Wildland Fire Retardants - Cleaning Basics

INTRODUCTION

Fire retardants are designed to suppress and decrease the intensity of wildland fires, and to protect property when wild fires threaten. Fire retardants are evaluated by the USDA Forest Service's[1] Wildland Fire Chemical Systems (WFCS) subgroup for testing, use and monitoring. The primary products are formulated under the trade name Phos-Chek®,[2] and are currently being used in California by the US Forestry Service to decrease the intensity of wildland fires. This allows ground fire crews to work more safely by containing the wildfires.

Fire retardants are extremely useful in suppressing wildfires so that fire fighting ground crews can access burning areas to complete the job of extinguishing the fire. These products have been used since the late '50s. Unfortunately, their use can create residual problems for property owners, although those problems pale in comparison with the alternative of failing to suppress the fire: that being total property destruction.

PRODUCT TYPES AND APPLICATION

According to the National Fire Protection Association (NFPA), there are three general types of products used as Class A fire retardants:

1. **Long-term retardants** typically are applied from fixed or rotary-wing aircraft. While there are a number of products that have been used as fire retardants in the past, Phos-Chek®, manufactured by ICL Performance Products LP, is the predominant brand used for *long-term* fire retardation today. Regarding Phos-Chek® (259F, 259R, 259W and D-75F, D-75R), the USDA Forest Service WFCS web site specifies:
    a. Long-term retardants basically contain about 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 are less likely to discolor surfaces), thickener (natural gum and clay), corrosion inhibitors, stabilizers and bactericides.
    b. At this time, Phos-Chek® 259F and D-75F are the long-term fire retardants being dropped from aircraft on the California wildland fires. The chemical code "F" means they contain a

synthetic color resin; "R" means the retardant contains iron oxide for coloration, and "W" means the retardant is uncolored, actually appearing somewhat white or light beige. 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). Of course, it is this red colorant that can present problems for professional cleaners and restorers.

c. The concentration of fertilizer used in long-term retardants is what provides their fire suppressing capabilities. Due to this heavier concentration, it is important to use caution and good judgment when cleaning up the residual effects of long-term retardants.

d. 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.

2. **Foams** (Phos-Chek® WD881) typically are applied from ground equipment. Rarely are they dropped from aircraft as long-term retardants. Basically, foams are concentrated dish detergents: 99% water, and 1% surfactant, foaming agents, corrosion agents and dispersants. Foams are sprayed onto structures. Since fire retardant foams are composed of slightly more concentrated household dish-type detergent with no dye, they can be removed with thorough rinsing using copious water.

3. **Gels** (Phos-Chek® AquaGel K; Thermo-Gel® 200L), like foams, typically are applied using ground equipment. Like foams, rarely are gels dropped from aircraft as long-term retardants. Gels are water enhancers, consisting of 95-98% water, 2-5% thickeners, stabilizers and other minor ingredients. They may consist of proprietary blends of polymers, hydrocarbons, surfactants and water, with a slightly acid pH. Gels can be sprayed or spread onto structures. Gels protect structures from fire longer than foams, and for several hours versus minutes with water only.

   According to Ms. Cecilia Johnson, USDA Forest Service, Project Leader for WFCS, gels are formulated as a super-absorbent polymer (like that used in disposable baby diapers or surgical bandages that keep wounds moist) that is a thickened water-based solution. Gels come in two forms that may be identified by color (used for high visibility):

   a. orange (or dark orange if contaminated by long-term fire retardant drops), or clear gels, can be removed by rinsing with water or citric acid. In some cases, copious water-rinsing alone removes the residue.

   b. blue-colored gel is mixed with ingredients similar to mineral or vegetable oil (used as suspension agents) and water, and must be treated as such. These suspension agents make cleaning somewhat more challenging, in that oil components must be emulsified for efficient removal from surfaces where gels are applied.

CLEANING PROCEDURES

This paper is confined to procedures for cleaning building exterior surfaces. Interior surfaces that have experienced infiltration of long-term fire retardants should be cleaned using appropriate dry and wet cleaning techniques commonly used in fire restoration work.

At no time should chlorine bleach or chlorine bleach-based products be used in retardant removal. Using chlorine-based products could cause harmful and explosive gases.

Now, let's discuss long-term retardants, as they pertain to cleanup by professional cleaners and restorers. First, we need to remember that 85% of the long-term retardant, the most common exterior building

contaminant, is water, which, by itself, is safe, and, of course, water will evaporate. Second, we need to consider that ammonium compounds (ammonium phosphate, diammonium phosphate) can cause eye irritation, while causing cuts, scratches, chapped or sunburned skin to sting. Retardants are also known to cause dry skin; therefore, fire retardant that comes in contact with skin should be washed thoroughly with soap and water, followed by using a good quality skin cream to minimize drying and chapping.

Last, the minor ingredient used for color is iron oxide, otherwise known as rust; or more commonly today, other fugitive dye is used. Colorants may discolor wood or metal, particularly oxidized metal or painted surfaces. This red color, especially if from iron oxide, can be very stubborn to remove and should be washed off as soon as possible. Most fugitive red dyes are designed to degrade with exposure to ultraviolet (sun) light.

Improper power washing may force the red colorant in long-term fire retardants into wood and other porous materials, resulting in permanent staining. Therefore, to achieve maximum cleaning effectiveness on exterior surfaces contacted by long-term fire retardant - particularly durable, colorfast exterior surfaces that are showing staining or white residues (e.g., brick, stone, vinyl or aluminum siding, painted wood), specific cleaning agents and procedures should be considered. If long-term retardants colored with iron oxide (rust) are encountered, restorers should pay special attention to galvanized materials. Once protective zinc coatings are removed, underlying materials are subjected to oxidizing or rusting. In this case, appropriate re-application of a protective coating would be recommended.

Professional cleaning techniques that should be considered when removing long-term, gel or foam fire retardants from exterior structural surfaces include but are not limited to:

1. Cleaning technicians should wear appropriate safety equipment (gloves, goggles, respirators, protective clothing). Note that fire retardant *gel* residues on walkways, patios or pool decks may become slippery when wet during cleaning. Caution to avoid slip-fall injuries is advised.
2. Flora should be protected from chemical cleaners by covering them with plastic; they should be rinsed thoroughly with water after cleaning processes are complete.
3. Hand cleaning (prespray, hand agitate, rinse) may be required to remove fire retardant from window and door claddings, especially if paint or finishes have deteriorated or oxidized, making them more absorbent and susceptible to staining. The same may be necessary for other exterior finish materials (e.g., trim, gutters, downspouts). Window glass with baked-on *foam* or *long-term retardant* will have to be hand-scraped and cleaned using glass cleaner, or non-chlorinated tub-and-tile cleaners, which typically are acidic.
4. Ensure that windows and doors are sealed, or covered with plastic, to prevent moisture intrusion and corresponding damage within the structure.
5. A biodegradable general-purpose cleaner or pressure-washing compound, mixed according to manufacturer directions, should be spray-applied to exterior veneers (e.g., walls) working from bottom-to-top. Dry-solvent additives (propylene glycol), which are found in many household (kitchen) cleaning agents, may enhance emulsification of oils used in blue or clear *gel-type* fire retardants. Prespraying is a critical procedure if contaminant is to be fully dissolved or emulsified, and if staining compounds are to be successfully suspended rather than absorbed into porous building materials.
6. After spray applying, the cleaning solution should be uniformly distributed with a soft-bristled brush, followed by a few minutes of dwell time. The preconditioning solution should not be allowed to dry completely before pressure cleaning.
7. The wall should be pressure washed, working from *bottom to top*, always progressing upward into fresh detergent for maximum chemical effectiveness and soil suspension. Hot water speeds

chemical reactions and improves cleaning effectiveness. Note that older finishes on exterior veneers may be damaged by aggressive pressure cleaning.

8. Technicians should flush or rinse the wall from *top to bottom* to ensure removal of cleaning and contaminant residues. Inspect, respray and reclean areas that show residual staining or contaminant residue.
9. Ensure that no water is pooled, which may attract thirsty animals. Fill puddles with soil or sand as required.
10. Follow-up abrasive cleaning with blast media (sand, sponge, dry ice) may be required to remove (abrade away) residual staining from some surfaces, such as brick, stucco, stone, mortar or even wood.
11. Finally, remove plastic from foundation flora; rinse and water plants with copious water to dilute and remove residual contaminant or cleaning solution.
12. Surfaces that do not respond to cleaning may require recoating or replacement in some cases.

ADDITIONAL CONSIDERATIONS

According to MSDSs, upon decomposition, Class A fire retardants produce the byproducts carbon monoxide, partially oxidized hydrocarbons, smoke and soot. Class A retardants, when disposed, are not considered a hazardous waste, as defined by the Resource Conservation and Recovery Act (RCRA), 40 CFR 261, and may be transported safely.

Again, to avoid possible harm to pets or other animals, restorers should ensure that water exposed to retardants not be allowed to puddle or stand. It should be soaked up with sand, soil or other absorbents to avoid ingestion by animals. Pets and animals exposed to residues of the fire retardant should be shampooed and rinsed thoroughly, keeping in mind that retardants can dry their skin. If an animal appears sick from drinking from puddles or standing water, owners should seek medical attention and advise the veterinarian that the animal may have ingested a detergent or fertilizer-based product.

Cars exposed to long-term fire retardant residues should be quickly and thoroughly washed. Polishing can remove remaining staining and residue.

Inevitably homeowners will ask professionals about restoring their foliage and plants that have long-term fire retardant on them. Rainwater quickly dilutes the residual retardant, and again, these decomposed components and byproducts are not considered a hazardous waste.

As a point of interest, since the fertilizer concentration in long-term fire retardant is higher than that sold at garden stores, it may cause leaf burn. According to Mr. Chuck George, "It is recommended that, with copious water to dilute the concentration, greenery will fully recover." Plants may appear to be dead after contact, although in most cases they will recover and grow back in one to two months. Some aesthetically valuable vegetation may not survive exposure. When garden produce (e.g., fruits and vegetables) has been exposed to long-term fire retardant, as with all produce, it should be washed thoroughly before being consumed.

Bottom line, the byproducts from diluted long-term fire retardants are less hazardous than smoke and soot, and are not considered hazardous waste.

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The Society of Cleaning and Restoration Technicians (SCRT) is a non-profit, international Trade Association headquartered in Franklin, Tennessee. For additional information, contact SCRT Headquarters, 200 Vantage Way, Franklin, TN 37067; 800-949-4728 (toll free), 615-591-9610 (local); 615-591-6920 (fax); or access www.scrt.org.