



# GREEN UMBRELLA®

## Architectural Concrete Systems

## FLATWORK GUIDE

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### GUIDE DESCRIPTION

The instructions and advice given here will help all parties involved in placement succeed in creating an exposed concrete floor that will look its best.

These guidelines will help ensure that both the owner and the architect's expectations are met and, if specified, positively impact a Grind, Honed, and Polished finish. The Flatwork contractor and GHP contractor should be included in the pre-con and pre-pour meetings to discuss the procedures outlined below

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### SUB GRADE (LASER GRADING RECOMMENDED)

To minimize cracking caused by restricting movement, care should be taken to compact (per ACI 302.1R-15) and fine grade the sub-grade as flat as the finished concrete on the surface to ensure uniform thickness and the least resistance friction as the slab contracts and expands during thermal temperature changes. This will reduce possible reflective cracking caused by differential sub-grade restraints. This will also reduce surface defects caused by bleed water pooling in low spots on the vapor barrier during the plastic state and excessive water rising to the surface during the hydration stage, causing craze cracking and surface blemishes polishing contractor cannot fix. To further understand the importance of Sub Grade preparation and enhanced instruction, please see ACI 302.1R-15 Chapter 6.

### VAPOR BARRIER

An Under-Slab Vapor or Moisture Barrier may be used to prevent rising moisture from affecting your floors and maintaining a healthier establishment. Under-Slab Vapor Barrier material in 15 mil Polyethylene may be placed with the seams and penetrations taped before the concrete slab is poured and turned down in the footing. Moisture affects the polished surface appearance. If a vapor retarder is specified, the slab should also be reinforced with steel or welded wire that has a cross-sectional area of steel less than 10 percent of the concrete cross-sectional area and continuous below saw cuts to minimize dominant joint activation. Concrete slabs on vapor retarders slip, causing some joints not to open. This can allow the concrete shrinkage shortening to accumulate at one wide dominant joint.

## MIX DESIGN

Concrete Mixture shall be non-air entrained and Minimum 3500 PSI or higher.

The mix should be designed at around a .45 water-cement ratio.

The mix shall be designed as a total gradation mix and not using gap-graded aggregates.

Any admixtures, plasticizers, slag, fly ash, or anything taking the place of Portland-based cement shall not exceed 20%. A straight cement mix is recommended.

The cement shall be Portland cement type I/II conforming to ASTM C 150.

Maintain concrete temperature below 85 degrees, preferably below 75 degrees.

Keep concrete cool and moist as long as possible.

Decrease the rate of hydration and drying to minimize cracking.

Architects must approve all mixed designs.

If the integral color is used, the minimum batch size should never be smaller than three cubic yards.

Use the same source for cement, aggregates, and pozzolans throughout the job.

Monitor and control incoming material consistency. Do not use calcium chloride-based admixtures. Non-chloride admixtures may be used.

Wash out all drums before loading. Ready-mix supplier shall maintain a 5" inch slump +/- 1/2".

Obtain approval from Owner's Authorized Representative if the slump is outside these parameters. Minimize driver added water to maintain a 5" slump at the point of discharge without compromising the water content ratio. Utilize plasticizers for slump adjustment.

## CONCRETE PLACEMENT

Place concrete with 5" slump at point of discharge, \*strike off with laser screed, use rollerbug, bull float 90 degrees to screeds pull direction.

The bull float shall be 6' in length or larger; smaller bull floats can be used on sloped areas.

When the concrete is dumped into piles and then raked out, coarse aggregate can 'stack,' distribution will not be uniform, and the non-uniform coarse aggregate distribution will show through the polished surface. You will have uneven exposure for aggregate.

## FINISHING EDGES

When placing, re-straighten edges using a 3' to 6' metal or wooden 2x4 screed and run perpendicular with form or edge after initial screed and before floating.

Re-straighten edges, as possible, after the initial set and after the first pan float. This will help to reduce the typical dip along the edges.



## MACHINED FLOATING

Machine Floating with pans shall begin after placement when concrete's psi is sufficient to operate without causing excessive mortar or ridges and little or no bleed water is present.

Slab shall be checked and re-straightened with 10' or larger highway straight edge or bump cutter to ensure FF's are met. **\*\* (Only if slab will NOT be polished)\*\***

## MACHINED EDGES

When using pans, it is best to overrun the formed edge by 5".

Machined edges (walk behind) if walk-behinds are used, it is preferred to have pans or float blades for the initial passes.

The first pass along the edges shall be with the left side of the machine, which is referred to as the cutting side. This will pull the high concrete away from the edges first.

Back all edges & correct with Mag or Wood straight edge to fill.

Riding trowels are to be used in the same manner as the walk behind.

The cut side of the machine is the rear.

The fill side of the machine is the front.

## TROWELING

Troweling shall begin after the surface has received a minimum of a two pan float finish.

Concrete finish floors shall have a minimum of 3 passes resulting in a non-burned steel troweled finish. Do not over-trowel and burn the slab. The use of plastic trowel blades will help prevent burning the aggregate but are not required.

The slab drying must proceed naturally and must not be hastened by the dusting on of dry cement or sand.

Lightly tool or machine all edges at construction joints and exercise care that slab edges are not depressed or chattered along bulkheads, formed edges, columns, and pipes during finishing operations, particularly hand troweling.

## GENERAL CONFORMITY TO DESIGN GRADE

Unless otherwise indicated, the entire Random Traffic Floor shall fall within +/- 3/4" of its specified elevation.

## FF/FL TESTING

All floor flatness, levelness, and grade conformity tests shall be made (at the Owner's expense) on each newly installed Random Traffic Slab within 8 hours after completion of the final troweling operation. FF and FL tests shall be made by a factory-certified technician in accordance with ASTM E1155 (latest revision) using an "F-Meter", "D-Meter", or "Axiom".

Grade conformity tests shall be made using an optical or laser level. Results of all floor tolerance tests - including a formal notice of acceptance or rejection of the work, shall be provided to the polishing contractor within 12 hours after testing. Failure to adhere to the testing and reporting requirements set forth in this paragraph shall constitute de-facto acceptance of the work.



## FF/FL EXCEPTIONS

Both the overall and minimum local FL levelness tolerances set forth in Local Flatness/Levelness above shall not apply to any Random Traffic Slab that is to be inclined or cambered. Likewise, no FL levelness tolerances will be applied to any un-shored elevated construction.

The general conformity to design grade tolerance set forth in General Conformity to Design Grade above will apply to un-shored elevated slab constructions, but in all such cases, the tolerance will be increased to +/- 1-1/2".

## LOCAL FLATNESS/LEVELNESS

The Random Traffic Floor shall conform to the following minimum F-number requirements:

Preferred strike-off method: Somero S 240 or SXP Laser Screed. If hand screed is used: Strike off with vibrating screed, using a rail system with set elevations, the slab must be bump cut with 10' or 12' Hwy straight edge during pan float finish in 2 directions to increase FF numbers and reduce wave index.

**\*NOTE:** Weekends and holidays shall be ignored when computing specified testing and reporting deadlines.

## REMEDY FOR OUT-OF-TOLERANCE WORK

The entire Random Traffic Floor shall be subdivided into Minimum Local Floor Sections bounded either by the column and half-column lines or the construction and control joints, whichever subdivision yields the smaller areas.

All Minimum Local Floor Sections measuring at or above the specified MLFF and MLFL numbers shall be accepted for F-number compliance as constructed.

All Minimum Local Floor Sections which fail to meet or exceed both specified minimum local F-numbers shall be removed and replaced (in the case of slabs-on-grade), or ground and/or re-topped (in the case of elevated slabs).

No remedies for defective Minimum Local Floor Sections other than removal and replacement of slabs-on-grade and grinding and/or re-topping of elevated slabs will be permitted.

The finish needs to be uniform in color and levelness with no trowel marks, footprints or depressions from hand tools, kneeboard ETC...

Concrete to be placed in accordance with ACI 302 1R-15 Class 5 floor. Concrete to be finished in accordance with ACI 117

Floor shall be tested in accordance with ASTM E 1155 The polished concrete contractor shall be included in distribution of reports and receive one copy of the FF/FL test results within 12 days of actual testing.

## SAW CUTTING

Based on independent studies, we recommend saw cutting with a Soff Cut Saw ASAP without raveling edges or dislodging aggregates

All re-entrant corners should have rebar inset & be cut 50% of the slab depth to reduce cracks from internal pressure

Panels should be kept as square as possible and should be approved by the architect

The Random Traffic Floor shall conform to the following minimum F-number requirements:

Floor Flatness Number: FF

Specified Overall Value = 50

Minimum Local Value = 35

Floor Levelness Number: FL

Specified Overall Value = 30

Minimum Local Value = 20

We recommend the following based on slab thickness to help minimize slab curling and panel cracking:

4" thick to be cut at 10' OC EW

6" thick to be cut at 12' OC EW

8" thick to be cut at 15' OC EW

## CURING

Wet curing is preferred to dam exterior edges and flood slab or runs sprinkler hoses to overlap, so slab has no dry spots, but if this cannot be achieved, the use of blankets is preferred; blankets must be pulled 5 days before polishing use a dissipating or water-based cure and seal.

Do not use a densifier or hardener material.

Concrete shall be cured a minimum of 28 days before Abrasive Polishing (\*Unless use of Green Umbrella GreenCut and Green Umbrella WetCut systems are used)

The application shall take place prior to fixture and trim installation and/or substantial completion.

Polished area should be closed to traffic during Profile, Hone, Polish process.

For day-of placement cure and best results, use GreenIce Cure by Green Umbrella.

## SLAB PROTECTION

### The floor should be protected from the following:

Silicone chalks should NOT be used if at all possible. (Lime or collected “saw dust” preferred) The RED and yellow chalks are PERMANENT DYES. RED Chalk, black markers, wax pencils should NOT be used for framing. White or Blue chalks are OK. Do not over mark for the framing. Do NOT use silicone sprays to “Hold” the lines. The sprays repel the stain and leave harsh, permanent scars on the floor.

Do not use , Tape, Glue, Solvents, Pine-Sol, Varnish, Non Breathing Plastics, Liquid Nails, Silicone, Plastics, Nails, Plumbers Glue, Foam Insulation, Bond Release Agents, Flux, Oils, Grease, Polyurethane, Paint, Markers (framers often write dimensions of doorways in marker on the slab, ask them to make that note on the wood framing the doorway), Grease Sticks, Spray Paints, Crayons, Muriatic Acid, and other chemicals both before and after staining.

Do not allow spills to dwell on the floor. Clean with Green Umbrella Green Clean & Degreaser™

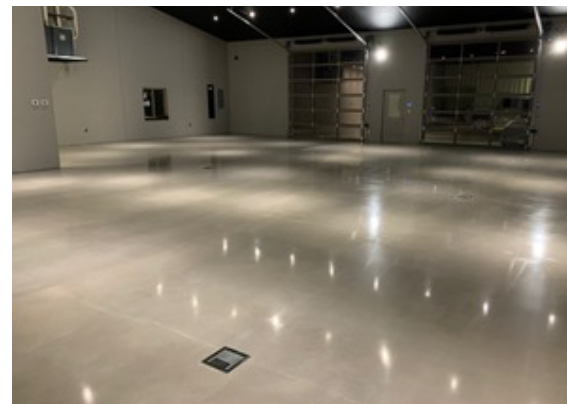
It is important that wood, sheet goods, insulation boards, plywood, press board, drywall, sections of framing, and the like not lay on the slab for extended periods of time. They can transfer resins and tannins into the slab. This will alter the moisture content in the slab which leaves a pattern in the finished floor. Cardboard should be placed between the slab and the stacked material to minimize any unwanted transfers. Also Food, Beverages, Oil, Glass, Metal, Paint, Caulk, or Primers.

Be sure to check lift tires for nails and screws, diaper all equipment from oil and grease drips, do not allow pipe cutting equipment on slab.

## AFTER PROFILE, HONE, POLISH PROTECTION

It is essential that you do not tape the floor! When covering the floor, overlap sheets of \*Green Umbrella Build Board. Tape the first sheet to the wall, then overlap the second sheet to the first and tape it to the paper. DO NOT TAPE TO THE FLOOR. Always use Breathable Tape.

Duct Tape, Masking Tape, Packaging Tape, Strap Tape, Blue Tape, Green Tape, and Electrical Tape there are NO exceptions. The tape alters the natural curing process and transfers chemicals to and from the slab. Tape, Plastics and other Adhesives can contribute to Plasticizer Migration. This WILL SHOW in the finished product.



## SCREED SLAB SURFACES WITH A VIBRATORY STRAIGHTEDGE AND STRIKE OFF TO CORRECT ELEVATIONS.

A sufficient amount of paste is needed at the surface for polishing, and this is best accomplished by the use of a vibratory straightedge such as a hand-held vibratory bull float, a vibrating screed, a truss screed, or a laser screed. Hand-screeding will not provide enough surface paste. There are also new vibratory handles available.

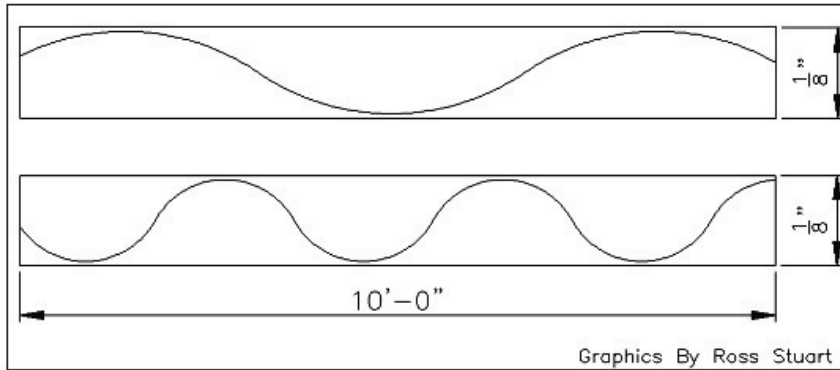


FIGURE 1

Figure 1 shows the wave index of a slab, both are within a 1/8" in 10' therefore the ACI 117 and ASTM E1155 must be adhered to for polished concrete slabs.

**Do not leave the vibratory screed at any one location while the vibrator is running; move it continuously across the slab.**

Too much vibration at one location drives the coarse aggregate deeper into the slab. This results in variations in coarse aggregate exposure after polishing. This effect of nonuniform vibration can be due to leaving a vibratory screed running when it is not advancing or, for self-propelled laser-guided screeds, lowering the vibrating head onto the surface before the machine is moving.

**Do not use a highway straightedge or bump cutter on the concrete surface during finishing operations.**

This removes too much paste from high spots, leaving variations in the polished surface. Flatness for polished concrete is best achieved by the use of pan floats.

**Finishing - Do not trowel over adjacent hardened concrete surfaces. Inspect trowel machines prior to each pass and remove any accumulated mortar.**

Troweling over adjacent hardened concrete from previous placements scratches the concrete surface. Some of the worst scratches come from debris falling off an uncleaned trowel machine. These scratches will often be visible on the polished surface.

**Machine-trowel the slab edges and as close as possible to walls and columns. Minimize hand-finishing. Insist the contractor use a 2'diameter edge power trowel.**

Machine-troweling and hand-troweling result in differing surface densities, with the former's surface being denser and harder. Results of the differing densities will be obvious in a polished surface.