RESIDENTIAL EXTERIOR CONCRETE GUIDELINES

TABLE OF CONTENTS:

RESIDENTIAL EXTERIOR CONCRETE GUIDELINES

This information is intended for exterior residential concrete construction. These guidelines are in accordance with ACI 332-08 Requirements for Residential Concrete Construction, ACI 318-08 Building Code Requirements for Structural Concrete, and the ACI Concrete Flatwork Technician & Flatwork Finisher's hand book. These guidelines are not a substitute for a project specification, Consolidated Concrete will not be held responsible for the misuse of these guidelines.

If interested in more information or training please contact your Consolidated Concrete representative. We offer hands on ACI Flatwork Finisher classes, complete copies of the above referenced ACI documents as well as NRMCA Concrete in Practice guidelines.

CONCRETE MIX DESIGN GUIDELINES:

Coarse & Fine Aggregates

- Comply with ASTM C33 and/or Nebraska Department of Roads Specifications.

Air Entrainment

- An Air Content of 5.5 to 8.5 percent at the point of delivery is recommended, in accordance with ACI 332-08.

Durability Requirements

- Water/Cementitous (W/C) ratio less than or equal to 0.45.
- Strength greater than or equal to 4,500 psi at 28 days.
- Strength at or greater than 4,000 psi prior to exposure to frost; the average first frost at Eppley Airfield is October 10th.
- Avoid the use of calcium chloride accelerators. This may cause discoloration. Other accelerators are available that minimize the chance of discoloration.

Slump Requirements

- 5 inch maximum slump without the use of a mid or high range water reducing admixtures.

CONSOLIDATED CONCRETE'S RECOMMENDED MIXES:

- L4500 AE RESIDENTIAL
- The above mix design has been formulated to meet all of the requirements stated above and can be placed at a 6" slump.

CONSTRUCTION AND FINISHING GUIDELINES:

Sub grade

- Should be uniform and have adequate support throughout.
- If quality of sub grade is in question, contact a Geotechnical Engineer.
- Prior to placement; sub grade should be damp but not saturated.

Adding Water at the Project Site

- Water should ***NOT*** be added at the project site in excess of the amount stamped on the delivery ticket. This will ensure that the maximum water/cementitious ratio is not exceeded.
- If water is added at the project site, it should be a ***ONE TIME*** addition per ASTM C94 at the beginning of the load not exceeding the amount stamped on the delivery ticket.
- If additional slump is needed, the use of a mid or high range water reducing admixture is required. Contact your Consolidated Concrete representative for more information.

Slab Thickness

- 4 - 5 Inches is the minimum recommended thickness if the sub grade conditions are ideal and traffic is limited to passenger vehicles only.

Surface Slope

- Positive drainage should always be provided for exterior slabs. To establish positive drainage, set forms and screed guides to provide a slope of 1 inch in 4 foot to prevent ponding. Less than this minimum slope can create situations where water will pond on the concrete with the potential for surface deterioration.

Finishing

- All finishing should be conducted in accordance with the ACI (American Concrete Institute's) Concrete Flatwork Technician & Flatwork Finisher Hand Book.
- To become an ACI Certified Concrete Flatwork Technician & Flatwork Finisher contact your Consolidated Concrete representative.
- ***Hard Steel Trowel and Swirl finishes are not recommended.***

Jointing Guidelines

- Joints should be installed in a timely manner and installed in accordance with ACI 332-08. Depending on sub grade conditions install joints at spacing's not exceeding 24 times the thickness of the slab in inches. Therefore a 4" slab would have a maximum of 8' joints and a 5" would have a maximum of 10' joints.
- Aspect ratio of joints should be no more than 1.5 and should be installed as close to right angles as possible taking care to avoid re-entrant corners.

Joint Depth

- Joint depths must be a ***minimum*** of ¼ of the slab thickness.

Isolation Joints

- Install isolation joints wherever the slab abuts other slabs or structures. With the exception of stoop slabs, exterior slabs should not be tied to the foundation.

CURING AND SEALING RECOMMENDATIONS:

Curing (Begin Immediately after Final Finishing)
To increase the durability and service life of exterior concrete, it must be properly cured. Curing is designed to prolong and maximize the hydration process of the concrete. This process increases strength, decreases permeability and in turn extends the service life of the concrete. Concrete curing should consist of one of the following.

Option 1: Apply an appropriate membrane or curing compound as soon as possible after the final finishing is complete.

Method 1: As soon as possible after the final finishing is complete, cure with **Nox-Crete Bro- Cure** at a rate of 400 square feet per gallon, taking care not to over-apply.

Method 2: As soon as possible after the final finishing is completed, cure with **Nox-Crete Cure & Seal 100** E at a rate of 300 square feet per gallon, making sure not to over-apply. Overuse may result in uneven color, discoloration and/or aggregate pop-outs.

NOTE: **Cure & Seal 100 E** may be used as a Curing compound and a Sealer. The first application of Cure & Seal 100 E is considered curing the second application is considered Sealing. If Cure & Seal 100E is used as a Curing Compound and a Sealer it must be used in conjunction with itself.

Sealing

To maintain the appearance and durability of the concrete it should be sealed no sooner than 28 days after installation in dry condition. Sealing is designed to keep moisture and contaminant's, like deicing chemicals, from being absorbed into the concrete. Silane and siloxane penetrating sealers have been shown to be more effective sealers in resisting deicing chemicals. Since sealers eventually will degrade from environmental affects and no longer function as intended, concrete should be sealed on a regular basis in accordance with the manufacturer's instructions or as needed. To properly seal your concrete one of the following methods should be used:

Method 1: No sooner than (28) after installation, apply **Nox-Crete Water Repellent Silane Sealer Stifel GC**, at a rate of 150 square feet per gallon, taking care not to over-apply.

Method 2: No sooner than (28) after installation, apply a second coat of **Nox-Crete Cure & Seal 100 E** to the concrete, using a coverage rate of 300 square feet per gallon, taking care not to over-apply.

GUIDELINES FOR MINIMIZING THE EFFECTS OF DEICING CHEMICALS

DO NOT USE ANY DEICERS DURING THE FIRST WINTER OF SERVICE

DEICING CHEMICALS CARRIED IN OFF THE STREET DURING THE FIRST WINTER OF SERVICE SHOULD BE WASHED OFF THE CONCRETE IMMEDIATELY!

This document presents recommendations on how to minimize the damaging effects of deicing chemicals applied to concrete surfaces. Any substance that will lower the freezing point of water can potentially damage concrete by creating excessive, artificial freeze-thaw cycles at the concrete surface. The number and severity of the freeze-thaw cycles during a winter season is what causes the damage such as scaling. Historically, such as with the use of sodium chloride, there has not been an actual chemical attack.. Deicing chemicals containing magnesium chloride and calcium chloride, when used in excess, can cause chemical deterioration. Please be aware that many products are labeled "safe for concrete" but in reality may not be so. The process of minimizing the effects of deicing chemicals starts with proper mix design, proper installation, and proper curing once the concrete has been placed followed by the subsequent application of a sealer.

Alternatives to Deicers

Using deicers may seem necessary to keep your concrete free from snow and ice buildup in the winter-time, but we recommend alternatives that will reduce surface slipperiness and improve safety while maintaining the long-term of your concrete.

- Seal your concrete before the first winter with a sealer recommended above.
- Use plain sand to increase traction.
- Keep concrete free of snow and ice.
- Avoid using acids for cleaning concrete. Consolidated has products specifically designed to clean concrete.

DECORATIVE CONCRETE GUIDELINES

Decorative Concrete can incorporate color, exposed aggregate finished, specialty concrete toppings, and specialty concrete finished. Concrete color is achieved with (1) integral color added at the ready mix plant, (2) color hardeners broadcast onto the surface of fresh concrete (3) form-release agents and (4) specialty concrete toppings. A combination of these processes can be used to expand the possibilities of decorative concrete design and to customize a particular look for an owner.

Consolidated's **LIQUID COLOR SYSTEM** is the first of its kind in the region, and is the result of an industry alliance with Consolidated Concrete and Solomon Liquid Colors. The integrations of Consolidated's state-of-the-art concrete production facilities, Solomon's technical expertise in color dispensing systems, and the innovation in our concrete coloring gives customer a precise formula for consistent concrete from load to load and from project to project. In addition to today's 50 standard integral colors, Solomon's integral system has the capabilities to match colors from other manufactures as well as custom match colors from a buildings brick, siding, paint, (etc.). When choosing colors, keep in mind that colors are an approximation of the final concrete color. Concrete has a natural variation in appearance similar to marble, granite or wood. The natural color of various materials, the method used to finish the concrete and curing and sealing will affect the co
lor of the hardened concrete. Consolidated recommends a representative job-site pre-construction test panel be constructed to ensure that your color choice is matched to your or your owner's satisfaction. The test panel should be reviewed no less than 28 days after placement.

Consolidated Concrete's Do's and Don'ts for Decorative Concrete

- **DON'T** use Calcium Chloride as an accelerator' use Non-Chloride Accelerator (NCA) if early set times are desired. Calcium Chloride will cause discoloration.
- **DO** use a penetrating sealer such as Nox-Crete Sparkl Seal
- **DON'T** use deicing chemicals containing ammonium sulfate, ammonium nitrate, or any other sulfate salt.
- **DON'T** use deicing chemicals other than plain sand for additional traction until the slab's second winter season.
- **DO** use "grit" such as Tri-Grit by TK products. This material may be used when applying the final sealer.
- **DO AIR TESTS** when using decorative concrete in exterior applications. The plastic air test should be administered by an agent of an independent testing agency.
- **DO A TRIAL PLACEMENT**. All decorative concrete projects (integral color, color hardener and exposed aggregate) should have a representative job-site pre-construction panel to ensure satisfactory results. The sample panel should be constructed in accordance with ACI 303, Section 1.6.2 and viewed no less than 28 days after placement.

DO REALIZE THAT concrete color may vary due to finishing techniques and curing condition and may change over time

PREVENTING READY MIX CONCRETE CHEMICAL BURNS

The primary irritant action of plastic (unhardened) concrete on the skin can be attributed to its abrasive, hygroscopic, and alkaline properties. Abrasive concrete components, such as sand and aggregate, can chafe the skin, thus weakening the skin's defense against attack by the natural causticity of plastic concrete. The sensitive skin of the ankles, shins, wrists, and forearms seems most susceptible to this type of irritation. It is likely that small particles of sand work their way between the skin and clothing and abrade the skin when the clothing rubs against them.

Finished portland cement, which constitutes approximately 14% of the weight of concrete, is hygroscopic and, as such, tends to draw moisture from the skin. This can result in abnormally dry skin that can crack, thus further increasing susceptibility to attack by alkaline materials.

As a rule, finished portland cement contains 0.2% to 0.8% alkali (sodium and potassium oxides) and 0.1% to 1.0% free lime. When water is added to the dry ingredients of concrete, a caustic solution is produced; prolonged skin contact with the solution may cause first-, second-, or third-degree chemical burns.

The experience of plasterers and masons demonstrates that workers finishing ready mixed concrete need not suffer chemical burns. The lime content of plaster and mortar is greater than that of portland cement concrete, yet workers using these former materials are able to avoid injury.

PREVENTION

Skin burns can be prevented by avoiding excessive contact with plastic concrete and by practicing good hygiene. Waterproof gloves and boots offer protection against the abrasive, hygroscopic, and caustic actions of concrete. Barrier creams, applied before work, can enhance the skin's resistance to the harmful effects of contact with plastic concrete and can help replenish the skin's natural oils. Since this type of burn develops without an accompanying sensation of pain, exposed skin should be promptly cleansed after work is finished. Clothing that has been wetted by contact with plastic concrete should not be left in prolonged contact with the skin and should be laundered before it is worn again.

TREATMENT

Washing exposed skin promptly with water can reduce chemical burns involving ready mixed concrete. If any concrete gets into the eyes or if you feel any burning sensations, rinse immediately and repeatedly with water and get prompt medical attention.