



THE EXPANDING IMPACT OF WILDFIRES

Remediation Science and Strategies for Affected Properties

By Jason Lang and Benjamin Heckman

More wildfires are impacting homes, businesses, and communities every year, and their impacts go well beyond the area of direct exposure to the fire and burning. Smoke and wildfire residues can travel long distances and settle on surfaces or infiltrate building structures, potentially causing damages and impacting human health. With a lack of recognized standards or generally accepted minimum-threshold values for cleaning and remediation, it can be difficult to determine the actual impact

to a property and how to determine how “clean” is clean for post remediation clearance testing and re-occupancy.

Therefore, wildfire impact assessments are an important aspect to the insurance claims process, where the ultimate goal is returning the claimant’s property and indoor environment to its pre-wildfire condition. Here is how these assessments can be conducted to ensure an efficient and successful remediation process.

WILDFIRE IMPACT ASSESSMENTS

Generally, an industrial hygienist (IH) or environmental professional (EP) are

involved in wildfire impact assessments. They work with stakeholders, including homeowners, insurance claims professionals, and community leaders to determine the extent of wildfire impacts, including property damages and impacts to human health. They develop protocols for restoration and cleaning activities, keeping in mind the health and safety of the remediation worker and the building owners/occupants. Ultimately, they provide opinions based upon professional judgment concerning the adequacy of remediation activities in returning to pre-wildfire conditions.

The American Industrial Hygiene Association (AIHA) has recently developed a document titled, “Technical Guide for Wildfire Impact Assessments” to help guide IHs, EPs, and other stakeholders through the process of wildfire-impact investigations. It provides information on the investigation process; sampling and analytical techniques; and cleaning and restorative practices.

A wildfire assessment will include information related to the history of the wildfire events, general construction details of the property of interest, visual and olfactory inspection to characterize physical and odor impacts, and sampling for fire residuals. Collaboration between the investigator and all involved stakeholders can provide for more effective and efficient outcomes. It is important that before the assessment takes place, everyone is in agreement as to a clearly defined objective, scope of work, and criteria basis for both initial determination and post-remediation verification.

Before entering the affected property or structure, a hazard assessment should be conducted to determine what risks may be present that could jeopardize the health and safety of the assessor. Is there structural damage? Are there risks of fire, electrical hazards, or gas leaks? What about damaged trees and



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risks of falling debris? Are there risks of exposure to airborne asbestos, lead, or other hazardous materials? A structural engineer and a certified industrial hygienist (CIH) would be best equipped to answer these complex risk questions.

When gathering information related to the history of the fire events, note details such as dates, size of the fire, geographical data, and locations of the affected property in comparison to the actual fire, weather data (including wind direction), input from nearby observers, and ambient air quality data. It is also important to note if any cleaning or restoration activities have already been attempted.

The visual and olfactory inspection is the most important aspect of the investigation. A basic site characterization is important to detail any other potential sources of fire residuals. This is especially important for properties located farther away from the fire source. An experienced investigator will be able to pick up specific visual cues of actual wildfire damage, which can include selective deposition/accumulation of combustion-related particles, electrophoresis, thermophoresis, filtration mark/threshold streaks, smoke webs and smoke chains/smoke tags, and/or corrosion.

Olfactory, or odor perception, is very subjective, but can be used along with visual cues and other investigative activities to help determine impacts. When entering a potential affected structure, a general burnt odor or fireplace/campfire smell would be a good indicator of potential impact.

Sampling and analysis of fire residuals is important to determine the environmental quality, to aid in identifying impacted areas within a structure, and to potentially identify the cause of health complaints. As with any type of sampling, a sampling strategy and defined purpose for the sampling should be identified before anything is collected.

Generally, the purpose of collecting samples is to prove or disprove a particular hypothesis or belief (i.e. the

furniture and carpets are impacted by soot). To prove or disprove your hypothesis, you choose the best sampling methods available for the particular situation. Also, you should have a plan of action in response to the results of your sampling. In short, know why you are sampling, and don't sample just to sample.

Generally, sampling for fire residuals includes surface tape lifts, wipes, and/or micro-vacuuming. Each method has its own advantages/disadvantages depending on the type of surface to be sampled. The same is true for the sample analysis. There are several types of microscopy, including light microscopy, electron microscopy, and X-ray spectrometry. Each method will provide a different level of definition that the investigator can use to answer his theory. Currently, there are no standards for quantifying fire/combustion particles using microscopy, however, two approaches are typically used. One is a percent-ratio analysis that compares the percentages of fire residues to other dust found in the sample. The other approach is surface-density concentration, which quantifies fire combustion particles and is independent from other dust particles found in the sample.

After the samples have been collected and analyzed, it is important to have some kind of baseline or background level for comparison. While there are no published acceptable baseline levels for comparison, as we have for some other environmental contaminants, a baseline or background concentration can be determined by using an appropriate sampling strategy and recognized testing method. This involves taking background samples from a location on or near the site that was not impacted by combustion particles from the fire event.

Background samples will likely contain common combustion particles that are part of the background, including particles from wood-burning fireplaces, stoves, candles, cigarettes, and vehicle exhaust. Background samples should be collected and analyzed using

the same types of sampling methods as the regular samples that were collected from the affected structure. Ideally, they should also be collected during the same sampling date.

Additionally, air sampling for volatile organic compounds may help identify characteristic sources of wildfire odors and aid in evaluating health hazards for occupants. It may also be used to verify remediation effectiveness in some situations.

REMEDIATION PROCESS

Once a determination has been made concerning the extent of fire impacts, the IH or EP will design a remediation protocol with the intended goal of restoring the structure or property back to pre-fire condition. Restoration methods will progress from least aggressive to most aggressive. This may include a basic surface cleaning using wet wiping and high efficiency particulate air (HEPA) filter vacuuming, or the complete removal and rebuild of an impacted structure. A professional restoration contractor may be needed to facilitate the scope of work and to adequately restore the structure.

After the restoration, the IH or EP will perform a post-remediation verification inspection to ensure all fire residuals and odors are not present. This will include a verification that the scope of work has been followed and completed. Additional confirmation surface and/or air samples may be taken and compared to previously collected interior samples and background samples.

Selecting an independent consulting firm with credentialed staff that has an understanding of the current wildfire impact assessment science; the ability to evaluate wildfire structural contamination and human health risks; an understanding of the proper sampling strategies/laboratory methods, remediation procedures; and a relationship with a qualified laboratory with wildfire-analysis experience are all crucial in achieving an efficient and successful remediation project. ■