How to Paint Lines on Concrete Floor:

A Comprehensive Guide to the Preparation, Application, and Maintenance of Paint on Concrete Surfaces.



How to Paint Lines on a Concrete Floor

So you have decided that you need to place lines on a factory, warehouse or other concrete floor. What is the best way to do it?

It is natural to think of painting the concrete. After all, painting concrete has a long history—on highways, in parking lots and on many industrial workplace floors.

This extensively researched story will explain how to properly paint lines on a concrete floor.



General Considerations

Concrete is not a natural ally of paint. One of the most respected paint companies in the U.S., Valspar Paint, notes on its website: "Concrete is a surface that presents a number of challenges to paint in terms of adhesion and long-term durability, especially on horizontal concrete walking surfaces." To paint the lines, correct surface preparation is paramount.

What needs to be done? One of the first things to do is to remove chemicals that interfere with paint bonding.

"Many materials, if not removed from the surface, will affect the life of the coating," explains ASTM International (formerly the American Society for Testing and Materials). Also, the concrete surface must be roughened, since a rougher surface "increases the surface area available for bonding between the concrete and the coating, enhances adhesion at the concrete/coating interface, and helps the coating resist peeling and shear forces," explains the Society for Protective Coatings. There are essentially four steps to painting a concrete floor:

1. Evaluate the concrete slab.

- 2. Prepare the concrete for paint.
- 3. Apply the paint.
- 4. Allow it to dry.

Each step is discussed in turn below.

1—Evaluate the Concrete Slab

A concrete slab can be thought of as a canvas. What type of canvas will you be painting on? Evaluating the concrete slab is the first step in painting it.

There is no universally agreed-upon method of surface preparation. "No preferred method of finishing concrete to accept coatings has been established," states the Society for Protective Coatings. Instead, the decision must be based on the characteristics of the particular concrete slab, since not all concrete surfaces (i.e., canvases) are equal.

Has the concrete been coated or sealed?

Sealed concrete is not a receptive canvas for paint. Why? Sealers and glossy coatings are designed to make the surface resistant to moisture penetration, and this imperviousness to moisture also prevents paint from being absorbed by the concrete. "Coatings must absorb a little bit into concrete surfaces in order to achieve the proper bond," notes the trade publication Concrete Construction. As Valspar Paint points out, a sealer or coating on a concrete surface "may greatly inhibit paint adhesion if it cannot be removed."

If you are unsure whether your concrete has been either sealed or coated, there is a simple test. Simply sprinkle some water on the surface and see if the water is absorbed into the concrete. **"If it beads up, the sealer will have to be removed before any paint goes down,"** explains the website Everything About Concrete. Many experts recommend the same test.



One common form of coating found on concrete are curing compounds. Curing compounds are applied to concrete to enable it to retain moisture while it cures, since newly laid concrete requires water to cure properly. The net impact of a curing compound is similar to a sealer, in that it will tend to keep liquids, including paints, from absorbing into the concrete.

A variety of other chemical coatings also interfere with paint bonding, including surface hardeners. Surface hardeners are chemicals that help to reduce wear on the floor; but by hardening the concrete surface, they make the surface impermeable to paint.

Bottom line: If you wish to paint a line on concrete that has been treated with a sealer or coating, the sealer or coating must be removed before the paint is applied. To accomplish this, the concrete should be stripped to a level below that to which the sealer or coating has penetrated.

Has the concrete been polished?

Polished concrete (a popular choice these days) must first be roughened before paint is applied to it. Roughening increases the bonding surface area, creating a stronger bond between the paint and the concrete. In painters' language, it provides enough "tooth" to enable the paint to "bite."

The Concrete Network website explains: "For proper bonding of concrete overlays and coatings, it's important to give the surface the correct concrete surface profile, or CSP." The International Concrete Repair Institute measures CSP using the average distance from the peaks of the surface to the valleys. The scale ranges from a CSP of 1, which is nearly flat, to a CSP of 9, the roughest. For paint, the concrete surface profile should normally be CSP 3. Too smooth a surface will make it difficult for the paint to bond.

Bottom line: If you wish to paint polished concrete, the smooth surface will need to be roughened first. Generally this is accomplished by mechanical means such as shotblasting or grinding.

Is the concrete uncoated and unsealed?

If the concrete is uncoated and unsealed, it may be a good candidate for acid etching. Acid etching is generally easier and less expensive to perform than mechanical abrasion.

International Concrete Repair Institute (ICRI) Concrete Surface Profile (CSP) Scale:



CSP 1 (acid etched)



CSP 4 (medium shotblast)



CSP 7 (heavy shotblast)



CSP 2 (grinding)



CSP 5 (medium-heavy shotblast)



CSP 8 (extreme shotblast)



CSP 3 (light shotblast)



CSP 6 (heavy shotblast)



CSP 9 (extreme shotblast)

Does the concrete pass a moisture test?

Some concrete floors have high moisture levels. If you paint safety lines on concrete of this kind, the results will not be acceptable. "Concrete with excessive moisture will soon work to destroy the adhesion of any paint applied to it," notes Valspar Paint. "Many coating types will not adhere over entrapped moisture," ASTM International cautions.

The basic problem is that hydrostatic pressure can cause the paint to lift. It is not difficult, though, to test whether moisture is coming up from within the concrete.

ASTM International notes in instructional documents, "You can test for moisture by taping a 2' x 2' piece of plastic wrap to the concrete using duct tape on all edges. Allow the plastic to sit for 24 hours. **If water droplets appear on the underside of the plastic, or if the concrete is damp, the surface contains excess moisture and should not be painted. Moisture problems must be corrected before coating.**"

This plastic sheet technique for determining excess moisture is accepted by ASTM International.



Bottom line: Test the concrete for moisture. If the concrete fails the moisture test, it should not be painted. For possible ways to remediate the moisture issue, consult an experienced concrete contractor.

Does the concrete have grease or oil on it?

As with any painting project, the canvas needs to be clean. According to ASTM International, Grease and oil should be removed using a detergent, trisodium phosphate (TSP), or steam cleaning, and this should be done before abrading or acid etching the concrete.

If the oil or grease has seeped deeply into the concrete, the oil or grease may bleed back even after you clean the surface. That is, although the surface may look clean initially, oil or grease within the concrete may wick up to the surface, potentially loosening the paint. For this reason, painting a concrete floor that is contaminated with oil or grease poses special issues.

Is it newly laid concrete?

The alkalinity of new concrete makes for poor adherence of paint. (The alkalinity comes from lime, which is an ingredient of concrete.) Traditionally, new concrete is not coated until at least 28 days after placement.

2—Prepare the Concrete for Paint

As explained above, the general objective in preparing concrete for painting is to strip chemicals such as sealers, coatings, and hardeners and to give the concrete the correct level of roughness. ASTM International recommends a surface profile of CSP-3. The primary methods used to prepare the surface are shotblasting, grinding, scarifying, and acid etching. Each is described below.



Shotblasting

Shotblasting is the most popular method of preparing a concrete floor for a coating. In the Journal of Protective Coatings & Linings, Tracey Glew provides an overview of the process.

"In the correct conditions, shotblasting is one of the most cost-effective methods of preparation.... Shotblasting machines are available in walk-behind, 110-volt single-phase and three-phase electric and ride-on versions, and all offer different operating widths."

The article goes on to say:

"The process involves propelling steel shot or abrasive at high velocity (by a rotating wheel contained in the body of the machine) onto the surface to produce the desired profile. The debris removed is then collected in a dedicated vacuum/filtration unit for disposal upon completion of the process, and the shot is recycled. Many profiles can be achieved; each profile is determined by the size or grade of shot or abrasive selected and the speed at which the machine is propelled."

But shotblasting must be done carefully. Damaging the concrete is a concern. Shotblasters are not made in small enough widths to abrade a narrow line. However, some contractors will place duct tape on either side of the desired safety line and then run the shotblaster over it.

Grinding the Surface

In the same article in the Journal of Protective Coatings & Linings, Tracey Glew describes the process of grinding concrete.

Glew states, "Grinding would be selected when a flat, level and smooth concrete surface is required. It is used for removing surface contaminants, adhesives, paint, sealers, and coatings, and for cleaning. Grinding models are available in single-phase or three-phase electric and in single-head, double-head, and multi-head versions.... Grinding is achieved by diamond, tungsten, or resin-bonded plates or discs that are secured to the single or multiple rotating heads."

Grinders, which come in a variety of sizes, are used for polishing concrete, too. They tend to be better at creating smoothness than roughness. Thus they usually do not create as optimal a surface profile for paint as shotblasters do.

Scarifying

According to Amy Flanagan of Blastrac, a company that sells concrete surface preparation equipment, scarifiers are versatile surface preparation tools used for concrete, asphalt, and even steel surfaces.

"Scarifiers use steel- or carbide-tipped cutters in various shapes, depending on the application, that are loaded on shafts, which are placed around the perimeter of a cylindrical drum," Flanagan said. "As the drum rotates, the cutters strike the surface at a high speed, fracturing the coating and/or contaminants and abrading the concrete surface. The tools are used to remove contaminants, coatings, adhesives, and paint."

A scarifier is used only when the coating that must be removed is quite thick.

Chemical Methods: Acid Etching

In this method, a mixture of water and acid (traditionally muriatic acid, which is another name for hydrochloric acid) is placed on the concrete and then rinsed away, producing a surface profile that resembles medium coarse sandpaper.

Acid etching is not recommended for "areas where curing compounds or sealers have been used," according to the Society for Protective Coatings. ASTM International similarly says that acid etching will not work correctly if there are sealers, curing compounds, or surface hardeners. But if the concrete is unsealed, uncoated, and unhardened, acid etching may be an appropriate choice.

After acid etching, it is important to test the concrete's pH in order to ensure that all of the residual chemicals have been rinsed away.

Which method should you choose?

There is no single "correct" method of preparing a concrete surface, observes Amy Flanagan in her article "Keys to Concrete Surface Preparation: Shot Blasting, Scarifying, and Grinding." A variety of factors should be considered. She also notes that the various methods are sometimes used in combination.

Another opinion comes from the paint company, Sherwin-Williams, that suggests either grinding, "abrasive blast," or "steel shot blast"; it counsels against acid etching.

Some contractors may be tempted to use an electric sander to prepare the surface. However, sanding makes the concrete smooth, reducing the surface area for paint bonding. The Society for Protective Coatings accepts the use of sanding and wire brushing to remove existing coatings, but emphasizes that "these methods may not produce the required surface profile." Using sanding in combination with acid etching may be a viable option.

3—Apply the Paint

Once you have done the necessary prep work, it is time to apply the paint. Use painters' tape to mark the safety line's desired borders.

The border taping must be done with care, of course, because if the tape is not straight, the line will not be either. Painters have various tricks for applying and removing the tape in order to achieve sharp painted lines.

As for choosing the right type of paint, epoxies are widely recognized as the most durable coating for concrete. It is usually best to apply two coats, and also be sure to wait the recommended amount of time between coats.



4—Allow the Paint to Dry

Painted concrete takes much longer to dry than people usually realize. Valspar Paint recommends waiting at least 72 hours. DRYLOK advises that the surface will be ready for heavy foot traffic after 24 hours and for automobile traffic after five days. Sherwin-Williams urges waiting between 48 and 72 hours before subjecting the painted concrete to heavy traffic.

For using its brand of concrete paint, BEHR offers these guidelines:

- Allow 24 hours for light foot traffic.
- Allow 72 hours for heavy foot traffic and furniture.
- Allow 7 days before subjecting to automotive tires. ...
- TIP: Premature heavy traffic will cause paint failure which will require spot re-coating."

Maintenance

An industrial floor typically experiences heavy traffic, and over time, the safety lines are likely to need repair. To repaint the lines, most professionals will either strip off the old paint entirely or else strip off as much of the old paint as they can without damaging the concrete. If the lines are in good enough shape, some may remove the paint only in damaged spots, making sure that the juncture between those spots and the rest of the floor is feathered.

If a change in the configuration of the work area is needed, the old safety lines might need to be removed entirely. Suffice it to say that stripping paint off of concrete is one of contractors' least favorite jobs, due to the way that paint seeps into concrete's pores.

Summary

Concrete is not a simple surface to paint. The concrete slab must first be evaluated, and then its surface must be prepared correctly. Has the concrete been sealed or coated? If so, the sealer or coating must be stripped off. The concrete surface will also need to be roughened in order to allow the concrete and the paint to form a proper bond. After preparing the floor and then painting the concrete, it is crucial to give a painted concrete floor a number of days to dry.

"While you can paint drywall in a day or two, you'll need a week or more to finish painting concrete," says Pat Curry, a former senior editor at Builder magazine. "Concrete painting is trickier than painting most surfaces," he adds.

Stop Painting—Use Floor Tape

For many businesses, floor markings are a must for optimum productivity. This means using visual cues, signs and floor markings to direct employees and equipment in the most efficient and safe way, all in an effort to keep waste low and productivity high.

The preceding pages described how to paint lines on a concrete floor (the most common floor surface in industrial settings), to create a visual organization system. Another option is using floor tape. This method is popular because companies frequently change paths or placements of floor markings as workflow needs change. For instance, if a company gets a new piece of equipment that must be added into the workflow, existing equipment is shifted to make room. This will usually create a need for updated floor markings.



In addition to changing floor marking layouts, marked floors in a production facility whether with paint or tape—are going to experience degradation due to equipment traffic and/or pallet dragging. So planning ahead on how these floors will be marked and maintained is a given to keep safety standards and productivity levels high. Repainting lines could take up to seven days and it is not an inexpensive endeavor. Floor tape can be easily applied, pulled up and reapplied to a new area or pathway or to repair damaged tape—making it a better solution than painting. Advantages of floor marking over painting lines are:

- Less time and labor for installation
- No costly shutdown during installation
- No need for aggressive treatment of floor before application, which may damage floor
- Ease of modification if lines need to be moved
- Impactful messages can be applied to floor tape increasing the visual instruction value of the markings.

Floor tape is a much more efficient process to implement and maintain. Most floor marking tape on the market is cheaply produced, costs about \$5 a roll and easily stretches and tears.

We believe that painting floors and using cheap vinyl tape is not the answer for companies looking to be efficient and productive. Our company was built around the idea that there is a better solution for marking floors. Our flagship product, <u>Superior Mark™</u> floor tape, is the perfect solution. With patented beveled edges and a recessed adhesive, Superior Mark[™] tape is more resistant to being pulled up by forklifts or dragging pallets than competing tapes. We manufacture Superior Mark[™] tape in-house, using heavy duty PVC, which makes it dirt resistant, easy to clean and makes it easily removed in one piece. Competing tapes have an average of 3 mils thickness, while Superior Mark Tape is 32 mls thick.

Check out this <u>video</u> that shows the difference between Superior Mark[™] and competing tapes, learn more about Superior Mark[™] on our <u>website</u>, or call us today to talk to one of our consultants at 1-866-284-1541.