paint contractors engaged in sandblasting, Shell will make respiratory protective equipment available to all contractors. Sandblasters are to provide their own air-supplied hoods and other protective gear required for this work.

Special respiratory protection required because of process related factors (e.g. potential exposure to chemicals being handled within a unit) will be supplied by DPMC to sandblasters.

DPMC will supply cartridges, air-purifying masks, air-line respirators and other appropriate respiratory protective equipment through the Central Respirator Center or satellite cabinet system. Respirator maintenance for equipment used by contractors will be equivalent to that provided Shell's employees.

DPMC will supply the required respiratory protective equipment needs of contractors during turnarounds.

Construction contractors including capital and purchase order contractor needs will be reviewed by Industrial Hygiene and Engineering on a case-by-case basis. This applies to lead burner work and tank cleaning.

3. RESPIRATORY TRAINING - DPMC

Safety and Industrial Hygiene will make available to all maintenance contractors a qualified trainer to train one of their supervisory personnel who will be responsible for training the contractors' personnel. Acceptance of this offer by contractors is on a voluntary basis. Records of this training will be retained by the Safety Representative - Contractors.

The Safety Respresentative - Contractors and the DPMC Shell Maintenance organization retain the right to periodically audit the respirator training provided to employees of Shell contractors.

Construction contractors will normally not be required to use respirators to install new facilities. In the event of a chemical release, the proper response for these contractors is evacuation to a safe area. Where respiratory protection is to be used during a project, the employees engaged in this work are to receive the required training by their employer.

Short-term maintenance work requiring the use of respiratory protection such as tank cleaning will be required to verify that the required training has been completed prior to initiating work.

4. QUANTITATIVE FIT TESTING

For contractors utilizing Shell air-purifying respirators, Shell will make available fit testing equipment and a qualified technician to conduct fit testing. Contractor fit testing is to be conducted with the type of mask used by Shell personnel (Scott and MSA).

Contractor fit testing is to be held once per year to pick up new employees and retest old employees. This frequency may be adjusted to accomodate Shell needs and to reflect changes in testing requirements.

Shell is to provide a copy of our general fit test procedure and testing criteria to the management of each contractor. They are to accept in writing or provide their own testing criteria.

During contractor fit testing, an appropriate respresentative from the contractor is to be present to maintain records and supervise the testing activity.

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