

MAINTENANCE

Film Formers - 'Wet Look'

The film formers are usually made from acrylic compounds. They form a thin coating on the surface of your concrete, leaving a wet look; much like varnish does on wood. These products generally tend to be less expensive on a per gallon basis than their penetrating counterparts, but you'll probably find that they will need more frequent application since they will weather and wear away more quickly.

One significant advantage of the film formers is that there is usually not a compatibility concern with the method of curing used or whatever previous sealer might have been applied.

The biggest problem that can develop with the film formers is that they tend to darken the color of your concrete. This may not be a problem on decorative concrete where a deeper color is desired, but on plain concrete the color variation may be objectionable. Just like varnish will enrich the color of wood, these will do the same to concrete. And just like it may take several coats of varnish to provide an even, rich color, don't expect the film forming concrete sealer to perform differently. If after one coat you get some dark areas and some light, you may want to apply another coat to make it evenly dark. These initial variations in color may be caused by natural variances in the porosity of the

concrete and/or uneven application, but they are quite normal.

One other potential problem is too much of a film build up on the surface may reduce the friction that keeps feet or tires from slipping. Applying film-forming sealers too heavily or in too many coats can also cause the sealer to bubble, turn white, or flake off.

Penetrating Sealers - 'Dry Look'

Most penetrating sealers are made from derivatives of silicone called silanes or siloxanes. These materials are designed to penetrate into the pores of concrete, and once there, react with the alkaline materials and moisture to form silicone. The silicone filled pores then make your concrete water repellent.

While the silane and siloxane penetrating sealers are usually more expensive than the film formers, they should last longer. Another reason that the penetrating sealers are gaining in popularity in spite of their price, is that, when properly applied, they don't change the appearance of the concrete. Their biggest disadvantage, or at least the major concern in their application, is that there can be no other membrane cure or sealer on the concrete when applying and the concrete must be over 28 days old.



A HOMEOWNER'S GUIDE TO HEALTHY CONCRETE



**CONCRETE
BASICS**

CURING

MAINTENANCE



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Concrete driveways and walkways can greatly enhance the appearance and value of a property. Healthy concrete, however, does not happen by accident. Thoughtful planning, a proper concrete mix, professional placement and the proper curing and maintenance can produce beautiful concrete that will last for years. The time to think about what you want from your concrete in terms of appearance, performance and maintenance is BEFORE - the concrete is placed.

You may hear many things about what to do with your newly placed concrete - some are good ideas, others are myths and misconceptions. This brochure is to help you, the homeowner, understand what is needed for healthy concrete and to separate these myths from reality. While the information presented will not make you a concrete engineer or contractor, it will help you to make informed choices when planning your concrete driveway, walkways, and patios. In particular, this brochure is designed to help you understand the curing and sealing processes and the homeowner's responsibility once the concrete has been placed and finished.



Construction Responsibilities

Concrete construction is a complex set of activities requiring professional skills and an extensive understanding of concrete. Usually several parties are involved -the general contractor, the home builder, the concrete contractor, the ready-mix producer and the homeowner. The technical aspects of installing concrete such as planning, preparation, mix specification, placing and finishing are the responsibility of the home builder, ready-mix producer, and largely, the concrete contractor. The homeowner should discuss the type of curing used with the contractor to determine the appropriate type of future maintenance (sealing). Ultimately, any ongoing maintenance is the homeowner's choice and responsibility.

Concrete Concerns

Concrete is a blend of cement, coarse aggregate (crushed stone or gravel), fine aggregate (sand) and water. Therefore, it may and most likely will have some natural imperfections.

The most prevalent concerns of homeowners are scaling and uniform appearance. Because of concrete's complexity, it takes a team effort to address these potential problems.

Scaling

Also called mortar flaking, scaling is the localized or widespread loss of the concrete surface, usually affecting the top $\frac{1}{16}$ to $\frac{1}{4}$ inch. Most scaling can be prevented by the use of air entrained concrete - **All exterior concrete must be air entrained**

Your ready-mix producer and concrete contractor control the amount of air entrained in the concrete and the mix quality. In freeze-thaw climates, it is very important to place exterior concrete with entrained air, as the tiny air pockets provide space for water to expand into when it freezes.

Proper Finishing

The concrete contractor must be aware of the proper timing of the finishing operations, which can vary greatly depending on the weather. Finishing too early or too late can adversely affect the quality of the surface. Over finishing can reduce the amount of entrained air voids in the surface leaving the concrete surface susceptible to freeze/thaw scaling distress. It is important to minimize manipulation of the surface, therefore swirl finishes are not recommended. It is critical that excess water is not worked into the surface during the finishing operations. This practice can lead to a significantly weakened wearing surface susceptible to scaling distress.

Judicious Use of Deicing Agents

Sodium chloride (common rock salt) and calcium chloride on their own will not chemically damage or etch your concrete. However, the fact that all deicer products allow the surface to stay saturated longer can lead to damage

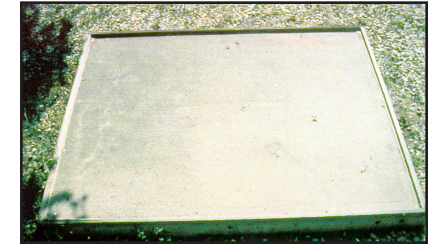


fig.1 A 15 year old air entrained concrete slab

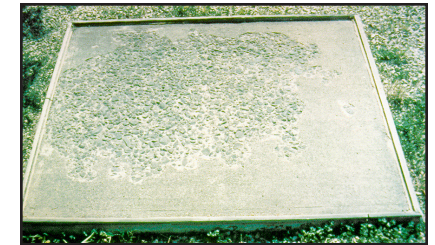


fig.2 A 15 year old non-air entrained concrete slab exhibiting scaling

of your concrete. Use of any labeled product claiming 'safe on concrete' can be harmful even after the concrete has aged. Deicing products that contain magnesium chloride, calcium magnesium acetate, ammonium nitrate or ammonium sulfate can chemically attack the concrete, causing severe damage.

Carefully read the product label to see what it contains and how to use it prior to application. If proceeding, use deicers sparingly and cautiously to help undercut and loosen ice and/or snowpack and promptly remove off the surface. To minimize damage to the concrete, remove any remnant deicers off the surface as soon as practical. Do not use deicers to completely melt away ice or snow

Deicing salts are not recommended in the first winter and over the life of the concrete should always be used judiciously. Use plain sand instead during

the first winter for traction. Promptly remove any inadvertent deicing salts tracked onto concrete less than three months old.

Aggregate Popouts

Aggregate popouts are small, shallow pits that can appear on concrete surfaces when certain naturally occurring stone particles near the surface absorb water, freeze, and expand. As the particles break apart, they can also cause a small piece of the surrounding concrete to fracture away. Although all concrete materials are carefully selected, it is not practical to remove every weak or absorptive particle from natural sand and stone, so occasional popouts can occur. A certain quantity of unsound particles in the aggregate sources is acceptable by industry standards.

Popouts are primarily an appearance issue and do not reduce the strength, durability, or expected service life of the concrete. Good concrete placement, finishing, and curing practices help minimize their occurrence, but they cannot always be prevented. If desired, individual popouts can be repaired by removing the loose material, drilling out the remaining imbedded unsound particle and filling the area with an appropriate patching product.



Insufficient or No Curing

Failure to properly cure your concrete often results in lower strength concrete, cracking, dusting, and a weak surface skin which will be prone to scaling. Although proper curing should be done by your concrete contractor, it is absolutely necessary that you and your contractor work together on this because the curing method affects your plans for ongoing maintenance.

Uniform Appearance

It seems that most homeowners are looking for their concrete to turn white quickly and evenly. In reality, the longer your concrete keeps its darker color, the better it is retaining moisture. This will ultimately result in stronger, healthier concrete.

Your entire drive or walkway should even out in appearance over the first month after placement. Variations of dark and light areas during this time are normal.

After reading this brochure, you will discover that you need to start at the end - that is the end result you want - and plan back to the beginning of your concrete construction to produce healthy, durable concrete. For technical information on concrete mixes, design and placement, refer to Ohio Concrete's *Industry Recommendation for Exterior Concrete Flatwork* - available for download at www.ohioconcrete.org. If you have any additional questions regarding curing and sealing, we would welcome your call.

Freeze - Thaw Resistance

Curing can also help concrete to be more durable and resistant to damage caused by freezing and thawing. As long as the hydration process continues in concrete, the cement portion hardens and becomes more dense. If the concrete is properly cured, it will be less porous than uncured concrete, thus making it more difficult for water and salts to penetrate.

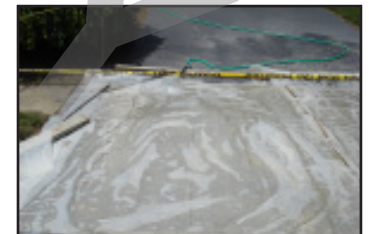
Properly cured concrete is also more wear resistant and less susceptible to dusting and scaling.

Curing Concrete - How is it Done?

There are numerous methods for curing concrete from covering with plastic sheeting or wet burlap or ponded water.

Moist Curing

Probably the best method for curing concrete is to flood the surface continuously with water for the first seven (7) days after placement. However, it is important that the concrete not be allowed to dry out during this time. Often, contractors will recommend to the homeowner to wet the new driveway for the first week after its completion. But, if the concrete is allowed to dry between soakings, this alternate wetting and drying may actually damage the concrete. So if you are going to water cure, plan on keeping the sprinkler going for at least a week.



Curing Concrete - What Does it Mean?

When there's an unsightly concrete driveway, everyone would like some way to 'cure' the problem, but that's not what we mean by curing concrete. It is true, however, that had the problem concrete been properly cured, it may never have gotten sick. Curing is the maintaining of a satisfactory moisture content and temperature in concrete for a sufficient period of time during its early stages so that its desired properties may develop.

Strength

The amount of water in the concrete while it is being placed is normally more than must be retained for curing. However, concrete that dries out too quickly may not retain enough water needed for the hardening process - a chemical reaction called hydration.

Temperature also greatly affects the hydration process. While hot weather can make the concrete harden and gain strength faster, it ultimately leads to a weaker concrete than one that has been kept cool (but not within freezing range) during its first few days.

Thus, the goal in curing is to keep the concrete cool and moist so that it gains its strength slowly but efficiently. Laboratory tests show that moist cured concrete can be twice as strong as concrete cured in a dry environment.

Membrane Curing

The most common method of curing new concrete driveways is the use of a liquid membrane-forming compound normally called a curing compound. These materials are usually sprayed or rolled on the concrete surface. Once dry, they form a thin film which restricts the evaporation of moisture from the concrete.



The most important thing to remember regarding the use of a curing compound is timing. The application of these products should be done as soon as the final finishing operations are complete or as soon as their application won't mar the concrete's surface. So if someone says, "Let's wait until tomorrow to apply the curing compound," you will know it's not a good idea.

The next most important thing is application rate. A light sprinkling of the curing compound on the surface will not do the trick. A sufficient coat according to the manufacturer's recommended coverage rate (usually 150 ft²/gal) is critical.

Curing with sealing in mind

When choosing the curing method and materials that will be used on your driveway, one important aspect to consider is how you intend to seal and maintain your concrete in the future. Sealing your concrete is addressed in the next section, but for now let's look at how the curing method can affect your sealing decision.

The most common type of membrane cure used is referred to as a 'cure and seal'. But let's make one thing clear, this is not a one step process for permanent concrete sealing. It does, however, dictate the use of a filmforming sealer unless the 'cure and seal' is removed or allowed to naturally wear off over time.

If you plan to use a penetrating sealer for ongoing maintenance, then your concrete should either be moist cured or cured with an easily removed, dissipating concrete curing compound.

By making the sealing choice before the driveway is installed, you can then inform your contractor on the curing method that you would prefer.

Maintaining Your New Concrete

You wouldn't use a strong caustic soap to clean your new carpet. Nor would you use acid to clean your new kitchen or bathroom fixtures. In fact, you're pretty careful about how you clean and take care of your new home inside. But, what about outside concrete walks, drives, patios, porches and steps? Give the new exposed concrete around your house the same consideration as your pretty new interior! It's quality concrete, but don't abuse it.

New concrete should be at least three months old before deicing chemicals - those that contain sodium chloride (common salt) or calcium chloride - are used. Remember, deicing salts are not recommended in the first winter. The only safe material to use to make the concrete surface skid resistant during the first winter is plain sand. Promptly remove any deicers tracked onto or inadvertently broadcast on new concrete.

It is helpful that a recommended surface sealer be applied in the fall prior to the concrete's first winter. Check with your builder, contractor or ready mix supplier for recommended quality concrete sealers and refer to the next section on choosing sealers. These can be rolled or sprayed on and do require re-application for continued performance.

THE 'WET LOOK' VS. THE 'DRY LOOK'

Wet Look - Film Formers

Dry Look - Penetrating Sealers

Advantages

- better stain protection (i.e., oil, grease, etc.)
- usually compatible with curing method used
- glossy to medium gloss look
- deepens and highlights the color of exposed aggregate, colored or stamped concrete

- should not change the concrete's appearance
- less frequent applications needed
- easy to apply
- tend to be less costly

Disadvantages

- can darken the concrete
- may appear blotchy if not evenly applied
- will wear away, requiring more frequent applications
- may create a slippery surface

- usually more costly
- not as effective as a stain protector
- cannot be applied over a film forming compound

Never use deicers containing ammonium sulfate or ammonium nitrate. These products are commercial fertilizers used by farmers and have on occasion been packaged and sold as deicers. They will effectively melt snow and ice, BUT they will also rapidly disintegrate concrete. Also, deicers containing magnesium or acetate are also known to be harmful to concrete and should be avoided.

Clear snow and ice, including deicers, from your concrete surfaces as soon as possible.

Sealing Concrete - Ongoing Protection

Just as you paint the trim on your home or wax your car to keep them looking nice and protect their base structures from detrimental elements, you should seal your concrete regularly to protect it from moisture penetration and prolong

its life too. Although it seems ironic, it is true that when concrete is first placed, we want to keep the moisture in; once it has matured, we want to keep moisture out. This is especially true for concrete that will be subjected to freezing and thawing. You can do this by maintaining your concrete with a sealer designed to keep out water and deicing chemicals.

Choosing a Sealer

Choosing a product to seal your concrete can seem like a complicated process, but let's try to cut through it all to some simple choices. There are really only two types of concrete sealers - those that form a film on the surface of your concrete, giving it a wet look, and those that are designed to penetrate the concrete leaving it dry looking, yet water repellent. Like any choice, each has its advantages and disadvantages.