RESPIRATORY PROTECTION PROGRAM

TENNECO OIL COMPANY

CHALMETTE REFINERY

ΓEN 4208

TABLE OF CONTENTS

THE RESPIRATORY SYSTEM

WHY DO WE BREATHE?

Respiration is fundamental to life, but it's more than just breathing. Every breath brings fresh air into the lungs containing 21% oxygen. We breathe only 21% oxygen in a mixture of about 78% nitrogen and small amounts of other gases. The oxygen is the key element of air which the body must have in order to carry out metabolism. The oxygen which enters the lungs is carried to the blood stream and distributed to each cell throughout the body.

The oxygen enables the cells to burn the fuel (food) and produce energy for all body functions. That process is termed metabolism.

WHAT IS THE SYSTEM?

To aid in the understanding of the respiratory system, an anatomical drawing follows showing important features. The anatomy of the respiratory system is designed to enable respiration to occur efficiently. The nasal passages are constructed with hairs and cartilage projections as partial filters for removing dust and other particles. The inhaled air is also moistened and warmed in the nose and mouth before entering the pharynx and trachea (windpipe). The trachea then leads to the bronchus which subdivides into smaller and smaller passages ending in the terminal bronchioles. The part of the respiratory system from the nose and mouth to the terminal bronchioles is called the upper respiratory system in which there is no gas exchange occurring.

The terminal bronchioles lead to the respiratory bronchioles which contain clusters of small sacs called alveoli. The alveoli are where gaseous exchange occurs from the air sacs to the pulmonary veins which carries the oxygen rich blood to the heart. To illustrate the small size of the alveoli, it should be pointed out that there are approximately 300 million alveoli in each pair of lungs.

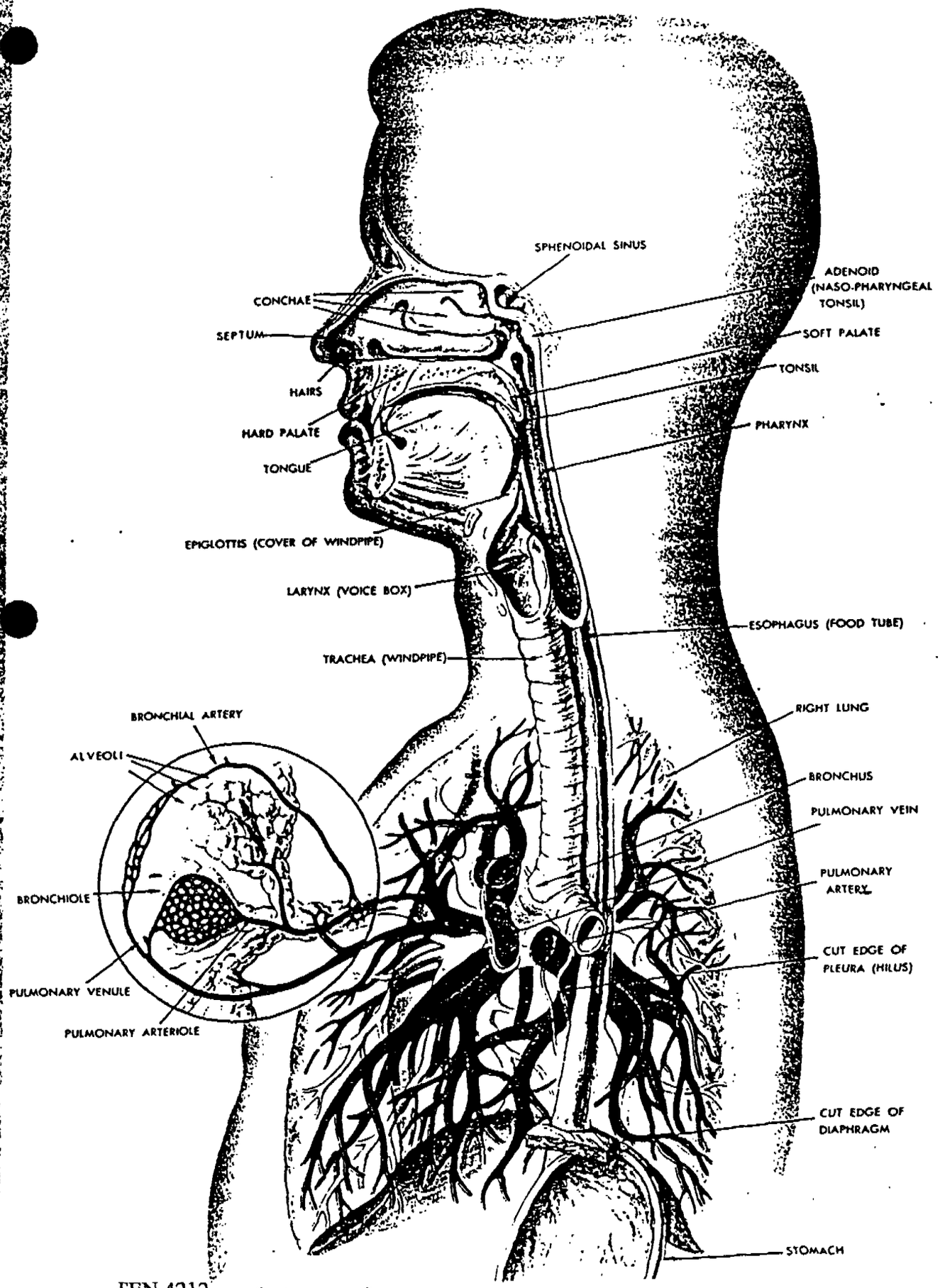
HOW DOES THE SYSTEM WORK?

The basis for the respiratory process is the exchange of air rich in oxygen (21%) and low in carbon dioxide for the enhaled air high in carbon dioxide and low in oxygen.

Although seemingly simple, the mechanics of respiration is much more complex than a simple gaseous exchange. The response to breathe is triggered by the imbalance of oxygen and carbon dioxide in the cells of the body. The increase of carbon dioxide in the cells stimulates the chest cavity to induce breathing. The chest cavity surrounds the lungs and acts as a bellows during respiration. As the chest cavity expands, the air is forced into the lungs by differences in pressure. The oxygen in air is transferred to the bloodstream by contact of the veins with the alveoli. The oxygen rich blood is transported to the lungs where it is pumped to the brain and other parts of the body. The brain cells require more oxygen than other cells and permanent damage can result if the brain is deprived oxygen for four minutes. This is a critical relationship occurring every time one breathes.

As physical activity increases, the metabolism increases demanding more oxygen. Therefore, a greater volume of air per unit time is required and the respiratory rate increases. A person at rest breathes roughly 9.3 liters per minute while someone undergoing maximum work uses 132 liters per minute.

It is easy to see the importance of respiration in our life and knowledge of the mechanics of breathing will aid us in our comprehension of hazards which may affect respiration as well as in the use of respiratory protective devices.



IEN 4212

From *The Wonderful Human Machine*, published by the American Medical Association

RESPIRATORY HAZARDS

Respiratory hazards which affect a person's health must be identified and recognized in the workplace before control measures can be instituted. Respiratory hazards are categorized into two main classes:

1. Oxygen Deficiency

2. Toxic Air Contaminants
   a. Particulates
   b. Vapor and Gases
   c. Combination of particulates, vapor, and gases

These classes identify the hazard, but the extent of the hazard must also be known. One method to determine the extent of the hazard is to classify the atmosphere as being:

1. Immediately Dangerous to Life or Health (IDLH), or,

2. Not immediately Dangerous to Life or Health

An atmosphere immediately dangerous to life or health, an IDLH atmosphere, is defined as an atmosphere from which a person cannot escape unprotected within a half hour without irreversible health effects or one that has the potential for "obvious severe eye or respiratory irritation which would inhibit escape without injury". IDLH atmospheres may be due to oxygen deficiency or toxic contaminants.

An atmosphere not immediately hazardous to life or health may cause immediate physical discomfort or irritation, produce harm after prolonged exposure, or cause chronic poisoning after repeated short exposures, but it does not cause irreversible damage during a single exposure.

Respirator selection requires distinguishing between IDLH and non IDLH atmospheres since the method of protection is different for each category.

Remember that an IDLH or non-IDLH atmosphere merely determines the degree of hazard but not the type of hazard. In order to properly determine control measures needed, be they engineering or protective equipment such as respirators, it is essential to know and understand the type and degree of the hazard encountered.

THE NORMAL ATMOSPHERE

The normal atmosphere of the planet Earth is a composition of the following gases:

Gas	Vol.%
Nitrogen	78.09
Oxygen	20.95
Argon	0.93
Carbon Dioxide	0.04
Other Gases	Trace

Water vapor may be present in varying concentrations, sometimes comprising up to 5% of the total volume.

OXYGEN DEFICIENCY

The definition of an "oxygen deficient" atmosphere is any atmosphere that does not contain enough oxygen to support metabolism for an unlimited period. For Chalmette Refinery purposes, an oxygen content in air less than 19.5% shall be considered "oxygen deficient", and an IDLH atmosphere.

Oxygen deficiency can result from many causes, however the result is simply a displacement of air by a substance which lowers the oxygen content below 19.5%. Some of the leading causes of oxygen deficiency are:

1. Inert gases, such as carbon dioxide, nitrogen, helium, etc. These gases have no toxic effects but simply displace the oxygen. Carbon dioxide and nitrogen are heavier than air so the oxygen deficiency will occur initially at the low point in a vessel and will eventually rise and fill the entire vessel.

2. Rusting of metal. The rusting of metal is a slow oxidation process which consumes oxygen from the atmosphere. Oxygen deficiency can be expected whenever a vessel is closed for an extended period of time.

3. Pyrophoric Iron Sulfide. The formation of iron sulfide, like rusting, consumes the oxygen from the air. Iron sulfide is likely to be formed in vessels which had sulfur products or oils and gas containing sulfur compounds (sour crude) flowing through them.

4. Rotting of organic matter. Any closed vessel containing organic matter such as vegetable oils, fruits, etc. will become oxygen deficient due to the decaying processes.

5. Preservative coatings applied to the interior of vessels can also cause an oxygen deficient atmosphere.

A few general precautions about oxygen deficiency are:

If a vessel has been closed for an extended period, assume the atmosphere inside to be oxygen deficient until the proper tests can be made.

Oxygen deficiency can be detected only by an oxygen analyzer. There are no visual or odor determinations which can be made to assure a safe atmosphere.

Never enter a vessel with an oxygen deficient atmosphere, or one suspected of being oxygen deficient without appropriate respiratory protection.

TOXIC CONTAMINANTS

In order to better comprehend the hazard of toxic atmospheres, it it necessary to understand the basics of the toxic materials and their effect on the body. There are three ways for toxic materials to enter the body; ingestion, absorption through the skin, and inhalation. Ingestion is not a common mode of entry in the workplace but can occur in small amounts from particulates which are inhaled ~~and~~ or swallowed with the mucous.

Skin absorption is a frequent method of toxic material contact with the body. The mere surface area of the skin contributes to the toxic exposures.

Although the skin area is large, the skin also acts as a barrier against most chemical intrusion. Many chemicals, though, may rapidly enter the body through the skin and cause harm. Even if no chemical penetration through the skin occurs, reaction on the skin surface can result in irritation.

Entry of toxic agents through inhalation is by far the most serious method of entry. Most industrial poisonings occur from the inhalationof toxic materials. Although the surface area of the skin, 2 square meters, appears large, the adult respiratory system has a surface area of 70-100 square meters. This coupled with the intimate contact the alveoli have with the circulatory system, explains the severe reactions which may result from toxic material inhalation.

General guidelines for determining (selection?) the proper respiratory equipment needed are an understanding of the physical state of the contaminant and it's general effect on the body (physiology). The following is a list of common forms of contaminants creating respiratory hazards:

1. Liquid - A formless fluid that flows in accord with the laws of gravity. Example: water
2. Gas - A material which readily and uniformly distributes itself throughout any container and can be changed to the liquid or solid state only by the combined effect of increased pressure and decreased temperature. Example: methane
3. Mist - Suspended liquid droplets generated by condensation from the gaseous to the liquid state or by breaking up a liquid into a finely dispersed state. Example: paint spray
4. Vapor - The gaseous form of substances which are normally in the solid or liquid state at room temperature and pressure. Example: benzene vapors
5. Fume - Dispersed minute solid particles formed from the condensation of metals heated to vaporization. Example: welding fumes
6. Dust - A dust is a finely divided solid particle generated by mechanical means. i.e. crushing, grinding, etc. Example: talc

Once a description on the form of a contaminant is determined, the toxic effects on the body must be known in order to specify the proper respiratory equipment. The following is a list of physiological classifications of chemicals:

1. Irritant - Any chemical causing aggrevation of whatever tissue the material comes in contact with. The irritation can be of the skin, eyes, or respiratory systems.
   Examples: acids (HF), bases (caustic, ammonia, amines) petroleum solvents (kerosene, xylene, etc.) sulfur oxides (SO_2), hydrogen sulfide (H_2S)

2. Asphyxiants-Materials which interfere with the transfer of oxygen to the body tissues. There are simple asphyxiants and chemical asphyxiants.

   Simple Asphyxiants - physiologically inert gases that displace the oxygen in the air to levels below which respiration can occur. Materials which result in oxygen deficiency.

   Examples: nitrogen, carbon dioxide, methane

   Chemical asphyxiants - materials which, through direct chemical action, prevent the oxygen inhaled through the respiratory system to be absorbed into the blood or transported to the tissues.

   Examples: carbon monoxide, hydrogen cyanide, hydrogen sulfide

3. Narcotics and Anesthetics- materials affecting the central nervous system causing it to fail to do its normal job.

   Examples: hydrogen sulfide (H_2S), Tetra Ethyl Lead (TEL), others

4. Systemic Poison - materials which affect a body system away from the point of entry, i.e., the liver (hepatic system), kidney (renal system), etc.

   Examples: Aromatics (Benzene, Xylene, etc.), Tetra ethyl (TEL), mercury, ethylene dichloride (EDC), propylene dichloride.

5. Particulates -
   A. Fibrosis producing dusts - Dusts that cause an increase of fibrous tissue in the lung area. These dusts are associated with pneumoconiosis conditions.

   Examples - silica, asbestos

B. Inert Dust - Dust that do not alter the structure of the lungs spaces, do not cause scar formation and do result in reversible tissue reaction. Sometimes called nuisance dusts.

Examples - some catalysts (those comprised) of calcium carbonate, aluminum silicate, etc.)

6. Carcinogens - Materials which affect the cells of the body causing the growth of new cells which are abnormal compared to the cells from which the new cancerous cells originated.

Examples - Benzene, Asbestos, Vinyl Chloride

CLASSIFICATION OF RESPIRATORY EQUIPMENT

There are two main categories of respiratory equipment, (A) air purifying and (B) air supplying.

A. AIR PURIFYING

The most important thing to remember about these types of respirators is:
None should be used in oxygen deficient atmospheres. They should not be used and will offer no protection in atmospheres with less than 19.5% oxygen.

Three types

(1) Particulate Removing

(2) Vapor and Gas Removing

(3) Combination Particulate, Vapor and Gas Removing

1. Particulate Removing
   a. Single use or b. Replaceable Filter

notes: a. Single use type filters are for low concentrations of most dusts

b. Replaceable Filters provide protection against higher concentrations of dusts, metal fumes, mists, toxic dusts, asbestos, radon daughters and combinations of any of the above.

2. Vapor and Gas Removing
   a. Single use and b. Replaceable Filter

notes: a. Single use offers protection against low concentrations of the vapor or gas specified.

b. Replaceable Filter type has either molded facepiece with replaceable cartridges or molded facepiece with breathing tube and belt mounted canisters (Gas Mask).

3. Combination Particulate, Vapor and Gas Removing

Same as Vapor and Gas Removing except with filter protection for particulates.

B. AIR SUPPLYING

Can be used in oxygen deficient atmospheres (with some limitations).

Three types

(1) Self contained Breathing Apparatus

(2) Supplied Air Respirators

(3) Combination self contained Breathing Apparatus and supplied air.

1. Self Contained Breathing Apparatus

Open circuit compressed air
a) Demand or b) Pressure demand

notes: Service Times
30-45 minutes - Approved for Rescue Operations
3-15 minutes - Recommended for escape use only

2. Supplied Air Respirators

Airline connections to Half Mask, Full Facepiece or Hood.
a) Demand b) Pressure Demand c) Continuous Flow

3. Combination Self Contained Breathing Apparatus and Supplied Air

Supplied Air Respirator with auxillary air supply
a) Demand b) Pressure Demand c) Continuous Flow

notes: Auxillary Compressed Air Supply Service Times
a) 3-10 minutes for b) more than 15 minutes for

TYPES OF RESPIRATORY EQUIPMENT USED AT THE CHALMETTE REFINERY

A. Particle Mask

Type	Protection for
3M #8710	Dusts
3M #8706	HF vapors & mists

B. Twin Cartridge Respirator - AO Brand

Filter	Protection for
R-53	Acid Gases - Organic Vapors
R-55	Dusts, Mists and Organic Vapors
R-56	Dusts, Fumes & Mists

Facepiece Size

4000 Series - Extra small facepiece
5000 Series - Medium facepiece
6000 Series - Larger facepiece

C. Full Facepiece Canister Respirator - MSA Brand

a. Organic vapor canister-black (GMA-SS)
b. Acid gases and organic vapors-yellow (GMC-S)

D. Full Facepiece Pressure Demand Self Contained Breathing Apparatus

1) Survivair Model 9838-20 (2216 psi)

2) Survivair Model 9845 Mark I (4500 psi)

E. Full Face Pressure Demand Airline Respirator With 5 Minute Escape Bottle

1) Survivair Hip Pak

2) Scott Ska Pak

3) Robert Shaw RAM-5 Welder's Airline

F. Escape Paks

Robert Shaw - RAM-5 Escape Pak
5 minute service life

SELECTION OF PROPER RESPIRATORY EQUIPMENT

The following information is designed as a quick reference in the selection of the proper respiratory equipment under various hazard and environmental conditions. The first chart is a general overview of all respiratory equipment and the catagories for use under different hazard classifications. The remainder of the charts pertain to specific hazards (chemicals) and/or specific job functions. It must always be remembered that conditions upon which a respirator was selected may change at anytime requiring another type respirator for an additional level of protection. This is a general guideline and must be used as such. Always be alert to changing conditions.

In order to assist in the interpretation of the charts, several items should be understood. A brief description of each chemical is given with important data to be considered in respiratory protection, the flash point, TLV and STEL. The threshold limit value (TLV) is a rough guideline for the concentration a worker should be exposed to for an eight hour day without using respiratory protection. The short term exposure limit (STEL) is the concentration a worker should be exposed to for any 15 minute period. Important factors to consider about the TLV or STEL are:

1. The TLV's are not fine lines between safe and unsafe atmospheres.

2. TLV's for different chemicals cannot be compared, i.e. HF (TLV=3 ppm) is not more hazardous than Benzene (TLV=10 ppm) Just because the TLV is lower.

3. TLV's are for <u>workplace</u> contaminant in <u>air</u> concentrations only.

Other clarifications of the charts are:

1. The use of any filter type respirator in an oxygen deficient atmosphere or IDLH atmosphere is strictly prohibited.

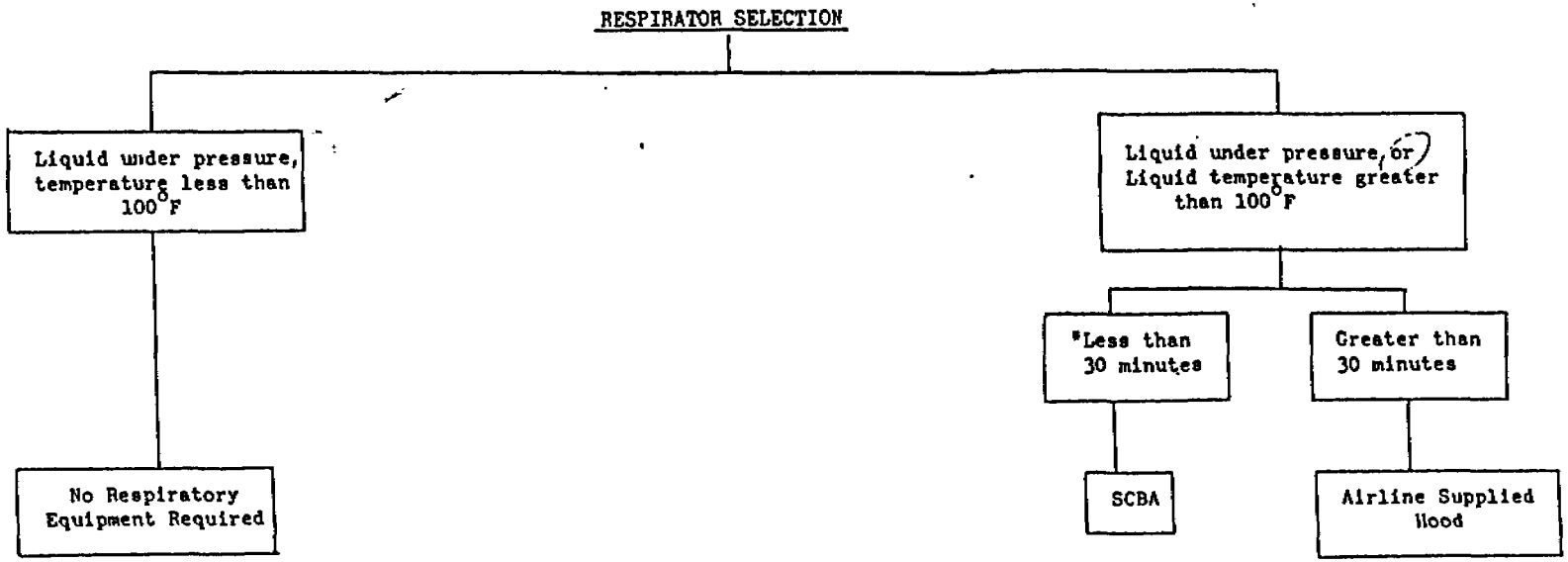
2. The designation in the charts for the "Organic Vapor Cartridge Respirator" refers to an AO half mask respirator with the twin R-55 cartridges, the "Acid Gas Cartridge Respirator" refers to an AO half mask respirator with the twin R-53 cartridges, and the "Combination Dust and Organic Vapor Cartridge Respirator" refers to an AO half mask respirator with the twin R-56 cartridges.

3. For jobs planned to extend longer than 15 minutes and an IDLH atmosphere exists or can potentially exist, an airline respirator with the 5 minute excape pak must be used. The rationale behind this is to prevent a situation where the user of a SCBA is breathing heavily and is still in the IDLH atmosphere but runs out of air. By using the airline respirator, more confidence and security in having a safe air supply is established.

4. Gas masks are <u>never</u> to be used where hydrogen sulfide gas exceeds 10 ppm since the warning properties are inadequate.

5. The term SCBA refers to self contained breathing apparatus.

AMINES (DEA, MDEA, AO-22, Neutrafilm) - The various type of amines can generally be classified into one category for respiratory protection. All amines can be absorbed through the skin therefore any skin contact should be avoided.

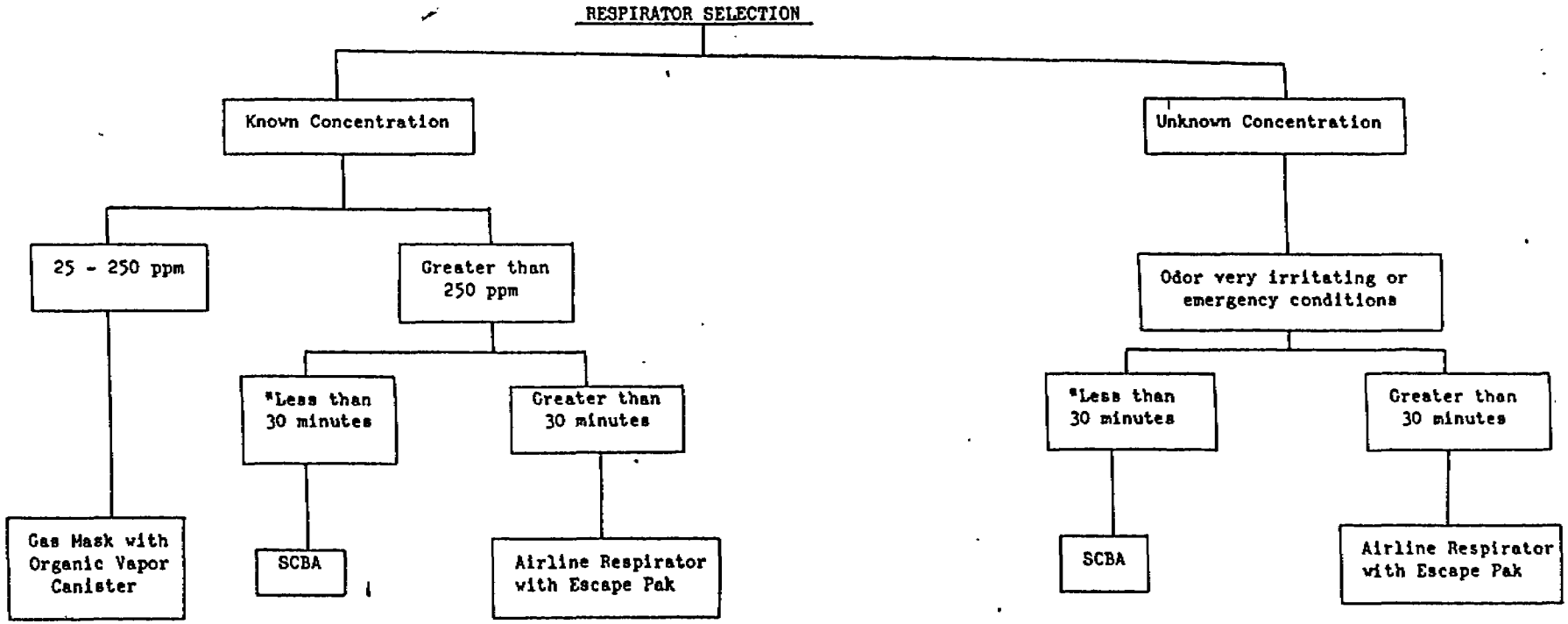


*If job planned will take no longer than 15 minutes. Under emergency conditions, the full service life of 30 minutes may be used.

TEN 4223

AMMONIA (NH_3) - A colorless gas with an extremely pungent odor.

TLV = 25 ppm
STEL = 35 ppm

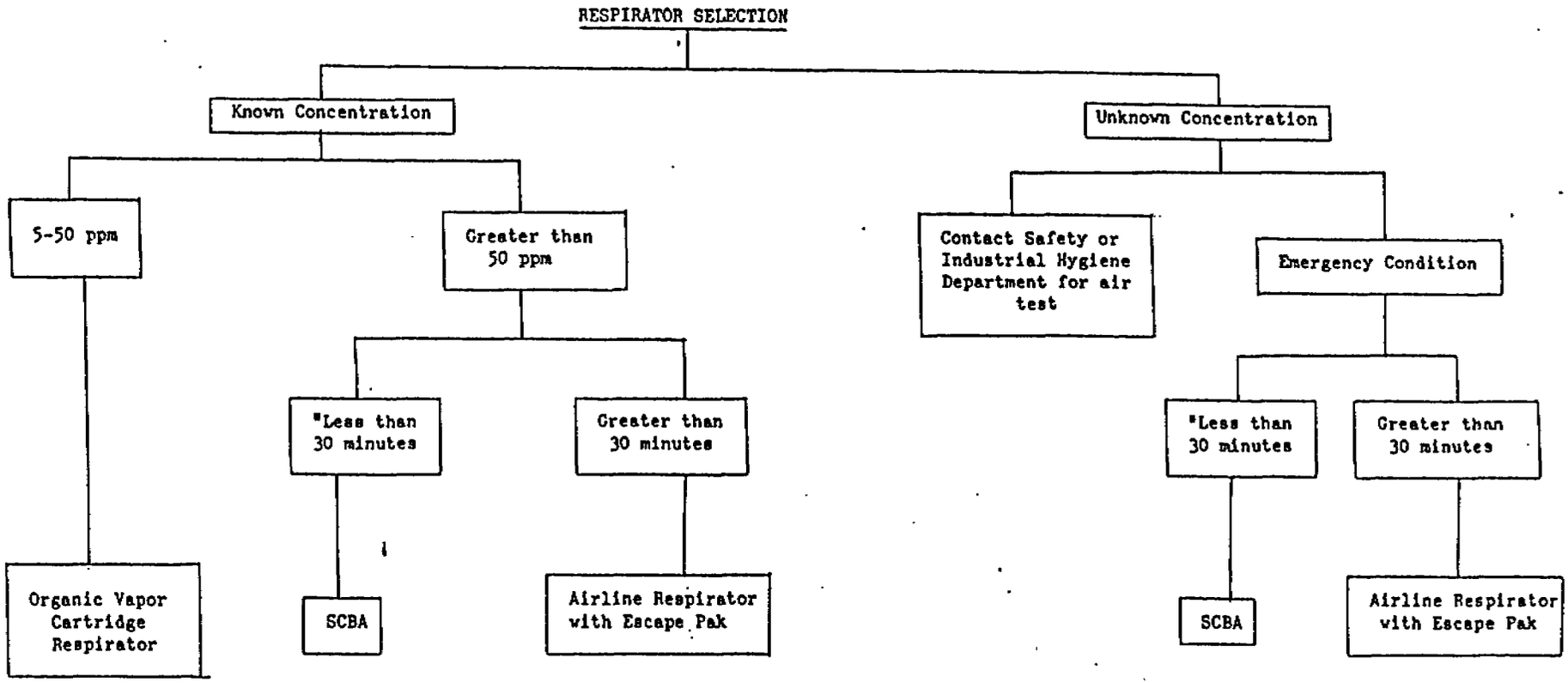


* If job planned will take no longer than 15 minutes. Under emergency conditions, the full service life of 30 minutes may be used.

IEN 4224

ANILINE - A colorless, oily liquid with an aromatic amine-like odor.

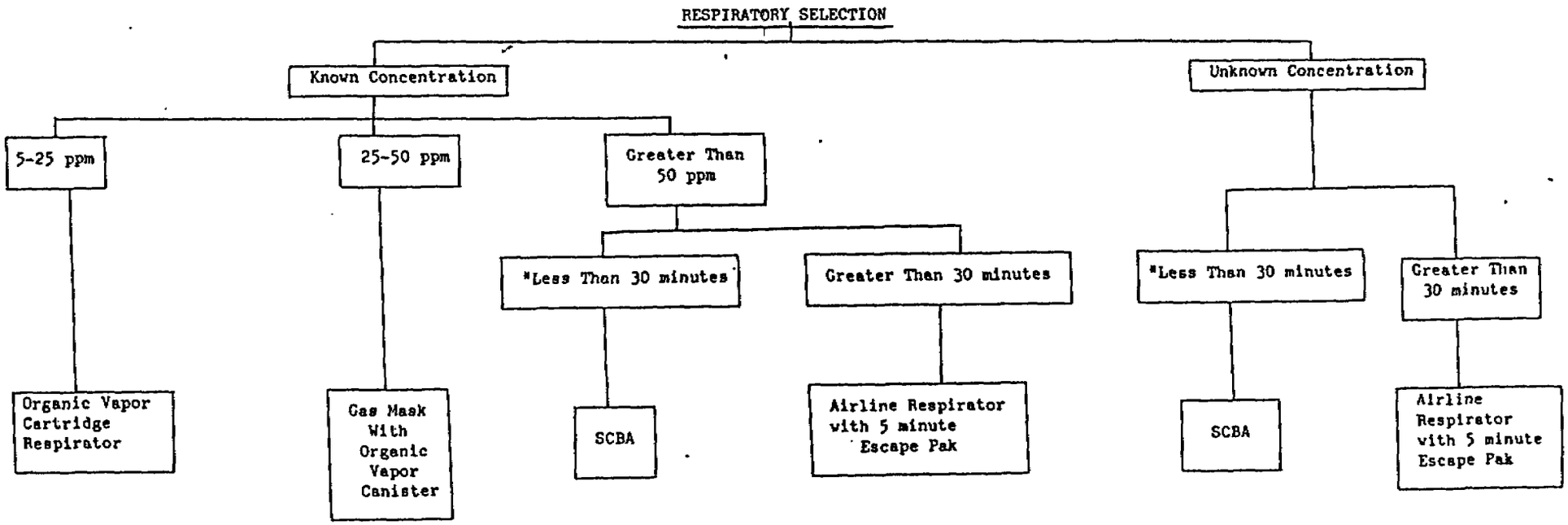
TLV = 5 ppm
No STEL



* If job planned will take no longer than 15 minutes. Under emergency conditions, the full service life of 30 minutes may be used.

BENZENE (C_6H_6) - A colorless, flammable hydrocarbon liquid having a pleasant, aromatic odor. Benzene should be handled as a cancer causing compound. Any exposure, however small, should be avoided.

Flash Pt = 12° F (-11°C)
TLV (8 hours) = 5 ppm ~~10ppm~~ Action level .5 ppm
STEL (15 minutes) = 25 ppm ~~5 ppm~~



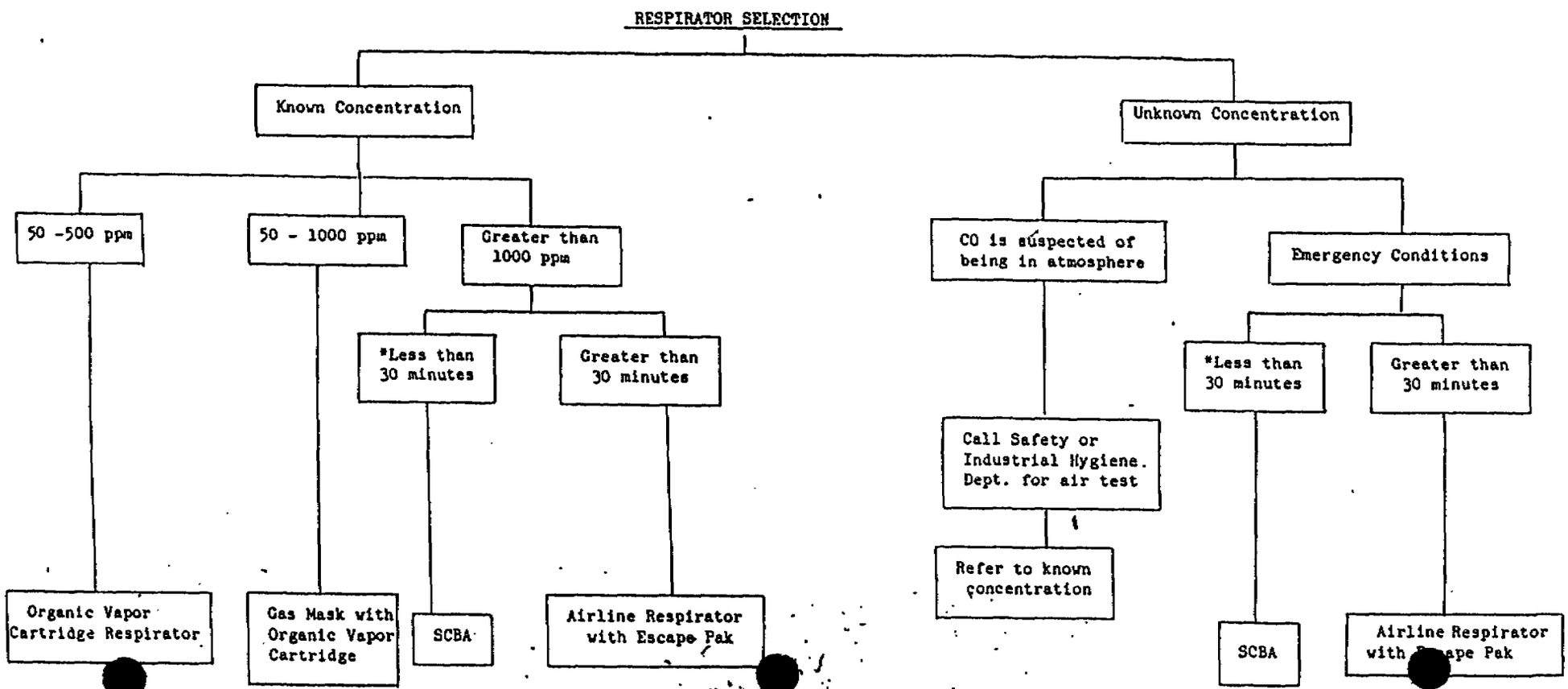
TEN 4226

* If job planned will take no longer than 15 minutes.
Under emergency conditions, the full service life of 30 minutes may be used.

IEN 4227

CARBON MONOXIDE (CO) - A colorless, odorless gas

TLV = 50 ppm
STEL = 400 ppm



* If job planned will take no longer than 15 minutes. Under emergency conditions, the full service life of 30 minutes may be used

SOLID CATALYSTS

The Specifications for respiratory protection from catalyst dust must include the type of materials in the catalyst as well as the process conditions affecting the catalyst.

be based on

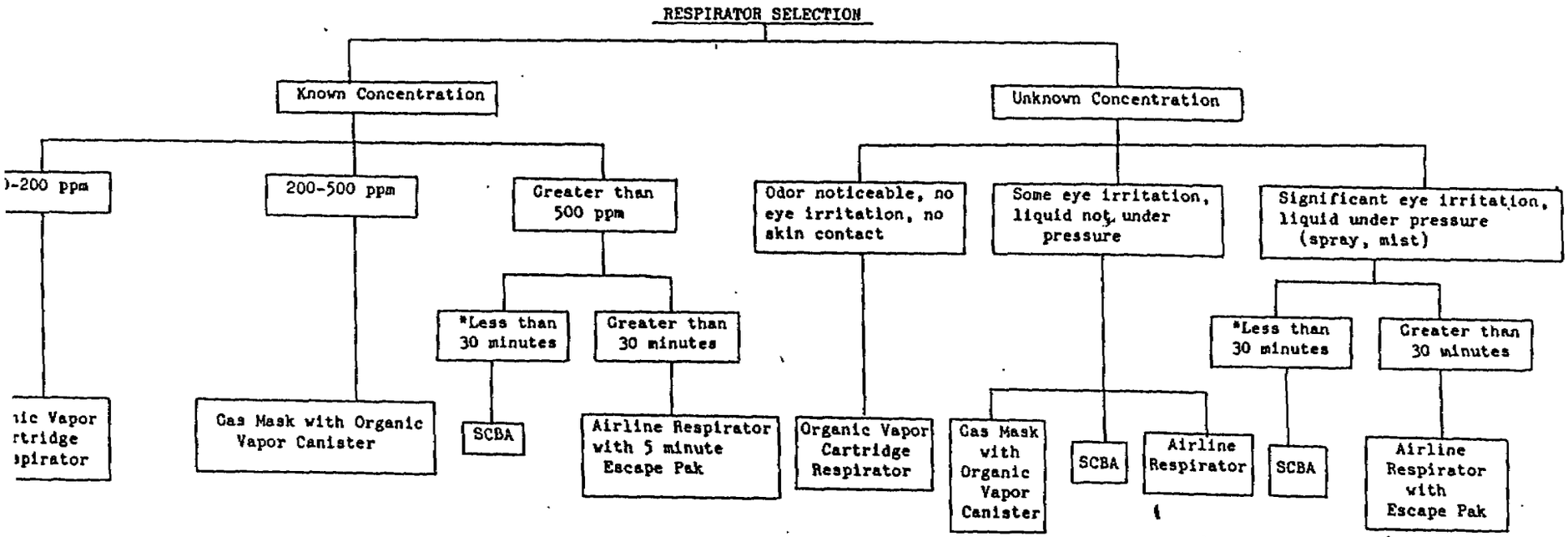
What action?

IEN 4228

TEN 4229

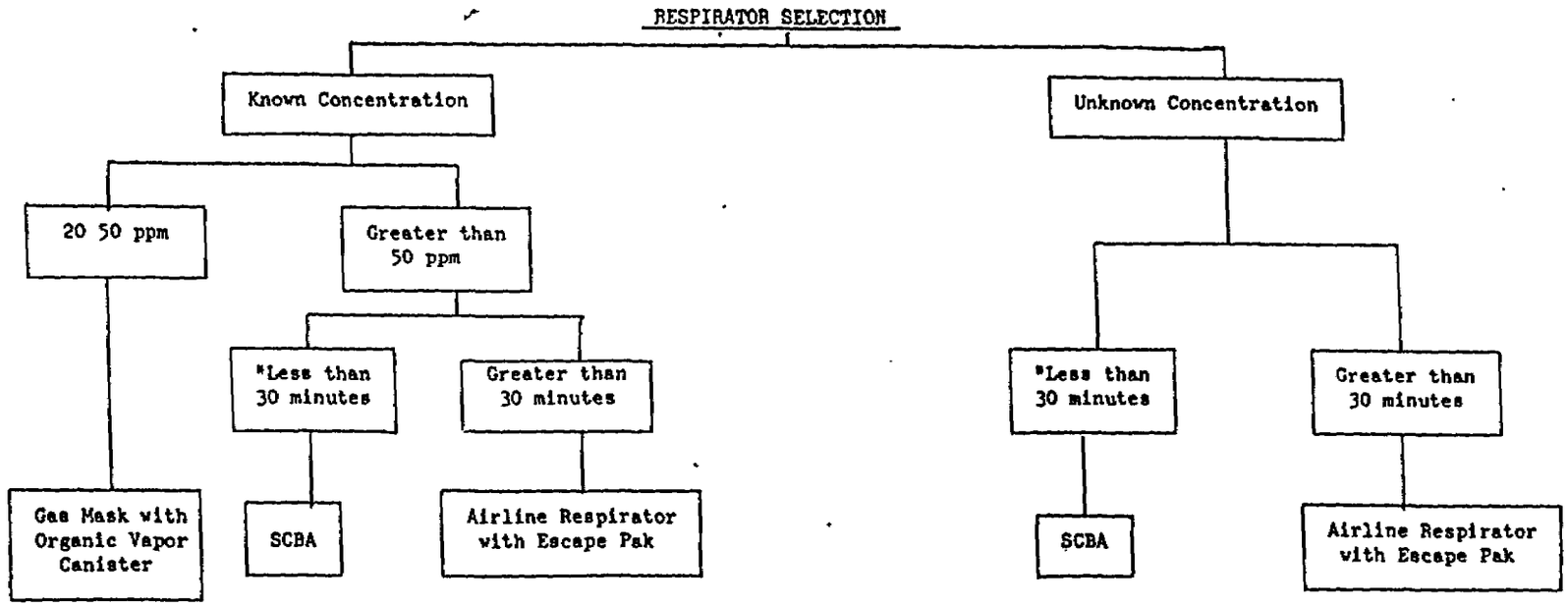
ETHYL BENZENE - A colorless, flammable liquid with a pungent odor.

Flash Point = 59°F (15°C)
TLV = (8 hours) = 100 ppm
STEL (15 minutes) = 125 ppm



* If job planned will take no longer than 15 minutes. Under emergency conditions, the full service life of 30 minutes may be used.

ETHYLENE DIBROMIDE (EDB) - A colorless, heavy liquid with a sweet odor. This compound is a suspect cancer causing agent. Any contact should be avoided.
Flash Pt. = None
TLV = 20 ppm
STEL = 30 ppm

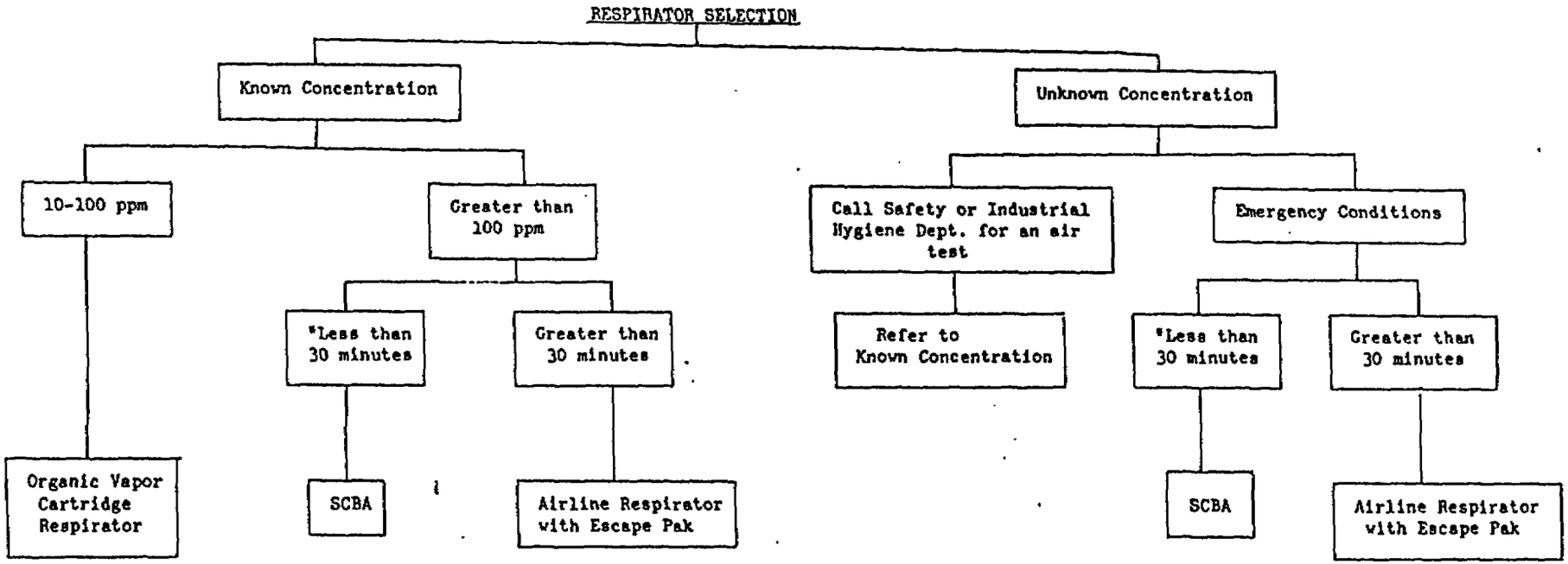


* If job planned will take no longer than 15 minutes. Under emergency conditions, the full service life of 30 minutes may be used.

TEN 4230

ETHYLENE DICHLORIDE (1,2, Dichloroethane) - A colorless, flammable liquid with a pleasant; sweet odor.

Flash Pt. = 56°F (13°C)
TLV = 10 ppm
STEL = 15 ppm

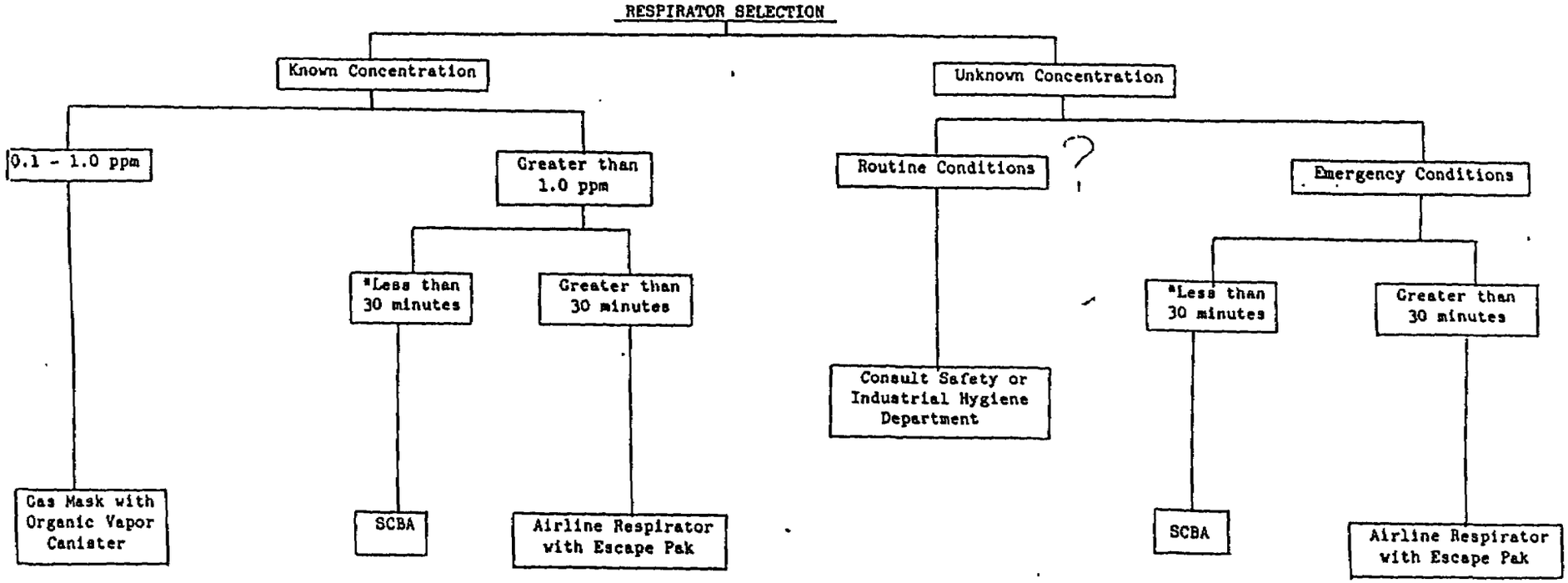


* If job planned will take no longer than 15 minutes. Under emergency conditions, the full service life of 30 minutes may be used.

IEN 4232

HYDRAZINE - A colorless, combustible, fuming liquid. A suspected cancer causing substance. Any contact should be avoided.

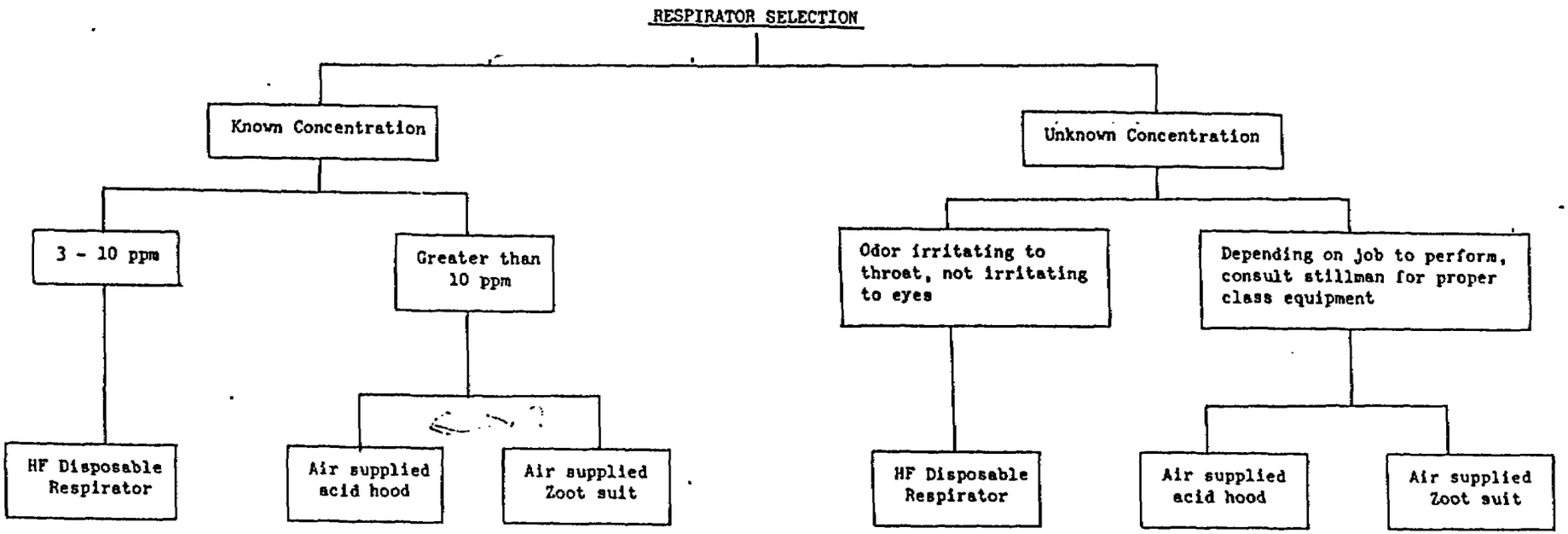
Flash Pt. = 126°F
TLV = 0.1 ppm
No STEL



* If job planned will take no longer than 15 minutes. Under emergency conditions, the full service life of 30 minutes may be used.

HYDROGEN FLOURIDE (HF) - As encountered in the plant, HF is a yellowish or light brown liquid with an irritating acrid odor. The vapor will form a white or yellowish cloud.

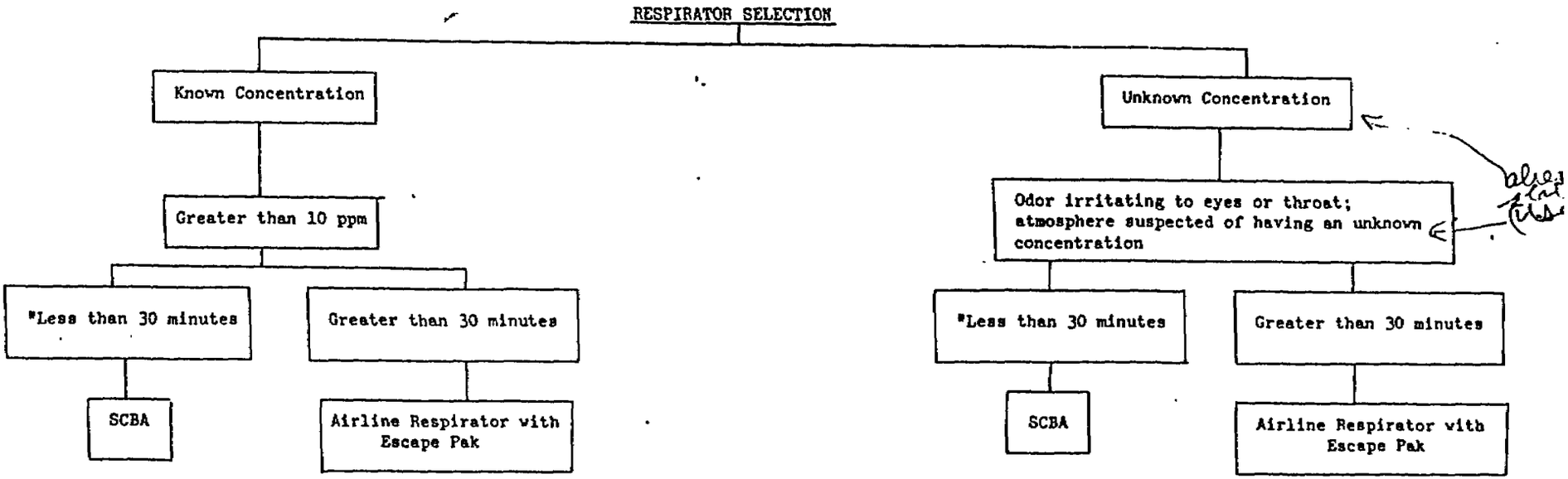
Boiling Pt = 67°F
TLV = 3 ppm
No STEL



TEN 4233

HYDROGEN SULFIDE (H_2S), also Sour Water- A colorless gas with an odor somewhat like rotten eggs. It is highly flammable, heavier than air, and rapidly deadens the sense of smell.

TLV = 10 ppm
No STEL

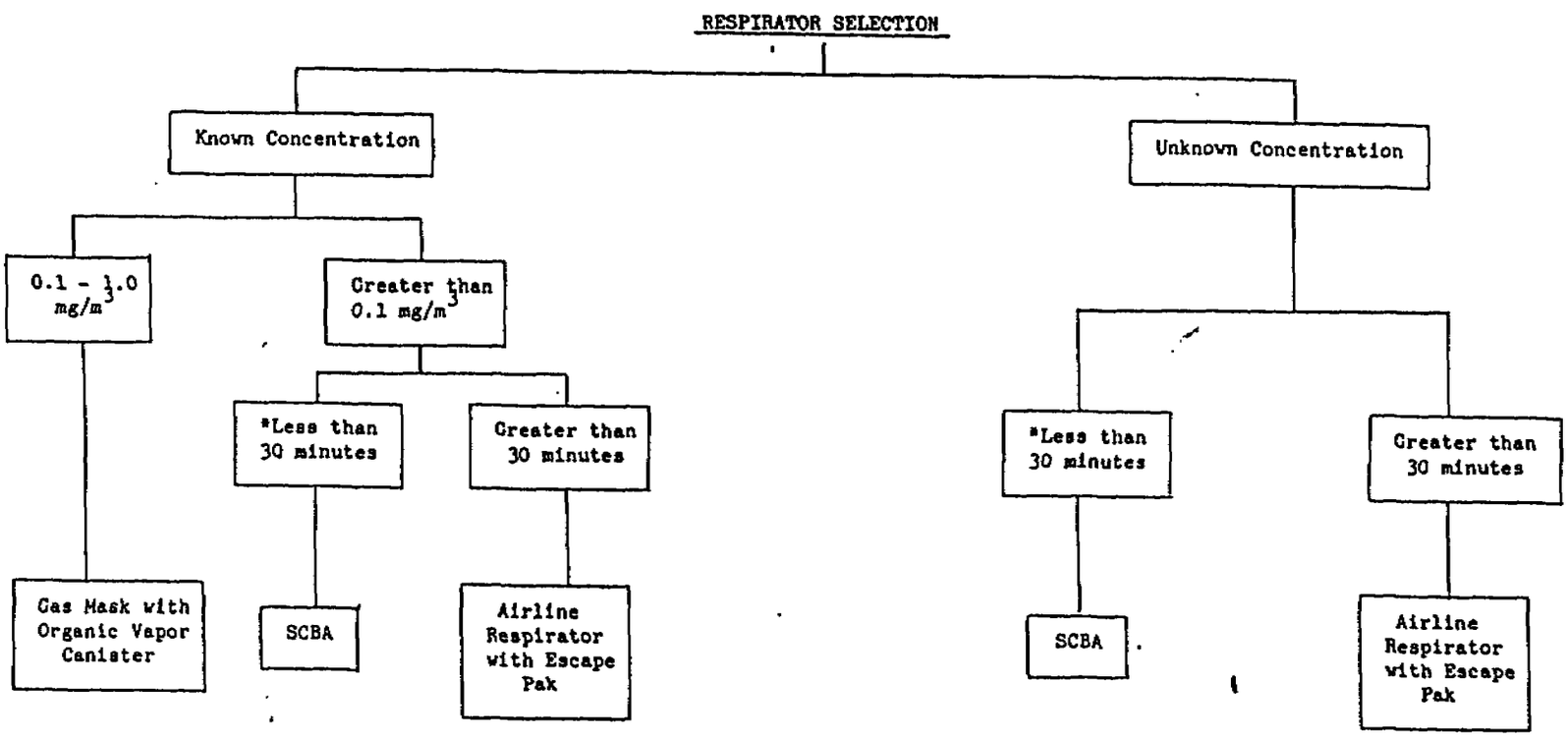


* If job planned will take no longer than 15 minutes. Under emergency conditions, the full service life of 30 minutes may be used.

TEN 4234

MMT (Methylcyclopentadienyl manganese tricarbonyl) - An orange liquid having a faint, pleasant herbaceous odor.

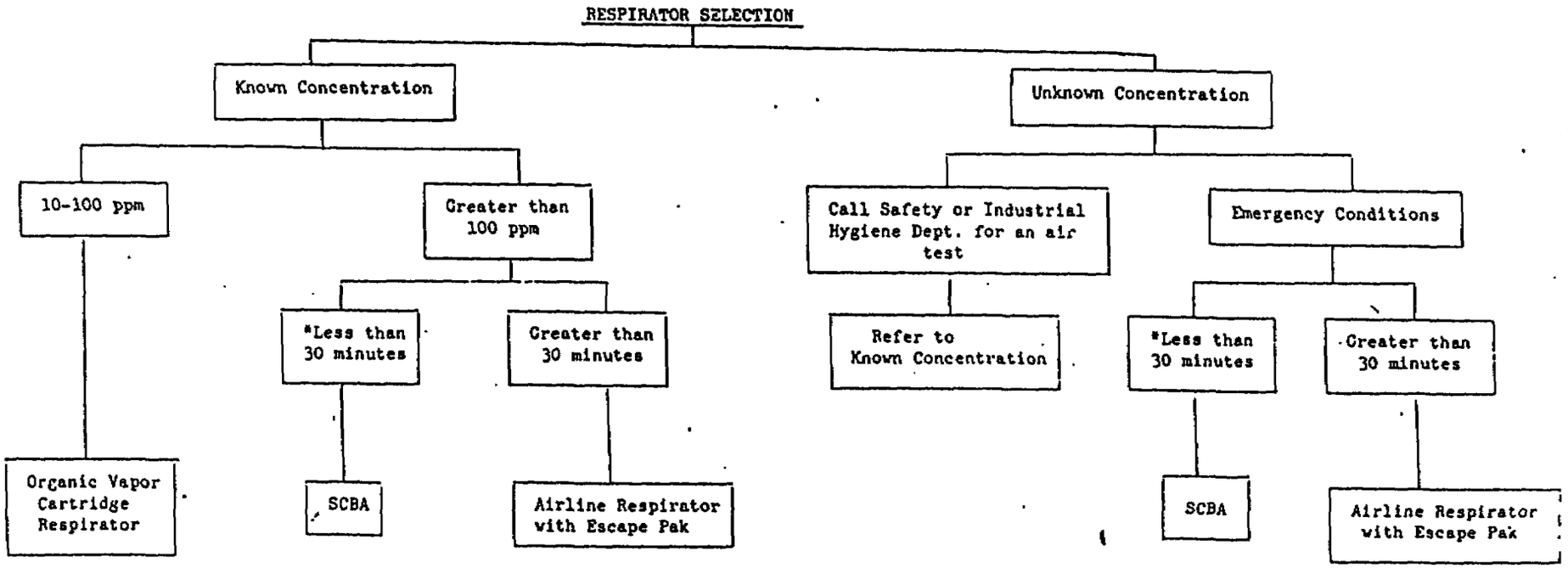
Flash Pt = 205°F
TLV = 0.1 ppm
STEL = 0.3 ppm



* If job planned will take no longer than 15 minutes. Under emergency conditions, the full service life of 30 minutes may be used.

PROPYLENE DICHLORIDE (1,2, Dichloropropane) - A colorless, flammable liquid with a pleasant, sweet odor. This chemical has a high degree of skin absorption. Avoid skin contact.

Flash Pt. = 60°F
TLV = 10 ppm
STEL = 15 ppm

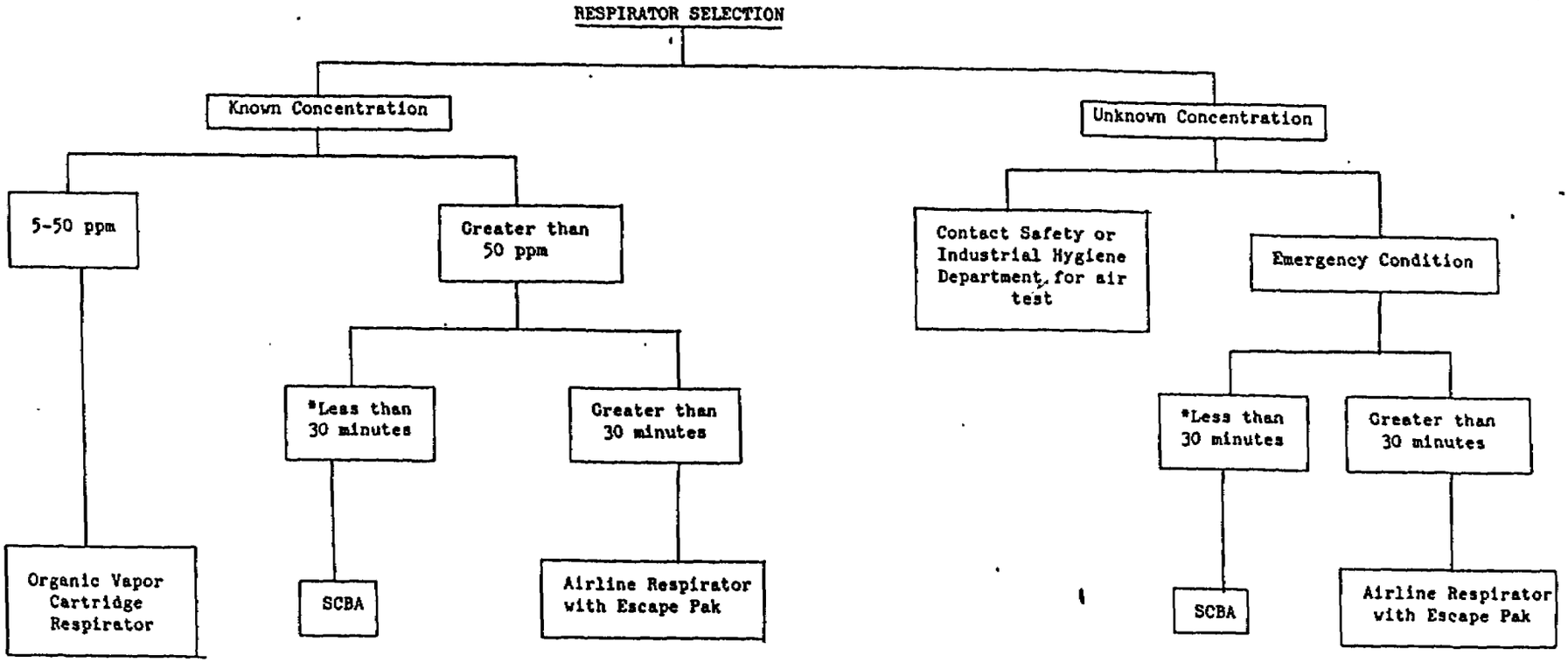


* If job planned will take no longer than 15 minutes. Under emergency conditions, the full service life of 30 minutes may be used.

TEN 4237

PYRIDINE - A colorless liquid with a sharp penetrating odor. Any skin contact should be avoided.

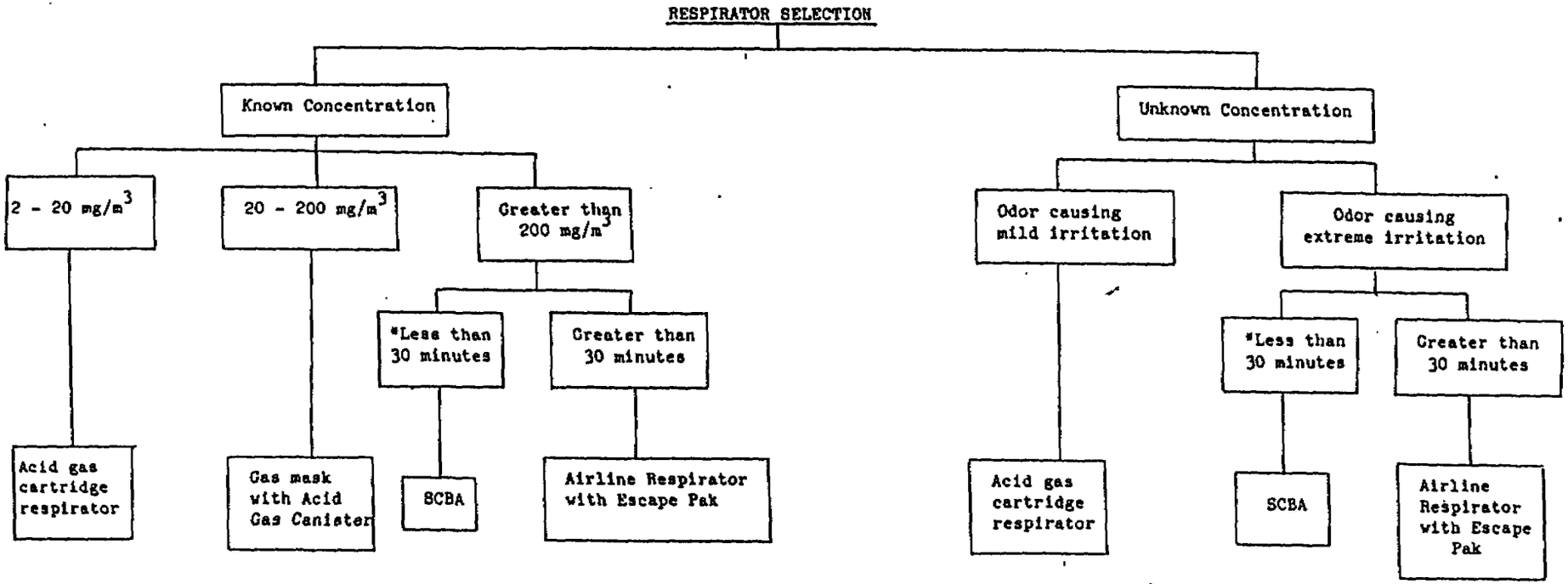
Flash Pt. = 68°F
TLV = 5 ppm
STEL = 10 ppm



* If job planned will take no longer than 15 minutes. Under emergency conditions, the full service life of 30 minutes may be used.

SODIUM HYDROXIDE (CAUSTIC, NaOH) - White pieces, lumps or sitcks which attract water and have a corrosive effect on human tissues. Also, solutions containing sodium hydroxide.

TLV = 2 mg/m^3
STEL = None

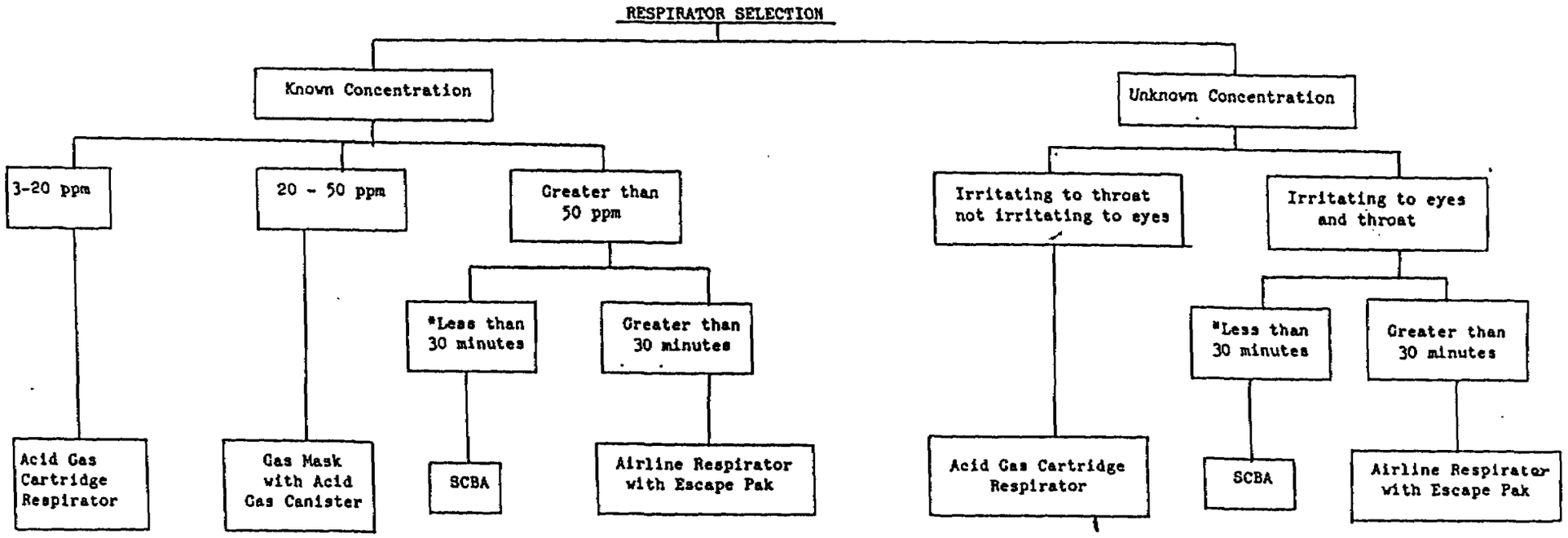


* If job planned will take no longer than 15 minutes. Under emergency conditions, the full service life of 30 minutes may be used.

TEN 4239

SULFUR DIOXIDE (SO_2) - A colorless gas with a pungent, acrid odor.

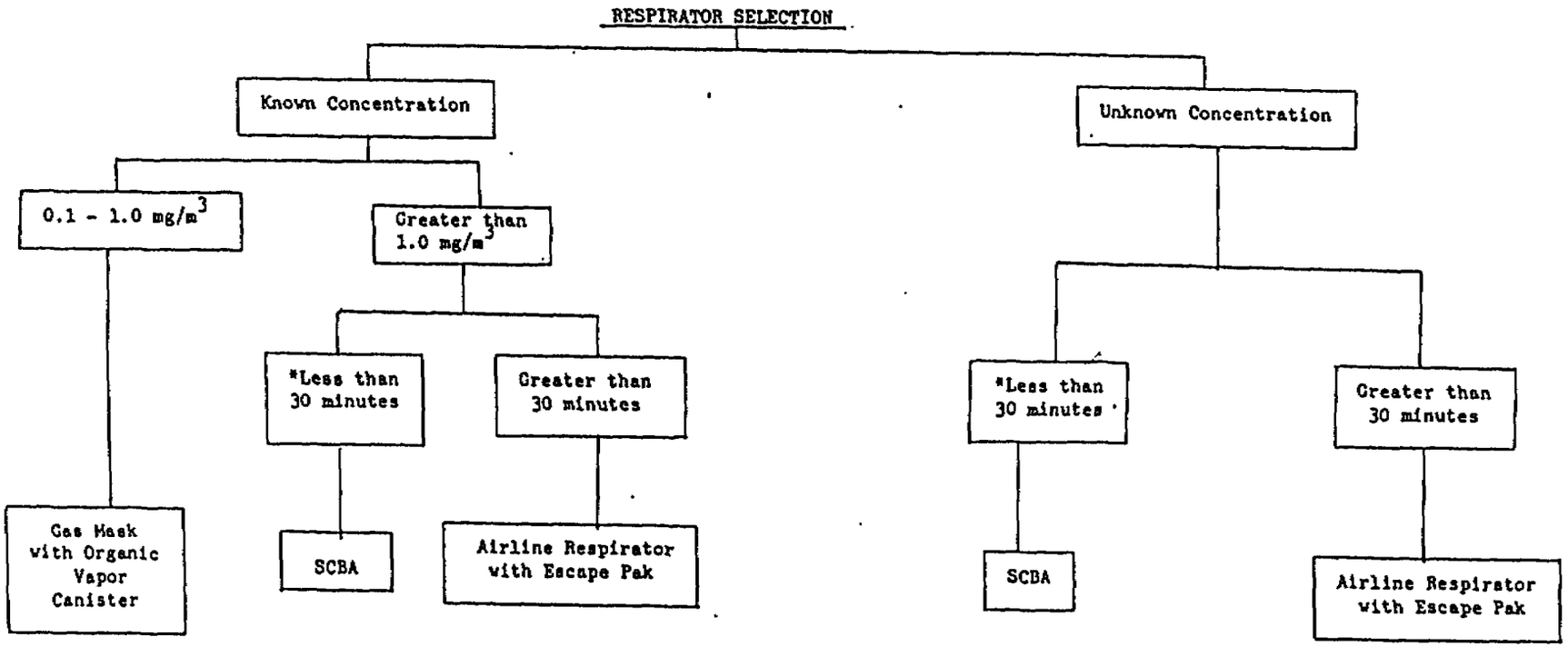
TLV = 2 ppm
STEL = 5 ppm



* If job planned will take no longer than 15 minutes. Under emergency conditions, the full service life of 30 minutes may be used.

TETRA ETHYL LEAD (TEL) - A colorless, oily liquid with a pleasant characteristic odor.

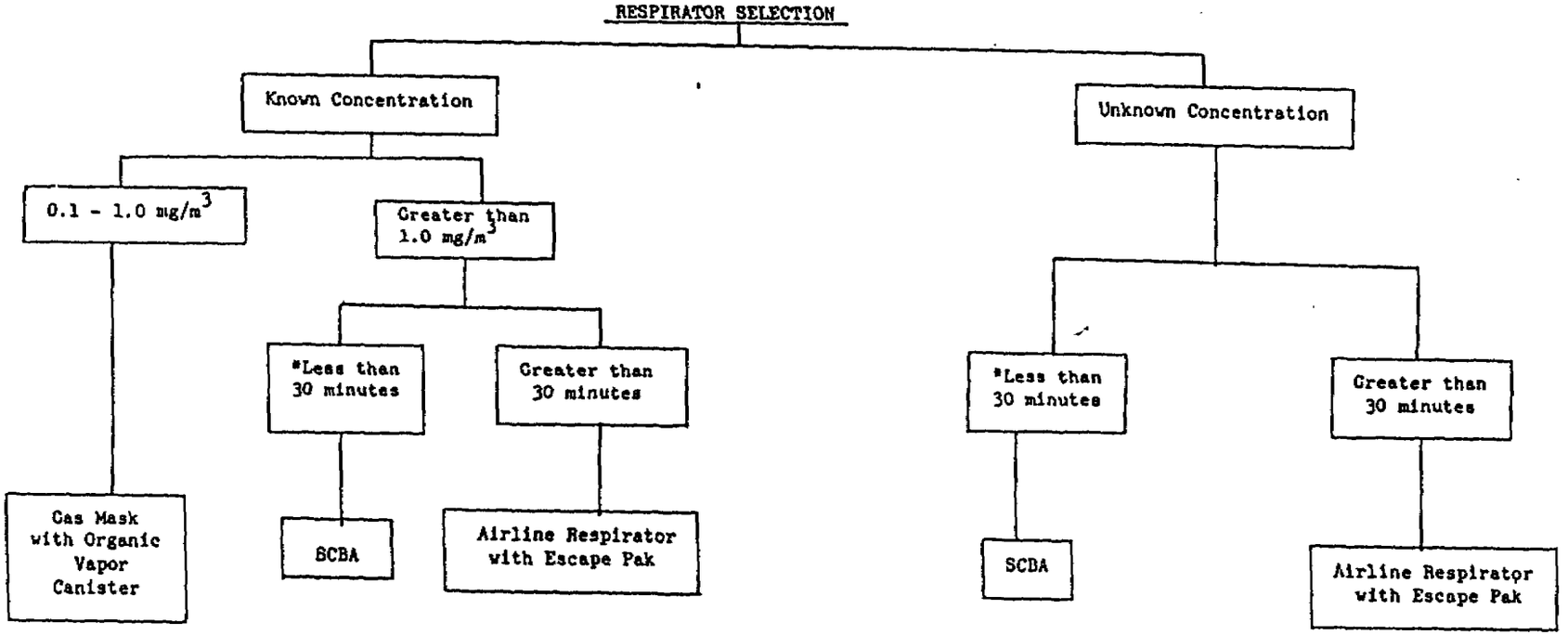
TLV = 0.1 mg/m^3
STEL = 0.3 mg/m^3



* If job planned will take no longer than 15 minutes. Under emergency conditions, the full service life of 30 minutes may be used.

TETRA METHYL LEAD (TML) - A colorless, oily liquid with a pleasant characteristic odor.

TLV = 0.1 mg/m^3
STEL = 0.3 mg/m^3

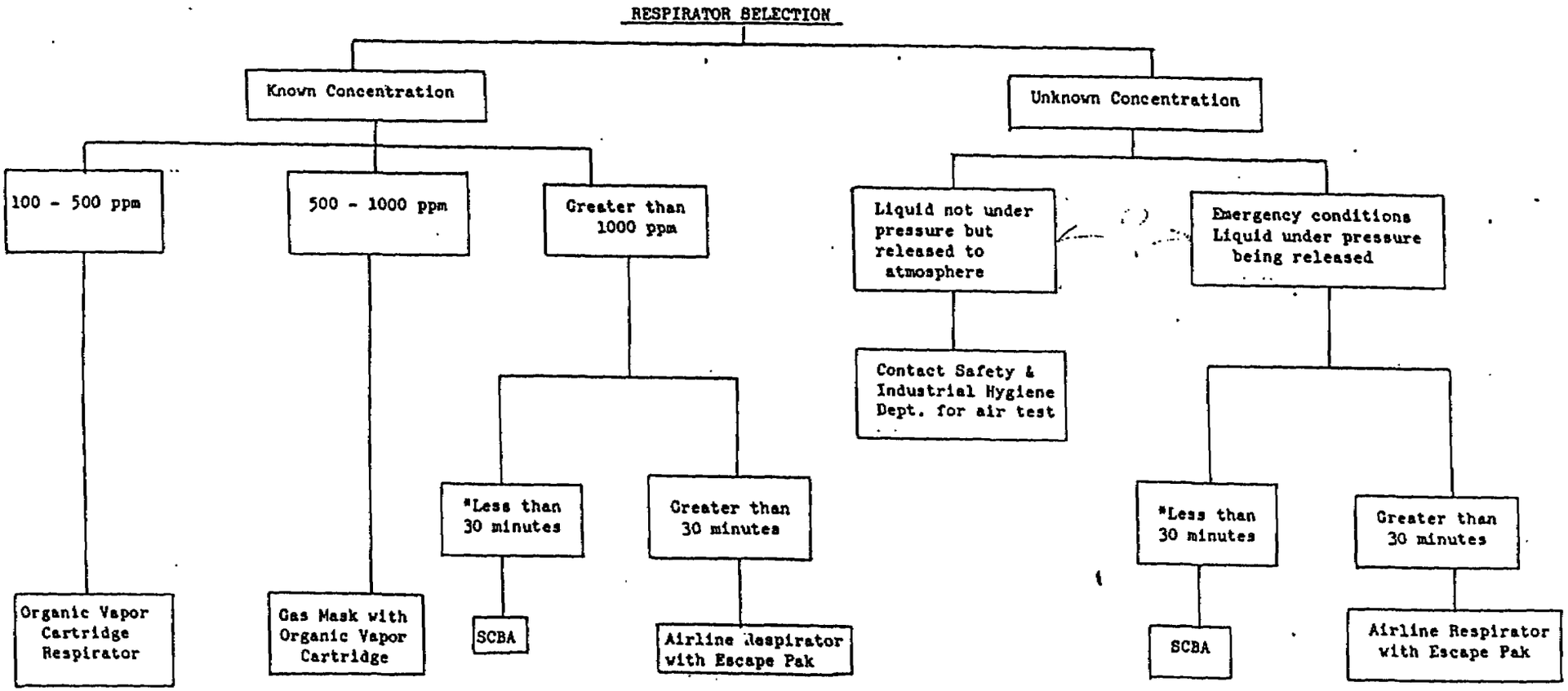


* If job planned will take no longer than 15 minutes. Under emergency conditions, the full service life of 30 minutes may be used.

TEN 4242

TOLUENE - A colorless, flammable liquid with a benzene-like odor.

Flash Pt = 40°F
TLV = 100 ppm
STEL - 150 ppm

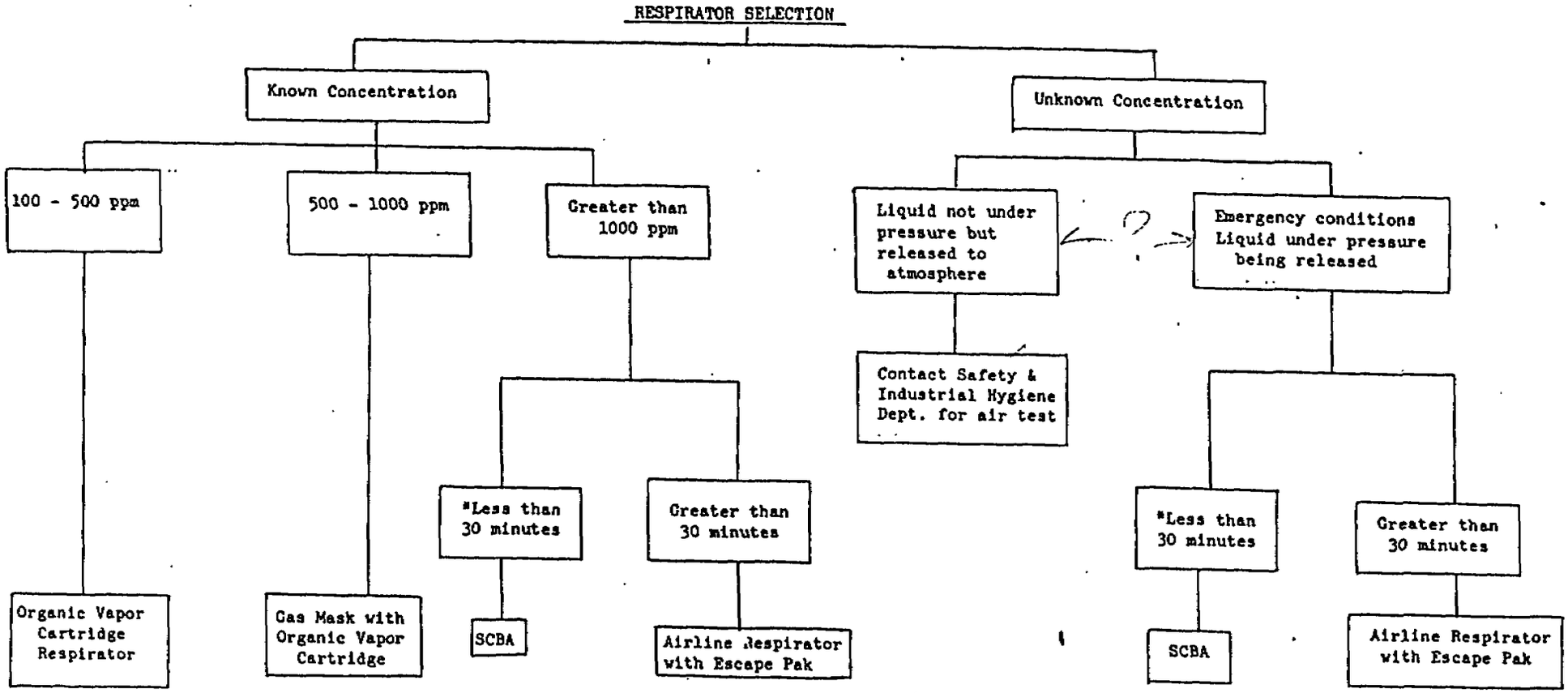


* Job planned will take no longer than 15 minutes. Un[redacted] emergency conditions, the full service life of 30 minutes [redacted] be used.

TEN 4243

TOLUENE - A colorless, flammable liquid with a benzene-like odor.

Flash Pt = 40°F
TLV = 100 ppm
STEL - 150 ppm

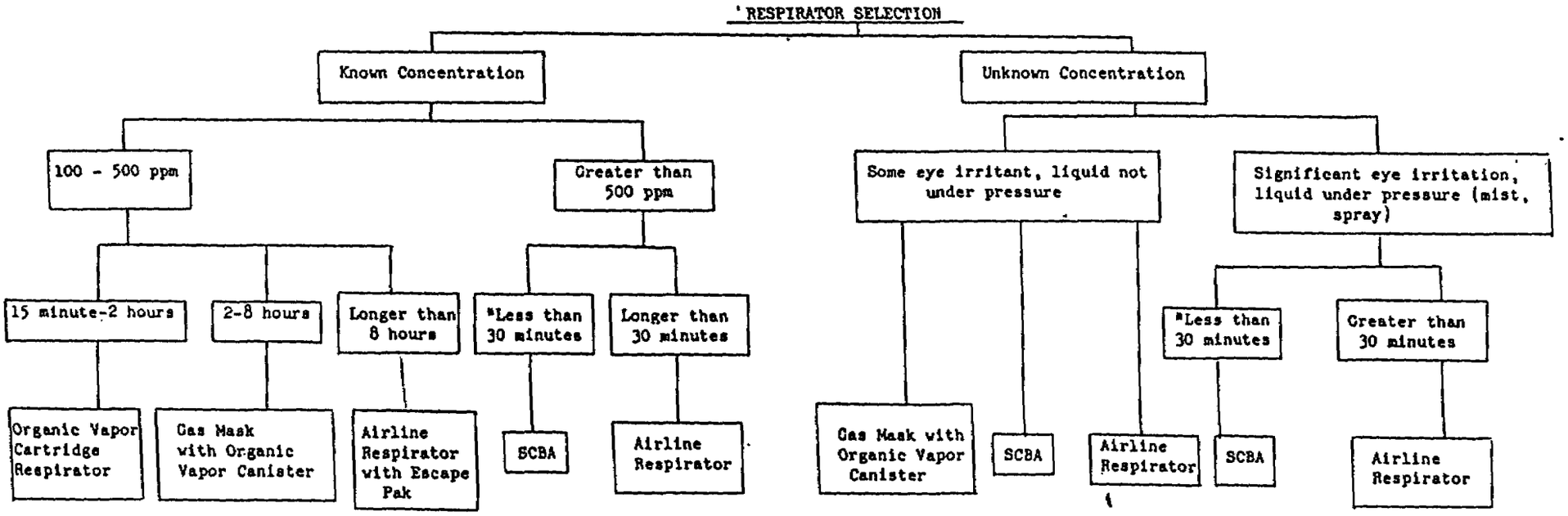


* If job planned will take no longer than 15 minutes. Under emergency conditions, the full service life of 30 minutes may be used.

TEN 4244

XYLENE (ORTHO, META, PARA, MIXED XYLENES) - A clear, colorless, flammable liquid having an aromatic odor similar to that of benzene and toluene.

	Ortho	Meta	Para
Flash Point =	63°F	77°F	77°F
TLV (8 hours) =	100 ppm	100 ppm	100 ppm
STEL (15 min.) =	150 ppm	150 ppm	150 ppm



RESPIRATORY PROTECTION FOR SPECIFIC JOBS

BLINDING

A. Lines which may contain H_2S gas or Liquids that may have H_2S present.

USE: Airline Respirator with Escape Pak

Examples: Sulfur Plant Lines, Sour Water Lines, Sour Crude Lines

B. Lines which contain Liquids that will cause serious adverse health effects due to the quantity of chemical, its vapor pressure, its toxicity, and any unknown pressure that may be present.

USE: Airline Respirator with Escape Pak

* Acid Hood
* Rain Suit
* Rubber Boots
* Rubber Gloves

* Mandatory if encountering substance under pressure or its vapors may be irritating to skin.

Examples: DEA, MDEA, BENZENE, XYLENE, ETHYL BENZENE, TOLUENE, OILS, AMMONIA, ORGANIC LEAD, ETHYLENE DICHLORIDE, PROPYLENE DICHLORIDE, HYDRAZINE, CAUSTIC

C. Lines which may contain high concentrations of Toxic Gases.

USE: Airline Respirator with Escape Pak

Examples: Sulfur Dioxide, Carbon Monoxide, Flue Gas, Waste Gas.

TANK CLEANING

Refer to Respirator Selection Chart for specific chemical. If not listed, check with Safety Dept. or Industrial Hygiene Dept. for proper equipment.

VESSEL ENTRY

Always check Entry Tag for specific Respiratory Requirements. Follow all vessel entry procedures.

IV. WELDING

A. Open Area

1. Steel (not galvinized, painted or removed from process area)

   No Respiratory Protection Required

2. Steel or other metals which have been galvanized, painted, or removed from a process area other than in plain water service.

   USE: Half mask respirator with twin cartridges for dust, fumes and mists

3. Aluminum, Bronze, Monel, Stainless Steel, other Alloys

B. Confined Space

1. Steel (not galvanized, painted or in plain water surface)

   USE: Half mask respirator with twin cartridges for dust, fumes and mists.

2. Steel which has been galvanized, painted, or in other than water service and any aluminum, bronze, monel, stainless steel, or other alloys.

   USE: Half mask welders airline respirator with escape pak.

RESPIRATORY PROTECTIVE DEVICE

GUIDELINES FOR USE, FITTING AND TRAINING

A. Guidelines For Use Of Particle Mask, 3M Brand 8710 and HF Disposable 3M Brand 8706

1. The 3M Brand 8710 offers single use 8 hour protection from low concentrations of nuisance dust.

2. The 3M Brand 8706 offers single use 8 hour protection from low concentrations (less than 10 ppm) of Hydrogen Flouride.

3. They give no protection from oxygen deficient atmospheres. Do not use in atmospheres containing less than 19.5% oxygen.

4. They give no protection from gases, vapors or mists.

Fitting Instructions

1. Before wearing, prestretch each strap by grasping and pulling the strap between both hands at 1-2 inch intervals around the entire length of the strap.

2. Cup respirator in hand with nosepiece at fingertips, allowing headbands to hang freely below hand.

3. Cup respirator under chin with nosepiece up.

4. Pull top band over head and position at top back of head. Pull bottom band over head and position around neck below ears.

5. Using both hands, mold metal nosepiece to shape of nose.

6. Check fit by cupping both hands over respirator and exhaling vigorously. If air flows around nose, tighten nosepiece. If air leaks at respirator edges, work straps back along the sides of the head.

B. Guidelines For Use Of Half Mask Twin Cartridge Respirator

1. Offers 8 hour protection from moderate concentrations of dusts, fumes, mists and vapors (depending on cartridge used).

2. Offers no protection from oxygen deficient atmospheres. Do not use in atmospheres containing less than 19.5% oxygen.

3. Cartridge Selection

Type Cartridge	Type Hazard
R-53	Acid Gases-Organic Vapors
R-55	Dusts, mists, & organic vapors
R-56	Dusts, fumes & mists

4. Facepiece Selection:

4000 Series - Extra small facepiece
5000 Series - Medium facepiece
6000 Series - Larger facepiece

Fitting Instructions

1. Choose correct facepiece to fit your face and correct filters for the specific hazard.

2. Place mask to face with nosepiece up and hook bottom strap around neck. With bottom of respirator under chin, hook top band and position at top back of head. Adjust straps to proper tightness.

3. Check for fit by placing palms of hands over cartridges and sealing off any openings and breathe in. If the facepiece collapses slightly and no leakage from the edges of the facepiece is defected, the respirator fits properly.

Remember, a respirator should not have to be tightened too tight if the facepiece fits properly.

C. Full Face Canister Respirator

1. Offers 8 hour protection from moderate to relatively high concentrations of vapors and gases specified.

2. Offers no protection from oxygen deficient atmospheres. Do not use in atmospheres containing less than 19.5% oxygen.

3. Cartridge Selection

a. Organic Vapors-Protection from concentrations up to 1000 ppm, depending on time period. See selectior charts.

b. Acid bases and Organic Vapors - See selection charts

Fitting Instructions

1. Place facepiece to face and tighten straps starting from bottom and working each side to the top. Check for fit by squeezing hose and breathing in. If facepiece collapses and no leakage is detected, the facepiece fits. If leakage occurs, tighten straps and check fit again.

2. Choose correct canister for the specific hazard.

D. SELF CONTAINED BREATHING APPARATUS (SCBA)

The SCBA units used at the Chalmette Refinery are the Survivair Model 9838-20 (2216 psi) and the Survivair Model 9845 Mark I (4500 psi). These units operate essentially the same. The main difference is the high pressure (4500 psi) units are lighter in weight and have a more streamlined design, but the units are not interchangeable. The units are approved for use during rescue and emergency situations by the National Institute for Occupational Safety and Health (NIOSH). The SCBA supplies fresh breathing air in accordance with your needs. A single tank of compressed air, carried on your back, provides the air, and a pressure-demand regulator on your waist belt controls the flow of air to the facepiece. Exhaled air is released to the atmosphere and is not rebreathed. The regulator closes automatically while you are exhaling, so that your air supply is not wasted.

COMPONENT PARTS OF THE SURVIVAIR SCBA UNITS:

1. A cylinder and valve to contain a supply of compressed breathing air.
2. A high-pressure, flexible hose which routes the compressed air from the cylinder to the regulator.
3. An audible-alarm which gives an audible ringing sound to indicate low cylinder air pressure.
4. A pressure-demand regulator which reduces the cylinder pressure to a breathable pressure and supplies the wearer with the air in direct response to his breathing requirements. All entries into immediately dangerous or hazardous atmospheres require the use of the pressure-demand regulator.
5. A facepiece assembly consisting of a rubber facepiece and lens, with head band, exhalation valve, and breathing tube.
6. A back pack on which the cylinder is mounted and by which the entire apparatus is worn.

CYLINDER

The capacity, pressure and rated duration of the cylinders are as follows:

LOW PRESSURE - 45 cu. ft. at 2216 psi for 30 minutes

HIGH PRESSURE - 45 cu. ft. at 4500 psi rated for 30 minutes.

These volumes represent the amount available when the air is reduced to atmospheric pressure by demand for breathing.

The rated duration of the apparatus is determined by NIOSH in their testing procedures. This duration is based upon men performing moderate to heavy work.

The user should not expect to obtain exactly the 30-minute rated duration when using the apparatus. The duration of the apparatus will depend on factors such as:

1. the degree of physical activity of the user
2. the physical condition of the user
3. the degree by which the breathing rate is increased by excitement, emotions, fears, etc.
4. the degree of training or experience in the use of the apparatus
5. whether or not the cylinder is full
6. the condition of the apparatus

Operational duration, which takes into effect all of the above factors, may greatly reduce the rated duration. Operational duration is approximately half of the rated duration. In reality, each person should determine his own duration by using the breathing apparatus under extremely strenuous work conditions.

A ratchet looking device protects the valve located on the cylinder from accidental closing during use. A non-recoil plug and burst disc assembly protects against cylinder over-pressurization. The cylinder valve handle is positioned horizontally for greater ease in turning the valve on and off when the breathing apparatus is being worn. The valve is always located, while being worn, to the user's right side.

The cylinder for the low pressure unit is a DOT-3AA cylinder rated at 2216 psi. The cylinder is made of high strength steel alloy AISI 4130. The exterior surface is protected from damage and corrosion by a special primer coat and outside coat of white polyurethane.

The cylinder for the high pressure Mark I unit is a DOT No. E-7235 cylinder rated at 4500 psi. The cylinder is made of 6351-T6 Aluminum fiberglass over-wrap on the straight section with S-2 glass filament and epoxy resin binder, which has a tensile strength of 325,000 pounds per square inch. The aluminum cylinder shell is Alrok® processed to give a hard coating that is corrosion resistant.

FLEXIBLE HOSE (HIGH PRESSURE)

The high-pressure hose connection to the cylinder is made with a hand-tightened fitting. A seal is made by a brass cone fitting which uses an O-ring gasket as a seal between the male and female sections. This gasket should be checked periodically during routine inspections.

The high-pressure hose has a nitrile inner liner and a neoprene outer cover. The hose is reinforced with a single braid of Kevlar, a new stronger-than-steel product.

AUDIBLE ALARM

The alarm is an audible warning device that has a banjo swivel connection at the regulator end and a hand-tight fitting at the cylinder connection. The loud ringing sound indicates a low air pressure condition in the cylinder. The alarm set points are 500 psi for the low pressure units and 1000 psi for the high pressure units. The alarm will ring continuously when the cylinder pressure reaches that pre-set pressure. The pressure remaining in the cylinder at the start of the alarm approximately corresponds with 4 to 6 minutes rated time remaining. Operational time should be approximately 2 to 3 minutes or less.

Remember, the Audible Alarm is indicating low air pressure and it is imperative, when it does ring, that you leave the area to obtain another cylinder. Do <u>not</u> remain in the area. When the unit is first turned on, the alarm will briefly sound. This signifies that the alarm is set to sound at low cylinder pressure. If the alarm does not sound when the unit is turned on and pressurized to the regulator, this indicates the alarm malfunction and the unit should be repaired.

PRESSURE-DEMAND REGULATOR

The regulator is the heart of the apparatus. It serves the double function of reducing the incoming air from cylinder pressure to a breathable pressure and delivering to a facepiece any quantity of air "demanded" by the wearer while simultaneously allowing a slight "positive pressure" to be maintained in the facepiece

The components of the regulator are: two pressure reducing stages, a mainline shut-off valve, a by-pass valve, a pressure gauge, a filter and a lever to change from don to use position. The function of the two stages serve to reduce the cylinder pressure to a breathable pressure by allowing cylinder air to enter the regulator through the high pressure hose. The air flows past the pressure gauge, through the main line valve and into the first stage reducing valve. The air then flows through the second stage reducing valve and into the outlet. The reducing valves are critical flow orifices and incorporate a balanced two stage design allowing maximum air flow with minimum inhalation effort.

The regulator for the Survivair high pressure (4500 psi) and the low pressure (2216 psi) units are not interchangeable. They function in the same manner but differ by the fact that the first stage of the regulator for the high pressure units reduces 5000 psi while the first stage of the low pressure units reduces 2216 psi of cylinder pressure.

The mainline valve is used to supply air under normal conditions and also can be shut off when desired and the air flow controlled by opening the by-pass valve and adjusting it to the desired air flow. This should only be done under emergency conditions when the mainline valve is not supplying air since the adjustment of the by-pass valve may unneccessarily waste air. The mainline valve has a locking device to assure that the valve is not accidently closed. The locking device also prevents mistaking the mainline and by-pass valves during use. To prevent confusion even when wearing gloves, and when donning in the dark, the mainline valve handle is square-shaped, and the by-pass valve handle is round. The valve handles are also color-coded, the mainline valve handle being silver and the by-pass valve handle being red. A dust cap is attahced to the regulator case and should be placed over the outlet when not in use to protect against objects entering the regulator, and to prevent damage to the outlet threads.

The pressure gauge assembly displays the pressure inside the regulator and high pressure hose at all times. The gauge sensing mechanism is a coiled, spring-like hollow bourbon tube, having one end plugged and attached to a pointer and the other end attached to the air source. Pressure inside the tube makes it deflect, causing the pointer to rotate in an arc whose length is proportional to the pressure.

The filter is made of sintered-bronze, and prevents the entrance into the regulator of foreign matter larger than 50 microns.

The lever to change from don to use corresponds to the modes of operation of the regulator. The don position is the demand mode where the user only receives air upon inhalation (demand). The use position is the pressure demand mode where there is a slight positive pressure inside the facepiece at all times, and additional air is received upon inhalation. The only authorized mode of operation is the pressure demand. In this function, any leaks in the facepiece seal will force breathable air out and prevent contaminated air from entering. This is required at all times, especially when entering an IDLH atmosphere.

FACEPIECE ASSEMBLY

The full-vision facepiece is the same on both the low pressure and high pressure units. The facepiece is made of silicon rubber with a polycarbonate lens. To conserve air, and for standing by outside a hazardous atmosphere, a neck strap attached to the facepiece allows the wearer to remove the facepiece, but keeps it in a "ready" position for rapid donning.

The positive pressure exhalation valve is spring loaded to maintain 1.0 inch of water column at all times. The exhalation valve is made of natural rubber.

The facepiece is held in place by a head harness with 5 independently adjustable straps that attach to quick-release buckles on the skirt. Upon donning, the straps should be adjusted starting with the lower side straps and working toward the top. The straps should be adjusted snugly but not too tight. To check for a proper facepiece seal, place the palm of the hand over the end of the low pressure hose. Then breathe in. The facepiece should collapse against the face indicating an adequate seal. When removing the facepiece, loosen the straps, remove from the head and pull the straps back over the lens to protect the lens from scratching.

BACKPACK

The backpack design is slightly different for the high pressure Mark I unit than for the low pressure units. Both backpacks incorporate an alpine design in order to distribute the weight evenly over the hips, which is the strongest part of the body for supporting weight. The backpack of the Mark I unit is hinged at the shoulder blades to allow for more freedom of movement. The frame is made of lightweight aluminum. The backpack for the low pressure units is not hinged at the shoulders and is made of SAE 1010 tubular steel.

The shoulder and waist straps are made of 2 inch nylon webbing and the waist straps are 1 inch

strap has a slide buckle for quick donning. The cylinder is retained in the backpack by a 3 inch wide stainless steel band. One end of the band is hinged while the other is retained by a 180^{0} rotating, overcenter locking cam that secures the cylinder in place.

INTEGRATED OPERATION OF ANY SCBA

DONNING (to be accomplished in 30 seconds)

1. Check cylinder gauge for full indication, 4500 psi for the Mark I unit and 2216 psi for the low pressure unit.

2. Don backpack assembly by the over-the-head method. Place cylinder on ground with straps facing up and cylinder stem pointed away from you. Grab cylinder and lift over head. Slip arms through shoulder straps allowing cylinder to slide in position on back. Adjust shoulder straps. Buckle and tighten waist strap.

3. Move don/use lever on regulator to don position.

4. Open silver main line valve fully open.

5. Close red by-pass valve.

6. Open cylinder valve 1½ turns.

7. Place facepiece to face and pull straps over your head. Adjust straps from the chin straps working up to the top. Close off breathing hose with your hand and suck in. Mask should collapse indicating an adequate seal.

8. Attach low pressure hose from the facepiece to the regulator.

9. Switch don/use lever to use.

-note: Donning should take approximately 30 seconds ~~when~~ experienced.

REMOVING

1. Close cylinder valve.

2. Remove facepiece by pulling from chin, over the head. Loosen straps and pull straps over lens.

3. Unscrew low pressure facepiece hose from regulator.

4. Open by-pass valve to purge pressure from the regulator.

5. Remove backpack by slipping off should straps.

PERFORMANCE

Now that we have a knowledge of why we must use the breathing apparatus, how it operates, its care, and some of its limitations and capabilities, we must have some idea of what to do in emergency situations where the breathing apparatus is worn and an unusual circumstance takes place. It may be too late to try to find a solution to a problem when life is at stake, especially when it could have been worked out prior to the emergency situation. We must have some idea of what to do before it happens.

ENTRY INTO AN IDLH ATMOSPHERE

Entry is very important because you are leaving a safe or clean atmosphere and entering a hazardous atmosphere. You, your breathing apparatus, and facepiece seal must be ready.

1. Remain calm and do not panic as this puts you into a state of incapability, both mentally and physically. An emotional state will increase your breathing rate.

2. Work with a partner, check ~~each~~ other out, stay together and communicate.

3. Stay low upon entry, especially where heat is involved as it is cooler close to the ground level. Also, this aids in visibility where smoke is present. If you cannot see where you are going, feel ahead of you for obstructions or holes.

4. Utilize radio sets in large buildings, basements, cellars, or wherever else the situation warrants its use.

5. The use of lights can penetrate smoke and darkness very well to aid in any search.

LIFE LINE

The life line is very seldom used, but we still should know the proper procedures and usage.

Any area that is or appears to be highly hazardous from the standpoint of a man becoming lost or separated, the life line must be used. Some of the areas would be reactors, large square footage areas, and so on.

The life line should be secured to the safety harness. For confined space entry through a small top opening, a parachute harness is required.

The signals for the life line are easy and simple to remember. The work OATH is key:

one pull	=	O-K
two pulls	=	A-dvance
three pulls	=	T-ake up slack
four pulls	=	H-elp

The signals should be transmitted with full arm swings and acknowledged by the person receiving the signal.

While traveling up or down stairs, inclines or ladders, while wearing a life line, have sufficient amounts of the life line in your hand to release in case you are signaled at that moment. This way, you can release the slack and not be pulled down or off a ladder, stairs or incline when signaled.

The line tender must pay attention to his line at all times and keep track of the time his man has been in the area or building. The line tender must not tend more than two lines.

CONSERVATION OF AIR

When using the breathing apparatus, the conservation of air is very important. The air that you learn how to conserve may be the air that is needed to rescue one more victim or to get you out of the hazardous area. To conserve air, the wearer must develop proper breathing control; this is to slow your free breathing rhythm (no skip breathing or extra shallow breaths). To acquire this breathing control, it takes experience, not only during emergencies but in actual organized training programs.

Excitement, emotions and fears will consume air. The wearer must try to remain calm and relaxed in any situation to conserve air and to think logically. Work should be accomplished at a good steady pace so as not to over-exert and expend all your energy and waste air. The wearer's physical condition also has a bearing on air consumption. Develop your physical stamina through regular exercise.

When the breathing apparatus is not needed, remove the facepiece if you are in a safe atmosphere and if your clothing is safe. Before you reenter the hazardous atmosphere, put the facepiece back on.

Above all, don't take chances at any time to conserve air.

IF YOU NEED ASSISTANCE (TRAPPED OR PINNED)

Attract someone's attention by:

1. Signaling with life line.

2. Shouting; you can open by-pass and lift facepiece.

3. Rap on air cylinder with metal object four times, pause, rap four times, pause, and so on until acknowledged and you are found.

REGULATOR MALFUNCTION

The regulator being a mechanical device, it may malfunction at any time, and you must react quickly. The steps are few and easy to follow.

1. Advise your partner.

2. Open by-pass and regulate flow.

3. Close main line valve.

4. Be moving out of the area to safety.

NOTE: A full cylinder will last approximately 10 minutes when only the by-pass is used. Once you are outside, the breathing apparatus must be reported as a Class I defect and repaired at once.

SPECIAL ATMOSPHERES

The breathing apparatus is designed to give full respiratory protection but it cannot protect you from gases or toxic substances that attack the body through the skin. Other protection is needed along with the breathing apparatus.

Examples:

1. Ammonia

2. Hydroflouric Acid

3. Tetraethyl Lead

These can enter the body by: 1) absorption through the skin; 2) ingestion; 3) inhalation; and 4) through a puncture or wound. Protect yourself by wearing full protect

COMING OUT OF TOXIC AREAS

When leaving a toxic or radioactive contaminated area, do not remove facepiece as soon as you are in a clean atmosphere. Your clothing may be contaminated to the point where the removal of the facepiece could produce serious injury or death unless you are checked. If your air supply is expended, disconnect the breathing tube from the regulator, hold the end of the tube away from your clothing, and continue to breath while wearing the facepiece until you have been monitored.

TRAINING

Constant and in-depth training with the breathing apparatus will build your knowledge of its operations, limitations, and capabilities. Most important, you gain confidence in its use because you are familiar with the apparatus. Training sessions will be very practical and as realistic as possible.

It is recommended that you wear the breathing apparatus during a training session that includes strenuous work, working on and climbing ladders, and working or moving in close or narrow passage ways at least once a year. This type of training sessions will build your confidence in its use, develop breathing control, and simulate closely emergency usage.

It is also recommended that you put the apparatus on at least once a month. This will enable you to quickly and efficiently put the apparatus on at any emergency with natural moves without thinking of the steps.

Setting up the apparatus is very important, as the unit must be ready for the next use. If it is not, the efficiency of putting the apparatus on in a quick manner has been nullified. When puting the apparatus back in a compartment or case, you must:

1. Have head straps in proper position.
2. Have shoulder straps in proper position.
3. Have waist buckle in proper position.
4. Bleed pressure off system.
5. Open all strap buckles to the extreme loose position.
6. Recharge the air cylinder if less than 1500 psi for low pressure units and 4000 psi for high pressure units.

OPERATION

1. Lift the unit out of the carrying case.
2. Check that the high-pressure hose is securely attached to the regulator and cylinder valve. Tighten by hand.
3. Check the cam-lock on the cylinder band; make sure that the cylinder is secure in the back pack.
4. Don the unit by placing your right arm through the right shoulder strap and your left arm through the left shoulder strap (like putting on a coat). (Figures 1A and 1B).
5. You may also don the unit by lifting it up and over your head. (Figures 2A, 2B, and 2C).

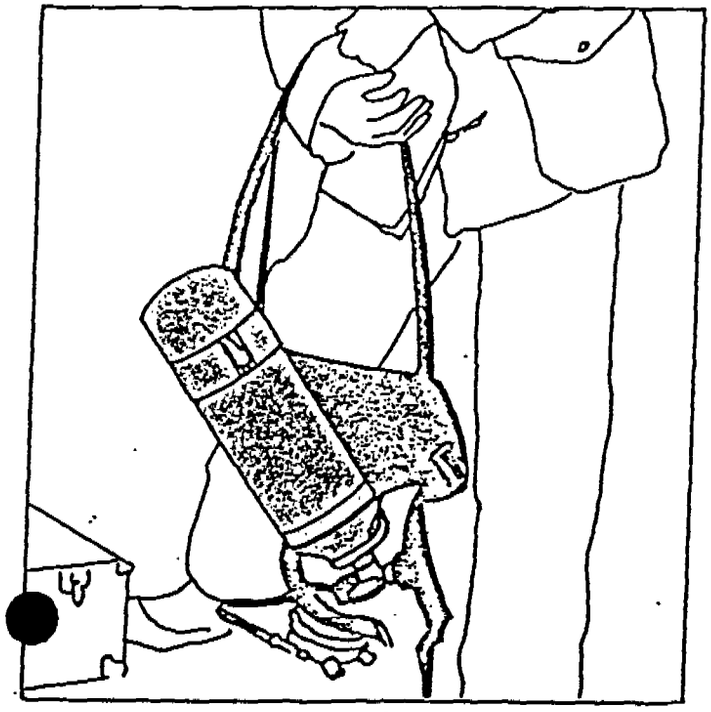


Figure 1A

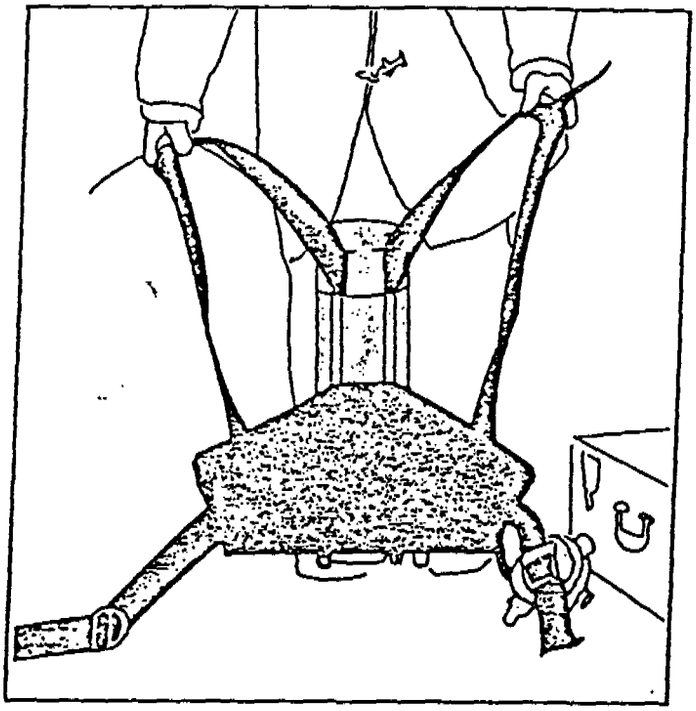


Figure 2A

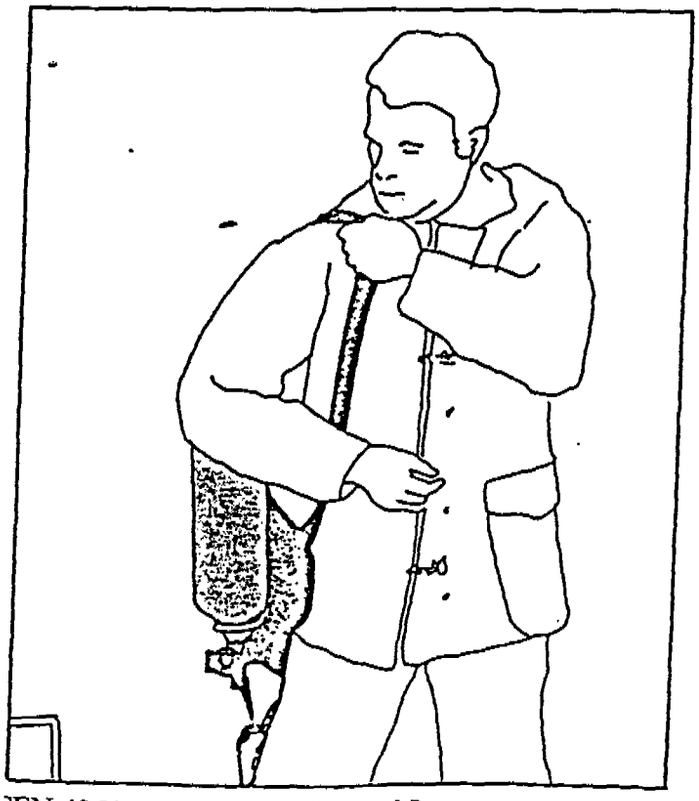


Figure 1B

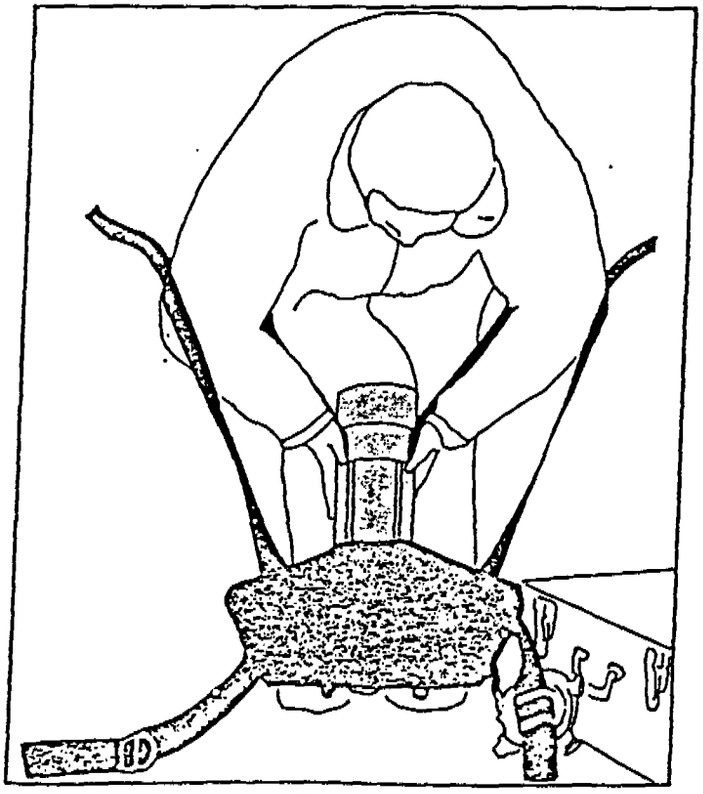


Figure 2B

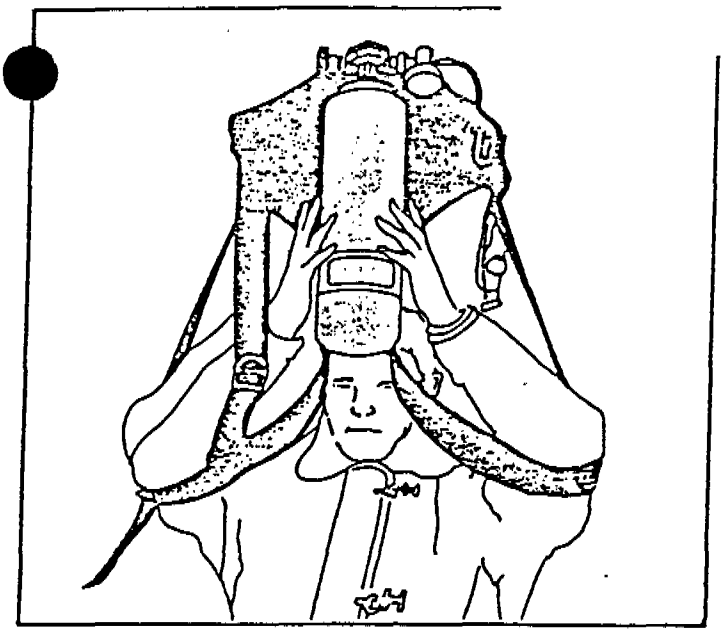


Figure 2C

6. Bend forward and pull the shoulder adjustment straps until the back support strap rests in the small of your back. (Figure 3).

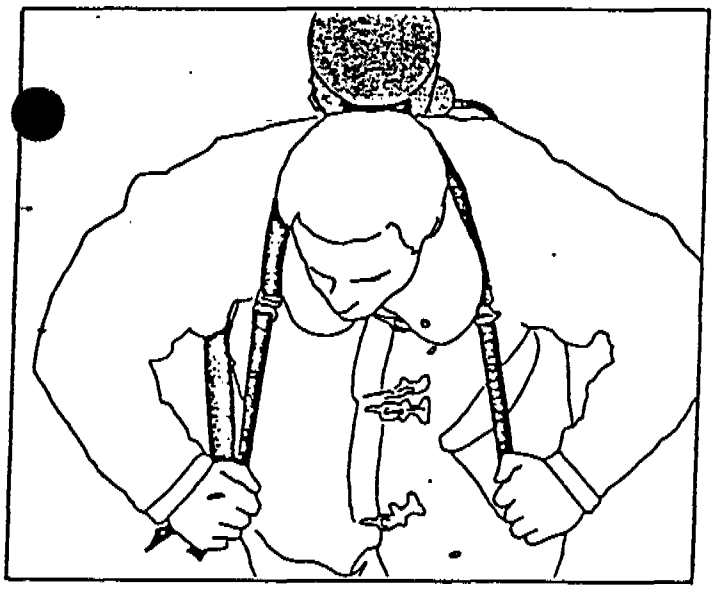


Figure 3

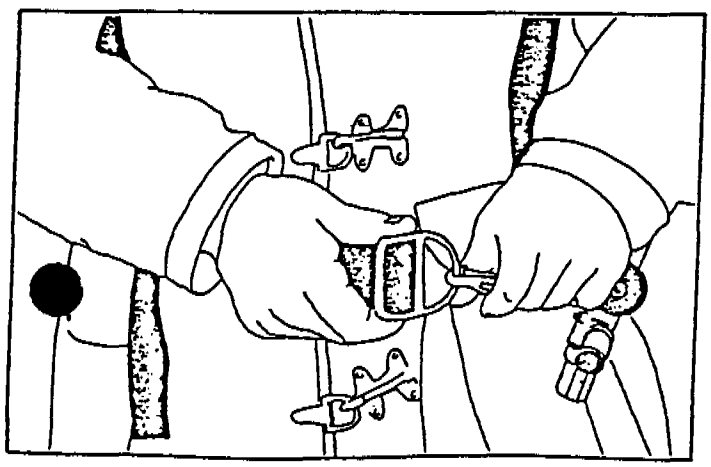


Figure 4A

7. Clip the slide buckle on the waist strap to the snap on the regulator strap. Pull the free end to tighten. (Figures 4A and 4B).
8. Open and lock the mainline valve.
9. Close the bypass valve.
10. Remove the dust cap from the regulator outlet.

> **NOTE**
>
> Place the regulator control knob in the DON position before opening the cylinder valve.

12. Open the cylinder valve (Figure 5) and check the pressure reading on the regulator pressure gauge. A full cylinder should indicate about 4500 psi. Be sure the valve-handle locking ratchet is engaged to prevent accidental valve closure.

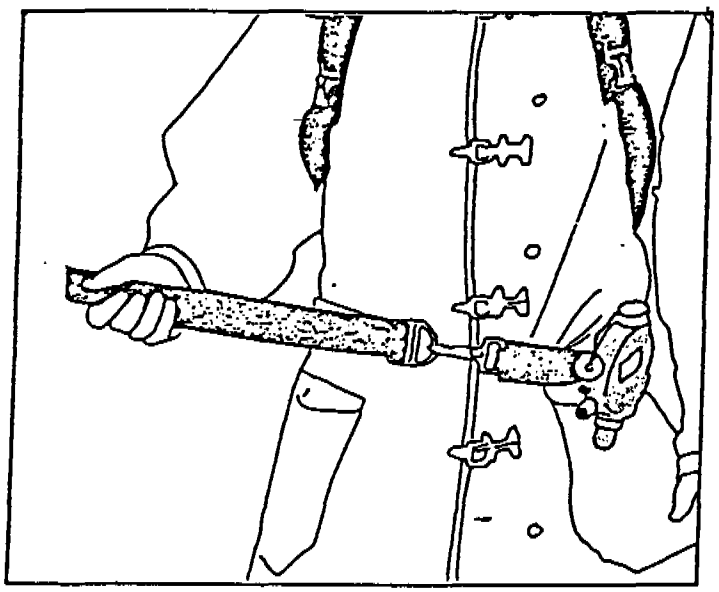


Figure 4B

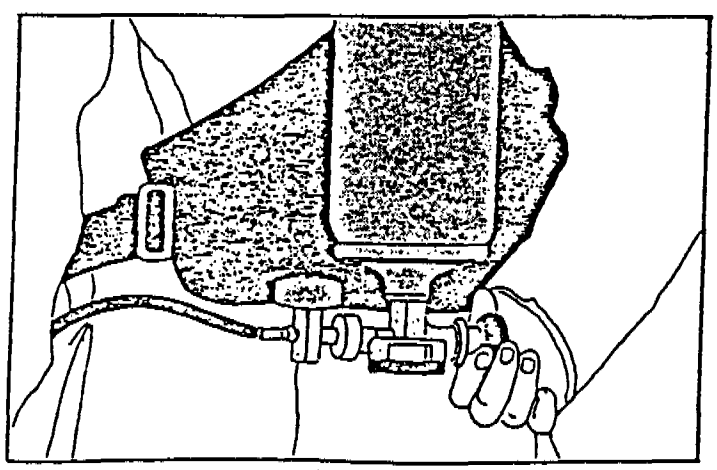


Figure 5

TEN 4262

13. Adjust the head harness straps on the facepiece fully out. Grasp the facepiece with your thumbs looped through the straps; then pull the straps up, over your head and fully down in back. (Figure 6).
14. Place your chin against the chin stop. Tighten the chin straps; then tighten the temple straps, and finally the top strap. Do not overtighten the straps. (Figure 7).
16. Attach the low-pressure hose to the regulator. (Figure 8).
17. Place the regulator controls in the USE position. (Figure 9).
18. Inhale and exhale to check regulator operation. Your SCBA is now ready for use.

WARNING

Your SCBA has a rated service time of 30 minutes. This means that, under average conditions, you will have 30 minutes to enter, work in, and exit from a toxic area. Depending on your own work rate, lung size, etc., you may consume air at a faster or slower rate than the average. In any event, when your low-air alarm bell starts ringing, PROCEED IMMEDIATELY TO A SAFE AREA! The alarm bell will start ringing when you have 6 minutes (under average conditions) of breathing time left.

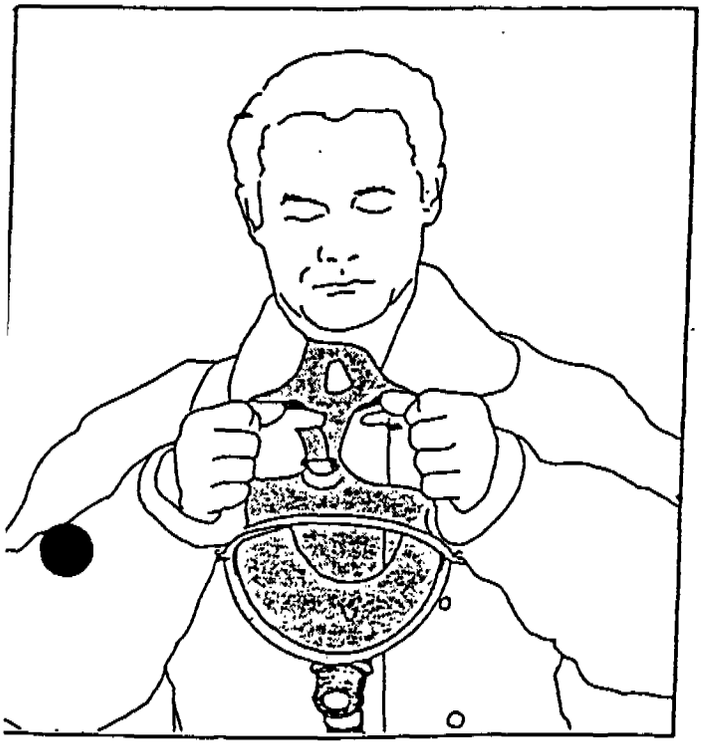


Figure 6

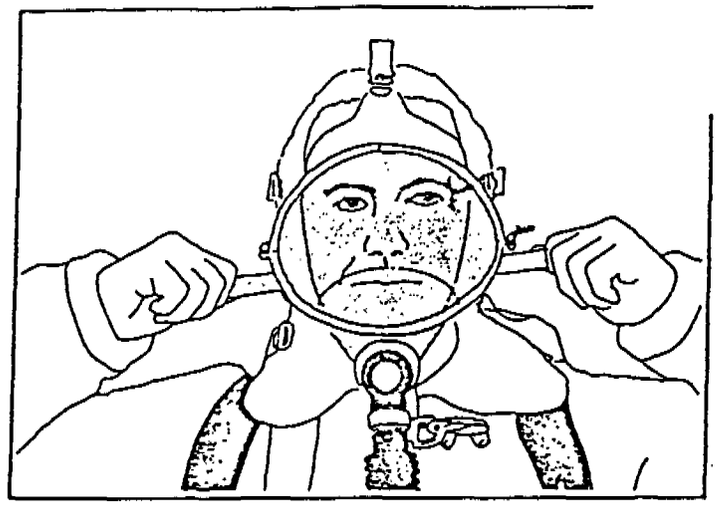


Figure 7

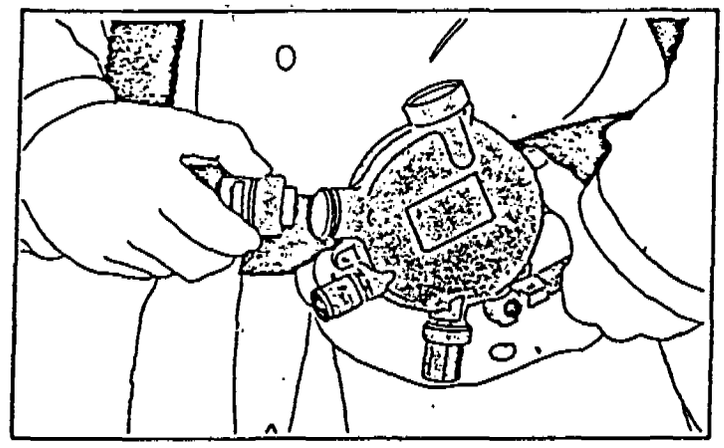


Figure 8

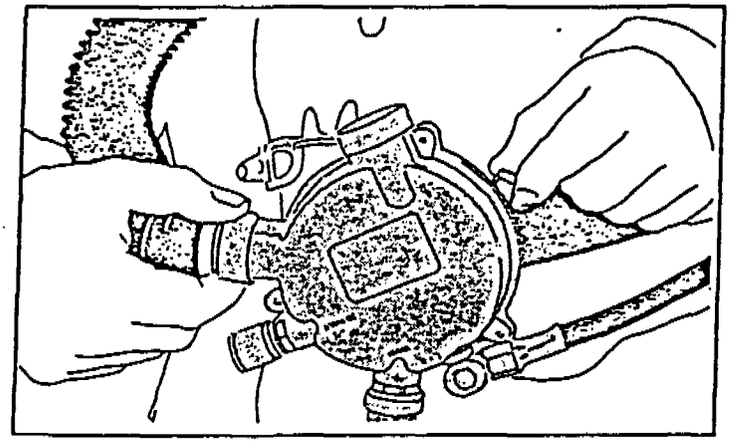
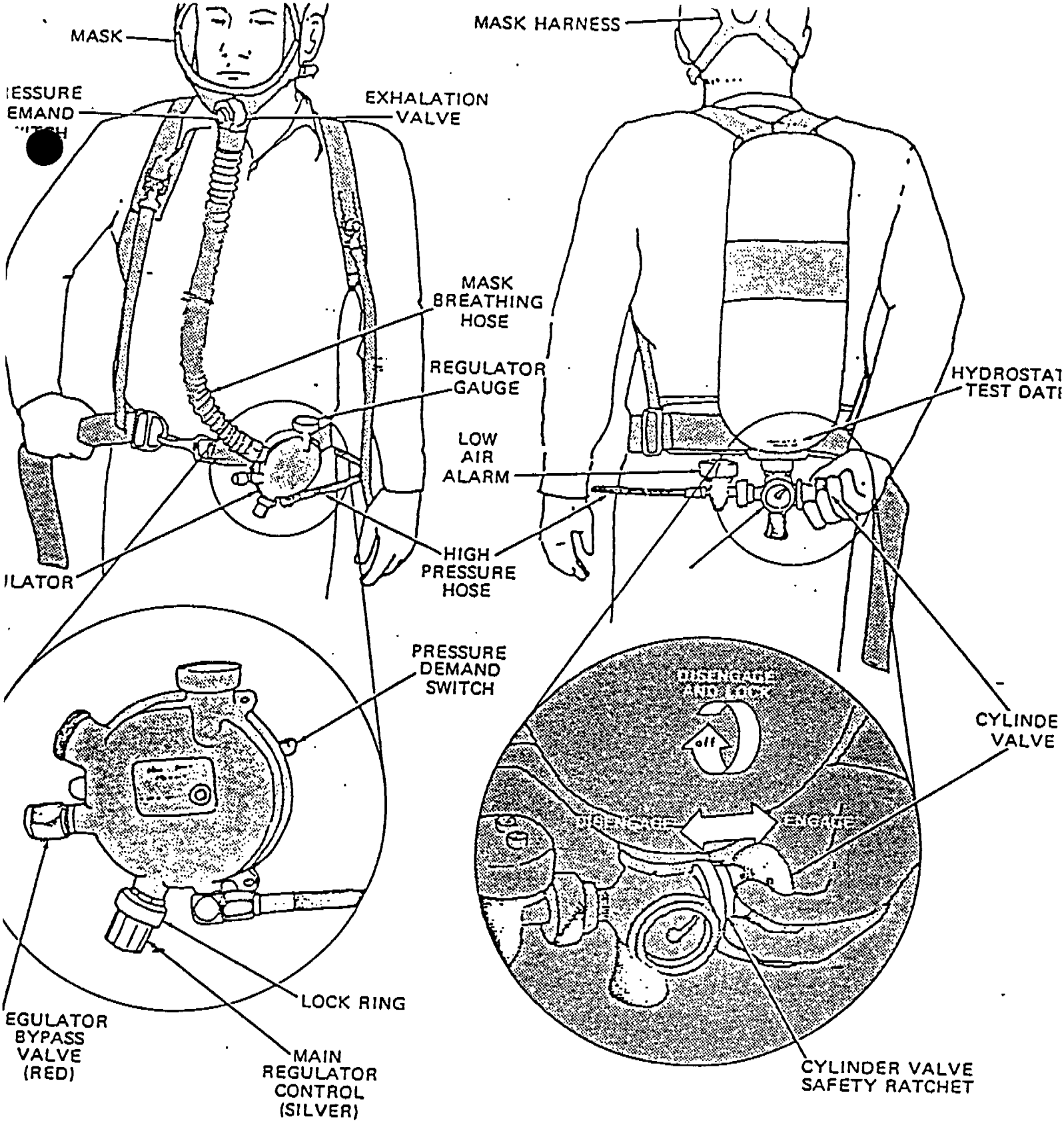


Figure 9

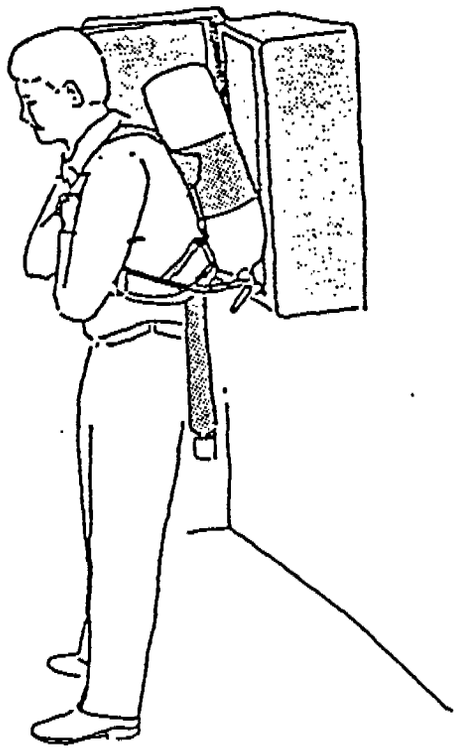


Survivair Self-Contained Breathing Equipment

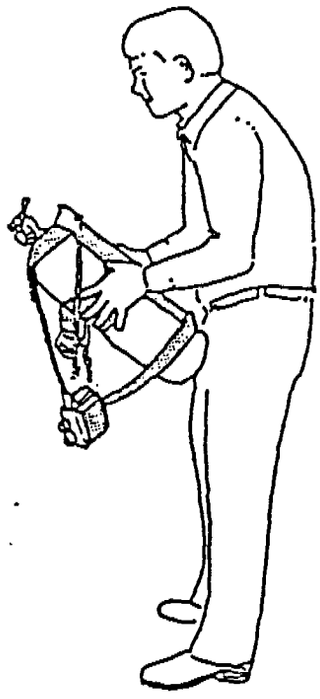
TEN 4264

The regulator for the Survivair unit is mounted on the left side of the waist belt. The regulator controls are color-coded: the main regulator control is

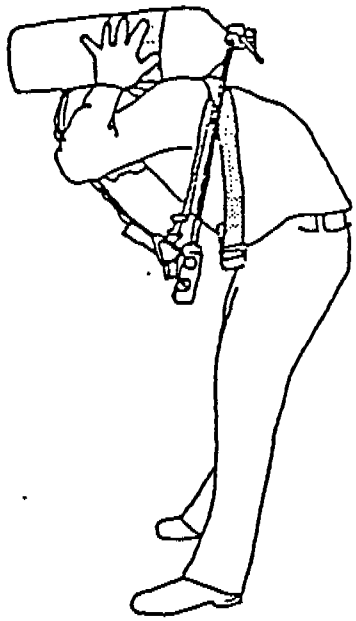
Open the wall case and, with your back to the cylinder, slip the shoulder straps on as if you were putting on a coat.



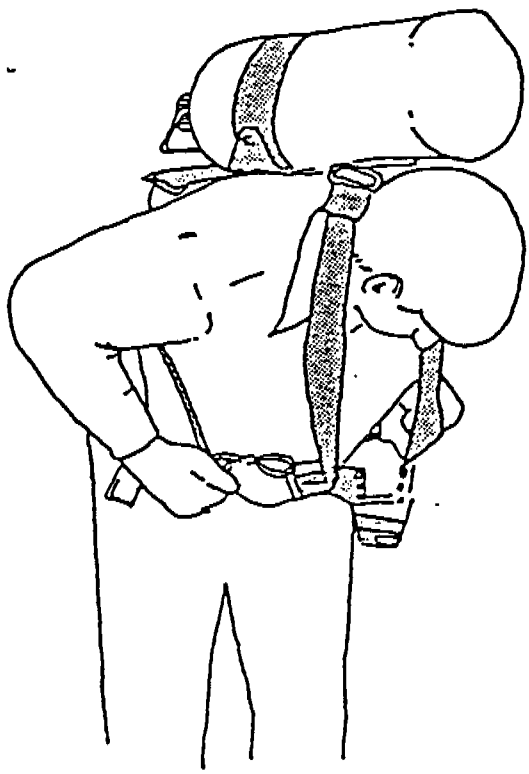
Holding the shoulder straps as if they were suspenders, take a step forward to pull the cylinder from the wall case.



Grasp the cylinder, keeping the valve pointed away from you and the backplate toward you. Place your hands on either side of the cylinder, about halfway between the upper and lower end.



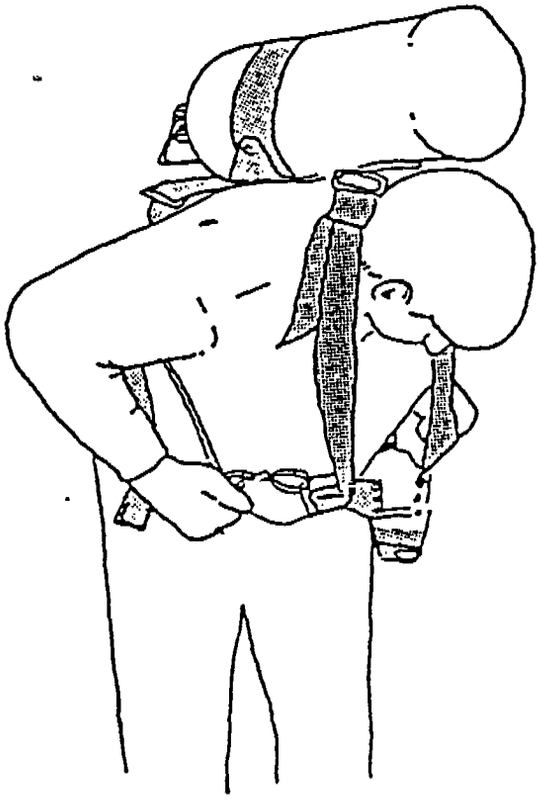
Now lean forward slightly, duck your head, and swing the cylinder over your head, placing it at the back of your neck. Be sure that the shoulder straps fall over your elbows, so that your arms will be through the loops when you let the cylinder go.



Bend over far enough that the cylinder will balance at the back of your neck without your holding it, and let go with both hands.

If your unit has no chest buckle (the MSA and Survivair units do not), turn to the next page.

If your unit does have a chest buckle (the Scott units do), buckle it while still bent over and turn to the next page.



Pull down on the free ends of the side straps to tighten them.

You may find it necessary to bend over to position the cylinder properly. The bottom of the cylinder brace should rest in the small of your back.

Connect and adjust the waist belt.

22

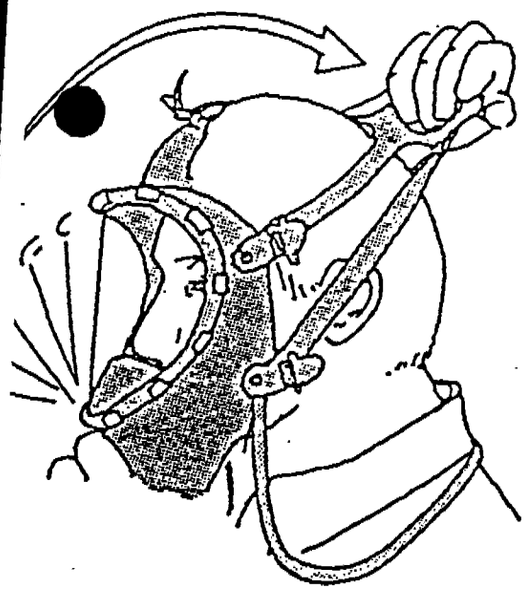
Now, check to be sure the regulator valves are in the proper position.

The bypass valve on the regulator must be closed (turned all the way clockwise).

The main regulator valve must be open (turned all the way counterclockwise).*

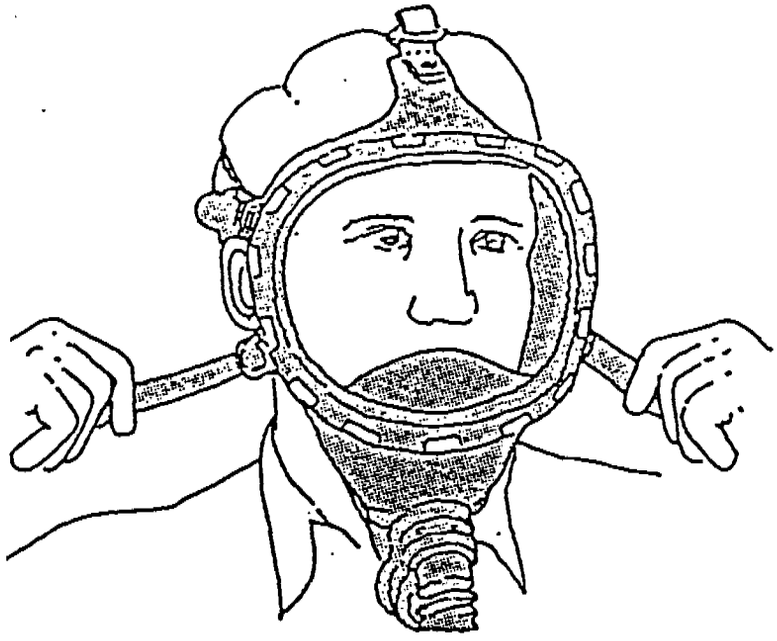
*On most units, you must depress the safety ratchet or loosen the lock ring to move the main valve.

23



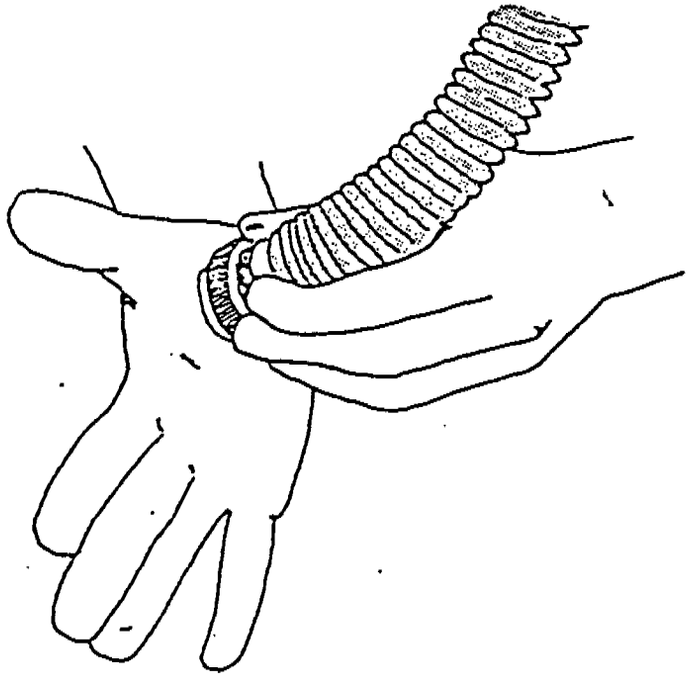
If you wear eyeglasses, remove them or wear the type designed to be worn with a mask.

Put on the mask by placing your chin in the mask and by pulling the strap assembly over your head and as far down as it will go.



Check to be sure that the face seal is flat to your skin all the way around the edge of the mask.

Then, adjust the mask strap assembly by pulling on the ends of the straps until the mask is snug. First adjust the lower straps, then the side straps, and finally, the top strap(s).



Each time you put on your unit, you should test the mask and breathing tube in the following way.

First, block the end of the breathing tube with your palm or thumb. Hold it tightly to insure a good seal.*

*MSA recommends squeezing the tube tightly to seal it.

Continue blocking the tube, take a deep breath, and hold it for 10 seconds.

The mask should collapse slightly toward your face (a vacuum has been created).

If the mask expands to its normal position while you are holding your breath, then it's possible that the mask or the hose leaks.

Readjust the mask straps, take another deep breath, and again hold it for 10 seconds. If the mask still leaks, have it examined by qualified maintenance personnel.

Now, check the exhalation valve by breathing out with the breathing tube blocked with your hand. If you notice any appreciable build-up of pressure inside the mask, or if air escapes between the mask and your face, the exhalation valve is defective and should be checked by authorized maintenance personnel.

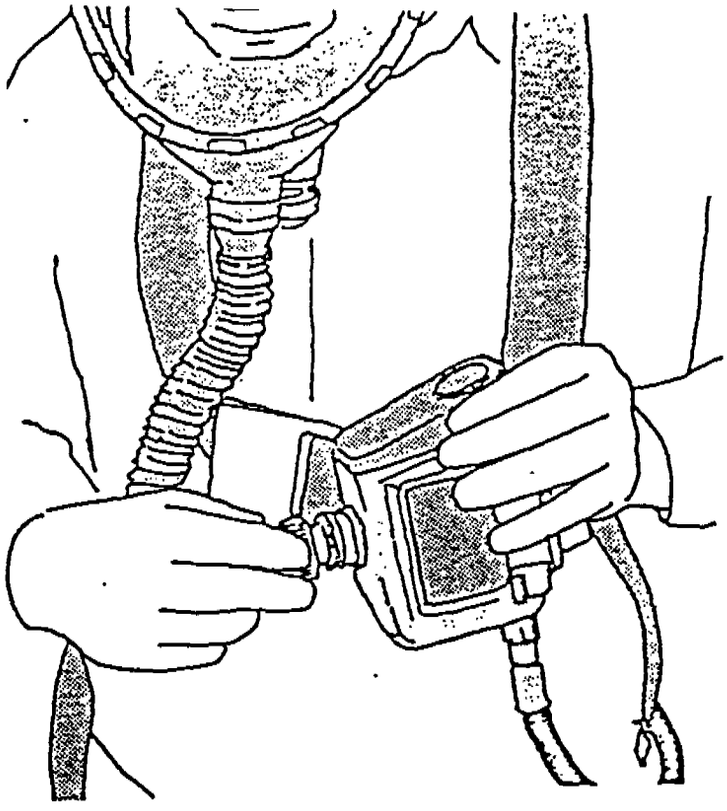
If your regulator outlet has a dust cover, remove it now.

Open the cylinder valve* on the bottom of the cylinder by turning it counterclockwise. (This will cause the low air alarm on the Survivair unit to ring briefly until the system is pressurized.)

It is important that the cylinder valve be completely open, so be sure that you turn it as far as you can without forcing it.

*Be sure the bypass valve is closed or that the pressure-demand switch is in the demand position when you open the cylinder valve.

If your unit has a manually operated cylinder valve safety ratchet, engage it now.



Connect the mask breathing tube to the regulator and tighten it fingertight.

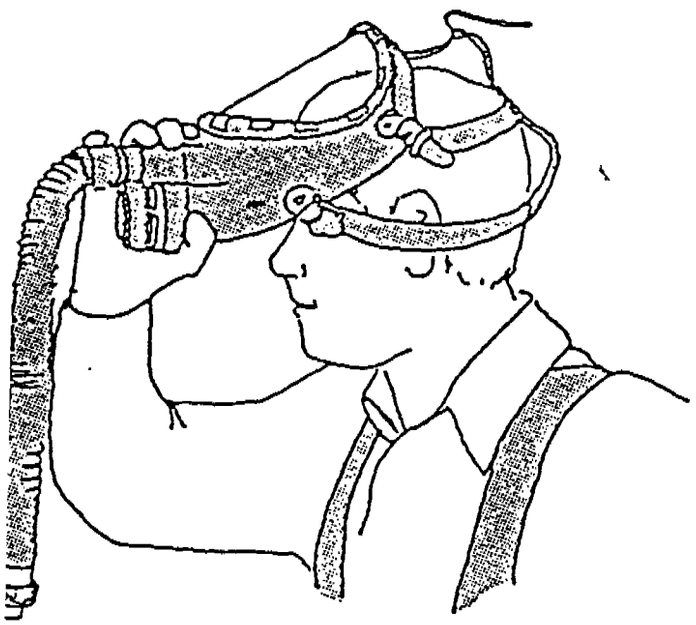
This completes the procedure for putting the unit on. Turn the page for removal and storage instructions. If you are conducting the operational check, turn to page 82.

Removal and storage procedures vary depending on the brand of equipment involved.

If you have Scott or Survivair equipment, turn to the next page.

If you have MSA equipment, turn to page 41.

Check to be sure that the regulator pressure-demand switch, if your unit has one, is in the demand (off) position.



Unfasten the breathing tube from the regulator.

Remove the mask by grasping the breathing tube mount and exhaust valve assembly, and pulling it away from your face and up.

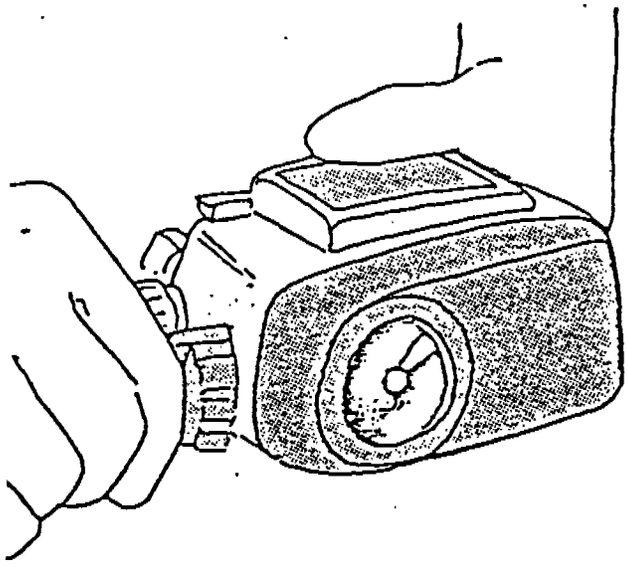
Extend the mask straps to the full out or loose position.

Unfasten the waist buckle and the chest buckle and take off the cylinder as if you were removing an overcoat.

38

Disengage the cylinder valve safety ratchet, and close the valve. You should not have to force it to make it seat.

39



Before continuing, be sure that the flow of air from the regulator outlet is not restricted, either by the dust cover or by your clothing. Do not hold your hand over the outlet.

Open (by turning counterclockwise) the bypass valve on the regulator briefly to release the pressure in the cylinder hose and regulator. If your unit has a low air alarm, it will ring.

After the pressure has been released, close the valve.

Now turn to page 45.

Disengage the cylinder valve safety ratchet and close the cylinder valve.

Do not force it. It should seat easily.

Release the pressure in the cylinder hose and regulator by breathing normally until the air is exhausted and the regulator gauge reads 0. If your unit has a low air alarm, it will ring.

Do not release the pressure by opening the bypass valve.

Unfasten the breathing tube from the regulator and replace the dust cap on the regulator outlet, if your unit has one.

Loosen the mask harness by releasing the headband buckles and fully extending the straps.

Remove the mask by grasping the hose mount and pulling away from your face and up.

Unfasten the waist and chest buckles, and take off the cylinder and regulator assembly as if you were removing an overcoat.

Replace the regulator outlet dust cap if your unit has one.

Now, fully extend all the adjustable straps on the body harness, and leave the waist buckle and chest buckle unfastened.

AIR SUPPLIED RESPIRATORS

The essential elements of the air supplied full face respirators are the full facepiece with the 5 minute escape pak, the breathing air hose, and pressure reducing regulator on the breathing air bottle. The multiple hose connector is optional.

THE AIR SUPPLIED RESPIRATOR

The full facepiece is similar to the SCBA facepiece and is donned and tested for face fit in the same manner as the SCBA facepiece. The two brands used are the Scott Ska Pak and the Survivair Hip Pak. Essentially the operation of either unit is the same. The auxillary air supply is designed to supply at least 5 minutes of escape air to the user in case the main air supply is cut off. The Scott auxillary air bottle has fittings which allow it to be connected to the Scott facepiece only and the Survivair bottle can only be connected to the Survivair facepiece. Each system has a low pressure hose ending in a Schrader type quick disconnect fitting and both brands meet the applicable OSHA and NIOSH standards.

BREATHING AIR HOSE

The breathing air hose for the Scott Ska Pak and the Survivair Hip Pak is made of chemical resistant rubber and can be used in total lengths of up to 250 feet but multiples of no longer than 25 feet. They are designed to operate at 125 psig and meet the requirements established by OSHA and NIOSH. The Scott breathing air hose is to be used with the Scott Ska Pak only and the Survivair brand hose is to be used with the Survivair Hip Pak only.

PRESSURE REDUCING REGULATOR

The regulator used for breathing air purposes can only be attached to the large 230 ft. breathing air bottles. The regulator can be attached to one bottle or the bottles can be hooked together in series by the use of high pressure hoses and the regulator placed on one end. The regulator consists of a high pressure gauge to display the air pressure in the cylinder(s) and a low pressure gauge to display the outlet pressure supplied to the mask or hood. A multiple hose adapter can also be connected to the regulator for use of multiple lines. All low pressure hose fittings and the regulators have Schrader quick disconnect fittings.

RESPIRATORY EQUIPMENT CHECKLIST GUIDELINES

The Respiratory Equipment Checklist will be kept in each control room where self contained breathing apparatus (SCBA) are used in an operating unit. In the tank farm and on the wharfs, the checklist will be kept in the pumper's office and dock offices, respectively. The Fire and Safety Technician on the 3-11 shift will be responsible for daily inspection of the equipment and completion of the checklist for all defects.

There are two basic types of defects, Class I and Class II. A Class I defect is one which needs immediate correction and warrants immediate removal from the area. When a Class I defect is found, it should be logged on the checklist and the unit brought by the Fire and Safety Technician to the personal protective equipment room and exchanged for a proper operating SCBA. A Class II defect is one which doesn't warrant immediate removal but should be corrected as soon as possible. In a Class II defect, the SCBA unit can remain on the unit until the personal protective equipment room attendant can correct the defect. He should be notified during the day shift by the Fire and Safety Technician.

The following is an example of checklist items and common defects which may occur:

Week - example: 7-14 to 7-20-79

Unit - example: HOS
If there is more than one SCBA in the unit, specify which SCBA is inspected. Only one checklist should be filled out for each SCBA.

Tank Condition - Cylinder capacity on low pressure units of approximately 2200 psi indicates a full tank. Tanks should not be used if pressure is below 1500 psi and should be considered empty if reading 500 psi. On high pressure units, a full indication is 4500 psi, they should not be used if less than 4000 psi and considered empty if reading 1000 psi. This would be a Class I defect. Avoid emptying tank to zero pressure. Cylinders which show evidence of exposure to high heat or flame indicate a Class I defect. Rusty areas, scratches, or chipped handles, etc. idndicate a Class II defect.

Harness Assembly - General conditions of belts, shoulder straps, and buckle operation. A Class I defect would be one which would not allow the SCBA unit to be donned. All other defects would be Class II.

Gauges on the tank and regulator should

IEN 4281

coincide. A difference in psi reading would indicate a faulty gauge or regulator. This would be a Class I defect. A Class II defect would be cracked gauge lens, etc.

Regulator - Regulator should be inspected for general appearance. It should be inspected functionally by pressuring the system while having the regulator in the demand position. One inhalation in the demand position should signify correct operation of the regulator. Major defects should be noted as Class I.

Connections - All connections should be hand tight. Never use a wrench to tighten connections. Any defects which allow significant leakage would be a Class I defect.

Face Shield - Lens of the mask should have no large scratches or vision difficulty. Cracks and broken lens should be noted and rated a Class II defect.

Head Straps - General condition of buckles and straps on mask should be noted. Major defects should be classed as I and minor as Class II.

Rubber Pliability - Check for rubber discoloration, cracking or peeling. Check around all connections for stress cracks in rubber. Major defects in crucial areas, i.e. mask hose and tank hose should be noted as Class I.

Cleaning - The mask should be cleaned after each use. Dirty masks are a Class II defect.

Five Minute Escape Paks - Check for pressure of 5000 psi. Refill if less than 4000 psi. Inspect inner coils for defects, corrosion, etc., all connections and head covering for major defects.

FAVORABLE _____

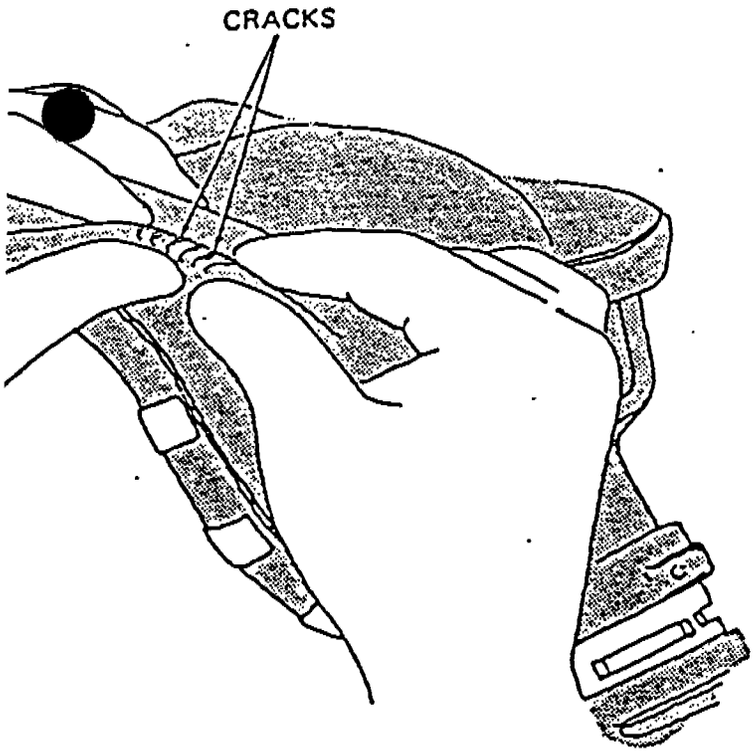
SCBA LOCATION: _____

	S	M	T	W	T	F	S	OPERATOR INITIALS	SHIFT
NK CONDITION									
RNESS ASSENBLY									
UGE CONDITION									
GULATOR									
NNECTIONS									
CE SHIELD									
BBER PLIABILITY									
EANING									
MINUTE ESCAPE PAKS									

D E F E C T S

TE	CLASS I	CLASS II

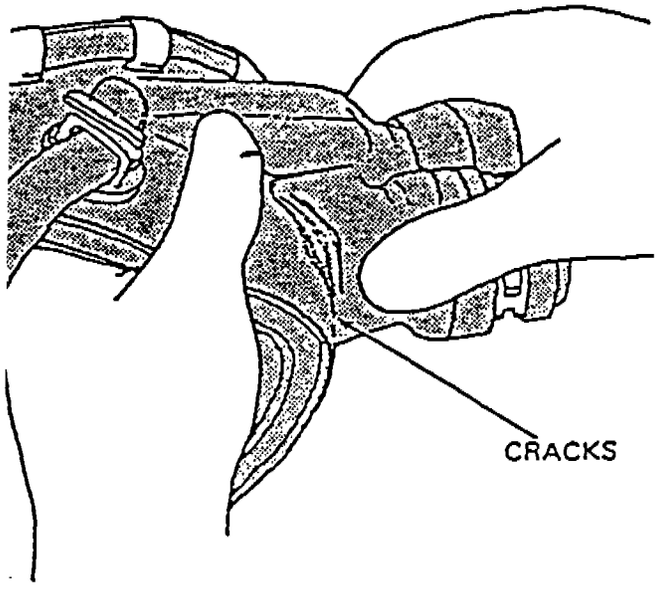
TEN 4283



The mask edge that touches your face should be soft, pliable, and without cracks.

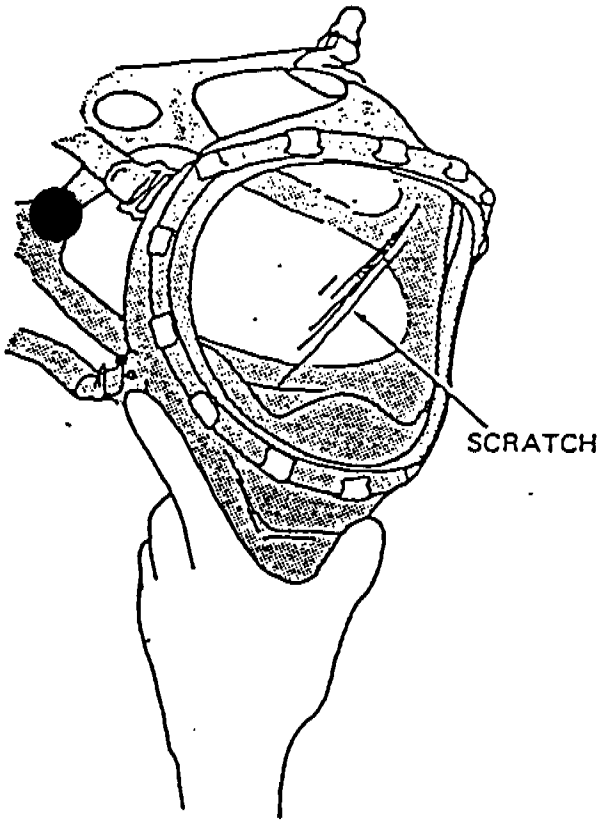
Grasp this edge with both hands, keeping your thumbs about two or three inches apart. Stretch the edge of the mask. Working your hands around the mask, check the entire seal.

Cracks indicate that the mask is deteriorating and should be replaced.

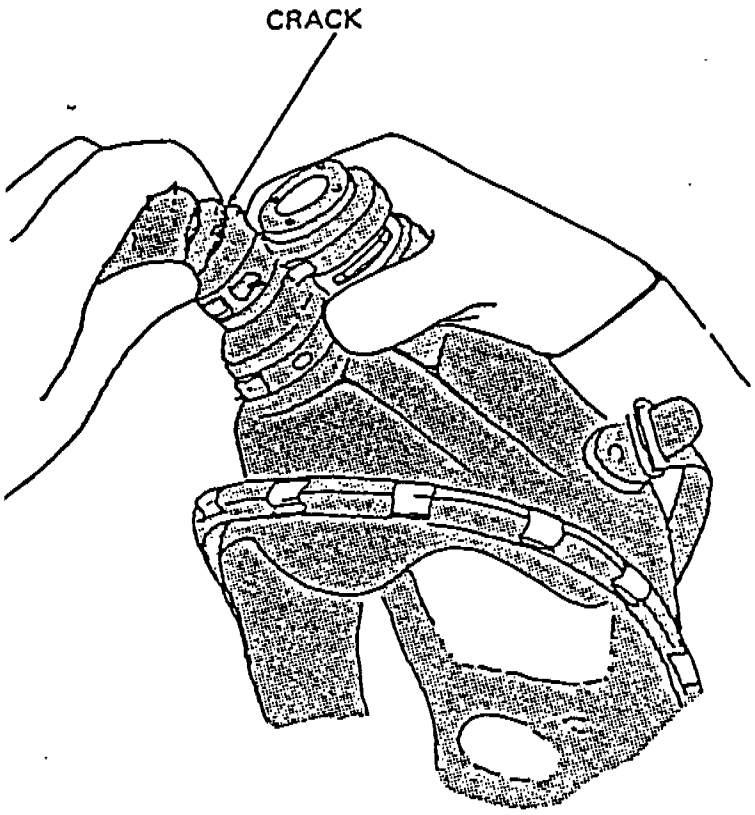


If your mask has a flexible breathing-tube connection (some are hard plastic), check it for cracks.

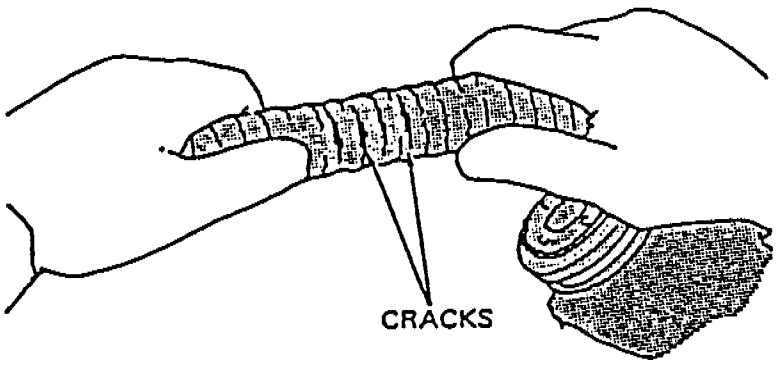
Grasping the tube mount with one hand and the under-chin portion of the face seal with the other, flex the rubber at the base of the hose mount. If cracks appear when the rubber is stretched, the mask is defective and should be replaced.



If the mask lens is scratched to the point that the scratches interfere with your vision, have it replaced by an authorized repairman.



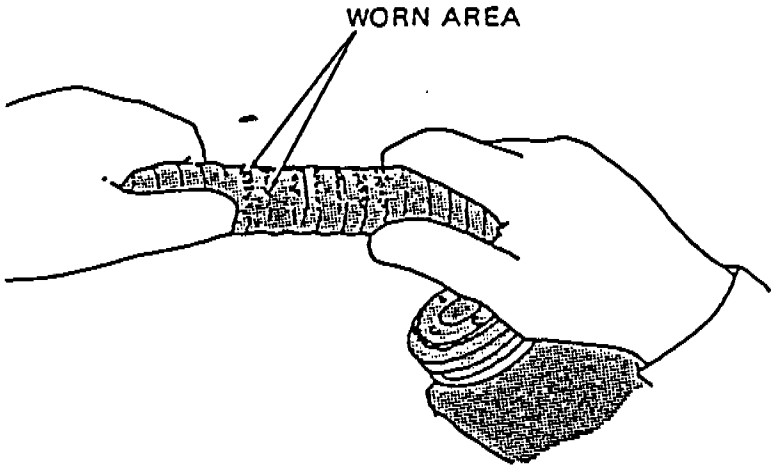
Stretch the breathing tube where it connects to the mask. If cracks appear, the hose is defective, and the unit should not be used until the hose has been replaced.



Now stretch the tube from end to end and check for cracks and pinholes down the entire length of the tube.

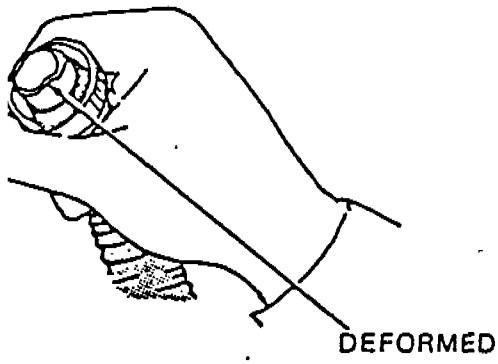
Rotate the tube and check it on all sides.

Extremely small cracks won't interfere with the proper functioning of the tube, but, if you have any doubts about the seriousness of the cracks, have the tube inspected by authorized service personnel.



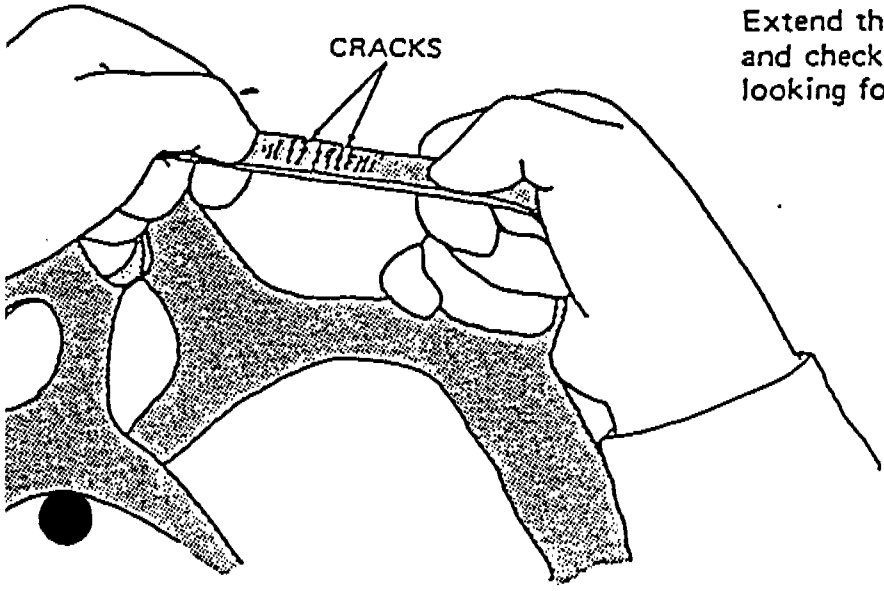
The breathing tube may have come in contact with abrasive surfaces. Check the edges of the corrugations for excessive abrasion and wear.

If you think that the tube is worn thin enough that it may rupture, have it checked by an authorized repairman.



Examine the breathing-tube-to-regulator fitting. It should be round, show no evidence of having been deformed by weight or by impact, and slide easily into the fitting on the regulator.

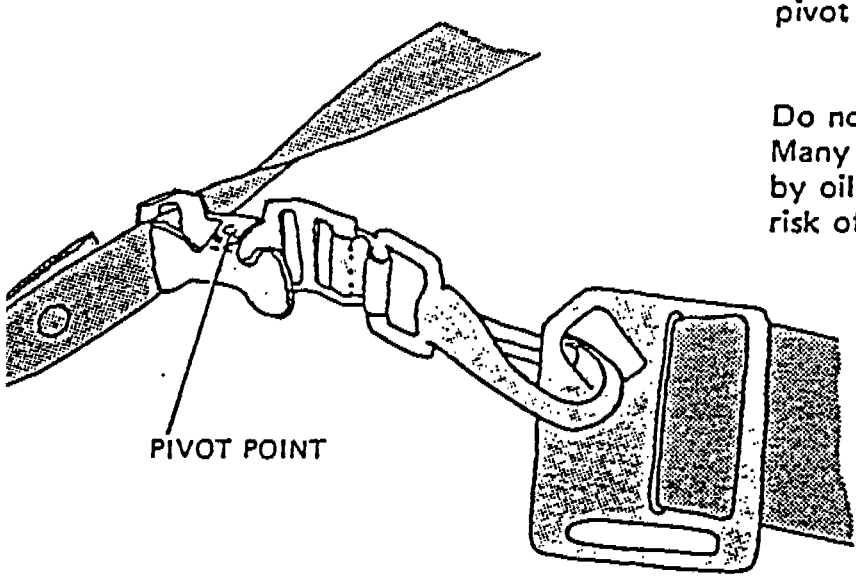
A rubber O-ring or washer should be visible at the base of the fitting.



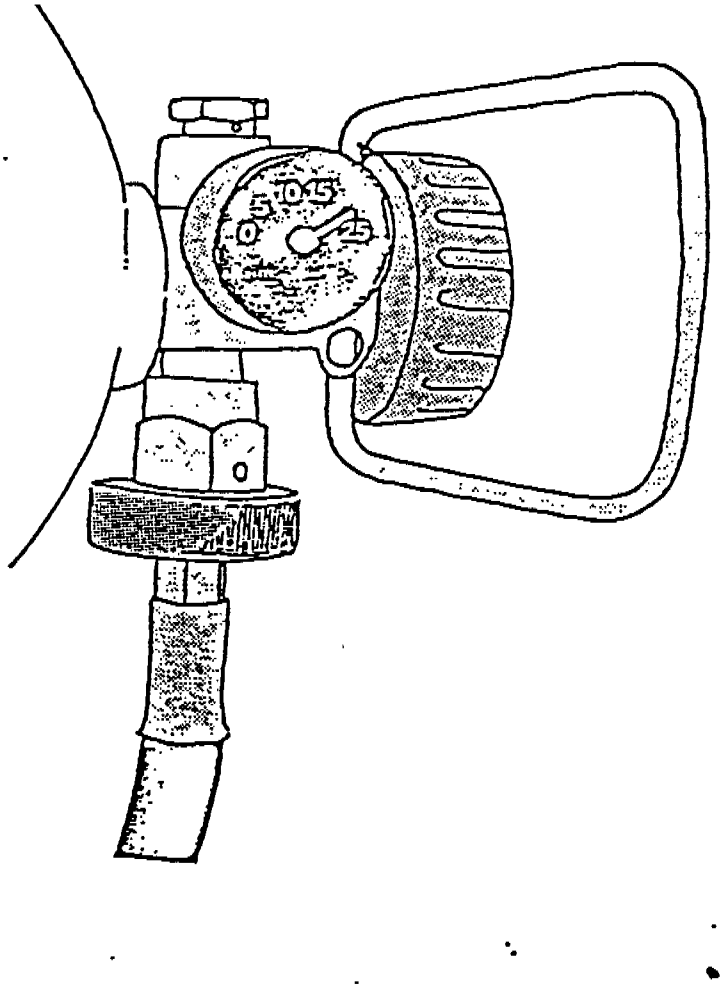
Extend the mask harness straps completely, and check each strap by stretching it and looking for cracks and splits.

If the tightening buckles are stiff and will not work freely enough to maintain tension on the straps, sparingly apply silicone oil to the pivot points.

Do not use oil on any part of the air system. Many of the components would be damaged by oil contamination, and there would be risk of explosion.



Examine the body harness for loose rivets and missing nuts and bolts. Be sure that the chest and waist buckles work properly.



Check to be sure that the cylinder is fully charged (about 2000 pounds per square inch). Also check to be sure that the gauge lens has not been cracked or broken.

If the cylinder is not fully charged because the unit has just been used or because repeated tests have depleted it, attach a yellow tag from the last section of this book, or attach a fully-charged cylinder according to the manufacturer's instructions.

If the cylinder gauge reads less than fully-charged for no apparent reason, tag it red and have it inspected.

Examine the cylinder-to-regulator hose carefully for signs of chipping or wear.

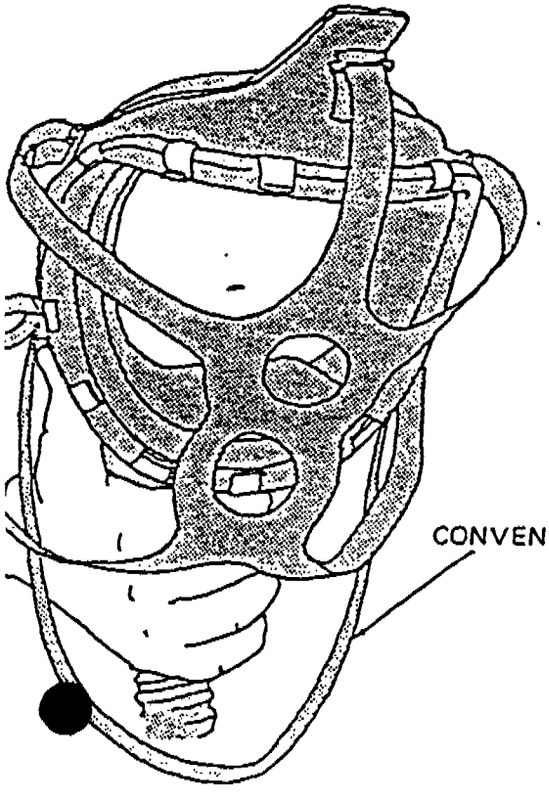
Since this hose must handle more than 2000 pounds per square inch of pressure, it must be in good condition.

If you have any question about the condition of the hose, have it examined by an authorized repairman.

Some units have pressure-demand switches and some units do not.

Check the illustration of your unit for the number and location of pressure-demand switches, if any, on your unit.

Be sure the switches are in the off (demand) position.



Some units are equipped with a convenience strap for supporting the mask when it is not in use. If your unit has one, put the convenience strap around your neck before you put the mask on.

MAINTENANCE, STORAGE, DISTRIBUTION AND CLEANING OF RESPIRATORY EQUIPMENT

Maintenance of respiratory equipment involves proper cleaning, fitting, disinfecting, repairing and storing of all respiratory equipment. Maintenance of respiratory equipment will be handled by the Personal Protective Equipment Room attendant.

All respiratory equipment except for alky unit equipment, will be initially checked out of the equipment room by employees or contractors. The distribution of half mask respirator facepieces will be on an individual basis for all maintenance employees following a qualitative facepiece fit test. Operating and other employees would not normally require a half mask respirator therefore no fit testing will be conducted on those employees. The fit testing will be conducted by introducing isoamyl acetate (banana oil) vapors near the facepiece while the employee is wearing the respirator with organic vapor cartridges. Following a positive test for proper seal, a secondary check with a smoke tube will be conducted in a similar manner. If again a positive indication is found, the facepiece brand and model number will be recorded on the employees loan slip for a permanent record. If a negative result is found in either test a different brand or size respirator will be tried until positive results on both tests are reported. If the negative result for proper seal is a result of facial hair, then the employee must shave in order to obtain the proper fit test result. The respirators will be available for issue in a clean sanitary condition and placed in a plastic bag for each employee fitted. The issue procedures will be the same as for any safety equipment issue.

Each employee or contractor is required to return any respiratory equipment except disposable respirators into the equipment room within 24 hours of checkout. The proper use and care of the equipment is the responsibility of the employee or contractor who has checked it out. Upon returning of the equipment, the attendant will inspect it for flagarant abuse or missing items, clean, sanitize and dry each respirator. When dry, the respirators will be placed in clean plastic bags sealed and stored according to brand and model number.

Maintenance records will be kept on all SCBA equipment by completing the following form. The maintenance records will serve to identify excessive wear on the units, approximate usage patterns, and serve as indicators for replacement of older units.

All breathing air for use by airline respirators and SCBA units will be tested to assure the quality of the air meets the Compressed Gas Association's Commodity Specification for Grade (D) Air. These specifications call for the oxygen content to be between 19.5 - 23.5% O[illegible] 20 ppm, no appreciable odor, and carbon dioxide less than 1000 ppm.

RESPIRATOR INSPECTION RECORD

RE RATOR _____ NO. _____

.OCATION: DATE _____

DEFECTS FOUND	REPAIRED	INITIALS

:SPIRATOR _____ NO. _____

ICATION: DATE _____

DEFECTS FOUND	REPAIRED	INITIALS

TEN 4292

ALKYLATION UNIT BREATHING AIR SYSTEM

The respiratory protection at the alkylation unit consists of compressed breathing air supplied to a series of manifolds along the center aisle of the unit. The breathing air is used with either the acid hood or the zoot suit, as the work requires.

AIR COMPRESSOR

The air compressor used for breathing air is a Worthington three cylinder, two stage air cooled compressor located at the western end of the # 1 Crude Unit. The compressor has a preliminary Anderson High Efficiency Type 75SEPA filter, a 250 psig Air Receiver, and final Del-Monox Air Purifier Model # 250F. Safety features include an automatic start/stop mechanism to maintain air receiver pressure between 150-230 psig, a ¼" relief valve, a low pressure alarm annunciator set at 140 psig, and an Enmet Model ISA-44RAL carbon monoxide alarm.

The Anderson high efficiency SEPA filter is strictly a particulate filter, filtering the air before it enters the compressor while the Del-Monox Air Purifier filters most gases before the air reached the manifolds.

The start/stop mechanism is set to start the compressor when the air receiver compressor drops to 150 psig and stop the compressor when the receiver pressure reached 230 psig.

LOW PRESSURE ALARM

If for any reason the receiver pressure drops below 140 psig, the low air pressure alarm will sound in the control room and light on the control board. If the alarm signals low air pressure, there are two possible causes:

1. Excess demand on compressor due to leakage or suit adjustment.

2. Compressor shutdown due to low oil pressure, high discharge temperature, electrical failure or broken belts.

If the cause of alarm is excess demand by suits, the pressure should stabilize at a pressure above 150 psig. However, if it is caused by leakage conceivably it might go to ZERO psig, if the leak is major.

If the compressor shutdown for low oil pressure or high temperature, look at the oil pressure gauge on the compressor. If the oil pressure is below 15 psig, the compressor was shutdown on low oil pressure; if the pressure was above 15 psig, the shutdown was due to high discharge temperature.

CARBON MONOXIDE ALARM

The Enmet carbon monoxide alarm is an additional safeguard to assure high quality of the compressed air. The alarm is located behind the control board and is connected to the sensor at the compressor which is set to alarm audibly and visually with an amber light at 20 ppm CO concentration in the compressed air and with a red light at 50 ppm CO concentration. The normal operation is the ON, green light, being lit and the case will feel warm to the touch of a hand. The meter reading of CO should be below 20 ppm. The horn should be on.

EMERGENCY RESERVE SYSTEM

In case of low air pressure alarm or high CO concentration alarm, activate the emergency reserve air system. This system employs 12-230 ft^3 breathing air cylinders connected in series to a pressure reducing regulator, which feeds the air into the existing airlines and on to the manifold stations. The normal operation is to keep two cylinders opened up to the regulator but no air discharged from the regulator while the air compressor is operating. If the CO or low air pressure alarm sounds, close the valve on the airline by the air compressor. This prevents the compressed air in the cylinders from backing up to the compressor. Then, open the regulator by the air cylinders pressurizing the manifold system. Other air cylinders can be brought on line at this time. The rationale behind only keeping two cylinders on line under normal conditions is to prevent the leakage of air from the reserve system.