

NFPA 1851 Compliance

“Maintaining PPE in Winston-Salem”

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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.

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Abstract

Personal Protective Equipment (PPE) is essential to the safety of firefighters. Departments and firefighters should establish a compliant selection, care, and maintenance program for PPE. The problem was the Winston-Salem Fire Department did not meet all of the (PPE) requirements associated with the National Fire Protection Association (NFPA) standard 1851. The purpose of the research was to determine to what extent fire departments meet all of the requirements associated with National Fire Protection Association (NFPA) standard 1851. The descriptive research methodology was used to answer the following questions: (a) To what extent do departments comply with NFPA 1851? (b) What sections of NFPA 1851 are most important for fire departments? (c) How do departments meet the maintenance requirement of NFPA 1851? (d) To what extent do departments conduct an advanced inspection of all PPE ensembles elements? (e) What concerns do departments have with the 10-year PPE replacement requirement's ability to reduce safety risks and potential health risks for firefighters? The procedures included interviews with representatives from bunker gear manufacturers, and a telephone and an on-line survey of professionals in fire departments throughout the state and country. Articles were collected from the National Fire Academy in Emmitsburg, Maryland, the internet, journals, and trade magazines to support the research. The results showed that fire departments comply with the selection, care, and maintenance policy, mandatory retirement of all 10-year-old PPE, routine cleaning and inspection, annual advanced cleaning and inspections, repairs and service by an Independent Service Provider (ISP), and record keeping requirements in NFPA 1851. Key recommendations included developing a formal selection, care, and maintenance (SCAM) program policy, providing advanced inspections and annual cleaning for PPE via an Independent Service Provider, purchasing a second set of bunker gear, and upgrading the fire department's PPE record keeping resources.

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Introduction

The fire service continues to seek out ways to reduce safety and health risks associated with firefighting. The proper selection, care and maintenance of firefighter personal protective equipment (PPE) is essential to reducing health and safety risks. Many departments have implemented programs and standard operating procedures for PPE. However, there are still departments that do not place a significant focus on PPE. According to Jeffrey O. and Grace G. Stull (2014), there have been improvements during the last 10 years in firefighter awareness in understanding the consequences of not maintaining their PPE. However, firefighters still are concerned about contamination remaining in their clothing even after proper cleaning. A firefighter's ability to carry out tasks at an incident is directly related to their confidence in their equipment. PPE is the first level of protection and firefighters should be completely aware of the impact of not taking proper care of gear and the importance of the proper selection of gear. Firefighters that do not wear or maintain their gear properly could lead to unnecessary failures and firefighter injuries (Jeffrey O. and Grace G. Stull 2014).

PPE service life is a key concern for fire departments. There is still debate surrounding what parameters should govern the useful life span of PPE and when it should be taken out of service due to age and wear and tear. According to Thompson (2009), PPE age is a current issue in departments. Smaller departments tend to have bunker gear that is 10 years old or older and many departments across the country have at least one element of PPE over 10 years old (Thompson, 2009).

The Marken PPE Restoration Company (2014) emphasizes that firefighter risks are reduced when PPE ensembles are used and maintained properly. Risks are always present and proper use keeps risks at acceptable levels. Departments should establish a compliant selection, care, and maintenance (SCAM) program. The company also emphasizes that the 2014 edition of

NFPA 1851 provides guidance for developing a SCAM program. A SCAM program should include a written policy that details selection, care, and maintenance procedures. Company officials believe departments enhance firefighter safety by providing higher levels of protection and quality care to PPE ensembles (Marken PPE Restoration, 2014).

Some fire departments have not completely accepted and reacted to the need to emphasize a focus on the selection, care, and maintenance of PPE. Jeffrey and Grace Stull (2012), note that mandatory replacement of gear is still a debate among fire service and equipment research organizations. Studies still lag when considering helmets, gloves, hoods, and footwear. Research conducted for the U.S. Fire Administration nearly 15 years ago showed a variety of effects of use and care on clothing material performance properties. Feedback from more up-to-date research for gear performance is better but still inclusive. Studies demonstrate for example that a characteristic such as tear strength and water absorption resistance for shell materials is significant in some cases and minor in others. Thermal protective performance improved with use in some cases and not in others. The authors also note that the interpretation of performance test results associated with gear protective quality is unclear due to insufficient industry research.

When to retire gear is a judgment call for members responsible within a department. Fire officials argue that the 10-year mandatory retirement obviates these judgment calls or the fact that no judgments are made at all. Departments struggle with replacing gear that appears to be fit for duty. The National Fire Protection Association Needs Assessment Comprehensive Report in 2011 showed that 63 percent of departments have some personal protective clothing that is at least 10 years old. However, this is down from 74 percent in 2001 and up from 59 percent in 2005. It also showed that 53 percent of departments do not have enough reserve personal

protective clothing to equip 10 percent of emergency responders. This is down from 62 percent in 2001 and 57 percent in 2005. These statistics show that there are a substantial number of departments that either cannot or choose not to comply with the 10-year mandatory retirement in NFPA 1851 (Jeffrey and Grace Stull, 2012).

More importantly, reports still indicate that firefighter complacency leads to them not caring and maintaining their gear. According to Calfee (2013), the individual wearing the gear and all of his or her habits and activities encountered can shorten the life span of PPE. Improper storage, tool storage in pockets, heat and mechanical stress, and poor maintenance can lead to the early failure of gear. Key firefighter responsibilities include knowing the facts about their gear, how to inspect their gear, and how to clean it (Calfee, 2013).

A Volunteer Firemen's Insurance Service training article (VFIS) (2014) indicates that 80,000 injuries occur annually to firefighters and reports indicate that firefighter PPE is a factor in the injuries that occurred. The article notes that data shows that gloves, wristlets, positive pressure breathing apparatus (SCBA) and hoods accounted for 32 percent of the equipment problems. This article further notes that preventing injuries is a responsibility for all firefighters (VFIS, 2014).

In addition to individual care, a department should direct proper gear selection, care, and maintenance through training and an aggressive PPE policy. According to Turnout Services (2014), NFPA 1851 programs are designed to reduce safety and health risks associated with the improper or poor maintenance of PPE ensembles. Tracking maintenance is a key component in minimizing risks. The standard requires departments to conduct annual inspections, advanced cleaning twice a year, and keep records on gear. Departments should also use certified technicians to inspect, clean, and repair equipment based on manufacturer recommendations.

The article notes that failures occur due to improper maintenance, excessive wear, and inadequate care. Proper care minimizes the risks, saves money, and extends the life of PPE (Turnout Services, 2014).

A properly developed SCAM program is essential to firefighter safety and personal protective equipment longevity. Even though Winston-Salem successfully purchases gear for firefighters, gear selection, care, and maintenance should be strategic. A policy driven PPE program would enable the department to meet present and future safety and libel issues when PPE is a factor in reviews or investigations. According to Lucas (2014), a risk assessment can reduce liability for a fire department. The assessment identifies the dangers and risks associated with performing the daily duties of firefighting. OSHA may ask for a risk assessment when investigating injuries and accidents. A department should be able to demonstrate its understanding and preparation for the hazards that may occur in the community, including hazards associated with chemical, biological, radiological and nuclear terrorist incident. Departments using the types of PPE that will protect employees from the hazards identified in a risk assessment will be in a better position to defend themselves if an accident occurs (Lucas, 2014).

The problem was the Winston-Salem Fire Department did not meet all of the (PPE) requirements associated with the National Fire Protection Association (NFPA) 1851 standard. The purpose of the research was to determine to what extent fire departments meet all of the requirements associated with National Fire Protection Association (NFPA) 1851 standard. The descriptive research methodology was used to answer the following questions: (a) To what extent do departments comply with NFPA 1851? (b) What sections of NFPA 1851 are most important for fire departments? (c) How do departments meet the maintenance requirement of

NFPA 1851? (d) To what extent do departments conduct an advanced inspection of all PPE ensembles elements? (e) What concerns do departments have with the 10-year PPE replacement requirement's ability to reduce safety risks and potential health risks for firefighters?

Background and Significance

The City of Winston-Salem is located in Forsyth County, North Carolina, in what is known as the Piedmont Triad Community. Winston-Salem is the 4th largest city in North Carolina with a population of 232,385 residents and its jurisdiction covers approximately square 132 miles (U.S. Census Bureau, 2011). According to recent data from the North Carolina (NC) Home town locator (2014), the population has grown to 234,666 residents and Winston-Salem is now the 5th largest city in North Carolina behind Durham (NC Hometown Locator, 2014).

Firefighter PPE has always been a priority in City government. However, budget constraints have limited the department's ability to supply second sets of bunker gear to firefighters. The department has specifications established to purchase gear, however, there has been no structured program designed to continually review the process of selecting, maintaining, and replacing gear. The department did adopt the NFPA 1851 ten year retirement of gear in 2010. New gear was purchased with funds from the Fire grant to replace all gear that was 10 years or older. This was the department's first effort to complying with 2008 edition of NFPA 1851. However, critical elements such as advanced cleaning and an efficient record system designed to keep up with criteria such as issue date, repair and cleaning history, and replacement schedules are not adequate for the department based on the standard. According to an overview of the 2008 National Fire Protection Association (NFPA) 1851 standard (2008), the ensemble components covered include coats, pants, coveralls, helmets, gloves, footwear, and hoods. The fire department must develop a plan to select, purchase, and maintain the gear. The plan should

include a process for inspecting and cleaning PPE if it is soiled, contaminated, or physically damaged. This includes trim, closures, and hardware (National Fire Protection Association, 2008).

The city has a “Central Warehouse” that has been responsible for purchasing and stocking gear to meet the department needs. Critical aspects such as proper sizing and retiring old or damaged PPE have not been maintained during the recent years. In addition, recent turnover and purchasing policy changes have significantly reduced the Warehouse’s ability to stock the gear necessary to meet fire department demands. The present fire department written record system is also hampered due to the lack of fire staffing and a software application necessary to keep up with gear turnover. The Central warehouse inventory and tracking process is not adequate in managing the required records based on the NFPA standard. According to Turnout Services (2014), tracking maintenance is a key component in minimizing risks associated with disease and injury. NFPA 1851 programs are designed to reduce safety and health risks associated with improper or poor maintenance of PPE ensembles (Turnout Services, 2014). Lopez (2012) also indicated the importance of record keeping, noting that it is essential to document gear information such as purchase, issue dates, and cleaning and repair dates. The data can be captured with web-based or local software (Lopez, 2012). According to Costo (2008), the selection, specifying, modifying, and replacing of PPE should be a continuous process that constantly monitors the change in the environment where the gear is used. Departments should be completely aware of the standards that govern the care, and maintenance of gear. This is essential in documenting the history of the service life and maintenance of the gear (Costa, 2008). Winston-Salem has retired all of its gear that is 10 years or older. The old gear was worn and items such as age, serial numbers, and other identification labels were worn away. The

National Volunteer Fire Council (NVFC) (2012) guidelines express the importance of record keeping. Records and storage of gear should follow the manufacturer's recommendations. This includes documenting the purchase and issuance of gear to ensure that it is retired in 10 years and earlier if significantly worn, and retired if contaminated by and CBRN or other dangerous contaminants (National Volunteer Fire Council, 2012).

Finally, a recent OSHA visit to the department demonstrated that at least two of the criteria were important with regard to OSHA. The condition of the gear at the employee level and the potential injury that could result from damaged or worn PPE is a key focus for OSHA. Damaged turnout coats and pants can lead to employee injury and should be kept and maintained at every level. North Carolina had adopted the NFPA criteria pertaining to care and maintenance of PPE. According to Lopez (2102), departments should become familiar with the standards since PPE maintenance, cleaning, and selection is important to a firefighter's health and safety. This article expresses that the Occupational Safety and Health Administration (OSHA) typically upheld NFPA 1851 as an industry best practice and that it would be applied if the condition of PPE was a factor in litigation associated with death or injuries. In addition, the department's training policy should reflect NFPA 1851 and OSHA regulations, including awareness on how to inspect, clean, and how to report damage and contamination that would require advanced cleaning. A fire department should also deliver practical training to firefighters on how to routinely inspect and clean PPE after use and annually. Repairs should be done by a verified cleaning facility that has the training and equipment necessary to repair, replace, and reconstruct gear (Lopez, 2012).

The information noted above indicates the importance of having a formal selection, care, and maintenance program within a fire department. Employee safety and department

accountability are leading reasons for instituting a formal policy. The department did not meet all of the NFPA guidelines for selection, purchasing, and maintaining gear. The purpose of the research was to determine to what extent fire departments meet all of the requirements associated with National Fire Protection Association (NFPA) 1851 standard. The Winston-Salem Fire Department could improve firefighter safety by implementing the best practices identified in this research.

The research is directly related to the National Fire Academy Executive Leadership (EL) which focuses on leaders using adaptive leadership to solve adaptive problems. The selection, care, and maintenance of gear is an adaptive problem because it involves changing the mindset of department members to incorporate adaptive strategies in PPE policies that go beyond the budget, routine specifications, and complacency in caring for gear that is often practiced in departments. Personnel safety is essential to service and a must when the rescue personnel don their gear to deliver fire protection to the citizens and themselves. Utilizing adaptive change strategies is necessary to influence and persuade department members to maintain a complete awareness of NFPA 1851 and practice proper care and maintenance of PPE through a compliant selection, care, and maintenance (SCAM) program (FEMA, 2013).

This research addresses Goal 1 of the U.S. Fire Administration (2010) strategic plan goals: Reduce risk at the local level through prevention and mitigation. This goal focus encourages local fire organizations to reduce risk for the community and the firefighter. Firefighter protection via PPE is directly related to his or her safety in conducting fire activities and being able to provide rescue services to citizens in the community. When a department develops and implements a proper selection, care, and maintenance PPE program, firefighters are better trained and prepared individually and collectively to respond to incidents with PPE that

will protect them during fires and other hazards they face during incidents (U.S. Fire Administration, 2010).

Literature Review

The literature review examined resources that identified the key criteria associated with meeting the NFPA 1851 standard. The material reviewed sought to first determine what criteria NFPA 1851 required with regard to agencies selecting, maintaining, and caring for PPE. The review then examined resources that detailed the intent of the specific criteria including the role of the fire agency, its employees, the manufacturer, the independent service providers, and the vendors that worked with departments in purchasing PPE. This writer also searched for examples of departments or resources that demonstrated how NFPA 1851 was being addressed. This would enabled this writer to make recommendations after determining critical elements necessary to meet NFPA 1851 in lieu of procurement, safety, liability and the best practices for updating and improving the current gear selection, care and maintenance process in Winston-Salem.

The Abilene Fire Department (2006), standard operating guideline on PPE purpose is to provide maximum protection for fits freighters and to comply with state requirements. The program includes a section on PPE inspection including routine and advanced and special cleaning, washing process and responsibilities, firefighter responsibilities, and schedules including officer responsibilities (Abilene Fire Department, 2006). This is an example of a department that has a PPE program that complies with NFPA 1851.

According to Anderson and Gaskin (2103), firefighters are more likely to develop multiple types of cancer based on multiple reports from NIOSH, University of Cincinnati, and the Firefighter Cancer Support Network (FCSN). The article sites exposure from unclean turnout

as a factor. She states that the Los Angeles Fire Department, the Emergency Services Bureau (ESB), the Risk Management Section (RMS) and the Supply and Maintenance Division (S&M) have collaborated on PPE program. Guidelines include prohibiting turnout gear in living quarters of fire stations, re-establishes the department safety committee to help with safety practices, bar coding and tracking all PPE, managing the replacement, budget forecasting, repair, cleaning, and inspection documentation. Other future plans include distributing two sets of gear to firefighters, and more washer-extractors to clean their PPE between ISP cleanings (Anderson and Gaskin, 2013). This is important since it associates disease prevention with an effective PPE program.

According to Calfee (2013), two NFPA standards govern PPE. NFPA 1971 is the standard on protective ensembles for structural firefighting and proximity firefighting (2013 ed.). The standard sets the minimum standard for the manufacturer's guidelines. NFPA 1851 sets the minimum standard for the fire department including PPE care and maintenance. It also establishes guidelines for contractors cleaning and repairing gear. He explains that a reasonable service life and a maintenance plan are two common concerns pertaining to firefighter PPE. He notes that the NFPA 1851 states that all elements shall be retired 10 years after the manufacturing date. The article further suggest that factors affecting gear service life include care and maintenance, exposure to elements, thermal stress, mechanical stress, material used in design and construction, and the firefighter. Gear is used daily. The individual wearing the gear and all of his or her habits and activities encountered can shorten the life span of PPE. Improper storage, tool storage, heat and mechanical stress, and poor maintenance can lead to early failure of gear. Key firefighter responsibilities include knowing the facts about their gear, how to inspect their gear, and how to clean it. Dirty gear reduces its ability to protect the user. Thermal heat can degrade the outer shell and reduces its effectiveness. Checks for tears, discoloration, seam

damage, and holes should always be a key part of the inspection process. Thermal heat can also reduce the effectiveness of the inner liner system. High heat can make the liner brittle. Any signs of discoloration should be checked for stability. If there are breaks or tears, the item should be replaced. Damage should be reported using the proper notification and documentation processes as specified in Section 4.3 of NFPA 1851. Following proper care and maintenance will ensure that the gear protects firefighters and it will lead to a longer gear life cycle (Calfee, 2013). This is important since it cites NFPA 1851 as a source for PPE guidelines and cites key elements of the standard.

Calfee (2013) noted that developing specifications for PPE is a big task and selection decisions should include company officers. Personnel should be familiar with the right level of thermal protection performance (TTP), the right level of total heat loss, (THL), how to identify problems and solutions for PPE, and why firefighters have to give up TTP for THL. Specifying gear is a serious task since the lives of firefighters depends on gear effectiveness. Staff should be familiar with NFPA 1851 and 1971 when considering selecting and caring for gear. Finance and purchasing staff should also be involved and familiar with compliance requirements. A risk assessment should be done to determine PPE needs based on the most common incidents types encountered by firefighters. Performance issues should be documented and addressed, especially when injuries occur. Administration should make sure personnel talk about gear performance and inform the department when there are problems. An agency should prioritize its PPE needs and weigh the importance of thermal protection and firefighter heart stress during fires. Fit, mobility, and gender are important factors in gear use and selection. The ensemble is basically layers of garments designed to protect firefighters from heat and flames. Gear has changed and departments should research PPE thoroughly when considering selection, care, and maintenance

(Calfee, 2013). This is important since it sites NFPA 1851 as a source for PPE guidelines and sites key elements of the standard and noted the importance of a risk assessment.

According to Costo (2008), the selection, specifying, modifying, and replacing PPE should be a continuous process that constantly monitors the change in the environment where the gear is used. Research that brings about improved technologies and changes and updates in regulatory standards provide a medium for increased safety for firefighters. Low-tech changes such as the straps below the knees that are being evaluated by the Philadelphia Fire Department can benefit firefighters by reducing fatigue that may occur during climbing. High-tech advances such as integrated improvements in the moisture barrier can provide maximum improvement in firefighter safety. NFPA Standards 1551 and 1971 stand out as the industry backbone in detailing the most effective criteria for PPE design, testing, certification, selection, cleaning and maintenance, and specifications. He also notes that the civil courts will reference the prevailing industry standards for guidance in adjudication in civil cases. Departments should be completely aware of these standards and the potential liability associated with not having a quality PPE SOP, maintenance and cleaning process in place. Departments should evaluate the organizational risks through a continuous risks assessment, collect data on injuries and use it to identify PPE-related issues, network with peers, monitor changes and developments, and develop a comprehensive working knowledge of the standards that impact the use and care of PPE (Costo, 2008). This shows the impact of technology and gives an overview of legal considerations for agencies.

Brian Cummings (2013), the Los Angeles Fire Department Fire Chief instituted a PPE management plan to establish better protection of firefighters from cancer due to contamination from dirty gear. The department conducted a risk assessment to establish PPE needs. The plan includes a restriction policy for fire Station living quarters, re-establishes the department safety

committee, PPE tracking, PPE personal sizing, distribution of two sets of turnouts to members, a name panel for gear, PPE Cleaning, PPE extractors, and PPE inspections. The plan focuses on increasing the health and safety of the department's firefighters (Cummings, 2013). This is a good example of a department that has included the key elements of the guideline in its policy. It also demonstrates the importance of employee health and safety.

According to F.I.E.R.O. Staff (2012), risks are part of the fire service. However, departments subject themselves to more legal risks by failing to develop, implement, maintain and document a PPE program. Occupational Health and Safety (OSHA) has requirements for PPE. CFR 1910.132 states that PPE for the face, head, and extremities, protective clothing, respiratory devices, and protective shields and barriers, shall be provided, used, and maintained in a sanitary and reliable condition wherever it is necessary. These are necessary protections since firefighters are subject to environmental, chemical, radiological, or mechanical irritants, and other hazards that can cause injuries. A PPE program should encompass a hazard assessment and selection process, communication of the selection to employees, fit, documentation, and damaged PPE policies. Training should encompass donning/doffing, limitations, retirement, and care and maintenance. Departments should also review NFPA 1500 to make sure they are in compliance. This is valuable since it reveals the legal consequences of not developing and maintaining a PPE program (F.I.E.R.O. Staff, 2012).

According to an article in Fire Apparatus (2013), hydrocarbon-soiled gear absorbs more radiant heat and is more likely to conduct electricity than clean gear. Heavily soiled gear also is more likely to ignite. Even after washing, smoke and soot deposits on dirty gear can become trapped in fibers, increasing secondary exposure risk to firefighters. Firefighters can become ill by inhaling, ingesting or absorbing cancer-causing toxins from materials such as

petroleum or asbestos, or from communicable diseases from bodily fluids such as blood. This article demonstrates the importance of cleaning gear to remove toxic substances to reduce risks that impact the safety and health of firefighters (Fire apparatus, 2013).

According to the FireRescue1 Staff (2011), there were more than 81,000 fire-related firefighter injuries annually in the United States between 2006 and 2008. Firefighter injuries in residential structures accounted for 65 percent of the injuries while outside, vehicle, and other fires combined represented 13 percent of firefighter injuries. Overexertion/strain accounted for 25 percent of the injuries. PPE failure in fire-related firefighter accounted for 9 percent of the injuries in the report based on NFIRS data. Failures tend to be associated with gloves, wristlets, positive pressure self-contained breathing apparatus (SCBA), and hoods. Studies indicates that equipment standards combined with current equipment replacement cycles may be a factor in reducing injuries caused by protective equipment failures. This article demonstrates that PPE related injuries represent a small portion of injuries fire department and that PPE programs may be effective in reducing injuries (FireRescue1 Staff, 2011).

According to a 2014 report prepared by Paul Kashmanian and Casey C. Grant, all fire fighters are not equipped with personal protective clothing. In addition, the report indicated that a large percent of fire departments members have gear that is at least 10 years old. Departments are concerned and are still asking questions about the NFPA 1851 standard. 46 inquiries were transmitted to NFPA staff on NFPA 1851 from June 2012 to June 2013. 29 inquiries were about gear retirement and replacement. The remaining inquiries were about helmet life span and ISP verification.

Other issues support the use of retired gear acquired by firefighters. Keeping old gear out of firefighter's hands can be difficult. Gear is often sold over the internet. NFPA 1851 highly recommends that old gear not be used by firefighters. Old helmets and the habit of wearing them

looking battle scared contributes to firefighters not wanting to part with the helmets. Sometimes it is reused for training and sometimes sold. Selling old gear, especially 10-year old gear that could be used for firefighting is dangerous and is discouraged. Retired gear should be and is often destroyed. This makes it more important for departments to have policies that catalog and check gear dates, the condition of gear, and monitor how firefighters are maintaining their gear.

Cleaning and repairing can be handled either in-house or outsourced. Independent service providers (ISPs) or manufacturers clean and repair gear. Trained firefighters can perform advanced cleaning and repairs. However, they have to be trained and verified by a third party. End-users such as firefighters can and should routinely clean and maintain PPE. Departments may outsource maintenance and repairs to an independent third party organization, such as a verified ISP. Some train department members to perform the cleaning, inspecting, and repairing gear. Some departments conduct routine inspections and cleaning in-house and use an ISP to perform advance cleaning and repairs. The 2014 edition of NFPA 1851 states that advanced garment repairs can only be done by the manufacturer, a Verified ISP, or by a verified ISP. The survey indicated that 42 % of gear is cleaned at fire stations, 37% is cleaned at a central FD on-site location, and 21% of departments outsourced cleaning to a third party.

When considering PPE retirement, many fire professionals argued that replacement should be based on use, condition or inspection by an ISP and not based on manufacturer time parameters such as the 10-year rule. Other suggest other time parameters such as 5 years lifespan compared to a 10-year life span. The report concludes that nearly two-thirds of the fire departments use PPE that is at least 10 years old. Even though this trend has declined (74% in 2001 compared to 63% in 2010), it is apparent that fire departments are using 10 year old PPE, especially smaller departments that lack resources to purchase gear. Some fire departments policies maintain adequate PPE, care and maintenance programs, and institute training for their personnel (Grant, Casey C. and Kashmanian, Paul, 2014). This article contained details about all

of the issues that NFPA 1851 attempts to address in PPE safety. It is important since it details ensemble elements covered, firefighter roles, department roles, independent service provider roles and covers an in depth perspective about the 10-year retirement in NFPA 1851.

According to Honeywell (2012), the 1851 standard imposes seven areas of compliance on departments to support the selection, care, and maintenance of PPE. These elements include the mandatory retirement of all 10-year-old or older PPE, routine cleaning and inspection, detailed record keeping, advanced cleaning, annual advanced cleaning and inspections, advanced inspection, and repairs by an Independent Service Provider (ISP). In addition to these criteria, a department should have a formal policy to communicate the policy to fire department members (Honeywell, 2011). This author clearly outlines the compliance elements of NFPA 1851.

According to It Happens in Seconds (2014), the D.C. Firefighters burn foundation's NFPA 1851 overview explains that PPE is designed to work in unison with all of the ensemble components. The complete set includes a helmet, coat/jacket, pants, gloves, hood, boots, and SCBA and should meet the national standards for structural firefighting. The outer shell Provides tough, durable first line of defense against heat & flame and physical damage. The moisture barrier keeps moisture from entering the system, and the thermal liner protects the firefighter from thermal exposure. Gear should be sized properly and it should work with the body when firefighters are crawling, kneeling, bending, and while performing firefighting tasks and activities. Gear should overlap to prevent exposure and gear should be purchased that meets the department's needs. Gear should be stored properly, cleaned when contaminated, and inspected for damage and wear and tear. Finally, gear should not be worn when wet since wet gear increases a burn occurrence (It Happens in Seconds, 2014). This article supports the key elements of NFPA 1851 and how the garment should be worn for the best protection.

According to Johnson (2014), firefighters in Augusta Georgia have new turnout gear. Augusta firefighters were issued two sets of turnout gear, which includes gloves, hood, suspenders, jacket and pants. Department personnel indicate that gear gets dirty during response. The second set of gear is used while the other set is drying after use or washing. Cross-contamination and injuries from steam burns can occur when gear is wet. This department notes that the 10 year expiration should be used instead of being stocked in the warehouse. It cost the department nearly \$15,000 to provide PPE and dress uniforms to each firefighter. In addition, firefighter complaints have stopped since the update in new gear and uniforms. This is an example of a department t's focus on safety and employee satisfaction through their PPE program (Johnson, 2014). This article supports the need for second sets of gear in a department.

According to Lopez (2102), departments are still learning about the content in the NFPA 1851 standard. NFPA 1851 has been in existence since 2001, but fire departments only recently have become familiar with its contents and have been implementing programs. He notes that departments should become familiar with the standards since PPE maintenance, cleaning, and selection is important to a firefighter's health and safety. This article expresses that the Occupational Safety and Health Administration (OSHA) views NFPA 1851 as industry best practice and that it would be applied if the condition of PPE was a factor in litigation associated with death or injuries. A program incorporating the guidelines would also save money, and extend the life of PPE. The department's training policy should reflect NFPA 1851 and OSHA regulations, including awareness on how to inspect, clean, and how to report damage and contamination that would require advanced cleaning. The author also notes that the Occupational Safety and Health Administration (OSHA) is a can enforce the standard even if you are not in an OSHA state. It is mandated by federal OSHA, which applies to all states that haven't adopted

their own OSHA program. Practical training should be delivered on how to conduct routine checks after use. Agencies should conduct annual advanced inspections. Repairs and advanced cleaning should be done by a verified cleaning facility that has the training and equipment necessary to repair, replace, and reconstruct gear. Finally, record keeping is essential to document cleaning which can be done with web-based or local software (Lopez, 2012). This article covers the key elements of the standard and the impact of OSHA in PPE reviews.

According to Lucas (2014), a risk assessment provides benefits to a fire department. Departments subject themselves to liability if they don't conduct a risk assessment. The assessment ensures that fire organizations have fully investigated the risks associated with the job and provided the proper PPE that is capable of protecting firefighters. It also demonstrates that the department developed a PPE specification that will fulfill the needs of the department. The risk assessment can support decisions when considering low bids where a gear may not meet the protection requirements based on the local hazards and risks. Finally, OSHA may ask for a risk assessment when investigating injuries and accidents. NFPA 1851 provides guidance on the selection, care, and maintenance of protective ensembles for structural firefighting and proximity firefighting. The risk assessment should include the types of duties performed, frequency of use, organization's experiences, geographic location and climate, incident operations and the likelihood of a chemical, biological, radiological and nuclear terrorist incident. In addition, sections from OSHA 1910.132(d) include a focus on hazard assessment and equipment selection, an assessment of the workplace to determine if hazards are present, or are likely to be present, which necessitate the use of PPE, employee use the types of PPE that will protect the affected employee from the hazards identified, and communicating the gear selection to employees. The

department will be better prepared to defend itself if an accident occurs (Lucas, 2014). This source covers OSHA and the importance of a risk assessment in a PPE program.

According to Marken PPE restoration (2014), the proper use of PPE ensembles reduces the risks of firefighters to acceptable levels. Risks are always present and departments and firefighters should establish a compliant selection, care, and maintenance (SCAM) program. The ensembles are designed to protect firefighters from multiple hazards and heat exposures. Departments should train personnel to wear PPE and care for their PPE properly. This should lead to a significant reduction in PPE failures. This article further expresses that the 2014 edition of NFPA 1851 was developed to provide criteria for a SCAM program. Programs should include a written policy that details selection, care, and maintenance procedures. A SCAM provides the means for defense in cases of litigation due to injuries, sickness, or death that may result from the improper selection, improper use, poor maintenance, and inadequate care of protective ensembles. Benefits of a SCAM include higher levels of protection, a quality care and maintenance program, cost savings, equipment longevity, better record, and evaluations that expose issues and trends. This is important for this research since it outlines and summarizes how the standard affects fire gear selection, cleaning, inspection, and repair and highlights the benefits of a SCAM program (Marken PPE Restoration, 2014).

Morse (2014) explains the importance of NFPA 1851 in an article in 360 Fire. The standard covers what gear is made of, how to wash and dry it, gear repair, and a 10-year replacement requirement. Pros of new gear include better fit, lack of stains, better pockets, larger reflective stripping and updated safety features. Cons may include gear stiffness, and simply getting used to it. Gear is worn out since it is used for training, fire incidents, vehicle accidents, and washing it. The 10-year replacement requirement is reasonable when considering gear use

over time. Finally, personnel should check gear for wear and dirt, and clean it to prevent spread of infectious disease, and carcinogens from smoke residue (Morse, 2014). This article offers feedback about the positive and negative aspects of new gear and the key elements of the standard.

According to an overview of the 2008 National Fire Protection Association (NFPA) 1851 standard (2008), the ensemble components covered by the standard include coats, pants, coveralls, helmets, gloves, footwear, and hoods. The fire department must develop a plan to purchase, and maintain the gear to meet the standard. This should include inspecting the gear after use, soiling, contamination, physical damage, damaged trim, and damaged closures and hardware. Fire personnel should routinely clean ensemble elements after each use to remove debris and any soiling without taking the elements out of service. An advanced inspection of the ensemble elements should be conducted by trained persons within the department or an independent service provider annually or whenever routine inspections indicate that a problem may exist. Special cleaning and repairs should only be conducted by certified organizations or vendors (NFPA, 2008). This source notes the components and the importance of cleaning gear.

According to Rezazadeh and Torvi (2011), many associations and manufacturers have developed guidelines associated with the useful life protective clothing. They note that NFPA 1851 states that gear shall be retired not later than 10 years after its manufacture date or if it is damaged or contaminated to the point where repair is not effective. This leads to many issues while working in the field during incidents. The point at which the gear has been used to the point that it becomes a danger to firefighter's safety is a serious concern. Departments should develop regular replacement and selection policies to make sure that damaged or worn gear is placed on a regular basis. The article concluded that departments often do not maintain damage

and contamination audits that effectively detect gear that should be retired (Rezazadeh and Torvi, 2011). This article introduces the fact that there are other guidelines that focus on old gear issues.

According to Shamrock Gear Restorations LLC (2014), NFPA 1851 does not certify gear. It just outlines levels of cleaning including routine, advanced, and specialized. The standard also outlines the minimum records that agencies should maintain, and defines decontamination solution requirements. It also outlines how and where agencies should clean soiled or contaminated PPE. This organizations states that gear should be cleaned at minimum every 6 months and that units should receive advanced cleaning when soiled. These criteria should reduce safety and health risks associated with improper selection, care, maintenance, and gear longevity. They also note that departments should conduct annual inspections, advanced cleaning twice a year, and keep records on gear including retirement and gear disposition. They also express that procedures should be in place that address firefighter injury and death. Finally, the authority having jurisdiction or department is responsible for its PPE since NFPA 1851 is a user standard. This is important for this research since it outlines and summarizes how the standard affects fire gear cleaning, inspection, and repair (Shamrock Gear restoration LLC, 2014).

According to a memorandum written to fire protection specialist and state fire instructors by Bryant Stevens (2014), NFPA 1851 is a voluntary standard in New York State. His memorandum indicates that OSHA 1910.156 does not require compliance with NFPA 1851. There is no state requirement identifying a set time period for retiring gear. It is up to the instructors to make sure gear is serviceable and safe. They do not restrict student participation based on non-compliance with NFPA 1851, including the “10 year rule”. This memo demonstrates that requirement to comply with NFPA 1851 are not equal across states (Stevens, 2104).

According to Jeffrey and Grace Stull (2012), mandatory replacement of gear is still a debate among fire service and equipment research organizations. Gear performance research has been inclusive. Many of the studies were conducted on garments with little focus on helmets, gloves, hoods, and footwear. The research conducted for the U.S. Fire Administration nearly 15 years ago showed various effects of use and care on clothing material performance properties. Observations noted include degradation of certain characteristics such as tear strength and water absorption resistance for shell materials significant in some cases and minor in others. Thermal protective performance actually improved with use in some cases. The authors also note that interpretation of performance test results associated with gear protective quality is unclear due to insufficient industry research. Unfortunately, no one has any solid, fail-safe advice on how to make that interpretation and the whole aspect of retirement becomes murky, and is a judgment call for whoever is responsible within the department. Some argue that the 10-year mandatory retirement obviates these judgment calls or the fact that no judgments are made at all.

Departments struggle with replacing gear that appears to be fit for duty. The National Fire Protection Association Needs Assessment Comprehensive Report in 2011 showed that 63 percent of departments have some personal protective clothing that is at least 10 years old. This figure is down from 74 percent in 2001 and up from 59 percent in 2005. It also showed that 53 percent of departments do not have enough reserve personal protective clothing to equip 10 percent of emergency responders, but this is down from 62 percent in 2001 and 57 percent in 2005. These statistics show that there are a substantial number of departments that either cannot or choose not to comply with mandatorily retiring their gear after 10 years. This is valuable for this research since it establishes that the 10 year replacement guideline is not yet validated by conclusive research (Jeffrey and Grace Stull, 2012).

According to Jeffrey O. and Grace G. Stull (2014), fire departments have made progress in cleaning gear and that firefighters are more aware of the consequences of not maintaining their gear. However, they note that firefighters are concerned about contamination remaining in their clothing even after proper cleaning. The article notes that 75 percent of departments have policies and standard operating procedures for maintaining PPE. Firefighters don't typically have spare helmets and boots. Firefighters typically inspect their own gear after each fire and they are also generally responsible for cleaning their gear. They also clean the gear at fire stations. Some departments still use a verified independent service provider to clean gear. Independent Service Providers tend to meet NFPA 1851 requirements. Providers indicate that departments tend to conduct one cleaning per year. The providers also indicate that turnout clothing is not accompanied by hydrostatic testing for gear that is more than three years old. They said a significant proportion of gear that is tested have moisture-barrier failures. More than 70 percent of the service providers indicate that cleaning and decontamination is done to remove chemicals or other hazardous substances. The article notes that manufacturers offer cleaning services for gear, which include rental or lease programs for coats and pants. The manufacturers indicate that the main focus for the future NFPA 1851 revision should be on when to retire gear. They conclude that industry needs to do more to support firefighters and that departments should do more support NFPA 1851 requirement. This article supports this research since it indicates that proper care and maintenance of gear is better than it was 10 years ago (Jeffrey O. and Grace G. Stull, 2104).

According to an article written by Thompson (2009), PPE age is a current issue in departments. Smaller departments tend to have gear that is 10 years or older. Two-thirds of departments across the country have at least one element of PPE over 10 years old. Gear

technology changes over time and the management of gear that is older will most likely be different from newer gear. It is important that fire organizations and their members read NFPA 1851 so that they know the actual intent of the content. The article notes the importance of considering community hazards and risks when selecting gear. Gear selection should be matched to the industry and local hazards in a community. A risk assessment an important tool that will supports gear selection and service demands (Thompson, 2009).

According to Tutterow (2007), many departments have adopted the NFPA 1851 standard while others have made small steps toward compliance. He also explains that many have ignored the standard. Dirty and poorly maintained gear that is worn as a badge of courage and honor poses undue safety and health risks to firefighters. The 2008 revision the next revision of NFPA 1851 requires that all PPE be retired 10 years after date of manufacture. This includes: helmets, gloves, coats, pants, hoods, and boots. PPE may last only two or three years and in many cases, no more than five years. Requirements include ISP having written verification by an independent third party, the third-party certification organization must be accredited according to the International Organization for Standardization (ISO) Guide 65, and departments must train and require its members to report problems with PPE. Fire departments should budget and develop a program to demonstrate their commitment to protecting its firefighters (Tutterow, 2007).

According to Tutterow (2012), firefighters in New York are upset that they have to turn in helmets due to the 10-year requirement and pay for them if they want to collect them as a keepsake. The NFPA 1851 standard requires helmet, hood, gloves, boots, turnout coat, and trousers of taken out of service after ten years from the date of manufacture. The community and the firefighters submitted proposals to maintain the helmets as loaner gear. The NFPA Technical Committee rejected the proposal because, "loaner" PPE meant that it is used in the field for

firefighting (Tutterow, 2012). Both Tutterow articles explain the importance of compliance and what a department should do to make sure old gear is not used for firefighting.

According to Turnout Services (2014), NFPA 1851 programs are designed to reduce safety and health risks associated with the improper or poor maintenance of PPE ensembles. Tracking maintenance is a key component in minimizing risks. The standard requires departments to conduct annual inspections, advanced cleaning twice a year, and keep records on gear. Departments should also use certified technicians to inspect, clean, and repair equipment based on manufacturer recommendations. The article notes that failures occur due to improper maintenance, excessive wear, and inadequate care. Proper care and minimizes the risks, saves money, and extends the life of PPE. This is important for this research since it outlines and summarizes how the standard affects fire gear cleaning, inspection, and repair (Turnout services, 2014).

According to a training article in VFIS (2014), advances have been made in the design, replacement cycle and in the standards for manufacturing and maintaining firefighter PPE. 80,000 injuries occur annually to firefighters and reports indicate that firefighter PPE is a factor in the injuries that occurred. The article notes that data shows that gloves, wristlets, positive pressure breathing apparatus (SCBA) and hoods accounted for 32 percent of the equipment problems. This article further notes that preventing injuries is a responsibility for all firefighters. Action reviews are important in determining what really happened when an injury occurred. Reviews for injury prevention should include a review any existing protocols, a review of incidents where conditions may have existed, and a review of the safety practices and actions taken to determine what could be done differently to reduce the cause for the injuries (VFIS, 2014).

According to a commentary documented in National Volunteer Fire Council (NVFC) guide (2012), the NFPA 1851 standard addresses the minimum selection, care, and maintenance requirements for structural firefighting protective ensembles and proximity firefighting ensembles, including requirements associated with chemical, biological, radiological, and nuclear (CBRN) protection. Components covered include garments, helmets, gloves, footwear, and other PPE components that meet NFPA 1971 requirements. Organizations that use gear must develop and implement a program for the selection, care, and maintenance of the ensemble components. Departments maintenance should include advanced, contract, routine, and specialized cleaning. Advanced cleaning involves the washing with cleaning agents. Contract cleaning is done by an outside facility that specializes in the cleaning of PPE. Routine is done by firefighters with the appropriate brushes or spot cleaning with water and a brush. Specialized cleaning is done to remove hazardous materials or body fluids.

The guide notes the importance of conducting a risk assessment to determine the hazards that will be encountered by firefighters. Criteria considered should at minimum include physical, environmental, thermal, chemical, biological, electrical, radiation, operational, and ergonomic hazards. National trends and occupational safety and health criteria should also be considered when purchasing gear.

Routine inspections should be conducted by firefighters based on skills learned through training. The goal is to remove contaminants through routine cleaning and heavy soil or contamination through advanced cleaning. Repairs must be performed by the original manufacturer an ISP, or a member of the organization who has received training by the manufacturer or an ISP.

Records and storage of gear should follow the manufacturer's recommendations. Gear should be replaced at 10 years and earlier if worn, and retired if contaminated by and CBRN or other dangerous contaminants. Finally, gear should be destroyed and not used for live fire training and should be marked to denote that it is training gear (National Volunteer Fire Council (NVFC), 2012). This supports the research since it covers the key requirement of NFPA 1851.

According to the United States Department of Labor, Occupational Safety and Health Administration (OSHA) (2011), the agency or the workplace shall assess the work environment and determine the personal protective equipment(PPE) necessary for safe use based on the hazards in that work environment. This means the place of work and the hazard environment during incidents for the fire service. The agency should identify and supply the necessary PPE, training for gear use, when and how to wear it, review how to care for it and its limitations, and follow the recommendations of the manufacturer in determining its life cycle including when and how to dispose and replace then gear. This is stated in CFR (CFR) 29, 1910.132 and in CFR 1910.132 (d) (2) (United States Department of Labor, 2011). This article expresses the importance of a hazard assessment by a department and OSHA's perspective of the standard.

Procedures

The procedures provided the information and data necessary to answer the questions developed for this project. Three Surveys were conducted to obtain feedback from fire departments, bunker gear manufacturers, and independent service providers to determine the best practices and current trends in meeting PPE requirements associated with NFPA 1851. Thirty (30) fire departments were contacted, fourteen (14) departments in North Carolina and sixteen (16) departments from other parts of the United States through a telephone survey to determine how they maintain bunker gear. A total of 19 departments responded to the survey. Twelve

North Carolina departments responded and seven departments outside of North Carolina responded to the survey. (The Questions and results are in Appendix A)

An on-line survey was conducted using SurveyMonkey to determine how departments are complying with NFPA 1851. A list of department representatives was contacted utilizing EFO students, a survey web link, and e-mails to respondents. (The survey and responses are in Appendix B)

Feedback was obtained through telephone interviews conducted with representatives from four bunker gear manufacturers to establish best practices associated with the NFPA 1851 requirements. The agencies represented were Ricochet, Globe, Lion Apparel, Morning Pride and Ranger (Honeywell). The interviews were conducted in September and October of 2014. (The Questions and results are in Appendix C)

A phone survey of representatives from independent service providers was conducted to determine how departments they provided gear services to comply with NFPA 1851. The six ISP's that responded to the survey were Done Right, Gear Cleaning Solutions, Gloves, Inc., Lion Total Care, 911 Safety, and Minerva. These ISPs were taken from the bunker gear maintenance survey data. (The survey and responses are in Appendix D)

Assumptions and Limitations

This writer assumed that the on-line survey would have a high response rate since respondents were NFA EFO peers and the survey was sent out via the Executive Fire Officer Section of the International Association of Fire Chiefs, and via a web link. It was also assumed that fire departments in-state and out-of-state would respond and support the research. This writer also assumed that feedback obtained through telephone interviews from department

representatives would be accurate and that respondents in all of the surveys would be knowledgeable enough to respond to the survey questions. It was also assumed that the return of research information would be more effective if a department member was assigned the task of delivering, collecting, and tabulating the results of the survey. Even though the response was small, there was enough data to support the research.

Results

There were five (5) questions developed to address the problem and purpose of this research. It was important to determine the key NFPA 1851 elements that departments meet to comply. (a) To what extent do departments comply with NFPA 1851? Departments comply with the NFPA 1851 selection, care, and maintenance policy, mandatory retirement of all 10-year-old or older PPE, routine cleaning and inspection, annual advanced cleaning and inspections, repairs and service by an Independent Service Provider (ISP), and record keeping requirements. The telephone survey revealed that more than 91% of the respondents comply with these elements of the standard. Additional data from the on-line survey revealed that 27.7% of the respondents meet all of the requirements of NFPA 1851. 59.09% of the respondents meet some of the requirements. There were no respondents that indicated that their department met none of the NFPA 1851 standard. Finally, 13.64% of the respondents did not know to what extent their department complies with NFPA 1851. (b) What sections of NFPA 1851 are most important for fire departments? The telephone and the on-line survey demonstrated that all 22 of the respondents (100%) met the 10 year requirements for bunker gear, helmets, boots, gloves and hoods. This demonstrates that the 10 year retirement of gear is the most important section to the departments that responded. Servicing PPE annually including advanced inspection and cleaning was important to fire departments. 27.27 % (6) of the respondents met the 3 year advanced

inspection. 27.27% (6) of the respondents met the annual requirement after 3 years. 45.45% (10) of the respondents service the gear when it is needed. Maintaining records was the next section that was important to fire departments. (c) How do departments meet the maintenance requirement of NFPA 1851? According to the surveys, departments use independent service providers (ISPs) to conduct advanced cleaning, inspections and repairs. 94% of the phone survey used ISPs to perform advanced cleaning and inspections. Fire department members conduct routine cleaning and inspections to meet the NFPA 1851 requirements. Departments also utilize certified in-house staff to perform advanced cleaning and repairs. Departments comply with the 10-year guideline and others replace gear every 5 years. They maintain the gear records via software applications. Finally, departments have developed standard operating procedures and policies that govern PPE. (d) To what extent do departments conduct an advanced inspection of all PPE ensembles elements? Departments conduct advanced inspections at least one time annually. All 19 (100%) of the respondents from the telephone survey conduct an advanced inspection annually. All of the ISPs (Done Right, Gear Cleaning Solutions, Gloves, Inc., Lion Total Care, 911 Safety, and Minerva) surveyed indicated that their fire department clients conduct annual advanced inspections and cleaning of bunker gear. The NFPA 1851 on-line survey indicates that departments conduct annual advanced inspections and cleaning for their bunker gear. 27.27 %. (6) of the respondents met the 3 year advanced inspection. 27.27% (6) of the respondents met the annual requirement after 3 years. The ISP's responded that all of their clients meet the 3 year requirement. 45.45% (10) of the respondents service the gear when it is needed. (e) What concerns do departments have with the 10-year PPE replacement requirement's ability to reduce safety risks and potential health risks for firefighters? Departments are concerned about the cost of PPE, the mandatory 10-year requirement especially where gear may

be good for use after 10 years of service and respondents were concerned about monitoring gear for wear and tear.

Discussion

There have been significant changes in attitudes and compliance activity since the early 2000's. According to Tutterow (2007), in 2007, many departments had adopted the NFPA 1851 standard while others had made small steps toward compliance. Still, many continued to ignore the standard. He concluded that dirty and poorly maintained gear that is worn as a badge of courage and honor poses undue safety and health risks to firefighters and that departments should develop a program to demonstrate their commitment to protecting its firefighters (Tutterow, 2007).

Fortunately, attitudes have been progressively changing in the recent years. Lopez states in a Fire Engineering article in 2012 that the NFPA 1851 standard has been in existence since 2001, but many fire departments only recently have become familiar with its contents since the changes in 2008 and have been implementing programs (Lopez, 2102). This applies to Winston-Salem. Even though the department has formerly adopted the 10-year retirement, the gear maintenance, training, and recording aspects of the standard need updating. New gear alone does not address attitudes and keep up with key rear data. This has to be enforced through policy and supervision. The Winston-Salem Fire Department should note the best practices and required elements and update the current policy in the department.

Fire departments have improved their PPE selection, care and maintenance since 2008. Firefighter safety and health concerns should be enough to compel fire departments to comply with the 1851 standard. In addition to these concerns, The United States Department of Labor

through the Occupational Safety and Health Administration (OSHA) (2011) has made the requirement a federal mandate which even applies in non-OSHA states (United States Department of Labor, 2011).

However, as recent as 2012, PPE compliance questions still exist and there is still some debate and concern regarding PPE in the fire service. Jeffrey and Grace Skull (2012) noted that mandatory replacement is still a controversial discussion among fire service and equipment research organizations. Even though there has been improvement in PPE, the interpretation of performance test results associated with gear protective quality is unclear due to insufficient industry research. When gear is worn and subject to replacement verse the 10-year requirement is not completely supported and has removed the fire department's decision making discretion regarding replacing gear. Research findings have not completely validated the 10-year criteria and the effectiveness of the rule is still unclear research. Some departments have replaced gear and others still have gear 10 years old because they cannot replace it or choose not to replace it (Stull, Jeffrey & Grace, 2012).

It is apparent that NFPA 1851 compliance requirement can vary from state to state. This may contribute to departments not complying with the standard. According to a memorandum written to fire protection specialist and state fire instructors by Bryant Stevens (2014), NFPA 1851 is a voluntary standard in New York State. OSHA 1910.156 does not require compliance with NFPA 1851. There is no state requirement identifying a set time period for retiring gear. They do not restrict student participation based on non-compliance with NFPA 1851, including the "10 year rule" (Stevens, 2104).

However, safe PPE is still important to firefighters and departments alike. According to Honeywell manufacturers (2014), the 1851 standard imposes seven areas of compliance on departments to support the selection, care, and maintenance of PPE. These elements include the mandatory retirement of all 10-year-old or older PPE, routine cleaning and inspection, detailed record keeping, advanced cleaning, annual advanced cleaning and inspections, advanced inspection, and repairs by an Independent Service Provider (ISP). In addition to these criteria, a department should have a formal policy to communicate the policy to fire department members (Honeywell Inc., 2012). The Winston-Salem Fire department meets this requirement and should continue to update gear annually.

According to the D.C. Firefighters burn foundation, PPE is designed to work in unison with all of the ensemble components: a helmet, coat/jacket, pants, gloves, hood, boots, and SCBA and should meet the national standards for structural firefighting. The best protection comes from proper wear and maintenance, avoiding wearing wet gear, and gear inspections. Firefighter safety is the greatest benefit the ensemble covering and fitting the firefighter to maximize protection and reduce injuries (It Happened in Seconds, 2014).

According to an overview of the 2008 1851 National Fire Protection Association (NFPA) standard (2008), the ensemble components covered by the standard include coats, pants, coveralls, helmets, gloves, footwear, and hoods. The fire department must develop a plan to purchase, and maintain the gear to meet the standard (NFPA, 2008). This research has demonstrated that these criteria can be grouped into six distinctive areas of compliance: selection, care, and maintenance policy, mandatory retirement of all 10-year-old or older PPE, routine cleaning and inspection, annual advanced cleaning and inspections, repairs and service by an Independent Service Provider (ISP), and record keeping. This research was conducted to

determine to what extent departments meet these NFPA 1851 elements as noted in question (a). The telephone survey demonstrated that 91% of the respondents met the key criteria noted above. The on-line survey revealed that 27.7% of the respondents meet all of the requirements of NFPA 1851. 59.09% of the respondents meet some of the requirements. Jeffrey O. and Grace G. Stull (2014), state that progress has been in cleaning gear and that firefighters are more aware of the consequences of not maintaining their gear. Examples of compliance criteria met by departments includes policies and standard operating procedures for maintaining PPE, inspection performed after incidents by firefighters and they routinely cleaning of gear at the fire stations. Departments also use a verified service to perform advanced inspections, cleaning, and to repair gear (Stull, Jeffrey & Grace, 2104).

In addition, the United States Department of Labor, Occupational Safety and Health Administration (OSHA) (2011), CFR (CFR) 29, 1910.132 and in CFR 1910.132 (d) (2) states that the agency shall conduct a hazard assessment to identify and supply the necessary PPE, training on when and how to wear it, care and maintenance, when and how to wear it, review how to care for it and its limitations, and when and how to dispose and replace then gear (United States Department of Labor, 2011).

Finally, not having a plan or an inadequate plan can create legal problems for a department. According to F.I.E.R.O. Staff (2012), departments should not subject themselves to more legal risks by failing to develop, implement, maintain and document a PPE program. Occupational Health and Safety (OSHA) has requirements for PPE. CFR 1910.132 states, PPE for the for eyes, face, head, and extremities, protective clothing, respiratory devices, and protective shields and barriers, shall be provided, used, and maintained in a sanitary and reliable condition wherever it is necessary (F.I.E.R.O. Staff, 2012).

The second question focused on the sections of NFPA 1851 that is most important to fire departments. The on-line survey validated that the 10 year requirements for bunker gear, helmets, boots, gloves and hoods is the most important criteria of the standard. 100% of the respondent indicated they met the 10-year requirement. Rezazadeh and Torvi (2011) stated in an article that many associations and manufacturers have developed guidelines associated with the useful life protective clothing. NFPA 1851 states that gear shall be retired not later than 10 years after its manufacture date or if it is damaged or contaminated to the point where repair is not effective. This generates more cost to departments that have adopted the 10-year rule, but is essential to the safety of employees. Damaged PPE presents a danger to a firefighter's safety and should be a serious concern for departments and its members. Departments should develop regular replacement and selection policies to make sure that damaged or worn gear is placed on a regular basis regardless of the age of the gear. They also concluded that departments often do not maintain these elements of gear care (Rezazadeh and Torvi, 2011).

This demonstrates that the 10-year retirement of gear is the most important section to the departments that responded. All 19 (100%) of the telephone respondents comply with the 10 year requirement. All 22 of the on-line respondents met the requirements for the 10 year replacement of these PPE items. The ISP survey also supported this conclusion. Their clients adhered to the 10-year requirement. 27.27 % (6) of the on-line respondents met the 3-year advanced inspection. 27.27% (6) of the respondents met the annual requirement after 3 years. 45.45% (10) of the on-line respondents service the gear when it is needed. The next most important criteria of NFPA 1851 based on the data is the annual advanced inspection. 18 (95%) of the telephone respondents comply with the annual advanced cleaning requirement. 27.27 % (6) of the on-line survey respondents departments met the 3 year advanced inspection perform it

annually each year. According to Lopez (2012), departments should utilize a verified cleaning facility to repair gear and perform advanced cleaning annually. These independent service providers have the training and equipment necessary to repair, replace, and reconstruct gear. He also notes that record keeping is essential and that web-based or local software should be used to document PPE records (Lopez, 2012).

According to Jeffrey O. and Grace G. Stull (2014), fire departments have made progress in cleaning gear. Some departments use a verified independent service provider to clean gear. These Independent Service Providers tend to meet NFPA 1851 requirements. Independent Service Providers indicate that departments tend to conduct one cleaning per year (Jeffrey O. and Grace G. Stull, 2104).

According to a commentary documented in National Volunteer Fire Council (NVFC) guide (2012), departments maintenance should include advanced, contract, routine, and specialized cleaning. Advanced cleaning involves the washing with cleaning agents. Contract cleaning is done by an outside facility that specializes in the cleaning of PPE (National Volunteer Fire Council (NVFC), 2012).

The Abilene Fire Department is just one example of a department complying with the cleaning requirements. It is their opinion that their standard operating PPE guideline provides maximum protection for its freighters and the guideline complies with state requirements. The program includes a section on PPE inspection including routine and advanced and special cleaning, washing process and responsibilities, firefighter responsibilities, and schedules including officer responsibilities this is an example of a PPE program (Abilene Fire Department, 2006). Annual advanced inspections are being conducted by departments and are a best practice. These have not occurred for all personnel in Winston-Salem and should become a part of the

department's annual budgeted functions. Advanced inspections and cleanings are the key to risk reduction and safety.

Question three addresses how departments meet the maintenance requirement of NFPA 1851. Department utilize a combination of in-house personnel and independent service providers to maintain their gear. They also maintain records of gear utilizing software applications. According to a commentary documented in National Volunteer Fire Council (NVFC) guide (2012), components covered in the NFPA standard 1851 include garments, helmets, gloves, footwear, and other PPE components that meet NFPA 1971 requirements. A Department's maintenance program should include advanced, contract, routine, and specialized cleaning. Contract cleaning is done by an outside facility that specializes in the cleaning of PPE. Routine is done by firefighters with the appropriate brushes or spot cleaning with water and a brush. Specialized cleaning is done to remove hazardous materials or body fluids by contract ISPs. Firefighters should be trained to conduct routine inspections after use based on skills learned through training. The goal is to remove contaminants through routine cleaning and heavy soil or contamination through advanced cleaning. Repairs must be performed by the original manufacturer an ISP, or a member of the organization who has received training by the manufacturer or an ISP. Records and storage of gear should follow the manufacturer's recommendations. Gear should be replaced at 10 years and earlier if worn, and retired if contaminated by and CBRN or other dangerous contaminants. Finally, gear should be destroyed and not used for live fire training and should be marked to denote that it is training gear (National Volunteer Fire Council (NVFC), 2012). This aspect was lacking due to a manual system. The department has developed a data base to capture and maintain adequate records based on knowledge obtained through this research. This is a key element that should be

maintained. The lesson learned here is the importance of strategically using an ISP to conduct annual inspections, the three year inspection and advanced cleaning in addition repairs. This is a critical task that Winston-Salem will benefit equipment longevity and firefighter safety.

Calfee (2013) noted that proper care and maintenance will ensure that the gear protects firefighters and lead to a longer gear life. Firefighters must play a major role in gear maintenance. Firefighters should be responsible for knowing the facts about their gear, how to inspect their gear, and how to clean it. Firefighter should be trained to checks for tears, discoloration, seam damage, and holes when they inspect gear. Signs of discoloration due to heat damage or exposure should be checked for stability. If there are breaks of tears, the item should be replaced. Damage should be reported using the proper notification and documentation processes as specified in Section 4.3 of NFPA 1851 (Calfee, 2013).

There are examples of departments and its member's role in PPE programs. Brian Cummings (2013), Chief of the Los Angeles Fire Department Fire Chief instituted a PPE management plan to establish better protection of its firefighters from cancer due to contamination form dirty gear. The plan includes a restriction policy for fire Station living quarters, re-establishes the department safety committee, PPE tracking, PPE personal sizing, distribution of two sets of turnouts to members, a name panel for gear, PPE Cleaning, PPE extractors, and PPE inspections. The plan focuses on increasing the health and safety of the department's firefighters (Cummings, 2013).

Question four addressed to extent do departments conduct an advanced inspection of all PPE ensembles elements? 95% of the departments meet the annual objectives of NFPA 1851 based on the data from the surveys. According to Turnout Gear Services (2014), departments should use certified technicians to inspect, clean, and repair equipment based on manufacturer

recommendations. Proper care and minimizes the risks and reduces failures that may occur due to improper maintenance, excessive wear, and inadequate care (Turnout Gear Services, 2014).

According to an overview of the 2008 National Fire Protection Association (NFPA) 1851 standard (2008), the ensemble components covered by the standard include coats, pants, coveralls, helmets, gloves, footwear, and hoods. An advanced inspection of the ensemble elements should be conducted by trained persons within the department or an independent service provider annually or whenever routine inspections indicate that a problem may exist. Special cleaning and repairs should only be conducted by certified organizations or vendors (NFPA, 2008). The department in Winston-Salem can outsource this item or do it in house. The lack of the advanced opens the door to potential health risk and liability. Changes in policy will reduce these risks for the department members.

According to an article in Fire Apparatus (2013), hydrocarbon-soiled gear absorbs more radiant heat and is more likely to conduct electricity than clean gear. Heavily soiled gear also is more likely to ignite. Soiled gear should be cleaned by a verified independent service provider to remove cancer-causing toxins from petroleum or asbestos, or from communicable diseases from bodily fluids such as blood. This demonstrates the importance of cleaning gear to remove toxic substances and increase the safety and health (Fire apparatus, 2013).

Question five attempts to address the concerns that departments have with the 10-year PPE replacement requirement's ability to reduce safety risks and potential health risks for firefighters. Even though most respondents comply with the 10-year retirement criteria, many are not convinced that it is appropriate and even that it takes away the department's ability to use its own discretion in retiring and replacing gear. Jeffrey and Grace Stull (2012), indicate that some departments service PPE as needed. Fire department officials argue that the 10-year mandatory

retirement takes the departments discretion on gear condition and retirement out of their hands. Gear that appears to be fit for duty should be okay to use. The National Fire Protection Association Needs Assessment Comprehensive Report in 2011 showed that 63 percent of departments have some personal protective clothing that is at least 10 years old, but this is down from 74 percent in 2001 and up from 59 percent in 2005. It also showed that 53 percent of departments do not have enough reserve personal protective clothing to equip 10 percent of emergency responders. Even though this figure is down from 62 percent in 2001 and 57 percent in 2005, it is apparent that all departments are not meeting some NFPA 1851 requirements because they cannot or choose not to comply with mandatorily retiring their gear after 10 years (Jeffrey and Grace Stull, 2012).

According to Calfee (2013), NFPA 1851 sets the minimum standard for the fire department and states that all PPE elements shall be retired 10 years after the manufacturing date. He explains that a reasonable service life and a maintenance plan are two common concerns pertaining to firefighter PPE. Factors affecting gear service life include care and maintenance, exposure to elements, thermal stress, mechanical stress, material used in design and construction, and the firefighter (Calfee, 2013).

Morse (2014) explains the importance of the NFPA 1851 10-year replacement requirement in an article in 360 Fire. The benefits of new gear include better fit, lack of stains, better pockets, larger reflective stripping and updated safety features. On the other hand, negatives may include gear stiffness, and simply getting used to it. Gear is worn out since it is used for training, fire incidents, vehicle accidents, and washing it. The 10-year replacement requirement is reasonable when considering gear use over time (Morse, 2014).

In a survey of representatives from bunker gear manufacturers including Ricochet, Globe, Lion Apparel, Morning Pride and Ranger (Honeywell), and Independent service providers including Done Right, Gear Cleaning Solutions, Gloves, Inc., Lion Total Care, 911 Safety, and Minerva believe that fire departments believe that NFPA 1851 has improved firefighter safety. According to the FireRescue1 Staff (2011), PPE failure in fire-related injuries accounted for 9 percent of the injuries in the report based on NFIRS data. Studies indicates that equipment standards combined with current equipment replacement cycles may be a factor in reducing injuries caused by protective equipment failures. PPE related injuries represent a small portion of firefighter injuries and PPE programs may be a factor in reducing firefighter injuries (FireRescue1 Staff, 2011).

In summary, many departments do comply with all of the requirements of NFPA 1851 and some are still complying with key elements that they can afford. There have been improvements in attitudes and departments are more familiar with the standard. All of the core NFPA criteria which include selection, care and maintenance policy, mandatory retirement of all 10-year-old or older PPE, routine cleaning and inspection, annual advanced cleaning and inspections, repairs and service by an Independent Service Provider (ISP), and record keeping are essential and are best practices that should be incorporated into the Winston-Salem strategic plan. Relevant addition findings indicate that a risk assessment should be a component of a PPE program. According to Anderson and Gaskin (2103), cancer is a risk that can be avoided or reduced form proper gear maintenance. The Los Angeles Fire Department has collaborated with other agencies to enhance their PPE program (Anderson and Gaskin, 2103). Johnson, (2014) wrote that the fire department in Augusta, Georgia supplied personnel with a second set of gear to support cleaning efforts and to keep firefighters in dry gear. Employee morale is up as

employees express their satisfaction in the department's actions (Johnson, 2014). Departments have improved but more effort is needed from departments in budgeting and directing and encouraging firefighters to maintain gear properly.

Recommendations

The research has revealed that a fire department should establish a compliant selection, care, and maintenance (SCAM) program. According to Marken PPE Restoration (2014), risks are always present and the proper use and maintenance of PPE keeps risks at acceptable levels. Departments should establish a compliant selection, care, and maintenance (SCAM) program. This should include a written policy that details selection, care, and maintenance procedures. A department enhances its firefighter safety by providing higher levels of protection and quality care to PPE ensembles (Marken PPE Restoration, 2014).

Recommendations for Winston-Salem include the following:

1. The department should review its PPE process and develop a formal selection, care, and maintenance (SCAM) program that includes a risk assessment component.
2. The department should provide advanced inspections and annual cleaning for PPE via an Independent Service Provider.
3. The department should purchase a second set of bunker pants and coat to accommodate employees when gear is being serviced.
4. The department should incorporate the hazard and risk assessment findings into the PPE selection, care, and maintenance program.
5. The department should upgrade PPE record keeping resources and established records as a core element in the PPE program.

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Appendix A

Departments Survey to Determine NFPA 1851 Maintenance of Bunker Gear

1. Arlington, VA
2. Atlanta, Ga
3. Baltimore, MD
4. Charleston, SC
5. Charlotte, NC
6. Chicago, Ill.
7. Concord, NC
8. Detroit, MI
9. Durham, NC
10. Elizabeth City, NC
11. Fayetteville, NC
12. Greensboro, NC
13. Greenville, NC.
14. High Point, NC
15. Kernersville, NC
16. Los Angeles, Calif.
17. Memphis, Tenn.
18. Myrtle Beach, SC
19. Nashville, Tenn.
20. New York, NY
21. Norfolk, Va.
22. Orlando, Florida
23. Philadelphia, Pa.
24. Phoenix, AZ
25. Raleigh, NC
26. Salisbury, NC
27. Rocky Mount, NC
28. Washington, DC
29. Wilmington, NC
30. Wilson, NC

WSFD NFPA 1851 Compliance Survey for maintenance of Bunker gear

Date: _____ Time: _____

1. What is the name of your department? Who are you?
2. Does your department comply with NFPA 1851 PPE requirements? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes _____ No _____
 - b. Service gear Annually Yes _____ No _____
 - c. Department has a Selection Process/Program (SOP)? Yes _____ No _____
 - d. Firefighters trained and conduct inspections on PPE? Yes _____ no _____
 - e. Maintain Records of PPE? Yes _____ No _____
 - f. Department Selection, care, and maintenance policy? Yes _____ no _____
3. How does your department meet the maintenance requirement of Bunker gear?
 - a. Department trained/certified members service your gear in house? _____
 - b. Send your gear to an Independent Service Provider (ISP)? _____
 - c. Do not service gear _____
4. Who or what ISP services your gear? _____
5. What concerns does your department have with the 10-year PPE replacement requirements?
 - a. Cost of gear?
 - b. Ability to reduce safety risks and potential health risks for firefighters?
 - c. Monitoring gear for wear, tear, or damage?
 - d. Other Concern(s)?
6. What sections of NFPA 1851 are most important to your fire departments? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes _____ No _____
 - b. Service gear Annually Yes _____ No _____
 - c. Department has a Selection Process/Program (SOP)? Yes _____ No _____
 - d. Firefighters trained and conduct inspections on PPE? Yes _____ no _____
 - e. Maintain Records of PPE? Yes _____ No _____
 - f. All of the above? _____
7. Do you have a SOP or policy you can share through e-mail?

WSFD NFPA 1851 Compliance Survey for Maintenance of Bunker Gear

Date: 11/12/2014 Time: 3:49

1. What is the name of your department? Who are you? Charleston, SC. Will Garwood
2. Does your department comply with NFPA 1851 PPE requirements? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes X No _____
 - b. Service gear Annually Yes X No _____
 - c. Department has a Selection Process/Program (SOP)? Yes X No _____
 - d. Firefighters trained and conduct inspections on PPE? Yes X no _____
 - e. Maintain Records of PPE? Yes X No _____
 - f. Department Selection, care, and maintenance policy? Yes _____ no X
3. How does your department meet the maintenance requirement of Bunker gear?
 - a. Department trained/certified members service your gear in house? X
 - b. Send your gear to an Independent Service Provider (ISP)? X
 - c. Do not service gear _____
4. Who or what ISP services your gear? Bunright
5. What concerns does your department have with the 10-year PPE replacement requirements? (c)
 - a. Cost of gear?
 - b. Ability to reduce safety risks and potential health risks for firefighters?
 - c. Monitoring gear for wear, tear, or damage?
 - d. Other Concern(s)?
6. What sections of NFPA 1851 are most important to your fire departments? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes _____ No _____
 - b. Service gear Annually Yes _____ No _____
 - c. Department has a Selection Process/Program (SOP)? Yes _____ No _____
 - d. Firefighters trained and conduct inspections on PPE? Yes _____ no _____
 - e. Maintain Records of PPE? Yes _____ No _____
 - f. All of the above? X
7. Do you have a SOP or policy you can share through e-mail? No

WSFD NFPA 1851 Compliance Survey for Maintenance of Bunker Gear

Date: 11/07/2014 Time: 9:00

1. What is the name of your department? Who are you? Charlotte, NC. Chief Owens
2. Does your department comply with NFPA 1851 PPE requirements? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes ☒ No ☐
 - b. Service gear Annually Yes ☒ No ☐
 - c. Department has a Selection Process/Program (SOP)? Yes ☒ No ☐
 - d. Firefighters trained and conduct inspections on PPE? Yes ☒ no ☐
 - e. Maintain Records of PPE? Yes ☒ No ☐
 - f. Department Selection, care, and maintenance policy? Yes ☐ no ☒
3. How does your department meet the maintenance requirement of Bunker gear?
 - a. Department trained/certified members service your gear in house? ☒
 - b. Send your gear to an Independent Service Provider (ISP)? ☒
 - c. Do not service gear ☐
4. Who or what ISP services your gear? EMS
5. What concerns does your department have with the 10-year PPE replacement requirements? (d)
 - a. Cost of gear?
 - b. Ability to reduce safety risks and potential health risks for firefighters?
 - c. Monitoring gear for wear, tear, or damage?
 - d. Other Concern(s)?
6. What sections of NFPA 1851 are most important to your fire departments? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes ☐ No ☐
 - b. Service gear Annually Yes ☐ No ☐
 - c. Department has a Selection Process/Program (SOP)? Yes ☐ No ☐
 - d. Firefighters trained and conduct inspections on PPE? Yes ☐ no ☐
 - e. Maintain Records of PPE? Yes ☐ No ☐
 - f. All of the above? ☒
7. Do you have a SOP or policy you can share through e-mail? Yes

WSFD NFPA 1851 Compliance Survey for Maintenance of Bunker Gear

Date: 11/13/2014 Time: 1:40

1. What is the name of your department? Who are you? Chicago Fire, Ill
2. Does your department comply with NFPA 1851 PPE requirements? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes X No__ 5 year replacement
 - b. Service gear Annually Yes X No __
 - c. Department has a Selection Process/Program (SOP)? Yes X No__
 - d. Firefighters trained and conduct inspections on PPE? Yes X no__
 - e. Maintain Records of PPE? Yes X No__
 - f. Department Selection, care, and maintenance policy? Yes X no__
3. How does your department meet the maintenance requirement of Bunker gear?
 - a. Department trained/certified members service your gear in house? __
 - b. Send your gear to an Independent Service Provider (ISP)? X
 - c. Do not service gear__
4. Who or what ISP services your gear? Lion total Care.
5. What concerns does your department have with the 10-year PPE replacement requirements? (a) Cost of gear
 - a. Cost of gear?
 - b. Ability to reduce safety risks and potential health risks for firefighters?
 - c. Monitoring gear for wear, tear, or damage?
 - d. Other Concern(s)?
6. What sections of NFPA 1851 are most important to your fire departments? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes__ No__
 - b. Service gear Annually Yes __ No__
 - c. Department has a Selection Process/Program (SOP)? Yes __ No__
 - d. Firefighters trained and conduct inspections on PPE? Yes __ no__
 - e. Maintain Records of PPE? Yes __ No__
 - f. All of the above? X
7. Do you have a SOP or policy you can share through e-mail? Yes

WSFD NFPA 1851 Compliance Survey for Maintenance of Bunker Gear

Date: 11/13/2014 Time: 9:12

1. What is the name of your department? Who are you? Concord, NC. Gearld Harris
2. Does your department comply with NFPA 1851 PPE requirements? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes ☒ No ☐
 - b. Service gear Annually Yes ☒ No ☐
 - c. Department has a Selection Process/Program (SOP)? Yes ☒ No ☐
 - d. Firefighters trained and conduct inspections on PPE? Yes ☒ no ☐
 - e. Maintain Records of PPE? Yes ☒ No ☐
 - f. Department Selection, care, and maintenance policy? Yes ☒ no ☐
3. How does your department meet the maintenance requirement of Bunker gear?
 - a. Department trained/certified members service your gear in house? ☐
 - b. Send your gear to an Independent Service Provider (ISP)? ☒
 - c. Do not service gear ☐
4. Who or what ISP services your gear? Minerva, Charlotte, NC
5. What concerns does your department have with the 10-year PPE replacement requirements? (a)
 - a. Cost of gear?
 - b. Ability to reduce safety risks and potential health risks for firefighters?
 - c. Monitoring gear for wear, tear, or damage?
 - d. Other Concern(s)? If gear is good after 10 years, should be able to use it.
6. What sections of NFPA 1851 are most important to your fire departments? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes ☐ No ☐
 - b. Service gear Annually Yes ☐ No ☐
 - c. Department has a Selection Process/Program (SOP)? Yes ☐ No ☐
 - d. Firefighters trained and conduct inspections on PPE? Yes ☐ no ☐
 - e. Maintain Records of PPE? Yes ☐ No ☐
 - f. All of the above? ☒
7. Do you have a SOP or policy you can share through e-mail? Yes

WSFD NFPA 1851 Compliance Survey for Maintenance of Bunker Gear

Date: 11/07/2014 Time: 8:50

1. What is the name of your department? Who are you? Durham, NC. Chief Sannipoli
2. Does your department comply with NFPA 1851 PPE requirements? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes X No _____
 - b. Service gear Annually Yes X No _____
 - c. Department has a Selection Process/Program (SOP)? Yes _____ No _____
 - d. Firefighters trained and conduct inspections on PPE? Yes X no _____
 - e. Maintain Records of PPE? Yes X No _____
 - f. Department Selection, care, and maintenance policy? Yes X no _____
3. How does your department meet the maintenance requirement of Bunker gear?
 - a. Department trained/certified members service your gear in house? X Supply warehouse
 - b. Send your gear to an Independent Service Provider (ISP)? X for repair
 - c. Do not service gear Clean Only
4. Who or what ISP services your gear? Total Care in Philadelphia
5. What concerns does your department have with the 10-year PPE replacement requirements? (d) If gear is good after 10 years, should be able to use it. (2 sets of gear)
 - a. Cost of gear?
 - b. Ability to reduce safety risks and potential health risks for firefighters?
 - c. Monitoring gear for wear, tear, or damage?
 - d. Other Concern(s)? If gear is good after 10 years, should be able to use it. 2-sets
6. What sections of NFPA 1851 are most important to your fire departments? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes X No _____
 - b. Service gear Annually Yes X No _____
 - c. Department has a Selection Process/Program (SOP)? Yes _____ No _____
 - d. Firefighters trained and conduct inspections on PPE? Yes _____ no _____
 - e. Maintain Records of PPE? Yes _____ No _____
 - f. All of the above? _____
7. Do you have a SOP or policy you can share through e-mail? No

WSFD NFPA 1851 Compliance Survey for maintenance of Bunker gear

Date: 11/12/2014 Time: 4:15

1. What is the name of your department? Who are you? Elizabeth City Fire, NC.
Barry Overman
2. Does your department comply with NFPA 1851 PPE requirements? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes ☒ No ☐
 - b. Service gear Annually Yes ☒ No ☐
 - c. Department has a Selection Process/Program (SOP)? Yes ☐ No ☒
 - d. Firefighters trained and conduct inspections on PPE? Yes ☐ no ☒
 - e. Maintain Records of PPE? Yes ☐ No ☐ Don't know
 - f. Department Selection, care, and maintenance policy? Yes ☐ no ☐ Don't know
3. How does your department meet the maintenance requirement of Bunker gear?
 - a. Department trained/certified members service your gear in house? ☒
 - b. Send your gear to an Independent Service Provider (ISP)? ☐
 - c. Do not service gear ☐
4. Who or what ISP services your gear? _____
5. What concerns does your department have with the 10-year PPE replacement requirements? (d) Removes gear after 10 years, use it for training
 - a. Cost of gear?
 - b. Ability to reduce safety risks and potential health risks for firefighters?
 - c. Monitoring gear for wear, tear, or damage? Remove gear after 10 years, use for training
 - d. Other Concern(s)? Removes gear after 10 years, use it for training.
6. What sections of NFPA 1851 are most important to your fire departments? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes ☒ No ☐
 - b. Service gear Annually Yes ☒ No ☐
 - c. Department has a Selection Process/Program (SOP)? Yes ☐ No ☒
 - d. Firefighters trained and conduct inspections on PPE? Yes ☒ no ☐
 - e. Maintain Records of PPE? Yes ☐ No ☐
 - f. All of the above? ☐
7. Do you have a SOP or policy you can share through e-mail?

WSFD NFPA 1851 Compliance Survey for maintenance of Bunker gear

Date: 11/13/2014 Time: 9:24

1. What is the name of your department? Who are you? Fayetteville, NC. David Hargis
2. Does your department comply with NFPA 1851 PPE requirements? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes ☒ No ☐
 - b. Service gear Annually Yes ☒ No ☐
 - c. Department has a Selection Process/Program (SOP)? Yes ☒ No ☐
 - d. Firefighters trained and conduct inspections on PPE? Yes ☒ no ☐
 - e. Maintain Records of PPE? Yes ☒ No ☐
 - f. Department Selection, care, and maintenance policy? Yes ☒ no ☐
3. How does your department meet the maintenance requirement of Bunker gear?
 - a. Department trained/certified members service your gear in house? ☒
 - b. Send your gear to an Independent Service Provider (ISP)? ☒
 - c. Do not service gear ☐
4. Who or what ISP services your gear? Minerva, Charlotte, NC
5. What concerns does your department have with the 10-year PPE replacement requirements? (d) No concerns
 - a. Cost of gear?
 - b. Ability to reduce safety risks and potential health risks for firefighters?
 - c. Monitoring gear for wear, tear, or damage?
 - d. Other Concern(s)? None.
6. What sections of NFPA 1851 are most important to your fire departments? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes ☐ No ☐
 - b. Service gear Annually Yes ☐ No ☐
 - c. Department has a Selection Process/Program (SOP)? Yes ☐ No ☐
 - d. Firefighters trained and conduct inspections on PPE? Yes ☐ no ☐
 - e. Maintain Records of PPE? Yes ☐ No ☐
 - f. All of the above? ☒
7. Do you have a SOP or policy you can share through e-mail? Yes

WSFD NFPA 1851 Compliance Survey for Maintenance of Bunker Gear

Date: 11/13/2014 Time: 9:24

1. What is the name of your department? Who are you? Greenville Fire, NC.
Captain Horn
2. Does your department comply with NFPA 1851 PPE requirements? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes X No ____
 - b. Service gear Annually Yes ____ No X As needed only
 - c. Department has a Selection Process/Program (SOP)? Yes X No ____
 - d. Firefighters trained and conduct inspections on PPE? Yes X no ____
 - e. Maintain Records of PPE? Yes X No ____
 - f. Department Selection, care, and maintenance policy? Yes X no ____
3. How does your department meet the maintenance requirement of Bunker gear?
 - a. Department trained/certified members service your gear in house? ____
 - b. Send your gear to an Independent Service Provider (ISP)? X
 - c. Do not service gear ____
4. Who or what ISP services your gear? MES Globe
5. What concerns does your department have with the 10-year PPE replacement requirements? (c)
 - a. Cost of gear?
 - b. Ability to reduce safety risks and potential health risks for firefighters?
 - c. Monitoring gear for wear, tear, or damage?
 - d. Other Concern(s)?
6. What sections of NFPA 1851 are most important to your fire departments?
(Check all that apply)
 - a. Meets 10 year retirement requirement? Yes ____ No ____
 - b. Service gear Annually Yes ____ No ____
 - c. Department has a Selection Process/Program (SOP)? Yes ____ No ____
 - d. Firefighters trained and conduct inspections on PPE? Yes ____ no ____
 - e. Maintain Records of PPE? Yes ____ No ____
 - f. All of the above? X
7. Do you have a SOP or policy you can share through e-mail? yes

WSFD NFPA 1851 Compliance Survey for Maintenance of Bunker Gear

Date: 11/13/2014 Time: 9:24

1. What is the name of your department? Who are you? Kernersville, NC. Richard Conley
2. Does your department comply with NFPA 1851 PPE requirements? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes X No Every 3 years
 - b. Service gear Annually Yes X No
 - c. Department has a Selection Process/Program (SOP)? Yes X No
 - d. Firefighters trained and conduct inspections on PPE? Yes X no
 - e. Maintain Records of PPE? Yes X No
 - f. Department Selection, care, and maintenance policy? Yes X no
3. How does your department meet the maintenance requirement of Bunker gear?
 - a. Department trained/certified members service your gear in house? X
 - b. Send your gear to an Independent Service Provider (ISP)? X
 - c. Do not service gear
4. Who or what ISP services your gear? Minerva, Charlotte, NC
5. What concerns does your department have with the 10-year PPE replacement requirements? (a)
 - a. Cost of gear?
 - b. Ability to reduce safety risks and potential health risks for firefighters?
 - c. Monitoring gear for wear, tear, or damage?
 - d. Other Concern(s)?
6. What sections of NFPA 1851 are most important to your fire departments? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes No
 - b. Service gear Annually Yes No
 - c. Department has a Selection Process/Program (SOP)? Yes No
 - d. Firefighters trained and conduct inspections on PPE? Yes no
 - e. Maintain Records of PPE? Yes No
 - f. All of the above? X
7. Do you have a SOP or policy you can share through e-mail?

WSFD NFPA 1851 Compliance Survey for Maintenance of Bunker Gear

Date: 11/11/2014 Time: 9:51

1. What is the name of your department? Who are you? High Point Fire, NC. Brian Evans
2. Does your department comply with NFPA 1851 PPE requirements? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes X No
 - b. Service gear Annually Yes X No
 - c. Department has a Selection Process/Program (SOP)? Yes X No
 - d. Firefighters trained and conduct inspections on PPE? Yes X no
 - e. Maintain Records of PPE? Yes X No
 - f. Department Selection, care, and maintenance policy? Yes no
3. How does your department meet the maintenance requirement of Bunker gear?
 - a. Department trained/certified members service your gear in house?
 - b. Send your gear to an Independent Service Provider (ISP)? X
 - c. Do not service gear
4. Who or what ISP services your gear? Minerva, Charlotte, NC
5. What concerns does your department have with the 10-year PPE replacement requirements? (d) Slower stations gear may be used less and in good shape in 10 years.
 - a. Cost of gear?
 - b. Ability to reduce safety risks and potential health risks for firefighters?
 - c. Monitoring gear for wear, tear, or damage?
 - d. Other Concern(s)?
6. What sections of NFPA 1851 are most important to your fire departments? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes No
 - b. Service gear Annually Yes No
 - c. Department has a Selection Process/Program (SOP)? Yes No
 - d. Firefighters trained and conduct inspections on PPE? Yes no
 - e. Maintain Records of PPE? Yes No
 - f. All of the above? X
7. Do you have a SOP or policy you can share through e-mail?

WSFD NFPA 1851 Compliance Survey for Maintenance of Bunker Gear

Date: 11/13/2014 Time: 11:15

1. What is the name of your department? Who are you? Myrtle Beach, SC. Chief Norket
2. Does your department comply with NFPA 1851 PPE requirements? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes X No Every 3 years
 - b. Service gear Annually Yes No X As needed only
 - c. Department has a Selection Process/Program (SOP)? Yes X No
 - d. Firefighters trained and conduct inspections on PPE? Yes X no
 - e. Maintain Records of PPE? Yes X No
 - f. Department Selection, care, and maintenance policy? Yes X no
3. How does your department meet the maintenance requirement of Bunker gear?
 - a. Department trained/certified members service your gear in house?
 - b. Send your gear to an Independent Service Provider (ISP)?
 - c. Do not service gear X
4. Who or what ISP services your gear? Minerva, Charlotte, NC
5. What concerns does your department have with the 10-year PPE replacement requirements? (c) Replace gear every 7 years
 - a. Cost of gear?
 - b. Ability to reduce safety risks and potential health risks for firefighters?
 - c. Monitoring gear for wear, tear, or damage?
 - d. Other Concern(s)?
6. What sections of NFPA 1851 are most important to your fire departments? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes No
 - b. Service gear Annually Yes No
 - c. Department has a Selection Process/Program (SOP)? Yes No
 - d. Firefighters trained and conduct inspections on PPE? Yes no
 - e. Maintain Records of PPE? Yes No
 - f. All of the above? X
7. Do you have a SOP or policy you can share through e-mail?

WSFD NFPA 1851 Compliance Survey for Maintenance of Bunker Gear

Date: 11/12/2014 Time: 9:14

1. What is the name of your department? Who are you? Nashville, Tenn. Brian Jones
2. Does your department comply with NFPA 1851 PPE requirements? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes X No__ Every 3 years
 - b. Service gear Annually Yes___ No X- As needed only
 - c. Department has a Selection Process/Program (SOP)? Yes X No___
 - d. Firefighters trained and conduct inspections on PPE? Yes X no___
 - e. Maintain Records of PPE? Yes_ X No___ (Image trend)
 - f. Department Selection, care, and maintenance policy? Yes X no__
3. How does your department meet the maintenance requirement of Bunker gear?
 - a. Department trained/certified members service your gear in house? X
 - b. Send your gear to an Independent Service Provider (ISP)? X
 - c. Do not service gear___
4. Who or what ISP services your gear? Lion Apparel, Philadelphia
5. What concerns does your department have with the 10-year PPE replacement requirements? (a) replace gear every 7 years
 - a. Cost of gear?
 - b. Ability to reduce safety risks and potential health risks for firefighters?
 - c. Monitoring gear for wear, tear, or damage?
 - d. Other Concern(s)?
6. What sections of NFPA 1851 are most important to your fire departments? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes___ No___
 - b. Service gear Annually Yes ___ No___
 - c. Department has a Selection Process/Program (SOP)? Yes ___ No___
 - d. Firefighters trained and conduct inspections on PPE? Yes ___ no___
 - e. Maintain Records of PPE? Yes ___ No ___
 - f. All of the above? X
7. Do you have a SOP or policy you can share through e-mail?

WSFD NFPA 1851 Compliance Survey for Maintenance of Bunker Gear

Date: 11/12/2014 Time: 4:05

1. What is the name of your department? Who are you? Orlando Fire, Supply Manager
2. Does your department comply with NFPA 1851 PPE requirements? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes X No__ Every 3 years
 - b. Service gear Annually Yes X No__ 2 years and as needed only
 - c. Department has a Selection Process/Program (SOP)? Yes X No__
 - d. Firefighters trained and conduct inspections on PPE? Yes X no__
 - e. Maintain Records of PPE? Yes X No__
 - f. Department Selection, care, and maintenance policy? Yes X no__
3. How does your department meet the maintenance requirement of Bunker gear?
 - a. Department trained/certified members service your gear in house? X (Clean only)
 - b. Send your gear to an Independent Service Provider (ISP)? X (repair only)
 - c. Do not service gear__
4. Who or what ISP services your gear? Bay Area Gear
5. What concerns does your department have with the 10-year PPE replacement requirements? (None) adhere to NFPA 1851, follow recommendations
 - a. Cost of gear?
 - b. Ability to reduce safety risks and potential health risks for firefighters?
 - c. Monitoring gear for wear, tear, or damage?
 - d. Other Concern(s)?
6. What sections of NFPA 1851 are most important to your fire departments? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes__ No__
 - b. Service gear Annually Yes __ No__
 - c. Department has a Selection Process/Program (SOP)? Yes __ No__
 - d. Firefighters trained and conduct inspections on PPE? Yes __ no__
 - e. Maintain Records of PPE? Yes __ No __
 - f. All of the above? X
7. Do you have a SOP or policy you can share through e-mail?

WSFD NFPA 1851 Compliance Survey for Maintenance of Bunker Gear

Date: 11/13/2014 Time: 9:35

1. What is the name of your department? Who are you? Philadelphia Fire,
2. Does your department comply with NFPA 1851 PPE requirements? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes X No
 - b. Service gear Annually Yes X No
 - c. Department has a Selection Process/Program (SOP)? Yes X No
 - d. Firefighters trained and conduct inspections on PPE? Yes X no
 - e. Maintain Records of PPE? Yes X No
 - f. Department Selection, care, and maintenance policy? Yes X no
3. How does your department meet the maintenance requirement of Bunker gear?
 - a. Department trained/certified members service your gear in house?
 - b. Send your gear to an Independent Service Provider (ISP)? X
 - c. Do not service gear
4. Who or what ISP services your gear? 911 Safety, Conshohocken, Pa.
5. What concerns does your department have with the 10-year PPE replacement requirements? (No concern: Bunker gear does not last 10 years)
 - a. Cost of gear?
 - b. Ability to reduce safety risks and potential health risks for firefighters?
 - c. Monitoring gear for wear, tear, or damage?
 - d. Other Concern(s)?
6. What sections of NFPA 1851 are most important to your fire departments? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes No
 - b. Service gear Annually Yes No
 - c. Department has a Selection Process/Program (SOP)? Yes No
 - d. Firefighters trained and conduct inspections on PPE? Yes no
 - e. Maintain Records of PPE? Yes No
 - f. All of the above? X
7. Do you have a SOP or policy you can share through e-mail?

WSFD NFPA 1851 Compliance Survey for Maintenance of Bunker Gear

Date: 11/13/2014 Time: 2:55

1. What is the name of your department? Who are you? Phoenix Fire, Ar. Lofe Ribodale
2. Does your department comply with NFPA 1851 PPE requirements? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes X No__
 - b. Service gear annually Yes X No__
 - c. Department has a Selection Process/Program (SOP)? Yes X No__
 - d. Firefighters trained and conduct inspections on PPE? Yes X no__
 - e. Maintain Records of PPE? Yes X No__
 - f. Department Selection, care, and maintenance policy? Yes X no__
3. How does your department meet the maintenance requirement of Bunker gear?
 - a. Department trained/certified members service your gear in house? X
 - b. Send your gear to an Independent Service Provider (ISP)? X
 - c. Do not service gear__
4. Who or what ISP services your gear? Bid out annually
5. What concerns does your department have with the 10-year PPE replacement requirements? (c)
 - a. Cost of gear?
 - b. Ability to reduce safety risks and potential health risks for firefighters?
 - c. Monitoring gear for wear, tear, or damage?
 - d. Other Concern(s)?
6. What sections of NFPA 1851 are most important to your fire departments? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes__ No__
 - b. Service gear Annually Yes __ No__
 - c. Department has a Selection Process/Program (SOP)? Yes __ No__
 - d. Firefighters trained and conduct inspections on PPE? Yes __ no__
 - e. Maintain Records of PPE? Yes __ No __
 - f. All of the above? X
7. Do you have a SOP or policy you can share through e-mail?

WSFD NFPA 1851 Compliance Survey for Maintenance of Bunker Gear

Date: 11/12/2014 Time: 9:00

1. What is the name of your department? Who are you? Raleigh Fire, NC Rob Horton
2. Does your department comply with NFPA 1851 PPE requirements? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes X No
 - b. Service gear Annually Yes X No
 - c. Department has a Selection Process/Program (SOP)? Yes X No
 - d. Firefighters trained and conduct inspections on PPE? Yes X no
 - e. Maintain Records of PPE? Yes X No
 - f. Department Selection, care, and maintenance policy? Yes X no
3. How does your department meet the maintenance requirement of Bunker gear?
 - a. Department trained/certified members service your gear in house?
 - b. Send your gear to an Independent Service Provider (ISP)? X
 - c. Do not service gear
4. Who or what ISP services your gear? Minerva, Charlotte, NC or send back to Honeywell
5. What concerns does your department have with the 10-year PPE replacement requirements? (c) Some gear does not need to be replaced in 10 years
 - a. Cost of gear?
 - b. Ability to reduce safety risks and potential health risks for firefighters?
 - c. Monitoring gear for wear, tear, or damage?
 - d. Other Concern(s)?
6. What sections of NFPA 1851 are most important to your fire departments? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes No
 - b. Service gear Annually Yes No
 - c. Department has a Selection Process/Program (SOP)? Yes No
 - d. Firefighters trained and conduct inspections on PPE? Yes no
 - e. Maintain Records of PPE? Yes No
 - f. All of the above? X
7. Do you have a SOP or policy you can share through e-mail? No

WSFD NFPA 1851 Compliance Survey for Maintenance of Bunker Gear

Date: 11/12/2014 Time: 9:45

1. What is the name of your department? Who are you? Rocky Mount Fire, NC, Josh Malinowski
2. Does your department comply with NFPA 1851 PPE requirements? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes X No
 - b. Service gear Annually Yes X No Committee
 - c. Department has a Selection Process/Program (SOP)? Yes X No
 - d. Firefighters trained and conduct inspections on PPE? Yes X no
 - e. Maintain Records of PPE? Yes X No
 - f. Department Selection, care, and maintenance policy? Yes X no
3. How does your department meet the maintenance requirement of Bunker gear?
 - a. Department trained/certified members service your gear in house?
 - b. Send your gear to an Independent Service Provider (ISP)? X
 - c. Do not service gear
4. Who or what ISP services your gear? Gloves, Inc.
5. What concerns does your department have with the 10-year PPE replacement requirements? (b)
 - a. Cost of gear?
 - b. Ability to reduce safety risks and potential health risks for firefighters?
 - c. Monitoring gear for wear, tear, or damage?
 - d. Other Concern(s)?
6. What sections of NFPA 1851 are most important to your fire departments? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes No
 - b. Service gear Annually Yes No
 - c. Department has a Selection Process/Program (SOP)? Yes No
 - d. Firefighters trained and conduct inspections on PPE? Yes No
 - e. Maintain Records of PPE? Yes No
 - f. All of the above? X
7. Do you have a SOP or policy you can share through e-mail? Yes

WSFD NFPA 1851 Compliance Survey for Maintenance of Bunker Gear

Date: 11/11/2014 Time: 10:57

1. What is the name of your department? Who are you? Salisbury Fire, NC, Battalion Chief Morris
2. Does your department comply with NFPA 1851 PPE requirements? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes X No__ (rotate 5 years)
 - b. Service gear Annually Yes X No __
 - c. Department has a Selection Process/Program (SOP)? Yes X No__
 - d. Firefighters trained and conduct inspections on PPE? Yes X no__
 - e. Maintain Records of PPE? Yes X No__
 - f. Department Selection, care, and maintenance policy? Yes X no__
3. How does your department meet the maintenance requirement of Bunker gear?
 - a. Department trained/certified members service your gear in house? __
 - b. Send your gear to an Independent Service Provider (ISP)? X
 - c. Do not service gear__
4. Who or what ISP services your gear? Minerva, Charlotte, NC
5. What concerns does your department have with the 10-year PPE replacement requirements? (d) Some gear still good after 10 years. Department rotates every 5 years.
 - a. Cost of gear?
 - b. Ability to reduce safety risks and potential health risks for firefighters?
 - c. Monitoring gear for wear, tear, or damage?
 - d. Other Concern(s)?
6. What sections of NFPA 1851 are most important to your fire departments? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes__ No__
 - b. Service gear Annually Yes __ No__
 - c. Department has a Selection Process/Program (SOP)? Yes __ No__
 - d. Firefighters trained and conduct inspections on PPE? Yes __ no__
 - e. Maintain Records of PPE? Yes __ No __
 - f. All of the above? X
7. Do you have a SOP or policy you can share through e-mail? Yes

WSFD NFPA 1851 Compliance Survey for Maintenance of Bunker Gear

Date: 11/11/2014 Time: 11:15

1. What is the name of your department? Who are you? Wilson Fire, NC, Chief Godwin
2. Does your department comply with NFPA 1851 PPE requirements? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes X No__ 5 year replacement
 - b. Service gear Annually Yes X No__
 - c. Department has a Selection Process/Program (SOP)? Yes X No__
 - d. Firefighters trained and conduct inspections on PPE? Yes X no__
 - e. Maintain Records of PPE? Yes X No__
 - f. Department Selection, care, and maintenance policy? Yes X no__
3. How does your department meet the maintenance requirement of Bunker gear?
 - a. Department trained/certified members service your gear in house?__
 - b. Send your gear to an Independent Service Provider (ISP)? X
 - c. Do not service gear__
4. Who or what ISP services your gear? Gloves, Inc.
5. What concerns does your department have with the 10-year PPE replacement requirements? (a) we replace gear every 5 years
 - a. Cost of gear?
 - b. Ability to reduce safety risks and potential health risks for firefighters?
 - c. Monitoring gear for wear, tear, or damage?
 - d. Other Concern(s)?
6. What sections of NFPA 1851 are most important to your fire departments? (Check all that apply)
 - a. Meets 10 year retirement requirement? Yes__ No__
 - b. Service gear Annually Yes__ No__
 - c. Department has a Selection Process/Program (SOP)? Yes__ No__
 - d. Firefighters trained and conduct inspections on PPE? Yes__ no__
 - e. Maintain Records of PPE? Yes__ No__
 - f. All of the above? X
7. Do you have a SOP or policy you can share through e-mail? Yes

Winston-Salem 1851 Compliance Survey for Maintenance of Bunker Gear Summary

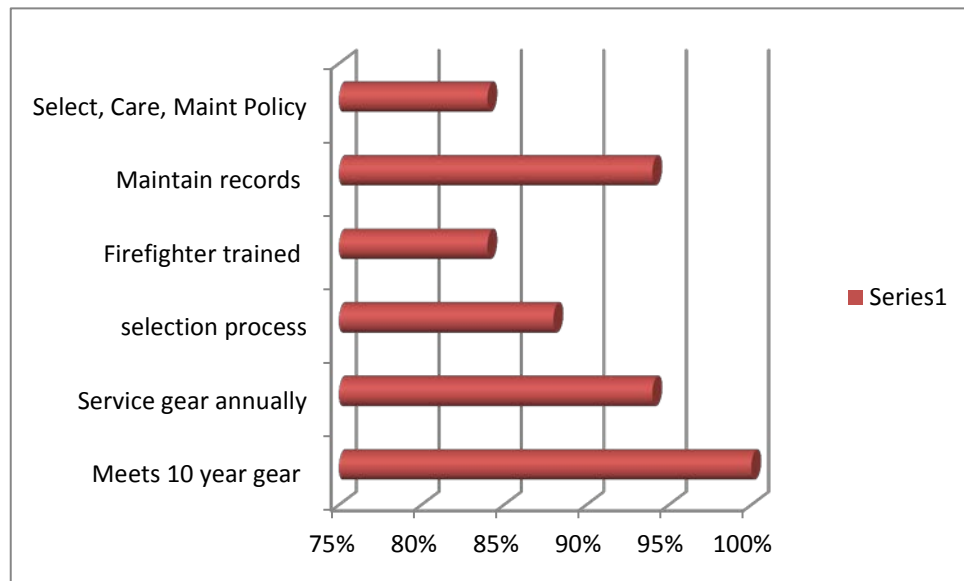
2. Does your department comply with NFPA 1851 PPE requirements? (Check all that apply)

- a. Meets 10 year gear retirement: Yes 19 No 0
 b. Service gear annually: Yes 18 No 1
 c. Department has a selection process: Yes 17 No 2
 d. Firefighter trained conduct inspections on PPE: Yes 16 No 3
 e. Maintain records of PPE: Yes 18 No 1
 f. SCAM Policy: Yes 16 No 3

Total Respondents 19: Total Yes Responses: 105 Total possible Yes Responses 114

Criteria	%Response	Yes	No	%Response	Respondents	%Total
Meets 10 year gear	100%	19	0	0	19	
Service gear annually	94%	18	1	0.05%	19	
selection process	88%	17	2	0.11%	19	
Firefighter trained	84%	16	3	0.16%	19	
Maintain records	94%	18	1	0.05%	19	
Select, Care, Maint Policy	84%	16	3	0.16%	19	
Total		104			114	91%

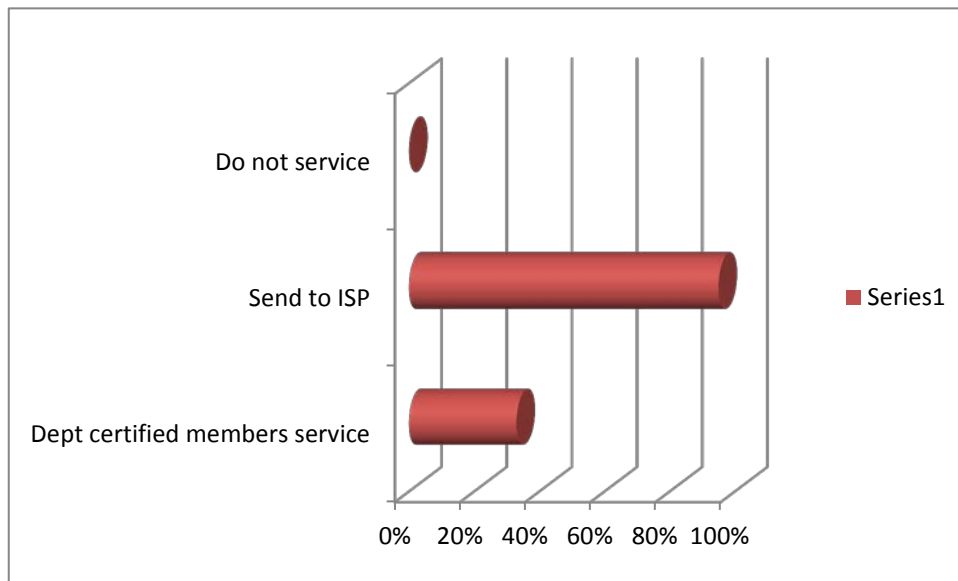
% Yes Respondents



3. How does your department meet the maintenance requirement of bunker gear?

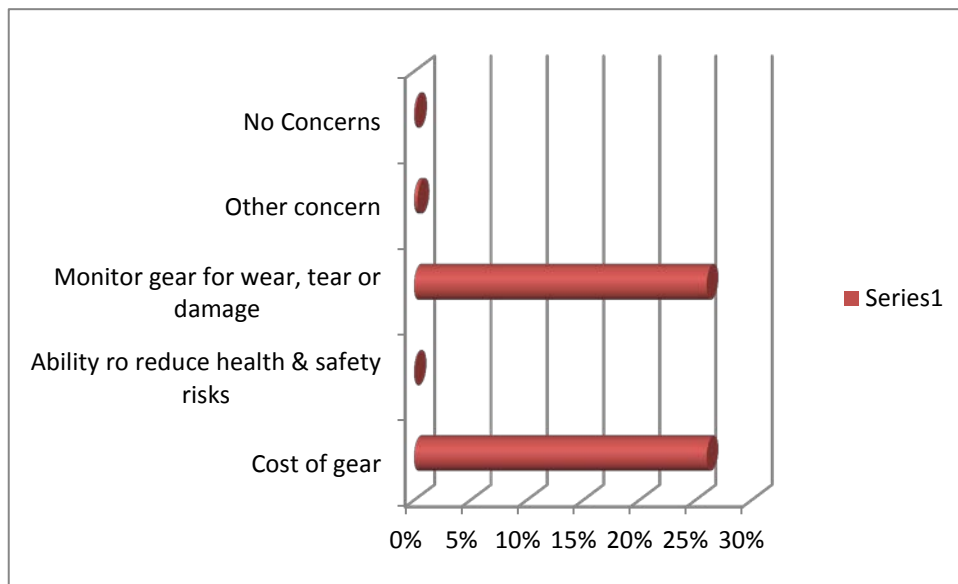
Criteria	% total	response	Respondents
Dept certified members service	33%	6	19
Send to ISP	95%	18	19
Do not service	0.05%	1	19

How department services gear



5. What concerns does your department have with the 10-year PPE Replacement requirement?

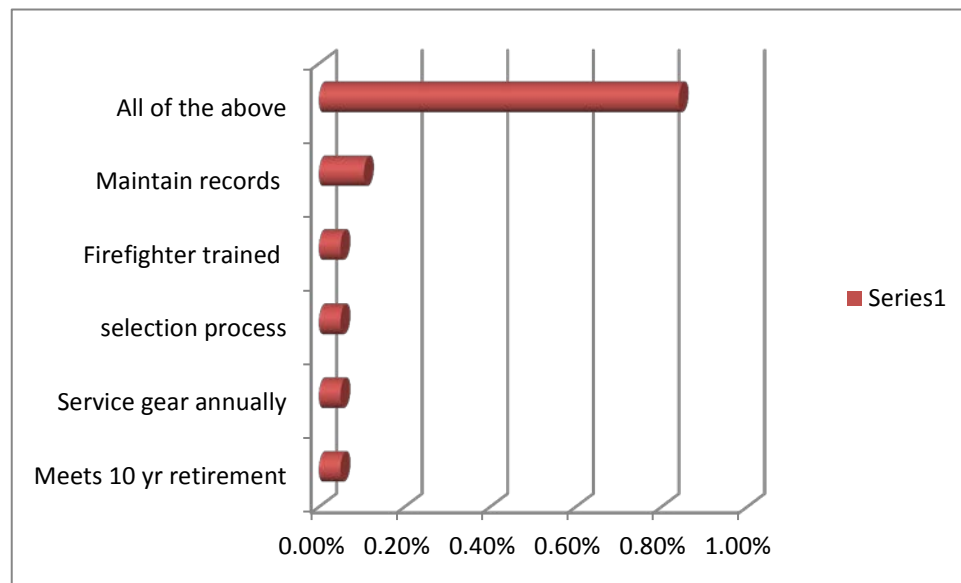
Criteria	% Response	Response	Respondents
Cost of gear	26%	5	19
Ability to reduce health & safety risks	0.05%	1	19
Monitor gear for wear, tear or damage	26%	5	19
Other concern	0.32%	6	19
No Concerns	0.11%	2	19



6. What Sections of NFPA are Most Important to your fire department?

Criteria	%Response	Yes	%Response	No	Respondents
Meets 10 yr retirement	0.05%	1	0		19
Service gear annually	0.05%	1	0.21%	4	19
selection process	0.05%	1	0		19
Firefighter trained	0.05%	1	0.11%	2	19
Maintain records	0.11%	2	0		19
All of the above	0.84%	16	0.00%		19

Most Important NFPA 1851 sections



Appendix B

Fire Department Manufacturer/Vendor Survey

The department is currently reviewing its Turnout gear selection, care, and maintenance program. Please ask our vendors the following questions to determine how departments are specifying bunker gear.

1. What is your name and your company's name?
2. Is it okay to use your responses in a research project that may be published? Yes____
No____
3. What bunker gear brand do you sell? _____
4. Do departments that purchase your PPE to comply with the NFPA 1851 10 year gear retirement?

Yes____ No____
5. Do you sell sets that are designated by the purchasing agency as a 2nd set of gear?

Yes____ No____
6. Do departments that purchase your gear follow the NFPA 1851 annual gear advanced check requirement? Yes____ No____
7. Do departments that purchase your gear follow the NFPA 1851 3 year PPE liner test as stated in chapter 12? Yes____ No____
If not, what do they tend to do in meeting this requirement?
8. Is your agency a verified Independent Service Provider (ISP)? Yes____ No____
If not, what ISP services your gear?
9. Has the focus on NFPA 1851 improved firefighter awareness on maintenance and care?
Yes____ No____
Comments:
10. Do Departments that buy your gear feel that NFPA 1851 has improved firefighter safety?
Yes____ No____

Date:

Time:

Interviewer:

Fire Department Manufacturer/Vendor Survey

The department is currently reviewing its Turnout gear selection, care, and maintenance program. Please ask our vendors the following questions to determine how departments are specifying bunker gear.

1. What is your name and your company's name? Globe
2. Is it okay to use your responses in a research project that may be published? Yes X
No
3. What bunker gear brand do you sell? Carnes RSI, Reaction, Globe extreme, (GXL, GXY)
4. Do departments that purchase your PPE to comply with the NFPA 1851 10 year gear retirement?

Yes No Don't know X
5. Do you sell sets that are designated by the purchasing agency as a 2nd set of gear?

Yes X No
6. Do departments that purchase your gear follow the NFPA 1851 annual gear advanced check requirement? Yes No Don't know X
7. Do departments that purchase your gear follow the NFPA 1851 3 year PPE liner test as stated in chapter 12? Yes No Don't Know X
If not, what do they tend to do in meeting this requirement? Don't know
8. Is your agency a verified Independent Service Provider (ISP)? Yes No X
If not, what ISP services your gear?
9. Has the focus on NFPA 1851 improved firefighter awareness on maintenance and care? Yes X No In addition, manual for care of gear is included with purchase
Comments:
10. Do Departments that buy your gear feel that NFPA 1851 has improved firefighter safety? Yes X No Standard has leveled playing field-supports employee needs and department needs.

Date: 10/29/2014

Time: 1:40 PM

Person Interviewed: Stacie Whitinburg

Fire Department Manufacturer/Vendor Survey

The department is currently reviewing its Turnout gear selection, care, and maintenance program. Please ask our vendors the following questions to determine how departments are specifying bunker gear.

1. What is your name and your company's name? Honeywell Manufacturing
2. Is it okay to use your responses in a research project that may be published? Yes X
No____
3. What bunker gear brand do you sell? Morning Pride, Carnes RSI, Reaction, Globe extreme, (GXL, GXY
4. Do departments that purchase your PPE to comply with the NFPA 1851 10 year gear retirement?

Yes X No____ Don't know (They should)
5. Do you sell sets that are designated by the purchasing agency as a 2nd set of gear?

Yes X No____
6. Do departments that purchase your gear follow the NFPA 1851 annual gear advanced check requirement? Yes X No____ Don't know (We assume so.)
7. Do departments that purchase your gear follow the NFPA 1851 3 year PPE liner test as stated in chapter 12? Yes X No____ Don't Know ____ (We assume so.)
If not, what do they tend to do in meeting this requirement? Don't know
8. Is your agency a verified Independent Service Provider (ISP)? Yes X No____
If not, what ISP services your gear? None in particular- Any that are certified
9. Has the focus on NFPA 1851 improved firefighter awareness on maintenance and care?
Yes X No____
Comments: (Noted the company's "wash your hood Sunday program".)
10. Do Departments that buy your gear feel that NFPA 1851 has improved firefighter safety?
Yes X No____ Don't know X

Date: 10/29/2014

Time: 2:20 PM

Person Interviewed: Niki Carter

Fire Department Manufacturer/Vendor Survey

The department is currently reviewing its Turnout gear selection, care, and maintenance program. Please ask our vendors the following questions to determine how departments are specifying bunker gear.

1. What is your name and your company's name? Lion Apparel
2. Is it okay to use your responses in a research project that may be published? Yes X
No ____
3. What bunker gear brand do you sell? Janesville
4. Do departments that purchase your PPE to comply with the NFPA 1851 10 year gear retirement?

Yes X No ____ Don't know ____
5. Do you sell sets that are designated by the purchasing agency as a 2nd set of gear?

Yes X No ____
6. Do departments that purchase your gear follow the NFPA 1851 annual gear advanced check requirement? Yes X No ____ Don't know ____
7. Do departments that purchase your gear follow the NFPA 1851 3 year PPE liner test as stated in chapter 12? Yes X No ____ Don't Know ____
If not, what do they tend to do in meeting this requirement? Don't know
8. Is your agency a verified Independent Service Provider (ISP)? Yes X No ____
If not, what ISP services your gear?
9. Has the focus on NFPA 1851 improved firefighter awareness on maintenance and care? Yes X No ____ In addition, manual for care of gear is included with purchase
Comments:
10. Do Departments that buy your gear feel that NFPA 1851 has improved firefighter safety? Yes X No ____ They believe it keeps them up-to-date with gear features and capability.

Date: 10/29/2014

Time: 2:40 PM

Person Interviewed: Jay Salyers

Fire Department Manufacturer/Vendor Survey

The department is currently reviewing its Turnout gear selection, care, and maintenance program. Please ask our vendors the following questions to determine how departments are specifying bunker gear.

1. What is your name and your company's name? Richochet
2. Is it okay to use your responses in a research project that may be published? Yes X
No____
3. What bunker gear brand do you sell? Richochet-Maximum mobility
4. Do departments that purchase your PPE to comply with the NFPA 1851 10 year gear retirement?

Yes X No____ Don't know____
5. Do you sell sets that are designated by the purchasing agency as a 2nd set of gear?

Yes X No____
6. Do departments that purchase your gear follow the NFPA 1851 annual gear advanced check requirement? Yes____ No____ Don't know X
7. Do departments that purchase your gear follow the NFPA 1851 3 year PPE liner test as stated in chapter 12? Yes____ No____ Don't Know X
If not, what do they tend to do in meeting this requirement? Don't know
8. Is your agency a verified Independent Service Provider (ISP)? Yes____ No X
If not, what ISP services your gear? None in particular- Any that are certified
9. Has the focus on NFPA 1851 improved firefighter awareness on maintenance and care?
Yes X No____
Comments:
10. Do Departments that buy your gear feel that NFPA 1851 has improved firefighter safety?
Yes X No____

Date: 10/29/2014

Time: 1:50 PM

Person Interviewed: Peter Askey

Appendix C

Fire Department Compliance with NFPA 1851

1. What type fire department do you work in?

- ☒ What type fire department do you work in? Paid/Municipal
- ☒ Paid/Volunteer
- ☒ Combination
- ☒ Volunteer

2. To what extent does your agency comply with NFPA 1851?

- ☒ To what extent does your agency comply with NFPA 1851? Department meets all requirements
- ☒ Department meets some requirements
- ☒ Department meets none of the requirements
- ☒ Don't know

3. Does your agency meet the following requirements?

- ☐ Does your agency meet the following requirements: 10 year expiration for bunker gear
- ☐ 10 year expiration for helmets
- ☐ 10 year expiration for boots
- ☐ 10 year requirement for gloves
- ☐ 10 year requirement for hoods

4. To what extent does your department meet the maintenance requirement?

- ☒ To what extent does your department meet the maintenance requirement? Departments meets 3 year requirement
- ☒ Department meets annual requirement after 3 years
- ☒ do not meet 3 year requirement
- ☒ service gear only when needed

Other (please specify)

5. How many sets of gear do you issue your members?

- ☐ How many sets of gear do you issue your members? Issue 1 set of gear (full ensemble)
- ☐ Issue 2 sets of gear (full ensemble)
- ☐ Issue 2nd set of pants and coats only

6. How many staff do you use to maintain PPE?

- ☐ How many staff do you use to maintain PPE? one employees
- ☐ Two employees
- ☐ Three employees
- ☐ More than three employees

Other (please specify)

7. Do your employees see this requirement as valuable?

- ☐ Do your employees see this requirement as valuable? Very important
- ☐ somewhat important
- ☐ not important
- ☐ don't know

Other (please specify)

8. How many people do you issue gear to in your department?

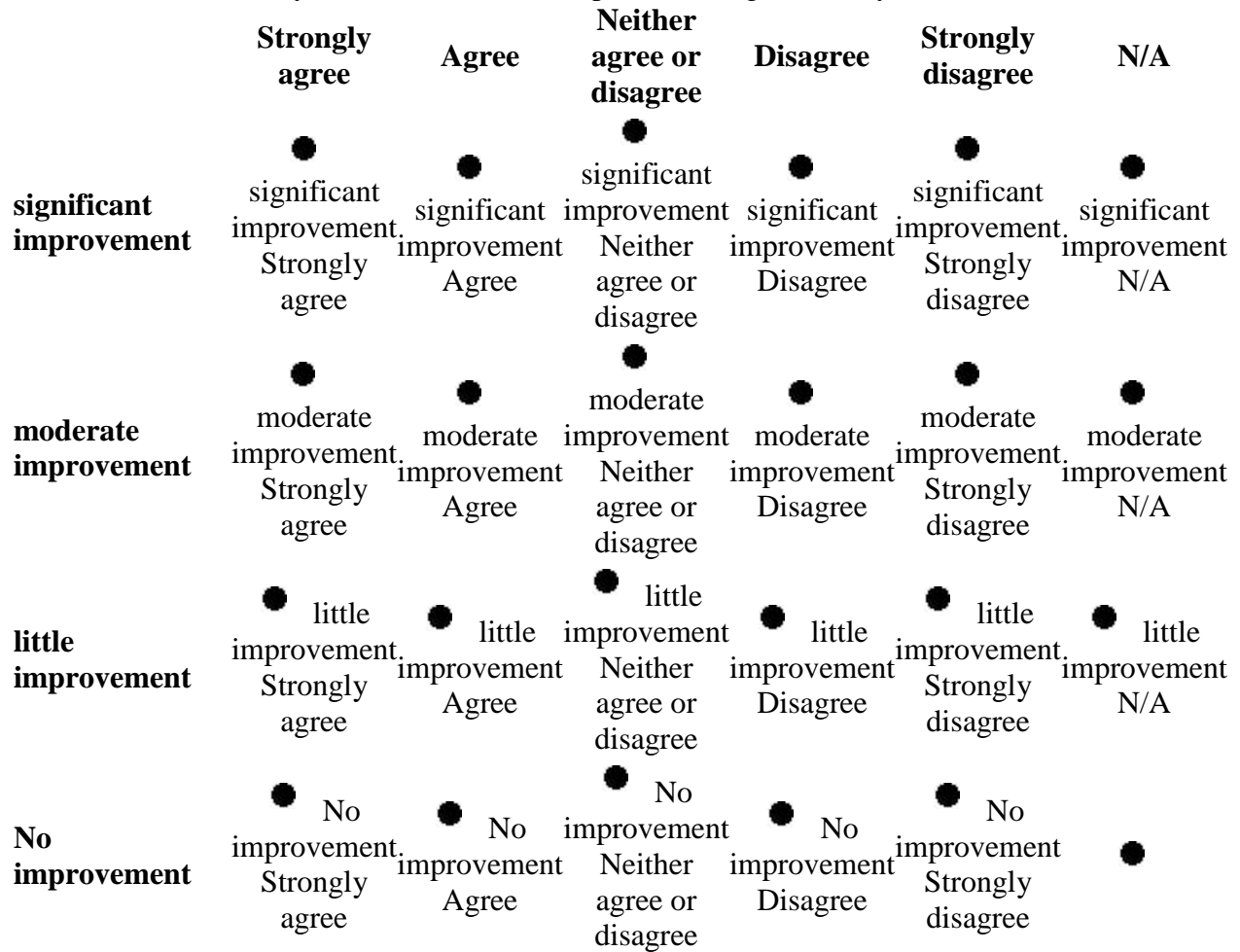
- ☐ how many people do you issue gear to in your department? 10 to 50
- ☐ 51 to 100
- ☐ 101 to 150
- ☐ 151 to 200
- ☐ 201 to 250
- ☐ more than 250

9. What do you budget for gear annually?

- ☐ What do you budget for gear annually? \$5000 to \$50,000
- ☐ \$50,000 to \$100,000
- ☐ \$100,000 to \$150,000
- ☐ \$150,000 to \$200,000

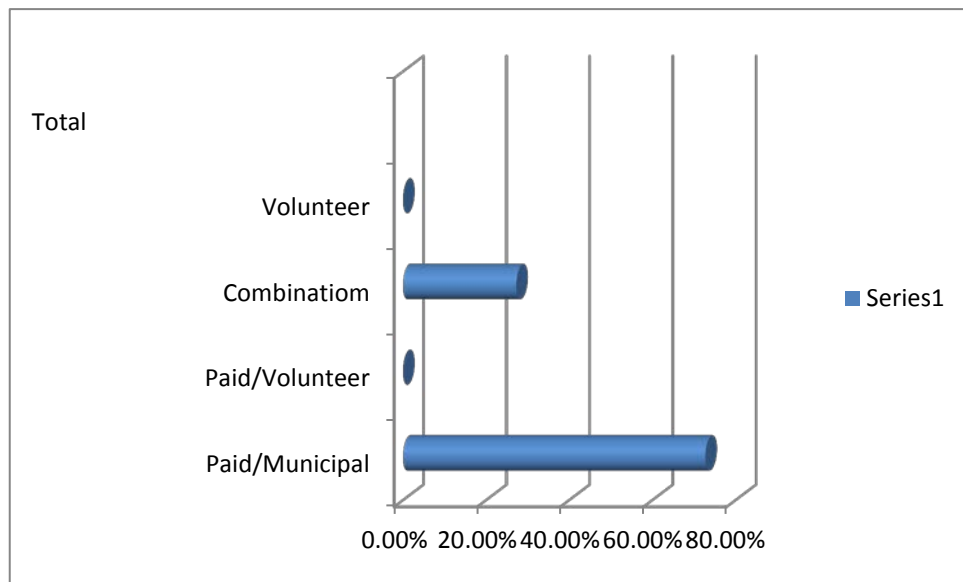
Other (please specify)

10. To what extent do you feel NFPA 1851 improves firefighter safety?



1. What type fire department do you work in?

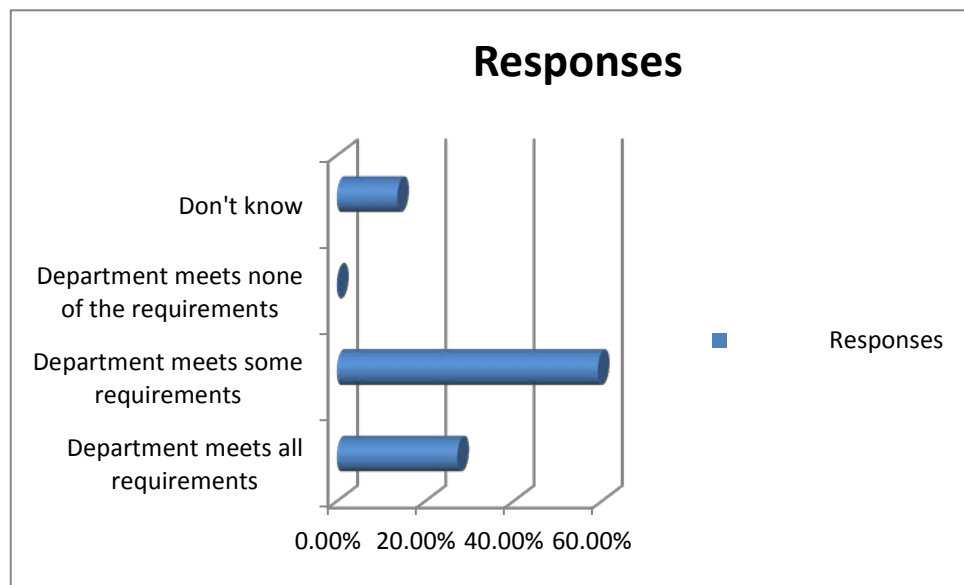
Answer column	Responses	respondents
Paid/Municipal	72.73%	16
Paid/Volunteer	0.00%	0
Combination	27.27%	6
Volunteer	0.00%	0
Total		22



2. To what extent does your agency comply with NFPA 1851?

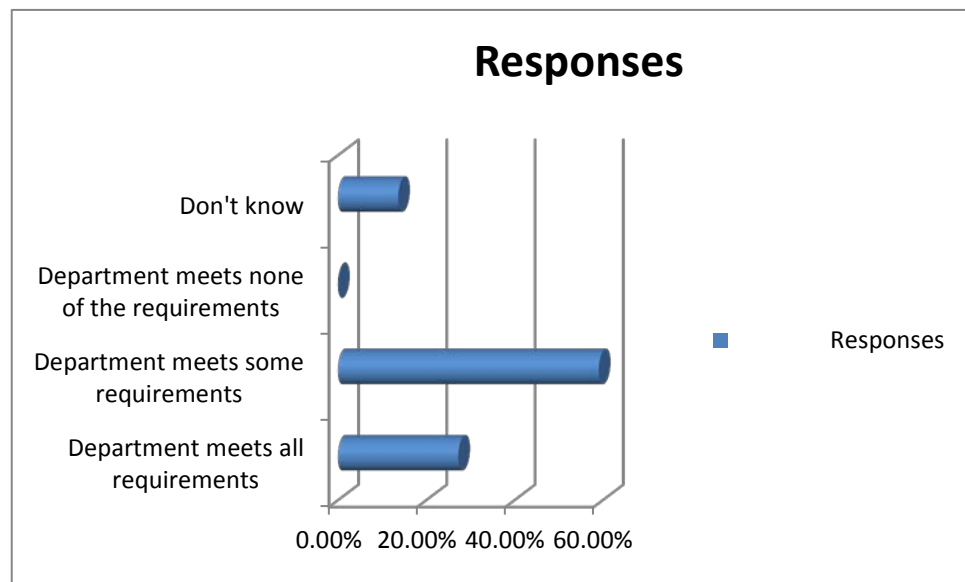
22 Responses

Answer Choices	Responses	Respondents
Department meets all requirements	27.27%	6
Department meets some requirements	59.09%	13
Department meets none of the requirements	0.00%	0
Don't know	13.64%	3
		22



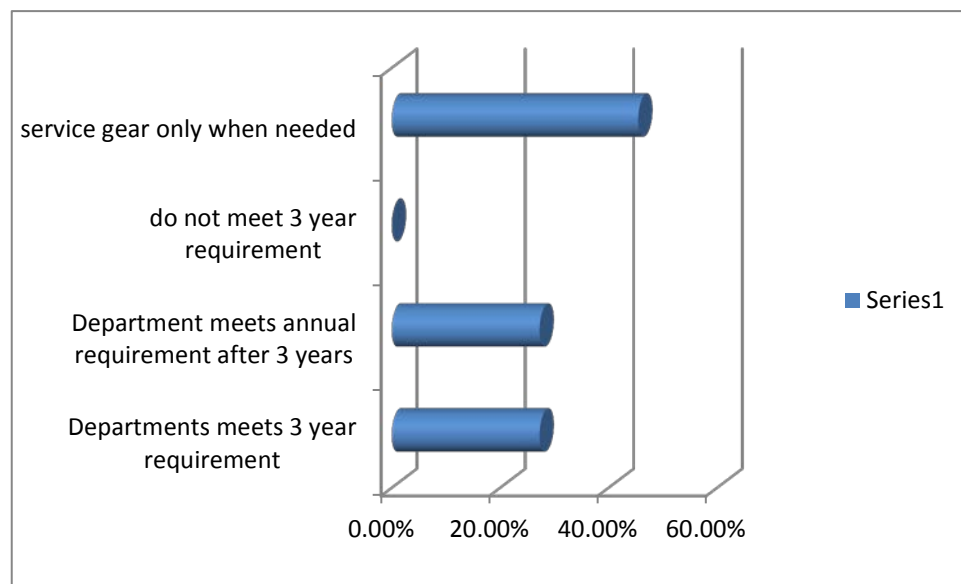
3. Does your agency meet the following requirements?

Answer Choices	Responses	Respondents
Department meets all requirements	27.27%	6
Department meets some requirements	59.09%	13
Department meets none of the requirements	0.00%	0
Don't know	13.64%	3
		22



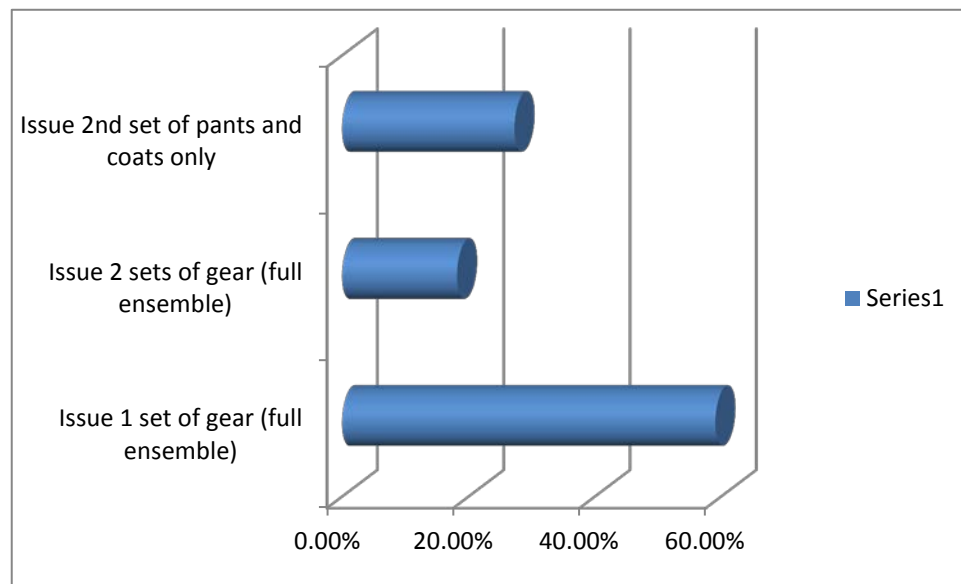
4. To what extent does your department meet the maintenance requirement?

Answer Choices	Responses	Respondents
Departments meets 3 year requirement	27.27%	6
Department meets annual requirement after 3 years	27.27%	6
do not meet 3 year requirement	0.00%	0
service gear only when needed	45.45%	10
Total		22



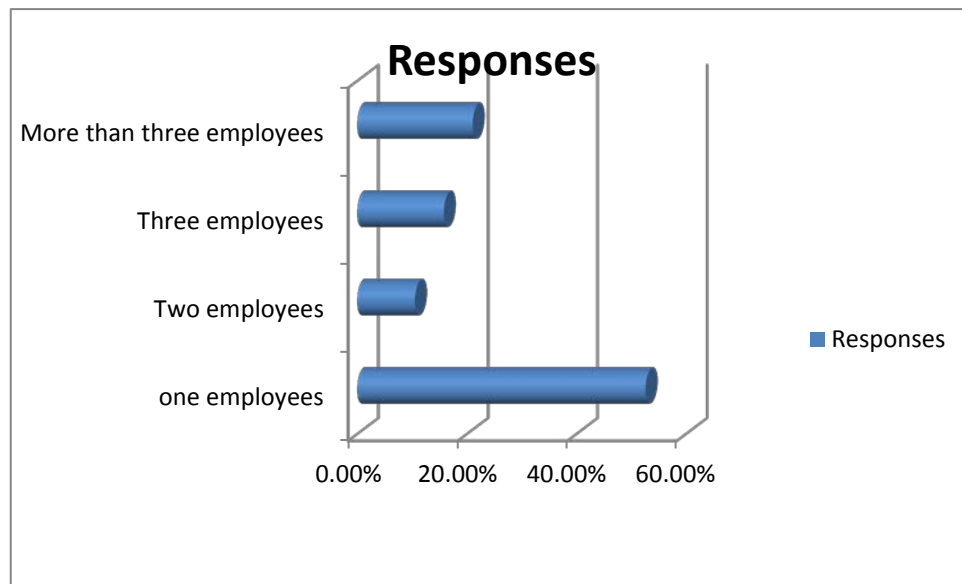
5. How many sets of gear do you issue your members?

Answer Choices	Responses	Respondents
Issue 1 set of gear (full ensemble)	59.09%	13
Issue 2 sets of gear (full ensemble)	18.18%	4
Issue 2nd set of pants and coats only	27.27%	6
Total		23



6. How many staff do you use to maintain PPE?

Answer Choices	Responses	Respondents
one employees	52.63%	10
Two employees	10.53%	2
Three employees	15.79%	3
More than three employees	21.05%	4
Total		19



Showing 4 responses

We test and clean in house, sub out all repairs

9/18/2014 11:39 PM

Two that run all employees help

9/17/2014 3:47 PM

On duty personnel wash PPE. Repairs are brought to outside vendor.

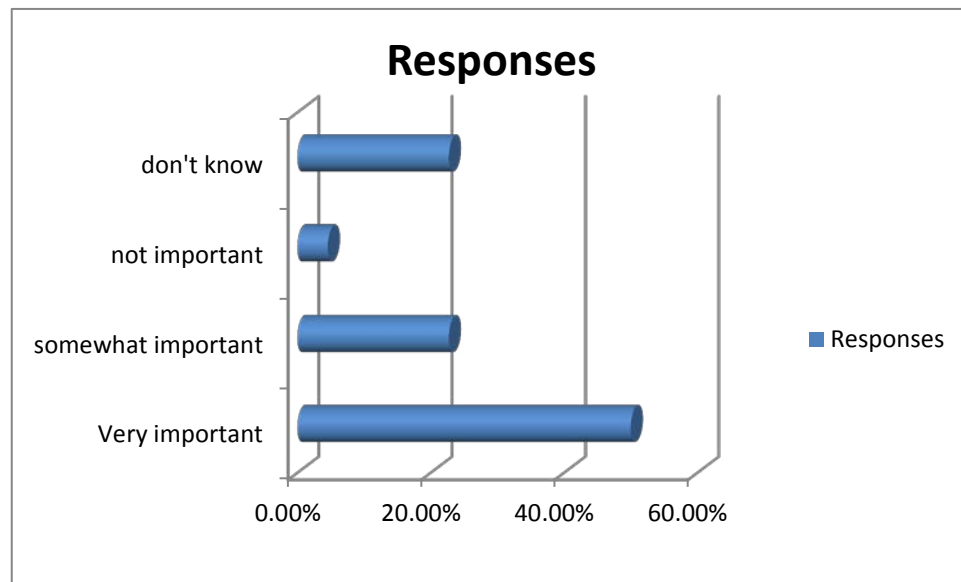
9/17/2014 3:38 PM

A shift captain and his/her company of 4 others

9/11/2014 4:27 PM

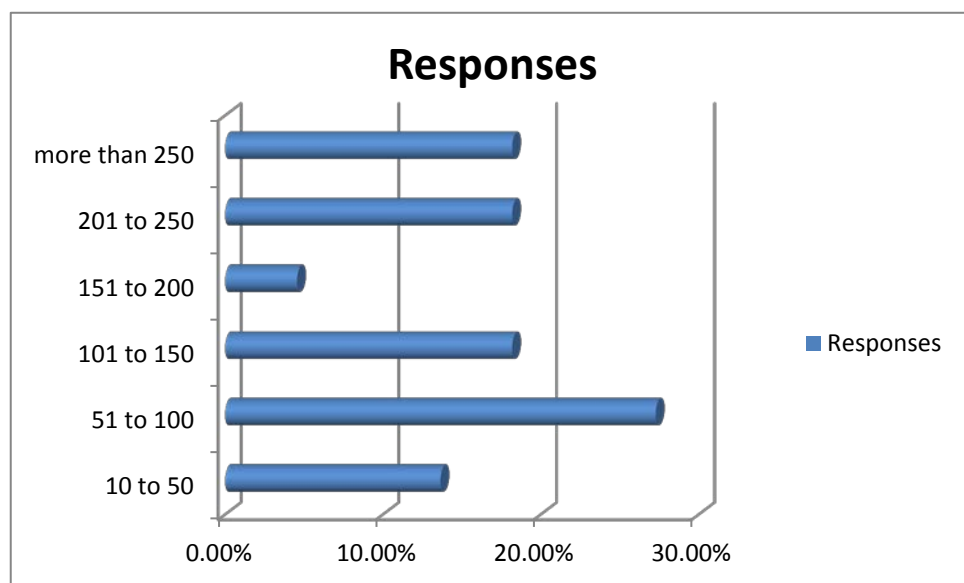
7. Do your employees see this requirement as valuable?

Answer Choices	Responses	Respondents
Very important	50.00%	11
somewhat important	22.73%	5
not important	4.55%	1
don't know	22.73%	5
Total		22



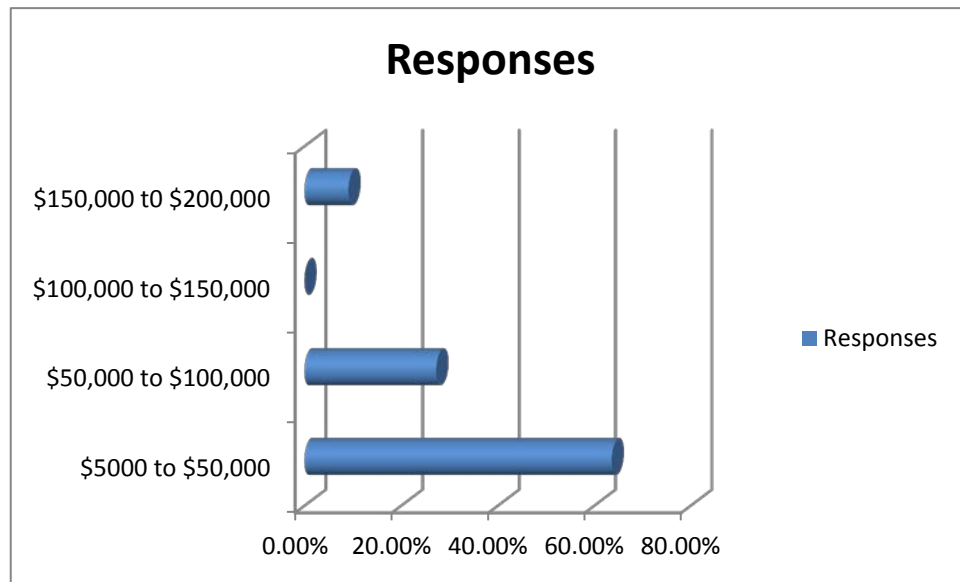
8. How many people do you issue gear to in your department?

Answer Choices	Responses	Respondents
10 to 50	13.64%	3
51 to 100	27.27%	6
101 to 150	18.18%	4
151 to 200	4.55%	1
201 to 250	18.18%	4
more than 250	18.18%	4
Total		22



9. What do you budget for gear annually?

Answer Choices	Responses	Respondents
\$5000 to \$50,000	63.64%	14
\$50,000 to \$100,000	27.27%	6
\$100,000 to \$150,000	0.00%	0
\$150,000 to \$200,000	9.09%	2
Total		22



1 Million Annually

9/23/2014 4:30 PM

Unknown but chose 50-100k since

9/23/2014 3:48 PM

Which has begun falling short of actual needs?

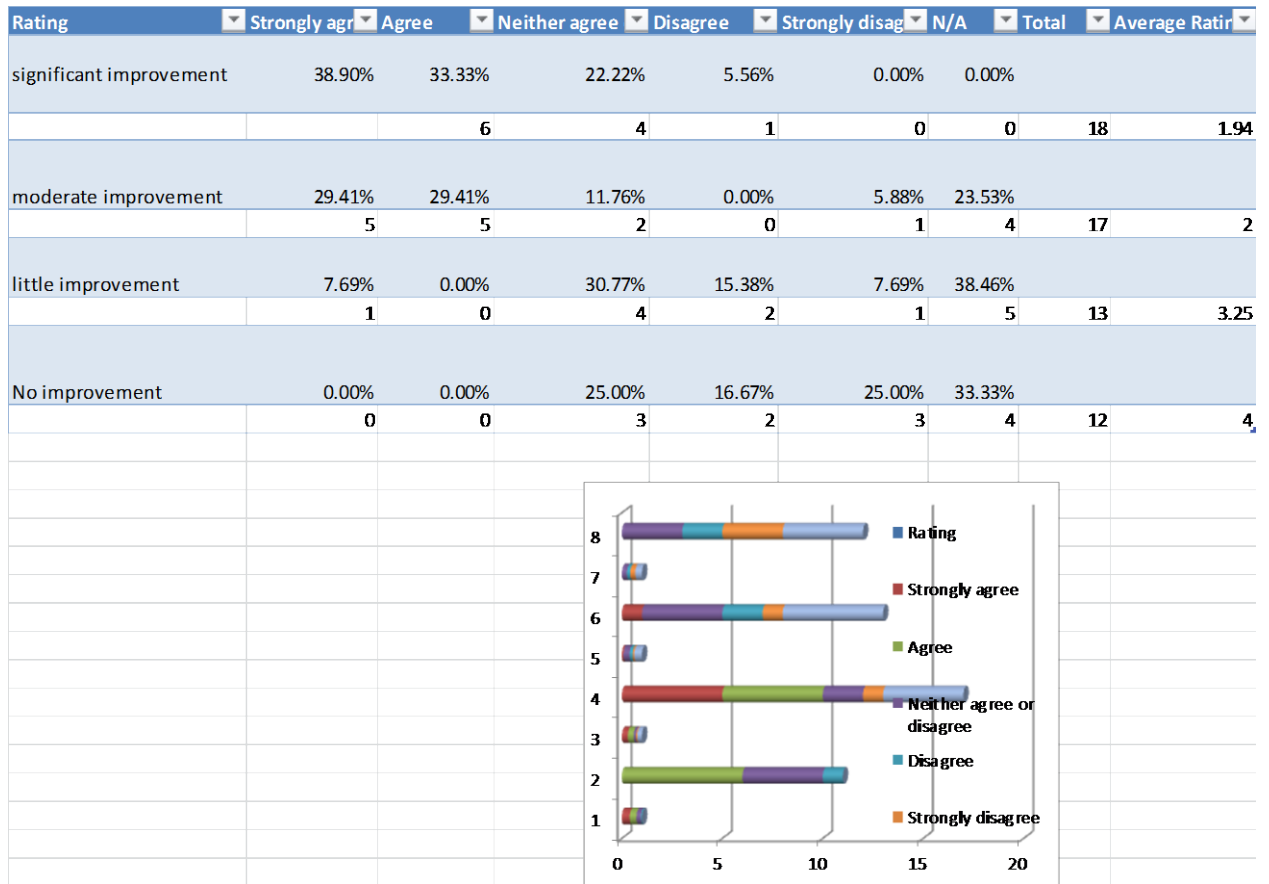
9/22/2014 9:28 AM

15000

9/18/2014 11:39 PM

Unknown

10. To what extent do you feel NFPA 1851 improves firefighter safety?



Appendix D

Fire Department Independent Service Provider Survey

The department is currently reviewing its Turnout gear selection, care, and maintenance program. Please ask the ISPs the following questions to determine how departments are servicing bunker gear.

1. What is your name and your company's name?
2. Is it okay to use your responses in a research project that may be published? Yes____
No____
3. What bunker gear brand do you service? _____
4. Do departments that you service comply with the NFPA 1851 10 year gear retirement?
Yes ____No____
5. Do you service sets that are designated by the purchasing agency as a 2nd set of gear?
Yes ____No____
6. Do departments that you service follow the NFPA 1851 annual gear advanced check requirement? Yes ____No____
7. Do departments that you service follow NFPA 1851 3 year PPE liner test as stated in chapter 12? Yes ____No____
If not, what do they tend to do in meeting this requirement?
8. Is your agency a verified Independent Service Provider (ISP)? Yes____ No____
If not, what ISP services your gear?
9. Has the focus on NFPA 1851 improved firefighter awareness on maintenance and care?
Yes____ No____
Comments:
10. Do Departments that you service feel that NFPA 1851 has improved firefighter safety?
Yes ____No____

Date:

Time:

Representative:

Fire Department Independent Service Provider Survey

The department is currently reviewing its Turnout gear selection, care, and maintenance program. Please ask the ISPs the following questions to determine how departments are servicing bunker gear.

1. What is your name and your company's name? Done Right
2. Is it okay to use your responses in a research project that may be published? Yes X
No_____
3. What bunker gear brand do you service? All
4. Do departments that you service comply with the NFPA 1851 10 year gear retirement?
Yes X No_____
5. Do you service sets that are designated by the purchasing agency as a 2nd set of gear?
Yes X No_____
6. Do departments that you service follow the NFPA 1851 annual gear advanced check requirement? Yes X No_____
7. Do departments that you service follow the NFPA 1851 3 year PPE liner test as stated in chapter 12? Yes X No_____
- If not, what do they tend to do in meeting this requirement?
8. Is your agency a verified Independent Service Provider (ISP)? Yes X No_____
- If not, what ISP services your gear?
9. Has the focus on NFPA 1851 improved firefighter awareness on maintenance and care?
Yes X No_____
- Comments:
10. Do Departments that you service gear feel that NFPA 1851 has improved firefighter safety?
Yes X No_____

Date: 11-24-2014

Time: 12:25

Representative: Terry

Fire Department Independent Service Provider Survey

The department is currently reviewing its Turnout gear selection, care, and maintenance program. Please ask our vendors the following questions to determine how departments are specifying bunker gear.

1. What is your name and your company's name? Gear Cleaning Solutions
2. Is it okay to use your responses in a research project that may be published? Yes X
No _____
3. What bunker gear brand do you service? Fire/All
4. Do departments that you service comply with the NFPA 1851 10 year gear retirement?
Yes X No _____
5. Do you service sets that are designated by the purchasing agency as a 2nd set of gear?
Yes X No _____
6. Do departments that you service follow the NFPA 1851 annual gear advanced check requirement? Yes X No _____ (some do not)
7. Do departments that you service follow the NFPA 1851 3 year PPE liner test as stated in chapter 12? Yes X No _____
If not, what do they tend to do in meeting this requirement?
8. Is your agency a verified Independent Service Provider (ISP)? Yes X No _____
If not, what ISP services your gear?
9. Has the focus on NFPA 1851 improved firefighter awareness on maintenance and care?
Yes X No _____
Comments:
10. Do Departments that you service feel that NFPA 1851 has improved firefighter safety?
Yes X No _____

Date: 11-24-2014

Time: 1:50

Representative: Paulina Valdez

Fire Department Independent Service Provider Survey

The department is currently reviewing its Turnout gear selection, care, and maintenance program. Please ask our vendors the following questions to determine how departments are specifying bunker gear.

1. What is your name and your company's name? Gloves, Inc.
2. Is it okay to use your responses in a research project that may be published? Yes X
No _____
3. What bunker gear brand do you service? All
4. Do departments that you service comply with the NFPA 1851 10 year gear retirement?
Yes X No _____
5. Do you service sets that are designated by the purchasing agency as a 2nd set of gear?
Yes X No _____
6. Do departments that you service follow the NFPA 1851 annual gear advanced check requirement? Yes X No _____
7. Do departments that you service follow the NFPA 1851 3 year PPE liner test as stated in chapter 12? Yes X No _____
If not, what do they tend to do in meeting this requirement?
8. Is your agency a verified Independent Service Provider (ISP)? Yes X No _____
If not, what ISP services your gear?
9. Has the focus on NFPA 1851 improved firefighter awareness on maintenance and care?
Yes X No _____
Comments:
10. Do Departments that you service feel that NFPA 1851 has improved firefighter safety?
Yes X No _____

Date: 11-24-2014

Time: 12:15

Representative: Karen Sezak.

Fire Department Independent Service Provider Survey

The department is currently reviewing its Turnout gear selection, care, and maintenance program. Please ask our vendors the following questions to determine how departments are specifying bunker gear.

1. What is your name and your company's name? Lion Total Care
2. Is it okay to use your responses in a research project that may be published? Yes X
No _____
3. What bunker gear brand do you service? All
4. Do departments that you service comply with the NFPA 1851 10 year gear retirement?
Yes X No _____
5. Do you service sets that are designated by the purchasing agency as a 2nd set of gear?
Yes X No _____
6. Do departments that you service follow the NFPA 1851 annual gear advanced check requirement? Yes X No X (some do not)
7. Do departments that you service follow the NFPA 1851 3 year PPE liner test as stated in chapter 12? Yes X No _____
If not, what do they tend to do in meeting this requirement?
8. Is your agency a verified Independent Service Provider (ISP)? Yes X No _____
If not, what ISP services your gear?
9. Has the focus on NFPA 1851 improved firefighter awareness on maintenance and care?
Yes X No _____
Comments:
10. Do Departments that you service feel that NFPA 1851 has improved firefighter safety?
Yes X No _____

Date: 11-24-2014

Time: 12:20

Representative: Heather

Fire Department Independent Service Provider Survey

The department is currently reviewing its Turnout gear selection, care, and maintenance program. Please ask our vendors the following questions to determine how departments are specifying bunker gear.

1. What is your name and your company's name? 911 Safety.
2. Is it okay to use your responses in a research project that may be published? Yes X
No_____
3. What bunker gear brand do you service? Any
4. Do departments that you service comply with the NFPA 1851 10 year gear retirement?
Yes X No_____
5. Do you service sets that are designated by the purchasing agency as a 2nd set of gear?
Yes X No_____
6. Do departments that you service follow the NFPA 1851 annual gear advanced check requirement? Yes X No_____ (some do not)
7. Do departments that you service follow the NFPA 1851 3 year PPE liner test as stated in chapter 12? Yes X No_____
- If not, what do they tend to do in meeting this requirement?
8. Is your agency a verified Independent Service Provider (ISP)? Yes X No_____
- If not, what ISP services your gear?
9. Has the focus on NFPA 1851 improved firefighter awareness on maintenance and care?
Yes X No_____
- Comments:
10. Do Departments that you service feel that NFPA 1851 has improved firefighter safety?
Yes X No_____

Date: 11-24-2014

Time: 12:25

Representative: Nick Marzano

Fire Department Independent Service Provider Survey

The department is currently reviewing its Turnout gear selection, care, and maintenance program. Please ask our vendors the following questions to determine how departments are specifying bunker gear.

1. What is your name and your company's name? Minerva (Globe)
2. Is it okay to use your responses in a research project that may be published? Yes X
No _____
3. What bunker gear brand do you service? All
4. Do departments that purchase you service comply with the NFPA 1851 10 year gear retirement?

Yes X No _____
5. Do you service sets that are designated by the purchasing agency as a 2nd set of gear?

Yes X No _____
6. Do departments that you service follow the NFPA 1851 annual gear advanced check requirement? Yes X No _____
7. Do departments that (you service) purchase your gear follow the NFPA 1851 3 year PPE liner test as stated in chapter 12? Yes X No _____
If not, what do they tend to do in meeting this requirement?
8. Is your agency a verified Independent Service Provider (ISP)? Yes X No _____
If not, what ISP services your gear?
9. Has the focus on NFPA 1851 improved firefighter awareness on maintenance and care?
Yes X No _____
Comments:
10. Do Departments that (you service) buy your gear feel that NFPA 1851 has improved firefighter safety?
Yes X No _____

Date: 11-21-2014

Time: 2:30

Representative: Jeanne Pierson

Appendix E

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: Antony Farmer (11/25/2014)