Exterior concrete flatwork such as driveways, patios, loading docks, building entrances and walkways can greatly enhance the aesthetics and value of your property. Many factors play a role in sustaining the durability of your concrete. Cemstone proportions exterior concrete mix designs according to American Concrete Institute guidelines. Having the correct mix design alone, will not guarantee durability. It is also how the mix is produced, placed, finished, cured and then maintained that determines the quality and longevity of the concrete. Early-age protection of the concrete surface is critical, therefore curing should begin immediately after final finishing. Inadequate curing will result in a significant loss of surface strength and durability.

How to Maintain Your Exterior Concrete

Sealing
Sealing helps maintain the appearance and durability of concrete. Sealers are designed to keep moisture and contaminants like deicing chemicals from being absorbed into the concrete. Since sealers will wear over time and no longer function as intended, concrete should be sealed on a regular basis. Reapply sealer per the manufacturer’s recommendations or as needed. You can spot check your concrete to determine when sealers need to be reapplied. When water no longer beads on the surface of the concrete, it is time to reseal.

Preventing Freeze-Thaw Damage
Two key conditions must occur to create deteriorating freeze-thaw damage. The first condition is saturation of the concrete, and the second condition is freeze-thaw cycles. Without the combination of these conditions, damage will not occur. The use of deicing chemicals often accelerates surface deterioration of concrete. This is especially true with new concretes which have not had ample amount of time for internal moisture to dry out. Deicing chemicals lower the freezing point of water and also allow water to saturate further into the concrete.

• Avoid using deicing chemicals on your concrete, especially for the first winter. Sand or traction grit can be used for traction.
• Promptly remove snow and ice accumulation manually from your concrete.

Other Maintenance Tips
• The best concrete maintenance is the preventative kind. Preventative maintenance involves cleaning with a broom or rinsing to remove dirt and debris when weather permits.
• Fertilizers contain substances which chemically attack concrete. Promptly sweep off any fertilizer that is inadvertently cast on the concrete when spreading lawns.
• Remove stains immediately. While sealer will help to protect concrete from stain absorption, it’s still a good idea to remove oil, gasoline or other spills as soon as possible.
• Avoid using harsh acids for cleaning concrete. Use products designed for use on concrete.
Cracking
Concrete expands and contracts with changes of moisture and temperature and deflects depending on load and support conditions. Cracks can occur due to the following:

- Plastic shrinkage cracks caused by high evaporation rates during placement
- Improper jointing
- Continuous external restraint
- Lack of isolation joints
- D-cracks from freezing and thawing
- Craze cracks from shrinkage of the dense paste layer at the surface
- Settlement cracks caused by inadequate subgrade

Pop-outs
Because concrete is made from natural products it may have some natural imperfections. A pop-out is a cone-shaped cavity in a horizontal concrete surface left after an aggregate close to the surface has expanded and fractured. A pop-out can be caused by either a physical reaction or a chemical reaction.

Physical: A physical reaction is when a porous rock absorbs water and freezes, causing the rock to expand and fracture.

Chemical: An example of a chemical reaction is when alkalies in the cement react chemically with the silica found in some aggregates, a gel is formed which expands causing a small surface pop-out.

According to the Aggregate and Ready-Mix Association of Minnesota, one can expect some pop-outs per square yard depending on the type of aggregate used. Pop-outs do not in any way decrease the structural integrity of a concrete slab. Please see ARM’s “Understanding Concrete Popouts” for expectations.

Scaling
Scaling is the localized flaking or peeling of a weakened concrete surface exposed to freezing and thawing. Light scaling does not expose the coarse aggregate. Moderate scaling exposes aggregate (1/8-inch to 3/8 inch deep).

How to Prevent Scaling:

- Concrete needs to have adequate air entrainment.
- Use correct timing for finishing operations: Finishing too early may result in trapping of the bleed water minimized surface air content which decreases the freeze/thaw durability.
- High evaporation rates caused by high temperatures, high winds and/or low relative humidity can cause premature drying of the surface.
- Do not use deicing chemicals, instead use sand or traction grit to provide traction on icy surfaces.
- Never leave fertilizers which contain ammonium sulfate or ammonium nitrate on the concrete.
- Concrete slabs should be constructed for proper drainage to prevent water from standing on the surface.
- Provide proper curing to ensure the chemical reaction of cement with water occurs.

Uniform Color
Uniform appearance is created by following a uniform process during the installation. The subgrade should be a uniformly graded base material. All organic matter and clay soils should be removed from the subgrade. Make sure the mix design is the same for every pour and use a consistent water/cement ratio. Request to use the same brand of cement when matching existing concrete. Adding chloride accelerators may cause darkening. Over-finishing a surface or using different finishing techniques can change the appearance. The ambient conditions during placement as well as the curing method can also affect color.

This document does not include all placement and/or protection procedures necessary. Due to weather conditions at the time of placement and thereafter, proper hot weather concrete and cold weather concrete plans should be established prior to placement.