

Work Safely with Spray-on Fireproofing

“...Those who burn, prepare, grind, sift or sell [gypsum] are, as I have often observed, afflicted with great difficulty breathing...”
- Bernardino Ramazzini, 1700

Plasterers, laborers, pipefitters, and electricians are among the many trades exposed daily to spray-on fireproofing. This material used to be quite dangerous because of its asbestos content. Currently produced fireproofing has little or no asbestos, but contains other potentially toxic products.

What is in Spray-On Fireproofing?

Spray-applied fireproofing is made up of cement-like or fibrous materials or a combination of both, with commonly used materials being gypsum, slag wool, Portland cement and vermiculite. Other ingredients may include: Fuller’s earth, calcium hydroxide (caustic lime), bauxite, kaolin clay, mica and carbon black. These may be combined with chemical accelerators to speed hardening. Because formulations may change, the best way to know the exact composition of any fireproofing product is to request a Material Safety Data Sheet (MSDS).



Commonly marketed products include:

<u>Product</u>	<u>Manufacturer</u>	<u>Ingredients</u>
Monokote MK-6	WR Grace	Primarily calcium sulfate (a dry form of gypsum). Also contains calcium carbonate (chalk), cellulose (paper), polystyrene (Styrofoam), and quartz (a form of crystalline silica). An accelerator (hardener) used with MK-6 contains aluminum sulfate.
Cafco 300	Isolatek	Primarily gypsum and vermiculite.
Cafco Blaze Shield	Isolatek	Primarily slag wool (mineral wool) and cement.

Is Fireproofing Dangerous to My Health?

MSDS’s for many popular fireproofing materials state they can be irritating to the skin, eyes and respiratory tract, including the nose, throat and lungs. Workers who spray or work around fireproofing have reported nosebleeds, bronchitis, pneumonia, asthma, sinus infections, flu-like symptoms, sore throat, eye irritation, sneezing, cough, shortness of breath and itchy and dry skin.¹ Corrosive ingredients in the raw (unused) product, such as cement, lime and alum, may also cause chemical burns. Because new fireproofing contains little or no asbestos, it is not as likely as it once was to cause cancer. (continued...)

As with any chemical, the health effects of fireproofing will depend on your dose. There have been few studies of worker exposure. An extremely high level of total and alkaline dust was measured in a 2003 Ontario study conducted during the mixing of fireproofing materials.² For practices other than mixing, a few studies have shown silica and respirable mineral wool fibers to be generally below recommended guidelines, with the highest exposures reported in sprayers, an electrician working overhead³ and another electrician pulling cable in a tight space.⁴

Of particular concern as they relate to potential long-term effects are:

- Crystalline silica, such as quartz, found in small amounts in Portland cement and which could be a contaminant of gypsum, limestone, mica, vermiculite, kaolin clay or other mined materials. Overexposure to crystalline silica has been known to cause lung cancer and silicosis.
- Portland cement, which, in addition to silica, contains small amounts of hexavalent chromium, also a potential cancer causing agent. Because cement is corrosive and contains hexavalent chromium, it can also cause skin rashes and skin allergies.
- Fiber glass and mineral wool, known to be irritants and considered cancer-causing agents by some agencies. Recent studies of workers exposed to these fibers, however, have not supported increased levels of cancer, leading the International Agency for Research on Cancer to withdraw its classification of these fibers as possible cancer causing agents in 2002.
- Gypsum, found in many construction products such as plaster, drywall, and cement. Considering its wide use, there has been little research on its potential long-term health effects. While no serious health effects have been revealed through a dozen or so studies published over the past century, such studies remain too incomplete to draw firm conclusions. Additionally, because some forms of synthetic gypsum may contain natural radioactivity⁵ or trace levels of heavy metals⁶ there remains a clear need for more research.
- Asbestos, known to cause cancer and scarring of the lungs, is of less concern since 1991 when the U.S. Environmental Protection Agency (USEPA) banned the composition of more than one half per cent asbestos in spray-on fireproofing. One result is that the MSDS's of ten of the most commonly used products do not list asbestos as an ingredient (greater than a tenth of a per cent must be reported). In 1990, the year prior, a major source of vermiculite, a mine in Libby, Montana that was found to be contaminated with asbestos, was finally closed. Monokote, at one time, contained vermiculite from Libby, but no longer contains vermiculite. Although other vermiculite mines have reported less or no contamination, asbestos has been found in trace amounts at existent vermiculite plant{s}.⁷ While products such as Cafco 300, A/D 5, and Pyrolite 22 and 15 HY today all do contain vermiculite, the products' manufacturers state them to be asbestos free. Meanwhile little monitoring has been done, and to date no government agency has stated conclusively that currently mined vermiculite is free of asbestos or of serious risk to end users.⁸

How Can I Work Around Spray-on Fireproofing Safely?

Follow the manufacturer's instructions for any specific product when spraying or disturbing fireproofing. You may also consider the following work practices and protective gear to reduce potential exposure:

Mixing: Use equipment that reduces the amount of dust released. Mixers should be equipped with dust covers. Continuous mixers are preferable to the drum and paddle type. Use bag opening and pouring techniques that minimize dust. Exhaust fans may be necessary, especially if mixing in enclosed areas.

Spraying: Two types of nozzles, combination air/water and multi water-point, were found in a 1993 study to be more effective than the conventional single water-point in reducing dust and fiber levels.⁹ Clips, hangers, supports, sleeves and other attachments should be in place before applying fireproofing. Some workers cover attachments with duct tape or plastic and leave an extra few inches hanging so they can find their attachments and easily remove overspray. Additionally, cover accessory materials that should not be sprayed with plastic. The general area should also be sealed off and restricted to the sprayers. Openings to the building's ventilation system must be sealed to avoid contamination.

Power tools: Any power tools that must come in contact with the material should be equipped with a HEPA-filtered dust collection system.

Welding: Fireproofing that contains polystyrene (like MK-6) will emit sulfur dioxide if heated to extreme temperatures. The manufacturer recommends removing it before welding or cutting steel.

Removal: Material should be wet before attempting to remove it. Wet material may be removed by cutting it with a knife and/or scraper. Place wet material in a bag and seal it for disposal. Remove small areas at a time. Use a drop sheet to collect scrap material.

Housekeeping/hygiene: At the end of each shift, the work area should be free from visible debris. Debris should be stored in a closed container. Never use compressed air, leaf blowers, or dry sweeping for cleaning up surfaces or clothing as these generate dust. If possible use a HEPA vacuum or wet sweep when feasible, and with care as some products may become extremely slippery or freeze up when wet. If such clean-up procedures are not feasible, use a dust suppression compound when sweeping. To prevent skin rash from caustic materials, wash skin with a neutral soap (most liquid soaps are neutral).

Protective clothing: Protect your skin and eyes with loose fitting clothing and a face shield or goggles when working directly with fireproofing. During spraying and mixing, disposable coveralls and gloves are recommended. Tight cuffs and collars may rub dust and fibers into skin. NIOSH has recommended laundering services to prevent dust and fibers from further contaminating your car, home or family members. If not feasible, remove dusty clothes at the worksite, transport in a sealed bag and wash separately from other clothes.

Respirators: Respirators should be used if ventilation and work practices cannot control dust levels. Construction workers are often exposed to a variety of dusts and fumes, some of which may be more toxic than fireproofing. It is also a good idea for every worker to have their own personal respirator.

Manufacturers have recommended NIOSH-approved N95 respirators when spraying or working directly with fireproofing. NIOSH recommends that, at minimum, a filtering face-piece respirator be worn if visible dust is generated, such as when a cloud of dust persists for more than a few seconds (11). A half-face respirator with P100 cartridges is a better alternative to a disposable respirator for a number of reasons, including the impracticality of monitoring the exact exposures of every fireproofing or other construction site job to determine if workers are required to have more than N95 protection, and the difficulty in checking the seals of disposable filtering face-piece respirators. That said, however, half-face respirators only protect workers from a certain amount of dust. If dust levels are above legal limits, as may be true particularly if you are mixing, it is recommended that you insist on monitoring and choose respirator protection accordingly.

Additionally, anyone who relies on a respirator should be clean-shaven in order to achieve a proper seal, as well as trained in the proper use of respirators, fit-tested and enrolled in a respirator program. Wearing a respirator without proper training or fit testing could result in exposures from a false sense of security.

What Are My Legal Rights?

Under the Occupational Safety and Health Act (OSHA), you have the right to request and obtain from your employer a copy of the MSDS of any material you may be exposed to, including materials used by contractors other than your own. These sheets include ingredients, health effects and precautions to follow. It is a good idea to keep your own file of MSDS's and the name, date, contractor, and job on which it was used.

Your employer must train you on the hazards to which you are exposed. They must keep a list of the hazardous chemicals that they know are present at your worksite. You should insist that your employer add all hazardous materials, including the fireproofing products, to their list. They must keep this list, and give you access to it, for up to 30 years.

If you are concerned that you may be exposed to any chemicals above legal limits, you may contact OSHA. Unfortunately the legal limits set for most ingredients mentioned are over 30 years old, and symptoms have since been documented on jobs for which levels were found below OSHA standards.¹⁰

Where Can I Get More Information?

If you think you may be suffering from overexposure to chemicals, construction dust or any work-related illness or injury, contact the Mount Sinai Center for Occupational and Environmental Medicine to request an evaluation. We are also interested in analyzing samples of fireproofing.

Further information on construction related hazards is also available by contacting OSHA (212-337-2378) and/or The Center to Protect Workers Rights (301-578-8500 / www.cdc.gov/elcosh).

¹ National Institute for Occupational Safety and Health, Health Hazard Evaluation Report No. 2000-0134, p. 6, 2000.

² Verma, David K., et al, "Current Chemical Exposures Among Ontario Construction Workers, *App. Occ. And Environ. Hygiene*, 18: 1031-1047, 2003.

³ Verma, David K., et al, "Current Man-Made Mineral Fibers Exposure Among Ontario Construction Workers, *J. of Occ. and Env. Hyg.*, 1:306-318, 2004.

⁴ Schneider, S. and P. Susi, Final Report: An Investigation of Health Hazards on a New Construction Project, Occupational Health Foundation, April, 1993.

⁵ O'Brien, R.S. et al, "Estimates of Inhalation Doses Resulting from the Possible Use of Phospho-Gypsum Plaster-Board in Australian Homes, *Health Physics*, 68(4): 561-570, 1995.

⁶ "Report and Expert Statement (Abridged Version) on Studies to Assess the Health Aspects of Natural Gypsum and FGD Gypsum from Carbon-Fired Power Plants With Regard to the Use of these Gypsums in the Production of Construction Materials", 1996, English translation supplied by US Gypsum.

⁷ National Institute for Occupational Safety and Health, Letter to Maureen O'Donnell, HETA 2000-0407, 2004.

⁸ U.S. Environmental Protection Agency Office of Pollution Prevention and Toxics, Fact Sheet/Q&A: Asbestos-Containing Vermiculite.

⁹ Construction Safety Association of Ontario, Synthetic Vitreous Fibres: Guidelines for Construction 2004.

¹⁰ National Institute for Occupational Safety and Health, Health Hazard Evaluation Report No. 2000-0134, p. 11, 2000.

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