Floor Sander Dies When Wood Floor Refinish Product Ignites - Massachusetts

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SUMMARY

On July 2, 2005, a 43-year-old floor sander (the victim) was fatally injured when the one story single family house he was working in caught fire. The victim and a co-worker had just finished installing hardwood floors and were finishing them. The incident occurred when the flammable lacquer floor sealer that they were applying ignited, causing the house to catch fire. Calls were placed to Emergency Medical Services (EMS) and the fire department. Within minutes, EMS and fire department personnel arrived at the site to attend to the victim and control the fire. The victim was pronounced dead at the scene. The co-worker was able to exit the house without injuries. The Massachusetts FACE Program concluded that to prevent similar occurrences in the future, employers should:

- **Use wood floor finishing products that are less flammable (products with flash points greater than 100° F) for indoor applications**
- **Ensure that work areas are adequately ventilated during indoor application of wood floor finishing products**
- **Ensure that ignition sources including gas pilot lights are extinguished prior to beginning work**
- **Conduct job hazard analyses and implement and enforce a safety checklist to be completed prior to beginning work**
- **Develop, implement, and enforce a written hazard communication program that includes training employees about the chemicals they work with and the associated hazards and controls of these chemicals.**

The wood floor finishing industry and other stakeholders, such as contractors, insurance companies, and government agencies should:

- **Educate consumers about the hazards associated with finishing wood floors and actions that can be taken to minimize these hazards, such as the use of less flammable floor finishing products.**

Homeowners finishing wood floors themselves or through hired contractors should:

- **Ensure that only less flammable floor finishing products (products with flash points greater than 100° F) are used inside their homes.**

In addition, policymakers should:

- **Consider developing regulatory approaches to minimize the risk of fires and explosions during wood floor finishing.**

BACKGROUND

Wood floor sanding and finishing can expose workers, building occupants, and homeowners to a variety of health and safety hazards. In Massachusetts, three workers died within a ten month period (September 2004 – July 2005) in fires resulting from wood floor finishing when the flammable lacquer floor sealer they were applying ignited. All three of these fatally injured workers were Vietnamese immigrants. According to a Safety Bulletin released by the Boston Fire Department, between 1995 and September 2004, Boston, Massachusetts has experienced more than 25 fires directly attributed to hardwood floor installation and refinishing, resulting in a property loss value of over 1.5 million dollars. This Safety Bulletin has been included at the end of this report.

Nationally from 1992-2002, 52 fatal injuries were sustained by workers in the floor laying/other floor work business (Bureau of Labor Statistic, Census of Fatal Occupational Injuries data, using Standard Industrial Code 1752, not necessarily wood floors). Of these injuries, 21% (11/52) resulted from fires and explosions. Five of the workers who died due to fire or explosion were employed specifically in wood floor sanding.

In 2004, the Massachusetts Floor Finishing Safety Task Force was formed with members from community, health, safety, academic and economic development organizations. A report has been released by this task force and is referenced at the end of this FACE report.

INTRODUCTION

On July 6, 2005, the Massachusetts FACE Program was alerted by local media that on July 2, 2005, a floor sander was fatally injured when the house he was working in caught fire. An investigation was initiated. The Massachusetts FACE Director was in contact with the local fire and police departments and the Occupational Safety and Health Administration (OSHA). The fire report, police report, death certificate, OSHA inspection report, and product information were reviewed during the course of the investigation. Several unsuccessful attempts were made to contact the victim's family.

The victim was self employed as a wood floor installer and finisher. He had been in business approximately four years at the time of the incident. The victim performed the wood floor installing and finishing work only on weekends. Typically the victim worked alone, but occasionally he hired an assistant, depending on the size of the job. The victim had a fulltime weekday job as a machine operator for a medical equipment manufacturer.

It appeared that the victim did not have a written comprehensive hazard communication program and did not provide training to the occasional co-workers. After the incident, the company was considered no longer in business. Both the victim and his co-worker were Vietnamese immigrants.

INVESTIGATION

The company was hired to install and finish hard wood floors in the living room and hallway of a one-story single family house. The incident occurred on a Saturday, the victim and the co-worker's first day on-site for this job. They arrived at the house at 7:30 a.m. to start the job. The owners of the house were not home at this time. The living room and the connecting hallway were the two locations where the hardwood floors were being installed. A closet, which housed a gas hot water heater and gas furnace, was located off the living room. A bathroom was located off the hallway.

One of the first tasks they performed on-site was removing the wall to wall carpet in the living room and the hallway. The carpet was rolled up and removed from the house. The victim and co-worker then started installing the unfinished wood floors. At approximately 3:30 p.m. the wood floor installation was complete. The home owner had stopped by the house and was informed that the wood floors were installed and that the next task was to sand and apply a lacquer sealer and that by 6:00 p.m. the lacquer sealer would be dry enough to walk on the floors. The home owner left and the victim and the co-worker started sanding the floors. The sanding creates a smooth surface and prepares the wood floor for the application of the finishing products. The wood floor sanding was completed a little before 5:00 p.m. and the wood dust was cleaned from the area.

The first product applied to the wood floors was a lacquer sealer. A five gallon container of the lacquer sealer was brought inside the house from the work van. According to the manufacturer's material safety data sheet, the lacquer sealer being used contained, but was not limited to, acetone, toluene, xylene and keytones and had the following physical characteristics:

- Hazardous Material Identification System (HMIS) ratings of: health (2), flammability (3), and instability (0). HMIS is a numerical rating system ranging from zero to four: minimal hazard (0), slight hazard (1), moderate hazard (2), serious hazard (3), and severe hazard (4) (Figure 1).
- Vapor density rating greater than one (this lacquer sealer is heavier than air).

- Percent volatile (the percentage of a liquid or solid that will evaporate at an ambient temperature of 70° Fahrenheit (F)) rating of 72% - 84%.
- Flash point (lowest temperature at which a chemical's vapors are concentrated enough to ignite) rating of 9° F.
- Flammability classification rating of 1B (flash point below 73° F and boiling point at or above 100° F).

The victim and co-worker started to apply the lacquer sealer. During the lacquer sealer application the front door to the house was open and the house's windows were closed. No other ventilation was used throughout the project. The gas pilot lights for both the hot water heater and the gas furnace, both located in the closet off the living room, had not been extinguished. Prior to the incident, the co-worker had been using a brush to apply the lacquer sealer in hard to reach areas in the hallway near the bathroom. The victim had been applying the lacquer sealer in the living room with an applicator. The five gallon container of lacquer sealer was located in the living room near the victim.

When the vapors from the lacquer sealer ignited it caused an explosion blowing out several of the house's windows resulting in the house catching fire. The victim yelled "fire" and both the victim and the co-worker ran for the front door. The co-worker made it out of the house uninjured, but the victim did not make it out of the burning house.

The home owner of the house located across the street heard the explosion and looked out a window of her house. She saw the fire and the co-worker who had exited the house. She called 911 and the local fire and police departments arrived within minutes. The victim was found by the fire department personnel inside the house behind the front door. The fire was extinguished by the fire department. The body of the victim was transported to the medical examiner's office.

Investigations conducted by multiple agencies determined that the ignition source was most likely the pilot of the gas hot water heater in the closet off the living room. There was a warning label adhered to the hot water heater that warned against flammable vapors in proximity to the unit. Estimated damage to the house was in excess of $180,000.

CAUSE OF DEATH

The medical examiner listed the cause of death as extensive thermal injury.

Recommendation #1: Employers should use wood floor finishing products that are less flammable (products with flash points greater than 100° F) for indoor applications.

Discussion: The flash point of a liquid is the lowest temperature at which it gives off enough vapors to ignite when a source of ignition (see recommendation #3) is present. The lower the

flash point of a liquid, the higher the risk of fire or explosion. Many floor finishing products with flash points greater than 100° F, which are less flammable, are available. The flash point of a product can be found on the product label or the manufacturer's material safety data sheet (MSDS) or by calling the manufacturer.

In this incident, a highly flammable lacquer sealer (flash point of 9° F) was being used indoors. When finishing wood floor indoors, less flammable floor finishing products (products with flash points greater than 100° F) should always be used. Less flammable products will greatly reduce the risk of product ignition and subsequent explosions and fires.

Recommendation #2: Employers should ensure that work areas are adequately ventilated during indoor application of wood floor finishing products.

Discussion: In this case, the front door of the house was open during the lacquer sealer application. Inadequate ventilation during indoor application of flammable floor finishing products, such as lacquer sealers, can lead to a buildup of the product vapors to a concentration that could easily ignite.

It is recommended that employers ensure work areas are adequately ventilated for the products being used. Ventilation should draw the air out of the work area during indoor floor finishing and could include opening windows and using fans classified as explosion proof that are plugged in outside of the work area. Work area ventilation should continue until the applied floor finishing product is dry.

Providing adequate ventilation during indoor use of flammable wood floor finishing products, including lacquer sealers, can be problematic because too much air flow can interfere with the quality of the wood floor finish. The complexity of ensuring indoor work areas are adequately ventilated while applying flammable floor finishing products without jeopardizing the quality of the wood floor finish underscores the importance of using products with flash points above 100°F for indoor use.

Recommendation #3: Employers should ensure that ignition sources including gas pilot lights are extinguished prior to beginning work.

Discussion: In this case an ignition source was located within 50 feet of where the lacquer floor sealer was being applied. This ignition source was a pilot for a gas hot water heater that had not been extinguished, located in a closet off of the living room, one of the two locations were the wood floors were being finished.

Ignition sources within 50 feet of floor finishing product application should be extinguished. Sources of ignition include, but are not limited to, cigarettes and lighters, pilot lights for gas appliances (gas stoves, gas hot water heaters, gas heating units, gas clothes dryers), cycling electrical appliances (refrigerators, air conditioners, electric heating units, electric hot water

heaters), and electrical devices that could be inadvertently switched on (lights, radios, electrical switches). Cigarettes should not be smoked or lit within the work area, gas pilots should be extinguished and cycling electrical appliances and other electrical devices should be turned off and unplugged prior to using flammable products. It should be ensured that electrical switches, such as light switches, are not switched during the entire floor finishing process, from sanding to when the applied floor finishing product is dry. When possible turn off the power to the work area.

Recommendation #4: Employers should conduct job hazard analyses and implement and enforce safety checklists to be completed prior to beginning work.

Discussion: In this case, the pilot for the gas hot water heater had not been extinguished prior to beginning work and was the source of ignition in this incident. Also, the surviving co-worker reported that the house's windows were closed but the front door was open at the time of the incident. Not using fans and having the house's windows closed during the lacquer sealer application allowed the flammable vapors to build up.

Before the start of a floor finishing job, a competent person* should work with the homeowner to gather as much information as possible on ignition sources within the work area and ventilation options. This information and the product manufacturer's safety precautions should be incorporated into a wood floor finishing safety checklist that is given to the work crew before going to the work site for the first time. The employer should ensure that the tasks on the safety checklist are performed prior to starting work.

**Competent person:* a person through training or knowledge who is capable of identifying existing and predictable hazards in the surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them.

Recommendation #5: Employers should develop, implement and enforce a written hazard communication program that includes training employees about the chemicals they work with and the associated hazards and controls of these chemicals.

Discussion: Employers are required by the Occupational Safety and Health Administration (OSHA) to instruct employees in the recognition and avoidance of unsafe conditions, in the regulations applicable to their work, in this case floor finishing, and to control or eliminate any hazards or other exposures that could result in serious illness or injury.

Floor finishing companies should develop and implement a hazard communication program that includes identifying and developing a list of all hazardous chemicals used and generated in floor finishing, obtaining material safety data sheets (MSDSs) and labels for each hazardous chemical

and informing employees about these chemicals and the associated hazards through employer provided training. Hazard communication training should include, but not be limited to:

- an explanation of material safety data sheets and the labeling system
- where and how employees can obtain and use the appropriate hazard information
- safety and health hazards of the chemicals used and generated in floor finishing
- methods and observations that may be used to detect a presence (or an elevated level) of hazardous chemicals at the jobsite
- measures for employees to protect themselves from hazards, such as appropriate work practices, emergency procedures, and personal protective equipment.

It is required that all trainings be documented. Documentation should include: who provided the training and their qualifications, the content of the training, workers who were trained, and any assessments of workers' comprehension of the training.

Companies that employ workers who do not understand English should identify the languages spoken by their employees and design, implement, and enforce a multi-lingual hazard communication program. To the extent feasible, the hazard communication program should be developed at a literacy level that corresponds with the literacy level of the company's workforce. Companies may need to consider providing special safety training for workers with low literacy to meet their safety responsibilities.

Help for companies is available through the Massachusetts Division of Occupational Safety (DOS) which offers free consultation services designed to help small employers recognize and control potential safety and health hazards at their work sites, improve their safety and health programs, and assist in training employees (http://www.mass.gov/dos/consult/index.htm).

In addition, the Massachusetts Department of Industrial Accidents (DIA) has Occupational Safety and Health Training Grants available for companies and organizations that are covered by the Massachusetts Workers' Compensation Law. The grant money must be used to provide and improve prevention education and training in occupational safety and health to employers/employees within the Commonwealth (http://www.mass.gov/dia/Safety/index.htm).

Recommendation #6 The wood floor finishing industry and other stakeholders, such as contractors, insurance companies, and government agencies should educate consumers about the hazards associated with finishing wood floors and actions that can be taken to minimize these hazards, such as the use of less flammable floor finishing products.

Discussion: An educated consumer will be able to make the best decisions about which floor finishing process to choose and which contractor to hire based on their knowledge of associated

hazards and available product choices. Consumer education should be a joint effort involving floor finishing contractors, insurance companies and government agencies.

Floor finishing contractors and insurance companies should provide information to consumers about floor finishing options and impact of all available products. Government agencies should consider the implementation of an outreach program to inform the public about associated hazards and the availability of less flammable products for floor finishing.

Recommendation #7: Homeowners finishing wood floors themselves or through a hired contractor should ensure that only less flammable floor finishing products (products with flash points greater than 100° F) are used inside their homes.

Discussion: Homeowners who ensure that only less flammable products, products with flash points greater than 100° F, are allowed to be used inside their home, will minimize the risk of fires and/or explosions that could endanger themselves, their families, and workers (when using contractors).

Recommendation #8: Policymakers should consider developing regulatory approaches to minimize the risk of fires and explosions during wood floor finishing.

Discussion: There are a number of regulatory approaches that may reduce the risk of fires and explosions associated with wood floor finishing and thereby protect workers and the general public. The effectiveness and the feasibility of the following approaches should be explored:

- State licensing requirements for wood floor finishers that would require training, designation of competent persons, and oversight of business practices.
- Permitting rules that would require contractors or homeowners to notify local fire departments or other appropriate local agencies of plans for wood floor finishing jobs involving the use of flammable products. Information about product selection and safe work practices would be handed to the person obtaining the permit.
- Disclosure requirements that direct wood floor refinishers and manufacturers to provide information to consumers about the flash point and toxicity of the products to be used in their homes.
- Requiring the use of less flammable products (products with flash points greater than 100° F) when finishing wood floors indoors.

The wood floor finishing industry in Massachusetts consists mainly of small businesses, many of whom are Vietnamese owned and staffed (particularly in the Boston area). Representatives from the wood floor finishing industry and the Vietnamese community should play an integral part in exploring licensing, permitting or disclosure requirements, to ensure that the procedures are feasible, economical and linguistically appropriate.

REFERENCES

Code of Federal Regulations, 29 CFR 1910.1200 Hazard Communication. Government Printing Office

Code of Federal Regulations, 29 CFR 1926.21 Safety training and education. Government Printing Office

Code of Federal Regulations, 29 CFR 1926.20 General safety and health provisions. Government Printing Office

Code of Federal Regulations, 29 CFR 1926.57 Ventilation. Government Printing Office

Boston Fire Department, Press Release, Safety Bulletin Hazards Associated With Hardwood Floor Refinishing. Accessed October 18, 2004 at http://www.cityofboston.gov/bfd/download/Hardwood%20Floor%20Refinishing%20PR.pdf

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Green Seal, Choose Green Report, February 2005. Accessed March 2005 at http://www.greenseal.org/recommendations/CGR_wood_finish.pdf

Figure 1 – Example of a Hazardous Material Identification System (HMIS) label with the HMIS ratings for the lacquer sealer used in this incident.