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Can I Take This Off Yet: A Breathing Apparatus Policy for the Wolfeboro Fire-Rescue Department

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Certification Statement

I hereby certify that 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.

Signed_____

Abstract

The problem is the Wolfeboro Fire-Rescue Department had no formal policy regarding the use of self-contained breathing apparatus, which may result in increased firefighter mortality and morbidity. Members had no written guidance on when to don or doff breathing apparatus and as a result may be exposed to toxic products of combustion. The purpose of this project was to create a breathing apparatus policy using the action research method.

The research questions were: what are the dangers to the membership of not having a breathing apparatus policy? What types of breathing apparatus policies do other departments have? What cultural barriers in the department may be faced when implementing such a policy?

A literature review revealed significant research on the dangers of products of combustion, with hydrogen cyanide attracting significant attention in recent years. Federal requirements and consensus national standards required a written respiratory protection plan. Scientific studies of the products of combustion and their effects on the human body were reviewed. All indicated the effects are often severe. Policies of other fire departments were reviewed. Members of the department were surveyed for their views. A written policy was developed.

Recommendations included implementation of the policy after a period of training of personnel and that members must be continually trained on the dangers of exposure to products of combustion. The department should purchase hydrogen cyanide monitoring equipment and a finger-probe carbon monoxide monitor, and should continue to work with local agencies and local hospitals to increase availability of pre-hospital treatment for cyanide exposure. In addition, further research is needed into the relationship between cardiac-related deaths of firefighters and the products of combustion.

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Introduction

The problem is the Wolfeboro Fire-Rescue Department has no formal policy regarding the use of self-contained breathing apparatus (SCBA), which may result in increased firefighter mortality and morbidity. Members have no written guidance on when to don SCBA and when to discontinue its use and as a result may be exposed to toxic products of combustion.

The purpose of this project is to create a breathing apparatus policy for the Wolfeboro Fire-Rescue Department using the action research method. It is attached as Appendix A.

The research questions are: what are the dangers to the membership of not having a breathing apparatus policy? What types of breathing apparatus policies do other departments have? What cultural barriers in the department may be faced when implementing a breathing apparatus policy?

Background and Significance

Wolfeboro is located on the eastern shore of Lake Winnipesaukee in an area of central New Hampshire known as the Lakes Region. The Lakes Region is a popular four-season tourist area with a number of special events throughout the year.

The Wolfeboro Fire-Rescue Department protects 59 square miles of land and the islands located within its boundaries on Lake Winnipesaukee, Lake Wentworth, Crescent Lake, Rust Pond, and several smaller bodies of water.

Due to its long history as a tourist destination the town is known as the "Oldest Summer Resort in America." According to the New Hampshire Office of Energy and Planning (NHOEP), Wolfeboro Fire-Rescue serves a year-round population of 6,347 residents. The population of

Wolfeboro has grown approximately 33% since 1990 (NHOEP, 2009). Daytime population is estimated at more than 9,000 and an average summer population of over 20,000. Wolfeboro has a population estimated at 30,000 during special events. The department protects property with an assessed valuation of over $2 billion. Wolfeboro is home to five retirement/elderly communities, a six-town regional school system, Huggins Hospital, a private boarding school, and three large summer camps.

The Wolfeboro Fire Department traces its origins back to 1866. In the mid-1960s, the town saw the need to provide a specialized response to medical and rescue emergencies and created the Wolfeboro Rescue Squad as a separate town agency. The Rescue Squad was outfitted and responded to medical emergencies, motor vehicle accidents, and other emergencies both with and without the Fire Department as appropriate. During this time, the Town contracted with a private company to provide ambulance transport services. The Rescue Squad was staffed by volunteers while the Fire Department consisted of paid-on-call and career members.

In 1992, the Wolfeboro Board of Selectmen merged the Rescue Squad and its responsibilities into the Fire Department and renamed the resulting agency the Wolfeboro Fire-Rescue Department. The Town continued to contract with a private service for ambulance transport.

Today, Wolfeboro Fire-Rescue is a combination full time and paid-on-call department with 11 full time personnel consisting of the chief, one deputy chief, three lieutenants, six firefighters, and 9 on-call firefighters. All career staff and all but one call members are cross-trained between fire suppression and emergency medical services (EMS). Stewarts Ambulance Service provides ambulance transport under a multi-year contract. The contract requires two ambulances to be housed in the company's Wolfeboro facility staffed to the emergency medical

technician (EMT)-intermediate level. Typically, the company provides at least one paramedic. Fire-Rescue has five members trained at the EMT-intermediate level, with the balance being EMT-basics and one EMS first responder.

The career staff works a schedule of rotating 24-hour shifts. Typical daily staffing includes an officer and two firefighter/EMTs. When a member is on leave, a scheduled day off, or at training, the department operates with a minimum of two on duty. The chief and deputy chief work daytimes during the week. There is additional staffing for some special events.

During 2010, the department responded to 1,109 calls including fire, rescue, EMS, hazardous materials, and water-related emergencies. A typical daytime response involves the duty crew, possibly one or both chief officers, and some call personnel. Some staff may remain to cover the station depending on the nature of the incident. A nighttime alarm often results in only the duty crew responding. Depending on the severity and nature of the call, chief officers and other call and career members may respond from home. All members are allowed to respond to any call at any time including the career staff.

Wolfeboro Fire-Rescue is a member of the Ossipee Valley Mutual Aid Association (OVMAA). The OVMAA is comprised of the fire-rescue departments from nine towns and several private ambulance companies that provide emergency response to those towns. One town, Ossipee, has three separate fire-rescue departments. Another, Wakefield, provides service to neighboring Brookfield under a contract. The OVMAA also operates the countywide hazardous materials response team.

Wolfeboro Fire-Rescue is undergoing a long-term paradigm shift. For many years, it was a department consisting primarily of paid-on-call members and officers, with a minimal full time staff presence. Over the last 20 years or so, many call members have left or retired. It has proven

difficult to recruit and retain call members who can maintain the level of involvement of their predecessors. That attrition has resulted in the hiring of more full-time staff and transformed the department into primarily a career department with call members performing more of a support role. Simultaneously, many new policies and procedures have been implemented and old ones updated, but this process has not always kept up with the latest fire service best practices. Creation and implementation of a written breathing apparatus policy would fill a void in department policies designed to protect the health and safety of the members.

The process to develop and put in place a department standard operating guideline (SOG) to address firefighter breathing apparatus use meets the goal of the United State Fire Administration (USFA) National Fire Academy's (NFA) course "Executive Leadership" to visualize and implement processes and interpersonal skills used by effective executive-level managers (Federal Emergency Management Agency, 2005). It addresses the USFA's operational objectives to reduce the loss of life from fire of firefighters and to respond in a timely manner to emerging issues.

Literature Review

Smoke is still underestimated as a source of toxic poisoning (Schnepp, n.d.). Although it is well known in the fire service that smoke is toxic, most firefighters would not be able to name five products of combustion from a typical structure fire. The composition of smoke is greatly impacted by combustion and fire behavior, which in turn is mostly the result of the extensive use of synthetics in both commercial and residential settings. Rapid fire development and highly toxic nature of the smoke make firefighting today far more dangerous than ever before.

Hydrogen cyanide (HCN) can rapidly incapacitate a victim preventing escape from the fire. HCN can cause death even when oxygen levels are normal (Schnepp, n.d.).

The signs and symptoms of acute HCN poisoning are similar to those of oxygen deprivation (Schnepp, n.d.). They include headache, dizziness, anxiety, stupor, rapid breathing and increased heart rate. In severe cases seizures may occur. The patient may also experience respiratory distress or arrest, and eventually cardiac arrest. The most promising treatment appears to be the use of hydroxocobalamin, known commercially as Cyanokit. Side effects of the treatment appear insignificant and transient (Schnepp, n.d.).

Inhalation of toxic smoke is the leading cause of death from fires and is a major cause of firefighter death (Hall, 2009). Many toxic products of combustion are released by fires, including hydrogen chloride, CO, and HCN. Hydrogen chloride is a contact irritant. Exposure causes the cells to release fluids (edema) which results in cellular damage and death. Other contact irritants include particulate matter such as soot. Particles can lodge in the upper airway and the lungs, causing airway obstruction (Hall, 2009).

Fires also result in creation of corrosive and irritating gases (Hall, 2009). These gases include aldehydes and acrolein. Acrolein causes protein destruction deep in the lung tissue. Most of the corrosive gases are caused by the burning of plastics. Many plastics contain chlorine, which when burned form hydrogen chloride, phosgene, and hydrochloric acid. When hydrogen chloride comes in contact with the moist membranes of the airway, it creates hydrochloric acid. This results in upper airway edema, which when combined with inhalation of superheated air causes rapid and severe swelling resulting in airway obstruction (Hall, 2009).

CO and HCN are systemic poisons. Once absorbed into the blood through the lungs, systemic poisons attack critical cell functions or cause death of the cells (Hall, 2009). CO

interferes with the ability if the blood to transport oxygen, and prevents muscle cells from being able to store oxygen. This has a particularly serious impact on the heart muscle. It takes relatively high concentrations of CO in the bloodstream to cause toxic effects or death. Once exposed, many will have long-term neurological impairment, cognitive dysfunction, short-term memory loss, and vision problems. HCN results from burning materials containing a nitrile or a cyano group. These chemicals are primarily found in various types of plastics used in building construction and personal belongings. The greatest amount of HCN production results from low-heat, low oxygen situations. Exposure to HCN may result in loss of consciousness, apnea, and cardiac arrest in five to eight minutes. The victim may present with the signs of severe smoke inhalation. HCN and CO may work together to cause death at lower than toxic levels of either chemical alone. Both are odorless (Hall, 2009).

Firefighters exposed to smoke are at a much higher risk of injury than civilians who are rescued from a fire incident (Hall, 2009). Most civilians are not working at high levels of exertion and are at floor level, where smoke is least toxic. In addition, civilians are often rescued during the free burning phase of a fire, when smoke toxicity tends to be less. On the other hand, firefighters affecting a rescue and/or extinguishing a fire are working at or above maximum oxygen uptake requirements, often in areas of the building where smoke and fire conditions are severe. Exposure to products of combustion can also occur during overhaul. Many departments use the CO level as determined by metering to decide if SCBA is needed during the overhaul phase of operations. However, because HCN is produced at lower temperatures than CO, HCN may be present when the CO level appears safe. Victims of a closed-structure fire who are symptomatic must be aggressively treated for both CO and HCN poisoning. This treatment should start at the scene (Hall, 2009).

Walsh writes that HCN is present in essentially every modern fire (Walsh, n.d.). The amount of HCN may vary depending on location of the fire, the type of fuel being burned, the absolute temperature and the ambient oxygen level. The first step in management of smoke inhalation is the first responder's awareness that the presence of HCN is highly likely in closed-structure fires (Walsh, n.d.).

Augustine said the signs and symptoms of HCN poisoning are very similar to those associated with CO exposure (Augustine, n.d.). Exposure to lethal amounts of HCN commonly occurred at closed-structure fires. Exposure to CO and HCN often occurred at the same time. Diagnosis of HCN poisoning must be presumptive as testing and sampling cannot generally be done in the short window of time when successful treatment is possible. It should be suspected in any instance where a patient was exposed to smoke in a closed-structure fire, regardless of whether the patient received burns. In-hospital testing that reveals elevated plasma lactate concentrations and elevated oxygen content of venous blood are strong indicators of HCN poisoning (Augustine, n.d.).

Firefighters' exposure to CO may increase their risk of cardiovascular disease significantly (Bledsoe, 2007). Because CO is transferred to the bloodstream more readily than oxygen, exposure to CO results in a period of decreased oxygen in the blood called hypoxemia. Hypoxemia often results in the formation of free radical compounds, which cause cell damage. The human heart requires a steady stream of oxygen to function normally. The damage from CO exposure can result from either acute or chronic exposures (Bledsoe, 2007).

The brain also needs a constant supply of oxygenated blood. Lack of brain oxygenation caused by CO exposure can cause neurological problems that can be temporary or permanent (Bledsoe, 2007). These problems generally affect mood and the thought process. The appearance

of these manifestations of CO poisoning can be delayed from two to 40 days, a phenomenon called delayed neurological syndrome (Bledsoe, 2007).

HCN is a colorless, odorless gas and a highly toxic chemical that interferes with energy production in the cells (Murphy, 2010). It is 35 times more toxic than CO during acute exposure. The fire service should consider HCN present at all structure fires and treat these fires as hazardous materials incidents. Firefighters tend to remove their respiratory protection during overhaul, as there appears to be no smoke. When firefighters typically perform overhaul is one of the times on the fire curve that HCN production is greatest. A firefighter who has performed suppression or overhaul at a structure fire and collapses must be considered a victim of HCN poisoning and treated as such. The practice of removing SCBA during overhaul must stop (Murphy, 2010).

The University of Pennsylvania Department of Emergency Medicine conducted a study of the carboxyhemoglobin (COHgb) levels of firefighters during fire suppression and overhaul (Dickinson, Mechem, Thom, Shofer, & Band, 2008). COHgb is the chemical produced in the body when hemoglobin is exposed to CO. Hemoglobin is the substance in the blood that normally carries oxygen to the tissues. Data was collected using a common finger probe device to determine COHgb levels. Firefighters are at risk for acute and chronic exposure to the products of combustion including CO. SCBA generally provides protection from exposure to CO during suppression, but firefighters who worked without SCBA during overhaul showed elevated and possibly damaging levels of COHgb. SOPs should be adopted by all departments that require use of SCBA during all phases of interior firefighting operations including overhaul (Dickinson et al., 2008).

A number of injuries noted after two fires in April 2006 prompted a study by the Providence Fire Department (PFD). The study determined the injuries were caused by HCN and resulted in several recommendations by the committee charged with the investigation (Varone, Warren, Jutras, Molis, & Dorsey, 2006). The committee said HCN is present in smoke in far greater quantities than previously thought, most likely due to modern materials such as plastics. Symptoms of HCN poisoning mimic those of CO poisoning. To prevent a recurrence, PFD should implement additional training for firefighters on the dangers of HCN and why procedures must be updated to reflect the new reality. Firefighters must also be trained in the use of HCN detection equipment. Compliance with existing respiratory protection policies must be increased. Training should be developed for SCBA use in unusual situations such as climbing ladders and confined spaces. Extra air cylinders should be available at scenes. Additional personnel should be assigned to assist the incident commander at fire scenes. Protective clothing should be washed after every fire incident. Steps should be taken to ensure the medical community is aware of the dangers and presence of HCN. Additional fire and medical research into HCN needs to be undertaken. The PFD should implement new procedures to improve tracking of exposures. The public, media, and lawmakers should be educated on the dangers of HCN (Varone et al., 2006).

Underwriters Laboratories' (2010) research showed products of combustion vary greatly from fire to fire depending on what is being burned and the ventilation conditions of the fire. Synthetic materials created more smoke than natural materials. Styrene based materials commonly found in the home and consumer products created the most smoke. Vinyl compounds and wood products created HCN, while all burning compounds resulted in production of CO. In large scale tests, over 99% of smoke particles were less than 1 micron in diameter. Of these, over 97% were not visible to the naked eye. Exposure to many products of combustion can have an

acute effect on the respiratory system and may result in chronic respiratory illness. Large amounts of ultrafine particles were found during both fire suppression and overhaul. Repeated exposure may accelerate cardiovascular disease (Underwriters Laboratories, Inc., 2010).

The US Department of Labor Occupational Health and Safety Administration (OSHA) promulgates a standard for respiratory protection. It requires an employer to provide respiratory protection for employees who need it to protect their health (OSHA, 2008). The employer must have a written policy regarding respiratory protection. Firefighters must enter the hazardous atmosphere in pairs and be in contact with each other. At least two others must remain outside and be prepared to effect a rescue of the interior members if needed, a requirement known in the fire service as the "two-in, two-out" rule. The only exception is if performing a rescue prior to the arrival of resources. The OSHA standard also addresses SCBA maintenance, storage, and testing (OSHA, 2008).

The National Institute for Occupational Safety and Health (NIOSH) recommends firefighters take responsibility for their own safety by reporting hazards discovered during firefighting to the appropriate on-scene personnel (NIOSH, 2010). Firefighters should also comply with department SOPs and SOGs and be constantly aware of their surroundings. Fire departments should develop the appropriate SOPs and SOGs and ensure members are familiar with and trained on them. Rapid intervention teams should be in place at every structure fire (NIOSH, 2010).

The National Fire Protection Association (NFPA) publishes many consensus industry standards regarding fire service issues. *NFPA 1500: Standard on fire department occupational safety and health program* (NFPA 1500) requires the fire department to develop and implement a comprehensive written risk management plan and an occupational safety and health policy,

including a respiratory protection plan (NFPA, 2007). Respiratory protection is part of the required program. Firefighters engaged in operations in an immediately dangerous to life and health (IDLH) atmosphere, a potentially IDLH atmosphere, or an unknown atmosphere must use SCBA. Members using SCBA cannot remove their facepieces or otherwise disconnect any part of their SCBA that would allow ambient air to be breathed unless the air has been confirmed safe by testing and maintained as safe with adequate ventilation. An atmosphere that is deficient in oxygen or contains a toxic product or contaminant is considered hazardous. Overhaul and operating above the fire floor are treated as operations in a hazardous atmosphere (NFPA, 2007).

NFPA 1404: Standard for fire service respiratory protection training (2006) requires the policies developed under NFPA 1500 to be reinforced through training. Training must include hazard recognition; understanding SCBA components, safety features, and limitations; donning and doffing; and service inspections and maintenance (NFPA, 2006).

NFPA 1001: Standard for fire fighter professional qualifications (2008) is a consensus standard for the skills required for two certification levels for firefighters, firefighter I and firefighter II. It applies to all career and volunteer firefighters who primarily fight structure fires. In the standard, use of SCBA is considered a firefighter I skill. It requires the firefighter to be able to use SCBA correctly and to leave hazardous areas prior to air depletion (NFPA, 2008).

The New Hampshire Division of Fire Standards and Training and Emergency Medical Services (NHFSTEMS) is responsible for certification and training in the fire and EMS service in NH. NHFSTEMS recently adopted the text, *Fundamentals of fire fighting skills, 2nd edition* by Jones and Bartlett Publishers & NFPA for firefighter I and firefighter II programs. Firefighters must use SCBA on arrival at a fire scene and wear it during overhaul until the air is tested and proven safe by the incident safety officer. Firefighters should carefully manage their

air to maximize their time in the hazardous area and leave before their low air alarm sounds. Air management is both a team effort and an individual responsibility (Jones & Bartlett, Publishers LLC & NFPA, 2009).

It is common in the fire service for interior firefighters to work until their low-air alarm sounds, and then make their way out of the structure. The emergency air reserve was never meant to be used for firefighting (Bernocco, Gagliano, Phillips, & Jose, 2008). But bad habits, poor information, and lack of training have resulted in the fire service routinely using the emergency reserve for active firefighting. Firefighters should follow the rule of air management (ROAM) which states the firefighter should monitor his or her air supply and leave the hazardous atmosphere before the low air alarm activates. By making activation of the low-air alarm much less common, ROAM serves to reinforce the perception that a low-air alarm is a true emergency (Bernocco et al., 2008).

An officer or firefighter must be personally committed to air management to affect change in the department (Bernocco et al., 2008). Change that does not make firefighting safer and more effective and efficient will fail. Members who are reluctant to change may make the best allies. The champion of the new policy must respond to objections by being positive and continually working to get buy-in. The agent of change must use both the formal and informal structure of the department. Seek allies from above and below in the organizational chart. Respect differing opinions. Members must make a conscious choice to adopt the new procedures for change to be effective in the long term. The Seattle Fire Department implemented air management rules in 2004. As a result, a low-air alarm is rarely heard on the fireground. The Seattle policy requires a radio report to indentify the firefighters involved and their status. Air management was also incorporated into the department's regular training (Bernocco et al., 2008).

The Seattle Fire Department was able to achieve buy-in for implementation of the air management policy for several reasons (Bernocco et al., 2008). The department had several instances of firefighters being injured as a result of dehydration and overheating. The department determined the problem stemmed in large part from extended repetitive work cycles, which resulted in mandated rest periods. The rehabilitation policy was also changed to reflect larger air cylinder sizes. A firefighter who worked until his low-air alarm sounded had chosen a longer work cycle, therefore the firefighter was required to take a longer rest period after a single cylinder. Those who exited the structure before their low-air alarm sounded were allowed to use two cylinders before being assigned to rehabilitation (Bernocco et al., 2008).

Rather than worry about the distinction between residential and commercial buildings, firefighters should be concerned with open versus enclosed structures. (Sullivan, 2009). Open structures have multiple points of firefighter access and egress; enclosed structures have limited access and egress. Most residential structure fires fall into the open category, as they have multiple doors and windows. Most firefighter line of duty deaths occur in open structures while firefighter deaths in enclosed structures tend to happen in groups. Many in the fire service use the same tactics in enclosed structures that are used in open ones, due to lack of training, no specific procedures or guidelines, lack of situational awareness, and lack of experience. Many firefighter deaths occur in enclosed structures due to disorientation. In an open structure, the air left in the cylinder when the low-air alarm sounds may be enough for escape, as long at the firefighter is oriented and there are no unforeseen complications or obstacles to escape. Air management policies must be developed for both types of structures and members must be trained in them. The culture of waiting until the low-air alarm sounds must be changed at all ranks (Sullivan, 2009).

People must be sold on new ideas; the good manager is in large part a salesperson (Conger, 1998). Getting buy-in from employees is one of the biggest hurdles a manager faces. A manager needs credibility to affect change, as credibility is the basis for effective persuasion. The case must be framed to correspond to address colleagues' concerns. The effective persuader must connect emotionally with those whose position he or she is trying to change. The most effective leaders draw on their emotions, knowing that an emotional argument is often more effective than one based strictly on cold facts and figures. The new, more successful and effective management style has moved from a command style based in bureaucracy to one rooted in teamwork and relationships (Conger, 1998).

Managing collaborative efforts between government agencies and the private sector is a core activity for today's public manager (Agranoff & McGuire, 2003). Collaboration occurs within the framework of government, known as vertical collaboration, and with outside agencies at the local level, called horizontal collaboration. Power and authority are decentralized. Some governments use collaboration extensively, while others do not. Evidence suggests variations in collaborative activity are related to the local manager's perceived political and operational barriers. Internal barriers are issues such as organizational inertia and differing jurisdictional needs. External barriers include extended amounts of time required for processes such as grants or loans to occur, the complexity of the processes, and differing program and fiscal accountability. In the jurisdiction-based model, completion of the local goal is the primary consideration. Jurisdiction-based managers recognize many agencies that may have an interest in the project, but contact only the ones that can provide specific, place-oriented resources that directly impact the manager's jurisdiction. Problem resolution is by facilitating and furthering

interaction and creating collaborative arrangements for better coordination (Agranoff & McGuire, 2003).

Governments that do not engage in collaboration are examples of the abstinence model (Agranoff & McGuire, 2003). The top-down model of collaborative management is based in bureaucracy and formal authority. It emphasizes executive level control and involves few or no resources outside of government. In the donor-recipient model, organizations that possess resources relevant to achieving the government's goal work with the government and each other interdependently rather than by control from the top of the organizational chart. The reactive model explains a government that does not use one model exclusively but moves between management models depending on the issue before it. Finally, in the contented model, the government has many resources itself and seeks collaboration with other local governments far more than private entities. A manager determines the right collaborative partners for any given project by tapping into the expertise of the stakeholders (Agranoff & McGuire, 2003).

Most people are familiar with two ways of negotiating: soft or hard. Fisher & Ury (1991) said the third is principled negotiation. In principled negotiation, the parties decide each issue on the merits rather than concentrating on what each side will or will not do. Areas of mutual agreement are found, and any remaining areas of conflict are decided by a standard independent of either side's will. It allows the negotiator to be fair and still achieve the goal (Fisher & Ury, 1991).

Principled negotiation involves separating the people from the problem (Fisher & Ury, 1991). This includes identifying the various positions and attempting to understand the other side's point of view and remembering that the other party is not just a representative of a differing opinion but is a human being first. Behind conflicting positions lies shared interests.

Negotiators should understand there might be many acceptable options. Reach a solution based on principle, not pressure. Use relevant objective standards like market prices or scientific principles to determine fairness (Fisher & Ury, 1991).

The literature review revealed a broad consensus that toxic products of combustion, particularly CO and HCN, are present at fire scenes throughout the process of extinguishment, overhaul and investigation. The link between exposure to these chemicals and both emergent and long-term health problems is well established. Sources were emphatic that SCBA must remain in use until the atmosphere is tested and determined to be safe. Federal regulations and consensus standards require a formal, written respiratory protection policy. Sources pointed toward development of a SCBA policy that begins with education of firefighters and fire officers, and includes metering, ventilation, and treatment of a low-air alarm on scene as a true emergency. All were clear that initiating change in the department would require input from all stakeholders, additional training, and clear understanding and enforcement of the new policy. These elements were included in development of a SCBA policy for Wolfeboro Fire-Rescue.

Procedures

Several sources were used to provide information for this project. First, fire service, EMS, business, and management science literature was reviewed.

Electronic mail was sent to several fire service groups in NH and nationwide to establish what other departments may have in place for SCBA policies. E-mail communications were sent to the NH Association of Fire Chiefs, the NH Fire Prevention Society, and the NH Fire Command listserver. A similar e-mail communication was sent to the NFA's Training, Resources, and Data Exchange Network for a national perspective. Relevant responses were

received from representatives of eight agencies. The responses that included personal communication are included as appendix B.

Local officials were interviewed. They included the area EMS cooordinator, the president of the ambulance company that serves Wolfeboro, and the chief of the OVMAA hazardous materials team.

Members of Wolfeboro Fire-Rescue were asked to participate in an anonymous on-line survey using Surveymonkey.com. Questions in the survey were developed in an effort to determine members' attitudes about SCBA use, and any cultural obstacles to implementation of a SCBA policy. Questions were predominantly multiple-choice for ease of analysis with room for individual comments on each. Of the 20 members at the time of the survey, nineteen were asked to take it. The author of this project did not complete it. The complete survey and results are included as appendix C.

The author attended a seminar in Tilton, NH on March 15, 2010, entitled "The truth about smoke inhalation and cyanide poisoning," sponsored by the Tilton-Northfield Professional Firefighters. The issue was discussed in detail, and the seminar served to hone the author's interest in the topic.

Results

Policies from other departments

The Derry, NH Fire Department SCBA SOG requires use during interior firefighting operations including overhaul, working on a roof or from an aerial device, at vehicle fires, when entering an unventilated confined space, when toxic contamination is suspected, or when there is any doubt about air quality (Derry Fire Department, 2009). Fit testing is required. When

operating in cold weather, members are required to put masks in a heated environment when not being used to prevent freezing, which may make it difficult to get a proper seal. Maintenance of the SCBA shall be in accordance with the manufacturer's instructions (Derry Fire Department, 2009). Derry also has an SOG regarding CO monitoring during a structure fire. It requires SCBA use at a structure fire until horizontal ventilation is established, gas-powered tools are no longer being used inside, the structure has been found to have less than 35 ppm of CO, and the line officer or safety officer determine it is safe to no longer use respiratory protection (Derry Fire Department, 2008). Battalion Chief Jack Webb said there has been no resistance to any of the SCBA policies (J. Webb, personal communication, June 5, 2010).

The Derry Fire Department has developed a draft policy regarding air monitoring during overhaul. It is designed to prevent occupational exposures to products of combustion (Derry Fire Department, 2010). SCBA shall continue to be worn until horizontal ventilation is established, gasoline powered tools are no longer being used inside, CO levels in the structure are monitored and are 35 ppm or less, HCN levels are 5 ppm or less, and the group or division supervisor or the safety officer determine it is safe to remove SCBA. The entire structure should be monitored with a meter with photoionization detection (PID) capabilities. A random sample of protective clothing worn by members during the incident shall be tested for HCN exposure. If HCN greater than 5 ppm is found on any member, all members operating in the structure will be decontaminated with a hoseline (Derry Fire Department, 2010). The department is testing the draft policy at some fire incidents, and Webb said he expects it to remain unchanged prior to formal adoption (J. Webb, personal communication, December 21, 2010).

The Wellfleet, MA Fire Department requires members to don SCBA when the atmosphere is IDLH, may become IDLH, or is oxygen deficient (Wellfleet Fire Department,

2005). This is to include operations above a fire, anywhere products of combustion are suspected, and in confined spaces. The incident commander or safety officer is responsible for determining when it is safe to remove SCBA. The atmosphere is to be tested prior to the determination. Officers are to make no exceptions to the policy (Wellfleet Fire Department, 2005). Chief Dan Silverman said there has been no resistance to the policy (D. Silverman, personal communication, June 1, 2010).

The Norwich, CT Fire Department SOG requires members to use SCBA whenever the atmosphere is hazardous, suspected of being hazardous, may rapidly become hazardous, or when operating above a fire (Norwich Fire Department, 2010). Members operating below grade shall wear SCBA unless testing indicates it is safe to breathe without protection. The manufacturer's instructions must be followed and the member shall be trained in SCBA use. Maintenance is in accordance with the manufacturer's requirements (Norwich Fire Department, 2010).

The James City County, VA Fire Department has separate SOGs for protective clothing and maintenance of breathing apparatus. The protective clothing SOG requires SCBA use in any contaminated atmosphere (James City County Fire Department, 2001). Removal is allowed when indicated by the incident commander or when the respiratory hazard is eliminated as determined by air monitoring equipment. SCBA is mandated when operating in a contaminated or potentially contaminated atmosphere in a confined space. Violations are handled according to the county code of conduct (James City County Fire Department, 2001).

The Poudre Fire Authority of Fort Collins, CO requires members to don SCBA in any area that is, is suspected of, or may become oxygen deficient (Poudre Fire Authority, 2009). Members may not remove their SCBA until an evaluation of conditions is completed. Monitoring must show less than 35 ppm of CO and/or less than 4.7 ppm of HCN present before

protection can be removed. The incident commander is responsible for this determination. Captain Patrick Love said the policy was developed with input from all ranks. The department has a long history of employee participation. There is occasionally resistance from members, but that feedback is used to try to improve the policy (P. Love, personal communication, May 28, 2010). Violations are handled in accordance with the department's discipline policy (P. Love, personal communication, December 7, 2010).

The Largo, FL Fire Rescue breathing apparatus SOP mandates SCBA use in any atmosphere which is or may suddenly become contaminated, which is or may become oxygen deficient or enriched, or in an atmosphere that is determined to be or may become IDLH (Largo Fire Rescue, 2008). This includes in an active fire area, above a fire, where products of combustion are visible, in a potentially explosive or flammable atmosphere, where invisible products of combustion may be present, and in any confined space that has not tested as safe. Premature removal of respiratory protection is to be avoided. Mask fit testing is required. The decision to remove SCBA is generally made by the company officer after an evaluation of conditions (Largo Fire Rescue, 2008). Division Chief of Training and Safety Otto Sandleben said the department specifically monitors for hydrogen cyanide (O. Sandleben, personal communication, June 1, 2010).

The Eagan, MN Fire Department SCBA policy requires SCBA in any atmosphere that is IDLH or may become IDLH (Eagan Fire Department, 2007a). Facial hair and eyeglasses are not allowed to interfere with the mask seal. Members must comply with the two-in, two-out rule. SCBAs and air-purifying respirators (APR) must be maintained according to the manufacturer's instructions (Eagan Fire Department, 2007a).

Eagan's SCBA and APR SOG requires also requires SCBA in any atmosphere that is IDLH or may become IDLH (Eagan Fire Department, 2007b). Use is required below grade, in a confined space, and during overhaul unless the atmosphere is tested and continually monitored. Eyeglasses cannot interfere with the mask seal. Annual mask fit testing is required. An APR adapter can be used with the mask when the contaminant is known, oxygen level is above 19.5%, CO is less than 25 ppm, and the air is continually metered. When any doubt exists, SCBA must be worn (Eagan Fire Department, 2007b). Eagan Fire Department SCBA Manager Tim Bush said the department recently purchased five-gas meters that can meter for HCN (T. Bush, personal communication, May 29, 2010). The department trains annually on safety and wellness, which includes how and when to don SCBA. Information from recent studies showing that HCN is generally present where CO is present is including in the training. The department stresses that repeated exposure to HCN can result in long-term cardiac effects including a shortened lifespan. Repeatedly presenting the information has made it easier to gain compliance from firefighters. The policies must be enforced by officers on the fireground, and it remains a work in progress to ensure the required air monitoring is performed (T. Bush, personal communication, May 29, 2010).

The Las Cruces, NM Fire Department requires SCBA use in any hazardous atmosphere. The department treats a low air alarm as a true emergency (Las Cruces Fire Department, 2009a). Members are required to be outside the structure prior to the alarm sounding. The firefighter who has a low air alarm sound must report the incident to his or her superiors with an explanation of whether there is an actual emergency. If the member whose alarm sounded advises there is no true emergency, the emergency situation is cancelled. The member is required to meet with the incident commander to explain the occurrence. Officers who hear a low air alarm are to listen for

radio traffic clearing it. If the alarm is not cleared, command is notified to begin rescue operations. Incident commanders are to make the appropriate changes to tactics to begin emergency operations and personnel accountability (Las Cruces Fire Department, 2009a). The structure shall be metered before allowing overhaul or investigation operations without SCBA (Las Cruces Fire Department, 2009b). If CO levels below 35 ppm, oxygen level between 19.6% and 21%, or a lower explosive level of under 10% are found, operations can be undertaken without SCBA at the company officer's discretion (Las Cruces Fire Department, 2009b). Las Cruces Deputy Chief of Operations Andrew Bencomo said implementation of the policies has not been an issue, although they have been in effect in various forms for some time (A. Bencomo, personal communication, May 28, 2010).

Local resources

Firefighters or civilians who display signs or symptoms of CO poisoning should be assumed to have been exposed to HCN and aggressively treated, preferably at the scene (Hall, 2009; Augustine, n.d.; Murphy, 2010). Treatment with either the cyanide antidote kit or the Cyanokit in the field is an approved EMS skill in NH. EMT-basics and intermediates can begin administration of the cyanide antidote kit, while a paramedic can use the Cyanokit (New Hampshire Bureau of Emergency Medical Services, 2009).

Stewarts Ambulance is the contracted transport ambulance service in Wolfeboro. The company is required to have two ambulances in town. President Steve Marsh said each ambulance carries two Cyanokits (S. Marsh, personal communication, December 10, 2010).

Huggins Hospital in Wolfeboro is Wolfeboro Fire-Rescue's medical resource hospital. EMS Coordinator Janet Williamson said Huggins has two Cyanokits available in the pharmacy.

They are being relocated to the emergency department to facilitate use after normal hospital pharmacy hours. If needed the kits can be delivered to a fire scene by the on-duty Huggins paramedic or used in the emergency department (J. Williamson, personal communication, December 7, 2010).

Frisbie Memorial Hospital in Rochester is the next closest hospital to Wolfeboro, about a 30-minute drive. Frisbie operates Frisbie EMS, a hospital-based advanced life support service. Assistant EMS Coordinator Gary Brock said each ambulance carries two Cyanokits, and they will deliver them anywhere in the area if requested (G. Brock, personal communication, December 5, 2010).

The OVMAA hazardous materials team may be activated by a member town at any time. It is under the command of Conway Fire-Rescue Chief Steven Solomon. Solomon said the team currently has no HCN monitoring capability (S. Solomon, personal communication, January 4, 2011). It does have a PID which can be used to determine the presence of some hazardous gasses.

Department survey

Wolfeboro Fire-Rescue members were surveyed for their opinions on SCBA use. Of the 19 members, 13 completed it for a return rate of 68%. Of those, 62% said their own personal knowledge and training determined when they don an SCBA at a structure fire, while 39% said it was determined by department SOP or SOG. One member commented that today's training emphasizes the importance of SCBA use and the members use that training to decide when to wear an SCBA. A plurality of 62% said the incident commander determined when to remove SCBA, with 23% saying department SOP/SOG made the determination, and another officer

decided on removal, while another 8% answered “other.” Two members commented on the question. One said training and education determined when SCBA is removed, while another said policy requires the air to be monitored with a gas meter throughout the incident and prior to removal. Eighty-five percent said they knew it was safe to remove SCBA at a structure fire after the area was checked with a multi-gas meter; 15% said it was when the incident commander said so. One member noted a multi-gas meter does not pick up all hazardous gasses. Almost 54% said they had never removed SCBA before they felt it was safe to do so, while 46% said they had. Those answering yes were asked why. The choices were “peer pressure,” “just following orders,” “would not look cool,” “not sure,” and “other.” Four of the six answered “other.” Two commented that there was a lack of training, and that SCBA is not usually worn during overhaul. Four of the six also said they felt no ill effects from removing the protection too soon. Two said they suffered a cough or chest congestion from removing SCBA too soon. Sixty-nine percent have not felt ill after working at a structure fire, while 31% said they had. Of those who did, 75% suffered extreme fatigue, while 25% suffered from headache, 25% from dizziness, and 25% from shortness of breath. Of those who said they felt ill, half did nothing about it. Other choices were “saw my personal doctor,” “reported it to the department,” “was taken to the hospital,” or “other.” Half answered “other.” Comments were made that the member went to rehabilitation or slept. All who responded said they were familiar or somewhat familiar with the effects of the products of combustion on the health of firefighters. Members who responded to the survey averaged over 18 years of fire service experience. Percentages were rounded to the nearest whole number.

Discussion

Reasons to create a policy

Smoke and other products of combustion are primarily invisible to the naked eye (Underwriters Laboratories, Inc., 2010). As a result, firefighters operating at an emergency scene may be tempted to rely on their perception of conditions and their personal experience to decide whether respiratory protection is needed, rather than scientific data. This can be a fatal mistake (Augustine, n.d.; Bledsoe, 2007; Dickinson et al., 2008; Hall, 2009; Schnepp, n.d.; Underwriters Laboratories, Inc., 2010; Varone et al., 2006; Walsh, n.d.). It would be appropriate then to base this decision on objective scientific data, which would also make buy-in from the firefighters easier to achieve (Conger, 1998; Fisher & Ury, 1991; Sullivan, 2009).

Many sources indicate a SCBA policy must be in formal, written form rather than some sort of verbal order (Bernocco et al., 2008; NFPA, 2006; NFPA, 2007; NFPA, 2008; OSHA, 2008). The policy must become an integral part of training to ensure it becomes second nature to the firefighters (NIOSH, 2010; Bernocco et al., 2008; Varone et al., 2006).

Cultural obstacles to implementation

There appear to be some cultural obstacles to overcome in the Wolfeboro Fire-Rescue Department to implementation of a breathing apparatus policy. Almost 54% of the members said they had never removed their SCBA before they felt it was safe to do so. Without a policy in place, it would appear these members were relying on their observations and perceptions or those of an officer to determine the safety of the atmosphere. Dickinson et al. (2008), Underwriters Laboratories (2010), Sullivan (2009) and Murphy (2010) said using one's senses to determine

safety is dangerous and unreliable. It may take a significant effort to overcome that inertia in the department.

Almost half (46%) of the members surveyed said they had removed their SCBA before they felt it was safe to do so. It may prove easier to change these members' behavior, as they already feel uncomfortable with the current practice. Thirty-three percent of those said they were following orders. This demonstrates the need for department officers to be educated on the dangers. The remaining 63% said they had other reasons. Comments indicated that SCBA is not usually worn during overhaul. Two-thirds of those who felt they removed SCBA too soon said they felt no ill effects. This fact may also contribute to a resistance to change as in the minds of these members no harm came from early removal of respiratory protection. Thirty-one percent of those who responded felt sick after working at a structure fire. Symptoms included extreme fatigue, shortness of breath, headache, and dizziness. These symptoms mirror those associated with exposure to products of combustion.

Wolfeboro Fire-Rescue has no written policy on SCBA use. However, according to the survey, 39% of the members think the decision to don SCBA at an incident is based on a department policy. Twenty-three percent said the determination to remove it is based on department policy. It seems many members perceive past practice as policy. Overcoming past practice may be the biggest cultural obstacle to change.

Since members appear to understand the dangers of exposure to products of combustion, adopting a provision for metering the fire area to determine whether SCBA can be removed should be simple. As 85% of the members already thought the decision was based on metering, including it as a requirement should be routine.

Details of the policy

The policy developed as a result of this research is called *Wolfeboro Fire-Rescue standard operating guideline 11-01/300-01: Use of self-contained breathing apparatus*. It incorporates many aspects of the literature reviewed, procedures in place at other departments, consensus standards, and federal requirements. It satisfies the OSHA (2008) requirement and the NFPA (2007) standard for a written respiratory protection policy.

The Wolfeboro Fire-Rescue policy includes the Derry Fire Department's (2010) procedures for interior monitoring. The Derry standard of allowing SCBA removal when CO levels are 35 ppm or less was changed to reflect that Wolfeboro Fire-Rescue might not always have an HCN meter available. Wolfeboro does have several CO meters. The Wolfeboro policy states that CO must be less than 10 ppm if there is no HCN meter on scene. This change was included to address conclusions in the research that HCN may be present in large quantities even when CO levels are low (Hall, 2009; Augustine, n.d.; Murphy, 2010; Varone et al., 2006). The Eagan Fire Department's language for fit testing and SCBA maintenance was also used (Eagan Fire Department, 2007a). Any firefighter who does not leave the fire area before his or her low-air alarm sounds is assigned to the rehabilitation sector and will remain out of the IDLH atmosphere, while a member who follows the policy may return to work (Bernocco et al., 2008). The Las Cruces Fire Department procedure for treating a low-air alarm as an emergency was incorporated (Las Cruces Fire Department, 2009a). The Wolfeboro policy is included as Appendix A.

Recommendations

The SOG developed by this project, *Wolfeboro Fire-Rescue Standard Operating Guideline 11-01/300-01: Use of self-contained breathing apparatus*, should be implemented as soon as possible. As part of the implementation process, members must be trained in the SOG and matters related to it. These include the potential for the need for additional personnel at the scene, where to locate additional resources and equipment, and the relevant NFPA and federal standards. For example, personnel must understand that the "two-in, two-out" rule allows for an exception when life is at immediate risk (OSHA, 2008).

Members must be continually trained on the dangers of exposure to products of combustion. The greatest amount of HCN is produced during low heat, low oxygen fire events, similar to conditions during overhaul of a structure fire (Underwriters Laboratories, Inc., 2010). While results of the department survey indicate members understand the dangers of the products of combustion, training should focus on changing the perception that it is safe to remove respiratory protection simply because smoke is not visible to the naked eye. This training should help overcome any objections to the policy.

Wolfeboro Fire-Rescue should pursue the purchase of HCN monitoring equipment and a finger-probe CO monitor. This will allow for full implementation of the SOG and a method to monitor firefighters for CO exposure on the fireground. Failing this, the department should work with the OVMAA to ensure the availability of this equipment on a regional basis. Perhaps the mutual aid system can purchase the equipment and develop a policy for responding with it to structure fires in the mutual aid system. Mutual aid departments should be encouraged to either develop a similar SOG for their own departments or consider a system-wide protocol.

It appears Cyanokit availability in the Wolfeboro area is good. The department should continue to work with the contracted ambulance service and the local hospitals to ensure this availability continues to grow to allow for the possibility of a mass exposure of firefighters and/or civilians.

It is generally accepted in the fire service that most line of duty deaths result from cardiovascular disease. Hall (2009) and Bledsoe (2007) said the long-term impact of exposure to many products of combustion is damage to the heart muscle. More research should be conducted into whether some or all of these deaths are actually due to the long-term manifestation of exposure to products of combustion or caused by stress and/or lack of exercise.

Perhaps the most straightforward long-term solution throughout the fire service is to implement training programs and drills that emphasize that a low-air alarm in an IDLH atmosphere should be treated as an emergency. Current basic firefighter training teaches candidates to leave the fire area before the low-air alarm sounds (Jones & Bartlett, Publishers LLC & NFPA, 2009). Bernocco et al. (2008) agree that reserve air is not meant for firefighting. Performing overhaul without respiratory protection before the atmosphere is tested and determined to be safe is a practice that must be eliminated (Sullivan, 2009).

Future readers will find the research into the toxicity of products of combustion is proceeding at a fast pace and many new scientific studies are available for review. It also appears many departments have recently implemented new breathing apparatus policies or updated existing ones, which in the future may provide hard field data for analysis on the effectiveness of the policies. In addition, as normal attrition in the fire service results in more firefighters who have received the latest training on SCBA use, many of the cultural barriers to implementation of a policy may be torn down.

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Appendixes

Appendix A: Wolfeboro Fire-Rescue SOG 11-01/300-01

Wolfeboro Fire-Rescue Department
STANDARD OPERATING GUIDELINE

Use of Self Contained Breathing Apparatus
SOG 11-01/300-01

1. **PURPOSE**
    a. The purpose of this SOG is to minimize the possibility of members being exposed to toxic products of combustion while operating at emergency scenes where toxic substances are or may become present.

2. **POLICY**
    a. All members are required to wear and use SCBA in any atmosphere that is immediately dangerous to life and health (IDLH) or may rapidly become IDLH. This includes all personnel operating in an active fire area; directly above an active fire area; in a potentially explosive or flammable atmosphere (gas leaks and fuel spills); where products of combustion are visible in the atmosphere (vehicle fires and dumpster fires); where invisible contaminants are suspected (such as during overhaul); where toxic products are present, suspected , or may be released without warning; or in any confined space which has not been tested to establish respiratory safety.

        i. All members required to work in an IDLH atmosphere will have an annual mask fit test.

        ii. No firefighter will have facial hair that interferes with a proper mask seal.

        iii. Firefighters requiring eyeglasses will only use eyeglass inserts approved by the Chief or designee.

        iv. SCBA will be inspected, used, cleaned, and maintained in accordance with the manufacturer's recommendations and the appropriate NFPA standards.

        v. Wolfeboro Fire-Rescue will comply with the "2 in-2 out" rule.

        vi. When operating in cold weather, members are required to put masks in a heated area, such as a running vehicle, when not being used to prevent freezing, which may cause a malfunction of the diaphragm or make it difficult to get a proper seal.

b. Firefighters shall continue to use SCBA while performing interior operations at a structure fire until:
    i. Ventilation has been established.
    ii. If an HCN meter is available, the entire structure has been checked with a CO meter and the CO levels are 35 ppm or less. If no HCN meter is available, the CO level must be 10 ppm or less.
    iii. The entire structure has been checked with a HCN meter (if one is available) and the levels are 5 ppm or less.
    iv. If available, the entire structure will be monitored with a gas meter with PID capabilities. Incident commanders are reminded an HCN meter and PID may be available through the Ossipee Valley Mutual Aid Association.
    v. Gasoline-powered tools are no longer being used inside the structure.
    vi. The incident commander and/or the safety officer shall determine that is safe to stop using SCBA.
c. Firefighters must exit an IDLH atmosphere before their SCBA low-air alarm sounds.
    i. Incident commanders and safety officers are to treat low-air alarms in an IDLH atmosphere as an emergency.
    ii. Any firefighter whose low-air alarm sounds in an IDLH atmosphere must immediately contact the appropriate supervisor to explain his/her status, and if appropriate, "clear" the emergency. The firefighter must then meet as soon as possible with the incident commander to explain the cause of the emergency.
    iii. Any firefighter who exits the IDLH prior to the low-air alarm sounding may replace his/her air cylinder and return, if needed, to the IDLH atmosphere. The firefighter is to be assigned to the rehabilitation sector after the second air cylinder is depleted.
    iv. Any firefighter whose low-air alarm sounds in an IDLH atmosphere shall be sent to the rehabilitation sector for the appropriate medical screening. The firefighter is to be reassigned to a task outside the IDLH atmosphere or taken out of service as appropriate.
d. Incident commanders are reminded compliance with this SOG may require additional resources including extra firefighting personnel on the fireground and they should plan accordingly.

3. **ENFORCEMENT**
    a. Violations
        i. Violations of this SOG will be handled in accordance with Wolfeboro Fire-Rescue General Order 10-01/100-02 Progressive Discipline, the Town of Wolfeboro Personnel Policy and/or the collective bargaining agreement.

4. **EFFECTIVE DATE**
    a. This SOG shall become effective on March 1, 2011.

_____ _____

Chief Philip H. Morrill, Jr. Date
Wolfeboro Fire-Rescue Department

Appendix B: Personal communications from other departments

From: Jack Webb [mailto:jackwebb@ci.derry.nh.us]
Sent: Tuesday, December 21, 2010 9:02 AM
To: Deputy Chief Thomas J. Zotti
Subject: RE: CO/Overhaul policy

The SOG has significantly changed, I have attached the latest draft. The new SOG has been retitled too: IDLH Monitoring during Overhaul; and includes monitoring for both CO and Cyanide (CN).

I don't expect this SOG to change before it is adopted, the only reason why we are waiting is to test it out at a few fires. We have purchased one CN meter, and currently keep it in the Battalion Chief's SUV. All our engines have Scott Scout 4 gas meters, while the BC has a Scott Scout 4 gas/PID meter. We attached the CN meter to the lanyard of the 4 gas/PID meter.

One of our firefighter/paramedics, Shawn Haggart - shawnhaggart@ci.derry.nh.us - did extensive research on CN and firefighting. He developed training, including a Powerpoint, and updated the SOG.

The CN meter we purchased is: MSA Altair Pro (CN). They cost between $500-600. This meter was picked because it is the same one used by our Regional Hazmat District.

Good Luck on your ARP. I just got the grade back (4.0) on my final ARP - so I am in a really good Christmas mood.

Battalion Chief Jack Webb
Derry Fire Department
14 Manning Street
Derry, NH 03038
(603) 432-6121 -- BC Office
(603) 432-6752 -- BC Fax
(603) 432-6751 -- Fire Administration
(603) 234-8857 -- Cell
jackwebb@ci.derry.nh.us
www.derry-nh.org

Sent from Outlook Web Access

-----Original Message-----
From: Deputy Chief Thomas J. Zotti [mailto:wolffiredepchief@metrocast.net]
Sent: Mon 20-Dec-10 17:59
To: Jack Webb
Subject: CO/Overhaul policy

Hi:

Still working on my last ARP for the EFO program.

Earlier this year you sent me Derry's CO/Overhaul policy. It indicates it is scheduled for update on 6/1/10.

Was it changed? Is the old one still in effect?

Thanks.

tjz

Deputy Chief Thomas J. Zotti
Wolfeboro Fire-Rescue Department
PO Box 629
251 South Main St.
Wolfeboro, NH 03894-0629

w) 603-569-1400
o) 603-569-8194

We have a very active safety committee and have had no issues with any of our SCBA and CO policies. We are in the process of purchasing a couple of HCN meters and will have an SOG, that will likely be combined with our SCBA/CO procedures. We also have masimo CO meters (handheld and built into a LP15) and I will have a final draft of a rehab policy done later today. In the meantime please see the attached:

P.s. I am a KRHS Alumni, class of 1980.

Battalion Chief Jack Webb
Derry Fire Department
14 Manning Street
Derry, NH 03038
jackwebb@ci.derry.nh.us

www.derry-nh.org
(603) 432-6751 -- Administration
(603) 537-9216 -- Administration Fax
(603) 432-6121 -- BC's Office
(603) 432-6752 -- BC's Fax
(603) 234-8857 -- Cell

Excellence through Integrity, Professionalism and Compassion

Deputy

In response to your TRADENET inquiry, here's the text of our SCBA policy. No problems or resistance. Hope this is helpful

Dan Silverman
Fire Chief
Wellfleet Fire Department
10 Lawrence Road
Wellfleet, MA 02667-7700
508-349-3754 phone
508-349-0318 fax
Dan.Silverman@wellfleet-ma.gov
www.wellfleet-ma.gov
www.wellfleetfire.com

Self Contained Breathing Apparatus
S.O.G. # G103
Effective Date: June 14, 2005
Last Revised: March 19, 2005
Supersedes: All previous directives and policies

Purpose: To provide a standard of respiratory protection to all personnel working in atmospheres that are immediately dangerous to life and health or have the potential to be. Department officers are to allow no exception to this policy.

Procedure:

1) Emergency Scenes.
   a) SCBA will be used by all personnel operating in IDLH environment.
      i) In a contaminated atmosphere.
      ii) In an atmosphere which is suspected or may suddenly become contaminated.
      iii) In an atmosphere which is or is suspected to being oxygen deficient.
      iv) This will include all personnel operating:
         (1) In or above a fire area.
         (2) In a potential explosive or fire area, including gas leaks and fuel spills.
         (3) Where products of combustion are visible in the air, including vehicle and dumpster fires.
         (4) Where invisible contaminates are suspected, such as carbon monoxide.
         (5) Where toxic products are present, suspected or may be released without any warning.
         (6) In confined space that has not been tested for respiratory safety.
   b) An SCBA may be worn without a facepiece when there will be sufficient warning to don respiratory protection.
   c) SCBA should be available to all pump operators.
2) SCBA Use

a) Only trained members will use SCBA on an emergency scene.
b) Waist belt and shoulder straps will be secured at all times.
c) A PASS device shall be activated whenever member is wearing a SCBA.
d) All members using SCBA will have a proper mask seal.
    i) Verified with annual fit-test.
    ii) Not compromised by beard or facial hair.
e) Members using SCBA will operate in teams of two or more and will be able to communicate through visual, audible, physical contact or safety guide ropes.

3) Removal of SCBA
    a) The Officer in Charge and/or the Safety Officer shall determine when SCBA can be removed.
    b) Prior to removal the area will be thorough ventilated and the air quality should be monitored and tested.
4) Care and Maintenance
    a) After an incident all SCBA shall be cleaned and all air tanks shall be filled.
    b) SCBA will not be altered in anyway that compromises the protective integrity.
    c) Maintenance and repairs of SCBA will be done to the manufacturer's specifications by trained and qualified personnel.
    d) Any SCBA pack that is found defective will be immediately removed from service for repairs or replacement.

Please note new email address.

Town of Wellfleet
www.wellfleet-ma.gov

Please think of the environment before printing this e-mail.

Chief,

Here is a response to your question on TRADENET.

I have provided copies of our Operational Directives (policies, operating guidelines; however you may refer to them).

#1

I am looking for help from any department that has implemented a breathing apparatus policy. I am looking particularly for any policy that addresses CO and hydrogen cyanide. A copy of your policy would be great...but I'm also interested in any issues you may have had putting it into place. Any resistance from firefighters? Fire service cultural issues? That sort of thing.

ANSWER: I am the coordinator of our Safety Committee here and we strive to put our FF's safety first, while trying not to provide unreasonable constraints to the job. Our committee is made up of FF's, Company Officers and one Battalion Chief so we can get many differing views on subjects at hand; this was done on purpose. So, did we get any resistance from the line? Yes, however we take the input and attempt to develop our system, policies, etc. on what is best workable solution. We have a long history of employee participation so the cultural thing does come into play, but probably not as much.

If you need any additional information or have questions please let me know.

Sincerely,

Patrick Love
Captain, Public Affairs & Education
Poudre Fire Authority
102 Remington St.
Fort Collins, CO 80524
970-416-2867 Office
970-566-2169 Cell
plove@poudre-fire.org

"Safety through Education"

Hi Chief,

Our procedure here for discipline issues is similar to many departments; talk first, written notice, pay reduction, suspension, etc. Within this process an Administrative Investigation is dictated. We are fortunate to not have many past the 'talk first' stage. Our discipline policy is part of our "Personnel Rules and Regulations" within the department. If you would like a copy of our policy I would be happy to forward it to you. Additionally, we do not have a contract.

Sincerely,

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"Safety through Education"

From: Deputy Chief Thomas J. Zotti [mailto:wolffiredepchief@metrocast.net]
Sent: Tuesday, November 30, 2010 1:08 PM
To: Patrick Love
Subject: RE: TRADENET question

Captain:

Thanks for your help with this...your materials have been very useful. I am working on my 4th year EFO project.

What is your procedure if someone violates either operational directive? Is discipline indicated? Is discipline carried out in accordance with a city or department policy, or a union contract?

Thanks again.

tjz

Please be advised any guidance for compliance with the NH State Fire Code included in this email or otherwise provided by this office does not relieve the recipient of his or her responsibility to comply with the Town of Wolfeboro Zoning Ordinance and any other state or local land use requirements.

Deputy Chief Thomas J. Zotti
Wolfeboro Fire-Rescue Department
PO Box 629
251 South Main St.
Wolfeboro, NH 03894-0629
w) 603-569-1400
o) 603-569-8194

FIRST PREVENTERS: A First Preventer may go under the title of Code Official, Building Inspector, Health Officer, Fire Chief, Fire Marshal, Fire Inspector, Building Official, Code Enforcement Officer, Plan Reviewer, Electrical Inspector, Plumbing Inspector, Mechanical Inspector, Energy Inspector or simply Building Safety Official. But these titles merely obscure their common mission: to prevent harm by ensuring compliance with building and fire safety codes before a disaster occurs. From hurricanes to tornados, floods, wildfires, earthquakes, snow storms, ice storms, or older poorly constructed buildings; the building, fire, plumbing, mechanical, energy and electrical codes administered and enforced by First Preventers play a major role in saving lives, protecting property and reducing future repair or recovery costs often paid for by taxpayer dollars.

-----Original Message-----
From: Patrick Love [mailto:plove@poudre-fire.org]
Sent: Friday, May 28, 2010 3:11 PM
To: wolffiredepchief@metrocast.net
Subject: TRADENET question
Chief,

Here is a response to your question on TRADENET.

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plove@poudre-fire.org

"Safety through Education"

Chief,

We have an aggressive air monitoring program. We monitor specifically for HCN. The policy is self-explanatory. The database is ever-growing and we are currently putting together articles for publication!

Also, you may want to take a look at the Hydrogen Cyanide Coalition website, they have some good information that may help educate/convince members to wear SCBA when they should!
http://firesmoke.org/

Hope this helps!
Otto Sandleben, Division Chief Training/Safety
Largo Fire Rescue
727-587-6740 ext. 2111
(cell) 727-235-8470
osandleb@largo.com

Chief Zotti,

Please find the attached documents outlining the current SOP and SOG used by the Eagan Fire Department (EFD). We initiated these policies in 2007 during an update and overhaul of our previews Policy and Standard Procedures Manual. Eagan currently utilizes an SOP & SOG system four our department. In simple terms the SOP consists of items that are more or less "carved in stone". Officers and line firefighters are expected to comply with SOP with departures allowed only under rare and unusual circumstances. The SOG uses a standardized approach to present a best practices approach to day-to-day operations.

EFD carries 4-gas monitors on chief's vehicles and all first out apparatus. They are equipped with O2, LEL, CO, and H2SO4 capabilities. Recently we have added the capability to monitor for HCN with the purchase of a limited number of 5-gas monitors. I also work full-time for the Maple Grove Fire Department. MGFD also carries 4-gas monitors on all first out apparatus and chief's vehicles. MGFD purchased single gas HCN monitors to be used along side the 4-gas monitors carried by fire chiefs.

Both departments have done annual training to address firefighter safety and wellness, including how and when we wear SCBA. We have placed increased emphasis on the fact that CO is present at all structure fires and the recent studies that show that if CO is present, then HCN is also present in some quantities. We have stressed the fact that firefighters with repeated exposure to HCN can experience a cumulative and lasting effect to their heart, including shortening their life.

It is a continuous effort and one that has to be enforced by officers on the incident scene to insure that proper air monitoring is conducted. Including information in recurrent training has made it easier to gain compliance from firefighters when they are told to continue using SCBA. It is an on-going work in progress to insure that officers in charge of fire scenes remember to start and continue air monitoring as outlined in the SOG.

Although the SOG does not specifically address HCN, the SOG does require continuous monitoring with appropriate gas meter. Today we know that includes HCN, as well as Co. Feel free to look over the SOP and SOG to see if there is anything that you can use.

Thanks!

Tim Bush
SCBA manager - Eagan Fire Department
Assistant Fire Chief - Maple Grove Fire Department

Hello Chief Zotti,
I have attached our Environmental Monitoring and Breathing Apparatus SOG's for your review and possible use. As far as implementation neither has been an issue, though they have been in place in one way, shape or form for many years.

Andrew Bencomo
Deputy Chief of Operations
Las Cruces (NM) Fire Department
(575) 528-3473
(575) 528-4082 (FAX)
"Discipline yourself and others won't have to." John Wooden

Appendix C: Wolfeboro Fire-Rescue Department survey

Wolfeboro Fire-Rescue SCBA Use Survey

SurveyMonkey

Who or what determines when you don SCBA at a structure fire?

		Response Percent	Response Count
Incident commander		0.0%	0
Personal knowledge/training		**61.5%**	**8**
Department SOP/SOG		38.5%	5
Other		0.0%	0
		Other (please specify)	1
		answered question	**13**
		skipped question	**0**

1. Who or what determines when you don SCBA at a structure fire?

	Other (please specify)	
1	Todays training inforces the importance of wearing a SCBA and i thing people are using that training to determine when or when not to us a SCBA	Dec 15, 2010 8:20 PM

Wolfeboro Fire-Rescue SCBA Use Survey

SurveyMonkey

Who or what determines when you remove your SCBA while operating at a structure fire?

	Response Percent	Response Count
Incident commander	**61.5%**	**8**
Other officer	7.7%	1
Other firefighter	0.0%	0
Department SOP/SOG	23.1%	3
When I feel like it	0.0%	0
Other	7.7%	1
Other (please specify)		2
answered question		**13**
skipped question		**0**

2. Who or what determines when you remove your SCBA while operating at a

	Other (please specify)	
1	Training / education	Oct 1, 2010 6:59 PM
2	Per sop/sog the air needes to be cleared by a gas meter and needs to be continually monitored throughout the incident.	Dec 15, 2010 8:20 PM

Wolfeboro Fire-Rescue SCBA Use Survey

SurveyMonkey

How do you know it's safe to remove your SCBA while operating at a structure fire?

		Response Percent	Response Count
Incident commander said so		15.4%	2
Other officer said so		0.0%	0
Other firefighter said so		0.0%	0
I looked around and felt it would be OK		0.0%	0
Metered area with multi-gas meter		**84.6%**	**11**
Other		0.0%	0
		Other (please specify)	1
		answered question	**13**
		skipped question	**0**

3. How do you know it's safe to remove your SCBA while operating at a

	Other (please specify)	
1	But a milti-gas meter will not pick up on all hazaedous gases.	Dec 15, 2010 8:20 PM

Wolfeboro Fire-Rescue SCBA Use Survey

SurveyMonkey

Have you ever removed your SCBA at a structure fire before you felt it was safe to do so?

	Response Percent	Response Count
Yes	46.2%	6
No	53.8%	7
Other (please specify)		0
answered question		13
skipped question		0

Wolfeboro Fire-Rescue SCBA Use Survey

SurveyMonkey

If yes, why?

	Response Percent	Response Count
Didn't want to be the only one wearing it/peer pressure	0.0%	0
Just following orders	33.3%	2
Not sure	0.0%	0
Wouldn't look "cool" or "tough" to keep it on	0.0%	0
Other	**66.7%**	**4**
Other (please specify)		2
answered question		**6**
skipped question		**7**

1. If yes, why?

	Other (please specify)	
1	Lack of training	Oct 1, 2010 7:01 PM
2	SCBA not usualy worn during overhaul	Oct 3, 2010 10:38 PM

Wolfeboro Fire-Rescue SCBA Use Survey

SurveyMonkey

Did you feel any health effects from removing the SCBA too soon?

	Response Percent	Response Count
Yes	33.3%	2
No	66.7%	4
answered question		6
skipped question		7

Wolfeboro Fire-Rescue SCBA Use Survey

SurveyMonkey

If yes, what sort of effects did you feel? (Check all that apply)

		Response Percent	Response Count
Headache		0.0%	0
Cough/chest congestion		**100.0%**	**2**
Dizzy feeling		0.0%	0
Shortness of breath		0.0%	0
Upset stomach/stomachach/nausea		0.0%	0
Extreme fatigue		0.0%	0
Other		0.0%	0
		Other (please specify)	0
		answered question	**2**
		skipped question	**11**

Wolfeboro Fire-Rescue SCBA Use Survey

SurveyMonkey

Whether or not you used SCBA at a structure fire, have you ever felt ill after working at a structure fire?

	Response Percent	Response Count
Yes	30.8%	4
No	69.2%	9
answered question		13
skipped question		0

Wolfeboro Fire-Rescue SCBA Use Survey

SurveyMonkey

If yes, what sort of effects did you feel? (Check all that apply)

	Response Percent	Response Count
Headache	25.0%	1
cough/chest congestion	0.0%	0
dizzy feeling	25.0%	1
shortness of breath	25.0%	1
Upset stomach/stomachache/nausea	0.0%	0
Extreme fatigue	**75.0%**	**3**
Other	0.0%	0
	answered question	**4**
	skipped question	**9**

Wolfeboro Fire-Rescue SCBA Use Survey

SurveyMonkey

What did you do about feeling ill?

		Response Percent	Response Count
Nothing		50.0%	2
Saw my personal doctor		0.0%	0
Reported it to an officer of the department (as first report of injury-worker's comp)		0.0%	0
Went/was taken to the hospital at direction of Fire-Rescue Department		0.0%	0
Other		50.0%	2
		Other (please specify)	3
		answered question	4
		skipped question	9

2. What did you do about feeling ill?

	Other (please specify)	
1	Rest rehab	Oct 1, 2010 7:01 PM
2	Slept	Oct 3, 2010 10:39 PM
3	rehab	Dec 15, 2010 8:52 PM

Wolfeboro Fire-Rescue SCBA Use Survey

SurveyMonkey

How long (in years) have you been in the fire service? (Total time, not just Wolfeboro Fire-Rescue)	
	Response Count
	13
answered question	13
skipped question	0

1. How long (in years) have you been in the fire service? (Total time, not just

	Response Text	
1	10	Oct 1, 2010 2:53 PM
2	22 years	Oct 1, 2010 3:06 PM
3	10	Oct 1, 2010 7:02 PM
4	10	Oct 2, 2010 12:46 PM
5	8 Years	Oct 3, 2010 10:40 PM
6	26 years	Oct 20, 2010 6:40 PM
7	8 years	Oct 26, 2010 3:04 PM
8	25 years combined service with 3 departments.	Oct 30, 2010 12:40 PM
9	Began with Plainfield Conn. Volunteers in1964. 10 years with Fairfield Ct; 22 years with Worcester..	Nov 8, 2010 9:17 PM
10	7.5	Dec 8, 2010 6:54 PM
11	35 yrs	Dec 8, 2010 8:21 PM
12	ten years, seven at a firefighter three as a fire explorer	Dec 15, 2010 8:23 PM
13	20 years	Dec 15, 2010 8:52 PM

Wolfeboro Fire-Rescue SCBA Use Survey

SurveyMonkey

Are you familiar with the effects of carbon monoxide, hydrogen cyanide, and other products of combustion on the the health of firefighters?

		Response Percent	Response Count
Yes		76.9%	10
Somewhat		23.1%	3
No		0.0%	0
		Comments	0
		answered question	13
		skipped question	0