

Improving the Renovation, Repair and Painting Training Course to
Eliminate Childhood Lead Poisonings: Wisconsin Observations

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Summary

In 2011, I worked briefly with the Asbestos and Lead Program for the State of Wisconsin. It was my job to conduct audits of our training providers as well as on-site inspections of work sites. During my time there I discovered a real disconnect between what I saw in the field and what is taught in class. Wisconsin has its own lead rules that are more stringent than the EPA's. After taking a critical look at the EPA's Renovation, Repair and Painting Rule (RRP) curriculum, I saw where the problems lay. The required hands-on training does not present the skills in a logical order and the demonstration is not similar enough to reality to be retained and transferred to a worksite consistently. Instead of contractors and homeowners learning how to conduct a job safely from start to finish, they are presented specific skills broken down into 11 skill sets.

Over a four month time span I took the EPA curriculum and wrote scripts, videotaped, edited and narrated training videos with the assistance of Department of Health Service staff to eliminate the disconnect between the classroom learning and the real world. The videos demonstrate lead-safe work practices in a manner intended to increase retention rates. The videos were released in July 2012, and since then inspection statistics show a 13 percent decrease in offenses from certified workers and a 31 percent decrease in violations overall. Data for the first half of 2013 also indicated a positive trend; violations by certified contracts are down an additional percent.

The Alaska Department of Environmental Conservation conducted a study in 1996, finding that 62 percent of Alaska private homes were built prior to 1979. This means approximately 49 percent of all Alaskan homes contain lead-based paint, 14 percent higher than the national average. The use of lead-based paint in colder regions is

not uncommon. Lead-based paint was praised for its durability and longevity, making it ideal for regions in the circumpolar north.

Americans spend nearly 90 percent of their time indoors. In cold climates, such as the Arctic, people tend to spend even more time indoors (EPA, 2012). Increased time indoors allows for increased wear on friction surfaces in the home. For children, deteriorating lead-based paint and lead in house dust are the primary and often most concentrated sources of lead (CDC, 2012).

The Center for Disease Control reports that in 2004 there were 143,000 deaths and a loss of 8,977,000 disability-adjusted life years attributed to lead exposure worldwide. The primary cause was lead-associated adult cardiovascular disease and mild intellectual disability in children. Children represent approximately 80 percent of the disease impact attributed to lead, with an estimated 600,000 new cases of childhood intellectual disabilities resulting from blood lead levels (BLLs) greater than 10 $\mu\text{g}/\text{dL}$ (CDC, 2012).

Introduction

Lead is hazardous to everyone. Our bodies have no need for lead, and thus it has only negative effects. Most at risk, however, are children under the age of six and pregnant women. It is within the first six years that children most readily develop and actively absorb lead in place of nutrients that may be missing in their diet.

Lead has been linked to impaired neurobehavioral function and cognitive skills, ADHD, ADD and, in adults, it can cause flu-like symptoms, decreased sexual ability, fatigue and stiffness in joints. People and animals can be exposed to lead via ingestion or inhalation. In the U.S. there are two main non-occupational sources of lead poisoning: lead-based paint in homes and prior to regulation, leaded emissions from automobiles or industry.

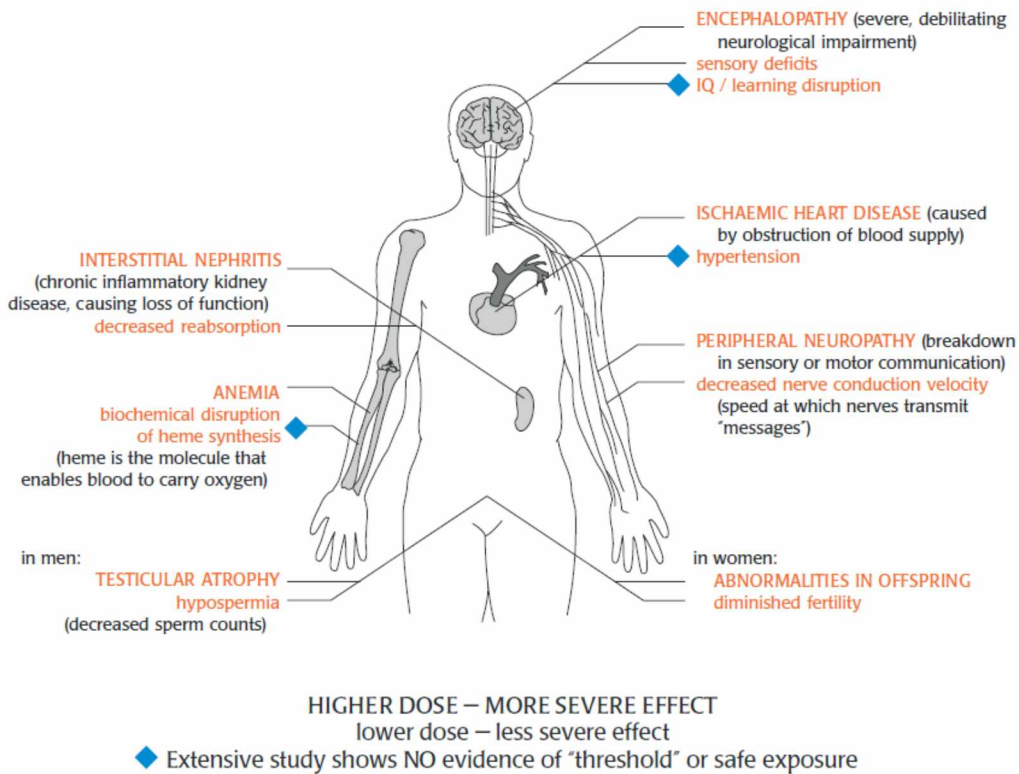


Figure 1: Organ Systems Affected by Lead (UNEP, 2013)

Lead-based paint is the last major source of lead poisoning in the United States. The EPA defines lead-based paint in CFR 745.82 as paint containing 0.5 percent lead by weight. Wisconsin's definition is much more stringent. State statute DHS 163 classifies paint which is 0.06 percent lead by weight as lead-based. This increased stringency allows Wisconsin to operate its own Renovation, Repair and Painting (RRP) program without federal oversight. There are multiple benefits for states operating their own programs, including: increased revenue generated from contractor certifications, independent regulation authority and increased inspection rates. Additionally, in Wisconsin, monetary fines from enforcement actions are allocated to the State Library Fund.

The purpose of the RRP program is to utilize lead-safe work practices to reduce exposure to lead by containing the lead contamination generated by renovation activities and reducing the amount of such contamination remaining after completion of the renovation activities.

For children especially, deteriorating lead-based paint and lead in house dust are the primary and often most concentrated sources of lead. Features of old homes, particularly windows, are the cause for much concern. The friction surfaces in a house (i.e. windows, doors, and stairs) can release dust throughout a home. Pets that then spend time in or jumping on the windows can disturb and transfer the dust. Children have been known to chew on window sills and trim while teething for the sweet taste of the paint. Workers in occupations that disturb lead-based paint can poison themselves by not

wearing the proper personal protective equipment, or poison their families by bringing the lead dust home on their clothing. There are limitless routes of exposure.

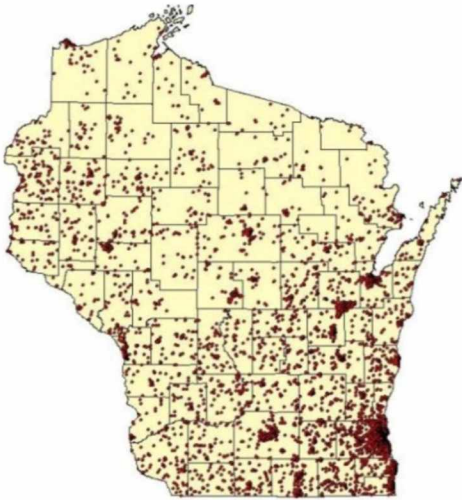
Scope of the Problem

The U.S. Environmental Protection Agency (EPA) estimates that 35 percent of all housing stock in the United States contains lead-based paint. The Center for Disease Control and Prevention (CDC) Background Report went further to find that 79 percent of all privately-owned homes built before 1978 contain lead-based paint. More specifically, the Alaska Department of Environmental Conservation (ADEC) conducted a study in 1996, finding that based on census data, 62 percent of Alaskan private homes were built prior to 1979. Using the CDC estimate, approximately 49 percent of all Alaskan homes contain lead-based paint, 14 percent higher than the national average. The use of lead-based paint in colder regions is not uncommon. Lead-based paint was praised for its durability and longevity, making it ideal for regions in the circumpolar north.

In fact, in various paint studies conducted in 1930, 1933, 1949, 1952, 1958, and 1960, F.L. Browne of the U.S. Forest Products Lab, a federal laboratory located in Wisconsin, concluded several times that lead-based paints on wood withstand weathering in wet and cold regions better than unleaded paints. In 1933, Browne deduced that “paints that contain no white lead, are subject to serious disadvantages that make it unwise to recommend them for general use by painters.” Where unleaded paints cracked and peeled off when surfaces expanded and contracted with the changing seasons, lead-based paint is flexible and virtually impermeable to water (Brown, 1933).

In addition to its high rate of use in Alaska, lead-based paint poses additional risks in Alaska because of the increased amount of time spent indoors during the winter months. Americans spend nearly 90 percent of their time indoors. In cold climates, such as the Arctic, people tend to spend even more time indoors, making the overall “health” of a home in Alaska very important (EPA, 2012). Increased time indoors allows for increased wear on friction surfaces in the home and increased opportunities for children to become lead poisoned.

The CDC has stated that there is no safe level of lead in children’s blood because of the effects it can have on cognitive development, and in 2012 it lowered the action level from 10 micrograms per deciliter ($\mu\text{g}/\text{dL}$) to 5 $\mu\text{g}/\text{dL}$. In Alaska, universal blood



lead testing of children is not required, adding a major limitation to estimating blood lead levels throughout the state. The national average for children between the ages of one and five with blood lead levels above 5 $\mu\text{g}/\text{dL}$ is 2.6 percent. (Wheeler, 2013)

The decrease in the action level has affected Wisconsin greatly. From 2001 to 2010 the Wisconsin Childhood Lead Program saw a decrease in the number of children with a blood lead level greater than or equal to 10 $\mu\text{g}/\text{dL}$ from 5,000 to 1,400. With the action level change, the number of children in 2010 with a blood lead level greater than or equal to 5 $\mu\text{g}/\text{dL}$ is 9,160, more than a six-fold increase in cases (WI Lead Program, 2013). Nationally, lowering the threshold to 5

$\mu\text{g}/\text{dL}$ has resulted in five times as many children being considered at risk of lead poisoning.

The map to the right illustrates the relationship of lead poisoning and age of housing in Beloit, WI. The darkest green indicates that 67

percent of the homes in the area were built before 1950. The red dots indicate a home where a child with an elevated blood lead level resides.

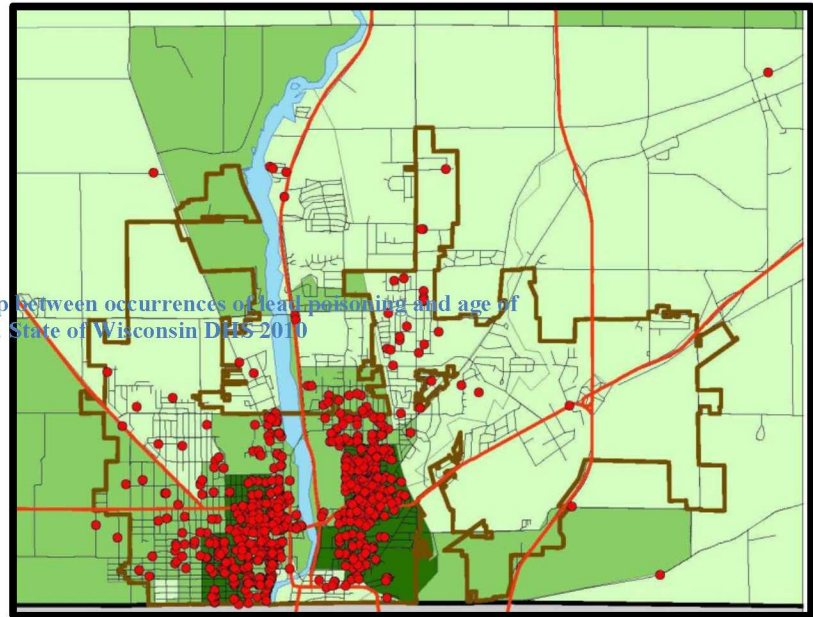


Figure 3: Relationship Between occurrences of lead poisoning and age of housing in Beloit, WI. State of Wisconsin DHS-2010

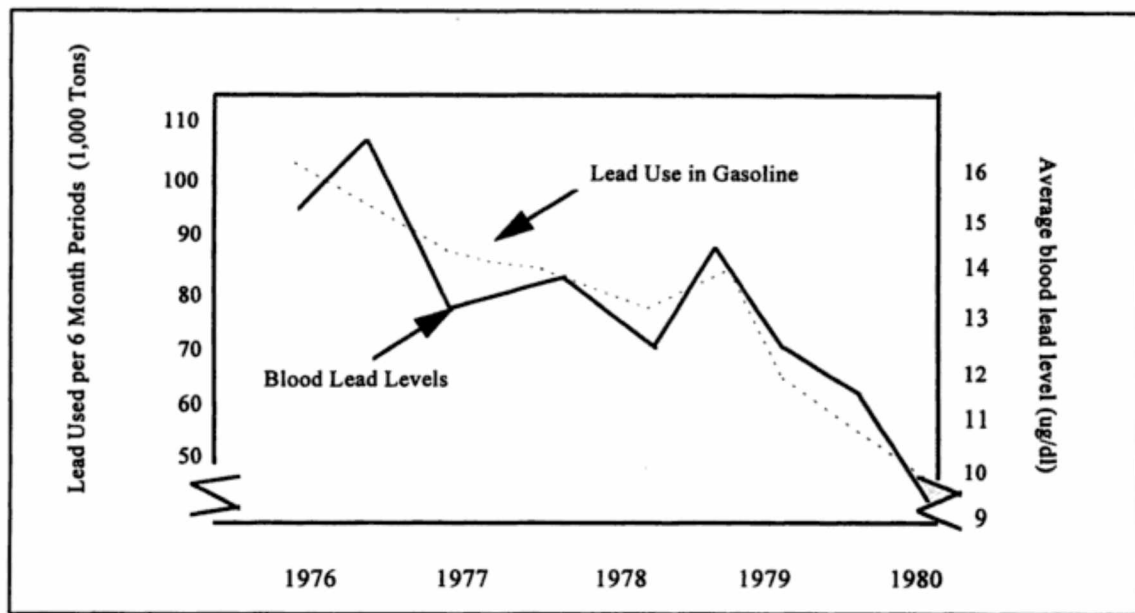
Clearly one can see that within the darkest green is where the red dots cluster. In fact, 90 percent of lead poisoned children live in a home built before 1950 (WI Lead Program, 2013).

Beyond Wisconsin, the U.S. Department of Housing and Urban Development (HUD) estimates 38 million U.S. homes have lead-based paint, 4 million of these homes have young children, and 1.2 million houses are at significant risk with low-income families and children under six years of age (HUD, 2002).

Lead-based paint, however, is not the only way that children are exposed. Lead in water, soil and air can also cause lead poisoning. Additionally, lead is found in some types of gasoline, electronic waste, industry, food cans, and folk remedies (WHO, 2010).

Leaded gasoline was used in the U.S. until 1995, contributing to high levels of lead in soils near roadways. Once in the soils, lead binds to other particles and remains persistently in the upper strata. Lead exposures of low income families living below overpasses or near major roadways within cities became very common. Since the systematic banning of leaded gasoline, the average blood lead levels in the nation have decreased.

Figure 4 illustrates the relationship between blood lead levels and the reduction of lead in gasoline between 1976 and 1980 (EPA 1986).



Source: U.S. EPA, 1985.

Figure 4: Blood lead levels decline dramatically with reduction of lead in gas, 1976-1980. Declining blood lead levels continue to today with complete removal of lead from gasoline and improved lead-based paint abatement techniques. Source: EPA, 1986

With leaded gasoline off the market and airborne lead decreasing dramatically, attention has turned to addressing lead in homes. Peeling, chipping and otherwise failing lead-based paint can be seen in many older communities throughout the U.S. These homes pose huge potential risks to human health.

The World Health Organization (WHO) estimates the annual additional costs associated with childhood lead poisoning at \$43 billion in extra health care and education

costs. Most importantly, it is 100 percent preventable but it is critical that homeowners, property flippers, landlords, and contractors do not create lead hazards during their renovation work on homes built before 1978 (WHO, 2010). Property flippers are of particular concerns with lead-safe work. Flippers typically purchase properties and quickly renovate to resell within two years for a profit. This means they may not be paying attention or spending the extra money to insure they are not creating lead hazards while they complete their work.

Why it's so important

In the past decade, studies have indicated that lead can cause significant irreparable damage in children at much lower levels than previously thought (Lanphear, 2005). Because of this new research, in 2012, the CDC decreased its action level for children's BLL from 10 $\mu\text{g}/\text{dL}$ to 5 $\mu\text{g}/\text{dL}$ (WI Lead Program, 2013). Although the connection between lead-based paint and lead poisoning is not new, only recently have researchers linked the lifelong impacts together.

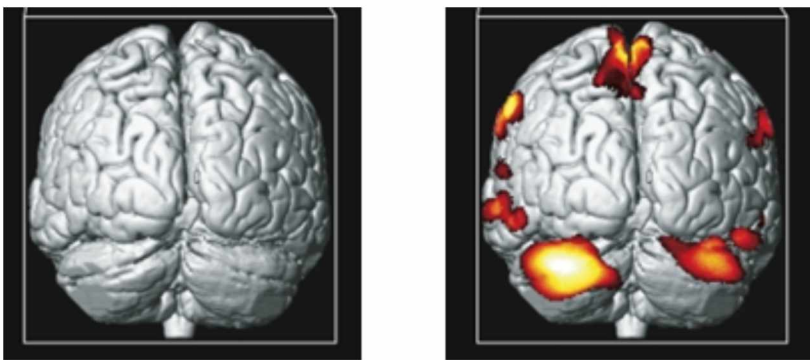


Figure 5: Comparing a healthy adult brain (left) to an adult brain after childhood lead poisoning (Cecil, et al. 2008)

The images above were the first to show the permanent life-altering effects that lead has on brain structure and help explain the long-observed behavioral issues in

children and adults with a history of lead exposure. These MRI scans of the adult brain are from a study published in 2008 entitled "Decreased Brain Volume in Adults with Childhood Lead Exposure" by Cecil et al. The image on the right represents adults who were lead poisoned as children. The image on the left is the brain of a non-exposed adult. The colored spots on the right are areas of the brain where researchers have found considerable loss of brain volume. The greater the child's mean BLL, the greater the loss in brain volume. Areas of the brain that are most affected are those responsible for social behaviors, impulse control, problem solving, attention, emotions, judgment, fine motor control, speech and language (Cecil, 2008).

To look more specifically at some of these affected areas, two studies published by the University of Wisconsin (UW) -Madison in coordination with Milwaukee Public Schools, looked at the effect of lead exposure on educational outcomes. The first study showed that children, with even low levels of lead exposure, had lower test scores in every subject on fourth grade standardized tests (Amato, 2012). Miranda found similar significant and negative effects of early and minimal lead exposure on statewide examinations in 2007 (Miranda, 2007). The second study looked at lead exposure and school suspensions. This study found that children who have been exposed to lead were nearly three times more likely to be suspended from school in fourth grade than children without lead exposure. Ultimately, lead accounted for 23 percent of the discipline gap between African American students and white students (Amato, 2013). More severe than suspensions, Needleman discovered an association between elevated BLLs and an increased risk of not completing high school (Needleman, 2004).

These findings are not rare; the impact of lead is immense and what's worse is childhood lead poisoning is 100 percent preventable in a home if care is taken when renovating the home and otherwise controlling lead hazards. Elevated blood lead levels have been linked to crime, decreased IQ, increased anti-social behavior and ADHD. In fact, just over 21 percent of the 1.8 million juvenile ADHD cases are linked to BLLs above $2\mu\text{g}/\text{dL}$ (Braun, 2006).

Wright, et al. studied 250 pregnant women living in homes contaminated with lead within the Cincinnati area. Prenatal maternal blood was measured during the first and early second trimester, and child BLL was tracked until age 6.5. The results from this study indicated an association between prenatal and postnatal blood lead concentrations and a higher rate of total arrests and arrests for offenses involving violence (Wright, 2008).

Kasten-Jolly, et al. in a study of developmental lead effects on behavior and brain gene expression in male and female mice found that neuroinflammation in the brain was present in both male and female mice but behavior results from the inflammation differed. Females did less exploration, while the males were more aggressive (Kasten-Jolly, 2012).

Lanphear et al. pooled international data and found the shocking association between IQ and low levels of lead exposure. The IQ decrease associated with a BLL increase from 2.4 to $10\mu\text{g}/\text{dL}$ was shown to be 3.9 points, whereas the decrease in IQ points associated with a change from 10 to $20\mu\text{g}/\text{dL}$ was about 1.9 points. This IQ change further decreased to a loss of 1.1 points when the BLL increased from 20 to 30

µg/dL. This study solidified the importance of preventing low levels of lead exposure (Lanphear, 2005).

Grosse et al. in 2002 estimated that the 80 percent decrease in blood lead levels from 1976 to 1999 in comparable groups of children aged 1-5 resulted in an average IQ increase of 2.2-4.7 points. Economically, Grosse estimates that each IQ point raises worker productivity by 1.76-2.38 percent thus resulting in an estimated \$110-\$319 billion benefit (Grosse, et al., 2002).

U.S. Legislative Background

In the early 1900s people recognized that when children ate paint chips it could cause seizure, coma and death. Beyond these immediate symptoms, lesser exposures were already being linked to learning and behavioral disabilities. Soon after these discoveries, in 1922, leaded gasoline hit the market for high-performance engines. However, even with immediate and continued inquiry regarding the public health implications of leaded gasoline, the product stayed on the market until 1995 (Fowler, 2008).

Public health concerns regarding lead fume exposure hit newspaper front pages in 1924 with the over-exposure and death of five New Jersey Standard Oil Company employees. These men worked in the laboratory at the plant and had been experimenting with further increasing the efficiency of gasoline with the addition of lead. It is important to note that the Occupational Safety and Health Administration (OSHA) deems lead fumes especially dangerous because the particle size is much smaller than dust. The small

particles created as a fume will reach the blood if inhaled then quickly move into the soft organ tissues in the body (Alvarez, 2001).

In the New Jersey Standard Oil case, four of the men were said to be violently insane before their deaths. Several workers had to be subdued and put into straightjackets. They were black and blue from uncontrolled muscle spasms. They exhibited paranoid and delusional behavior such as cringing from phantoms or snatching at imaginary winged insects. The afflicted workers could be suddenly violent or suicidal. They also had blue lines across their gums, a typical indicator of lead poisoning, but the behavioral symptoms were unlike any presented in previous lead-poisoning cases (NYT, 1924).

One refinery supervisor, famously said: “These men probably went insane because they worked too hard.” Workers at the refinery, however, knew that the exposure to lead vapor was dangerous. They dubbed the Du Pont refinery the “house of butterflies” because of the typical delusions of winged insects that affected many of the workers (Bent, 1925). As a result, New York City, Philadelphia, and other jurisdictions banned the sale of leaded gasoline (NYC later ended its ban on leaded gasoline in 1928) (Fowler, 2008).

The sudden increase in industrial related illnesses linked to leaded gasoline production fueled a federal inquiry in 1926 by the Public Health Service. It concluded that the dilute additive in gasoline posed no immediate threat to the public. Subsequently, by 1938, 90 percent of gasoline contained lead (PHS, 1962).

The next four decades were spent further delineating the relationship between lead exposure and human health. Norman Porritt, a physician, observed slow lead

poisoning via tainted water in several medical patients, noting the “slow, subtle insidious saturation of the system by infinitesimal doses of lead extending over long period of time.” His findings were recorded in the July 18, 1931 issue of the *British Medical Journal* (Porritt, 1931).

Concurrently, just after prohibition (1920-1933), tests conducted by the USDA and Annapolis researchers found Ethyl leaded gasoline and 20 percent ethanol blend performed equally well. The findings were never published and the oil industry continued arguing there was no viable alternative to leaded gasoline (Gray, 1933).

By 1943, research turned to lead exposure effects on children. Randolph Byers found that 20 children with lead poisoning had behavior problems. He concluded that eating lead-based paint chips causes physical and neurological disorders, behavior, learning and intelligence problems in children (Byers, 1943).

The paint industries rejected scientific evidence and attributed childhood lead poisoning to irresponsible parents allowing behaviors such as eating paint chips. The research work ended, but Byers’ research marked the modern era of lead neurotoxicology.

Clair Patterson, a geochemist, published an article in 1965 discussing unnatural levels of lead in air. He had studied ice core samples and found that the northern hemisphere contained 1,000 times more than the natural background lead levels. Then, based on this conclusion, Patterson pointed to the broad public health implications this could have. He said that the abundance of lead in the environment showed that people were being subjected to “severe chronic lead insult” (Patterson, 1965).

In 1970, as the Vietnam War raged on, Richard Nixon looked for a battle all Americans could support and created the United States Environmental Protection Agency (EPA) and Congress enacted the Clean Air Act (CAA). The Clean Air Act required the EPA to lower emissions of lead, hydrocarbons, carbon monoxide, and nitrogen oxides by 90 percent in only a few years (EPA, 1999). This comprehensive federal response replaced the original Clean Air Act of 1963, which was established to study and clean up air pollution after the 1948 smog cloud over Donora, Pennsylvania and the killer fog of London in 1952. The smog of Donora lingered for five days, sickened almost half of the city and killed 20 people. In London, over 3,000 people died. These types of events alerted the public to the health dangers of air pollution (EPA, 2012).

A year after the CAA, as evidence continued to swell, Nixon signed the Lead-Based Paint Poisoning Prevention Act (LPPA). This was the first national piece of legislation to restrict the lead content in paint used in housing built with federal money and fund lead reduction efforts within states. The LPPA was established to address and relieve some liability from the unsafe housing conditions within Housing and Urban Development (HUD) housing. Housing assistance began in the 1930s and grew more popular as the U.S. faced financial crisis, wars and then rapid urban development. These homes were coated in lead-based paint, now deteriorating and posing a human health hazard to residents. The federal government realized the expense it faced to remove the hazards in these homes and the possible liability from a poisoning. Then, and even more so by 1992, the focus began turning to prevention. This legislation also set the level of lead in blood warranting concern at 60 µg/dL (HUD, n.d.). The level of 60 µg/dL was chosen because it was the level at which overt physical symptoms were observed. The

following year, as professionals began recognizing that even lower levels could cause brain damage, the level was reduced to 40 µg/dL (Olympio, 2009).

In 1974, psychiatrist Herbert Needleman and colleagues found that teeth made better markers of past lead exposure than the blood samples that had been relied upon in the past. They collected teeth from 2,500 primary school children. Ultimately they found that as lead levels increased, all measures of school performance decreased significantly (Needleman, 1974). These types of findings pushed the Consumer Product Safety Commission to ban the use of leaded paint in residential properties and public buildings, along with toys and furniture coatings in 1978. The cited reason was “to reduce the risk of lead poisoning in children who may ingest paint chips or peelings” (HUD, n.d.). The year 1978 also saw the establishment of ambient air quality standards for lead after the Natural Resources Defense Council brought suit against the EPA. The court found that it was within the EPA’s power to set the standard under section 109 of the CAA (EPA, 1978).

It’s important to realize that the U.S. was not leading the world in regulating lead. In fact, the U.S. was far behind other parts of the world. The first lead poisoning case was diagnosed in 1887 and linked to lead-based paint by 1904. France, Belgium and Austria banned white-lead interior paint in 1909. In 1914, the first lead-paint poisoning death from eating crib paint was described. Then in 1921, a year after the National Lead Company admitted lead is a poison, the League of Nations banned white-lead interior paint. The U.S. declined to adopt the ban (Bellinger, 2006).

The EPA issued regulations requiring the gradual phase out of lead in gasoline in 1975, but it wasn’t until 1984 that the U.S. Senate considered banning the use of lead in

gasoline completely. This suggestion, however, was met with major pushback from the oil companies which claimed there was no viable alternative to lead as an anti-knocking agent within the engine. During the congressional hearing, Vernon Houk, director of the Centers for Disease Control and Prevention's Center for Environmental Health, reported that "if no lead had been allowed in gasoline since 1977, there would have been approximately 80 percent fewer children identified with lead toxicity" (Michaels, 2008). This revelation spurred many cities, including Chicago, to move ahead without the Federal government and issue their own bans on leaded gasoline (NYT, 1984). By 1985, the EPA was discussing a total ban on leaded gasoline as the blood lead action level was reduced to 25 $\mu\text{g}/\text{dL}$ (Shabecoff, 1985).

It wasn't until 1990, with Amendments to the Clean Air Act, that lead was banned from gasoline. The ban would be fully effective in five years. That same year, the blood lead action level was reduced to 15 $\mu\text{g}/\text{dL}$ and then to 10 $\mu\text{g}/\text{dL}$ in 1991 (EPA, 2013).

To keep emphasis on preventing lead poisoning, the Housing and Community Development Act issued the Title X Amendments in 1992. These amendments required disclosure of known information regarding lead-based paint on a home prior to sale or rental of that unit along with the mandatory distribution of the EPA *Protect Your Family from Lead In your Home* pamphlet (HUD, n.d.).

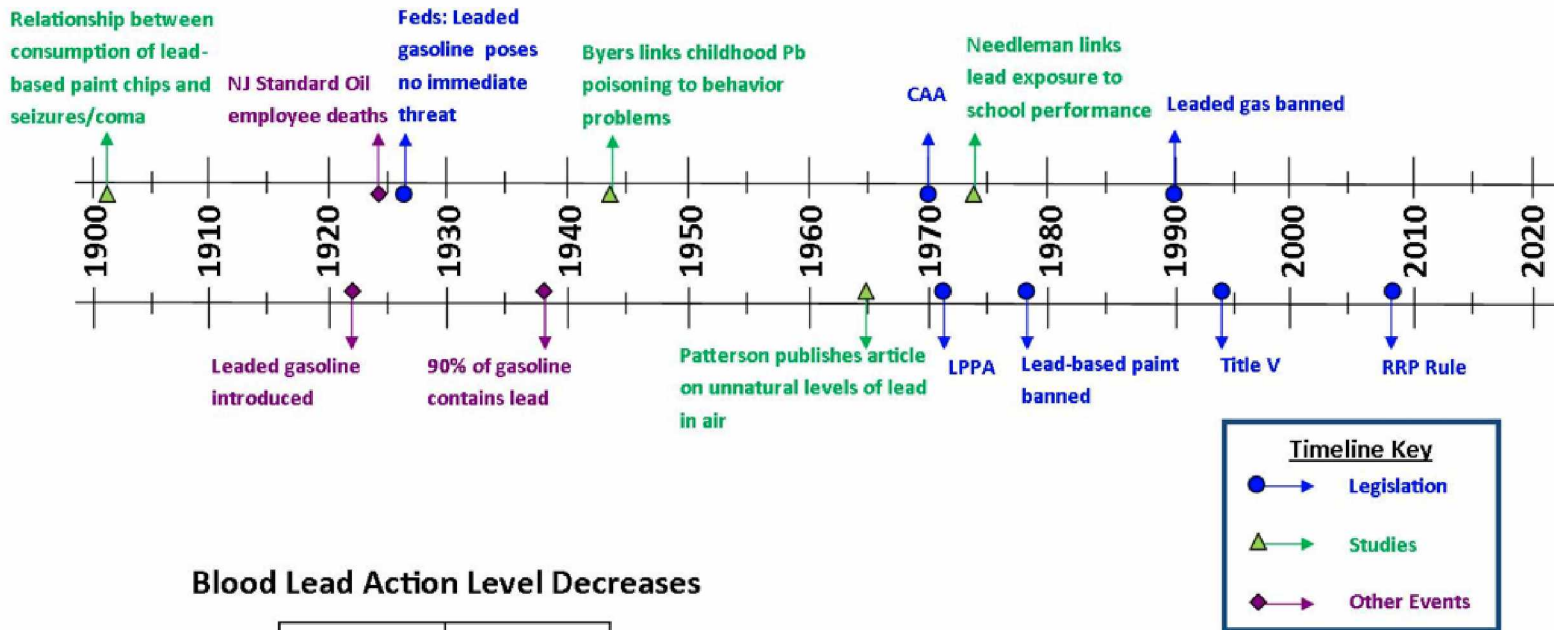
In 2008, the EPA revised the air emission rules for lead. The new air standard is 10 times lower than previous requirements set 30 years ago (EPA, 2008). In addition to air quality standards, the EPA also issued its final Renovation, Repair and Painting Rule regulating work practices when renovating homes with lead-based paint to ensure the work is being conducted safely. The RRP rule went fully into effect on April 22, 2010

(EPA, 2012). RRP requires that all renovators working in homes built before 1978 and disturbing more than six square-feet of lead-based paint inside the home or 20 square-feet outside the home, be certified through an accredited trainer. The EPA anticipates that once fully in effect, the RRP rule will protect nearly 5.3 million individuals per year, including 780,000 children, assuming 75 percent compliance with the rule (EPA, 2006).

The most recent move to be more protective against childhood lead exposure came in 2012. With over 6,000 studies conducted since 1990 demonstrating the negative effects of lead exposure even at low levels, the CDC lowered the blood lead level at which follow-up action is recommended for children from 10 $\mu\text{g}/\text{dL}$ to 5 $\mu\text{g}/\text{dL}$. This reference level is based on the 97.5th percentile of the National Health and Nutrition Examination Survey's blood lead distribution in children. Children above 5 $\mu\text{g}/\text{dL}$ are considered the highest 2.5 percent of children tested. The CDC plans to update this number every four years using the two most recent Health and Nutrition Surveys (CDC, 2012).

Although lowering the BLL action level was a huge success in protecting young children from lead exposure, it was a bitter sweet victory. The same year also brought a 93 percent cut to lead-poisoning prevention funding. This cut left many states without the staff to respond to the increased number of children now considered lead poisoned. Wisconsin lost federal funding for all but one staff member who was assigned to track poisoned children in the state-wide database. In response to this action, health department officials appealed to the state legislature and secured funding to continue the services that were funded in the past.

History of Major Lead Studies and Public Policy



Blood Lead Action Level Decreases

Year	BLL
1971	60 µg/dL
1972	40 µg/dL
1985	25 µg/dL
1990	15 µg/dL
1991	10 µg/dL
2012	5 µg/dL

Figure 6: Timeline of Lead Studies and Public Policy

Table 1: History of Blood Lead Action Level Changes

Global Problem

Lead poisoning isn't just a problem in the U.S.; children around the world face the danger of lead exposure. In China, lead is still being added to paint. In one study, 29 of 58 new paint samples contained lead equal to or exceeding 600 parts per million (ppm), including 14 equal to or exceeding 5000ppm (about 5 grams per liter) (Lin, 2009). To put this into perspective, it only takes 1 gram of lead dust (equivalent to the amount of sugar in a sugar packet) to contaminate a 2000 square foot home.

Canada, on the other hand, has seen great success with its lead regulations. In a study of Canadians' blood lead concentrations from 2007-2009, blood lead was detected in 100 percent of the population aged 6-79 years, with an average concentration of 1.34 $\mu\text{g}/\text{dL}$. This is, however, a three-fold decrease in average concentration from the previous Health Measures Survey conducted in 1978. In addition to this finding, Canadians with blood lead concentrations at or above 10 $\mu\text{g}/\text{dL}$ decreased from 27 percent in 1987 to less than 1 percent in 2009 (Bushnik, 2010).

The socio-demographic trends in Canadians with the highest blood lead levels are the same as in the U.S. People with the lowest incomes and people living in homes built more than 50 years ago all had higher blood lead levels than those who are wealthier, who live in homes less than 20 years old and those people who have never smoked (Bushnik, 2010).

Canada has also been similar to the U.S. in implementing bans on lead use. Unleaded gasoline was introduced in 1975 in Canada, followed by the complete ban of leaded gasoline in 1993. Since 1984, Canadians have seen lead levels in air drop by more than 99 percent (Health Canada, 2008).

Lead-based paint regulations were introduced in 1976 reducing the amount of lead that can be added to paint. This was further revised in 1991 when lead concentration was limited to its background level in interior and exterior paints. Thus where Americans likely find lead-based paint on pre-1978 homes, Canadians likely find lead-based paint in homes built before 1991 (Health Canada, 2008).

Russia, like many nations, is lagging behind in lead regulations. Leaded gasoline was in use until 2002 and lead is still widely used in new paints. Not surprisingly, lead levels in soil, air, paint and blood reflect this lack of regulation. In a pilot study conducted in 1995, joint U.S. and Russian researchers measured lead concentrations in paint, interior dust, drinking water, gasoline, soil and canned food in Moscow, Russia. The study generally found that paint, dust and water lead concentrations were at or below the EPA guidance levels. Gasoline lead concentrations within the city limits reflected the leaded gasoline ban in effect; however, outside Moscow city limits, leaded gasoline was still available. Lead concentrations in soil ranged from 500-2000 $\mu\text{g/g}$, levels that would be cause for hazard reduction measures in the U.S. (Orlova, 1995).

Russia, unlike the U.S. and Canada, also has industry as a major source contributing to lead in air. The U.S. and Canada use scrubbers to reduce lead emissions from industrial sources, whereas in Russia, emissions have a dramatic impact on the level of lead in the blood of area children. The World Health Organization has been tracking blood lead levels in children from 1990-2006. It found that in areas without a significant local source of lead the average blood lead level in children ages two to six was 5.5 $\mu\text{g/dL}$ and 3 $\mu\text{g/dL}$ for children ages eight to nine. On the other hand, in areas with a

significant source of lead children ages 3-7 in the far east of Russia had blood lead levels averaging 17 $\mu\text{g}/\text{dL}$ (Rudnai, 2009).

More specifically, a study conducted by Rubin, et al. in 2002 looked at blood lead levels in kindergarten children in the Russian towns of Ekaterinburg, Krasnouralsk and Volgograd. Overall, 23 percent of children had elevated blood lead levels ($>10 \mu\text{g}/\text{dL}$) and 2 percent were anemic (Rubin, 2002).

Addressing Lead-based Paint

In 2002, to more aggressively address one of the major remaining sources of lead exposure in the U.S., the EPA issued its final Renovation, Repair and Painting Rule regulating work practices when renovating homes with lead-based paint. The RRP rule went fully into effect on April 22, 2010. Wisconsin implemented its own RRP rule concurrently with EPA. In order to do so, Wisconsin maintains more stringent rules on testing, training and lead levels in paint. The purpose of the rule is to help eliminate childhood lead poisoning by requiring contractors who work with lead-based paint to become trained and certified in lead-safe work practices.

The EPA training curriculum is designed to be taught in eight individual modules then supplemented with 11 hands-on Skill Sets. Each module goes into detail about a specific skill needed to complete a lead-based paint renovation job safely. During audits I discovered that most trainers would do a piece of this hands-on, lecture, then do another piece, leaving a real disconnect in the flow of a job site. Also all of the training providers could only offer transportable props to demonstrate with instead of real walls and windows.

Contractors are typically very visual learners and can more easily apply processes when they are presented in logical order. The EPA curriculum does not do this. My inspection numbers clearly indicated that contractors being trained did not understand what was expected of them. In 2011, 50 percent of RRP violations in Wisconsin were by certified contractors. As renovation is such a big source of childhood lead poisonings, this is unacceptable. Effectively teaching safe work practices is imperative to stop this pattern (WI DHS, 2013).

As I began looking seriously at this problem, I conducted casual constructive interviews with certified contractors throughout the state. The most common concerns were “job-sites are never text book perfect” and “my job doesn’t look like what we did in class,” and also the excuse of choice for contractors in violation was always, “I don’t remember going over that in class.”

I was aware that unless a course were being audited, I could not verify that all the training aspects were covered adequately. Beyond this, once certified, lead-safe renovators were in charge of doing their own on the job training for the rest of their workers. I decided the most effective way to address all of these issues was to create training videos that would be required in class. This way, the curriculum is more standardized; it is ensured that if contractors at least see these videos they know what their site should look like and by utilizing several avenues of learning (reading, visual and hands-on) that there would be a higher retention rate. Additionally, these videos could be an instant resource for on the job training, making sure that other workers on the site can quickly see and understand what is expected when working lead-safe.

Training Videos: A New Approach

The process to create these training videos had three main phases: preparation, filming, and implementation. Each phase had specific checks and required approvals before I could move on to the next phase.

Preparation: Once I decided to take on this project there was instantly pressure to do it perfectly. Requiring another segment within the training would certainly be met with hesitation by the trainers who were already struggling to finish all of the course materials in the allotted eight hours.

To begin, I sat down with the joint EPA and HUD course materials to write out a script, find areas that were missing and brain-storm what would be the most important ideas to highlight in the videos. The curriculum presents the work practices in 11 skill sets, which trainers follow to ensure they have covered all of the materials. Each skill set outlines the process in which to complete each task and gives an estimated time that it should take to make it through each set. The skill sets are as follows:

1. Using EPA recognized test kits
2. Setting up barriers, signs and flapped entry doors
3. Cover or remove furniture
4. Establish Interior Containment
5. Establish Exterior Containment
6. Personal Protective Equipment (PPE)
7. Interior Final Cleaning
8. Exterior Final Cleaning
9. Bagging waste

10. Visual Inspection

11. Cleaning Verification Process

I found shortcomings in these early on; not only does it not make sense to teach the skills in this order, but the steps within each skill set also were not conducive to how the work would actually be done on a job. Contractors' comments about not using the book as a reference became very real when I saw that the text was not even set up in a logical order to follow through on a job. Even worse, with this training, the certified person is responsible for the on-site training of subcontractors using the EPA training materials as a guide.

Looking at it from the training providers' perspectives, they needed to work through all of these hands-on skill sets (plus taking a paint chip sample) in the allotted time and sign off on these contractors' ability to perform them flawlessly. Many of the training providers had been dividing up the hands-on activities to make the day easier for those in training, allowing for time to stand up and move around in the morning and afternoon. I wanted to be able to maintain that aspect in my new form of training because it does indeed make eight hours of training easier to achieve.

To begin, I took each hands-on skill that needed to be accomplished and divided it into either an interior or exterior skill and then had a few outlying ones that either are optional on a site or needed extra time to discuss. Ultimately, I ended up with five videos: Paint-Chip Sampling, Using a Recognized Test Kit, PPE, Interior Work Practices and Exterior Work Practices. Each video covers one or many of the skill sets in a logical work site oriented way. For example, the interior work practice video covered skill sets 3,

4, 2, 6, 7, 9, 10 and 11, in that order because that is how we would expect it to be done on an interior lead-safe work site.

Upon completing the scripts to ensure that I would not be putting the contractors in violation, I forwarded them to the Occupational Safety and Health Administration (OSHA) Consultation office to be reviewed for any possible safety violations. While the review was taking place, my team was brainstorming what materials we would need to perform these tasks at a real job and what location we could use to demonstrate these skills.

Working with UW-Madison we were able to arrange the use of the Heritage House, a home built in the 1800s that stands on the UW campus while it waits to be torn down. Its current use is as a police training facility until it can be sold and demolished for scrap. The home was deemed an ideal location as the rooms were big enough to host the filming equipment, and it would be very similar to what the contractors would be seeing on their job sites because it is a very typical Wisconsin style old home covered in lead-based paint.

After two weeks and with OSHA's approval, a materials list and a filming location, I was able to move onto the next phase in the project.

Filming: The filming process was the most time consuming. Interior and exterior work practice videos would be done at the Heritage House while the remaining three (paint-chip sampling, test kits and PPE) would be done in a large conference room at the Department of Health. Each video required following the steps perfectly to ensure that each required skill would be fulfilled.

The typical filming setup would include, my operating the filming equipment while simultaneously prompting the team on which step is coming next and my team trying to complete each step quickly and flawlessly. It was necessary to be as efficient as possible because we were under the time constraints listed in the skill sets. Additionally, since we have been advocating to the contractors that adding these safe work practices into their jobs would not add substantial time to their set up and take down, I thought it would be important to get the shots completed in one take.

Once I had the raw footage I would spend a few days roughly editing in titles and labels so my team could review it for any missed steps or violations. It took quite a few rounds of filming before we were all pleased with the outcome. For example, the exterior work practice video was refilmed eight times before the video quality, flow, time constraints, and process were completed flawlessly.

The videos themselves were completely muted during the review because we would not be using the audio of my prompts that were recorded at the site. After the video was up to par, I spent weeks editing the videos to delineate the skill sets, add narrative and make the videos into what they are now. Once this step was completed, each video needed to go through our internal review process and ultimately be approved by the Secretary of the Wisconsin Department of Health Services before it could be seen by the public.

The filming process from day one until departmental approval took over three months.

Implementation: With my product in hand, the most nerve-wracking portion of the project was ahead of me: discovering whether or not the contractors and training

providers would support and utilize these videos and see if the videos would be effective in increasing training retention and in decreasing violations by certified contractors.

I arranged a conference with all of the training providers within the state so I could personally introduce the videos, demonstrate how they would be using them in their course, get feedback and answer questions. To prepare for it, I put together a focus group with two of the local trainers in Madison. I held a private meeting with them to premier the videos and get their feedback while brainstorming what concerns and questions other trainers might bring up at the conference. This allowed me to prepare and attempt to answer most questions during my presentation of the videos themselves. It was also helpful because many times people are hesitant to voice their concerns or questions in a group of their peers and competitors.

The most prevalent concern that arose was being able to work the videos into the curriculum without extending the class time at all. I was confident that these videos would actually reduce the amount of time needed to demonstrate the skills because the audio goes through most of the lecture materials. Thus, trainers could use the lecture time as a review before releasing students into the hands-on portions to recreate what they had just seen, then discussed.

At the conference I presented the videos. Then, using the PPE video, demonstrated to the crowd with the help of two staff members who had never taken the training, that it could be used to shorten the presentation time. I had the staff members follow along with the video as it moved through the steps and discussed the ins and outs of lead-safe PPE. The video covered the lecture materials, the demonstration and led the hands-on in less than 10 minutes (and that was showing the video twice). This was less

than half the time I was observing in class to cover the same material. Additionally, the scripts were given to the training providers to use as checklists when observing the hands-on demonstrations.

The videos were met with general support but with some reservations about getting them worked into the flow of their classes. I assured the trainers that this implementation would not, and could not be left with just this meeting and be effective. Instead for two months following the release of the videos I went to every RRP training course that was held in Wisconsin to observe the implementation. I was able to answer questions and give advice for how to most efficiently use the videos. Beyond going to the classes, I also opened my schedule for any trainer who wanted to meet in a private meeting to go over implementation strategies. The scripts are presented in their entirety in appendix A.

CBA: Nothing to Lose

Calculating a cost benefit analysis poses many challenges, the biggest challenge being that all of the benefits come from preventing instances of lead poisoning. One of the most comprehensive cost benefit analysis regarding lead hazard reductions gives a conservative estimate that for every dollar spent on controlling lead hazards, \$17–\$221 would be returned in health benefits, increased IQ, higher lifetime earnings, tax revenue, reduced spending on special education, and reduced criminal activity (Gould, 2009).

However, these figures are based on the assumption that the lead-safe work is being done properly. Wisconsin found that 50 percent of our contractors out of compliance were certified to do the work properly. This is a huge problem because if a

renovation job is operated improperly, and even if no child is poisoned, it still costs an estimated \$218,320 for a single home to be decontaminated (Jacobs et al., 2003).

My videos address the issue of certified contractors conducting unsafe work. The EPA training isn't really tailored to the learning style of many contractors. By incorporating my videos, the training changes from merely text with a hands-on section to reading, seeing and doing. The overall goal is to make the training and certification process more effective in order to prevent the use of improper work practices and thus prevent childhood lead poisoning.

The actual cost of creating the videos is primarily driven by the hours I spent working on the project. Although the project spanned four months from script writing to implementation, the bulk of the work was conducted in the first three months. The other staff that appeared in the video also dedicated nearly three solid weeks to filming and additional time for review. Where we saved money was in materials and location. Most tools and materials were volunteered from staff, and the filming location was provided free of charge. The video equipment and video editing software was provided by me.

Below is a table with the estimated costs for developing the videos.

Table 2: Estimated Costs for creating Lead-Safe Work Practice Videos

Item	Est. Cost
Materials: wood, plastic, stakes cleaning supplies, personal protective equipment, etc.	\$300.00
Travel to and from site (4 cars, traveling 10 miles, for 10 visits @20 mpg and \$3.50 per gallon)	\$70.00
Staff time x4 staff persons @ \$24/hour for 120 hours	\$11,520.00
Production/Editing @\$24 for approximately 480 hours	\$11,520.00
Implementation visits 10 hours per visit for 8 visits @\$24	\$1,920.00

Total cost:	\$25,330.00
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From this point on, however, implementation in other states would be relatively cheap beyond paying for the typical training course audits. Wisconsin has implemented a new system in which any training provider who is repeatedly failing audits will be charged for the costs of the auditor to be on site, including the auditor's wages and travel.

So what is the expected pay off with the training? Unfortunately it all depends on how effective it is at preventing childhood lead poisoning. In one year after implementation, Wisconsin saw a 13 percent decrease in violations by certified contractors and a 31 percent decrease in violations overall, resulting in 16 fewer enforcement cases. This saves thousands of taxpayers' dollars in avoiding litigation against these contractors, and saves thousands of taxpayer dollars in health care costs, education costs, and criminal activity from potential lead poisoning typically brought on by renovation work.

Kartrina Korfmacher reported that providing a total savings may be inappropriate because each factor in determining the savings from preventing lead poisoning is highly variable depending on the degree of poisoning. However, she estimated that eliminating lead poisoning in New York would save the state over \$34 million in juvenile delinquent residential treatment, nearly \$8 million in special education costs, \$3 million in treatment costs and close to \$3 billion in loss of earning from lead poisoned children over their lifetime (Korfmacher, 2003).

Mahoning County took these same factors and determined its county of 235,000 people was spending \$0.5 million per year to care for lead poisoned children (Stefanak, 2005).

With these types of costs, extrapolated over a lifetime of care and problems, preventing just a handful of poisonings in Wisconsin would result in an overall benefit from the videos, not to mention the savings in litigation against contractors operating out of compliance.

First Year Results of Video Implementation

The lead-safe work practice videos were released in July 2012. Inspection statistics from July 2012-July 2013 show a 13 percent decrease in offenses from certified workers and a 31 percent decrease in violations overall. Mid-year for the second year in use shows this trend continuing with an additional 9 percent decrease in violations by certified workers. The inspection data are presented below.

Year	Total Violations	Certified	%	Uncertified	%
July 2011-2012 (pre-video implementation)	51	26	51	25	49
July 2012-2013	35	13	37	22	63
August 2013-November	25	7	28	18	72

Table 3: Wisconsin Inspection Data July 2011-November 2013

These very promising results have led to many public sector agencies incorporating this learning style into their own programs. Links to the videos are popping up on many homeowner and union websites. The EPA has distributed the videos into

three regions, CDC has distributed the videos to its Childhood Lead Poisoning programs, and HUD is using them at regional conferences. In the private sector, Home Depot has adopted the videos and trained 8,000 representatives in 20 states in the past year. The Wisconsin training providers have completely cut the skill set pages from their course materials and use the transcripts as the step by step directions for class.

Locally, many private companies use the videos as a way to quickly and effectively train their subcontractors in the field. One contractor told me the videos are the best training tool he has because he can get to a jobsite, load the video onto his tablet and be confident that his subcontractors will know what is expected of them to maintain compliance. Most recently, in an email correspondence dated December 4, 2013, a contractor said, “I have to applaud your Department for the new addition of the required videos associated with the refresher training. Being in construction related field a long time, I have found that most workers in this field do very well with, show me and I can do it. The video adds this important dimension of showing, along with the hands on training and a very knowledgeable live instructor, making the course more complete (Stankiewicz, 2013).”

Conclusion

The Wisconsin RRP training videos aid in solidifying the concepts and expectations of lead-safe work practices. Since their introduction, the regulatory agency (Lead and Asbestos Program at the Wisconsin Department of Health Services) has seen significant reductions in the number of certified contractors being found out of compliance with state RRP regulations. The videos are addressing the inconsistencies

between training classes and job sites that I observed during course audits and field inspections.

The Asbestos and Lead Section is working to expand the training video audience by translating the transcripts and videos into Spanish. The transcripts translated to date are provided in appendix B. Additionally, to increase implementation, the Asbestos and Lead Section is discussing how to improve outreach strategies, identify uncertified contractors and work with homeowners to increase their awareness of the hazards that can be created through renovation activities. The Lead and Asbestos Program has also asked that I present the findings of my project at the 2014 National Healthy Homes Conference in Tennessee.

The success of the RRP training videos has inspired the state of Wisconsin to use my methods in other sections. I've been approached to help create and implement training videos for asbestos abatement, radon and vapor intrusion. Similar implementation into Alaskan programs could result in state health benefits, as well as, increased revenue, compliance and retention.

With the ever growing success and continued distribution, the Wisconsin RRP training videos are expected to be a significant factor in bringing an end to childhood lead poisoning from renovation activities and become a model for increasing compliance.

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Appendix A: Training Video Scripts-

Lead-Safe Renovation Hands-On Skills Training**Transcript for Exterior Work Practices Video**

This video covers the proper steps for establishing exterior containment, setting up signs and barriers, final cleaning, bagging waste and visual inspection. These topics are covered as they would occur on a real job from start to finish. This exercise demonstrates how to properly conduct lead-safe work on the exterior.

Supplies needed for Exterior Lead-Safe Work Practices include:

Orange cones

Barrier tape

Warning signs

Plastic sheeting

Duct tape

Cutting tool

Tape measure

Disposable tack pad

Flashlight

Cleaning wipes

HEPA vacuum

Garbage bag

Establishing Exterior Containment

Before beginning: Close all doors and windows below or within 20 feet of the work area.

Step 1. Cover the ground with plastic sheeting at least 10 feet in all directions from the actual location of the paint disturbance. If your work is not being conducted on the ground floor make sure you use enough plastic to contain any debris that may be created from the renovation work.

Depending on your work scenario, 10 feet of horizontal plastic sheeting may not be adequate or possible. In this case you should consider using vertical containment or extending your horizontal containment.

Step 2. Secure the plastic to the side of the building. This will create a good seal to keep debris out of the soil.

If you're going to be using a ladder on the plastic you can cut holes for the feet through the plastic so that the ladder is stable on the ground but make sure you tape around the legs to maintain the containment and any time you move the ladder you'll need to patch the holes with duct tape.

Step 3. Weigh down the sides with 2 x 4s, bricks or stakes to keep the containment secure. Curbing the plastic by rolling it over 2 x 4s will create an additional barrier to prevent dust and debris from blowing off of the plastic.

Additionally, you can use spikes with washers and weights to keep the plastic from ballooning in wind or sliding around in the grass. Anything you use to hold down the plastic that is not completely wrapped into the plastic will need to be thrown away.

Step 4. Place barrier fencing around the perimeter of the work area 20 feet from the work surface and on all exposed sides.

Step 5. Place a **disposable tack pad** in the corner of the plastic sheeting nearest the work area entryway to control tracking dust off the plastic.

Step 6. Establish an entry point to the work area and place a sign that reads “Warning, Lead work area, No smoking or eating.”

Step 7. Stage all the tools, supplies and equipment that you will use to conduct the renovation, repair or painting work on the plastic sheeting to avoid contaminating the area outside the work area.

Wrapping Components for Disposal

After your work is completed, workers need to wrap and seal or bag all components and other large materials created during the renovation. High-efficiency particulate air (HEPA) vacuum the wrapped objects off and remove from the work area.

HEPA vacuum all tools before removing from the work area.

Exterior Final Cleaning

Step 1. Clean the plastic sheeting using a HEPA vacuum (although this is not required, it is a lot faster than wiping up the dust and debris by hand with cleaning cloths). Clean every surface in the work area from top down and from the innermost point in the work area towards the established entryway.

Step 2. Mist the plastic sheeting and fold the dirty side inward. Once gathered, you can either tape and seal the edges or place the folded sheeting in a heavy duty plastic bag.

This will need to be disposed of. Once placed into a heavy-duty plastic waste bag,

properly gooseneck the bag and HEPA vacuum the outside before removing from the work area.

Step 3. Remove any remaining waste from the work area and place in waste containers. Clean all surfaces in the work area and areas within 2 feet beyond the work area until no visible dust, debris or paint chips remain.

At this point, PPE may be removed. The proper method for removing PPE includes completely HEPA vacuuming yourself off, and then remove your work gloves, disposable coveralls, non-latex gloves, safety glasses and lastly your respirator. Use the hand-washing facility to wash your hands, face and shoes.

The last person to remove his/her PPE should keep on the respirator and gloves in order to take up the decontamination area by HEPA vacuuming, misting and folding in the plastic and placing in the waste bag. Remember to exit the decontamination area by walking over the tack pad before picking it up.

Step 4. After completing cleaning, recheck your work. Conduct a careful visual inspection of the work area for visible dust, debris or paint chips on hard surfaces and in the soil. If dust or debris is found, re-clean then recheck your work with another visual inspection.

Final Visual Inspection

Only a **certified renovator** may complete the final visual inspection.

Once you are confident there is no visible dust and debris, inform the **certified renovator** that the work area is ready for a visual inspection. The certified renovator carefully

inspects the entire work area, if there is no visible dust, debris or paint chips, the area is considered clean.

After passing visual inspection, barrier tape and caution signs may be removed.

Lead-Safe Renovation Hands-On Skills Training

Transcript for Interior Work Practices Video

This video covers establishing interior containment, covering immovable objects, setting up signs, barriers and flapped entry doors, final cleaning, visual inspection, cleaning verification, and bagging waste. These topics will be covered as they would for a real job from start to finish.

This exercise demonstrates how to properly conduct lead-safe work on the interior of a home, including when and how to remove or cover furniture; how to cover floors, seal doors and HVAC systems; where to establish critical barriers to the work area; how to clean after work has been completed; how to conduct the visual inspection and cleaning verification; and finally, how to properly gooseneck bagged waste.

Supplies needed for Interior Lead-Safe Work Practices include:

Heavy duty plastic sheeting

Cutting tool

Tape

Barrier tape/Warning signs/Orange cones

Tape measure

Disposable tack pad

Stapler

Dowel

HEPA vac

Spray bottle/garden sprayer

Wet wipes

Flashlight

PPE

Establishing Interior Containment

Before laying plastic, walk through the work area and close all doors and windows leading to or from the work area.

Tape the seams around each door and window casing with painters tape.

Step 1. Cut plastic sheeting so that it covers all exposed surfaces within 6 feet of components that will be affected by the work. Here, we will be working on the window on the right side of the screen.

Step 2. Put down any runners that you plan on using for accessing the work area. This will keep workers from tracking debris on carpets or floors when walking out of the work area. Make sure these are secured to the floor with tape.

Step 3. Close and cover all air and heat diffusers and intakes, and if it's possible, turn off the HVAC system altogether until cleaning verification has been achieved.

Covering or removing furniture

Remove all furniture from the work area. Removing all of the furniture will save time and materials. If, however, there are pieces of furniture that cannot be removed they will need to be properly covered using the method shown here.

Step 1. Cover the floor with plastic within the work area. Tape it completely to the walls and floor around the edges. Cut around the immovable furniture so that the plastic on the floor can lay flat.

Step 2. Cut a piece of plastic large enough to cover the immovable object and secure it with tape. Using painters tape on the walls will prevent damage to the paint on the walls, while using duct tape to tape plastic to plastic will give a secure seam.

Everything within 6 feet of surfaces that will be renovated, repaired or painted needs to be removed or covered, including window treatments, furniture and rugs.

Now that everything in the work area has been covered or removed, **stage your tools** on the plastic sheeting within the work area along with any other equipment that will be used to conduct the renovation, repair or painting work. Bringing your tools into the work area before starting the job will save having to bring them through the flapped door entry.

Once your tools are staged, close off your work area with a flapped entry door.

A **flapped entry door** is created by covering the work area entry doorway with 2 layers of plastic sheeting.

Step 1. Cut the first piece of plastic slightly bigger than the door frame so that it can be completely adhered to the frame.

Step 2. Use duct tape to create a vertical line about the size of a man from floor to header in the middle of the plastic sheeting on both sides. Use duct tape horizontally at the top and bottom to reinforce the plastic after it is cut.

Step 3. Make a small “S” fold at the top of the plastic sheeting and tape so that all layers are secured to the top of the door frame. Make a similar “S” fold at the bottom of the

plastic sheeting and tape so that all layers are secured to the floor. This will ensure the plastic is not tight and allow for people to move through it. You might want to staple the plastic to the door frame for a stronger hold, but make sure you have the owner's permission before doing so.

Step 4. Cut a long vertical slit through the duct tape, leaving about 6 inches at the top and the bottom uncut and reinforce the top and the bottom with horizontal duct tape to prevent the plastic from tearing.

Step 5. Measure and cut a second sheet of plastic sheeting. This piece should be slightly shorter than the door frame so that it will hang down flat against the first sheet of plastic. Tape this to the top of the door frame.

Step 6. Weight the bottom of the second layer of plastic sheeting by taping a dowel rod to the bottom with duct tape. This creates a self-sealing flap over the doorway and seals the opening that was cut into the first sheet of plastic. Once attached, the dowel should be situated about 3 inches off the floor.

An alternative to creating this T door is to set up a Z door. We will quickly demonstrate this entry door now.

A Z door requires three sheets of plastic. To use this properly, the plastic on the floor needs to be curbed so that any dust or debris is contained within the work area. The first piece of plastic is taped to the top and left side of the doorway. The second is taped to the top and right side of the doorway and the last piece of plastic is taped in the same method as the first piece, to the top and left. This door creates a weave entrance in which a worker enters by Z-ing through the alternating sheets. Put a series of S folds in the sheets

while taping them to the door frame. This will allow for a greater range of motion for entering and exiting through a Z-doorway.

To complete the containment you need to **control access** to your work area. Ask occupants to leave and remain out of the room where work is being done until after the cleaning verification procedure is complete or clearance is passed. Further, you need to place “Do Not Enter” signs at the entrance to your work area and put up barrier tape to keep occupants away and aware that work is being done.

Lastly, you’ll want to lay down a **tack pad** to help keep dust and debris that may be on worker shoes or boot covers from being tracked into non-work areas. The plastic runners that were discussed earlier are another option.

At End of Day or End of Work - Interior Final Cleaning

Once the work has been completed your tools need to be cleaned and removed from the work area before you can start cleaning. Vacuum off tools with the HEPA vacuum, or wipe them down with wet wipes. Using the plastic runners and tack pad, workers can take the cleaned tools out of the work area.

Step 1. The first step of interior cleaning is to wrap, seal or bag in plastic all removed components and other large materials or debris created during the renovation work.

HEPA vacuum off the plastic waste bags or wraps, remove from the work area and place in appropriate waste containers.

Step 2. Working top to bottom and from the inner most region of the work area towards the entry door, vacuum the walls and all plastic sheeting using the HEPA vacuum.

HEPA vacuum yourself. At this point workers can remove their tyvek suit, but leave on boot covers, non-latex gloves, eye protection and respirators.

Step 3. Mist the plastic sheeting and fold dirty side inward when removing it. Either seal the edges of the folded plastic with tape or place folded sheeting in a heavy duty plastic bag. Used plastic must be disposed of.

Step 4. Clean all surfaces within the work area and in the area 2 feet beyond the work area until no dust or debris remains. Start cleaning at the top of the wall and work down toward the floor. HEPA vacuum or wet wipe all the wall surfaces in the work area. HEPA vacuum all remaining surfaces in the work area, including furniture and fixtures. Use the upholstery attachment for the window surfaces and the crevice tool along the edge of the walls. Use the HEPA vacuum with a beater bar for carpeting.

Step 5. Wipe all remaining surfaces and objects in the work area except for carpeted and upholstered surfaces, with a disposable wet cleaning wipe. Mop uncarpeted floor using the two-bucket method of wet mopping. Mop strokes should be in long S motions. Work from the end farthest from the work area entrance back toward the entrance. Make sure never to step back into areas that have already been cleaned.

Step 6. If the property receives HUD funds, and as a best practice, repeat the cleaning procedure for walls, countertops and floors.

Step 7. After completing the cleaning procedure, check your work. Conduct a careful visual inspection of the work area looking for visible dust and debris. If visible dust or debris is found, repeat the cleaning procedure.

After completing the visual inspection, the T door can be taken down but tape barriers and DO NOT ENTER signs need to remain in place to control the work area.

Step 8. Once the cleaning procedure is complete and you've rechecked your work notify the certified renovator in charge of the project that the work area is clean and ready for final visual and cleaning verification inspections.

Final Visual Inspection

The visual inspection may only be conducted by a **certified renovator**.

Step 1. PPE required for visual inspection. When conducting a visual inspection make sure that you are wearing boot covers so that you do not track any dust or debris into the work area.

Step 2. Turn on all the lights in the work area and bring a bright white-light flashlight along to ensure adequate lighting.

Step 3. Systematically look at every horizontal surface in the work area. If you find dust and debris, re-clean the work area and repeat the visual inspection until it passes.

Step 4. Once you have carefully inspected all of the surfaces and have found no dust or debris the certified renovator may proceed to the cleaning verification procedure.

Cleaning verification

The cleaning verification may only be conducted by a **certified renovator**.

Step 1. As you enter the work area put on disposable foot covers so that you do not track dust and debris into the work area. Wear latex or non-latex plastic gloves.

Step 2. While wearing gloves, use a long handled mop with disposable wet pad. Wipe no more than 40 square feet per each new wet pad.

- Compare each pad used to the cleaning verification card.
- If the used wipe looks the same or lighter than the cleaning verification card, the floor is clean.
- If the used wipe is darker than the verification card you must re-clean the failed floor section by washing the floor with a wet cleaning wipe. Repeat the cleaning verification process.
- If the floor section fails a second time, you need to re-clean, wait an hour for it to dry, and then use an electrostatically charged dry cloth to complete the cleaning process.
You do not need to compare the dry cloth with the cleaning verification card.

Cleaning verification is also required for every window sill, countertop and horizontal surface within the work area. Use a new wipe for each window sill. A countertop may be wiped in its entirety with one wipe unless it is over 40 square feet.

Bagging Waste

When bagging waste, be sure to not overfill the bag.

Step 1. Gather the open end of the bag just below the neck of the bag and insert the HEPA vacuum. Use the vacuum to remove excess air from the bag. This prevents the bag from popping during disposal.

Step 2. Remove the vacuum hose and twist the neck of the bag to form an 8-10 inch column.

Step 3. Fold the twisted column over on itself in a similar manner to how you would fold a hose over onto itself to cut off the flow of water.

Step 4. Grasp the folded neck of the bag in one hand and wrap tape around the folded neck to secure the fold in place

Step 5. Now wrap the tape about 2 or 3 inches from the top of the fold several times so that the bag cannot come open. This should leave a loop handle on the top

Step 6. Lastly, use your HEPA vacuum to remove any dust from the exterior of the bags.

Once you've passed the cleaning verification and disposed of all the waste you can remove the signs and critical barriers around the work area.

Lead-Safe Renovation Hands-On Skills Training
Transcript for Paint Chip Sampling Video

This video shows students an alternative method for determining the presence of lead-based paint by collecting paint chip samples that are submitted to a recognized laboratory for analysis.

In Wisconsin, **only certified Lead Inspectors, Risk Assessors, or Hazard Investigators may take paint chip samples.** Lead-Safe Renovators may not take paint chip samples. Wisconsin Lead-Safe Renovation training teaches the full EPA curriculum to make your training transferrable to other states. Please check with a state's lead program before committing to a project in that state.

Supplies needed for PPE on Lead-Safe Renovations include:

Re-sealable sampling container

Measuring tool

Wet wipes

White paper

Cutting and scraping tools

Flashlight

Plastic gloves

Waste bag

Testing surface.

Taking a paint chip sample

Step 1. Set up your paint chip collection tray. This is done with a piece of white paper folded to a point at one end to create a funnel and placed under your testing area. If you are sampling on a vertical surface, make sure you design your collection tray to catch the entire sample. Tape it below the collection area.

Step 2. Put on your PPE - safety glasses and non-latex gloves.

Step 3. With a measuring tool, outline the collect area, typically a one-inch by one-inch square. This can easily be done without a measuring tool by using a one-inch chisel.

Step 4. Using a cutting tool, score the collection area both horizontally and vertically. This will allow for a more complete paint chip sample collection. You need to remove all of the paint within the collection area without removing any of the substrate.

Using the chisel upside down can help with separating the paint from the substrate.

Step 5. Transfer the collected sample to the paint chip sample collection container. This container should be labeled with the information regarding the test location, a unique identifier and the dimensions of the sampling surface.

Step 6. Now you can remove your non-latex gloves. The proper method is to remove the first glove inside out and hold it in the palm of the remaining glove, then turn the remaining glove inside out as well. You can now remove your safety glasses.

Step 7. Clean your sampling area and all the tools used during the sampling process with a wet wipe.

Step 8. Wash your hands. Label sampling container with the sample size, location and unique identification number.

Lead-Safe Renovation Hands-On Skills Training
Transcript for Personal Protective Equipment Video

This video show students how to properly don and doff personal protective equipment (PPE), as well as the steps for decontaminating and disposing of used equipment.

Supplies needed for PPE on Lead-Safe Renovations include:

Disposable coveralls

Disposable non-latex gloves

Disposable foot covers

Eye protection

Leather or canvas work gloves

P, R or N-100 respirator

Disposable waste bags

Duct tape

Hand washing facilities.

Donning Personal Protective equipment

Step 1. Put on protective coveralls. Disposable coveralls are a good way to keep dust off of workers' street clothes and to reduce the chance of spreading dust into an employee's vehicle or home.

Remember to use a HEPA vacuum to remove dust and debris from coveralls and all other outer wear before exiting the work area. To keep the cost down consider buying extra-large coveralls in bulk and sizing down to fit workers using duct tape.

Step 2. If your coveralls do not have built in booties, put on boot covers.

Step 3. Put on your P, R or N-100 respirator to prevent over exposure to lead dust.

Step 4. Put on safety glasses.

Step 5. Put on non-latex gloves.

Step 6. Put on your leather or canvas work gloves.

Step 7. Put on the hood of your disposable coveralls, or alternatively, you can wear a painter's hat. Head coverings are required by OSHA.

You are now ready to begin work.

For more information regarding the OSHA requirements for personal protective equipment please refer to their website.

Doffing Personal Protective Equipment

Step 1. After work is complete you'll need to completely HEPA vacuum yourself off.

Once HEPA vacuumed you can remove your work gloves.

Step 2. Remove your hat or the hood if it is attached already. Dispose the hood in the waste bag.

Step 3. Remove the disposable coveralls; remember to roll the coveralls into themselves in order to contain any lead dust. You may remove your boot covers along with your

disposable coveralls if they're not attached. And you'll need to dispose of these items in the waste bag.

Step 4. Remove your non-latex gloves; the proper method is to remove the first glove inside out, hold it in the palm of the remaining glove, then turn the remaining glove inside out while removing it as well. Dispose of the gloves in the waste bag.

Step 5. Remove your safety glasses. Either dispose or clean the glasses with a wet wipe.

Step 6. The last piece of personal protective equipment that should be removed is your respirator. Either clean or dispose the respirator.

Step 7. Use hand washing facilities or wet wipes to wash your hands, face and shoes.

Lead-Safe Renovation Hands-On Skills Training
Transcript for Using EPA Recognized Test Kit Video

This video teaches students how to correctly use an EPA and Wisconsin recognized test kit to determine if lead-based paint is present on components and surfaces affected by renovation work.

The Wisconsin Department of Health Services recognizes the 3M LeadCheck Lead Test Kit for use by certified Lead-Safe Renovators at the request of the home-owner to test components to determine if lead-safe work methods are required.

The Renovator must read and follow the instructions that come with the test kit and test each component separately. Each testing location and result must be documented in writing. For more information and general instructions for test kit use in Wisconsin visit our website at www.dhs.wisconsin.gov/lead.

Supplies Needed for Using a Paint Test Kit Include:

EPA recognized test kit with instructions

Plastic drop cloth

Duct tape

Disposable non-latex gloves

Disposable shoe covers

Verification card

Wet wipes

Garbage bag

Utility knife

Testing surface

Using a Recognized Test Kit

Step 1. Read the manufacturer's instructions. This is the most important step. Each test kit varies regarding the procedures for the most accurate results. The instructions also give you information regarding which substrates can be tested. Here we will be demonstrating the LeadCheck swabs and following the instructions they provide.

Step 2. You may want to secure a drop cloth. This can be put into place to catch any debris that may come loose during testing.

Step 3. Put on your personal protective equipment including disposable non-latex gloves, shoe covers and optional eye protection.

Step 4. Prep your surface. Cleaning the surface with a wet wipe will ensure accurate results without a bias from possible lead dust that has gathered on the surface.

Step 5. As per manufacturer's instructions, cut a quarter inch notch with diagonal exposure through all painted layers down to the bare surface.

Step 6. Activate your LeadCheck swab. Within the tube is a liquid and a powder, crushing each end of the tube and shaking will allow these to mix.

Step 7. Squeeze the liquid out of the applicator onto the notch that you cut into the painted component and rub the exposed cross section for 30 seconds.

If any of the painted layers contain lead a positive result will occur and the swab or the surface will turn pink or red. You must use one swab for every testing surface.

Step 8. You can confirm your results with the verification card provided by the manufacturer. If your testing surface yields a negative result you must use your verification card to prove that the kit was working correctly. There is lead on the card and thus it should yield a positive result.

Step 9. Cleaning up the testing site consists of using a wet wipe to clean any remaining residue off the testing surface and cleaning the cutting tool used to make the notch.

Step 10. At this point you can remove your personal protective equipment and take up the drop cloth. First, remove your boot covers while stepping off the plastic. HEPA vacuum and then mist the plastic with water, fold the dirty side in and dispose of your drop cloth in the waste bag.

Now you can remove your non-latex gloves. The proper method is to remove the first glove inside out, hold it in the palm of the remaining glove, then turn the remaining glove inside out while removing it, as well.

Last, remove your safety glasses and then wash your hands and face with a wet wipe.

Appendix B – Training Video Scripts (Spanish)

Entrenamiento Práctico de Renovación de Manera Segura con Plomo**Transcripción del Video de Prácticas de Trabajo Exterior****Lead-Safe Renovation Hands-On Skills Training****Transcript for Exterior Work Practices Video**

Este video cubre los pasos adecuados para establecer la contención exterior, crear letreros y barreras, realizar la limpieza final, colocar los escombros en bolsas de residuos y pasar la inspección visual. Estos temas se tratan de comienzo a fin de la manera en que ocurrirían en un verdadero trabajo. Este ejercicio muestra cómo realizar correctamente un trabajo de manera segura con plomo en el exterior.

Los artículos necesarios para las prácticas de trabajo de manera segura con plomo en el exterior incluyen:

Conos anaranjados

Cintas para barreras

Letreros de advertencia

Láminas de plástico

Cinta adhesiva (*Duct tape*)

Herramienta para cortar

Cinta métrica

Almohadilla de tachuela desechable (Disposable tack pad)

Linterna

Toallitas de limpieza

Aspiradora HEPA

Bolsas de residuos

Como establecer la contención exterior

Antes de comenzar: Cierre todas las puertas y ventanas localizadas a menos o dentro de 20 pies del área de trabajo.

Paso 1. Cubra el suelo con láminas de plástico por lo menos a 10 pies de distancia en todas las direcciones donde se realiza el trabajo de perturbación de pintura. Si su trabajo no se está llevando a cabo en la planta baja asegúrese de utilizar suficiente plástico para contener todos los escombros que se puedan crear debido al trabajo de renovación.

Dependiendo de su escenario de trabajo, 10 pies de láminas de plástico horizontal puede no ser adecuada o posible, en este caso usted debe considerar el uso de contención vertical o extender su contención horizontal.

Paso 2. Asegure bien el plástico en los lados del edificio. Esto creará un buen sellado para evitar que los escombros alcancen el suelo.

Si va a usar una escalera sobre el plástico le puede hacer agujeros al plástico donde están las patas para que la escalera se mantenga firme en el suelo pero asegúrese de poner cinta adhesiva alrededor de las patas de la escalera para mantener la contención, además cada vez que mueva la escalera necesitará reforzar los agujeros con cinta adhesiva.

Paso 3. Ponga peso en los lados con ladrillos o estacas 2 x 4, para mantener la contención segura. Para sujetar el plástico, enróllelo en una pieza 2 x 4 para crear una barrera adicional que evite que el polvo y los escombros se vuelen del plástico.

Además, puede utilizar clavos con arandelas y pesas para mantener el plástico firme y que no se vuele con el viento o se resbale en la hierba. Cualquier cosa que utilice para mantener el plástico firme que no esté totalmente cubierta con el plástico deberá desecharse.

Paso 4. Coloque barreras para cercar alrededor del perímetro de la zona de trabajo a 20 pies de la superficie de trabajo y en todos los lados expuestos.

Paso 5. Coloque una **almohadilla de tachuela desechable** en la esquina de la lámina de plástico más cercana a la entrada del área de trabajo para evitar arrastrar el polvo del plástico.

Paso 6. Establezca un punto de entrada al área de trabajo y coloque un letrero que diga "ADVERTENCIA, zona de trabajo con plomo, no fumar o comer".

Paso 7. Ponga las herramientas en el orden en que las va utilizar, materiales y equipos que utilizará para llevar a cabo la renovación, trabajo de reparación o pintura sobre la lámina de plástico para evitar contaminar la zona fuera del área de trabajo.

Como envolver los componentes para fines de eliminación

Una vez finalizado su trabajo, los trabajadores necesitan envolver y sellar o poner en bolsas todos los componentes y demás materiales grandes creados durante la renovación.

Utilice una aspiradora HEPA en los objetos envueltos y retírelos del área de trabajo.

Utilice una aspiradora HEPA en todas las herramientas antes de retirarlas del área de trabajo.

Limpieza final exterior

Paso 1. Limpie la lámina de plástico protectora utilizando una aspiradora HEPA (aunque esto no se requiere, es mucho más rápido que limpiar el polvo y los escombros a mano con paños de limpieza). Limpie todas las superficies del área de trabajo de arriba hacia abajo y desde el punto más profundo en el área de trabajo hacia la entrada establecida.

Paso 2. Humedezca con un rociador la lámina de plástico y doble la parte sucia hacia adentro. Una vez recogida, usted puede pegar y sellar los bordes con cinta adhesiva o colocarla doblada en una bolsa de plástico resistente. Ésta tendrá que ser eliminada. Una vez colocada en una bolsa de residuos de plástico resistente, cierre bien la bolsa y utilice una aspiradora HEPA en el exterior de la bolsa antes de retirarla de la zona de trabajo.

Paso 3. Retire cualquier residuo restante del área de trabajo y colóquelos en los contenedores de residuos. Limpie todas las superficies en el área de trabajo y las áreas dentro de 2 pies de distancia del área de trabajo hasta que no queden virutas de polvo, escombros o pintura visibles.

En este momento, puede quitarse el equipo de protección personal (Personal Protective Equipment o PPE por sus siglas en inglés) (Vea el video sobre Personal Protective Equipment para más detalles.). El método apropiado para quitarse el equipo de protección personal incluye utilizar una aspiradora HEPA en usted mismo y aspirar por completo todo el polvo y los residuos, y luego quitarse los guantes de trabajo, overoles desechables, guantes sin látex, gafas de seguridad y, por último, el respirador. Use las instalaciones de lavado de manos para lavarse las manos, cara y zapatos.

La última persona que se quite su equipo de protección personal debe dejarse puesto sus guantes y respirador para ocuparse del área de descontaminación utilizando una aspiradora HEPA, humedeciendo y doblando el plástico y colocándola en la bolsa de residuos. Recuerde salir de la zona de descontaminación caminando sobre la almohadilla de tachuela antes de recogerla.

Paso 4. Después de completar la limpieza, vuelva a verificar su trabajo. Realice una inspección visual cuidadosa de la zona de trabajo para señales de virutas de polvo, escombros o pintura sobre las superficies duras y el suelo. Si encuentra polvo o escombros, vuelva a limpiar y luego a verificar su trabajo de nuevo con otra inspección visual.

Inspección visual final

Sólo un **renovador certificado** puede completar la inspección visual final.

Una vez que esté seguro de que no hay polvo ni escombros visibles, informe al renovador certificado que el área de trabajo está lista para una inspección visual. El renovador certificado inspeccionará cuidadosamente el área de trabajo por completo si no hay virutas de polvo, escombros o pintura visibles el área de trabajo se considera limpia.

Después de pasar la inspección visual se pueden quitar las cintas para barreras y los letreros de precaución.

Entrenamiento Práctico de Renovación de Manera Segura con Plomo
Transcripción del Video de Muestreo de Virutas de Pintura

Lead-Safe Renovation Hands-On Skills Training
Transcript for Paint Chip Sampling Video

Este video les muestra a los estudiantes un método alternativo para determinar la presencia de plomo en la pintura mediante la recolección de muestras de virutas de pintura que se envían a un laboratorio acreditado para análisis.

En Wisconsin, **sólo los Inspectores de Pinturas a Base de Plomo, los Asesores de Riesgo, o los Investigadores de Peligro certificados** pueden tomar muestras de virutas de pintura. Los Renovadores que Trabajan de Manera Segura con Plomo no pueden tomar muestras de virutas de pintura. El entrenamiento de Renovación de Manera Segura con Plomo de Wisconsin enseña el currículo completo de la Agencia de Protección Ambiental (EPA por sus siglas en inglés) para que su entrenamiento sea transferible a otros Estados. Por favor consulte con un programa de plomo estatal antes de comprometerse con un proyecto en ese estado.

Los artículos necesarios para el equipo de protección personal (Personal Protective Equipment o PPE por sus siglas en inglés) sobre las renovaciones de manera segura con plomo incluyen:

Recipiente de muestreo resellable

Herramienta de medición

Toallitas húmedas

Papel blanco

Herramientas para cortar y raspar

Linterna

Guantes de plástico

Bolsa de residuo

Superficie de prueba

Tome una muestra de viruta de pintura

Paso 1. Coloque su bandeja con las virutas de pintura recolectadas. Esto se hace con una pieza de papel blanco doblado a un punto en un extremo para crear un embudo que se coloca bajo su área de prueba. Si hace su muestreo sobre una superficie vertical, asegúrese de diseñar su bandeja de recolección para que recoja toda la muestra. Péguela con cinta adhesiva debajo del área de recolección.

Paso 2. Póngase su equipo de protección personal - las gafas de seguridad y sus guantes sin látex.

Paso 3. Con una herramienta de medición, delinee el área de recolección, normalmente un cuadro de una pulgada por una pulgada. Esto se puede hacer fácilmente sin una herramienta de medición utilizando un cincel de una pulgada.

Paso 4. Utilizando una herramienta de cortar, marque la zona de recolección tanto horizontal como verticalmente. Esto permitirá una recolección de muestras de virutas de pintura más completa. Es necesario quitar toda la pintura dentro de la zona de recolección sin remover nada del sustrato.

Utilizar el cincel boca abajo puede ayudar con la separación de la pintura del sustrato.

Paso 5. Transfiera la muestra que recogió al envase de recolección de muestra de virutas de pintura. Debe ponerle una etiqueta a este envase con información sobre la ubicación de la prueba, un identificador único y las dimensiones de la superficie del muestreo.

Paso 6. En este momento se puede quitar los guantes sin látex. El método apropiado es quitarse el primer guante al revés y sostenerlo con la mano que tiene un guante, luego quitarse el otro guante al revés también. Ahora puede quitarse las gafas de seguridad.

Paso 7. Limpie el área de muestreo y todas las herramientas utilizadas durante el proceso de muestreo con una toallita mojada.

Paso 8. Lávese las manos. Póngale una etiqueta al envase de muestreo con el tamaño de la muestra, la ubicación y el número de identificación único.

Entrenamiento Práctico de Renovación de Manera Segura con Plomo
Transcripción del Video de Equipo de Protección Personal

Lead-Safe Renovation Hands-On Skills Training
Transcript for Personal Protective Equipment Video

Este video muestra a los estudiantes cómo ponerse y quitarse correctamente el equipo de protección personal (Personal Protective Equipment - PPE), así como los pasos para la descontaminación y eliminación de equipos usados.

Los artículos necesarios del equipo de protección personal (PPE) para las renovaciones de manera segura con plomo incluyen:

Overoles desechables

Guantes sin látex desechables

Cubre zapatos desechables

Protección para los ojos

Guantes de trabajo de cuero o lona

Respirador P, R, o N-100

Bolsas de residuos desechables

Cinta adhesiva (Duct tape)

Instalaciones para lavarse las manos.

Como ponerse el equipo de protección personal

Paso 1. Póngase un overol de protección. Los overoles desechables son una buena manera de mantener el polvo fuera de la ropa de calle de los trabajadores y reducir las posibilidades de propagación del polvo en el vehículo o en la casa del empleado.

No olvide utilizar una aspiradora HEPA para eliminar el polvo y los escombros de los overoles y otras piezas de vestir externas antes de salir del área de trabajo. Para mantener el costo bajo considere comprar overoles de una talla extra grande en cantidades grande y ajustar la talla utilizando cinta adhesiva.

Paso 2. Si sus overoles no están hechos con botines, póngase un cubre botas.

Paso 3. Colóquese el respirador P, R o N-100 para evitar el exceso de exposición al polvo de plomo.

Paso 4. Póngase las gafas de seguridad.

Paso 5. Póngase los guantes sin látex.

Paso 6. Póngase sus guantes de cuero o lona.

Paso 7. Póngase la capucha de su overol desechable, o alternativamente, usted se puede poner su gorra de pintor. Cubrirse la cabeza es requerido por OSHA.

Ahora está listo para empezar a trabajar.

Para más información sobre los requisitos de OSHA para el equipo de protección personal, consulte el sitio Web de OSHA.

Como quitarse el equipo de protección personal

Paso 1. Después de completar el trabajo es necesario que se pase la aspiradora HEPA en usted mismo para remover por completo cualquier residuo de polvo. Una vez que se ha pasado la aspiradora HEPA puede quitarse los guantes de trabajo.

Paso 2. Quítese el gorro o la capucha. Deseche la capucha en la bolsa de la basura.

Paso 3. Quítese el overol desechable; no olvide enrollar el overol con el fin de contener cualquier polvo de plomo. Se puede quitar su cubre botas junto con su overol desechable si éstos no están unidos. Usted necesitará desechar estos artículos en la bolsa de residuos.

Paso 4. Quítese sus guantes sin látex; la manera correcta de quitarse el primer guante es al revés, sosténganlo en la mano que tiene un guante, luego quítese el otro guante al revés también.

Paso 5. Quítese las gafas de seguridad. Deseche o limpie las gafas con una toallita húmeda.

Paso 6. La última pieza de equipo de protección personal que se debe quitar es el respirador. Limpie o deseche el respirador.

Paso 7. Use las instalaciones de lavado de manos o toallitas húmedas para lavarse las manos, cara y zapatos.