SPF Insulation is Energy-Efficient, but is it Safe for Workers?

More and more contractors are using spray polyurethane foam (SPF) insulation in residential and commercial buildings to make them energy-efficient. In fact, use of SPF insulation has increased 60% in the last five years. SPF insulates against air, moisture and gas and is often used in perimeter walls, crawl spaces and attics.

Many SPF marketers claim that their products are “green” and “environmentally-friendly.” Their labels often state that the products are “plant-based” or “made from soy beans.” Some also claim there is “no off-gassing,” they are “non-toxic” and are “safe.” These claims are misleading. Labels on these products usually do not provide information on toxic chemicals in the product, and they overlook other health and safety hazards contractors are exposed to while applying SPF.

Should you be concerned about your health when applying SPF insulation?

Yes. There are a number of health and safety concerns associated with applying SPF insulation. The biggest concern about working with SPF is being exposed to **isocyanates**.

Exposure to Isocyanates

Isocyanates are a group of chemicals that are “lung and skin sensitizers.” Even at low levels of exposure, these chemicals can lead to asthma, including in workers who have never had asthma before. Recent research shows that one out of four insulating workers has symptoms of work-related asthma. This rate is several times higher than it is in the general population of construction workers. Once the symptoms of asthma begin, they can last a lifetime and be triggered by exposure to common substances like dust, cold air, and particulates. This makes employment in other segments of the construction industry difficult. Asthma caused by on-the-job exposures to chemical sensitizers is a serious and potentially debilitating condition.

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Exposure to high levels of isocyanates, even over a short period of time, may also cause other lung problems like reactive airways dysfunction syndrome (RADS) and hypersensitivity pneumonitis. Examples of isocyanates are methylene bisphenyl diisocyanate (MDI), toluene diisocyanate (TDI), hexamethylene diisocyanate (HDI), and isophorone diisocyanate (IPDI), among others.

Immediate Symptoms of Isocyanate Exposure

- Wheezing, shortness of breath, coughing
- Irritation of eyes and lungs
- Possibly fevers
- Stuffiness of the nose
- Sore throat
- Tightness in chest

*See a doctor if you have any of these symptoms.

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Working in Confined Spaces

Applying SPF insulation often involves working in crawl spaces, attics, and overhangs that may be considered confined spaces – meaning it is difficult to get into or out of these spaces. Confined spaces pose a risk for asphyxiation because hazardous gases can build up or oxygen levels may be low. Every year, workers die in confined spaces due to toxic or oxygen-deficient atmospheres. Employers should evaluate the spaces that workers will be entering to determine if they meet Cal/OSHA's definition of a confined space. If they do meet the definition, the employer must follow Cal/OSHA's confined space entry procedures. These include ventilating the space, providing workers with appropriate personal protective equipment, and developing an effective rescue plan.

Potential for Fires

Under certain circumstances, SPF insulation can generate enough heat to spontaneously ignite. The employer should make a plan for each job that outlines escape procedures for workers in the event of a fire.

To prevent fires, be sure there is:

- adequate ventilation
- no open flames or other ignition sources in the area
- an ABC fire extinguisher appropriate for SPF

Other Chemical Hazards

There are other chemical hazards associated with SPF insulation that can harm workers and the environment. These include amines, which irritate the eyes and nose and can cause blurred vision and other visual problems, and flame retardants that build up in the body and are linked to various cancers and reproductive problems in women. Solvents may also be used during SPF application, which can impair mental acuity, irritate mucous membranes, and cause headaches, loss of coordination, nausea, and visual changes. "Blowing agents" in SPF may contribute to global warming.

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Follow These Health and Safety Precautions When Using SPF Insulation

- **Learn about the hazards of working with SPF.** Employers are required, under Cal/OSHA's Hazard Communication standard (Title 8 CCR Section 5194), to provide workers with the Material Safety Data Sheet (MSDS) for SPF as well as for any other chemicals being used. The Hazard Communication standard also requires employers to train workers about the health hazards of the chemicals they use and how to protect themselves.
- **Wear the proper personal protective clothing for the job.** Wear protective clothing and eye protection recommended by the product manufacturer on the MSDS. This should include safety glasses or goggles; chemical-resistant full-coverage clothing (e.g., a Tyvek suit); and chemical-resistant gloves (e.g., nitrile). Avoid getting foam on your skin or in your hair because the foam is very sticky and hard to remove.
- **Wear a full face respirator.** Employers must provide workers with the proper respirator for the job and make sure a doctor has determined they can safely wear it. When spraying SPF, it is recommended that workers use a full face supplied air respirator, a powered air purifying respirator, or at least a full face respirator with organic vapor cartridges and an N95 filter pad over the cartridges. The respirator must be fit-tested to ensure a proper fit. The respirator should never be removed while in the work area. Employers must also follow the requirements of the Cal/OSHA Respiratory Protection standard (Title 8 CCR; Section 5144).

- **Vacate building occupants and other workers who are not wearing protective equipment.** Let building occupants and other workers know about the chemical hazards, application schedule, the importance of vacating the area, and emergency procedures.
- **Provide plenty of ventilation in the work area.** Isolate the work space with plastic sheeting to prevent the chemicals from spreading to other rooms. On larger jobs, a contractor or engineer who knows about ventilation principles should be consulted to design and build a spray enclosure to isolate the spray process. Make sure the enclosure has an exhaust ventilation system with an adequate supply of fresh make-up air.

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- **Shut off ignition sources.** Ignition sources include sparks and open flames in the spray area as well as in adjacent rooms and behind neighboring walls. These include pilot lights to gas stoves, standard electric light switches, dryers, furnaces and water heaters. Do not smoke while spraying the foam.
- **Once the job is completed, wait before reentering the work area.** Generally, people can reenter the area when the insulating foam sealant has hardened to the point where it is no longer wet or sticky. The amount of time it takes for foam to harden varies depending on the product, temperature, humidity, the amount of foam being sprayed and other variables. It is recommended that there be a 12-hour period after the end of spraying before unprotected workers can enter the area and 24 hours for residents or other building occupants.
- **Clean up the work area, remove protective clothing, and wash up immediately.** It is recommended that trimming the product be done after the foam has completely hardened. Check the product label and instructions for when and how to trim the product. Hardened foam trimmings may be disposed of as you would other household wastes. Be sure to thoroughly clean up the work area after the job is completed. Do not mix unused parts together or mix with other hazardous materials for disposal. Remove protective clothing and wash up immediately.
- **Follow first aid measures if necessary.** Specific first-aid measures can be found on the MSDS.

Here are some typical first aid suggestions:

If a worker experiences acute symptoms of over-exposure to chemicals, such as headache, nausea, disorientation, irritability, or burning eyes and nose:

- Move the individual to fresh air.
- Administer oxygen if needed.
- Do not return to work. Seek immediate medical attention.

If chemicals get on the skin:

- Remove contaminated clothing.
- Wash thoroughly with soap and water.
- Seek medical attention if irritation develops or persists.

If chemicals are ingested:

- Do not induce vomiting.
- If conscious, rinse mouth with water.
- Seek immediate medical attention.

If chemicals get in the eyes:

- Flush with lukewarm water for at least 15 minutes.
- Seek immediate medical attention.

Resources for More Information

State Government Agencies

Commission on Health and Safety and Workers' Compensation (CHSWC)
(510) 622-3959
CHSWC@dir.ca.gov; http://www.dir.ca.gov/chswc

Division of Occupational Safety and Health (DOSH), Cal/OSHA
(800) 963-9424
InfoCons@dir.ca.gov; http://www.dir.ca.gov/dosh

Hazard Evaluation System and Information Service
Occupational Health Branch
Workplace Hazard Helpline (866) 282-5516
http://www.cdph.ca.gov/programs/hesis/Pages/default.aspx

California Environmental Protection Agency
General Public Contact, cepacomm@calepa.ca.gov
(916) 323-2514
http://www.calepa.ca.gov

WOSHTEP Resource Centers

Labor Occupational Health Program
University of California, Berkeley
(510) 643-2090
www.lohp.org

Labor Occupational Safety and Health Program
University of California, Los Angeles
(310) 794-5964
www.losh.ucla.edu

Western Center for Agricultural Health and Safety
University of California, Davis
(530) 754-8678
http://agcenter.ucdavis.edu

Federal Government Agencies

Occupational Safety & Health Administration (OSHA)
(800) 321-OSHA (6742)
http://www.osha.gov
Email: http://www.osha.gov/ecor_form.html

National Institute for Occupational Safety and Health (NIOSH)
Centers for Disease Control and Prevention
800-CDC-INFO (800) 232-4636
cdcinfo@cdc.gov

Environmental Protection Agency (EPA)
(202) 272-0167
http://www.epa.gov

Organizations and Additional SPF Resources

Spray Polyurethane.Org (Site sponsored by the American Chemistry Council) http://www.spraypolyurethane.org. Has free basic online training.

Exterior Spray Polyurethane Foam Insulation, Health & Safety Q&A, Guidance Document, Center for the Polyurethanes Industry • Spray Polyurethane Foam Alliance, p 3, Accessed 5/25/12

Spray Polyurethane Foam Insulation: Safe use and handling guidelines for installers. ©2009 Bayer Material Science. http://www.baycareonline.com/ums/import-export/nafta_373.pdf

Considerations for Safe Use of Isocyanates and Spray Polyurethane Foam (SPF), J Maddux, J Carter, Construction Roundtable Meeting, 19 November 2009, PowerPoint

Spray Polyurethane Foam Insulation: Safe use and handling guidelines for installers. ©2009 Bayer Material Science. http://www.baycareonline.com/ums/import-export/nafta_373.pdf

Environmental Health Technical Brief Spray Polyurethane Foam Insulation, Connecticut Department of Public Health Environmental & Occupational Health Assessment Program, Issue #4, December 2010

"Occupational Asthma: Isocyanates in Construction", Rhode Island Committee on Occupational Safety and Health, The RICOSH Quarterly, Spring/Summer 2011, p.3

Spray Polyurethane Foam (SPF): EPA Considerations, U.S. Environmental Protection Agency, Chemical Engineering Branch, Office of Pollution Prevention and Toxics (OPPT), A Lamba, MPH, CIH, , PowerPoint Slides 1-11

"Three Massachusetts Home Fires Linked to Spray-Foam Installation" M, Holladay, GBA Advisor, Posted on Jul 7 2011

Steps to Control Exposure, Design for the Environment, An EPA Partnership Program, http://www.epa.gov/dfe/pubs/projects/spf/steps_to_control_exposure.html, Accessed 5/25/12

Preventing Asthma and Death from MDI Exposure During Spray-on Truck Bed Liner and Related Applications, NIOSH, DHHS (NIOSH) Publication No. 2006–149, http://www.cdc.gov/niosh/docs/2006-149/pdfs/2006-149.pdf, Cincinnati, OH

Insulating Foam Sealant for Do-It-Yourself (DIY) Projects, American Chemistry Council, http://www.spraypolyurethane.org/, Accessed 5/25/12

Considerations for Safe Use of Isocyanates and Spray Polyurethane Foam (SPF), J Maddux, J Carter, Construction Roundtable Meeting, 19 November 2009, PowerPoint, Slide 4

Isocyanates, Factsheet, Hazard Evaluation System and Information Service, Richmond, CA, 1989, p 3

Green Job Hazards: Weather Insulating/Sealing – Fire, U.S. Department of Labor, Occupational Safety & Health Administration, Washington, DC, http://www.osha.gov/dep/greenjobs/spf_fire.html. Accessed 5/25/12

NIOSH Got Everything Covered? (poster), http://www.cdc.gov/niosh/docs/2008-109/

Gloves for the Job: Hand and Skin Safety Spray Foam Magazine, http://www.sprayfoam-mag.com/articles/gloves-for-the-job-hand-and-skin-safety.aspx

Hazardous Substance Factsheet on Toluene-2, 4-Diisocyanate, New Jersey Department of Health and Senior Services, April 2002

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