



# Respiratory Protection

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# Contents

INTRODUCTION .....	1
Definitions.....	1
Approved Respirators .....	1-2
New Respirator Selection Criteria .....	2
Responsibility .....	2
Respiratory Protection Program.....	2-3
Chart 1 - Respirator Decision Logic Flow Chart.....	4-5
Chart 2A - NIOSH 42 CFR Part 84 Filter Classifications Chart.....	6
Chart 2B - Flow Chart for Selecting Part 84 Particulate Filters .....	7

## Respiratory Protection



### Introduction

Every day, each of us is exposed to some degree of contamination in the air we breathe, both at home and on the job. Some of the same substances that help improve our quality of life, like chemicals for agriculture, fuel for our vehicles — can be toxic, pathogenic, or an irritant when inhaled. Fortunately, we can protect ourselves against respiratory hazards by following established safety guidelines and using appropriate protective measures (ventilation, fume scrubbers, respirators) when needed. The following information provides supervisors with a basic knowledge of respiratory protection as well as a working knowledge of the process of developing an effective respiratory protection program.

Unlike many other dangers, respiratory or breathing hazards are often invisible. We may not be able to see, feel, or smell them. These hazards may take the form of smoke, fumes, dusts, mists, gases, vapors, or insufficient oxygen supply. The first step to take in guarding against these breathing hazards is to identify them and quantify exposure levels.

Contained in the Code of Federal Regulations is the Respiratory Protection Standard (29 CFR 1910.134) that governs all aspects of respiratory protection for most industries and workplaces. Additionally, 29 CFR 1910.1200, the Hazard Communication Standard, states that employees who are exposed to hazardous materials must be trained on measures that they can take to protect themselves from such hazards. These measures include personal protective equipment/respirators. When the employer provides respirators for either mandatory or voluntary use, the employer must develop and implement a written respiratory protection program.

### Definitions

Respiratory contaminants are divided into two basic groups— particles and gases. A particle is a very small piece of matter. A dry particle is called dust. A liquid particle is called mist. A fume is a particle created by burning a material like metal. Some particles can be seen by the naked eye, others cannot. Seen or unseen, inhaled particles can clog and irritate our respiratory system. These contaminants are removed by air purifying particulate filters.

Gases are substances that have no identifiable shape or form. They can't be seen and we may not even be able to smell them. Gases simply hang in the air around us. Some liquids may become vapors when heated. For example, when water is boiled, it evaporates and becomes water vapor. Other liquids become vapors at or below room temperature. For example, bottled gas/L.P.G. evaporates readily at - 440°F and becomes a gas. Gases cannot be seen by the naked eye, but many can be dangerous when inhaled. Thorough and regular air sampling is the only way to determine their presence. These contaminants are removed by air purifying cartridges/canisters.

### Approved Respirators

Respirators are submitted for approval by a manufacturer as a complete unit. The unit includes straps, valves, face piece, and cartridges, filtration media, or a breathing air supply line. The specific unit parts vary according to the respirator type (e.g., “dust mask,” air purifying cartridge, or supplied air). The entire assembly is approved for use under test conditions and atmospheres as specified by the National Institute for Occupational Safety and Health (NIOSH), and the manufacturer. The interchange of pieces, parts, or car-

tridges from one approved respirator to another is not permitted (e.g., you cannot use a Brand X cartridge on a Brand Y respirator, even if it fits). Any modifications to a respirator voids the approval and leaves the employer liable to citation or litigation if an injury results from the use of a modified respirator.

### New Respirator Selection Criteria

The new Respiratory Protection Standard has had primary impact on the selection of air purifying particulate filters. The new standard mandates that contaminant particles must be evaluated as to being "oily or non-oily" as part of the selection criteria. The selection of air purifying cartridges or canisters and air supply devices has not been as pervasively affected by the new standard. The following is a brief outline of the essentials of the respirator selection process. Be aware that the following outline is a synopsis of the process, it is NOT a complete rendering of the respiratory protection selection protocol. (See Appendix I: Respirator Decision Logic Flow Chart and Appendix II: NIOSH Flow Chart for Selecting Part 84 Particulate Filters for a more detailed presentation of the respiratory protection selection process.)

1. Respiratory Hazard Identification: Particulate, Gas, Oxygen Deficient, or IDLH (Immediately Dangerous to Life or Health)
2. Determine level of employee exposure/concentration of airborne contaminant
3. Hazard Type
  - a. If the respiratory hazard is oxygen deficiency or IDLH, select the appropriate supplied air respirator.
  - b. If the respiratory hazard has a particulate component, go to the NIOSH 42 CFR Part 84 Flow Chart for Selecting Particulate Filters
  - c. If the respiratory hazard has a gas component, go to the ANSI K13.1-1973 chart for selecting cartridges and canisters. (A product specific selection chart, based on the aforementioned ANSI standard, is available from the manufacturers for use as a cartridge selection guide.)
  - d. It is important to remember that high levels of particulate and/or gas airborne contaminants may exceed the performance limits of air purifying devices, thus requiring the use of supplied air respirators.

4. If the airborne contaminant has poor *warning properties*, its presence is hard to detect at safe levels by sense of smell. It will be necessary to use a supplied air respirator.

### Responsibility

Employers are responsible for reducing the risk of exposure to air contaminants by implementing administrative or engineering controls. When these controls are not feasible, or do not reduce the levels of airborne hazards sufficiently to fully comply with the standards, protective equipment must be used. All protective equipment and its use must comply with OSHA standards.

Employees are responsible for using the protective equipment and complying with the established program.

### Respiratory Protection Program

Employers must develop and implement a written respiratory protection program in any workplace where respirator use is mandatory (as determined by air monitoring) to protect the health of the worker, or where respirator use is required by (the judgment of) the employer. The development and implementation of a written respiratory protection program is also necessary when the employer allows its employees voluntary use of approved respirators in such instances as exposure to nuisance levels of airborne contaminants. The voluntary use respiratory protection program is simpler both in practice and protocol. The particular requirements for the mandatory use and the voluntary use are found in the Respiratory Protection Standard, *29 CFR 1910.134*.

In any case, an effective respiratory protection program includes the following:

1. Written standard operating procedures for the safe and proper use of respirators
2. Regular program evaluation and modification of the existing procedures as needed
3. Respirator selection according to the potential and existing hazards (refer to the MSDS and the air sampling results in order to make proper protection selection)
4. Training in the proper selection, use, and maintenance of respirators which should occur when:
  - a. A new chemical is introduced
  - b. A change in respirators is required
  - c. A new hire is introduced to workplace hazards

5. Instruction in fit testing must include:
  - a. Demonstration and practice in wearing and adjusting the respirator
  - b. Determining proper fit
  - c. Positive/Negative seal test
6. All respirators must be:
  - a. Inspected for wear and deterioration for components before and after each use
  - b. Repaired by qualified personnel
  - c. Cleaned and disinfected after each use
  - d. Properly stored to protect against dust, sunlight, heat, extreme cold, excessive moisture, or damage
7. Medical examinations by a qualified physician must determine:
  - a. Pertinent health and physical conditions
  - b. Physical ability to perform the work
  - c. Continued ability to perform the work measured by periodic medical reviews
8. Regular monitoring of work area conditions, and the degree of worker exposure and stress
9. Air quality standards for:
  - a. Remote respirator air supplies delivered by cylinder or an air compressor that meet specific air quality standards
  - b. Clearly marked containers of breathable gas
10. Use of respirators approved by NIOSH

Chart 1

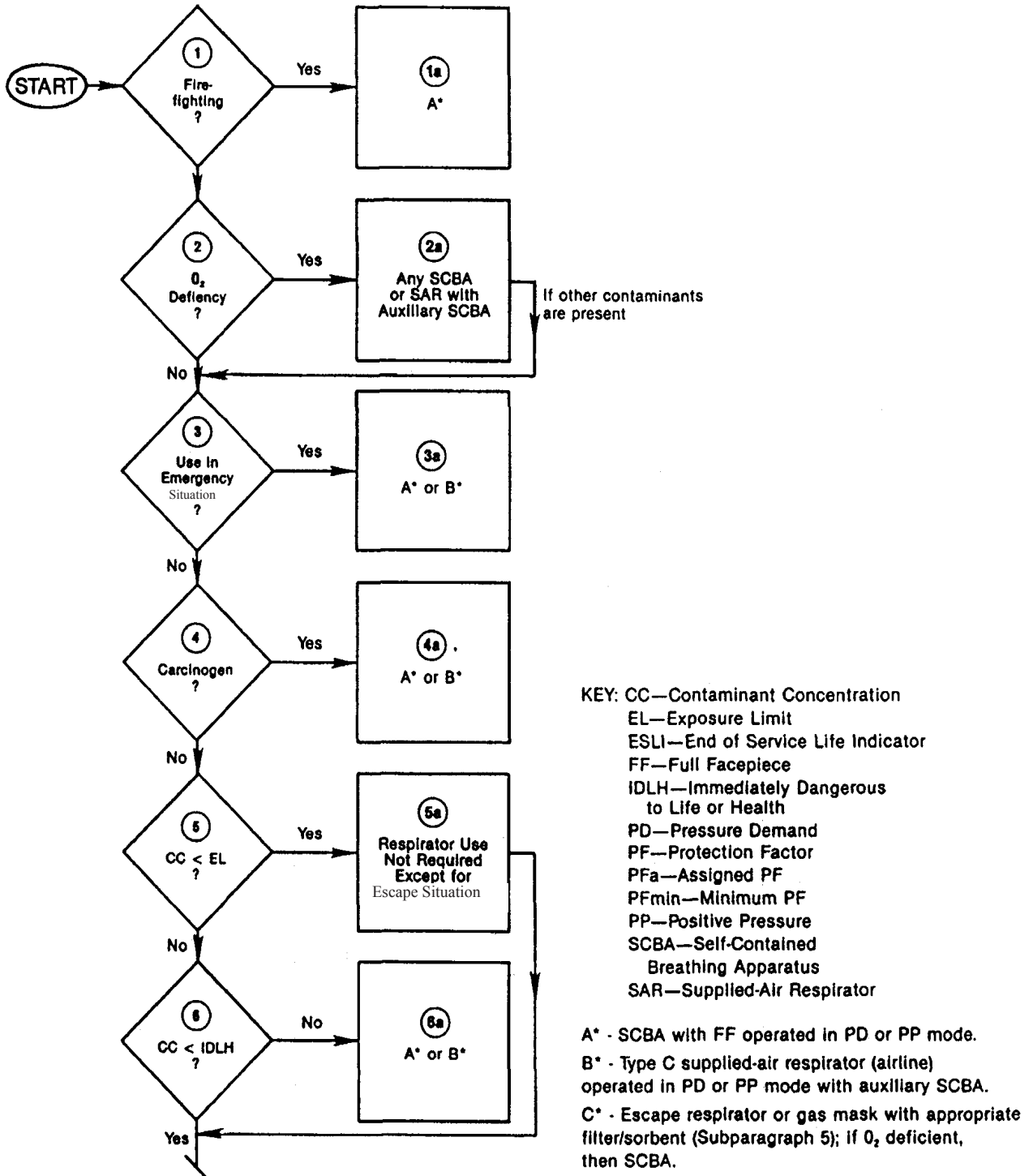


Figure 1. — Flow Chart of Respirator Decision Logic Sequence

Chart 1 continued

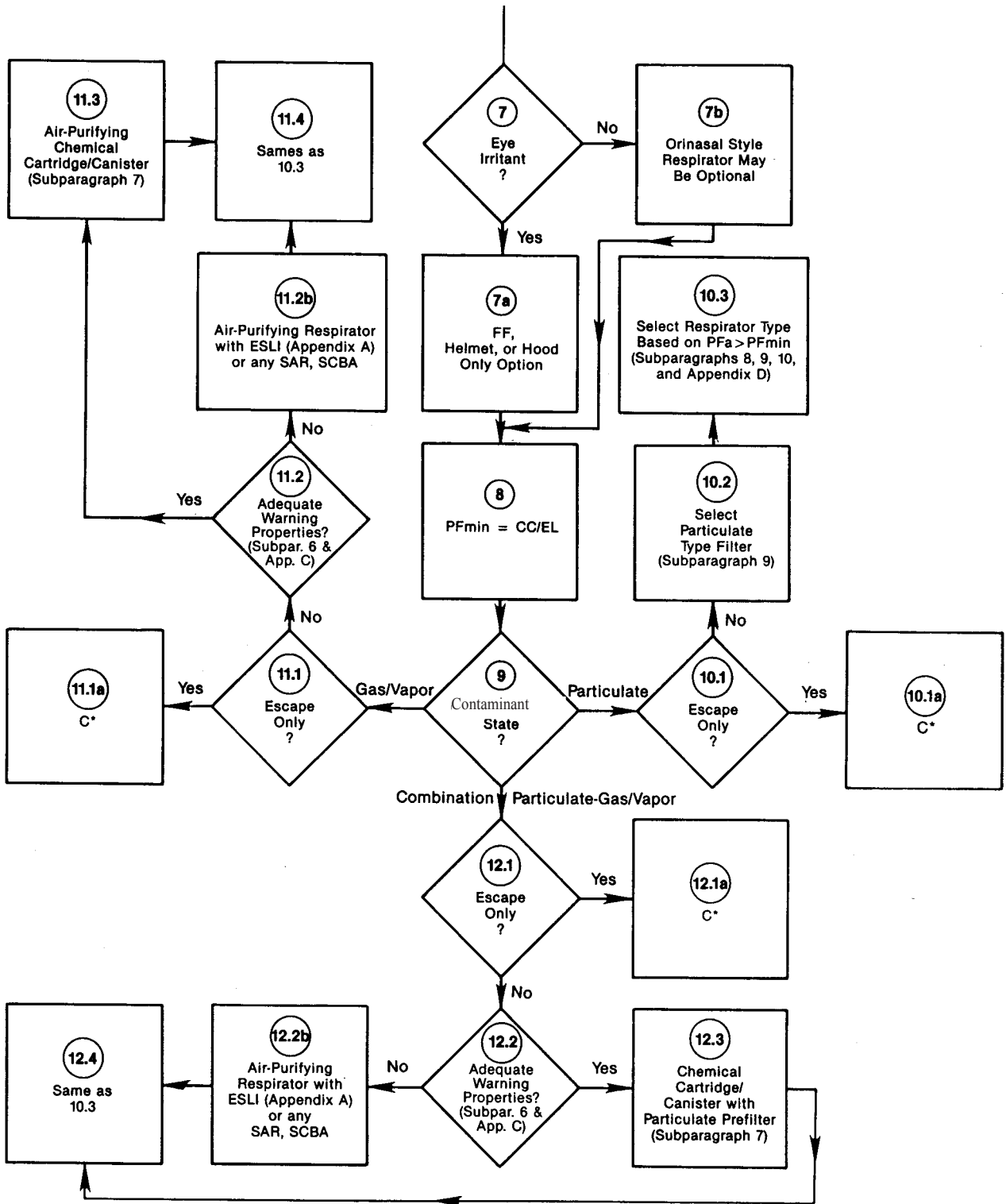


Figure 1. — Flow Chart of Respirator Decision Logic Sequence — Continued

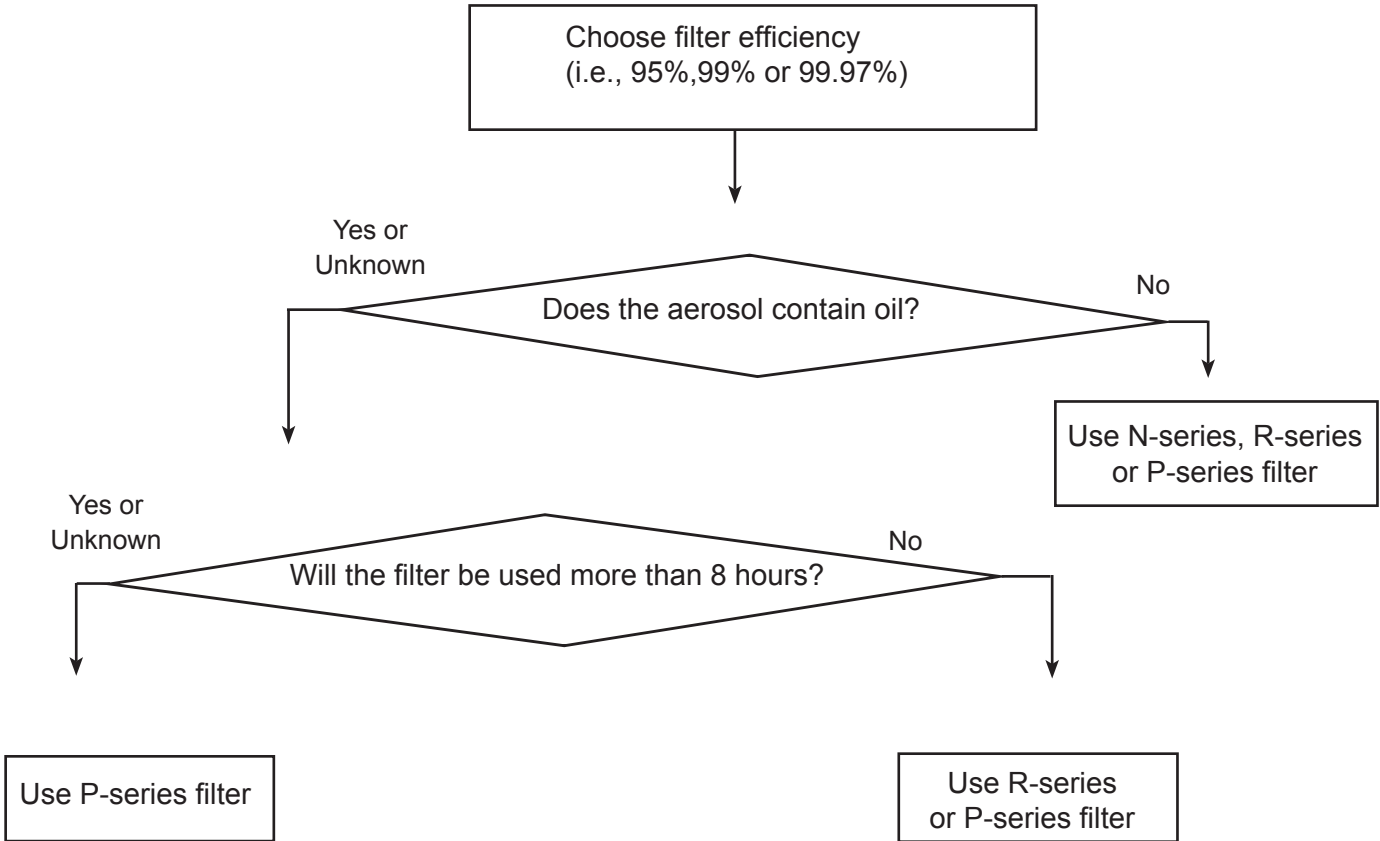
## **Chart 2A**

### **NIOSH 42 CFR Part 84 Filter Classifications**

- N - For solid particulates and non-aerosols that do not degrade filter performance.
- R - For solid particulates and degrading oil based aerosols. R Filters have "Use Limitations".
- P - For solid particulates and degrading oil based aerosols. P Filters have no "Use Limitations" other than those normally associated with particulate filters.

Three efficiency levels: -95%, 99%, 99.97%

**Chart 2B**



Three efficiency levels of filters 95%, 99%, or 99.97%