

# **CONTAINMENT AND REMOVAL OF FIRE RETARDANTS SETTLED ON BUILDINGS, CONTENTS AND LAND**



File Photo: EPA

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# Containment and Removal of Fire Retardants Settled on Buildings, Contents and Land



Picture from California Department of Forestry and Fire Protection (Cal Fire)

## TABLE OF CONTENTS

Fire Retardants .....	Page 3
Commentary .....	Page 3
Suppressants and Fire Retardants .....	Page 5
Retardants: General Health and Safety Issues .....	Page 6
Pet Safety .....	Page 7
Children Safety .....	Page 7
Fire Retardant Cleanup: A Prescriptive Approach to Problem Solving .....	Page 8
Unique Application and Use of Phos-Chek Fire Retardants .....	Page 11
References: .....	Page 11

## **Containment and Removal of Fire Retardants Settled on Buildings, Contents and Land**

# **FIRE RETARDANTS**

### **Commentary:**

**The discussion about the containment and removal of fire retardant materials is as controversial as the application of fire retardants.** There was (and still may be) a federal lawsuit filed against the USFS for the use of chemicals like Phos-Chek. A non-profit organization won a lawsuit in 2006, which found the government was not exempt from abiding with the National Environmental Policy Act and the Endangered Species Act.

**The role of a fire retardant is to steer flames and fire away from populated areas and buildings.** While building owners praise the “red cloud” sprayed nearby and on their property — and even demand it — the use of fire retardants increases the possibility for leaving a potent mix of potentially toxic chemicals behind. There is growing opposition to fire retardant use in certain situations. Heated debates flare over how much fire retardant is too much or whether or not it should even be used. Fire retardants are not merely water. Trees, plants, buildings, cars, equipment are adversely affected by some fire retardants endangering wildlife including aquatic animals, plants and organisms.

**So, what does a homeowner or a professional fire damage cleanup restorer do with the residual mess? The answer is – it depends.**

- When the fire retardant spray is away from property including lawns, parking and driveways, swimming pools and decks, buildings and equipment; it is best to let nature take her course and use sunlight, UV, temperature, humidity and rain to wash off chemicals.
- When the fire retardant affects personal property, risk management decisions should be made. The residual composition of some retardants can cause corrosion, pitting, discoloration and other problems.
- Some product manufacturers recommend washing it off with water because their chemicals are water-based. However, a growing discussion by environmental professionals, cities and government agencies like Fish and Game, do not want any chemical residues to get into the wastewater stream. The chemicals might end up in ponds, rivers, lakes, streams and the ocean; and in potable water supply reservoirs.
- Discussions among the environmental side are talking about the disposal of retardant waste in toilets and sewer systems. The County of Los Angeles does not want pills and prescription drugs to be disposed in toilets because the treatment system cannot completely filter out all chemicals. I wonder what they’d say about fire retardant residues.

**Notice:** At no time should chlorine bleach or chlorine-based products be used in fire retardant removal. Using chlorine-based products could cause the release of harmful and potentially explosive gases (SCRT).

## Containment and Removal of Fire Retardants Settled on Buildings, Contents and Land



Picture from the Bureau of Land Management



Picture from the Canadian Forest Service

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## SUPPRESSANTS AND FIRE RETARDANTS

**A distinction should be made between direct application on the burning fuel called a “suppressant” and a “fire retardant” used to extinguish the flaming and glowing phases of combustion:**

- A firefighting chemical applied directly to a fire (usually at the base of the flame), is termed a “suppressant” because the attempt is made to suppress the flames, not just prevent its spread.
- A “fire retardant” is any substance that, by chemical or physical action, reduces or inhibits combustion, thereby slowing or retarding the rate of spread at the front of the flame. Fire retardants are generally broken down into two categories, short-term and long-term.

### Short-Term Fire Retardants

**Short-term fire retardant is** any substance whose effectiveness relies almost solely on its ability to retain moisture and absorb heat by cooling. Water alone, thickened by any means, or with reduced surface tension additives, is a short-term fire retardant. Additives (foam) to water are essentially water modifiers or thickeners, which permit a thicker layer of water to coat the fuel, thereby increasing the time and energy required to vaporize the water. Once the water evaporates, any retarding action ends. Short-term fire retardants are usually applied directly to the fire and could easily be termed suppressants. Foam is an example of a short-term retardant.

### Long-Term Fire Retardants Including Phos-Check

**A long-term fire retardant contains** chemicals that alter the combustion process. The common ingredients include: 85% water, 10% fertilizer and 5% other minor ingredients, such as colorant (usually iron oxide – rust, or ‘fugitive dye’ that breaks down with UV light exposure and is less likely to discolor surfaces), thickener (natural gum and clay), corrosion inhibitors, stabilizers and bactericides.

**The active ingredient in long-term fire retardants include** salt that permits pyrolysis at a lower temperature and promotes the formation of H<sub>2</sub>O, CO<sub>2</sub> (water and carbon at once) and char, at the expense of flammable gases. Wood itself does not burn; rather, the gases that are produced through pyrolysis ignite wood components when the “flash point” is reached, and the gases provide additional heat required to produce additional flammable gases.

## **Containment and Removal of Fire Retardants Settled on Buildings, Contents and Land**

Examples of long-term fire retardants include: Fire-Trol 931, and Phos-Chek LV-R.

- Phos-Chek® 259F and D-75F were the long-term fire retardants dropped from aircraft on the California wildfires of 2007. The chemical code “F” means they contain a synthetic color resin.
- According to Mr. Chuck George, retired Project Leader for the USDA Forest Service Government Center in Missoula, Montana, long-term fire retardants are colored red for higher visibility over the drop zone and in time, they are designed to fade with exposure to UV light (sunlight). It is this red colorant that can present problems for homeowners, restorers and adjusters.
- The concentration of fertilizer used in long-term retardants is what provides their fire suppressing capabilities. Due to this heavy concentration of fertilizer components, it is important to use caution and good judgment when cleaning up the residual effects of long-term retardants.
- The pH of chemical components in fire retardants can be as low as one; however, products can be buffered to a pH of 5.5 to 7.5.

**Fire retardants are designed to suppress and decrease the intensity of wildfires, and to protect property when wild fires threaten.** Fire retardants are evaluated by the USDA Forest Service’s Wildland Fire Chemical Systems (WFCS) subgroup for testing, use and monitoring. The primary products are formulated under the trade name Phos-Chek®, and are currently being used in California by the US Forestry Service to decrease the intensity of wildfires.

### **FIRE RETARDANTS: GENERAL HEALTH AND SAFETY ISSUES**

**At no time should chlorine bleach or chlorinated bleach-based products be used in fire retardant removal.** Using chlorine-based products could cause harmful and explosive gases. Also, ammonium compounds (ammonium phosphate, diammonium phosphate) can cause eye irritation, while causing stinging of cuts, scratches, chapped or sunburned skin.

**Human exposure to fire retardants is believed to cause dry skin;** therefore, skin that comes in contact with fire retardant should be washed thoroughly with soap and water, followed by using a good quality skin cream to minimize drying and chapping. Retardants appear to be more of a health concern to wildlife and fish as compared to humans. “Chemicals, called polybrominated diphenyl ethers, or PBDEs, are widely used in televisions, remote controls, computers, mattresses and other products” (USA Today, September 4, 2008). In the same article John Kyte, a spokesman for the fire retardant industry said, levels of fire retardants found in children in the study were low — an average of 62 parts per billion in children, compared to 25 parts per billion in their mothers.

## **Containment and Removal of Fire Retardants Settled on Buildings, Contents and Land**

“Flame retardants save actual human lives, and no illness, ailment or harm to any human anywhere has ever been reported as a result of exposure to Deca, even among those who work producing the material,” Kyte says. “Potential concerns such as those raised by this study are the reason scientists and regulators are looking closely at this issue, and we support such monitoring and analysis.”

The above paragraph is based on fire retardant products found in our homes all the time. Draperies, children’s beds, to Christmas trees and other consumer products may have fire retardant protective coatings on them. Deca and bromine (brominated flame retardants) were commonly applied on consumer products from the 1950’s to just recently. It is believed Deca-BDE is no longer available as a flame retardant in some states. The state of Maine voted to ban Deca in consumer products including in mattresses as of January 2008. Yet, because of the potential damage chemicals in general affect our community, rivers and streams, we cannot discount the fact scientists may find a link that wildfire retardants chemicals may also affect children’s and babies health sometime in the future.

### **PET SAFETY AROUND WILDFIRE FIRE RETARDANTS**

**Pets exposed to fire retardants and smoke contaminated environments experience the same health effects as humans.** Therefore, pets like small children, elderly and immune-compromised individuals should stay out of areas and building having fire retardant colorant, smoke and soot contaminated environments and buildings until the environment and materials can be appropriately (sometimes professionally) cleaned and deodorized.

### **CHILDREN SAFETY AROUND WILDFIRE FIRE RETARDANTS**

**There is an increasing health concern about babies and children’s health exposure to fire retardants:** “Toddlers and preschoolers had levels of the chemicals that were on average three times higher than their mothers’, according to a study of 20 families by the Environmental Working Group, which has campaigned against the chemicals for several years.”

Children should not play with fire retardant and soot covered toys and swings, and play outdoor where grass, shrubs and foliage containing fire retardant materials.

## **Containment and Removal of Fire Retardants Settled on Buildings, Contents and Land**

### **FIRE RETARDANT CLEANUP: A PRESCRIPTIVE APPROACH TO PROBLEM SOLVING**

**Over my years of inspecting communities, buildings and materials affected by fire retardant chemicals, smoke and soot, one point of interest keeps coming back,** that is, building owners, insurers and restorers are actively involved in returning homes, workplaces, schools, churches and shopping malls back to a clean and deodorized state, but often they forget – the source of fire retardant including smoke and soot contamination lingers right outside the door.

**While we cannot control ambient air movement that causes a lingering smoke odor to remain in air,** we can cleanup the gross majority of soot, cold embers and fire retardant's residue. Sometimes a onetime cleanup process may be all that is required, but in many cases, multiple cleanings are necessary in heavy soot contaminated environments. The goal remains the same; eliminate tracking in the fire retardant chemicals and oily soot residue into homes and businesses.

**What to do first, soot-cleanup inside the building or soot-cleanup and removal of fire retardant residue around the surrounding building's environment?** When time is not a critical issue, i.e., returning the use of the building or contents (and cars and trucks) to the owner, clean up the exterior before attempting to clean up and deodorize the building or vehicle. Since we cannot separate cold embers, soot and fire retardant from each other, the prescriptive approach is to remove all of them at the same time. Yet, certain degreasing-like cleaning agents seem to work best for soot/oily based residues while mild detergents work best for wildfire retardant removal. Because of this fact, I broke down as much as possible the efficacy of cleaning agents to certain applications.

#### **1. Gross Soot and Cold Ember Removal:**

- a. When conditions are considered safe and ideal –
  - i. Use a leaf blower to move (air sparge) soot and cold embers off the building and roof, driveway, walkways and parking areas including lawn and foliage. For best results:
    1. Wind direction must be downwind from your building and away from neighboring structures;
    2. Temperature and humidity remains relatively low;
    3. There is no risk to nearby occupants and animals.
- b. When conditions are not considered safe and ideal –
  - i. Vacuum flat land and property (i.e., driveways, lawn, walkways), with a leaf capturing machine and a good condition (no holes or tears) leaf bag.
    1. Note:
    2. Consider lightly spraying a product like PAM inside the clean and good condition leaf filtration bag first.

## **Containment and Removal of Fire Retardants Settled on Buildings, Contents and Land**

3. PAM will allow the bag to have a smaller pore size but allow sufficient air to pass through the bag. It will also allow soot to collect and capture in the bag. PAM will not damage the bag and the bag can be detergent washed clean.
  - ii. HEPA vacuum roofs, ventilation systems, stucco and siding, windows, decks and walkways; and when required, sweep hard surfaces.

### **2. Fire Retardant Removal Basics:**

- a. When necessary, consult with your community, county or city department of environmental health services about the safe use of detergents and other products to remove and neutralize fire retardant residues. They may refer you to the fire department, USFS, AQMD, another agency or a product manufacturer for best advice.
- b. The most common type of wildfire retardant contains a fertilizer-like, phosphate-based compound with ammonium salts and Guar Gum. The actual amount of ingredients may be regulated by jurisdiction.
- c. As a responsible person, when you are stuck for what to do--go to the internet and look up various products materials safety data sheets (MSDS). For a link to Phos-Chek for example go to: <http://phos-chek.com/msds.php>.
- d. The disposing of Phos-Chek as a dry material is reported to be non-hazardous by the manufacturer; Resource, Conservation and Recovery Act (RCRA); 40 CFR 261 and US DOT; and therefore, dry Phos-Check materials should be able to be disposed in a landfill. (Refer to local regulations)
- e. The washing of fire retardants into storm drains and estuaries is believed to be a violation of city and county codes including state and federal fish and game regulations.
- f. Airborne exposure limits for worker exposure:
  - i. OSHA PEL
    1.  $15 \text{ mg/m}^3$  (total dust) 8-hour TWA /  $5 \text{ mg/m}^3$  (respirable) 8-hour TWA
  - ii. ACGIH TLV
    1.  $10 \text{ mg/m}^3$  (inhalable) 8-hour TWA /  $3 \text{ mg/m}^3$  (respirable) 8-hour TWA
- g. While wildfire fire retardant chemicals appear to be fairly harmless, they can cause pitting and damage to some building materials and contents. Meaning, the longer they remain on a surface, there can be an increase of damage to finishes and materials including discoloration.
- h. Phos-Chek Grade 259F, 259R and 259W MSDS's do not say anything about washing and neutralizing the product that settled on the surfaces of cars, buildings and contents.

## **Containment and Removal of Fire Retardants Settled on Buildings, Contents and Land**

### **3. Recommendations for the Removal of Water-base Fire Retardants from Trees, Plants, Lawn, Driveways, Walkways and Decks:**

- a. Some dry fire retardant residue can be removed easily on ground by vacuuming and sweeping. Again consider the use of a commercial leaf vacuum.
  - i. Caution: Air sparging and blowing Phos-Chek and other chemical fire retardants towards your neighbor's house or other parts of the community may be a violation of local ordinances.
  - ii. Caution: Always wear appropriate respiratory, eye and skin protection when vacuuming and sweeping.
- b. New fire retardant chemicals contain fertilizers and salts that can brown out and kill leaves.
  - i. Plants, trees and lawns benefit by washing them with a light detergent followed by fresh water rinsing.
  - ii. Check with your local plant specialist first but generally after detergent cleaning and fresh water rinsing, they may recommend a hydrogen peroxide spray to help plants breathe.
  - iii. A hydrogen peroxide spray on plants is believed to be an equivalent of an antioxidant.
- c. After sweeping and vacuuming up loose soot and fire retardant residue, driveways, walkways, decks and patios can be cleaned with detergent water, scrubbing and rinsing.
  - i. Caution #1: In all instances, check with local ordinances to determine if retardant agents can be washed down a city street that leads to a storm drain. When ordinances restrict the cleaning specialist from disposing retardants into sewers and storm drains, all waste will need to be captured and properly disposed.
  - ii. Caution #2: When fire retardant colorants are noticeable in swimming pools, Jacuzzis, ponds, etc., **do not** use bleach products--especially swimming pool bleach--to neutralize the colorant.

### **4. Recommendations for the Removal of Water-base Fire Retardants from the Exterior of Buildings and Contents:**

- a. As outlined above, dry vacuuming is highly recommended before attempting a wet cleaning process.
- b. When sweeping or vacuuming, workers should always wear appropriate eye and respiratory protection. Professionals should consider using HEPA vacuums.
- c. On the exterior of buildings and contents, immersion or surface clean, using a detergent (e.g., Dawn, Simple Green and some citrus-based cleaners) washing, scrubbing, rinsing and drying is all that is recommended. The sunlight should take care of any remaining residue over time.

## Containment and Removal of Fire Retardants Settled on Buildings, Contents and Land

- d. After cleaning and drying, place walk-off mats outdoors and indoors because recontamination easily occurs from continuous settled dust.
- e. Dispose all biodegradable wastewater appropriately.
- f. Take trucks and cars to a car wash for cleaning. Ensure all soot and retardant residue is removed. A protective wax is recommended.

### UNIQUE APPLICATION AND USE OF PHOS-CHEK FIRE RETARDANTS

An insurance company AIG and their “Private Client Group” is capable of providing customers with their own loss mitigation services. Meaning, AIG contracts with Firebreak Spray Systems who provides an additional layer of protection to personal property. Go to: <http://www.aigpcg.com> or <http://www.firebreaksystems.com/services/aig-wildfire-protection-unit.html>.



Picture Courtesy of Firebreak Spray Systems

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