

**California Department of Public Health
Occupational Health Branch**

**FATALITY ASSESSMENT AND CONTROL EVALUATION
PROGRAM (CA/FACE)**

**A Bathtub Refinisher Dies from Methylene Chloride Exposure
While Removing Paint from a Bathtub
Case Report: 17CA002**

SUMMARY

A bathtub refinisher, working alone in a small apartment bathroom, died of methylene chloride exposure while using the chemical to remove paint from a bathtub. The bathroom had a small, open window but no mechanical ventilation. The victim was not wearing any respiratory protection. The victim was the sole employee of a company that specialized in refinishing bathtubs and sinks.

The California Fatality Assessment and Control Evaluation (CA/FACE) Program concluded that bathtub refinishing contractors should take the following steps to prevent similar incidents:

- Use a safer paint removal product such those containing benzyl alcohol, dimethylglutarate, or dimethyl adipate. Avoid using products that contain methylene chloride or n-methyl pyrrolidone (NMP).
- If a methylene chloride-containing paint remover is used, it should only be done in a well-ventilated bathroom, using an airline respirator and polyvinyl alcohol (PVA) or Silvershield® gloves.

INTRODUCTION

On June 23, 2017, at approximately 6:45 pm, a 43-year-old Hispanic male bathtub refinisher, who had been working alone in a small apartment bathroom, died of methylene chloride exposure while using a methylene chloride-containing paint remover to remove paint from a bathtub. The CA/FACE program learned of the fatality from the California Department of Industrial Relations on June 26th. The CA/FACE investigator interviewed Cal/OSHA enforcement staff on July 17th and July 26th. Subsequently, on August 3rd, the sister of the victim was interviewed, and on August 31st, the employer was interviewed; both were interviewed in Spanish.

EMPLOYER

The employer was the victim's brother-in-law and they lived together in the same house. The brother-in-law ran a small company specializing in the refinishing of bathtubs, sinks,

countertops, and walls. His primary language was Spanish, but he also spoke limited English. He had been doing this type of work for 20 years. The employer was not a licensed contractor, but he had incorporated as a business the year before. At the time of the incident, the victim was his sole employee.

The company could handle two jobs at a time, with the owner and the victim each working alone. If there was just one job scheduled, the victim would do the work. The owner reported that they completed about five to six jobs per week. Property owners usually choose to refinish a bathtub, since replacing a tub is more costly.

WRITTEN SAFETY PROGRAMS, TRAINING, EXPERIENCE, AND KNOWLEDGE

The business owner did not have a written Injury and Illness Prevention Program (IIPP). He reported that he had personally trained the victim, and did have safety rules that had to be followed. These rules were not written down, however.

The owner stated that methylene chloride-containing paint removers were used to remove damaged layers of paint before repainting the bathtub. If the tub was unpainted, or had only one layer of paint on it, they often did not use a paint remover—just sanding before painting was adequate. If the tub had multiple layers of paint on it, and was in poor condition, then a paint remover would be used to remove the paint.

The owner said that he had always used methylene chloride-containing paint removers because it made some jobs faster and easier. He reported that everyone he knew in the trade used methylene chloride because it worked so well. On average it took 2½ to 3 hours to strip a bathtub using a methylene chloride-containing paint remover. The owner had purchased the paint stripper in this incident (Jasco Premium Paint and Epoxy Remover, labeled as containing 60% - 100% methylene chloride) at a large retail establishment.

The owner reported that he knew that methylene chloride was dangerous. He reported that he told the victim to always use gloves, goggles, ventilation, and a respirator. In this case, however, the bathroom was not ventilated, and the victim was not wearing eye protection, respiratory protection, or proper gloves. Furthermore, the type of respirator (organic vapor cartridge half mask respirator) found in the victim's van does not protect against methylene chloride vapors.

WORKER INFORMATION

The victim was a 43-year-old Hispanic male bathtub refinisher who spoke Spanish and limited English. He was born in El Salvador where he worked as a house painter and police officer before immigrating to the United States. He worked a number of jobs before starting to work for his sister's husband approximately four years prior. He lived with his sister and her husband, his employer.

INCIDENT SCENE

The incident scene was a small bathroom in an occupied residential apartment, similar to Exhibit 1. A large property management firm managed the apartment complex; it managed approximately 35 properties in southern California. The victim's employer was hired to refinish the bathtub and clean the tiled walls using an acid wash.

The bathroom measured 7 feet by 5 feet; the ceiling was 8 feet high. There was no mechanical ventilation. The bathroom had a small exterior window, measuring approximately 12 inches by 18 inches.



Exhibit 1. Photo of a similar bathtub being stripped of paint using a chemical paint remover (not the bathtub in this incident). *Photo courtesy of Michigan Fatality Assessment and Control Evaluation program.*

INVESTIGATION

The victim arrived at the apartment at approximately 9 am. He told the tenant that the family should leave the apartment because of the strong-smelling toxic chemicals he would be using. The tenant reported that the victim came out of the bathroom at about 10:30 am to get towels, and then returned to the bathroom, closing the door behind him. The tenant subsequently left the apartment.

The tenant reported that he returned to the apartment at approximately 2:15 pm, and found the bathroom door still closed. There was construction work taking place in an adjoining apartment unit, and the noise led the tenant to believe the victim was still working in the bathroom. At approximately 5:45 PM the construction noise ceased, and the tenant realized that there was no sign that the victim was still working in the bathroom. He called out to the

victim, received no answer, and found that the bathroom door was locked. The tenant called the police, and the paramedics also responded to the call.

When the paramedics were able to break through the locked bathroom door, they found the victim facedown, slumped over the edge of the bathtub. The victim was unresponsive and was pronounced dead at the scene. The police report noted that there were signs the bathtub paint was being stripped; there was a 1-gallon can of the Jasco product in the bathroom, and also a can of acid etch. The small bathroom window was open. The victim was not wearing a respirator and none was found in the bathroom. The victim was found wearing nitrile gloves.

CAUSE OF DEATH

The cause of death, according to the coroner's report, could not be officially determined. Forensic laboratory testing found 10% carboxyhemoglobin, with detectable methylene chloride, methanol, and acetone in blood. These findings are consistent with other reported fatal cases of methylene chloride exposure.¹

RECOMMENDATIONS

Methylene chloride exposure while removing paint from bathtubs is a significant cause of work-related deaths. A 2013 OSHA/NIOSH Hazard Alert found that, from 2000-2011, 14 workers died nationally as a result of methylene chloride being used to strip paint from bathtubs. Since 2014, at least five additional work-related deaths have been reported.

The CA/FACE program concluded that bathtub refinishing contractors should take the following steps to prevent similar incidents:

Recommendation #1: Use a safer paint removal product such those containing benzyl alcohol, dimethylglutarate, or dimethyl adipate. Avoid using products that contain methylene chloride or n-methyl pyrrolidone (NMP).

Discussion: Using methylene chloride-containing paint removers in bathrooms is extremely dangerous, as bathrooms are often small, enclosed spaces with little or no ventilation. Since methylene chloride is an extremely volatile chemical that evaporates readily when sprayed, brushed, or poured, the chemical vapors build up quickly. Moreover, because methylene chloride vapors are heavier than air, very high levels collect in the bathtub itself. This poses an increased hazard for workers bending over, and into, the bathtub as they work. Methylene chloride enters the body when inhaled and it can also be absorbed through unprotected skin. It can immediately irritate the eyes, nose, and throat. Direct contact can cause severe burns to the skin and eyes. Even small exposures are harmful over time as it can damage the liver,

¹ Fatal Exposure to Methylene Chloride Among Bathtub Refinishers — United States, 2000–2011. [Morbidity and Mortality Weekly Report \(MMWR\)](https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6107a2.htm)

February 24, 2012 / 61(07);119-122. <https://www.cdc.gov/mmwr/preview/mmwrhtml/mm6107a2.htm>

kidneys, and nerves, and can cause cancer. It also affects brain function, and at low levels can cause dizziness, fatigue, headaches, and nausea. At high levels it acts as an anesthetic, and can switch off the respiratory centers of the brain. In the body, methylene chloride turns into carbon monoxide which binds with hemoglobin, disabling the blood's ability to carry oxygen. This can cause death by asphyxiation. It can also starve the heart of oxygen, causing a heart attack.

The employee had used a methylene chloride-containing paint remover many times in the past. The owner reported that he had read the label and understood the risks. The warnings on the label are, however, difficult to understand and don't provide all the information needed to protect oneself. For example the labels warn of cancer risk but often do not make clear the possibility of rapid death.

Alternative work methods should be used to prep the bathtub surface for refinishing. Often sanding the surface is enough. In addition, there are paint removers that are based on less dangerous chemicals such as benzyl alcohol, dimethyl glutarate, or dimethyl adipate. Products containing n-methyl pyrrolidone (NMP) should not be used as this chemical can cause reproductive harm. A [guide to choosing safer chemical paint removal products](https://www.cdph.ca.gov/Programs/CCDC/PHP/DEODC/OHB/HESIS/CDPH%20Document%20Library/Paint-Removal-Methods.pdf) is online (see: <https://www.cdph.ca.gov/Programs/CCDC/PHP/DEODC/OHB/HESIS/CDPH%20Document%20Library/Paint-Removal-Methods.pdf>).

In this instance, had the victim removed the bathtub paint using a safer paint removal product, he would not have been exposed to fatally dangerous vapors, and his death would have been prevented.

Recommendation #2: If a methylene chloride-containing paint remover is used, it should only be done in a well-ventilated space, using an airline respirator and PVA or Silvershield® gloves.

Discussion: A well-ventilated space means that the vapors in the bathroom, and those settled in the bathtub itself, are continuously flushed out of the work area by clean air. Using the bathroom ceiling fan, or an open window, will not provide enough ventilation to prevent the dangerous accumulation of vapors. Opening the door, or putting a fan in the space or open doorway, are also not reliably effective.

In order to reduce the buildup of toxic vapors, a continuous flow of clean air to the work area is needed. An axial blower connected to a length of flexible ducting (a "manhole blower") should be used. It is important to ensure that the blower is set up to provide clean air and is not simply recirculating contaminated air into the bathroom. Set the manhole blower as far as possible from the bathroom as the length of ducting will allow, if possible directly in an open exterior window. Open any apartment windows to allow outside airflow into the room or hallway where the blower is located. The end of the blower ducting should be positioned so that the flow of air is directed into the bathtub itself. If there are bathroom windows, open them.

In addition to effective ventilation, a protective respirator must also be worn. Half-mask respirators equipped with organic vapor (OV) cartridges (a "painter's respirator") cannot protect against methylene chloride vapors. Studies have shown that methylene chloride is able

to penetrate the OV cartridges in a very short period of time. Full-face airline respirators, such as those used in automotive paint shops, offer reliable protection, and are the only kind of respirator that should be used. The respirator's compressor should be located in clean air, outside the bathroom, near an open window. The same airline respirator will also provide protection when spray painting the bathtub. Using a full-face respirator mask will protect the eyes from methylene chloride burns, eliminating the need to wear chemical goggles. All respirator use must be part of an OSHA-required respiratory protection program. In addition, PVA or Silvershield® gloves must be worn to protect the hands against methylene chloride burns and absorption through the skin. If the victim had set up an effective ventilation system, and used an airline respirator and PVA gloves, he would have been properly protected against methylene chloride exposure, and this fatality would have been prevented.

REFERENCES

[OSHA/NIOSH Hazard Alert: Methylene Chloride Hazards for Bathtub Refinishers](https://www.osha.gov/dts/hazardalerts/methylene_chloride_hazard_alert.html), January 2013.
(see: https://www.osha.gov/dts/hazardalerts/methylene_chloride_hazard_alert.html)

[CDPH/OHB: A Guide to Choosing Paint Stripping Products: Safety Considerations \(PDF\)](https://www.cdph.ca.gov/Programs/CCDC/DEOD/DCDC/DCDC/HESIS/CDPH%20Document%20Library/Paint-Removal-Methods.pdf)
(see: [https://www.cdph.ca.gov/Programs/CCDC/DEOD/DCDC/DCDC/HESIS/CDPH Document Library/Paint-Removal-Methods.pdf](https://www.cdph.ca.gov/Programs/CCDC/DEOD/DCDC/DCDC/HESIS/CDPH%20Document%20Library/Paint-Removal-Methods.pdf))

[CDPH OHB digital story 'Toxic Paint Removers: Safer Alternatives'](http://bit.ly/SaferAlternatives) – video
(see: <http://bit.ly/SaferAlternatives>)

[California Code of Regulations, Title 8, Section 1509, Injury and Illness Prevention Program.](https://www.dir.ca.gov/title8/1509.html)
(see: <https://www.dir.ca.gov/title8/1509.html>)

[California Code of Regulations, Title 8, Section 5144, Respiratory Protection.](https://www.dir.ca.gov/title8/5144.html)
(see: <https://www.dir.ca.gov/title8/5144.html>)

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FATALITY ASSESSMENT AND CONTROL EVALUATION PROGRAM

The California Department of Public Health, in cooperation with the Public Health Institute and the National Institute for Occupational Safety and Health (NIOSH), conducts investigations of work-related fatalities. The goal of the CA/FACE program is to prevent fatal work injuries. CA/FACE aims to achieve this goal by studying the work environment, the worker, the task the worker was performing, the tools the worker was using, the energy exchange resulting in fatal injury, and the role of management in controlling how these factors interact. NIOSH-funded, state-based FACE programs include: California, Iowa, Kentucky, Massachusetts, Michigan, New Jersey, New York, Oregon, and Washington.

Additional information regarding the CA/FACE program is available from:

[California FACE Program](#)

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