Respiratory Disease and the Russell Fire Department: Are We Protecting Ourselves?

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REVISIONS TO
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CERTIFICATION STATEMENT

I hereby certify the following statements are true:

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ABSTRACT

Firefighters are exposed to toxic and carcinogenic chemicals during the course of firefighting operations. Some of this exposure occurs through inhalation of smoke, gases and particulate matter. During fire suppression operations firefighters wear respiratory protective equipment (RPE). After fire extinguishment has started but before operations are complete firefighters remove their RPE. Firefighters continue to work in a contaminated atmosphere doing overhaul activities. During overhaul operations firefighters continue to inhale dangerous chemicals and put their lives and health at risk. The problem this study will address is Russell firefighters not wearing respiratory protective equipment during the overhaul phase of fire scene operations.

The purpose of this research is to construct and implement, within Russell Fire Department, a comprehensive personal protective equipment standard, including use of respiratory protective equipment.

The research method used is a descriptive process utilizing a survey and interview.

The research will attempt to answer the following questions:

a. What are the known toxins/carcinogens contained in smoke?
b. What are the short-term and long-term health effects for firefighters?
c. What is the current knowledge base about these risks among Russell firefighters?
d. What is the current practice of respiratory protective equipment use among Russell firefighters?

e. What is the current practice among Russell firefighters of determining the appropriate removal of SCBA?

f. What policies and procedures need to be implemented to assure compliance with wearing respiratory protective equipment?

This research project utilized a fifteen-question survey that was distributed electronically and in printed form. The survey used a combination of multiple-choice, closed-end and essay questions. The survey was distributed to active members of the fire service who were a minimum of age 18 and a certified firefighter. A total of 53 responses were received.

Results from the survey were consolidated into seven areas of information. Those areas include: age, career involvement in the fire service, level of knowledge about health effects of smoke inhalation, source of knowledge about health effects of smoke inhalation, fire departments that have a written SOP/SOG for wearing RPE, fire departments that have a written SOP/SOG for removal of RPE, and fire departments that conduct air sampling prior to removal of RPE.

Based on the results of the research the following recommendations are made:

1. Russell Fire Department shall implement a SOG/SOP for wearing personal protective equipment, including RPE.
2. All RFD members shall be instructed in the SOP/SOG, with emphasis on air quality monitoring and appropriate use of RPE.
3. Russell Fire Department should purchase air-purifying respirators for all personnel.

TABLE OF CONTENTS

INTRODUCTION

Part 1

Russell Fire Department is a combination department located in Geauga county in northeast Ohio that provides fire suppression, fire prevention, ALS EMS, technical rescue, hazardous material, dive team, fire investigation and fire safety education services to the community. The township is semi-rural, 21.5 square miles in area, with a population of 5200. The community is predominately residential. There is no industrial development and there is minimal retail or commercial development. Russell Fire Department responds to approximately 600 calls annually.

Part 2

Since the earliest recorded history of firefighting it is recognized that firefighters are exposed to toxic gases and smoke. In those days firefighters did not have special equipment to protect themselves from inhaling these substances. Often firefighters were required to run into burning buildings and hold their breath, crawling from window to window to catch a quick gasp of clean air. As a result of these inhalation exposures firefighters often contracted serious, life-threatening illnesses.

Today the fire service benefits from decades of research and scientific development. Several research projects have identified the health risks associated with inhalation exposure to smoke. In today's fire service there is greater awareness of firefighter safety and health protection. One result of this awareness is the increased use of respiratory protective equipment during firefighting operations. The increased use of respiratory protective equipment comes from the recognition of the change in the composition of today's materials. Prior to the 1950's the contents of buildings were

made of natural materials. These materials included wood, iron, horsehair, wool and cotton. Materials of this nature burn with a relatively low heat and do not produce the toxic by-products of synthetic materials. Today the contents of our homes and businesses are filled with an assortment of manmade materials. These materials include plastic, nylon, rubber, laminates, glue, paint and varnish. The common denominator of all these materials is their petroleum base. When petroleum products burn they create flammable, toxic and carcinogenic by-products. Even a short exposure to these chemicals can cause irreparable damage or death.

The fire service industry has developed protective equipment to safeguard firefighters from the effects of fire and smoke. Some of the most significant advances have come in the development of respiratory protection equipment (RPE). Self-contained breathing apparatus (SCBA) is the most advanced level of RPE. It provides a pressurized air source that enables firefighters to enter toxic, contaminated atmospheres and safely conduct firefighting and rescue operations. Without SCBA firefighters would quickly succumb to the deadly effects of heat, smoke and gases. Air-purifying respirators (APR) are available for situations where there is an absence of heat, sufficient oxygen is present but the atmosphere is contaminated with chemical or particulate substances. An APR will provide chemical and physical filtration of toxic and irritating substances. APR's are an effective component of a respiratory protection program.

Over the past two decades the fire service has established recommended policies and procedures for wearing RPE during fire suppression operations. In conjunction with those policies is the awareness of the danger of exposure to smoke and gases during the overhaul phase of operations. Overhaul is the phase of fire suppression operations where

the main body of fire has been extinguished and crews are looking for hidden areas of fire and continuing to cool the burning debris. During this time fire crews are exposed to hot fire embers that are producing gases, steam, and vapors.

There is an emerging body of evidence that warns of negative consequences for firefighters who do not wear their SCBA when conducting overhaul operations. Research shows that the atmosphere in a fire scene continues to have harmful smoke and gases even during the overhaul phase. Exposure to these conditions can lead to detrimental immediate and long-term health effects.

The problem this study will address is Russell firefighters not wearing respiratory protective equipment during the overhaul phase of fire scene operations. Currently, there is no Standard Operating Guideline (SOG) for the use of Personal Protective Equipment, including the use of respiratory protection.

Although there have been no smoke-related deaths or serious illness within the membership of Russell Fire Department, it is this author's belief that the leadership of RFD should take a proactive approach to firefighter respiratory safety. *The purpose of this research is to construct a written policy and standard operating guideline that will cause all Russell firefighters to wear respiratory protective equipment whenever they are conducting overhaul operations at a fire scene.*

The method of research for this project was a descriptive process utilizing surveys, questionnaires and interviews.

This research project will answer the following questions:

1. What are the known toxins/carcinogens contained within smoke?
2. What are the short-term and long-term health effects for firefighters?

3. What is the current knowledge base about these risks among firefighters?
4. What is the current practice of respiratory protective equipment use among firefighters?
5. What is the current practice for determining removal of SCBA?
6. What policies and procedures need to be implemented to assure compliance with wearing respiratory protective equipment?

BACKGROUND AND SIGNIFICANCE

Based on scientific research firefighters know that smoke contains many poisonous and carcinogenic components. Exposure to smoke can have serious health effects. These effects can immediately threaten a firefighter's life or have potential ramifications in the future. Exposure to smoke can lead to personal injury, chronic health effects, acute health effects, loss of availability to the department, increased department costs, financial hardship for firefighters and their families and diminished quality of life. One study noted 12 toxic gases, 3 vaporized heavy metals, asbestos and dust as the components of smoke. Recognizing this risk to firefighter's health has brought about regulations that are designed to protect the firefighter. The Ohio Administrative Code (OAC) section 4123:1-21-02 requires that firefighters be provided with safety equipment to protect them from harm and injury. Included in the OAC is a specific section related to respiratory protective equipment. The Occupational Safety and Health Administration (OSHA) standard 1910.134 also apply to firefighters. This standard addresses any occupation where the employee is exposed to smoke, fumes, dust, gases, sprays or mists. Respiratory protection is a necessity to protect the lives and health of firefighters. Numerous studies

have been conducted that document the increased risk of cancer and pulmonary disease in firefighters (see Literature Review). Every effort should be made to safeguard firefighters from these risks.

Russell firefighters are not exempt from these health risks. At present, there is not a reported case of cancer or pulmonary disease among Russell firefighters. A review of the injury reports of the past five years did not identify any claims of smoke related injury or illness. However, this does not absolve the department leadership from protecting the firefighters and preventing future health problems.

Russell Fire Department has not done a good job of implementing a comprehensive respiratory protection program. The use of respiratory protective equipment within the department has been influenced by two factors, training and past practice. The training program has focused on the physical operation of the equipment with little or no mention of the consequences of not wearing RPE. Past practice has been to wear self-contained breathing apparatus until fire suppression operations had been completed, but as soon as the air was 'clear' the SCBA masks were removed despite there still being smoke, gases and particulate matter in the air. The decision to remove RPE is made on an individual basis without the benefit of a standard policy or air quality monitoring. These two conditions could lead to a Russell firefighter being needlessly hurt or harmed. By not having a comprehensive respiratory protection program Russell Fire Department is in violation of the Ohio Administrative Code and could be subject to a great deal of liability or penalty.

Over the past ten years the department has made improvements in the level of respiratory protective equipment provided to the members. The department has

purchased SCBA that has the latest technological improvements including integrated PASS devices, emergency rope escape devices and connections for replenishing a depleted air supply. Russell Fire Department has purchased individual SCBA masks for each member.

The downfall in our protection comes in the lack of required annual testing and a comprehensive policy to guide the use of the equipment. The department does not conduct annual fit tests or provide for annual physicals of department members. Both of these conditions are also in violation of the OAC. The department does not have a standard operating guideline that spells out when the equipment shall be used and under what conditions it is appropriate to remove the protection.

The potential impact of this study on the Russell Fire Department is to develop a policy and procedures to decrease exposure to toxic and dangerous atmospheres leading to a decrease in the disability of firefighters, decrease in the cost of operating the department, prevention of future health problems and increase the quality of life for RFD members.

LITERATURE REVIEW

Musk, Peters and Wegnman (1977) studied a group of Boston, Massachusetts's firefighters that had been previously evaluated for lung function. Their study was a follow-up to the original research that documented lung function among firefighters. Changes in lung function were documented as relevant to both overall health and longevity of life.

Loke, Farmer, Matthay, Putnam and Smith (1980) collaborated on a study of the acute and chronic effects of firefighting on pulmonary function. The investigators studied a group of Connecticut firefighters in an effort to determine the effects of exposure to smoke during routine firefighting operations as they relate to pulmonary function.

Sheppard, Distefano, Morse and Becker (1986) studied the acute effects of firefighting on lung function. The study discovered a decrease in two important measurements of lung function. Firefighters were shown to have decreased forced vital capacity and decreased forced expiratory volume. Forced vital capacity is the volume of gas exhaled from completely filled lungs during a maximal expiratory effort. Forced expiratory volume is the volume of air that can be expired after a full inspiration. (Taber's 2008)

These decreases were measured over time and after multiple exposures to smoke. The authors recommend firefighters wear personal respiratory protective equipment during firefighting.

In 1994 the Ontario (Canada) Industrial Disease Standards Panel (IDSP) completed a study of firefighters and the relationship to increased rates of cardiovascular disease and cancer. This study was the support document for the implementation of 'presumptive cause' health care benefits for active Ontario firefighters. The conclusion of the IDSP was that increased rates of cancer were directly attributable to firefighters' exposure to the toxic components of smoke.

Gregg A. Hine and Gregory M. Kinnes (1996) conducted a National Institute for Occupational Safety and Health (NIOSH) Health Hazard Evaluation on behalf of the

United States Bureau of Alcohol, Tobacco and Firearms (ATF). This study was initiated due to the concern of fire investigators employed by the ATF about their exposure to toxic and carcinogenic products while conducting fire investigations. The study examined eight groups of chemicals that have been identified by NIOSH as having harmful effects. The report concluded that fire investigators are exposed to toxic and carcinogenic chemicals above acceptable NIOSH levels. Their recommendations included requiring ATF investigators to wear appropriate air-purifying respirators, establishing a respiratory protection plan that complies with OSHA standard 29 CFR 1910.134, using mechanical ventilation equipment to remove contaminants from the fire scene, and use of other (disposable) protective equipment to limit exposure to particulates and confine contaminants to the fire scene.

Bolstad-Johnson, Burgess, Crutchfield, Storment, Gerkin and Wilson (1998) conducted a study in conjunction with the Phoenix, Arizona Fire Department that analyzed the atmosphere of fire scenes during overhaul operations. Their study identified multiple toxic gases, vaporized heavy metals, asbestos and particulate matter. Their recommendation was for firefighters to wear RPE during overhaul operations.

A follow-up study was conducted by Bolstad-Johnson, Burgess, Crutchfield and Gerkin (2001) further investigating the adverse effects of toxic atmospheres on firefighter respiratory systems. Their findings include the recommendation that positive-pressure SCBA be worn throughout the overhaul phase of firefighting.

Mary Jane Dittmar (2002) authored a two-part article in Fire Engineering magazine that specifically addressed the issue of firefighters wearing SCBA whenever they are in a smoky or dust-filled atmosphere. Part 1 cites the data from a Canadian study that

correlates firefighting with higher rates of cancer. These cancers are attributable to exposure to the poisonous contents of smoke.

Part 2 discusses the issue of inhaling dust from fires or other emergency scenes. Research has shown that drywall and concrete dust can contain asbestos and silica. Both of these can cause irreparable lung damage.

Michael L. Donahue (2006) authored two articles that appeared in Fire Engineering magazine regarding fire investigators exposure to dangerous environments while conducting fire scene investigations. Mr. Donahue reviews the contents of today's typical residence and explains the dangers of inhaling toxic by-products of combustion. He provides an overview of respiratory protection devices and their application to the fire investigator. Mr. Donahue concludes his article with the suggestion that each fire scene be treated as a hazardous materials incident and every investigator must take appropriate protective measures.

JEMS Communications published a special supplement entitled Smoke Inhalation & Hydrogen Cyanide Poisoning (Summer 2004). This supplement addressed the effects of cyanide gas, a by-product of combustion, on both civilian victims and firefighters.

LeMasters, Genaidy, Succop, Deddens, Sobeih, Barriera-Viruet, Dunning and Lockey (2006) collaborated on a comprehensive review of existing research relevant to cancer risk among firefighters. This study is frequently referred to as the Cincinnati Study. The authors reviewed thirty-two studies that have quantified and qualified cancer risk among firefighters. The investigators presented evidence that firefighters are at a higher risk for twelve different types of cancer as compared to workers in similar occupations.

Hester (2006) reviewed the data and research into the chemical components of smoke. His overview includes references to additional studies on the toxicity of smoke and current procedures for protecting firefighters from adverse health effects due to smoke exposure.

Fabian and Gandhi (2007) of Underwriters Laboratories conducted a Smoke Characterization Project in conjunction with the Fire Protection Research Foundation. The primary focus of the project was to provide scientific information for use in the review of the efficacy of current smoke detector technology and the development of future detectors. This project has relevance to this applied research project as it provides the most up-to-date scientific data on the composition of the products of combustion.

Grant (2007) of the Fire Protection Research Foundation recently completed a study to help develop best practices for the use of SCBA and other respiratory protective equipment. One aspect of the project was to examine the issue of firefighter exposure to toxic conditions in the overhaul phase. The study reviewed the available literature, examined current practices and issued 21 key findings.

PROCEDURES

The procedure used to conduct the research was a descriptive process utilizing a survey distributed by written copy and electronic transmission. The purpose of the survey is to assess firefighter knowledge of the health hazards of smoke inhalation and research current fire service practices regarding the use of respiratory protective equipment. The survey was distributed to approximately 200 firefighters from several dozen departments across the United States. These firefighters represent career,

volunteer and combination departments. Minimum requirements for completing the survey were 18 years of age, certified as a firefighter and an active member of a department. The pool of potential participants is comprised of members from fire departments in Geauga County and Cuyahoga County, Ohio, OFE Alumni, and members of the Alabama Fire College Fire Officer III and IV program. The source of my data is a fifteen-item questionnaire. The survey utilizes a combination of multiple choice, closed-end, and essay questions.

The statistical analysis will be a condensation of the results of the closed-end and multiple-choice questions. Additional analysis will provide a synopsis of the responses to the open-ended/essay questions.

Definition of Terms

For the purposes of this research project the terms below are defined as follows:

A. Contaminated Atmosphere: Any air space that is, or reasonably assumed to be, contaminated with irritating, toxic, carcinogenic, infectious or asphyxiating agents.

B. Smoke: The by-products of combustion including all gases, chemicals, particles and incompletely burned products that combine with the ambient air.

C. Personal Protective Equipment (PPE): An ensemble of heat resistant garments and mechanical equipment worn by firefighters during firefighting operations. This equipment includes helmet, boots, gloves, hood, jacket, pants and respiratory protective equipment.

D. Respiratory Protective Equipment (RPE): Any device used to protect the respiratory system from exposure to smoke and dust. This equipment includes self-contained breathing apparatus and air-purifying respirators.

E. Self-Contained Breathing Apparatus (SCBA): A device that provides an uncontaminated pressurized air source to the wearer via a full-face mask.

F. Air-Purifying Respirator (APR): A device worn over the mouth and nose that provides physical and chemical filtration of the ambient air.

G. Multi-gas Meter: A hand-held device capable of sampling the ambient air and providing an analysis for specific gases and/or potential for an explosive atmosphere.

H. Full time firefighter: A person who derives their living from being a firefighter, including receipt of salary, benefits and pension.

I. Part time firefighter: A person who is employed as a firefighter at less than a full time position.

J. Volunteer firefighter: A person employed as a firefighter who receives no compensation or less than $500 per year in any form of compensation.

RESULTS

Based on the results of the Literature Review, answers to research questions 1 and 2 can be derived.

1. Research has determined that smoke contains benzene, carbon monoxide, hydrogen cyanide, hydrogen sulfide, acrolein, hydrogen chloride, phosgene, asbestos and silica. These products of combustion can have detrimental effects

on health by their carcinogenic, poisonous, asphyxiating or physically destructive effects.

2. The short-term health effects of these exposures include: injury, chest pain, headache, shortness of breath, pulmonary edema, dizziness, nausea and vomiting, and loss of consciousness.

   The long-term health effects include leukemia, cancer, pulmonary edema, and chronic obstructive pulmonary disease.

3. For questions 3-15 a survey of fire service members was conducted.

A total of 53 survey responses were received. The respondents represented:

- 59% career firefighters
- 26% part time firefighters
- 15% volunteer firefighters.
- Age 18-27 17%
- Age 28-37 20%
- Age 38-47 37%
- Age 48-57 23%
- Age 58-67 2%

An analysis of the responses from the survey reveals the following information.

- 90% of respondents considered themselves as ‘very’ or ‘somewhat’ knowledgeable about the physical and health effects of smoke.
- 70% of the respondents had received department provided training about the physical and health effects of smoke.

- 91% of the respondent's departments have a written SOP/SOG for wearing RPE.
- 40% of the respondent's fire departments have a written SOP/SOG for removal of RPE.
- 48% of fire departments conduct air quality sampling prior to removal of RPE.

Nine of the 53 respondents were members of Russell Fire Department.

This represents a response from 32% of department members.

The following information, specific to RFD, was derived.

- 89% of respondents considered themselves 'very' or 'somewhat' knowledgeable about the physical and health effects of smoke.
- 56% had received department-provided training about the physical and health effects of smoke.
- 89% of respondents believe RFD has a written SOP/SOG for when SCBA must be worn.
- 34% of respondents believe that RFD has a written SOP/SOG for removal of SCBA.
- 78% of respondents report RFD does not conduct air quality monitoring prior to SCBA removal.

Four SOP/SOG were submitted as a part of the response to the survey. Two of those criteria address APR use only in an EMS situation. Two SOG addressed use of APR during firefighting operations.

SOG 1 (Anderson City, SC Fire Department) provides APR availability to firefighters as part of their overall SCBA equipment. Responsibility for use rests with the company officer. The SOG states APR use shall be the responsibility of the company officer and shall be guided by department air monitoring criteria.

SOG 2 (Westerville, OH Fire Department) likewise provides APR capability to firefighters via their SCBA equipment. Responsibility for use is written as pertaining to both firefighter and company officer. SOG 2 further defines when APR use can be considered. The three general conditions are: during fire overhaul operations, during EMS operations and during Haz-Mat operations.

DISCUSSION

The vast majority of firefighters surveyed considered themselves to be knowledgeable about the detrimental effects of smoke inhalation. The survey respondents reported almost one-third of their departments educate personnel on the dangers of smoke inhalation. This would indicate that the issue of personal health and smoke inhalation has received some attention within the fire service. Yet, less than half of the departments take air samples before permitting firefighters to remove SCBA and only forty percent of respondents had a written SOP for when SCBA can be removed. Anecdotal evidence shows that there is a wide range in the criteria for when it is permissible to remove SCBA. Essay answers to the survey indicate that criteria for SCBA removal varies between relying on the company officer for permission, waiting until the atmosphere is

visually “all clear”, and removing SCBA and inhaling the ambient air to determine the safety of the atmosphere.

Results from RFD members paralleled the results of the total population surveyed. Close to ninety percent of respondents consider themselves knowledgeable about the detrimental health and physical effects of smoke inhalation. More than half had received department-provided training about those effects. Likewise, the RFD criteria for removing SCBA are as imprecise as the larger body. The survey indicates that air quality monitoring before SCBA removal is infrequently done and there is no specific department –wide understanding for when it is appropriate to remove SCBA.

The results of the survey support this author’s opinion that the issue of firefighter respiratory protection is well recognized in the fire service, but the practice of wearing RPE and having a specific RPE removal protocol is deficient.

The available research, as noted in the Literature Review, deals predominately with documenting the characteristics of smoke and the detrimental health effects associated with exposure to smoke. Additional research needs to be conducted to assess firefighter attitudes regarding wearing RPE and what actions are necessary to achieve a higher level of compliance in wearing RPE. A thorough review of departments that have implemented an in-depth firefighter respiratory protection program may provide suggestions that could be instituted industry wide. Clearly, there is a breakdown between understanding the problem and the implementation of policies and procedures that address the problem.

This research project looked at one part of a bigger more complex issue. Additional research needs done to investigate how to decrease atmospheric contaminants at fire

scenes, create new air monitoring devices that are useful in the fire service, create a new generation of RPE for use in post-fire situations and discover new medical treatments that will prevent or decrease health risks caused by exposure to contaminated atmospheres.

The implications for Russell Fire Department mirror the fire service at large. As long as firefighters are exposed to by-products of combustion they risk detrimental short-term and long-term health effects. These adverse health risks can have a devastating effect on the individual and the department. Russell Fire Department must place a high priority on protecting the respiratory health and safety of the department members.

RECOMMENDATIONS

1. Russell Fire Department shall implement a Standard Operating Guideline (see Appendix 1) for wearing personal protective equipment, including respiratory protective equipment.

   The fire chief, department training officer and this author will develop the SOG. The SOG will incorporate the latest information available from IFSTA and be in compliance with all applicable NFPA, OSHA, NIOSH and OAC standards. The SOG will be written and implemented by February 1, 2009.

2. All RFD members shall be instructed in the SOG with special emphasis on air quality monitoring and appropriate use of RPE.

   RFD members will be instructed in the SOG at the first regular department training session after the first of February. The SOG will be reviewed at the next 3 regular training sessions and then reviewed on an annual basis by the department training officer. This training will be mandatory and will be completed by all RFD members who are expected to operate in situations where SCBA would be required.

   Training on the use of the department's air quality meter will be done in conjunction with the implementation of the SOG. The department training officer will conduct the training on the use of the air quality meter.

3. Russell Fire Department should purchase air-purifying respirators for all personnel.

   Scientific research has documented that ambient air at a fire scene contains toxic and dangerous substances. Self-contained breathing apparatus is heavy and cumbersome. In order to provide respiratory protection for firefighters and alleviate some of the physical burden of firefighting, RFD should provide APR for the members to wear during overhaul or investigation operations. The APR should be a half-face mask with a filtration canister capable of protecting the wearer from the products of combustion. The APR must be approved by NIOSH. A SOG that includes air quality monitoring by means of a calibrated, multi-gas meter shall guide the use of APR.

4. All firefighters shall wear SCBA until they are out of a contaminated atmosphere.

   This is a recommendation that is made for the fire service in general. In order to protect firefighters at the highest possible level, SCBA should be worn until the wearer is out of the fire building and outside of any smoke conditions. This is the only way that firefighters can be sure they are not inhaling any toxic or dangerous substances.

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APPENDIX 1

Russell Fire Department Standard Operating Guideline

Personal Protective Equipment/Respiratory Protective Equipment

Purpose: The purpose of this guideline is to establish the minimum acceptable level for the use; care and replacement of RFD issued respiratory protective equipment (RPE).

Policy: It is the policy of Russell Fire Department that all personnel expected to respond and function in a contaminated atmosphere shall be equipped with respiratory protective equipment and trained in its proper use and maintenance. It shall be the policy of Russell Fire Department to be in compliance with all applicable NFPA, OSHA, NIOSH, and OAC standards.

Scope: This SOG applies to all RFD personnel that may be involved in fire suppression, fire rescue, hazardous materials response, EMS response, technical rescue, fire investigation or any response that necessitates protection from a dangerous or potentially dangerous atmosphere.

Definitions:

a. Personal Protective Equipment: Mechanical equipment, safety equipment and garments provided by RFD for the protection of personnel from dangerous conditions or weather-related conditions. This equipment includes heat resistant coat, pants, boots, hood, helmet, gloves, safety glasses, foul weather coat, coveralls and respiratory protective equipment.
b. Respiratory Protective Equipment: 1. Any device that provides physical or chemical filtration from contaminants in the ambient air. 2. Any device that provides an uncontaminated pressurized air source to the wearer via a full-face mask.
c. Contaminated Atmosphere: Any air space that is, or can be reasonably assumed to be, contaminated with explosive, irritating, toxic, carcinogenic, infectious or asphyxiating agents.

Use: All RFD personnel shall wear Personal Protective Equipment when involved in fire suppression, fire rescue, hazardous materials response, EMS response, and technical rescue and/or when in a dangerous or potentially dangerous environment.

All RFD personnel shall wear Personal Protective Equipment when engaged in training operations that come under any condition detailed in this SOG.

Respiratory Protection:

All RFD personnel shall wear Respiratory Protective Equipment when subject to a contaminated atmosphere or an atmosphere that can be reasonably assumed to be contaminated. Such atmospheres include fire suppression, overhaul, investigation, EMS operations and investigation of odor or gas release.

All RFD personnel shall wear Respiratory Protective Equipment when the atmosphere is oxygen deficient, or when the atmosphere can be reasonably assumed to be oxygen deficient. (Oxygen level below 19.5%)

RFD personnel may not remove RPE until they are in an atmosphere that is oxygen sufficient and is devoid of any products of combustion or air-borne particulate matter. A calibrated multi-gas meter shall be used to ascertain oxygen content and the presence of hazardous gases and vapors.

Air-purifying respirators: RFD personnel may, with the permission of the Incident Commander in conjunction with RFD air quality monitoring guidelines, wear APR during fire overhaul or investigation operations.

RFD personnel may wear APR when conducting EMS operations involving patients with a known or suspected air-borne, infectious condition.

Care: All RFD personnel shall be familiar with all labels attached to personal protective equipment.

RFD personnel shall not destroy, deface, alter or remove any label attached to personal protective equipment.

All RFD personnel shall clean and maintain their personal protective equipment in accordance with documents provided with the equipment and any attached labels.

Replacement: Personal protective equipment that is damaged or otherwise defective to the point of not providing its intended protection shall be removed from service. The immediate O.I.C. shall be notified and a replacement shall be issued.

a. Personal protective equipment removed from service due to damage, wear or defective condition shall be replaced by the department.
b. The department, at the individual's expense, shall replace personal protective equipment lost, altered, not properly cared for or intentionally misused.