

CONCRETE SAFETY PROGRAM

PURPOSE / SCOPE

Portland cement is one of the most widely used materials in construction. Applications include concrete floors, walls, and pavement; concrete blocks; and different mixtures of mortar and grout. Thousands of construction workers are exposed to concrete every day without harm.

Winger Contracting Company, herein referred to as Winger, normally utilizes concrete subcontractors for large projects. This program addresses small projects such as demo of existing concrete for installation of new equipment, pump/motor bases, tying concrete in around structural steel, and other small concrete projects. Anyone who uses or supervises the use of Portland cement must know its health hazards and the safe working procedures necessary to minimize exposure. This safety program outlines those hazards and makes recommendations on how to use cement safely.

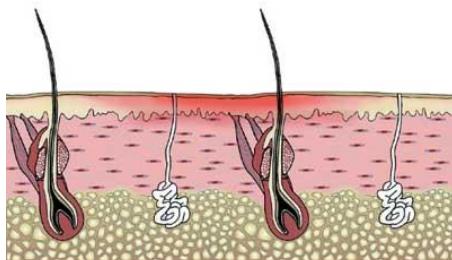
HEALTH HAZARDS

Cement can cause ill health by skin contact, eye contact, or inhalation. Risk of injury depends on duration and level of exposure and individual sensitivity. Hazardous materials in wet concrete and mortar include:

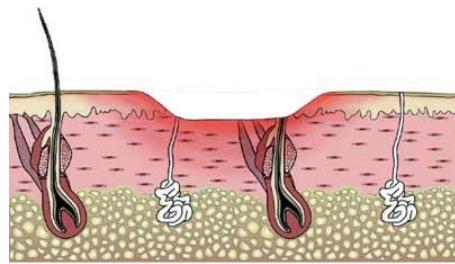
- ✚ alkaline compounds such as lime (calcium oxide) that are corrosive to human tissue
- ✚ trace amounts of crystalline silica which is abrasive to the skin and can damage lungs
- ✚ trace amounts of chromium that can cause allergic reactions.

SKIN CONTACT

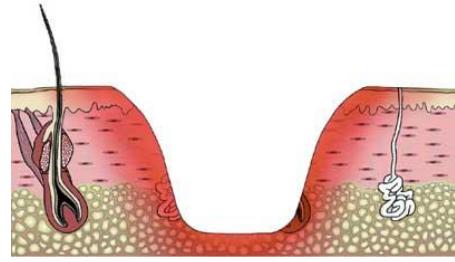
The hazards of wet cement are due to its caustic, abrasive, and drying properties. Wet concrete contacting the skin for a short period and then thoroughly washed off causes little irritation. But continuous contact between skin and wet concrete allows alkaline compounds to penetrate and burn the skin. When wet concrete or mortar is trapped against the skin—for instance, by falling inside a worker's boots or gloves or by soaking through protective clothing—the result may be first, second, or third degree burns or skin ulcers. These injuries can take several months to heal and may involve hospitalization and skin grafts.



FIRST DEGREE BURN - OUTER SKIN LAYER



SECOND DEGREE BURN - MIDDLE SKIN LAYER



THIRD DEGREE BURN - DEEP SKIN LAYER

Ironically, severe cases often occur when personal protective clothing or equipment is worn. Wet concrete may get trapped inside rubber boots or gloves or gradually soak through coveralls. Concrete finishers kneeling on fresh concrete have had their knees severely burned. Corrosive bleed water from the concrete is absorbed by the worker's pants and held against the skin for prolonged periods.

WATERPROOF RUBBER BOOTS ARE ESSENTIAL IN WORKING WITH WET CONCRETE

Without waterproof knee pads, kneeling on wet concrete can irritate or burn the skin. Cement dust released during bag dumping or concrete cutting can also irritate the skin. Moisture from sweat or wet clothing reacts with the cement dust to form a caustic solution.



ALLERGIC SKIN REACTION

Some workers become allergic to the hexavalent chromium in cement. A small yet significant percentage of all workers using cement will develop an allergy to chromium, with symptoms ranging from a mild rash to severe skin ulcers. In addition to skin reactions, hexavalent chromium can cause a respiratory allergy called occupational asthma. Symptoms include wheezing and difficulty breathing. Workers may develop both skin and respiratory allergies to hexavalent chromium. It's possible to work with cement for years without any allergic skin reaction and then to suddenly develop such a reaction. The condition gets worse until exposure to even minute quantities triggers a severe reaction. The allergy usually lasts a lifetime and prevents any future work with wet concrete or powder cement.

EYE CONTACT

Exposure to airborne dust may cause immediate or delayed irritation of the eyes. Depending on the level of exposure, effects may range from redness to chemical burns and blindness.

INHALATION

Dry cutting generates high levels of dust. Inhaling high levels of dust may occur when workers empty bags of cement. In the short term, such exposure irritates the nose and throat and causes choking and difficult breathing. Sanding, grinding, or cutting concrete can also release large amounts of dust containing high levels of crystalline silica. Prolonged or repeated exposure can lead to a disabling and often fatal lung disease called *silicosis*. Some studies also indicate a link between crystalline silica exposure and lung cancer.



CONTROLS FOR HEALTH HAZARDS

Concrete is easy to work with, versatile, durable, and economical. By taking a few basic precautions, it is also one of the safest building materials known. Relatively few people involved in mixing, handling, and finishing concrete have experienced injury. Outlined below are some simple suggestions-protection, prevention, common sense precautions-useful to anyone working with Portland cement and concrete. The following are some basic recommendations for handling and using cement safely:

- ⊕ Work in ways that minimize the amount of cement dust released. If visible dust is observed, the Winger Silica Exposure Program must be followed.
- ⊕ Where possible, wet-cut rather than dry-cut masonry products.
- ⊕ Mix dry cement in well-ventilated areas.
- ⊕ Make sure to work upwind from dust sources.
- ⊕ Where possible, use ready-mixed concrete instead of mixing on site.
- ⊕ When kneeling on fresh concrete, use a dry board or waterproof kneepads to protect knees from water that can soak through fabric.
- ⊕ Remove jewelry such as rings and watches because wet cement can collect under them.

PROTECT YOUR HEAD AND EYES

Construction equipment and tools represent constant potential hazards to busy construction personnel. That's why hard hats are required on all Winger projects.

Proper eye protection is essential when working with cement or concrete. Eyes are particularly vulnerable to blowing dust, splattering concrete, and other foreign objects. On some jobs it may be advisable to wear full-cover goggles or safety glasses with side shields. Sight is precious. Protect the head and eyes by using proper safety equipment and remaining alert.

PROTECT YOUR BACK

All materials used to make concrete—Portland cement, coarse aggregate, sand, and water—are quite heavy even in small quantities. When lifting heavy materials, your back should be straight, legs bent, and the weight between your legs as close to the body as possible. Do not twist at the waist while lifting or carrying these items. Rather than straining your back with a heavy load, get help. Remember to use your head, not your back.



Let mechanical equipment work to your advantage by placing concrete as close as possible to its final position. After the concrete is deposited in the desired area by chute, pump, or wheelbarrow, it should be pushed—not lifted—into final position with a shovel. A short-handled, square-end shovel is an effective tool for spreading concrete, but

special concrete rakes or come-alongs also can be used. Excessive horizontal movement of the concrete not only requires extra effort, but may also lead to segregation of the concrete ingredients.

PROTECT YOUR SKIN

When working with fresh concrete, care shall be taken to avoid skin irritation or chemical burns. Prolonged contact between fresh concrete and skin surfaces, eyes, and clothing may result in burns that are quite severe, including third-degree burns. If irritation persists consult a physician. For deep burns or large affected skin areas, seek medical attention immediately.



THE A-B-C-Ds OF FRESH CONCRETE'S EFFECT ON SKIN ARE:

- ⊕ Abrasive Sand contained in fresh concrete is abrasive to bare skin.
- ⊕ Basic & Portland cement is alkaline in nature, so wet
- ⊕ Caustic concrete and other cement mixtures are strongly basic (pH of 12 to 13). Strong bases-like strong acids- are harmful, or caustic to skin.
- ⊕ Drying Portland cement is hygroscopic-it absorbs water. In fact, Portland cement needs water to harden. It will draw water away from any material it contacts-including skin.
- ⊕ Clothing worn as protection from fresh concrete should not be allowed to become saturated with moisture from fresh concrete because saturated clothing can transmit alkaline or hygroscopic effects to the skin.
- ⊕ Waterproof gloves, a long-sleeved shirt, and long pants should be worn. If you must stand in fresh concrete while it is being placed, screeded, or floated, wear rubber boots high enough to prevent concrete from getting into them.
- ⊕ The best way to avoid skin irritation is to wash frequently with pH neutral soap and clean water.

PLACING AND FINISHING

Waterproof pads shall be used between fresh concrete surfaces and knees, elbows, hands, etc., to protect the body during finishing operations. Eyes and skin that come in contact with fresh concrete should be flushed thoroughly with clean water. Clothing that becomes saturated from contact with fresh concrete should be rinsed out promptly with clear water to prevent continued contact with skin surfaces. For persistent or severe discomfort, consult a physician.



PERSONAL PROTECTIVE EQUIPMENT (PPE)

Obtain and wear the appropriate personal protective equipment and ensure its condition is suitable for use. To protect skin from cement and cement mixtures, workers should:

- ⊕ Wear the appropriate PPE:
 - Type 1, Class E Hardhat.
 - Hearing protection for sound levels that exceed 80 dBA.
 - Suitable eye protection where mixing, pouring, or other activities may endanger eyes (minimum—safety glasses with attached side shields or tight-fitting unvented or indirectly vented goggles. Don't wear contact lenses when handling cement or cement products as dust can get in between your contacts and eyes and cause greater damage.
 - Faceshield for cutting, grinding, or hole penetrations.

- Suitable respiratory protective equipment such as a P, N or R 95 respirator or possibly a full-face respirator or Powered Air Purifying Respirator (PAPR) when cement dust cannot be mitigated.
 - If your safety goggles, faceshield, or respirator fogs over, step away into a safe area to clean them off.
 - Suitable alkali-resistant gloves.
 - Coveralls with long sleeves and full-length trousers (pull sleeves down over gloves and tuck pants inside boots and duct-tape at the top to keep mortar and concrete out)
 - Waterproof chemical resistant boots high enough to prevent concrete from flowing in when workers must stand in fresh concrete.
- ⊕ Know how to inspect, use, don and doff PPE correctly.
- ⊕ Be aware of heat stress potential when wearing PPE. Stay hydrated, take breaks and rotate job tasks between crew members as needed.
- ⊕ PPE may be removed after the work is complete and has been determined that is safe to do so.
- ⊕ Provide adequate hygiene facilities on site for workers to wash hands and face at the end of a job and before eating, drinking, smoking, or using the toilet.

FIRST AID

- ⊕ Clothing contaminated by wet cement should be quickly removed. Once the cement is inside your gloves or boots, it can become very irritating. Skin in contact with wet or dry cement should be washed immediately with large amounts of cool clean water.
- ⊕ Wash your hands and face and if necessary, your whole body thoroughly, after removing your PPE. Don't wash your hands with water from buckets used for cleaning tools.
- ⊕ Open sores or cuts should be thoroughly flushed and covered with suitable dressings. Get medical attention if discomfort persists. Contaminated eyes should be washed with cold tap water for at least 15 minutes.
- ⊕ Contact your foreman and safety team as soon as possible for further assistance.
- ⊕ If necessary, the affected person will be taken to get medical treatment.

SAFE WORK PROCEDURES

- ⊕ Before the start of any work, it is critical to communicate with the customer and obtain any applicable permits and Safety Data Sheets (SDS).
- ⊕ All workers must be trained in the customer's emergency evacuation procedure and emergency response plan. Employee must understand the use of equipment such as scaffolds, ladders, air quality monitors, alarms, fall protection equipment, fire extinguishing devices, aerial lifts, and if necessary, air moving equipment.
- ⊕ Have all personnel, tools, materials, equipment staged and ready.
- ⊕ Perform a Pre-Job Hazard Analysis (PJHA) before breaking into any hazardous substance pipeline or vessel. Those developing the PJHA must include a person who understands the process and the hazards involved.
- ⊕ In the event a worker gets cement in their eyes, test and flush eye wash stations and safety showers in the area before the work begins. Some locations have alarm systems on their eye wash and safety showers. Always follow the customer's safe work procedures at their location.
- ⊕ If necessary, barricade the area with the correct caution or danger tape and placards. If possible, set the barricades a minimum of 6-feet away from the work location. Maintain the barricade until work is completed. Always remove barricade, bits and pieces, at the end of the job.

- ⊕ Line of fire, struck by and caught between are hazards on every jobsite. All employees must be aware of their situational awareness for themselves and their co-workers. If you see something unsafe, STOP and reassess the situation. Continue working only after the issue has been addressed satisfactorily and approved by the foreman and crew.
- ⊕ Good housekeeping is critical to safe work standards for our employees. Keep tools and materials organized to prevent tripping and falling.
- ⊕ All protruding reinforcing steel, onto and into which employees could fall, shall be guarded with 4" x 4" rebar caps or other acceptable protective devices to eliminate the hazard of impalement.
- ⊕ ALWAYS pay attention to concrete truck drivers and their movements. Make eye contact with the driver and stay in his line of site in his rearview mirrors. If you can't see him in his rearview mirror, he can't see you! Use hand signals when backing trucks up to the proper location.
- ⊕ Concrete buckets shall be equipped with hydraulic or pneumatic gates shall have positive safety latches or similar safety devices installed to prevent premature or accidental dumping.
- ⊕ No employee shall be permitted to ride or work under concrete buckets while buckets are being elevated or lowered into position. To the extent possible, concrete buckets shall be routed so that no employee is exposed to the hazards associated with falling concrete buckets.
- ⊕ Sections of tremies and similar concrete conveyances shall be secured with wire rope (or equivalent materials) in addition to the regular couplings or connections.
- ⊕ Bull float handles, used where they might contact energized electrical conductors, shall be constructed of nonconductive material or insulated with a nonconductive sheath whose electrical and mechanical characteristics provide the equivalent protection of a handle constructed of nonconductive material.
- ⊕ Masonry saws shall be guarded with a semicircular enclosure over the blade to retain blade fragments from injuring a worker.
- ⊕ Formwork shall be designed, fabricated, erected, supported, braced and maintained so that it will be capable of supporting without failure all vertical and lateral loads that may reasonably be anticipated to be applied to the formwork.
- ⊕ Employers shall take measures to prevent unrolled wire mesh from recoiling. Such measures may include, but are not limited to, securing each end of the roll or turning over the roll.
- ⊕ Forms and shores (except those used for slabs on grade and slip forms) shall not be removed until the employer determines that the concrete has gained sufficient strength to support its weight and superimposed loads.
- ⊕ No employee shall be permitted to perform maintenance or repair activity on equipment (such as compressors, mixers, screens or pumps used for concrete and masonry construction activities) where the inadvertent operation of the equipment could occur and cause injury, unless all potentially hazardous energy sources have been locked out and tagged. Unplug power tools before changing accessories like blades, drill bits, etc.
- ⊕ Rigging equipment shall be inspected before each use. One Qualified Rigger and Signal Person shall be on each crew. Other crew members will follow their direction.
- ⊕ Cranes shall have a competent trained operator for the type of crane that is being utilized. All inspections and paperwork must be completed before work begins.
- ⊕ At the end of the job, clean your work area and leave the job site in a better condition than when you started.
- ⊕ Whenever conditions change from the original plan you must stop and reassess. If there is *any* doubt, STOP!

REQUIREMENTS FOR PRECAST CONCRETE:

- ⊕ Precast concrete wall units, structural framing, and tilt-up wall panels shall be adequately supported to prevent overturning and to prevent collapse until permanent connections are completed.
- ⊕ Lifting inserts which are embedded or otherwise attached to tilt-up precast concrete members shall be capable of supporting at least two times the maximum intended load applied or transmitted to them.
- ⊕ Lifting inserts which are embedded or otherwise attached to precast concrete members, other than the tilt-up members, shall be capable of supporting at least four times the maximum intended load applied or transmitted to them.
- ⊕ Lifting hardware shall be capable of supporting at least five times the maximum intended load applied or transmitted to the lifting hardware.
- ⊕ No employee shall be permitted under precast concrete members being lifted or tilted into position except those employees required for the erection of those members.

LIFT-SLAB OPERATIONS:

- ⊕ No employee (except those essential to the post-tensioning operations) shall be permitted to be behind the jack during tensioning operations.
- ⊕ Signs and barriers shall be erected to limit employee access to the post-tensioning area during tensioning operations.
- ⊕ Lift-slab operations shall be designed and planned by a registered professional engineer who has experience in lift-slab construction. Such plans and designs shall be implemented by the employer and shall include detailed instructions and sketches indicating the prescribed method of erection. These plans and designs shall also include provisions for ensuring lateral stability of the building/structure during construction.
- ⊕ Jacks/lifting units shall be marked to indicate their rated capacity as established by the manufacturer.
- ⊕ Jacks/lifting units shall not be loaded beyond their rated capacity as established by the manufacturer.
- ⊕ Jacking equipment shall be capable of supporting at least two and one-half times the load being lifted during jacking operations and the equipment shall not be overloaded. For the purpose of this provision, jacking equipment includes any load bearing component which is used to carry out the lifting operation(s). Such equipment includes, but is not limited, to the following: threaded rods, lifting attachments, lifting nuts, hook-up collars, T-caps, shearheads, columns, and footings.
- ⊕ Jacks/lifting units shall be designed and installed so that they will neither lift nor continue to lift when they are loaded in excess of their rated capacity.
- ⊕ Jacks/lifting units shall have a safety device installed which will cause the jacks/lifting units to support the load in any position in the event any jack/lifting unit malfunctions or loses its lifting ability.
- ⊕ Jacking operations shall be synchronized in such a manner to ensure even and uniform lifting of the slab. During lifting, all points at which the slab is supported shall be kept within 1/2 inch of that needed to maintain the slab in a level position.
- ⊕ If leveling is automatically controlled, a device shall be installed that will stop the operation when the $\frac{1}{2}$ inch tolerance set forth in paragraph (g) of this section is exceeded or where there is a malfunction in the jacking (lifting) system.
- ⊕ If leveling is maintained by manual controls, such controls shall be located in a central location and attended by a competent person while lifting is in progress. In addition to meeting the definition in §1926.32(f), the competent person must be experienced in the lifting operation and with the lifting equipment being used.
- ⊕ The maximum number of manually controlled jacks/lifting units on one slab shall be limited to a number that will permit the operator to maintain the slab level within specified tolerances of paragraph (g) of this section, but in no case shall that number exceed 14.
- ⊕ No employee, except those essential to the jacking operation, shall be permitted in the building/structure while any jacking operation is taking place unless the building/structure has been reinforced sufficiently to

ensure its integrity during erection. The phrase “reinforced sufficiently to ensure its integrity” used in this paragraph means that a registered professional engineer, independent of the engineer who designed and planned the lifting operation, has determined from the plans that if there is a loss of support at any jack location, that loss will be confined to that location and the structure as a whole will remain stable.

- ⊕ Under no circumstances, shall any employee who is not essential to the jacking operation be permitted immediately beneath a slab while it is being lifted.
- ⊕ For the purpose of paragraph (k) of this section, a jacking operation begins when a slab or group of slabs is lifted and ends when such slabs are secured (with either temporary connections or permanent connections).
- ⊕ When making temporary connections to support slabs, wedges shall be secured by tack welding, or an equivalent method of securing the wedges to prevent them from falling out of position. Lifting rods may not be released until the wedges at that column have been secured.
- ⊕ All welding on temporary and permanent connections shall be performed by a certified welder, familiar with the welding requirements specified in the plans and specifications for the lift-slab operation.
- ⊕ Load transfer from jacks/lifting units to building columns shall not be executed until the welds on the column shear plates (weld blocks) are cooled to air temperature.
- ⊕ Jacks/lifting units shall be positively secured to building columns so that they do not become dislodged or dislocated.
- ⊕ Equipment shall be designed and installed so that the lifting rods cannot slip out of position or the employer shall institute other measures, such as the use of locking or blocking devices, which will provide positive connection between the lifting rods and attachments and will prevent components from disengaging during lifting operations.

TRAINING

Winger employees shall be trained in safe work procedures while working with cement. Files will be kept at the Winger corporate office in their safety training files.

SOURCE CREDITS

U.S. Department of Labor, Occupational Safety and Health Administration, www.osha.gov CFR 1926, Subpart Q Concrete and Masonry Construction, §1926.700 through 1926.706

Electronic Library of Construction Occupational Safety and Health (elcosh)

<http://elcosh.org/document/1563/d000513/cement-hazards-and-controls-health-risks-and-precautions-in-using-portland-cement.html>

elcosh Keeping Cement Masons Safe: Preventing Falls, Struck by and Caught Between Accidents

Portland Cement Association <https://www.cement.org/cement-concrete-applications/working-with-concrete/working-safely-with-concrete>

Health and Safety Executive, **Cement**, Construction Information Sheet No 26 (revised)
Portland Cement Association, **Skin Safety with Cement and Concrete**, videotape

ADDITIONAL INFORMATION

For a complete listing of publications, videotapes, and further information on concrete safety for contractors, contact the American Society for Concrete Construction (ASCC) at 1.800.877.2753, or 38800 Country Club Drive, Farmington Hills, MI 48331-3411. Two useful publications are the *ASCC Safety Manual*, an extensive safety guide for concrete contractors, and the *ASCC Employee Safety Handbook*. For more information on cement, consult the manufacturer's material safety data sheet.

DOCUMENT CONTROL

Initial Program November 24, 2018