



# Fire Protection Training

Procedures Handbook 4300

FIREFIGHTER SAFETY

**TOPIC:** Respiratory Hazards: Physical and Mental Effects

**TIME FRAME:** 1 Hour

**LEVEL OF INSTRUCTION:**

**BEHAVIORAL OBJECTIVE:**

*Condition:* A written quiz

*Behavior:* The student will list and describe the physical and mental stresses on firefighters caused by toxic gases and oxygen deficiency. The student will identify CDF's policy on SCBA use.

*Standard:* With a minimum of 70% accuracy

**MATERIALS NEEDED:**

- Chalk and chalkboard
- Appropriate visual aids
- Audio visual equipment

**REFERENCES:**

- IFSTA, Essentials of Fire Fighting, 2nd Edition, Chapter 4
- IFSTA, Self-Contained Breathing Apparatus, 1st Edition, Chapter 3
- CDF, Health and Safety Procedures Handbook (1700)

**PREPARATION:**

When oxygen deficiency or toxic poisoning occurs human behavior can change dramatically. These occurrences can also cause substantial physical and mental stress. Firefighters must be able to judge which situations or events will give rise to these occurrences and protect themselves against them. Equally important, firefighters must recognize the symptoms resulting from oxygen deficiency or toxic poisoning in order to assist victims and fellow firefighters.

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RESPIRATORY HAZARDS:  
PHYSICAL AND MENTAL  
EFFECTS

| PRESENTATION   | APPLICATION  |
|--|--|
| <p><b>I. RESPIRATORY PROTECTION</b></p> <p>A. CDF Policy</p> <ol style="list-style-type: none"><li>1. "Employees will be provided with and required to wear the appropriate respiratory protection equipment when working in atmospheres that:<ol style="list-style-type: none"><li>a. Are hazardous</li><li>b. Are suspected to be hazardous</li><li>c. May become hazardous"</li></ol></li><li>2. A SCBA shall be worn whenever an employee is " ... working in, or when likely to be exposed to, an oxygen deficient atmosphere or dusts, mists, fumes, vapors, gases, or chemicals of such concentrations or duration as to cause injury..."</li></ol> <p>B. Hazardous Atmospheres Requiring a Respirator of the Pressure Demand Self-Contained Breathing Apparatus Type Include:</p> <ol style="list-style-type: none"><li>1. Oxygen deficient atmosphere. Exposures as short as 5 minutes can cause these problems.<ol style="list-style-type: none"><li>a. Oxygen normally comprises 21% of the air we breath</li><li>b. Impairment of physical and mental functions begin at 17% oxygen level</li><li>c. Dizziness, headache, and rapid fatigue occur at 12% oxygen level</li><li>d. Unconsciousness occurs at 9% oxygen level</li></ol></li></ol> | <p>Health and Safety<br/>Procedures Handbook<br/>(1700 Section 1729)</p> |

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| <ul style="list-style-type: none"><li>e. Death at 6% oxygen level</li><li>f. Symptoms of oxygen deficient atmosphere include:<ul style="list-style-type: none"><li>(1) Rapid breathing</li><li>(2) Dizziness</li><li>(3) Nausea</li><li>(4) Fatigue</li><li>(5) Impaired judgment</li><li>(6) Inability to reason</li><li>(7) Panic</li><li>(8) Fear</li></ul></li><li>2. Atmospheres with concentrations of dust, fumes, vapors, gases or chemicals which may cause injury<ul style="list-style-type: none"><li>a. Low concentrations for long duration can be as damaging as high concentrations for short duration</li><li>b. Non-emergency operations where respirator is required include but are not limited to:<ul style="list-style-type: none"><li>(1) Pesticide application</li><li>(2) Herbicide application</li><li>(3) Spray painting</li></ul></li></ul></li></ul> | <p>These applications do not necessarily require a pressure demand SCBA</p> |

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| <ul style="list-style-type: none"><li>(4) Chemical handling</li><li>c. Use in accord with recommendation on Material Safety Data Sheet (MSDS)</li><li>d. Operations where pressure demand self-contained breathing apparatus are required include but are not limited to:<ul style="list-style-type: none"><li>(1) Structure fires</li><li>(2) Vehicle fires</li><li>(3) Dump/dumpster fires</li><li>(4) Hazardous materials incidents</li><li>(5) Airplane crashes/fires</li><li>(6) Confined space operations</li><li>(7) Below ground operations</li><li>(8) When working in hazardous smoke other than a wildland fire</li></ul></li><li>3. Atmospheres with high temperatures<ul style="list-style-type: none"><li>a. As the temperature increases the stress placed on the body increases<ul style="list-style-type: none"><li>(1) Temperatures of 120oF - 140oF (dry heat) without respiratory protection can cause failure of the circulatory system.</li><li>(2) At temperatures of 160oF (wet heat) a person in full protective clothing and SCBA will find</li></ul></li></ul></li></ul> | <p>On what incidents should an S.C.B.A. be worn?</p> |

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| <p>conditions unbearable after 5 minutes</p> <p>(3) At temperatures of 190oF (dry heat) a person in full protective clothing and SCBA can comfortably work for 10 minutes</p> <p>b. High heat will destroy/damage the respiratory system most easily</p> <p>(1) Nose</p> <p>(2) Mouth</p> <p>(3) Trachea</p> <p>(4) Lungs</p> <p>4. Toxic atmospheres</p> <p>a. Combustion of structural or decorative components can produce high toxicity levels of the following:</p> <p>(1) Carbon monoxide (all fires)</p> <p>(2) Hydrogen sulfide (all fires)</p> <p>(3) Sulfur dioxide (all fires)</p> <p>(4) Hydrocyanic acid (silk fires)</p> <p>(5) Hydrogen cyanide (wool fires)</p> <p>(6) Hydrogen chloride (plastic fires)</p> <p>(7) Aldehydes (plastic fires)</p> <p>(8) Ammonia (plastic fires)</p> <p>(9) Cyanides (plastic fires)</p> <p>(10) Oxides of nitrogen (plastic fires)</p> |             |

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| <ul style="list-style-type: none"><li>b. If these toxins are inhaled, ingested or absorbed immediate death may occur</li><li>c. Many of these toxins are colorless and/or odorless and give no evidence of their presence</li><li>d. Err on the side of safety. If it is possible that toxins are present take precautionary measures<ul style="list-style-type: none"><li>(1) Proper protective clothing</li><li>(2) SCBA</li></ul></li></ul> <p>C. Self-Contained Breathing Apparatus are <b>Not</b> Designed for Underwater Use</p> |             |

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## ***SUMMARY:***

It is important that the firefighter recognize the symptoms and the effects of physical and mental stress associated with fire and the products of combustion. It is imperative that the firefighter understand the protection afforded them in these situations when protective clothing and an S.C.B.A. are used. Utilizing this knowledge and equipment can contribute to a long and successful career and an opportunity to enjoy retirement.

## ***EVALUATION:***

A written quiz.

## ***ASSIGNMENT:***

To be determined by instructor(s).