CASE STUDY: SOOT, SMOKE, ODORS - FURNACE PUFF-BACK

Project Description: Odor Investigation/Extent of Completed Restoration

Scope of Services: AET was contracted by an insurance company to evaluate residual odor complaints from a homeowner following completion of restoration activities involving an oil fired boiler puff-back. A puff-back is an explosion or backfire of unburned oil in the combustion chamber of the boiler which can release significant smoke and soot. A puff-back is not a fire event. A local restoration company was hired to formulate/implement decision-making and cleanup following the puff-back incident.

AET's Experience: Odors are frequently intermittent or transient and difficult to evaluate. Odors are frequently in the ppb range and odor perception/detection can significantly vary from individual to individual including occupants description of the perceived odor.

Common reasons for residual odors following restoration include:

- Inadequate cleaning of affected surface, especially hard-to-reach areas.
- Improper decision-making on items which can be cleaned rather than discarded.
- Failure to remove odors associated with chemicals used during the cleaning process
- Odor impact within concealed, inaccessible building locations such as inside walls containing porous insulation. Pressure differences within wall cavities allow air movement and can release odors to occupied areas.
- Pre-existing odors unrelated to the insurance event including water damage/mold or other building-related sources.

AET's Investigative Approach/Tools:

1. ***Interviews:*** Discussions with the homeowner center on the timing, locations and descriptions of the residual odor including any physiological symptoms. Discussions with the restoration contractor including their scope of services, observations, specific work procedures, chemicals used, and items cleaned or discarded.
2. ***White Glove Inspection:*** The extent/effectiveness of the restoration contractors cleaning was verified by visual inspection and surface wiping..
3. ***Surface Dust Sampling for Soot:*** Differentiation between surface dust and residual soot on interior surfaces was performed by tape-lift sampling and microscopic analysis.
4. ***Odor Detection:*** However subjective, odor complaints must be evaluated by the IAQ investigator using olfactory sense (his nose).
5. ***Air Quality Sampling***
   a. *Total Volatile Organic Compounds and Total Microbial Organic Compounds*: Air samples were collected in the odor complaint locations and compared to outdoors. Results were also compared to the US Green Building Council's established accepted background level for TVOCs in residential settings is 500 ug/M^3. MVOCs were compared to 8 ug/M^3,a level considered as an indicator of mold growth.
   b. *Polyaromatic Hydrocarbons:* PAHs are a group of 100 different chemicals formed during incomplete burning of oil or other combustion sources. PAHs in the air can become attached to dust particles as well as soot. PAHs are toxic by inhalation, skin contact and ingestion. PAH levels were sampled in worse case odor locations and compared to OSHA's PEL standard of 0.2 mg/M^3.
   c. *Direct Reading Instrumentation:* A ppbRAE VOC Analyzer which can measure VOCs in the ppb range can be used to search/scan for residual odor locations requiring additional cleaning including inaccessible areas such as inside wall cavities.

CONCLUSION: VOCs in the ppb range were detected. Specific areas requiring re-cleaning were identified. Potential odors in wall cavities will be isolated/sealed in-place.

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