Lessons Learned
Solutions for Workplace Safety and Health

Case Study 1

Floor finishers, lacquer sealers, and fires: safer product alternatives are the solution
What’s the best way to prevent fires from quick-drying floor finishes? Substitute a safer product.
CASE STUDY 1

Floor Finishers, Lacquer Sealers, and Fires: Safer Product Alternatives Are the Solution

Pia Markkanen, David Kriebel, Joel Tickner, Molly M. Jacobs

In 2004, two 35-year-old Vietnamese immigrants, Toan Bui and Ha Vu, were refinishing hardwood floors in a three-family house in Somerville, a city on Boston’s northern periphery. This was not at all an unusual scene. The older cities of New England feature tens of thousands of nineteenth- and early twentieth-century houses with fine old wood floors, which periodically need to be refinished. From an environmental and health perspective, there’s a lot that’s good about wood floors: they’re easy to keep clean, they’re comfortable and warm underfoot, and when they eventually get scuffed and dirty, they can be sanded and refinished several times before they need to be replaced.

Floor finishing is heavy, noisy, and dusty work, but it also requires attention to detail and a commitment to quality workmanship. In Massachusetts, the industry is now dominated by Vietnamese immigrants. An estimated 80 percent of all floor sanders/finishers in Boston are ethnic Vietnamese. In 2006, 127 of 144 registered Boston hardwood floor contractors had Vietnamese workers, and there are undoubtedly many more contractors who are not registered with the city.

Toan Bui and Ha Vu were typical workers in a typical trade—until 2004, when they died on the job in a fiery and entirely preventable disaster in which two co-workers were also badly burned. They had finished sanding the old floors and were coating them with a lacquer sealer that is typically 80 percent flammable solvent, with the remainder a mixture of resins that serve to coat and protect the wood. The entire house caught fire in a matter of seconds after the lacquer sealer was ignited by a pilot light in a gas stove.1,2

Sadly, other deaths have occurred under circumstances nearly identical to those described above. Between 1995 and 2005, more than 25 fires directly attributed to hardwood floor installation and refinishing occurred in Boston alone, resulting in a property loss valued at over $1.5 million.3 In 2005, in the nearby town of Hull, Massachusetts, a floor sander died from burns and another received minor burns while finishing wood floors that they had installed in a single-family home. A recent survey of 109 floor sanders/finishers in central and eastern Massachusetts found that 43 percent of respondents knew of fires that had broken out on hardwood floor-finishing jobs done by their company.4

In Toronto, two floor finishers died in 1991 as they were applying a lacquer finish to a new, unfinished hardwood floor, a fire broke out and an explosion followed. Ching Chan died of a suspected heart attack after helping his friend Chung Chow out of the burning building. Chung Chow died later from third-degree burns over 95 percent of his body. “The force of the explosion was
Between 1995 and 2005, more than 25 fires directly attributed to hardwood floor installation and refinishing occurred in Boston alone.

The floor-finishing industry

Floor sanders and finishers belong to the broad occupational group of carpet, floor, and tile installers and finishers. In 2008, this set of occupations accounted for about 160,500 jobs in the United States, and 35 percent of these workers were self-employed. The US Bureau of Labor Statistics (BLS) predicts 11 percent employment growth during 2008–2018 for floor sanders and finishers due to the increasing use of hardwood as a flooring material as well as the growing demand for residential renovations. Although earnings vary by geographic location and by union membership status, median hourly wages for floor sanders and finishers—at about $15 per hour—are the lowest in the broad occupational group.

Exposures to floor finishers

When a hardwood floor is installed, the wood flooring is first laid down on concrete or another type of foundation layer. Workers then smooth wood imperfections with sanding machines. During 1992–2002, 52 fatal injuries among workers in the occupational group of carpet, floor, and tile installers and finishers in the United States were reported to the Bureau of Labor Statistics. This is undoubtedly an underestimate: reporting of occupational fatalities is incomplete in the United States, and the data for small independent contractors are particularly inadequate. Of the known deaths, 21 percent (11/52) resulted from fires and explosions.

This case study highlights two major themes: (1) hazards of highly flammable wood floor-finishing products, in particular a number of serious fires these chemicals have caused in many communities; and (2) unprotected immigrant workers who need safer chemical alternatives to use at work. We start by describing the general nature of the floor-finishing work. The majority of the case study focuses on causes and aftermath of the two fatal fires in Massachusetts during 2004–2005 including the landmark State 2010 legislation that now prohibits the commercial use and sale of lacquer sealers in floor finishing. The case demonstrates the necessity of toxics use reduction (TUR) strategies—through government legislation, economic incentives, outreach, and training—as an essential element to promote public safety and fair business competition while making operations safer. Legislation is needed to ban hazardous products when less hazardous alternatives are clearly on the market.
to concrete or another type of foundation layer; (2) a sealer applied to the sanded wood surface; and (3) a varnish applied as a top coat as soon as the sealer has dried.11 Some sealers contain lacquer to speed drying, and are known as lacquer sealers.5 Some floor-finishing products contain chemicals that are toxic to the nervous system and reproductive system, cause cancer, and/or trigger allergies or asthma.4 And so while the fire hazard is perhaps the most frightening, it is not the only risk that these workers face.

Lacquer sealers have as much as 80% solvent in them... a gallon of lacquer on the floor is like pouring 3 quarts of gasoline on your basement. There are arson laws against that but no restrictions on using lacquer sealers in a closed environment like your home. — WoodFloorDoctor.com5

How flash fires happen
Most lacquer sealers are made from nitrocellulose alkyd resins and plasticizers.5 However, it’s the added lacquer thinner that makes these sealers both fast-drying and highly flammable.5 These products are inexpensive, and because they dry very quickly, many contractors use them as a quick first coat under varnish, despite their flammability.5 We would like to emphasize here that most floor sealers are not lacquers and are not flammable—industry experts who advised the Massachusetts Floor-Finishing Safety Task Force explained that lacquer sealers are not actually designed for floor finishing and fail to bind properly to coats of finish.12

For a liquid to be flammable, two conditions must be met: the liquid must be able to vaporize, and vapor at a sufficiently high concentration must come into contact with an ignition source. The flash point of a liquid is the lowest temperature at which the liquid produces enough vapor to catch fire in the presence of a flame or other ignition source. A product’s flash point can be found on its Materials Safety Data Sheet (MSDS), a summary of a chemical’s health effects, which employers are required by law to provide to workers, or on the product label, or by calling the product manufacturer.1

The lower a liquid’s flash point, the more flammable the liquid. Liquids that are formally classified as “flammable” have flash points under 100°F.4 Some floor-finishing products have much lower flash points, in the range of 25°F to 50°F; indeed, the product that led to one of the fatal fires in Massachusetts had a flash point of 9°F.4 In floor-finishing work, disastrous fires originate when lacquer sealer vapors come into contact with an ignition source, either a flame or a spark.4,13,14

It may seem that it should be easy to remember to extinguish pilot lights and other open flames, but this is not an adequate protection when chemicals can volatilize to explosive vapors so quickly. Anything that requires electricity can produce sparks: use of ventilation equipment, turning light switches on or off, unplugging an electric cord from a socket; or striking a metal object, such as a nail or staple in the floor. Even pouring liquid from one container to another can create enough friction to generate sparks if the containers are not grounded.4

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Rule of thumb: eliminating hazards is better than controlling them
Workers routinely work safely around highly flammable liquids and gases in a number of industries, including the oil and gas industry and the chemical refining industry. In these industries, there are requirements that all tools be non-sparking—hammers and screwdrivers are made of exotic metals such as bronze or beryllium; all electrical equipment must be elaborately shielded to ensure that sparks cannot occur; fire equipment and fire brigades are mandatory. Clearly, these kinds of precautions are not practical in residential home construction and repair. What are the alternatives?

Occupational hygienists are professionals whose job is to design workplaces to be safe for workers. They follow a set of fundamental principles, called the hierarchy of controls (see sidebar, Hierarchy of controls) when they search for solutions to a workplace hazard such as flammable chemicals. Long experience has shown that it is generally more effective to find solutions high up this list,
and move down to lower levels of control only when more effective methods are not feasible. For example, to control lung disease from breathing a toxic dust, it is generally more effective to use a ventilation system (#2 on the list) than a mask (#5). Masks require individual compliance, they often don’t fit well, and they are uncomfortable. They leak if they don’t have a good seal with the face, and workers often refuse to wear them. A well-designed ventilation system is subject to fewer kinds of failure.

The Massachusetts path to protections for floor-finishing workers
Alarmed by the deaths of floor finishers, community and public interest organizations mobilized in 2004 to protect workers and press for action by the state. As a result, a task force was formed, and its work ultimately formed the basis of a state law protecting floor-finishing workers.

The Massachusetts Floor-Finishing Safety Task Force
In Massachusetts, community organizing and the resulting participatory action research played a critical role in investigating causes of the fatal fires as well as developing and recommending a host of solutions to prevent these fires in the future. The process of many community stakeholders joining forces as well as maintaining this stakeholder partnership over several years (from 2004 until today) was groundbreaking. Through these years, participatory action research included various information collection strategies—for example, focus groups and interviews with the floor-finishing industry representatives, as well as with safety and environmental specialists; laboratory investigations and experiments; surveys among floor finishers; field investigations; and review of existing available data.

Viet-AID (Vietnamese-American Initiative for Development), a community-based organization that has been a leader in the fire investigation efforts, worked closely with the Massachusetts Coalition for Occupational Safety and Health (MassCOSH) and other groups to raise awareness about the dangers of using lacquer sealers. The Dorchester Occupational Health Initiative (DOHI)—funded by the National Institute of Environmental Health Sciences—had been conducting a health study among floor sanders and finishers when the fires occurred, and thus was able to mobilize a response quickly and release recommendations within weeks of the second fatal fire. MassCOSH—a part of DOHI—promptly formed the Massachusetts Floor-Finishing Safety Task Force, which comprised representatives from labor, industry (contractors), floor-finishing product manufacturers, government agencies, and environmental groups, to share their knowledge of the industry.

The task force conducted focus groups and interviews with business owners and product distributors and also carried out field investigations. In collaboration with the Massachusetts Toxics Use Reduction Institute (TURI), the Task Force tested a range of floor-finishing products in the TURI laboratory. Through this concerted community effort via participatory action research, the Task Force was able to develop a series of policy recommendations for improved protection of hardwood floor sanders/finishers, their customers, the general public, and the environment. In particular, the Task Force’s findings and recommendations (see sidebars Key findings and Priority Recommendations) focused on: (1) providing information for legisla-

Hierarchy of controls against workplace hazards: lacquer sealers
1. Substitute a less hazardous chemical or eliminate the need for the chemical altogether. Substitution would involve a less flammable agent, and is the solution that was pursued in Massachusetts. Eliminating the need for the chemical should also be effective. Approaches might include using a different kind of flooring that does not need to be varnished, or installing wood flooring that is pre-varnished in a (safer) factory.
2. Use engineering controls such as ventilation systems to reduce the hazardous exposure.
3. Make administrative changes that could reduce exposures—for example by using the chemical on smaller sections of floor spread out over longer periods of time.
4. Improve training and provide better information about the hazard and ways to avoid it.
5. Provide personal protective equipment. In this case, that’s hard to do—fire-proof suits are not feasible enough to merit consideration.
tors who seek to promote safer floor-finishing practices; and (2) helping employers, unions, professional organizations, consumers, and community organizations to better understand hardwood floor-finishing hazards and to undertake necessary safety measures.

**Recommendations to the Massachusetts legislature and other efforts**

On September 29, 2005 MassCOSH, along with its DOHI partners, released its floor-finishing safety report at the Massachusetts State House. The report—Protecting Workers and Homeowners from Wood Floor-Finishing Hazards in Massachusetts—called for a sweeping effort by employers, government, and communities to address not only the critical problem of fires but the health concerns associated with floor refinishing. After the report, the Massachusetts Floor-Finishing Safety Task Force (Task Force) was expanded to include members of industry, labor and community, and convened between January and April 2006 to develop specific policy recommendations for the state’s legislature. Other efforts to protect workers and the public from floor-finishing hazards were attempted. The level of protection offered by these efforts varied, and they met with mixed success.

The Task Force had found that many non-flammable, effective, floor-finish products are available on the market. First, the industry tried to

**Key findings of the Massachusetts Floor-Finishing Safety Task Force**

1. Non-flammable floor-finishing products are commercially available. Tests conducted by Green Seal and the Massachusetts Toxics Use Reduction Institute have found that non-flammable water-based products meet or exceed nearly all quality measures of flammable products tested. Although water-based products typically cost more than oil-based products ($30–$90 per gallon versus $10–$30 per gallon), a number of Boston-area floor-finishing businesses use water-based finishes for some or all jobs. These companies choose water-based finishes because they are more durable, reduce solvent exposure, dry in less time, allow occupants to return to the premises faster, and do not cause fires. Many non-flammable oil-based products are also available.

2. Small business owners face a number of barriers to safer and healthier products and practices. Increasing numbers of Boston hardwood floor-finishing businesses are owned and operated by Vietnamese immigrants. With little access to training in finishing techniques or health and safety, and virtually no Vietnamese-language information on the industry and its hazards, many of these companies rely on word of mouth and product distributors for advice on products and practices. Yet, some distributors do not promote safer products. Small companies may also lack understanding of the cost-benefit trade-offs of using nonflammable products.

3. Massachusetts boasts a range of resources for addressing the urgent issues associated with wood floor finishing. Vietnamese-American community groups have built strong networks of trust and communication with local businesses. Their input will be key to developing effective policies for this industry. Organizations including the Massachusetts Toxics Use Reduction Institute and New Ecology, Inc. possess expertise in the identification, testing, and promotion of safer products. The Division of Occupational Safety (DOS) oversees licensing of asbestos and lead contractors, and the DOS’s OSHA Consultation Program provides free health and safety assistance to small businesses. The Dorchester Occupational Health Initiative—a partnership of nonprofit organizations, community health centers, and university researchers—is charged with developing health and safety education with Vietnamese-American hardwood floor finishers in Boston.

With …virtually no Vietnamese-language information on the industry and its hazards, many [immigrant-owned] companies rely on word of mouth and product distributors for advice on products and practices.
move ahead with the voluntary ban of lacquer sealers. Initially nearly all floor-finishing product distributors in Central and Eastern Massachusetts voluntarily stopped selling lacquer sealers. However, one distributor started selling lacquer sealers again in response to the pressure from contractors who were accustomed to using them. Driven by concerns about a “level playing field,” all the distributors began selling the products again to avoid losing customers.

Around 2007, the Task Force unanimously called for two pieces of legislation in Massachusetts: (1) a ban prohibiting the use and sale of highly flammable floor-finishing products (those with flash points of less than 100°F), although at this time, the Task Force was skeptical about the likelihood a ban would succeed in being approved by the legislature; and (2) a certification process requiring that a) floor-finishing industry owners and employees become trained and certified, b) owners designate a certified worker to be responsible for completing a safety checklist, and c) companies provide a floor-finishing safety fact sheet to be signed by the consumer.2

In addition to the above, Task Force members urged the Massachusetts Board of Fire Prevention Regulations (the Board) to incorporate a ban on highly flammable products into the Massachusetts Fire Code. As a direct response to education and testimony by the Task Force members, the Board did take action. It adopted a regulation, effective June 1, 2010, requiring: (1) a permit and a warning sign on every door of any building where highly flammable products are used for floor finishing; and (2) removal of ignition sources such as pilot lights before the products are used.14 The Task Force continued to pursue the ban in order to broaden the enforcement beyond fire departments and because a ban would give the distributors, who were in strong support of the ban, the ability to remove the product from the market more easily.11

Landmark legislation in Massachusetts

As described above, the Task Force had been doubtful about the ban getting through the legislature. In 2008, an influential legislator expressed a concern about the certification initiative; however, he surprised Task Force members by encouraging them to pursue the ban more actively. Consequently, the Task Force switched gears and actively sought the ban. Despite numerous obstacles, including a last-minute rally by a chemical company, the bill made it through the legislature—one month before the end of the legislative session.

In July 2010, the Massachusetts state legislature banned the commercial use of the highly flammable lacquer sealers for floor finishing that had contributed to the fatalities in Somerville and Hull in 2004 and 2005. The new law prohibits the commercial use and sale of lacquer sealers

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Recommendations of the Floor-Finishing Safety Task Force4

1. Establish a licensing program for floor refinishing businesses; to ensure that the program is effective and accessible to people from diverse cultural and economic backgrounds, take immediate steps to form an oversight committee which comprises all affected stakeholders, including workers, small businesses, community organizations, labor unions, and health and safety experts.

2. Require both use and sales of non-flammable floor-finishing products with flash points at or above 100°F in place of flammable products with flash points below 100°F.

3. Promote the use of safer and healthier floor-finishing products through mechanisms such as tax credits, grants, low-interest loans, or other means of providing economic support for small businesses to substitute safer and healthier products and equipment for those associated with fire hazards and other public health hazards. Promote state procurement through the Massachusetts Environmental Purchasing Program.

4. Partner with organizations such as the Dorchester Occupational Health Initiative to develop, distribute, and promote culturally and linguistically appropriate training materials on safer and healthier products and practices. Extend these efforts throughout the state.

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a The certification initiative languished even though experts emphasized there was no safe way to use a flammable product in an industry that by its nature involves friction, wood dust, electricity, and heavy metal machinery.
In 2010, the Massachusetts state legislature banned the commercial use of flammable lacquer sealers for floor finishing.

with a flashpoint below 100°F if the coating alters a wood surface for purposes that are directly or indirectly connected with any business or other undertaking intended for profit. The law was signed by Governor Deval Patrick on July 2, 2010 and will take effect 180 days from signing. Governor Patrick described the law as "common-sense." The law sets a minimum $2,500 fine for a first violation and minimum $5,000 fine for subsequent violations with the possibility of imprisonment.

Before its passage, the bill received broad support, including endorsements from product distributors, contractors, labor and community groups, and the Metro Arson/Fire Investigators Association. In a hearing before the legislative committee, Quynh Dang—whose father owned a floor sanding business involved in the Somerville fire of 2004—testified, saying that the only way to make the industry safer was to prohibit the use of flammable lacquer sealers. The Vietnamese business community in Massachusetts is pleased about the Bill’s passage. Michael Le, a Task Force member and a product supplier to Vietnamese-owned floor-finishing businesses, called the deaths a “wake up call”:

I suddenly realized that all these customers were being exposed to these safety hazards. . . . I understood their language, I understood their need to earn a living . . . and I had to play a proactive role to protect these contractors and home owners.
— Michael Le, Owner of Capital Wood

Common precautions used in industry to prevent sparking around flammable liquids are simply not practical in residential home and construction repair.
LESSONS LEARNED

Approaches at both state and federal levels can be effective in protecting immigrant workers from fire and explosion hazards.

State-level protections for immigrant laborers in small businesses

Immigrant laborers in small businesses are vulnerable to serious injuries and exposures from occupational hazards. As described above, the vast majority of Massachusetts floor sanders and finishers are Vietnamese. All three workers killed in the two fatal fires were Vietnamese. Immigrant groups have also had long-term exposure to hazardous chemicals in other occupational settings, including nail salons (Vietnamese), cleaning services (Brazilians), and dry-cleaners (Korean).17,18,19

Safety and health practitioners are aware that even large profit-making businesses can perceive safety measures as a nuisance that threatens their competitive edge. For small enterprises—which must compete hard to keep their businesses alive—a decision to shift to a safer product or process may jeopardize their business. For example, several Massachusetts distributors voluntarily pulled the most flammable products from their shelves. However, as long as sales of these highly flammable materials remained legal, distributors risked losing customers to other businesses who continued to sell the unsafe product.

Immigrant laborers in small businesses—in any industry—need access to safer products; therefore, information and training mechanisms must convey how and where to obtain these safer alternatives. In this case, floor finishers were a market for safer alternatives from the distributors, who were eager to switch to safer alternatives but continued to be pressured by contractors who were accustomed to using lacquer sealers.

Use of safer products should be supported with economic incentives, whereas unsafe products should be discouraged with economic disincentives. Initially, the Task Force thought that economic incentives were necessary to switch to safer floor-finishing alternatives (see sidebar, Priority Recommendations, Recommendation 3). Such incentives turned out to be unnecessary in this case. Reader-friendly business cases that demonstrate the cost-benefit trade-offs of safer and healthier alternatives, and show that safe practices do not compromise the quality of the service and success of the business, are useful anywhere. The Task Force called for promoting safer procurement throughout the entire state government through the Massachusetts Environmental Purchasing Program.4

The Task Force also requested the Commonwealth of Massachusetts to partner with community-based organizations to develop, distribute, and promote training materials and other information mechanisms that are culturally and linguistically effective (see box: Priority Recommendations, Recommendation 4). Otherwise, there is a possibility that businesses will rely on anecdotal information or product distributors’ advice on safer and healthier work practices.

States can also adopt broader chemical safety policies to protect both workers and communities. At the time of writing this case study, Massachusetts has a Safer Alternatives bill in the legislature.20 The bill expands the successful Massachusetts Toxics Use Reduction Act (TURA) program—which has demonstrated that reducing the use of toxic chemicals both protects health and saves businesses money—in supporting industries in their efforts to replace toxic chemicals with safer alternatives in consumer products and manufacturing processes.20 The Massachusetts Safer Alternatives program would initially target 10 priority chemicals (lead, formaldehyde, trichloroethylene, perchloroethylene, dioxins and furans, hexavalent chromium, organophosphate pesticides, pentabromodiphenylether [PBDE], di-(2-ethylhexyl)phthalate [DEHP], and 2,4-dichlorophenoxyacetic acid [2,4-D]) that are currently replaceable with feasible safer alternatives for many uses.20

Federal protections for immigrant laborers in small businesses

With the exception of OSHA’s Hazard Communication (HAZCOM) Standard, the current federal regulatory system addresses only poorly the handling of a range of hazardous chemicals at work. As pointed out in other case studies in this publication, US chemical regulations have thus far been characterized by a one-chemical-at-a-time approach, setting Permissible Exposure Limits for individual chemicals. The consequences of floor-finishing fires are so serious that OSHA would be more than justified in issuing an emergency temporary

C A S E  S T U D Y  1 : F l o o r  F i n i s h e r s ,  L a c q u e r  S e a l e r s ,  a n d  F i r e s
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standard to ban flammable products in floor finishing. Even the HAZCOM framework remains limited in its capacity to protect workers. First, unless individual states have adopted HAZCOM laws to cover public-sector workers—as is the case in Massachusetts—OSHA’s HAZCOM covers only private-sector workplaces. Second, HAZCOM neither guides nor encourages the shift towards less hazardous chemical alternatives when such products are on the market. Third, chemical manufacturers do not do a good job of anticipating “foreseeable” uses of their products, which can end up in private homes and be handled under highly hazardous conditions. Fourth, and perhaps most important, HAZCOM does not take account of the vulnerability of immigrant laborers: the standard does not require labels, Materials Safety Data Sheets, and training materials for non-English speakers to be written in their native languages. The HAZCOM sections about labels and MSDSs in which the words “language” or “languages” appear are:21

The employer shall ensure that labels or other forms of warning are legible, in English, and prominently displayed on the container, or readily available in the work area throughout each work shift. Employers having employees who speak other languages may add the information in their language to the material presented, as long as the information is presented in English as well. (Section (f)(9))

Each materials safety data sheet shall be in English (although the employer may maintain copies in other languages as well), and shall contain at least the following information. (Section (g)(2))

The EPA’s 1976 Toxics Substances Control Act (TSCA) does not offer much protection for any workers in jobs like wood floor finishing. Nonetheless, TSCA reform is a prominent topic for discussion and on-going effort in the US Congress. In September 2009, EPA announced the following six Essential Principles for Reform of Chemicals Management Legislation:22

1. Chemicals should be reviewed against safety standards that are based on sound science and reflect risk-based criteria protective of human health and the environment.

2. Manufacturers should provide EPA with the necessary information to conclude that new and existing chemicals are safe and do not endanger public health or the environment.

3. Risk management decisions should take into account sensitive subpopulations, cost, availability of substitutes and other relevant considerations.

4. Manufacturers and EPA should assess and act on priority chemicals, both existing and new, in a timely manner.

5. Green chemistry should be encouraged, and provisions assuring transparency and public access to information should be strengthened.

6. EPA should be given a sustained source of funding for implementation.

EPA’s principle #3 could address some concerns that have been highlighted in this case study. A reformed TSCA could authorize EPA to ban extremely hazardous products—such as highly flammable floor-finishing materials—when safer alternatives are available on the market.

While the TSCA reform is important, we do not need to stay inactive until the TSCA reform has passed: safer alternatives policies can be initiated and adopted systematically at the state level as well as locally.

In the construction case study in this volume, we discuss further the role of training and advocacy for occupational safety and health for foreign-born immigrant workers. Proper training—especially when enhanced with active problem solving—has been shown to improve occupational safety and health knowledge, safety attitudes, and work practices among foreign-born immigrant laborers despite language barriers, educational background, or documentation status.23,24

This case study has described hazards of highly flammable wood floor-finishing products, specific needs of immigrant labor for safer and healthier products, and the new 2010 law in Massachusetts that prohibits the commercial use and sale of flammable lacquer sealers for floor finishing. The Massachusetts example also points the way for promoting similar initiatives nationwide to protect immigrant labor in small businesses.
CASE STUDY 1 — TIMELINE

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| 2004 | **Somerville, MA:** Two Vietnamese floor sanders/finishers, Toan Bui (age 35) and Ha Vu (age 35), died in a fatal fire while refinishing wood floors in a three-family house. Two of their co-workers were badly burned.  
**Danvers, MA:** Floor-finishing fire caused serious damage to a home, and a child of the homeowner was injured. |
| 2005 | **2005 Hull, MA:** Tinh Huynh (age 43), a Vietnamese floor sander/finisher, died in a fatal fire in a single-family home. A co-worker sustained minor burns. The workers were applying lacquer sealer which was ignited by a pilot light on a gas hot water heater.  
**Needham, MA:** Two homes destroyed in a floor-finishing fire. |
| 2006 | **Milton, MA:** Floor-finishing fire caused serious injuries to homeowner’s father, minor injuries to a worker, and damage to the home.  
**Taunton, MA:** Home destroyed in a floor-finishing fire.  
**Dennis, MA:** Home destroyed in a floor-finishing fire. |
| 2007 | **Marblehead, MA:** Fire consumed floor-finishing products in a contractor’s automobile. |
| 2009 | **US EPA** announced its Essential Principles for Reform of Chemicals Management Legislation, which included the principle that risk management decisions should take into account sensitive subpopulations, cost, and availability of substitutes. |
| 2010 | **Massachusetts** enacted legislation prohibiting the commercial use and sale of any flammable penetrating floor lacquer sealer with a flash point below 100°F. |

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References


Every day, 14 workers die on the job, and each year more than four million are seriously injured or sickened by exposures to toxic agents. Real change in the nation’s approach to workplace safety and health is desperately needed.

This case study is one in a series of six featured in the full report, Lessons Learned: Solutions for Workplace Safety and Health. The series includes:

- **Case Study 1**
  Floor finishers, lacquer sealers, and fires: safer product alternatives are the solution [www.sustainableproduction.org/lessons/case1](http://www.sustainableproduction.org/lessons/case1)

- **Case Study 2**
  When my job breaks my back: shouldering the burden of work-related musculoskeletal disorders [www.sustainableproduction.org/lessons/case2](http://www.sustainableproduction.org/lessons/case2)

- **Case Study 3**
  The poison that smells like butter: diacetyl and popcorn workers’ lung disease [www.sustainableproduction.org/lessons/case3](http://www.sustainableproduction.org/lessons/case3)

- **Case Study 4**
  Injuries are not accidents: construction will be safe when it’s designed to be safe [www.sustainableproduction.org/lessons/case4](http://www.sustainableproduction.org/lessons/case4)

- **Case Study 5**
  Regulating methylene chloride: a cautionary tale about setting health standards one chemical at a time [www.sustainableproduction.org/lessons/case5](http://www.sustainableproduction.org/lessons/case5)

- **Case Study 6**
  Safe food from safe workplaces: protecting meat and poultry processing workers [www.sustainableproduction.org/lessons/case6](http://www.sustainableproduction.org/lessons/case6)

- **Full Report**

- **Executive Summary**
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Through these case studies, the report identifies strategies for real change—approaches that can protect workers while stimulating innovation in safer forms of production that can also protect the communities in which we all live. Copies of the full report, executive summary, as well as the individual case studies can be downloaded from the Lowell Center for Sustainable Production’s website, by clicking on the links above.