

Carna Bunker Gear

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What Is Carna Bunker Gear

- Carna Bunker Gear is modeled after front line structural firefighting bunker gear with knee pads, elbow guards, radio pocket, survivor light strap, coat and jacket pockets and customizable adhesive patches. Carna Bunker Gear is intended for training use in non IDLH and non hazardous environments.
- Carna Bunker Gear is made from cotton, polyester and nylon with no oil repellents (PFAS) flame retardants (PBDEs, OPRFs) or phthalate (DEHPS).
- Carna Bunker Gear replicates the same weight, bulk and thermal retention as normal bunker gear for a fraction of the price with zero accumulated carcinogenic load.

The Elephant In The Room; Cancer

- “70% of firefighters will eventually die from cancer.”¹

How Do Firefighters Get Cancer

- Some of the carcinogens expected to increase cancer in firefighters is due to elevated exposure rates of PHAs, PFAs, PBDEs/ PBB, and DEHP and more.
- These chemicals are found on fire scenes from incomplete combustion of a wide variety of materials found in residential, commercial and vehicle fires (PHA, PFAS, PBDEs, DEHP) and even in basic fires with organic fuel sources such as wood (PAHs)
- During and after exposure these chemicals remain on the firefighter’s bunker gear in varying stages of off gassing and decay.
 - Some of these chemicals are even found in brand new unused bunker gear due to the need for high thermal capabilities and oil repellent properties (PFAs, PBDEs, DEHP).

What Are These Carcinogens?

- **PAHs**- The CDC defines polycyclic aromatic hydrocarbons (PAHs) as “a class of chemicals that occur naturally in coal, crude oil, and gasoline.”² PAHs result from burning coal, oil, gas, wood, garbage, and tobacco and have the ability to bind to or form small particles in the air.²
 - According to the cancer risk scale, for every 1 in 100,000 firefighters, 350 firefighters can develop cancers from clothing contaminated with PAHs via dermal absorption.³
- **PFAS**- According to the CDC, “per-and polyfluoroalkyl substances (PFAS) are a group of chemicals used to make fluoropolymer coatings and products that resist heat, oil, stains, grease, and water.”⁶ Fluoropolymer coatings can be in a variety of products including clothing, furniture, adhesives, food packaging, heat-resistant non-stick cooking surfaces, and the insulation of electrical wire.⁴
 - “Given fluoropolymers’ extreme persistence; emissions associated with their production, use, and disposal; and a high likelihood for human exposure to PFAS, their production and uses should be curtailed except in cases of essential uses.”⁵
- **PBDE**- The CDC identifies that “polybrominated diphenyl ethers (PBDEs) and polybrominated biphenyls (PBBs) belong to a class of chemicals that are added to certain manufactured products in order to reduce the chances that the products will catch on fire.”⁶ Finished products that may contain PBDEs include furniture foam

padding, wire insulation, rugs, draperies, and upholstery.⁶ Other PBDE-containing products include plastic cabinets for televisions, personal computers, and small appliances.⁶

- The researchers of the study concluded that “firefighters are exposed to PBDE flame retardants at levels much higher than the general public.”⁷
- **DEHP**- The California government Proposition 65 (P65) lists di(2-ethylhexyl) phthalate (DEHP) to raise awareness to the public regarding the harmful effects of DEHP.⁸ P65 reports that exposure to DEHP may increase the risk of cancer.⁸ Additionally, DEHP can impose birth defects and harm to the reproductive system.⁸ Exposure to DEHP can impair the reproductive system in males and impair child development in women exposed to DEHP during pregnancy. DEHP is still used in various types of plastic consumer products⁸.
 - DEHP was even found on most items of unused firefighter PPE, but at lower levels. This study concludes that “firefighters are exposed to high levels of DEHP Di(2-ethylhexyl) phthalate (DEHP), a probable human carcinogen, and at levels much higher than PAHs”⁹.

Reducing Carcinogenic Risk

- Limiting the total load and duration of time exposed to these carcinogenic chemicals is one tool we can adopt to reduce carcinogenic exposures.
- Current protocols call for decontamination and washing of personal protective equipment (PPE) / bunker gear post fire incidence.
 - There are many studies done on the effectiveness of gear washing “The current laundering techniques do not appear to effectively remove PAHs, OPFRs and PBDEs at the measured concentrations from firefighters’ uniforms.”
 - “Statistically significant decrease in the concentration of PAHs after laundering” was seen. However, complete removal was not evident, and in only a few instances there was a reduction in individual OPFRs (flame retardants).” Laundering techniques appear to currently be inadequate for removing semi volatile organic compounds (SVOCs)”¹⁰.

Extending the Life and Integrity of Structural Bunker Gear

- Research performed on washing bunker gear identified that after only 10 wash cycles “negative impacts were seen in trap tear strength of the outer shell and thermal liner, moisture barrier liquid penetration for the Fuel H (hydrogen) challenge, and total heat loss of the composite (THL).”¹¹
- Reduction in THL means that the bunker gear becomes saturated with fluid which does two things. One, an increase in thermal protection is seen but at the cost of reducing the ability of the firefighter to shed heat. Due to a higher potential of dehydration fire ground performance and firefighter safety can be compromised due to over washed gear and its negative effect on THL. Older gear that had more wash cycles showed the lowest ability for the firefighter to shed heat.
- Overall, the authors of the study found that “several important protective properties of turnout gear are significantly changed after repeated (between 0 cycles and 40 cycles) simulated fireground exposures followed by cleaning (laundering, decon) or laundering alone.”¹¹

- Minimizing the need to wash front line bunker gear is ideal for its performance and longevity. Reducing the training load of front line bunker gear by wearing Carna Bunker Gear is an excellent tool to help reach this goal.

How Often Must Firefighters Wear Structural Bunker Gear?

- Fire fighters must wear proper PPE for protection. Structural firefighter bunker gear is usually worn daily for a variety of calls that involve possible IDLH atmospheres, hazardous fluids or pathogens
- Estimates of 98% of the time spent training in bunker gear firefighters are NOT in IDLH atmospheres nor in contact with common hazardous fluids. This trend during training is seen in career and volunteer firefighting along with fire academies

Why Firefighters Should Wear Carna Bunker Gear

- During the time that firefighters train wearing structural bunker gear, 98% of that time could be spent in training gear such as Carna Bunker Gear instead of structural fire gear
- Carna Bunker Gear replicates normal structural firefighter bunker gear minus IDLH atmosphere capabilities which means it will never come in direct contact with high loads of carcinogens due to live fires or ever be composed of carcinogenic chemicals rendering it capable to operate in said IDLH atmospheres
- Thus, successful risk reduction of total carcinogenic load to firefighters may be achieved through this strategy
- Wearing Carna Bunker Gear will reduce the amount of negative structural and performance changes (THL & tear strength) experienced in firefighters' front line bunker gear over its lifetime due to less wash cycles equaling extended life time for their structural fire gear
- Police and military don't train with live ammunition all the time. They use wooden pistols and laser guns for a variety of training evolutions to improve safety and manage risk
- Football players wear special practice helmets to reduce concussions and they don't wear full pads every single practice. Nor do they wear their practice gear to play on game day due to previous wear and tear
- Why should firefighters continue to use a high-risk model for training thereby increasing exposures to carcinogens?

When To Wear Carna Bunker Gear

- Ideal times to wear Carna Bunker Gear would include the following training evolutions but are not limited to
 1. Donning and doffing
 2. Search and rescue
 3. Fire hose training,
 4. Establishing a water supply
 5. Throwing ladders, forcible entry
 6. Venting
 7. RIT and survival training
 8. Aerial operations
 9. Operating the fire pump
 10. Full gear physical fitness activities like team or individual circuit training
 11. Even public education events such as school events or open house events

Limitations Of Carna Bunker Gear

- Carna Bunker Gear is flammable and is not to be used in IDLH training or training that has a risk of exposure from NFPA 1971 common hazardous fluids.
- This includes live fire training scenarios, Hazmat and vehicle extrication training involving any potentially harmful liquid or vapor chemical. Common fluids according to NFPA 1971 are Foam (AFFF), liquid chlorine, battery acid, hydraulic fluid, gasoline, and antifreeze fluid, or pathogens.

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