



## THE FIRE SERVICE RESPONSE

Fire Fighter Occupational Cancer, Protections  
Pennsylvania Needs HB 1768



**SUPPORT HOUSE BILL 1768**





# Pennsylvania Professional Fire Fighters and Fire Chiefs



**T**his booklet reflects the position of the fire fighters and fire chiefs in the State of Pennsylvania regarding Pennsylvania's amendments to the Workers' Compensation Act that address fire fighter occupational diseases (HB 1768). We collectively present this information to refute the rhetorical, inaccurate and slanted review of fire fighter exposure — as well as morbidity and mortality from cancer, heart and infectious diseases.

**Professional fire fighters and fire chiefs throughout the state of Pennsylvania strongly support this legislation and ask you to vote YES on HB 1768.**

## Medical Justification for Legislation Addressing Fire Fighter Cancer, Heart and Infectious Diseases

Pennsylvania fire fighters work hard each and every day, proudly protecting and serving our citizens by answering the call for help — a call to save lives. That call may be to suppress fire and save lives jeopardized by smoke and flame. That call may be for emergency medical assistance and transport to the hospital. Fire fighters have little idea about the identity of many of the materials they are exposed to or the hazards of such exposures. Nevertheless, Pennsylvania fire fighters continue to respond to the scene and work immediately to save lives and reduce property damage without regard to the potential health hazards that may exist. A fire emergency has no controls or occupational safety and health standards to reduce the effect of toxic chemicals. It is an uncontrollable environment that is fought by fire fighters using heavy, bulky and often times inadequate personal protective equipment and clothing.

Some are also confused on the issue of paying for treatment of a fire fighter injured at work, in this case through an exposure to a toxic material, carcinogen or an infectious disease. Some also state that fire fighters are entitled to worker's compensation for injuries and illnesses and that their bills are routinely paid for and the fire fighter is compensated for lost productivity. Well, that is exactly what this legislation will do. It provides for a rebuttable presumption — that is, the employer can demonstrate that the exposure did not occur in the line of duty—to compensate a fire fighter if an exposure leads to a disease. Just as a fire fighter would be compensated for injuries that occurred after falling through the roof of a burning structure, a fire fighter who develops cancer or has an infectious disease from a job exposure would be compensated.

The worker's compensation system was designed decades ago to handle injuries easily linked to the workplace, such as a broken leg or a cut hand. As medical science has improved, we've learned that some cancers as well as heart, lung and infectious diseases are related to the work environment, including toxic chemicals in smoke. Not surprisingly, fire fighters are more likely to suffer from these occupational diseases.



An occupational disease takes years to develop. It's the result of a career of responding to fires and chemical spills; it's the result of breathing toxic smoke and fumes on the job; it is the response to continuous medical runs or extricating wounded victims at accidents. Because cancer, heart, lung and infectious diseases develop over time, it's impossible to say, "This specific emergency response caused my disease," yet fire fighters continue to get sick. The worker's compensation system needs to be improved to reflect the reality that fire fighters face each and every day.

Variability in exposures among Pennsylvania fire fighters can be great; however, a number of chemicals are commonly found in many fire scenarios. The common combustion products encountered by fire fighters that present either a cancer or heart disease hazard include but are not limited to: acrylonitrile, asbestos, arsenic, benzene, benzo(a)pyrene and other polycyclic hydrocarbons (PAHs), cadmium, chlorophenols, chromium, diesel fumes, carbon monoxide, dioxins, ethylene oxide, formaldehyde, orthotoluide, polychlorinated biphenyls and vinyl chloride. Also, findings from monitored fire fighters during the overhaul phase (fire is extinguished, clean-up begins and where respiratory protection is not usually available) of structural fires indicates that short-term exposure levels are exceeded for acrolein, benzene, carbon monoxide, formaldehyde, glutaraldehyde, nitrogen dioxide and sulfur dioxide.

## A further description of the common toxic substances encountered by fire fighters includes:

**Acrolein** — present in most fires as a combustion product of wood, cotton, carpeting and upholstery. Carcinogenicity is not well studied, but one of its metabolites is a known carcinogen.

**Acrylonitrile** — used in textiles and rubber for clothing, building materials and household products converted in the body to cyanide; known to cause cancer in animals and probably humans, especially cancers of the lung, prostate, stomach, colon, brain, blood and lymphatic system.

**Asbestos** — used widely in buildings for insulation *known to cause cancer in humans*, especially lung, laryngeal and gastrointestinal cancers.

**Benzene** — used in the manufacture of a variety of products (plastics, synthetic fibers, dyes, rubbers) and as a solvent *known to cause cancer in humans*, especially leukemia; a complex mixture of PAHs, benzene, formaldehyde and other chemicals; released from fire engines known to cause cancer in animals and probably humans, especially lung and bladder cancer.

**Carbon Monoxide** — a natural product of combustion, it blocks the body from carrying and using oxygen; likely causes cancer in animals and possibly humans, especially liver and kidney cancer.

**Diesel Exhaust and Soots** — contain a variety of chemicals including PAHs; fire fighters often have direct skin contact with soot that penetrates their clothing; *known to cause cancer in humans*, especially cancer of the skin, scrotum, lung, liver, esophagus and leukemia.

**Formaldehyde** — used in manufacture of textiles, plastics, adhesives, wood products, insulation, paints, leather and rubber; known to cause cancer in animals and probably humans, especially Hodgkin's disease, leukemia and cancers of the mouth, pharynx, lung, nose, prostate, bladder, brain, colon, skin and kidney.

**Vinyl Chloride** — used in the manufacture of plastics and present in building materials and consumer goods; *known to cause cancer in humans*, especially cancer of the liver, brain, lung, blood, lymphatic system, gastrointestinal system and malignant melanoma.

**Polycyclic Aromatic Hydrocarbons (PAHs)** — formed during the combustion of many organic materials associated with cancer in humans, especially cancer of the lungs, colon, pancreas, stomach, pharynx, bladder, brain, leukemia, kidney and ureter.

Fire fighters in Pennsylvania are routinely exposed to a variety of these chemical substances. Equipment for body and respiratory protection is only partially effective. The mixture of hazardous chemicals is different at every fire and the synergistic effects of these substances are unknown. Carbon monoxide and soots are found in *all* fires and benzene has been found in more than 90 percent of fires.

### Pennsylvania Fire Fighters and Heart Disease

Similar to efforts addressing fire fighters' cancer experience, studies that link fire fighting with heart disease fall into three main groups—laboratory studies, field studies and epidemiological studies. The first, animal laboratory experiments, have identified exposure to noise and certain chemicals (such as the common solvent carbon disulfide; carbon monoxide; arsenic; the common combustion by-products; polycyclic aromatic hydrocarbons; and elevated levels of the stress hormone, adrenalin) to contribute to the atherosclerotic process.

The second group, field studies, documents the exposure of fire fighters to these agents through industrial hygiene, biological and physiological monitoring. Industrial hygiene data indicates that the fire environment contains a number of potentially dangerous toxins. Most frequent exposures affecting the cardiovascular system include carbon monoxide, poly aromatic hydrocarbons, cyanide, benzene and hydrochloric acid. Arsenic and other toxic metals, organic solvents — such as carbon disulfide — and many other toxins may also be present depending upon the products of combustion and conditions at the scene. Due to the highly unpredictable nature of the fire environment, it is almost impossible to predict with any certainty all of the exposures that could be en-

countered at any given fire. Blood testing of fire fighters has demonstrated elevated levels of carboxyhemoglobin, a biological marker for carbon monoxide exposure that exceed levels found in both the smoking and non-smoking population. Increased levels of urinary catecholamines (a metabolite of adrenalin) in fire fighters following fire operations have demonstrated increased adrenalin levels. Electrocardiographic monitoring of fire fighters performing maximal exercise without the benefit of warm-up time, a situation that mimics real conditions, suggests diminished oxygen supply to the heart during the initial stages of activity under these circumstances.

The third group, epidemiologic studies of fire fighters and other occupational groups, is performed to determine if exposures actually result in elevated rates of heart disease.

For example, the three epidemiologic studies of fire fighters in New Jersey, Pennsylvania and Toronto have demonstrated increased mortality rates from heart disease in comparison to the general population. However, there has also been a number of other epidemiologic studies that have not found an increased risk. This is due to a number of factors:

- Statistical constraints — the number of individuals studied may not be sufficient to detect a difference.
- The studies rely on mortality, and measure only deaths from heart disease. Differences in survivorship between an occupational group and the general population resulting from disparities in the quality and accessibility of medical care or other factors may result in misleading conclusions about disease prevalence.



- Mortality studies rely on death certificates that are frequently inaccurate and may erode the ability of the study to detect real differences.
- Due to the physical and medical requirements, fire fighters tend to be healthier than the general population with disease incidence significantly less than the general population. An increase in the prevalence of a medical condition arising from workplace exposures may therefore be missed with comparison to the general population. This “healthy worker effect” is accentuated with fire fighters who are extremely healthy, and has been termed the “super healthy worker effect.” This problem may be controlled by using another, similar occupational group as a control. This has been accomplished in a number of studies of fire fighters using police officers as a comparison group. This may not be appropriate for the evaluation of heart disease, however, since a number of studies have also demonstrated an elevated rate of heart disease in police officers in addition to fire fighters.
- When studying an occupational group, certain sub-populations may be at greater risk for a disease due to differences in exposures, administrative policies, or other reasons. The ability of a study to identify and establish the increased rates in these subgroups may be limited due to statistical and study design constraints.

Any of these factors could result in an otherwise well-designed epidemiologic study failing to find an increase in the prevalence of an illness even if one existed (i.e. a “false negative” result).

The most recent study regarding fire fighting and heart disease was conducted by Dr. Stefanos Kales and colleagues at the Harvard School of Public Health. This study examined the link between cardiovascular disease deaths and fire fighting and looked at specific job duties to see which might increase the risk of dying from a coronary event. CCM, again, reported this study out of context. The study also found conclusive evidence that the risk of dying from heart disease is significantly higher during fire suppression, responding to alarms, returning from alarms and during certain physical training activities.

Further, in a report released by NIOSH after the Kales study was published, the federal government again recognized that cardiovascular disease among fire fighters is due to a combination of personal and workplace factors. NIOSH also recognized that hiring and maintaining medically and physically fit fire fighters is an important step in reducing cardiovascular disease. We agree and, in fact, fully support the International Association of Fire Fighters and International Association of Fire Chiefs Wellness-Fitness Initiative (WFI).

NIOSH further recommends that jurisdictions adopt the WFI. Fire department wellness programs do make economic sense. Adopting and implementing an occupational wellness program, such as the WFI, can reduce occupational claims and costs while simultaneously improving the quality and longevity of a fire fighter’s life. We would hope that the State of Pennsylvania would formally endorse such programs.

### Pennsylvania Fire Fighters and Cancer

Pennsylvania fire fighters are at an increased risk of exposure to certain carcinogens, and are therefore at an increased risk of developing certain cancers. Research has conclusively demonstrated that fire fighters have an increased incidence of leukemia, multiple myeloma, non-Hodgkin’s lymphoma, bladder cancer and brain cancer compared to other workers. Additional research indicates that fire fighters are at increased risk for prostate, large intestine and skin cancers. Research currently being conducted by the federal government, as well as academia, continues to strengthen the link between fire fighting as an occupation and specific additional cancers.

Some studies are likely to under count cases among fire fighters for several reasons. Fire fighters as a group may be more resistant to disease. Due to the rigorous physical demands of fire fighting, fire fighters are healthier when compared with the general population. Also, fire fighters who become ill may change to other occupations. This “double healthy worker effect” leads to reduced risk estimates for diseases in fire fighters. In addition, cancer may be under reported among fire fighters because many retire at age 50-55 and there is a long latency period for several cancers. As a result, fire fighters who are diagnosed with cancer after retirement from the fire service may not be included in epidemiologic studies.

Dr. Grace LeMasters and her colleagues conducted a very comprehensive review of 32 studies on fire fighters so as to quantitatively and qualitatively determine the cancer risk of the occupation. This meta-analysis, funded by the Ohio Bureau of Workers Compensation, used statistical techniques for combining information from these 32 different studies and found an association of fire fighting with significant increased risk for specific types of cancer.





When Vermont Governor Jim Douglas signed the fire fighter occupational disease legislation on May 22, 2007, he stated, "This is an important issue to fire fighters and their families. This new law will provide peace of mind to all of those who, in order to ensure our safety, willingly expose themselves to potentially carcinogenic agents in the line of duty."

In a more recent study, Dr. Tee Guidotti, from the George Washington University Medical Center, addresses the fire fighter cancer issues relevant to worker compensation issues and reasonableness of adopting a policy of presumption for those cancers associated with the occupation of fire fighting. Guidotti states that these "presumptions" are based on the weight of evidence, as required by adjudication, not on scientific certainty, but reflect a legitimate and necessary interpretation of the data for the intended purpose of compensating a worker for an injury (in this case an exposure that led to a disease outcome). Guidotti makes it clear that the assessments are for medicolegal and adjudicatory purposes and are not intended to replace the standards of scientific certainty that are the foundation of

etiologic investigation for the causation of disease. They are social constructs required to resolve disputes in the absence of scientific certainty. Understanding this is why there are 27 states that have adopted legislation or revised compensation regulations that provide a rebuttable presumption when a fire fighter develops cancer. Further, based on actual experience in those states, the cost per claim is substantially less than the unsubstantiated figures asserted by others. The reason for this, unlike benefits for other occupations, is the higher mortality rate and significantly shorter life expectancy associated with public safety occupations. These individuals are dying too quickly from cancer, unfortunately producing a significant savings in pension annuities for states and municipalities.

Therefore, Pennsylvania fire fighters and fire chiefs strongly believe that sufficient evidence is available that shows fire fighters suffer from cancer due to their fire fighting exposures. We believe it is time to enact legislation to clearly indicate that cancer is occupationally related to fire fighting.



## CANCERS

**Brain Cancer** — Many studies have found between 2-3 times increased risk. One study found an almost four fold risk. A dose-response relationship has been shown (increasing risk of brain cancer with longer length of employment as a fire fighter and with a greater number of fires attended). Vinyl chloride is commonly found in fires and is known to cause brain cancer. Acrylonitrile and formaldehyde are considered to be probably carcinogenic to the human brain.

**Digestive (Gastrointestinal) System Cancers** — Once cleared from the airways, inhaled particles and the carcinogens that adhere to them are transferred to the GI tract by swallowing. Asbestos, soots and vinyl chloride are all known to cause cancer of the human GI system.



**Colon Cancer** — Several studies have found an increased risk, with one study finding a more than two times higher risk. Another study found an almost two times higher (1.83) risk for fire fighters, with almost five times the risk (4.71) for those with more than 40 years of experience, suggesting a dose-response trend. Two other studies showed increased risk with increased exposure (length of employment, number of runs). Asbestos is known to cause colon cancer in humans. PAHs present in diesel exhaust have been linked to colon cancer.

**Rectal Cancer** — Excess rectal cancer (up to two times higher risk) has been found consistently in many studies of fire fighters.

**Pancreatic Cancer** — Some studies have found an increased risk. One study found a two times higher risk. Another study found three times the rate in fire fighters as compared to police officers (a comparable group).

**Liver Cancer** — The largest study of liver cancer found a two times higher risk for fire fighters.

**Stomach Cancer** — Most studies have found an increased risk. One study found a two times higher risk. Another study found a 2-3 times higher risk for fire fighters with more than 30 years of employment or more than 1,000 fires fought.

**Esophageal Cancer** — Some studies have found an increased risk. One study found a two times higher risk. Soots are present in all fires and known to cause cancer of the esophagus.

**Pharyngeal (Throat) and Oral Cancer** — Some studies have found an increased risk.

## Genitourinary Cancers

**Bladder Cancer** — Studies have found a 2-3 times increased risk. Two studies found a two times higher risk compared to police (2.11 and 1.7). Increasing risk with longer employment was demonstrated with risk for those with more than 40 years of experience increased by 5.71. Another study also supported a dose-response relationship. Diesel exhaust and formaldehyde probably cause bladder cancer in humans.

**Kidney Cancer** — Several studies have found increased risk for fire fighters. One study found a greater than four times increased risk. Another study found a greater than two times increased risk for those employed for more than 20 years. Other studies showed highest risk for those employed the longest as fire fighters. Diesel exhaust and formaldehyde probably cause kidney cancer in humans.

**Prostate Cancer** — Studies have consistently found an increased risk. Two studies found a greater than two times higher risk. Acrylonitrile and formaldehyde probably cause prostate cancer in humans.

**Testicular Cancer** — Several studies have shown a greater than 2 times increased risk. One study showed a four times higher rate. Fire fighters report that their groin area frequently becomes covered with "black soot." Soot is known to cause cancer of the scrotum.

## Hematological (Blood) and Lymphatic Cancers

In general, fire fighters have more than two times the risk. Vinyl chloride is known to cause hematological and lymphatic cancers in humans. Acrylonitrile and formaldehyde are probably carcinogenic to the human blood and lymph systems.

**Leukemias** — One study found a 2.67 times higher risk compared to police. Another study found fire fighters with more than 30 years of experience are at 2-5 times increased risk. Benzene and soots are known to cause leukemia in humans.

**Lymphomas** — In one study, fire fighters had non-Hodgkin's lymphoma at more than three times the rate of police officers (a comparable group). Other studies have also found elevated rates.

**Multiple Myeloma** — Fire fighters are at increased risk.

**Skin Cancer** — Several studies have found an increased risk. Two studies found an almost three times increased risk of skin cancer. One showed increasing risk with increased length of employment. Another study found a greater than three times increased risk in a subgroup of fire fighters. Fire fighters often have direct skin contact with soot, which is known to cause skin cancer in humans.





## Pennsylvania Fire Fighters and Infectious Diseases

Infectious diseases have become a hazard to fire fighters too big to ignore. Fire fighters and their employers must continue to take progressive steps toward reducing the risks of these hazards. Fire fighters and emergency medical responders are exposed during motor vehicle accidents in which blood and sharp surfaces often are present, by rescuing burn victims, and through the administration of emergency care. The victim may require extrication from a difficult-to-access accident scene, such as a motor vehicle accident or poorly accessible building. There may be broken glass or other sharp objects at the scene that are poorly visualized, and the lighting at the scene may be minimal. In addition, if the victim is bleeding profusely and needs to be extricated quickly to save his/her life, the emergency provider must act quickly, with disregard for his/her own safety. Fire fighters may also be involved in emergency medical treatment at the scene, including intravenous line insertion and blood drawing. The infectious disease status of the victim is almost never known to the fire fighter while he or she is rendering emergency services. All of these factors combine to place the fire fighter at increased risk of contracting a bloodborne contagious disease through a puncture wound, skin abrasion or laceration that becomes contaminated with infected blood or body fluids from the victim.

Some have misrepresented the literature by rhetorically addressing its claim that research on the risks of infectious and contagious diseases is also not conclusive. This cannot be farther from the truth. In the Morbidity and Mortality Weekly Report (MMWR) article some have cited, the authors stated, "This report summarizes the findings of five studies of HCV (Hepatitis C Virus) infection among first responders." This statement is untrue and grossly misleading. Only two of the five "studies" contain published data, and both of these efforts were developed and designed to assess issues related to Hepatitis B. The three remaining "studies" represent unpublished data collected during what were primarily Hepatitis C education and screening programs. Data collected in an uncontrolled and scientifically flawed manner can simply not be dubbed a "study" by these authors in order to confer validity. Furthermore, these "studies" were all cross sectional voluntary studies that had limited participation rates. The "studies" collected little to no information about the participants' occupational exposures, thus severely limiting the ability to assess any occupational risk factors.

Most importantly, four of the five "studies" failed to show an association between Hepatitis C and the most common risk factors in the general population (injection drug use, high-risk sexual behavior and transplant/transfusion prior to 1992). There was clearly an occupational risk factor.

These authors acknowledge that first responders, including fire fighters and emergency medical personnel, who are exposed to blood are at risk for infection by bloodborne pathogens. The exposure data from the "studies" cited indicates that emergency response employees have a high rate of exposure to blood and body fluids. In light of the biological and occupational plausibility of exposure, we believe that it is impossible to make any statements about the lack of association between work as an emergency response employee and Hepatitis C using the data from the five selected "studies."

The facts of fire fighter exposures to infectious diseases are clear. On October 16, 1998, the United States Centers for Disease





**Pennsylvania's professional fire chiefs and fire fighters strongly believe sufficient evidence is available that shows fire fighters suffer from cancer, heart and infectious diseases due to their exposures in performing the tasks involved in fire fighting and emergency medical care. We believe it is time for you to pass this legislation to clearly indicate that such diseases are occupationally related to fire fighting and provide those that suffer from these diseases a rebuttable presumption for compensation benefits.**

Control and Prevention published its "Recommendations for Prevention and Control of Hepatitis C Virus (HCV) Infection and HCV-Related Chronic Disease." CDC, through this document, has determined that health care workers, which include fire fighters and emergency medical personnel, are at occupational risk for acquiring Hepatitis C infections. The CDC guidelines recommend that departments implement policies for follow-up of HCV infection in emergency workers after a documented exposure to blood.

In fact, fire fighters are exposed to blood on a frequent basis during their daily work activities. In a U.S. federal government study conducted during the development of the federal OSHA Bloodborne Pathogen Standard (29CFR1910.1030 OSHA Regulatory Impact and Flexibility Analysis) it was shown that 98 percent of EMTs and 80 percent of fire fighters are exposed to bloodborne diseases on the job.

### **Pennsylvania Fire Fighters and Cost of Legislation**

Some may be confused on the issue of paying for treatment of a fire fighter injured at work, in this case through an exposure to a carcinogen, toxic combustion products or an infectious agent that results in disease. The legislation only provides for a rebuttable presumption — that is, the employer can demonstrate that the

exposure did not occur in the line of duty—to compensate a fire fighter if an exposure leads to a disease. Just as a fire fighter would be compensated for injuries that occurred after falling through the roof of a burning structure, a fire fighter who has acquired a disease from a job exposure would be compensated. Based on actual experience, the cost per cancer claim for those states having presumptive occupational disease statutes is substantially less than the unsubstantiated figures asserted by some. One reason for this, unlike benefits for other occupations, is the higher mortality rate and significantly shorter life expectancy associated with fire fighting. Fire fighters are dying too quickly from cancer and other occupational diseases, unfortunately producing a significant pension annuity saving for states and municipalities.

If, as some may claim, the existing worker's compensation system is fair as well as the appropriate mechanism to address such claims, then such legislation may not be needed. However, as testimony and experience have demonstrated, municipalities throughout Pennsylvania categorically deny fire fighter claims when such individuals suffer from an occupationally acquired disease.

Thank you for your support.





The following states have presumptive disability laws that recognize that fire fighters are at increased risk for certain illnesses. The laws create a rebuttable presumption that the specified diseases are job related.

State	Heart Disease	Lung Disease	Cancer	Infectious Diseases
Alabama	P	P	P	P
Alaska	pending	pending	P	
Arizona			P	P
Arkansas				
California	P		P	P
Colorado	P	P	P	P
Connecticut	P	pending	pending	pending
District of Columbia				
Delaware				
Florida	P		pending	P
Georgia	P	P		
Hawaii	P	P		
Idaho	P	P		P
Illinois	P	P	P	P
Indiana	P	P	P	P
Iowa	P	P		
Kansas	P	P	P	
Kentucky	P	P		
Louisiana	P	P	P	
Maine	P	P		P
Maryland	P	P	P	
Massachusetts	P	P	P	
Michigan	P	P		
Minnesota	P		P	P
Mississippi				
Missouri	P	P	pending	
Montana				
Nebraska			P	
Nevada	P	P	P	
New Hampshire	P	P	P	
New Jersey		P	P	
New Mexico				
New York	P		P	
North Carolina	pending	pending	pending	pending
North Dakota	P	P	P	P
Ohio	P	P		
Oklahoma	P	P	P	
Oregon	P	P	pending	pending
Pennsylvania	P	P		P
Rhode Island		P	P	P
South Carolina	P	P		
South Dakota	P	P	P	
Tennessee	P	P	P	
Texas	P	P	P	P
Utah	P	P		
Vermont	P		P	
Virginia	P	P	P	P
Washington	P	P	P	P
West Virginia				
Wisconsin	P	P	P	
Wyoming				







