

*Preventing Skin Problems from Working with Portland Cement*

**This guidance document is advisory in nature, informational in content, and is intended to assist employers in providing a safe and healthful workplace. The document does not serve as a new standard or regulation. It creates no new legal obligations.**

**Introduction**

Portland cement is a generic term used to describe a variety of building materials valued for their strong adhesive properties when mixed with water. Employees who work with portland cement are at risk of developing skin problems, ranging from mild and brief to severe and chronic.

Wet portland cement can damage the skin because it is caustic, abrasive, and absorbs moisture. Portland cement also contains trace amounts of hexavalent chromium [Cr(VI)], a toxin harmful to the skin. Dry portland cement is less hazardous to the skin because it is not as caustic as wet cement.

The purpose of this document is to make employers and employees aware of the skin problems associated with exposure to portland cement; to note the OSHA standards that apply to work with portland cement; and to provide guidance on how to prevent cement-related skin problems. Measures to protect employees from inhalation and eye hazards associated with exposure to portland cement are also noted.

**Who is at risk**

Any employee who has skin contact with wet portland cement has the potential to develop cement-related skin problems. Portland cement is an ingredient in the following materials:

- concrete
- mortar
- plaster
- grout
- stucco
- terrazzo

There are many different tasks that involve the use of portland cement. Examples of employees who may be exposed to the dangers of wet portland cement products include bricklayers, carpenters, cement masons, concrete finishers, hod carriers<sup>1</sup>, laborers, plasterers, tile setters, terrazzo workers, ready-mixed concrete truck drivers, bucket and buggy operators, and those involved in pouring and finishing work.

**Skin problems caused by exposure to portland cement**

Wet portland cement can cause caustic burns, sometimes referred to as *cement burns*. Cement burns may result in blisters, dead or hardened skin, or black or green skin. In severe cases, these burns may extend to the bone and cause disfiguring scars or disability.

Employees cannot rely on pain or discomfort to alert them to cement burns because cement burns may not cause immediate pain or discomfort. By the time an employee becomes aware of a cement burn, much damage has already been done. Cement burns can get worse even after skin contact with cement has ended. Any employee experiencing a cement burn is advised to see a health care professional immediately.

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Skin contact with wet portland cement can also cause inflammation of the skin, referred to as *dermatitis*. Signs and symptoms of dermatitis can include itching, redness, swelling, blisters, scaling, and other changes in the normal condition of the skin.

Contact with wet portland cement can cause a non-allergic form of dermatitis (called irritant contact dermatitis) which is related to the caustic, abrasive, and drying properties of portland cement.

In addition, Cr(VI) can cause an allergic form of dermatitis (allergic contact dermatitis, or ACD) in *sensitized* employees who work with wet portland cement. When an employee is sensitized, that person's immune system overreacts to small amounts of Cr(VI), which can lead to severe inflammatory reactions upon subsequent exposures. Sensitization may result from a single Cr(VI) exposure, from repeated exposures over the course of months or years, or it may not occur at all. After an employee becomes sensitized, brief skin contact with very small amounts of Cr(VI) can trigger ACD.

ACD is long-lasting and employees can remain sensitized to Cr(VI) years after their exposure to portland cement has ended. Medical tests (e.g., skin patch tests) are available that can confirm whether an employee has become dermally sensitized to Cr(VI).

Employees who work with wet portland cement and experience skin problems, including seemingly minor ones, are advised to see a health care professional for evaluation and treatment. In cement-related dermatitis, early diagnosis and treatment can help prevent chronic skin problems.

***SEE A HEALTH CARE PROFESSIONAL IF YOU WORK WITH WET PORTLAND CEMENT AND HAVE SKIN PROBLEMS!!***

#### **OSHA standards applicable to working with portland cement**

Several OSHA standards require employers to take steps to protect employees from hazards associated with exposure to portland cement. These standards include requirements for:

**Personal Protective Equipment** (29 CFR 1926 Subpart E for construction; 29 CFR 1910 Subpart I for general industry; 29 CFR 1915 Subpart I for shipyards)

OSHA's personal protective equipment (PPE) standards require that PPE be provided, used, and maintained in a sanitary and reliable condition whenever it is necessary to protect employees from injury or impairment. The employer must provide PPE such as boots and gloves as necessary and appropriate for jobs involving exposure to portland cement and ensure these items are maintained in a sanitary and reliable condition when not in use. Employees must be able to clean or exchange PPE if it becomes ineffective or contaminated on the inside with portland cement while in use. In addition, employers are required to provide PPE at no cost to their employees with limited exceptions (1910.132(h)).

**Sanitation** (29 CFR 1926.51 for construction; 29 CFR 1910.141 for general industry; 29 CFR 1915.97 for shipyards)

Construction employers must make washing facilities available for employees exposed to portland cement. Washing facilities must provide clean water, non-alkaline soap, and clean towels. Such facilities must be readily accessible to exposed employees and adequate for the number of employees exposed. The sanitation requirements for general industry and shipyards are similar to those for construction.

**Hazard Communication** (29 CFR 1926.59 for construction; 29 CFR 1910.1200 for general industry; 29 CFR

The Hazard Communication standard requires that manufacturers and importers provide information on material safety data sheets (MSDSs) and labels about the hazards of portland cement. Employers must make these MSDSs and labels available to employees. The Hazard Communication and Safety Training standards also require employers to provide training to communicate the hazards of exposure to portland cement to their employees. This training must address:

- the hazards associated with exposure to portland cement, including hazards associated with the cement's Cr(VI) content;
- preventive measures, including proper use and care of PPE and the importance of proper hygiene practices; and
- employee access to hygiene facilities, PPE, and information (including MSDSs).

#### **Recordkeeping** (29 CFR 1904)

Employers subject to OSHA recordkeeping requirements must inform employees of how to report work-related injuries and illnesses and record all new cases of work-related injury and illness (including cement burns and cases of dermatitis) that result in days away from work, restricted work or transfer to another job, medical treatment beyond first aid, or are otherwise determined to be a significant injury or illness by a physician or other licensed health care professional.

**Permissible Exposure Limit (PEL)** (29 CFR 1926.55 for construction; 29 CFR 1910.1000 for general industry; 29 CFR 1915.1000 for shipyards)

OSHA has established a permissible exposure limit to address the inhalation hazards of working with dry portland cement. Employers must limit airborne exposure to portland cement to 15 milligrams per cubic meter (mg/m<sup>3</sup>) of air for total dust and 5 mg/m<sup>3</sup> for respirable dust. Because the Cr(VI) content in portland cement is so low, it is anticipated that by meeting the permissible exposure limit (PEL) of 15 mg/m<sup>3</sup> for portland cement, employers will also meet the Cr(VI) PEL and action level of 5 and 2.5 micrograms per cubic meter (µg/m<sup>3</sup>) respectively (see 1926.1126).

#### **Preventing cement-related skin problems**

The best way to prevent cement-related skin problems is to minimize skin contact with wet portland cement. Compliance with OSHA's requirements for provision of PPE, washing facilities, hazard communication and safety training, along with the good skin hygiene and work practices listed below, will protect against hazardous contact with wet cement.

#### ***Good Practices for Glove Selection and Use***

- Provide the proper gloves for employees who may come into contact with wet portland cement. Consult the glove supplier or the cement manufacturer's MSDS for help in choosing the proper gloves. Butyl or nitrile gloves (rather than cotton or leather gloves) are frequently recommended for caustic materials such as portland cement.
- Use only well-fitting gloves. Loose-fitting gloves let cement in. Often the use of gloves and clothing makes exposure worse when cement gets inside or soaks through the garment. Use glove liners for added comfort.

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- Wash your hands before putting on gloves. Wash your hands *every time* that you remove your gloves.
- Dry your hands with a clean cloth or paper towel before putting on gloves.
- Protect your arms and hands by wearing a long sleeve shirt with the sleeves duct-taped to your gloves to prevent wet cement from getting inside the gloves.
- Follow proper procedures for removing gloves, whether reusing or disposing them. See Table 1 for proper procedures for removing gloves.
- Clean reusable gloves after use. Before removing gloves, clean the outside by rinsing or wiping off any wet cement. Follow the manufacturer's instructions for glove cleaning. Place clean and dry gloves in a plastic storage bag and store them in a cool, dry place away from tools.
- Throw out grossly contaminated or worn-out gloves.
- Keep the inside of gloves clean and dry.
- Do not use barrier creams or "invisible gloves." These products are not effective in protecting the skin from portland cement hazards.

**Table 1. Steps for safe glove removal:**

1. Wash off the outside of your gloves while you are still wearing them.
2. Loosen gloves on both hands, holding your arms down to prevent water from dripping onto the skin.
3. Holding your arms downward, pull the first glove down to remove **only the glove fingers**. The cuff should still be covering the palm of your hand.
4. Remove the second glove by grabbing it with the first glove.
5. Slip off the first glove.
6. Handle used gloves **by the inside only**.

Source: "Save Your Skin," CPWR, 2000b.

#### **Good Practices for Use of Boots and Other Protective Clothing and Equipment**

- Wear waterproof boots when necessary to prevent wet cement from coming into contact with your skin. It is as important to protect your legs, ankles, and feet from skin contact with wet cement as it is to protect your hands.
- Boots need to be high enough to prevent wet cement from getting inside. Tuck pants inside and wrap duct tape around the top of the boots to prevent wet cement from entering.
- Select boots that are sturdy, strong enough to resist punctures and tears, and slip resistant.

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- Change protective boots if they become ineffective or contaminated on the inside with wet cement while in use.
- Change out of any work clothes that become contaminated with wet cement and keep contaminated work clothes separate from your street clothes.
- When kneeling on wet cement use waterproof kneepads or dry kneeboards to prevent the knees from coming into contact with the cement.
- Wear proper eye protection when working with portland cement.

#### **Good Practices for Skin Care**

- Wash areas of the skin that come into contact with wet cement in clean, cool water. Use a pH-neutral or slightly acidic soap. Check with the soap supplier or manufacturer for information on the acidity and alkalinity of the soap<sup>2</sup>.
- Consider using a mildly acidic solution such as diluted vinegar or a buffering solution to neutralize caustic residues of cement on the skin<sup>3</sup>.
- Do not wash with abrasives or waterless hand cleaners, such as alcohol-based gels or citrus cleaners.
- Avoid wearing watches and rings at work since wet cement can collect under such items.
- Do not use lanolin, petroleum jelly, or other skin softening products. These substances can seal cement residue to the skin, increase the skin's ability to absorb contaminants, and irritate the skin. Skin softening products also should not be used to treat cement burns.

#### **Making Portland Cement Products Less Hazardous**

In recent decades there have been efforts to reduce the risk of developing cement-related skin problems by lowering the Cr(VI) content of portland cement. Cr(VI) is not intentionally added to portland cement and it does not serve any functional purpose. There are a variety of ways to minimize the amount of Cr(VI) in portland cement, including:

- Using slag, which is free of Cr(VI), in place of or blended with clinker, the primary source of Cr(VI) in portland cement. Slag is a by-product of the iron ore extraction process and has been used in concrete projects in the United States for over a century.
- Adding ferrous sulfate to portland cement may lower the Cr(VI) content of the cement. Use of ferrous sulfate has reportedly led to a decline in cases of allergic contact dermatitis in several countries (Goh et al., 1996; Avnstorpe, 1989; Roto et al., 1996)<sup>4</sup>.

Lowering the Cr(VI) content of portland cement can lessen, but not entirely eliminate, the risk of acquiring allergic contact dermatitis. It will not eliminate the other skin hazards posed by wet portland cement. Employers and employees need to take all necessary precautions to prevent skin contact with wet portland cement whether or not the cement contains measurable amounts of Cr(VI). Wearing proper gloves and other protective equipment, and following good skin care and work practices, provide the best protection against the skin hazards posed by wet portland cement.

*Edwin G. Foulke, Jr.*

Assistant Secretary of Labor for  
Occupational Safety and Health

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## TECHNICAL NOTES

<sup>1</sup> Hod carriers transport mortar, bricks, and concrete in a vee shaped trough (called a hod) to other employees.

<sup>2</sup> "An Employer's Guide to Skin Protection" (see CPWR, 2000c in the bibliography) contains a partial list of pH-neutral or moderately acidic liquid and bar soaps.

<sup>3</sup> "An Employer's Guide to Skin Protection" (see CPWR, 2000c in the bibliography) contains some information on neutralizing and buffering products.

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<sup>4</sup> After Denmark required the addition of ferrous sulfate to reduce the Cr(VI) content of cement to less than 2 parts per million, studies showed a reduction in the prevalence of Cr(VI) allergy (Irvine et al., 1994). However, some U.S. cement manufacturers who have experimented with the use of ferrous sulfate have not been able to achieve significant Cr(VI) reduction. The reasons for this inability may be due to variations in the Cr(VI) content of cement and the amount of time that passes between cement manufacture and use. Time delays are an important consideration because ferrous sulfate may lose its effectiveness over time, depending on how cement is packaged and on humidity and temperature conditions during storage.