TECHNICAL BULLETIN

During recovery from a wildfire event that has consumed human structures and possessions, the cleanup of residue is often complicated by non-natural hazardous contaminants, including lead. This Sentinel Technical Bulletin will go over the reasons why LEAD must be considered, why it is so often present among the combustion byproducts, and provides technical guidance that informs the materials and methods selection process.

RECOVERY MEMO FOR WIND-WATER STORM EVENTS, FLOODING, ICE, TORNADO, HURRICANE RECOVERY

V 25030

Required for:

- Restoration Contractors
- Adjusters
- Owners
- Occupants
- Government
- Engineers/Consultants
- Architects
- General Contractors

Reality of Lead Contamination After WUI events

Wildland fires typically yield predictable combustion byproducts (CBP) dominated by expected carbon dominated residues produced by plants and soils. Other than rare naturally occurring raw asbestos, the familiar contaminants associated with older human structures (e.g., asbestos, lead) are generally involved in fires located in the Wildland Urban Interface (WUI). Where uncontrolled fire can encounter habitation and industry, hazardous materials previously affixed to structures can become liberated by destruction of the structure, and transported by the updrafts and plumes, and redistributed to new indoor and outdoor locations.

This Technical Bulletin from Sentinel is specifically regarding lead contamination, and not just lead-based paint. Paint is often the most consequential source, but there are many more in human communities, and it is important to recognize that regardless of source or how lead is compounded, the element in any form is a powerful neurotoxin that is dangerous to everyone, but especially to young children (<7yo), during pregnancy and nursing, and a hazard to pets. Importantly, lead cannot be chemically-treated or otherwise altered to render it safe. Alchemy remains myth, and very far from science. Lead-containing substances can be removed or permanently isolated: the definition of abatement of lead is removal, and/or enclosure, and/or encapsulation with acceptable materials (which is another lead-related subject; see that Technical Bulletin – Lead Abatement).

A new neighborhood, i.e., predominantly recent construction cannot be presumed as protection. Lead in residential paint was banned in 1978, which is why lead regulations do not apply often to more recent homes. This has led to an everyday assumption that children living in the oldest homes (such as pre-1950) are most vulnerable in the oldest U.S. population centers. However, in a 1988 study by U.S. Health & Human Services[i], almost a quarter million children younger than 6 were living in the oldest (pre-1950) housing in the Los Angeles region. Adding a WUI-Fire event

suggests there is plenty of lead in old paint alone that wildfire will disperse when impacting where people live. In fact, a California Air Resources Board study[ii] found that when the Camp Fire burned Paradise, CA, the airborne levels of lead were 4x average in Chico (15 miles away), and the levels of zinc were 20x the average 150 miles distant in Modesto, CA. Lead is truly heavy, and as hard to disperse through the air, as it is a challenge to clean off from surfaces. This spread is remarkable testament to the unique pollution of wildfire, and serves notice that airborne infiltration of CBP doesn't care if the building was built before or after 1978.

There is no safe level of lead exposure, and lead poisoning effects are irreversible. Post-WUI Events, lead is often among the substances to be remediated, and there are techniques and products that can increase efficacy of cleaning, and often deliver a safely reoccupied structure faster.

The Clearance Thresholds for Lead

There is no safe level of lead. When a child's blood lead levels are +5µ/dl (microns per 1/10th liter blood), in most jurisdictions that Elevated Blood Lead (EBL) is considered actionable, i.e., trigger intervention. Not too long ago, the action level wasn't until 20µ/dl – now that is considered acute poisoning. There is no amount in drinking water that is acceptable, and the allowable content per public health authorities for lead in soil (e.g., playgrounds, gardens) or dust (e.g., from normal ageing/chalking, or disturbance/remodeling) has been steadily dropped as well. What about in the special circumstances of disaster recovery?

For the past several decades, when it comes to lead traces in dust after abatement or restoration, there are no special exemptions. Local public health officials can of course provide relief by variance or extension, but inexorably there must be eventual compliance. Enforcement may come especially in the case of Target Housing, as well as commonly child-occupied situations: a building, or a portion of a building, constructed prior to 1978, visited regularly by the same child, under six years of age, on at least two different days.[iii] After gradual decreases, i.e., tightening of the allowable levels of trace lead in dust, the national requirements for abatement and restoration contractors had reached acceptance levels by 2024 (and which reflect the on-the-ground reality at present) that are extremely hard to satisfy:

Surface (per EPA DLAL[iv])	Maximum level µg/ square foot (SF)
Floors	5
Window Sills	40
Window Well	100

Lead-Specific Cleaning Chemistry

Particulates that contain lead are heavy (think weighted blanket, or dentist's shielding apron for patients during X-ray), and they are going to resist cleaning away because of two main factors: 1.,

the difficulty breaking the settled lead off of what it is resting on; and 2., keeping the lead, once suspended awash in the cleaning liquid, from dropping out of suspension and stubbornly resetting on a surface (rather than into the container for disposal). This is what happens almost inevitably with ordinary (non lead-specific) cleaning products. The outcomes include smearing the lead around rather than removing it; working too hard (cleaning 6-8x to get to the clearance numbers above), and using too much chemistry (expensive, potentially damaging to surfaces, and possibly bad for the worker and environment).

The solution is working smarter by choosing a targeted lead cleaning chemistry. The proven chemistry that helps avoid the careless outcomes, is specifying and requiring Sentinel 805 EnviroWash Lead Dust Cleaner. This is a concentrated product specifically formulated to remove lead dust. Sentinel 805 is designed with chelating agents that bind with lead contaminants. Tech proprietary to Sentinel, the 805 can dislodge resistant lead particulates from hard surfaces, and then the chelates and suspension agents minimize the resettling that frustrates and inflates costs.

> While structure fire yields acid residues , mostly soot, best cleaned and neutralized with alkaline (high pH) chemicals.
>
> WILDFIRE RESIDUES are typically the opposite: wildfire residues are typically alkaline, and best cleaned and neutralized simultaneously by proper use of chemistry like Sentinel 805 Envirowash.

Sentinel 805 may be applied with sprayers, towels, rags or mops depending on the area/surfaces to be cleaned. Training is advised to show users how to avoid recontamination with dirty solution. The cleaning solution should be changed after each room has been washed and more often in larger areas. See Methods and Recommendations for more information re: methods.

The 805 is both concentrated and compliant. Ove five-gallon pail makes 55 gallons of usable solution, and the slightly acid 5.5-6.5 pH makes the 805 ideal for work on WUI-fires:

Methods and Recommendations for Cleaning Lead Dust

When using Sentinel 805 liquid cleaner (as well as EnviroTowels), there are proven techniques acquired from years of direct experience in the field. These include:

WET CLEANING

A. During wet cleaning:

1. Replace rags, wipes, sponges, microfiber cloths and mops frequently.
2. Replace cleaning solution and rinse water when dirty.
3. Do not use a high-phosphate detergent (such as TSP Trisodium Phosphate).

B. Pre-spray with prepared lead cleaner solution, but do not allow to dry. Only pre-spray as far ahead of physical cleaning activity as personnel resources and drying conditions together dictate.

1. Prespray with a pump-up, compression type sprayer to target cleaning solution activity in a controlled manner that minimizes runoff.
2. Use a foaming tip or similar to generate some foaming that extends contact time on vertical and overhead surfaces.

"THREE-BUCKET" METHOD

3. If cleaning with buckets, a 3 bucket system is recommended. Bucket one contains the diluted Sentinel 805 solution. Bucket two is for the wringing of mops, rags, sponges, etc. Bucket three contains clean water for rinsing. Use a clean mop, rag, sponge, etc., for rinsing.
    1. Fill bucket one with diluted cleaning solution.

DID YOU KNOW: CLEANING FIRE RETARDANT

When airdropped, some commonly used fire retardants are applied as mist-like particles that can be seen separating from the bulk of the material. This thin pink cloud contains millions of small spheres of fire retardant. These can also become part of the plume, travel far, and be stubborn to clean.

Suppressant often have a thick consistency to improve surface retention that is beneficial during a fire, but discourages simple cleaning and cleaning is impacted by the time elapsed before the suppressant residues can be addressed (increasing stains).

These suppressant products are water-based and water-soluble but may not be free-rinsing especially after time on the surface and hot conditions that "bake" the surface and suppressant together. Best cleaning practices typically start with wetting the impacted surface, allowing 15-30 minutes to dwell, and then attempting to rinse clean with plain water.

See our Technical Bulletin on Cleaning Wildfire Suppressants.

2. Apply mixed solution to the surface to be cleaned, either by spraying directly on the surface or by dipping the applicator into the first bucket of mixed solution.
3. Fill the second bucket with rinse water.
4. Leave the third bucket empty.

a. Or use a three-chamber bucket

5. Put cleaning implement (e.g., mop, rag, sponge) into the bucket of cleaning solution, then wring out excess into empty bucket.
6. Clean a small section and rinse in the rinse bucket. Wring out excess into empty bucket.
7. Repeat until entire surface is clean.
8. Rinse with clean water from pressure sprayer, and wipe/mop with a new clean implement.
9. Dispose of wastewater and soiled implements properly.

CLEANUP vs LEAD ABATEMENT

This Technical Bulletin describes important factors involving cleanup of lead intermingled with an array of post-fire contaminants from a WUI-fire. This document DOES NOT address abatement of lead-based paint. Abatement is a regulated process, and depending on the location, will incur requirements for lead-certified professionals conducting work practice standards enumerated in law and regulations. In short, it is the responsibility of the professionals associated with a WUI-fire cleanup to know or find out for their location when abatement (or Renovate Right) steps are necessary. Do not use the word “abatement” to reference cleanup. Abatement is removal or enclosure or encapsulation with approved materials, with the end result being that the lead is gone, or lead is managed in place, and permanently safe. In short, always utilize lead-safe work practices, use materials & methods formulated for the remediation professional, and reach out to experts (Sentinel included) whenever uncertain about a scope of work and the best descriptions to use in project communications.

[i] U.S. Department of Health and Human Services, (a report to Congress) *The Nature and Extent of Lead Poisoning in Children in the United States*, 1988.
[ii] California Air Resources Board study of four major 2018 wildfires (CARB 2021)
[iii] What is a child-occupied facility? | US EPA
[iv] https://www.epa.gov/lead/hazard-standards-and-clearance-levels-lead-paint-dust-and-soil-tsca-sections-402-and-403