Analyzing the SCBA Practices within the Bedford Division of Fire

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Political Legal Foundations

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CERTIFICATION STATEMENT

I hereby certify that the following statements are true:

1. This paper constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

2. I have affirmed the use of proper spelling and grammar in this document by using the spell and grammar check functions of a word processing software program and correcting the errors as suggested by the program.

Signed: ________________________________

Printed Name: ________________________________
Abstract

The problem this study investigated is the lack of proper usage of Self-Contained Breathing Apparatus (SCBA) during firefighting operations within the Bedford Fire Department.

The purpose of this research paper was to define better practices during overhaul and light smoke conditions that will help the firefighters reduce their risk of Cancer. The information from this study will be used for recommendation to the Fire Chief for improving the safety and sustainability of the present and future firefighters of the Bedford Fire Department.

The author used evaluative and descriptive research to answer the following questions:

When do Bedford Firefighters feel the atmosphere is safe after a structure fire?

At what point do Bedford Firefighters remove their SCBA?

Is the Bedford Officer Core enforcing proper usage of SCBA during overhaul?

Is the Bedford Fire Department properly equipped to monitor the atmosphere during overhaul operations?

What are the known toxins in the atmosphere during overhaul?

Does the Bedford Fire Department provide enough training annually on proper usage of SCBA during overhaul?

Firefighters are trained tactically everyday on how to protect themselves from unforeseen conditions. Unfortunately, most firefighters are not seeing the importance of safety throughout the course of the incident. This study will focus on making firefighters
and more importantly Incident Commanders aware of the value of (SCBA) during overhaul and during any smoke condition. Through factual research, statistical data and other related information, the reader will see the importance of this life saving device.

TABLE OF CONTENTS

CERTIFICATION STATEMENT ..................................................................................2

ABSTRACT .................................................................................................................3

TABLE of CONTENTS ...............................................................................................4

INTRODUCTION .......................................................................................................5

Statement of Problem ...............................................................................................5

Purpose of the Study .................................................................................................6

Research Questions ..................................................................................................7

BACKGROUND AND SIGNIFICANCE ....................................................................7

LITERATURE REVIEW .............................................................................................12

PROCEDURES .........................................................................................................21

Limitations of the Study ..........................................................................................22

RESULTS .................................................................................................................22

DISCUSSION ............................................................................................................24

RECOMMENDATIONS .............................................................................................27

REFERENCES ...........................................................................................................30

APPENDIX 1- BEDFORD FIRE OVERHAUL SURVEY ............................................33
INTRODUCTION

Statement of the Problem

Firefighters today are faced with an unbelievable amount of dangers everyday. Cancer never comes up in a tactics discussion because firefighters look at cancer as something that will not happen to them. Unfortunately, the statistics say otherwise and must be recognized. According to the American Cancer Society 559,888 Americans died from cancer in 2009, which translates into the second leading cause of death behind Heart Disease. A more frightening observation by the University Cincinnati revealed firefighters have a 102% greater chance of contracting testicular cancer than any other type of worker, a 53% greater chance of multiple myeloma, a 51% greater chance of non-Hodgkin lymphoma, a 39% greater chance of skin cancer, a 32% greater chance of brain cancer, a 28% greater chance of prostate cancer, a 22% greater chance of stomach cancer, and a 21% greater chance of colon cancer.

A more pressing observation the author of this study has found is that finding overall statistics for the total number of cancer related deaths for firefighters is difficult to find. One must specifically look at his/her own department to find the internal statistics to find how pressing of an issue it is and will continue to be. The author discovered that eight of the current twenty-four retired members who served for at least ten years with the Bedford Division of Fire, have either died from cancer or have been diagnosed with cancer since 1970. Two of the most recent cases were kidney cancer that was treated successful by removing a Kidney from each of the retired firefighters. In addition to cancer one member is currently diagnosed with Parkinson’s Disease and another member
died from Lou Gehrig’s Disease. Both diseases have been linked to the carcinogens produced during structure fires. Studies show an elevated (but so far not statistically significant) risk of lymphatic and haemotopoietic cancers for most firefighters. There is, however, a statistically significant risk for firefighters with more than 30 years of service (2010).

The Bedford Fire Department currently has a SCBA policy that requires all firefighters to wear SCBA while in the “Hot Zone”. Officers ensure this policy is being followed during fire attack operations, but during overhaul operations the Bedford Fire Department does not have a current policy on when it is acceptable to remove the protective equipment. Once complete knockdown of the fire is confirmed, positive pressure ventilation is accomplished to help alleviate remove any lingering products of combustion. Also, CO monitoring is accomplished throughout the overhaul operation to make sure CO levels are at an acceptable level to remove masks. *The problem this study investigated is the lack of proper usage of Self-Contained Breathing Apparatus (SCBA) during firefighting operations within the Bedford Fire Department.*

**Purpose of the Study**

*The purpose of this research paper was to define better practices during overhaul and light smoke conditions that will help the firefighters reduce their risk of Cancer.* The information from this study will be recommended to the Fire Chief for implementation into the departments operations.
Research Questions

When do firefighters feel the atmosphere is safe after a structure fire?

At what point do the firefighters remove their SCBA?

Are the policies, procedures and equipment used by the Bedford Division of Fire adequate during overhaul operations?

Does the BFD provide enough training annually on proper usage of SCBA during overhaul?

What are other fire department in the United States procedures in regards to SCBA use during overhaul?

BACKGROUND AND SIGNIFICANCE

The City of Bedford, Ohio is located in the southeast region of Cuyahoga County, with a population of roughly 14,214. Thirty nine percent of land use is designated as residential, 16.5% as metro parks, 8.8% commercial, 7.4% public and institutional, and 3.3% industrial. In 2009 the Bedford Fire Department responded to 2435 calls for service. During the time period from 1995-2009 run volume has shown an increase of 25%. Table 1 indicates fire and EMS call volume for the Bedford Division of Fire from 1995-2009.

TABLE 1

Bedford Division of Fire Call Volume

<table>
<thead>
<tr>
<th>YEAR</th>
<th>ALARMS</th>
<th>EMS</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>432</td>
<td>1174</td>
<td>1606</td>
</tr>
<tr>
<td>2000</td>
<td>437</td>
<td>1568</td>
<td>2005</td>
</tr>
<tr>
<td>2007</td>
<td>527</td>
<td>1704</td>
<td>2231</td>
</tr>
</tbody>
</table>
Bedford Division of Fire Call Volume

The Bedford Fire Department considers itself a well prepared fire department. Twenty-eight full-time firefighters are assigned to protect the City of Bedford and each other during each tour of duty. The Bedford Fire Department has a reputation of being well trained, aggressive and knowledgeable in firefighting. In addition, all vehicles are equally equipped with the latest technological gadgets in order to complete the variety of tasks faced daily.

Firefighter safety is the top priority within the Bedford Fire Department. In 2006 the Fire Chief issued new SOP’s and Rules and Regulations for the Bedford Division of Fire. These new documents exceeded the old documents and go into great detail on protecting the firefighters and the civilians. The SOP’s have great emphasis on firefighter safety and the Incident Command System.

All firefighters are issued two sets of turnout gear that meets or exceeds NFPA 1971 Standards. Rules and Regulations go into detail regarding the importance of laundering structural firefighting gear if exposed to products of combustion or hazardous substances. Firefighters are to utilize the washing machine within the fire department that is specifically designed for structural firefighting gear after an exposure. Unfortunately, in many cases firefighters are either continuing to wear their contaminated gear or they hang it in their gear locker until their next tour of duty.
SCBA usage during fire attack is a given at the Bedford Fire Department and
never has to be reinforced. At the beginning of each tour of duty every firefighter must
ensure proper functionality of their SCBA. Each fire apparatus has a full compliment of
spare SCBA and the ability to call an air truck from a neighboring department does exist.
Departmental SOP’s address when firefighters should don their SCBA when confronted
with contaminated atmospheres and the importance of ventilating these structure fires to
remove toxins that could be present. The SOP doesn’t address donning SCBA during
incidents regarding burnt food on the stove. Company Officers are permitted to give the
order to have firefighters remove their SCBA once they feel the atmosphere permits.

Absent from the Rules and Regulations and SOP’s are the need to clean all
equipment that might have been exposed to the products of combustion. This would also
include the inside of all apparatus that responded to the incident. Many times the tools
are sprayed with water and put back on the apparatus without using any detergent. Rules
and Regulations also address universal precautions, but describes the need during EMS
incidents.

Protecting firefighters from the carcinogens are MSA air packs. The author has
been using MSA for fifteen years without any equipment malfunctions. Each firefighter
has their own personal face piece that is assigned to them. Each firefighter gets fit tested
on an annual basis by an MSA representative, to ensure they have a proper seal. Annual
training on maintenance, rescue breathing and SCBA familiarity helps keep firefighters in
tune with these life saving devices.

Sensit Gold gas detectors are carried on all fire apparatus. These units have the
ability to detect flammable atmospheres, CO, hydrogen sulfide and oxygen levels.
Currently, these units seldom come off the fire apparatus during the overhaul phase of operations, unless a possible accelerant or natural gas is possibly present. SOP’s do exist for using the Sensit Gold during natural gas leaks, CO, and oxygen deficient atmospheres.

After firefighters are exposed to smoke the Lieutenant is in charge of filling out a smoke log. The smoke log contains information regarding the firefighters exposed, materials burning, incident number and location. Finally, each firefighter gets their CO level tested by a Rad-57 CO Oximetry. This information can be used by the firefighters in the event a history is needed for medical reasons.

The current average age of a BFD firefighter is 41 years old with, on average, 15 years of service time. Firefighters are permitted to have cost free annual physicals that are conducted by University Hospitals. Fortunately, the physicals are very thorough and are designed specifically for firefighters. Spirometry tests, chest x-rays, stress tests, and blood work are taken. While the cost is free only 17% of the firefighters take advantage of this possible life saving exam.

Surveying the 24 retired full-time Bedford Firefighters who served for a minimum of ten years 41% have either been diagnosed or died from some form of cancer. Included in this percentage are the two firefighters who were diagnosed with Lou Gehrig’s and Parkinson’s disease, which are related to the carcinogens from structure fires. The firefighter who was diagnosed with Lou Gehrig’s disease was forced to retire once diagnosed. The firefighter lost his battle with Lou Gehrig’s disease and left behind a wife and two young children. Many of these firefighters would agree that using SCBA during firefighting was not always a top priority, especially during overhaul.
Firefighting is a dangerous profession and in these times it has become even more threatening to a firefighter's life. Staffing levels are at bare bone levels for many Cuyahoga County fire departments and the Bedford Fire Department is no exception. Low staffing levels in many cases don’t allow swift efficient tactics to be employed, thus fires are burning longer. Longer burning fires usually equal longer overhaul operations, which expose firefighters to more carcinogens.

Unfortunately, as staffing levels lower run numbers have been increasing. With less people able to perform the needed overhaul, each firefighter is exposed to more carcinogens because more time is needed to accomplish the given tasks. Table 2 indicates incidents for the Bedford Division of Fire, requiring the usage of SCBA during 2005-May 14, 2010.

**TABLE 2**

*Incidents requiring the usage of SCBA by Bedford Fire Fighters*

<table>
<thead>
<tr>
<th>YEAR</th>
<th>CAR FIRES</th>
<th>DUMPSTER FIRES</th>
<th>COOKING FIRES</th>
<th>STRUCTURE FIRES</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>10</td>
<td>3</td>
<td>14</td>
<td>33</td>
<td>60</td>
</tr>
<tr>
<td>2006</td>
<td>13</td>
<td>2</td>
<td>7</td>
<td>35</td>
<td>57</td>
</tr>
<tr>
<td>2007</td>
<td>5</td>
<td>1</td>
<td>9</td>
<td>44</td>
<td>59</td>
</tr>
<tr>
<td>2008</td>
<td>8</td>
<td>1</td>
<td>11</td>
<td>28</td>
<td>48</td>
</tr>
<tr>
<td>2009</td>
<td>7</td>
<td>1</td>
<td>10</td>
<td>40</td>
<td>58</td>
</tr>
<tr>
<td>2010</td>
<td>4</td>
<td>0</td>
<td>9</td>
<td>13</td>
<td>26</td>
</tr>
</tbody>
</table>
Incidents requiring the usage of SCBA by Bedford Fire Fighters


The potential impact this study could have on the Bedford Division of Fire is the promotion of proper usage of SCBA during contaminated atmospheres. As a result of the proper usage the risks of being diagnosed with job related Cancer could be reduced dramatically.

LITERATURE REVIEW

According to the Firefighter Cancer Support Network 1.2 million Americans may be diagnosed with cancer this year. One out of every 2.7 women and one of every 2.2 men will be diagnosed with cancer (2004). To combat this terrible disease the United States spends between 4.8 and 5.2 billion annually to research and treatment development (2010). The EPA estimates there are over 70,000 toxic substances on file and when these substances burn together there are over 70 million possible combinations produced during a fire (2010). So in essence a structure fire could be considered a Hazardous Material Incident.

Overhaul is conducted when the majority of the fire has been extinguished and consists of firefighters finding and extinguishing hidden fires. Still many hidden dangers are still present during this phase of extinguishment that are linked to various forms of cancer and diseases that can be fatal. Overhaul in average last about thirty minutes (Bolstein-Johnson, et, al). Even after the fire is put out, burned fuels may still be
releasing this colorless toxic gases (Herbert). Herbert describes overhaul as the transitional phase when rescue and putting out the fire has passed (2008).

The Phoenix Fire Department produced a study in 2000 and 2001 “Characterization of firefighter Exposures During Overhaul” (Bolstead-Johnson, et al). The study was the first overhaul study ever produced and found very important information regarding the presence of carcinogens present during overhaul. Information found demonstrated the maximum concentrations of contaminants in the overhaul atmosphere exceeded occupational exposure limits and could therefore result in adverse health effects in firefighters without respiratory protection. Limitations of the study did exist according to researchers. Researchers could not always get to the incident in a timely manner prior to overhaul operations beginning, therefore the toxic gases that were reported could have been much higher than presented for the data collected. Findings suggest that a CO monitor cannot be used as an indicator for considering the atmosphere free of toxic gases. Even with CO levels of 4-5 ppm other toxins were still present at dangerous levels. The study also indicated that positive-pressure fans used to ventilate the structure, increased the CO levels to an average of 39 ppm within the structure. In addition HCN levels were ten times higher than previously though to be during overhaul operations.

A study by the University of Cincinnati (2005) suggests firefighters are at greater risk of developing testicular, prostate, non-Hodgkin’s lymphoma and multiple myeloma. In addition the UC Study concluded the personal protective gear firefighters are using is insufficient to adequately protect them from known carcinogens. According to Grace
LeMasters (2006) there’s a direct correlation between the chemical exposures firefighters experience on the job and their increased risk of cancer.

The University of Cincinnati Study revealed some other unfortunate stats regarding firefighter cancer. Firefighters face a 102% greater chance of contracting testicular cancer than any other type of worker, a 53% greater chance of multiple myeloma, a 51% greater chance of non-Hodgkin lymphoma, a 39% greater chance of skin cancer, a 32% greater chance of brain cancer, a 28% greater chance of prostate cancer, a 22% greater chance of stomach cancer, and a 21% greater chance of colon cancer

Other organizations are teaming up to further evaluate the correlation between firefighter cancer and overhaul. The United States Fire Administration (USFA) and the National Institute for Occupational Safety and Health (NIOSH) are partnering on a study to examine the potential for increased risk of cancer among firefighters due to exposures from smoke, soot, and other contaminants in the line of duty (2010). Cochran (2010) asserted that“ We have lost too many firefighters to this disease”.

Many believe the reason firefighters don’t mask up is because of the belief of other mechanisms believed to be sufficient during overhaul, like the N-95 mask. Of course the N-95 mask affords protection, but must be used for the right application, which is particulate protection of microns 0.3 in diameter. Particles sized between one and five microns can enter the upper airway, particles sized between 0.1 and 1.0 microns can enter the lower lungs and alveolar ducts, while particles larger than five microns will fall out of the air. Much has been illustrated in years past on N-95 masks during overhaul, but without comparison SCBA exceeds the protection of N-
95 masks. SCBA provide a protection factor exceeding 10,000, which means the air outside the mask is reduced more than 10,000 times. N-95 masks may or may not protect the firefighter from the smoke particles suspended in the air. Additionally the naked eye can only see particles sized ten microns or larger. Firefighters must realize toxic gases are not particulates and the N-95 masks offers zero protection against having these toxins enter the respiratory system (Herbert). Table 3 indicates various toxins that could be present during structure fires, where found, appearance, protection needed and target sites for the specific toxin.

**TABLE 3**

_Hazardous chemicals Bedford Firefighters may encounter_

<table>
<thead>
<tr>
<th>Where Found</th>
<th>Appearance</th>
<th>Protection</th>
<th>Target Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Asbestos</strong></td>
<td>Housing built 1950-1967, “cotton candy&quot; type covering on metal beams</td>
<td>White or grey</td>
<td>Dust masks. Can be carried home on clothes.</td>
</tr>
<tr>
<td><strong>Arsenic</strong></td>
<td>Common wood preservative. Very old white paint.</td>
<td>Green or yellow exterior or rough finished wood.</td>
<td>Dust mask if no fire. Acute exposure could lead to serious illness.</td>
</tr>
<tr>
<td><strong>Benzene</strong></td>
<td>2% to 10% of gas is benzene.</td>
<td>Component of smoke.</td>
<td>Respirator</td>
</tr>
<tr>
<td>Chemical</td>
<td>Source</td>
<td>Effect</td>
<td>Symptoms</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-----------------------------------------</td>
<td>---------------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Benz(a) Pyrene</td>
<td>Component of smoke</td>
<td>Respirator and wash of ASAP</td>
<td>Lung, gut, skin and bladder</td>
</tr>
<tr>
<td>Cadmium</td>
<td>Silver soldering solders, ceramic dyes.</td>
<td>Respirator</td>
<td>Lung irritant, emphysema, anemia</td>
</tr>
<tr>
<td>Ethylene Oxide</td>
<td>Sterilizing solution</td>
<td>Respirator</td>
<td>Irritant of eyes, lungs and mucous membranes</td>
</tr>
<tr>
<td>Formaldehyde</td>
<td>Common in overhaul smoke. Lower levels</td>
<td>Respirator</td>
<td>Irritant of eyes, mucous membrane, lung, skin.</td>
</tr>
<tr>
<td></td>
<td>even without fire.</td>
<td></td>
<td>Suspected carcinogen.</td>
</tr>
<tr>
<td>Polychlorinated Biphenyls (PCB)</td>
<td>Transformer fire. Oil around electric equipment. Look for red warning sticker</td>
<td>Respirator and protective clothing</td>
<td>Skin, melanoma</td>
</tr>
<tr>
<td></td>
<td>Light ballasts</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pole fires</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vinyl Chloride</td>
<td>Characteristic of smoke</td>
<td>Respirator</td>
<td>Cancer of the liver.</td>
</tr>
<tr>
<td></td>
<td>Colorless liquid or gas</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>sweet odor</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Hazardous chemicals Bedford Firefighters may encounter

Many plastic materials start to release toxins once a rise in temperature is reached (Dunn). Many of the new computers and TVs on the market today are made of polybrominated diphenyl ethers (PBDE’s, which pose a sever health hazard according to the EPA (2008). PBDE’s were used to slow the ignition and speed in which a fire
can grow when consuming materials made of plastics. In 2004 the United States banned products in the United States form being made of PBDE’s. Unfortunately, many of these products are still in houses firefighters go into while conducting overhaul operations.

Polyurethane by products is present during most structure fires. When heated it produces isocyanates, carbon monoxide, oxides of nitrogen, and hydrogen cyanide (Wikipedia). “Hydrogen cyanide may very well be the most lethal deadly product of combustion firefighters should be concerned with above all others” (Varone). Polyurethane is used a cushioning in furniture and in some bedding material and in the stains used for wood work. Toluene is another by-product, which is listed as one of the most dangerous chemicals for humans and is a known carcinogen.

Phosgene was first used during World War I by the Germans in 1915 as a chemical weapon (Lochart). Well involved kitchen fires pose a great risk of producing phosgene. Phosgene is produced when the freon in the refrigerator burns. Phosgene though very dangerous is not considered a carcinogen, but has deadly consequences if inhaled during firefighting operations (Health Protection Agency).

Benzene is often produced during structure fires and is a known carcinogen and causes a variety of cancers. Products such as paints, rubber, furniture wax, detergents, ink markers and gas stations may contain even larger amounts. In addition benzene is produced while cooking burnt food on the stove.

Formaldehyde is another known carcinogen and leukemia that is plentiful in every structure in the United States today. Firefighters who are overhauling a bathroom must be wearing SCBA because presence of formaldehyde is a likely
occurrence. Products such as toothpaste, lotions, shampoos, sun screen, bubble bath and baby wipes all contain formaldehyde (Group). Fires in funeral homes are also likely to contain this carcinogen because embalming fluid has formaldehyde in it. Also, formaldehyde can be found in shelving, plywood, insulation, cabinetry, carpet and plywood (Group). Firefighters must be extremely wary of this colorless, strong odor producing toxin because the results of exposure can be fatal.

Most firefighters wear their SCBA half of the time during overhaul (Herbert). Herbert also found that firefighters wear SCBA for respiratory protection and personal safety. While 50% of Bedford Firefighters remove theirs when the officers believe the atmosphere is suitable to do so, which correlates with the data provided by Herbert.

With so much evidence pointing towards the correlation between cancer and overhaul why do firefighters fail to protect themselves? In a study of sixty random firefighters by Fire Engineering (2001) 79.5% stated they seldom wear their SCBA during overhaul, while only 13.6% stated they always wear their SCBA during overhaul. The remaining 6.8% stated they sometimes do. As stated by Hales “Firefighters can’t avoid fire smoke, but firefighters can limit their exposure to carcinogens after a fire if they wear SCBA” (2008).

When looking at other fire departments beliefs and procedures compared to the Bedford Fire Department a vast difference does exist. According to John “Skip” Coleman the Toledo Fire Department has an “All Mask All The Time” policy to best protect the Toledo Firefighters, which was instituted in 1988. Coleman states this does hamper operations because they go through more SCBA bottles and members are still tired the next day after a structure fire. Post Orange Florida Fire Department
makes the determination on what materials were involved in the structure fire (Weir). Some fire departments have an array of equipment at their disposal to use in overhaul operations. Crestwood (MO) use N-95 masks, powered air purifying respirators, air purifying respirators and SCBA. The determination is based on monitoring the atmosphere then the most appropriate level of protection is declared by the Incident Commander (Schwering). The City of New York has a basic SCBA policy that requires SCBA in any atmosphere that could contain toxins (Dunn). Dunn also explains if overhaul is going to take longer additional units are dispatched to relieve interior crews. Other fire departments like the Wichita Fire Department and the West Metro allow members to remove their SCBA once CO levels are below 35 ppm (Wenzel). Other departments like Jackson Township base their decision on SCBA removal during overhaul by not seeing any smoke within the structure (Rieger).

The Bedford Division of Fire intends to follow both NFPA 1981 and NFPA 1852. NFPA 1981 is the Standard for Open-Circuit Self-Contained Breathing Apparatus. NFPA 1981 reviews the standards for certification, labeling, design, test methods, and performance requirements. While NFPA 1852 is the Standard on Selection, Care and Maintenance of Open-Circuit Self-Contained Breathing Apparatus. NFPA 1852 reviews the standard for program component, care, selection and maintenance. Currently, one Bedford Firefighter is in charge of the overall SCBA program and performs all minor maintenance issues in accordance with NFPA 1852.

During conditions that provide contaminated atmospheres the Bedford Division of Fire follows SOP #103.03 regarding SCBA use. The policy is very in depth about when firefighters are to don their SCBA and when they are to remove their SCBA.
Company Officers monitor the atmosphere with the Sensit Gold once overhaul operations permit and then make a determination on giving the order to have firefighters remove their SCBA. The Sensit Gold checks for oxygen, CO, LEL and hydrogen sulfide when used during a structure fire. According to Bolstad-Johnson CO levels should not be used in determining if other products of combustion are present during overhaul. SOP #101.08 directs firefighters on overhaul operations. According to this SOP continual positive-pressure ventilation will help reduce the amount of toxins within the structure fire during overhaul. According to Hebert particles the size of 0.1 and 1.0 can enter the respiratory system and cannot be seen by the naked eye. Positive-pressure will not only increase the movement of these particulates, but in some cases increase the CO level within the structure to 39 ppm (Bolstead-Johnson).

The Bedford Division of Fire maintains a “smoke log” for any smoke encounter by firefighters. The Lieutenant fills out the “smoke log” and each firefighter gets their CO level read by a Carbon Monoxide Oximeter. Additional information includes incident location, run number and the route the firefighter was exposed. The author spoke to the Ohio Police and Fire Pension Fund in regards to presumptive law. Firefighters and police officers have presumptive law when dealing with heart and lung disease (Conner). OP&F also stated it is very important that all exposures be documented and exactly what the firefighter was exposed to can help ensure a disability is awarded.
PROCEDURES

The research done for this project started with a review of journal articles, periodicals and websites dealing with the correlation between firefighter Cancer and overhaul. A review of the Bedford Division of Fire Rules and Regulations, SOP’s, smoke encounter data and SCBA/overhaul questionnaire was conducted. Additional information was conducted from the University of Cincinnati, Firefighter Cancer Study and from discussion with Dr. Stu Baxter. In addition NFPA Standards 1852 and 1981 were reviewed.

A survey of the twenty-six uniformed Bedford Firefighters was obtained in regards to SCBA use during overhaul operations. The author of this study abstained from providing information for the questionnaire. The survey was voluntary and was conducted over a one week period. All volunteers were left anonymous, with a departmental roster used to ensure all members completed one survey.

The survey consisted of six multiple choice questions pertaining to their usage and beliefs of proper SCBA practices. The author used the survey to determine if Bedford Firefighters are using their SCBA properly during overhaul. Information obtained included, when firefighters felt the atmosphere was safe to remove SCBA, does the Bedford Fire Department have satisfactory equipment to measure the atmospheric conditions, training, are Officers enforcing SOP’s and Rules and Regulations and at what point they removed their SCBA and why.
Limitations of the Study

The author of this study was a superior Officer to all, but one member of the Bedford Division of Fire. It is possible the firefighters gave the author answers that were not necessarily true opinions. Also, while conducting the survey the firefighters direct supervisor was present, which could have changed the outcome of some of the answers.

RESULTS

The results obtained for this research project was a survey distributed to the twenty-six uniformed firefighters. The firefighters completed a survey relating to their use of SCBA during overhaul.

QUESTION 1
When do you normally remove your SCBA after a structure fire?

50% Remove SCBA when Officer tells them to.
15% Remove when air quality is monitored by combustible gas detector.
11% Remove when fire is knocked down.
23% Remove when no particles are in the air.

QUESTION 2
At what point do you see other firefighters remove their SCBA?

50% Remove when Officer tells them to.
23% Remove when no particles in the air.
19% Remove when fire is knocked down.
1% Remove when heat conditions permit
1% Remove when air quality is measure by combustible gas detector.
**QUESTION 3**

Is the Officer core enforcing proper usage of SCBA during overhaul?

73% Yes

27% No

**QUESTION 4**

Is the Bedford Fire Department properly equipped to monitor the atmosphere?

50% Yes

50% No

**QUESTION 5**

Do you feel the Bedford Fire Department should provide additional equipment to you for overhaul besides your SCBA?

57% Yes

43% No

**QUESTION 6**

Does the Bedford Fire Department provide enough training on proper SCBA usage during overhaul operations on an annual basis?

30% Yes

70% No
The author feels the statistics point out that permission by the Officer core is believed to be the leading reason why firefighters remove their SCBA during overhaul. SOP’s and Rules and Regulations are being followed by a majority of the firefighters during overhaul operations. In addition a majority of the firefighters would like to see additional training on overhaul precautions on an annual basis.

DISCUSSION

Protecting the firefighters from all the dangers associated with firefighting should be the number one goal for all fire officers in the fire service. The overriding concern for all fire department operations should be safety (Avillo). The Bedford Division of Fire practices safety from all firefighting operations to the fullest extent and state of the art equipment helps accomplish the designated tasks. Equipment upgrades throughout the years have allowed firefighters to have a sense of security, while performing their dangerous occupation.

Research question number one was used to determine when firefighters remove their personal SCBA after a structure fire.

Data gained from the survey indicates that 50% of all firefighters remove their masks after the Officer gives them appropriate permission to do so. While 23% do so when no particles exist in the air and 15% remove SCBA when air quality is measured by a combustible gas detector.
Research question number two was used to see if the information received from question number one was accurate data for the study. The highest percentage was again by Officer orders at 50%, followed by no particles in the air at 23%.

Research question three was designed to see if the Officer core was enforcing proper SCBA usage during overhaul. Question three received the highest percentage at 73% saying the Officer core is in fact enforcing departmental policy. While 27% felt the officer core was not enforcing departmental policy. "Standing" operating procedures take effect until further notice, at which time the issuing authority amend or dissolve them (United States Military). The importance of policies is reduced confusion during operations and cost effective management (Praxis). Proper policy making can also have a direct impact on future expenditures for the Bedford Firefighters and the City of Bedford. Once diagnosed with cancer the costs are enormous for the patient. For instance the drug Dendreon which is a cancer fighting drug cost about 93,000 per patient. In essence providing an SOP regarding a “All Mask All The Time” could significantly lower the possibility of being diagnosed with cancer. According to Dr. Stu Baxter European Firefighters always wear SCBA during overhaul and when performing any work within a structure fire. Dr. Baxter also stated European Firefighters have a dramatically less frequent occurrence of being diagnosed with cancer than American Firefighters.

Research question four addressed the capability of the Bedford Fire Department to monitor the atmosphere during overhaul. The data indicates the department is split 50% to each side. Unfortunately, more information is needed as to why firefighters
feel the way they do in regards to their answer. The Bedford Fire Department utilizes the Sensit Gold CGD to monitor the atmosphere during structure fires. The Sensit Gold CGI is able to alert first responders to the presence of carbon monoxide, hydrogen sulfide, oxygen and combustible LEL gases (FDNN). In an analysis of how many chemicals are in production today in the United States the Cancer Prevention Coalition estimated over 70,000 chemicals are now in commercial production, many of which are used in household products. Firefighters only protection is the utilization of SCBA during overhaul. Hebert (2001) suggests that many of the chemicals are undetectable without specific monitors and are more dangerous than Carbon Monoxide.

Research question five was used to get data regarding the need for additional equipment besides SCBA during overhaul. Again the data was extremely close in proximity with 57% feeling addition equipment is needed besides SCBA and 43% stated SCBA provides enough protection. Another option instead of using SCBA are N-95 masks. Many firefighters don’t know the true facts regarding when they should be used during overhaul operations. Herbert (2001) did survey of sixty firefighters in regards to what protection N-95 masks afford them. Over half of the respondents believe N-95 masks protect firefighters from respiratory hazards during overhaul. This common misconception needs to be changed through education. Burgess (2001) in a study of cartridge respirators found they should not be worn during overhaul operations by firefighters. NIOSH (2009) recommends all firefighters wear SCBA throughout the overhaul operations to avoid possible exposure to respiratory toxins.
The final research question examined if the Bedford Firefighters receive enough training annually on SCBA use during overhaul. A majority of 69% of the firefighters felt they didn’t receive enough training on SCBA use during overhaul annually. While 31% felt the training was adequate. Annually all firefighters are fit tested by MSA and receive SCBA familiarity training that is conducted by the SCBA maintenance officer. The author did a search on Firehouse Software and no overhaul training was recorded during the last two years at the Bedford Division of Fire. Possible limitation could be inaccurate record keeping of shift Lieutenants who log the daily training. The Occupational Safety and Health Administration (OSHA) Respiratory Protection Standard 29 CFR 1910.134 requires a respirator protection plan and annual refresher training. NFPA 1404 (2006) Standard for Firefighter Respiratory Protection recommends annual training on the maintenance, usage, hazard recognition and limitations of SCBA by firefighters.

RECOMMENDATIONS

The Bedford Division of Fire has well written SOP’s and Rules and Regulations that help guide the firefighters during emergency operations. A vast amount of the firefighters are following the orders of their Officer when they feel it is appropriate to remove their SCBA during overhaul operations. The study did conclude that the retired Bedford Firefighters are being diagnosed with cancer at an alarming rate. In addition the study indicates the policies and equipment used are not sufficiently protecting the firefighters during overhaul operations.
Based on research the following recommendations should be implemented in order to lower the chances of being diagnosed with cancer or other devastating disease because of overhaul toxins:

1. It is recommended that all firefighters take advantage of the annual physicals. These physicals can help find cancer in the early stages, thus making treatment a greater possibility.

2. It is recommended that all firefighters entering a structure don SCBA when conducting overhaul operations, regardless of CO levels or particulate existence.

3. It is recommended that once complete knockdown of a fire is accomplished and no chance for re-kindle, ventilation of the structure is allowed to take place for at least 15 minutes prior to firefighters re-entering the structure.

4. It is recommended that firefighters don SCBA during any smoke condition.

5. It is recommended that an Air Truck be dispatched to all structure fires within the City of Bedford.

6. It is recommended that the Bedford Fire Department purchase a Chem Pro 100. This unit has the ability to measure carcinogens in the structure and alert firefighters of any hidden dangers.

7. It is recommended that Officers ensure all structural firefighting gear is laundered immediately after an exposure.
8. It is recommended that all equipment is washed with soap and water after an exposure to carcinogens.

9. It is recommended that a mandate be put in place that makes it mandatory for all firefighters to shower once they return to the station after an exposure.
REFERENCES


Environmental Health Sciences. Retrieved April 2010 from


University of Cincinnati Dr. Stu Baxter May 13, 2010
APPENDIX 1- BEDFORD FIRE SCBA & OVERHAUL SURVEY

1. When do you normally remove your SCBA after a structure fire?
   A. Once the fire is knocked down.
   B. Air quality is monitored by combustible gas detector.
   C. When heat conditions permit.
   D. Officer tells you that you can remove your SCBA.
   E. No particles are present in the air.

2. At what point do you see other firefighters remove their SCBA?
   A. Once the fire is knocked down
   B. Air quality is monitored by combustible gas detector.
   C. When heat conditions permit.
   D. Officer tells you that you can remove your SCBA.
   E. No particles are present in the air.

3. Is the Officer core enforcing the proper usage of SCBA during overhaul?
   A. Yes
   B. No

4. Is the Bedford Fire Department properly equipped to monitor the atmosphere?
   A. Yes
   B. NO

5. Do you feel that the BFD should provide additional personal equipment to you for overhaul besides your SCBA?
   A. Yes
   B. NO
6. Does the Bedford Fire Department provide enough training on proper usage of SCBA during overhaul operations on an annual basis?

   A. Yes

   B. No