

We are seeing more lightweight concrete in our construction, which is causing issues with our concrete and flooring installations. Throughout the country, we are seeing lightweight concrete with air entrainment of 3%-8% ±1.5%. In some parts of the nation, we are seeing normal weight concrete with elevated air content (+3%). This air entrainment is creating finishing issues with our slab when the specifications calls for FF >20. It is important to understand FF specifications, project needs, and limitations of the installation. Please use this and other Quality Bulletins on this topic to better understand and mitigate your risks on your project.

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- ❑ We are seeing finishing concerns and specification conflicts on new lightweight concrete floors with an air content of >3%. Typically we are seeing an entrained air content of ±3-8% ±1.5%.
- ❑ The concern is when the specifications call for an FF (Floor Flatness) of over 20, or a rough equivalent of ¼" per 10', because of the potential surface delamination at the upper concrete surface, the top 1" due to over finishing.
- ❑ Delamination is caused by flattening the air pockets near the surface when over finished. Over finishing will provide a compressed, dark, and smooth surface which is not conducive for proper floor prep activities. These concerns outweigh any benefit of a higher FF.
- ❑ When the FF is >20 and we are installing normal or lightweight concrete with an air content of >3%, the concrete finisher typically is needing to hard-trowel/over trowel the concrete to get to the >FF20 number. Typically, the finisher is unable to achieve an FF>20 without hard troweling the surface, which is a conflict in the specifications.
- ❑ **Concrete with an air content of >3% should NOT be hard troweled.** ACI 302 documents (Guide to Floor and Slab Construction) states that delamination is possible any time air entrained concrete is given a smooth, dense, hard – troweled finish. Reference ACI 302, article 10.11, 2016 edition, for recommended placement and finishing practices to reduce the risk of surface delamination on an air entrained lightweight concrete.
- ❑ Where to read the "Air Entrainment (A/E)" in the concrete mix design:

Light Weight Concrete S.O.M.D., Fill Slab, Pad		
4000 psi Lt. Wt. 110 ±3 lb./ft³	Mix #	ASTM Specification
Cement	564 lbs.	C-150
Fly Ash	100 lbs.	C-618
Fine Agg	1562 lbs.*	C-33
Lt. Wt. Coarse Agg	725 lbs.*	C-330
Water	34.0 gals.	Potable
HRWR	Variable dosage rate	C-494
A/E	3 – 6 %	C-260
Slump @ discharge of truck	8" Max	

- ❑ **Other than polished concrete locations, which require a FF50**, there is very little, if any, benefit to have the concrete finished to a higher FF number unless the floor requires a high FF, such as in a warehouse or TV studio (however lightweight concrete will likely not be used in these types of spaces). Always look out for high air in normal concrete.
- ❑ When the FF20 is specified, the concrete finisher is better equipped to be able to finish the floor to a "fuzzy" or "fresno" finish, which will provide a CSP #1 or #2 and keep the concrete surface open, which will also facilitate concrete slab drying. Combine this finish with a moist cure, and there is a chance that moisture mitigation will not be needed based on today's moisture tolerant adhesives and topping mixes.
- ❑ **As a suggestion ONLY...** I have found the following process work well to achieve a "fuzzy" or "fresno" finish: Rider w/pans, once or twice max w/plastic blades or combo blades, walk-behind trowel, & hand trowel to flatten any ridges.
- ❑ Floor prep will still be needed on most floors with an FF50 or less, when installing a topping or floor finish on the concrete. So, by specifying an FF of >20, there is little to gain and little money to be saved and likely more problems and costly repairs.
- ❑ **IF YOU HAVE A PROJECT WITH NORMAL & LIGHTWEIGHT CONCRETE WITH AN AIR CONTENT OF >3% AND AN >FF20, PLEASE RFI YOUR PROJECT TEAM AND OFFER THIS TECHNICAL BULLETIN AS A REFERENCE TO REDUCE THE FF TO 25 OR LESS.**
- ❑ **OR consider talking to the Structural Engineer to reduce the overall air entrainment to 3%, which would make the weight of the concrete from ±110 #/CF ± 3#/CF to ±114 #/CF ± 3#/CF, an increase in about 4#/CF or 2#/SF based on a 6" slab.** This is very minimal and would considerably remove the finishing problems that we are experiencing on our lightweight concrete floors. AECOM Quality recommends a "fuzzy" or fresno" finish on the slab for better floor topping or moisture mitigation.

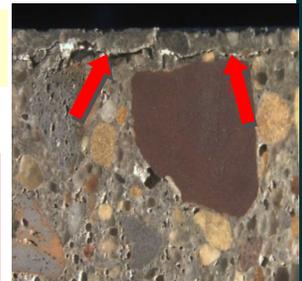
**Concrete Delamination**



**Concrete with +3% Air Content**

Black Surface is Hard Trowel—which delaminated because of the troweling

"Blessing the Slab" or adding water or a evaporation retarder to the surface to help with the finishing will create a weak surface, promote delamination (1" down or less), and cause color variations



This is a Stereomicroscope photo analysis showing the near surface delamination that has occurred because of over troweling the concrete surface of an air entrained concrete.