

Have Gun – Will Travel

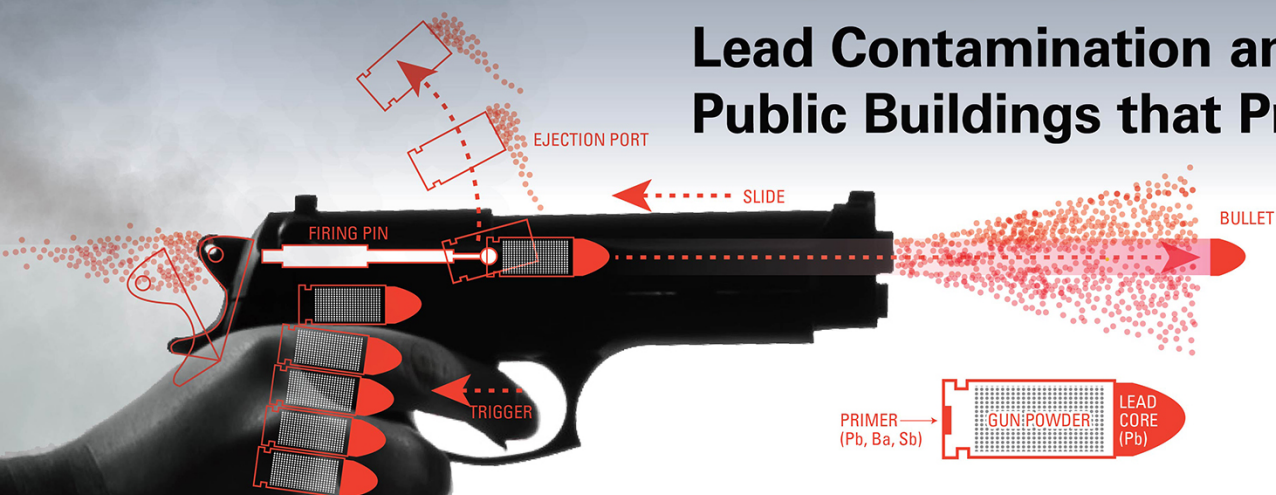
Lead Contamination and Health Risk Assessment in Public Buildings that Previously Housed Indoor Firing Ranges

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Introduction

Today, if one were to poll office building owners, managers or occupants about building environmental health risk issues, it would likely be that few, if any, would have concerns regarding lead. However, depending on the structure's prior use, this lack of concern regarding lead may be unfounded. This study details two independent and recent investigations of two structures – a state office building and a middle school – where elevated levels of lead were found throughout the facilities. Prior to the investigations neither building was suspected to have lead contamination. The only commonality between the two structures was that both had once housed indoor firing ranges that were last used decades prior to the investigations.

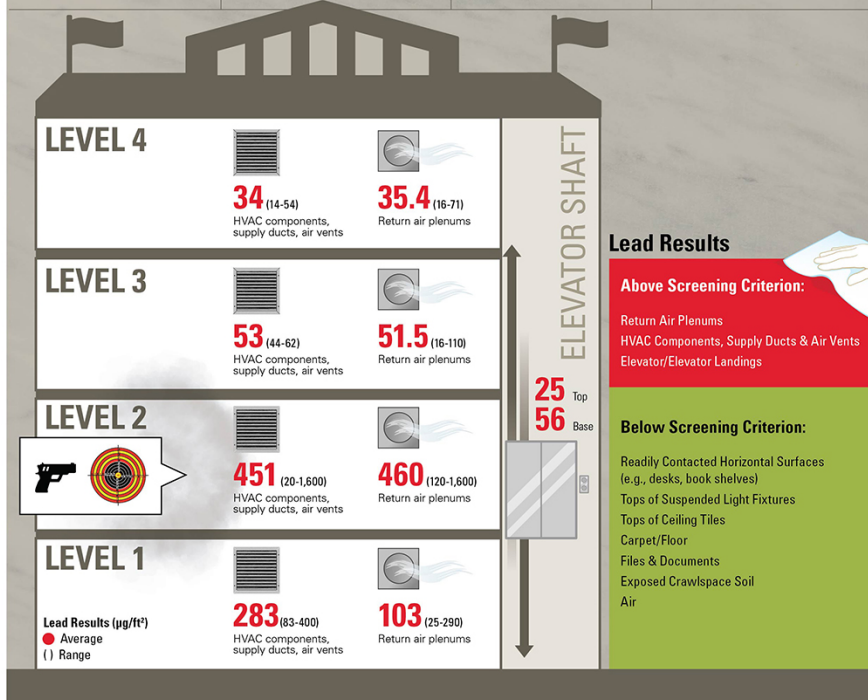
But here too there were differences, in that the firing range of the state office building had undergone a formal lead abatement decades before the present investigation whereas the middle school's firing range was not formally abated prior to the present investigation (or the construction of classrooms and offices). In order to determine whether the source of lead in both structures could be their former firing range, subsets of samples were analyzed for lead, barium and antimony jointly, as the collocation of these substances has been used to identify gunshot residue. Both structures required the communication of findings, which were compared to pre-determined risk based screening criteria, to building occupants, decision makers, and the media in order to discuss health concerns, building occupancy, and future building activities.

This study details two independent and recent investigations of two structures – a state office building and a middle school – where elevated levels of lead were found throughout the facilities.

It would be prudent for building owners/managers responsible for public facilities that once housed indoor firing ranges to test their environment in order to determine if lead is present.

State Office Building

ORIGINAL PURPOSE: National Guard Armory	CONVERSION TO PUBLIC OFFICE SPACE: 2005	YEAR BUILT: 1940-42	CURRENT BUILDING POPULATION: Adults
FIRING RANGE LOCATION: Level 2	FIRING RANGE LAST USED: Early-Mid 1970's FORMAL LEAD ABATEMENT OF FIRING RANGE: 1994	CURRENT USE OF FORMER FIRING RANGE: Storage/Offices	CURRENT LEAD INVESTIGATION: Fall 2013/ Winter 2014



Lead Results

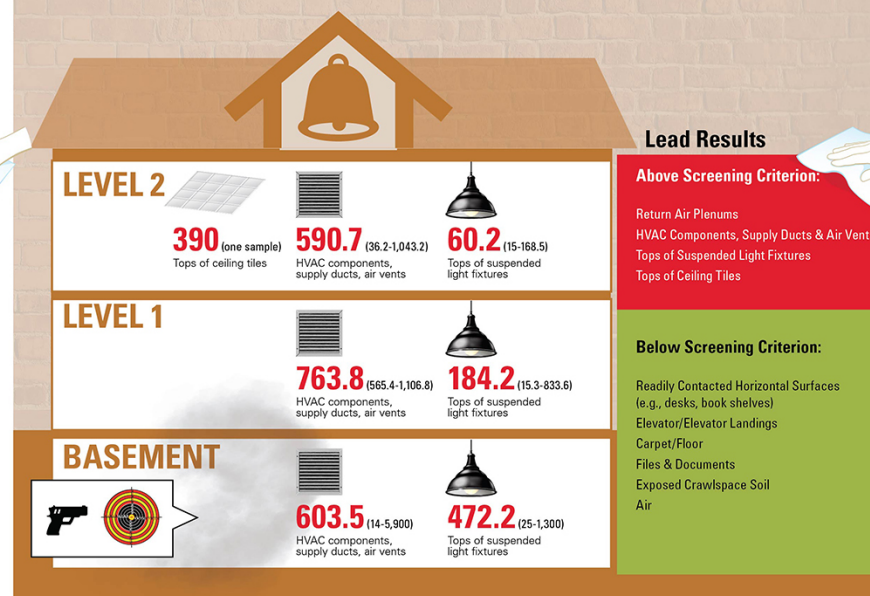
Above Screening Criterion:
Return Air Plenums
HVAC Components, Supply Ducts & Air Vents
Elevator/Elevator Landings

Below Screening Criterion:
Readily Contacted Horizontal Surfaces (e.g., desks, book shelves)
Tops of Suspended Light Fixtures
Tops of Ceiling Tiles
Carpet/Floor
Files & Documents
Exposed Crawlspace Soil
Air

Middle School

ORIGINAL PURPOSE: Middle School	CONVERSION TO PUBLIC OFFICE SPACE: N/A	YEAR BUILT: 1959	CURRENT BUILDING POPULATION: Adults & Children
FIRING RANGE LOCATION: Basement*	FIRING RANGE LAST USED: Early 1990's FORMAL LEAD ABATEMENT OF FIRING RANGE: None	CURRENT USE OF FORMER FIRING RANGE: Classrooms/ Offices	CURRENT LEAD INVESTIGATION: Winter 2014

*Basement located in the northwest section of the U-shaped structure



Lead Results

Above Screening Criterion:
Return Air Plenums
HVAC Components, Supply Ducts & Air Vents
Tops of Suspended Light Fixtures
Tops of Ceiling Tiles

Below Screening Criterion:
Readily Contacted Horizontal Surfaces (e.g., desks, book shelves)
Elevator/Elevator Landings
Carpet/Floor
Files & Documents
Exposed Crawlspace Soil
Air

Risk based decisions

Although workplace guidelines may technically apply to both structures, it was decided to use USEPA-based residential guidelines in both facilities due to building use (office/school) and/or type of occupant (office workers/children)

Although USEPA residential lead dust concentration of 40 µg/ft² could have been used, it was decided to use 25 µg/ft² as USEPA did for the World Trade Center assessment and because of declining blood lead levels in the general population. 10 µg/dl has, in the past, been used to identify populations of children with an unusual exposure to lead, but now that number has been lowered to 5 µg/dl (97.5 percentile). The lower surface screening criteria of 25 µg/ft² considered more appropriate given current blood levels in children (and adults).

USEPA residential air and soil screening criteria assumes a continuous (24/7, 365 day) exposure. This adds a margin of safety for populations with generally discontinuous exposures (8-10 hours per day, 5 days per week).

Employed analytical methods with detection limits well below screening criteria.

Findings

Lead was found at levels exceeding screening criterion in samples collected from generally inaccessible areas such as return air plenums, tops of suspended lights and ceiling tiles and HVAC system components (incomplete exposure pathways).

Lead was not found above screening criteria on surfaces easily contacted by building occupants (i.e., tops of desks, book shelves, chairs) or in the air (complete exposure pathways).

The collocation of lead, barium and antimony in a subset of samples suggests that the former firing ranges were the source of lead in the structures. No other obvious source of lead (e.g., lead paint) were observed. No elevated blood lead levels found among individuals of either building who underwent biological testing, lending further support that the current building environment was not placing building occupants at increased risk for adverse health outcomes.

What happened?

Office Building: The finding of lead in the HVAC plenums of the office building resulted in the office manager independently (and without the benefit of a discussion or additional data) ordering an evacuation of office personnel. The building is currently unoccupied. The finding of lead anywhere in a building can have significant impacts on risk management decisions.

School: The school was temporarily closed while lead abatement was conducted in the basement area/other lead contaminated areas and the results of additional sampling throughout the school became available. The school is currently in use.

Recommendations

Remediation of areas of elevated lead concentrations by a certified lead abatement contractor was recommended despite the incomplete exposure pathway in order to mitigate potential future lead exposure issues.

Conclusions

The current data indicate that even if an indoor firing range itself underwent formal lead abatement, lead contamination may still be present in other areas of the building years after the range was last used. Therefore, it would be prudent for building owners/managers responsible for public facilities that once housed indoor firing ranges to test their environment in order to determine if lead is present.

Sample Type	Analyte	Sample Location	Office	School
Wipe	Pb Pb+Ba+Sb	Readily contacted horizontal surfaces (e.g., desks, book shelves)	✓	✓
		Return air plenums	✓	✓
		HVAC components, supply ducts and vents	✓	✓
		Tops of ceiling tiles	✓	✓
		Elevator and elevator landings	✓	✓
MicroVac	Pb+Ba+Sb	Carpet/Floor	✓	✓
		Files & documents	✓	✓
		HVAC supply ducts	✓	✓
		Tops of ceiling tiles	✓	✓
Soil	Pb+Ba+Sb	Exposed crawlspace soil	✓	✓
Air	Pb Pb+Ba+Sb	All levels of both buildings	✓	✓

Sample Type	Screening Criteria	Source
Wipe/MicroVac	Pb: 25 µg/ft² Ba: 10,200 µg/ft² Sb: 58.3 µg/ft²	World Trade Center Environmental Assessment: Selecting Contaminants of Potential Concern and Setting Health-Based Benchmarks (2003)
Soil	Pb: 400 mg/kg Ba: 15,000 mg/kg Sb: 31 mg/kg	USEPA Residential Soil Screening Levels
Air	Pb: 0.15 µg/m³ Ba: 0.52 µg/m³ Sb: 0.21 µg/m³*	USEPA Residential Air Screening Levels

*USEPA residential air screening level for antimony trioxide