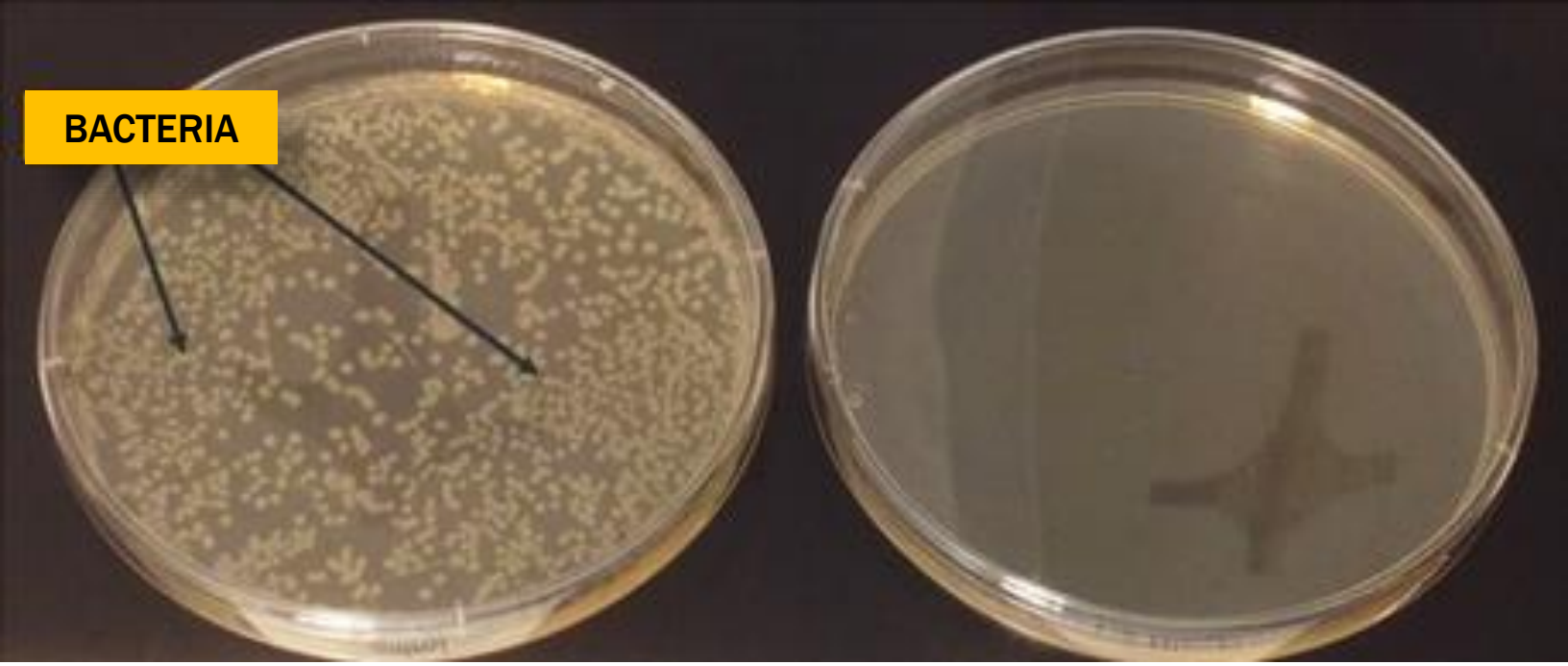

CORNERSTONE® FLOORING

Reducing Risk of 483

Sanitary Design Benefits of Anti-Microbial Flooring & Wall Systems

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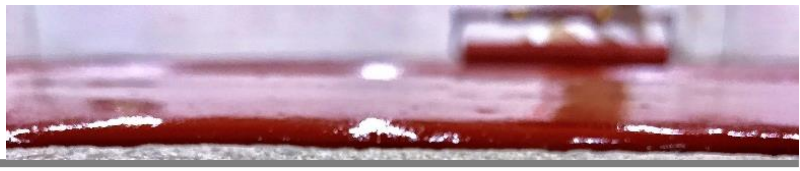

Sanitary Design Benefits of Anti-Microbial Flooring & Wall Systems

A single source Flooring expert for over 30 years, Cornerstone Flooring understands the importance not only of floors and walls that look good but comply with The Food Safety and Modernization Act (FSMA and HACCP Certification).

Single source means

- Custom Formulated Anti-Microbial Flooring and Wall Solutions
- Fully integrated manufacturing and distribution
- Experienced Installation
- No Subcontractors

After thousands of installations, food plant visits and audits, Cornerstone Flooring understands the specific needs of floors and walls in a Food Manufacturing Facility.

Cornerstone Flooring customers have allowed us to partner with them to solve issues from failing floors, ponding water, peeling walls, and microbial monitoring.

Choosing the right Anti-Microbial flooring and wall system can help keep your product safe as well as saving maintenance and money.

Aren't all floors the same?

Polyurethane vs. Epoxy in a Food Manufacturing Facility

A well-known flooring industry choice, epoxies have claimed to be chemical resistant, especially to acids. However; modern food plants subject floors to much more than acids in processing, production, and sanitation.

Water below the surface is eating away at the existing epoxy floor. This paste of decomposing epoxy was hiding underneath.

Why Epoxies Fail

The coefficient of expansion for epoxy resin systems typically differs from the concrete substrate by 50%. Therefore, where thermal shock and fluctuating process temperatures are involved, the epoxy matrix opens up exposing a more porous matrix.

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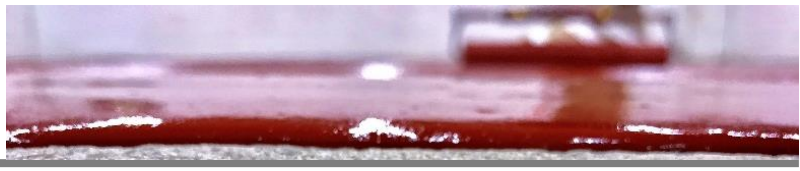


Avoid FDA Form 483

Top Food Facility Violations during fiscal year 2018 as listed on an FDA Form 483:

Sanitation Monitoring – FDA cited 188 of the 874 food facilities (21.5%) for not properly monitoring sanitation conditions and practices with sufficient frequency. **Facilities are required to monitor** aspects such as the safety of the water coming into contact with food or food contact surfaces, **prevention of cross-contamination and maintenance of hygiene facilities.**

Sanitary Operations and Plant-Maintenance – FDA cited 167 facilities (19%) for either not maintaining cleanliness of their facility or **failing to keep them in good repair.**

While no flooring or wall product negates the need to sanitize, our systems offer a proactive approach to maintaining a sanitary facility.

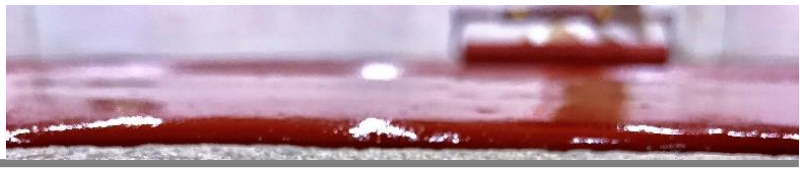
Once the epoxy becomes open, the food product's pH and cleaning solutions will penetrate the epoxy screed and attack the resin's curing agent which will break down, causing the floor to debond and fail.

Bacteria, sugars and other agents will also gain access, developing and causing further failure in the epoxy floor.

A 100% solids castor oil-based polyurethane flooring system is ideal for the food industry. The system has a coefficient of expansion similar to concrete. Therefore, the system is not open to the same stress as the epoxies.

Castor oil-based polyurethane flooring systems are extremely chemical resistant and not affected by citric acid, sweeteners, product pH and bacteria. Polyurethanes also have high temperature tolerance, between -50°F and +250°F.

The right antimicrobial floor and wall system can aid in your ability to maintain the highest food safety sanitation standards. This system with an appropriate sanitation plan will not allow microorganisms, including bacteria, to survive and thrive.



Antibacterial Activity and Efficacy

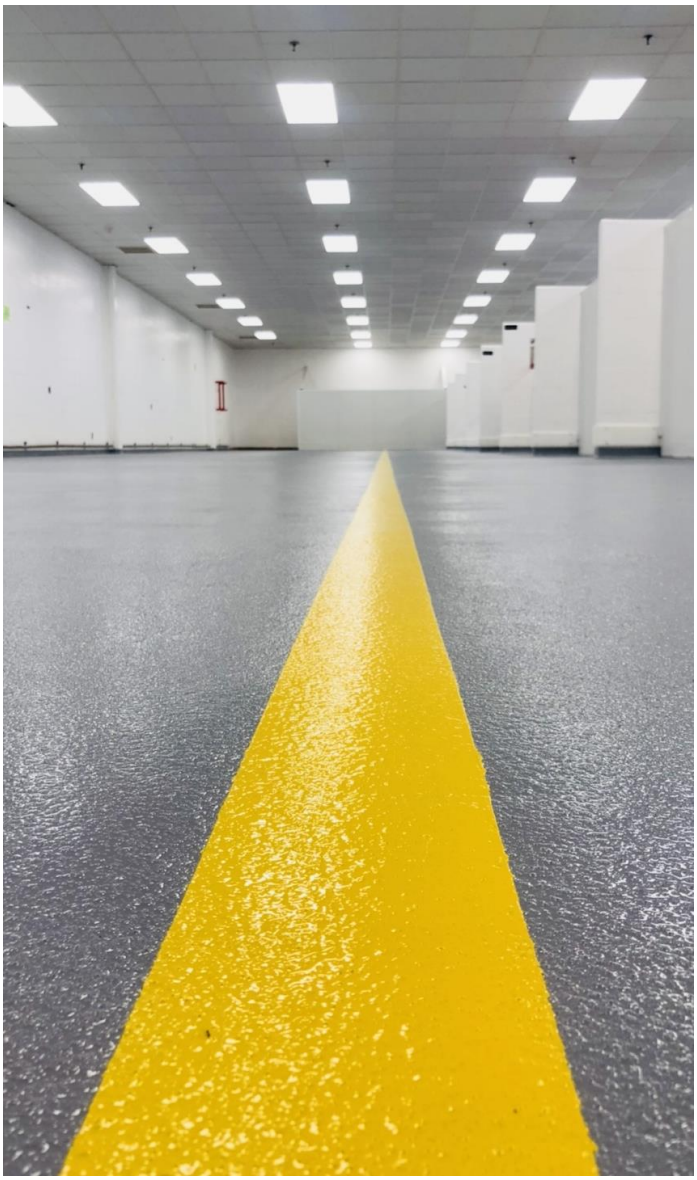
After years of satisfied customers commenting on how Cornerstone floors paired with sanitation reduced the number of positive swabs for eColi, Salmonella, and even hard to kill Listeria, an independent third party was contracted to prove the antibacterial activity and efficacy of Cornerstone Flooring's Polymeric Wall and Floor Systems.

Multiple independent studies using ASTM International Method E2180 in Microchem's Round Rock, TX Laboratory.

The test microorganisms selected were Escherichia coli, Salmonella enterica, Listeria monocytogenes & Cronobacter sakazakii – four common threats to food safety.

Initial testing included our Fiber-reinforced wall system as well as CornerCrete SB floor system, also referred to as CS5000SB. Both systems consist of multiple layers and each component of the system has the anti-microbial to ensure the system continues to protect against bacterial harborage even if the topcoat is worn away.

These were tested against a polyurethane system with no anti-microbial agent to verify the properties of a system with no added anti-microbial material.



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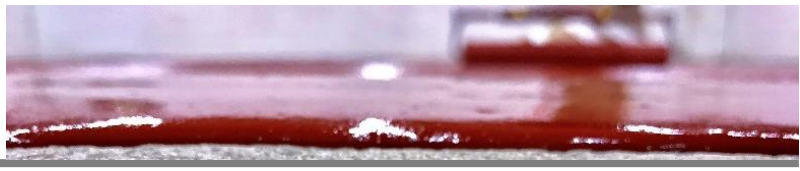

ASTM E2180 Study Results- Completed by Microchem (Independent 3rd Party)

Test Microorganism	Contact Time	Carrier Type	Study	CFU/Carrier	Percent Reduction Compared to Control at Contact time	Log 10 Reduction Compared to Control at Contact Time
E. coli 8739	24 Hours	Fiber reinforced Wall System	N8627	<5.00E+00	>99.99998%	>6.75
		CornerCrete SB Floor System (7 Year Retest)	NG14471	<1.00E+00	>99.999996%	>7.45
		Polyurethane System, No Anti-microbial	NG14471	2.85E+07	No Reduction	No Reduction
S. enterica 10708	24 Hours	Fiber reinforced Wall System	N8627	<5.00E+00	>99.99996%	>6.39
		CornerCrete SB Floor System (7 Year Retest)	NG14471	1.26E+03	99.988%	3.92
		Polyurethane System, No Anti-microbial	NG14471	1.05E+07	No Reduction	No Reduction
L. monocytogenes 15313	24 Hours	Fiber reinforced Wall System	N8627	<5.00E+00	>99.9995%	>5.32
		CornerCrete SB Floor System (7 Year Retest)	NG14672	1.00E+00	99.9999991%	8.03
		Polyurethane System, No Anti-microbial	NG14672	1.06E+08	No Reduction	No Reduction
Cronobacter sakazakii 29004	24 Hours	CornerCrete SB Floor System	NG20120	5E+02	>99.988%	>4.70
		Polyurethane System, No Anti-microbial	NG20120	2.50E+07	No Reduction	Plate counts above limit of detection

The limit of detection for this assay is 5.00E+00, values below the limit of detection are notes as <5.00E+00 CFU/Carrier in the table and as zero in the graph

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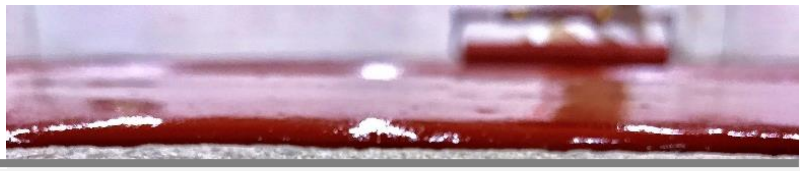

Log and Percent Reductions in Microbiology and Anti-Microbial Testing

To keep the individual numbers manageable, microbiologists usually express them using scientific notation.

Similarly, when calculating the magnitude of the change in cell number, microbiologists often use a logarithmic scale (log scale). Simply speaking, taking the log value of a large number, such as the number of cells killed in a disinfectant test, transforms it into a smaller one that is easier to work with.

1 log reduction = 90% reduction
2 log reduction = 99% reduction
3 log reduction = 99.9% reduction
4 log reduction = 99.99% reduction
5 log reduction = 99.999% reduction
6 log reduction = 99.9999% reduction

Source: Rex, Spencer. "Log and Percent Reductions in Microbiology and Antimicrobial Testing." *Porto*, 2018, microchemlab.com/information/log-and-percent-reductions-microbiology-and-antimicrobial-testing.

For Microchem Laboratory to consider an ASTM E2180 study to be scientifically defensible, the <u>following criteria must be met:</u>

1) The average number of viable bacteria recovered from the time zero samples must be approximately 5x10^5 (500,000)cells/ surface or greater.

2) Ordinary consistency between replicates must be observed for the time zero samples.

3) Positive/Growth controls must demonstrate growth of appropriate test microorganism.

4) Negative/Purity controls must demonstrate no growth of test microorganism.

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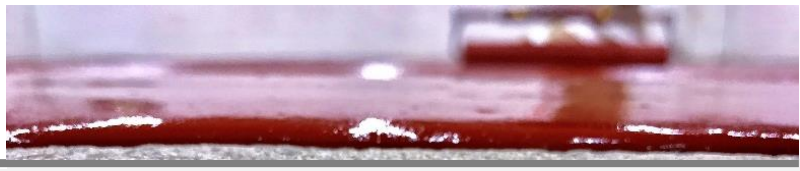
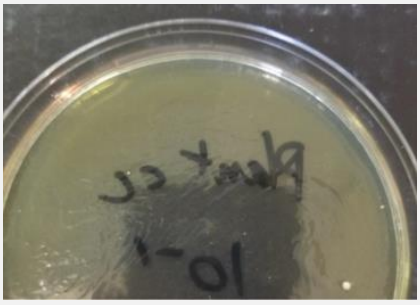


Side by Side Floor swabs:

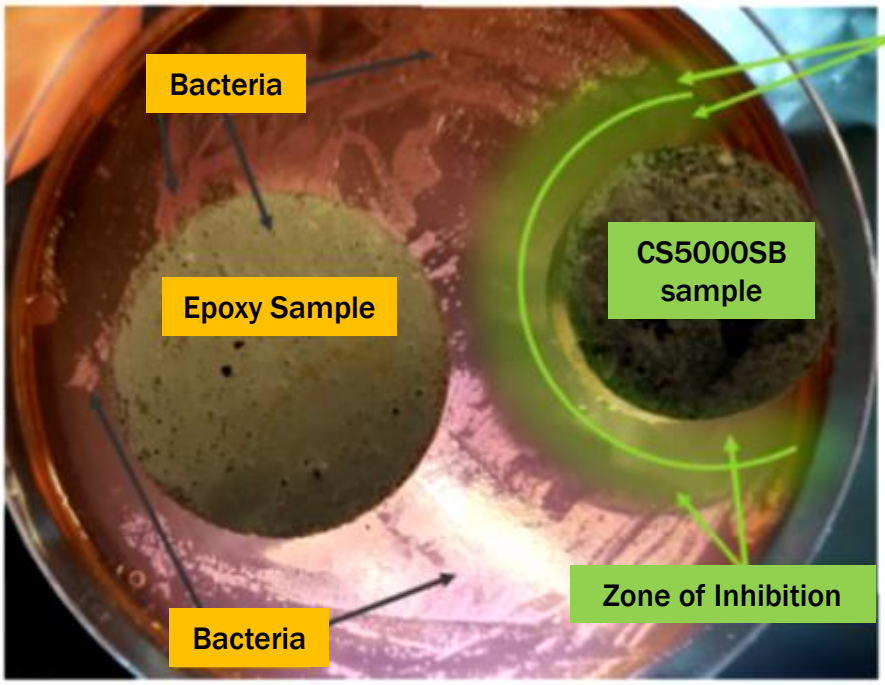
Samples were serially diluted with Nutrient Agar and read out as Total Plate Count. The samples were taken within 12" of each other, one of the CornerCrete SB patch and the other of the existing Dairy Tile. The results after the first production day, taken the morning after sanitation, showed a difference of over 3-log (80 cfu/ml on the CornerCrete SB Floor vs. 234,000 cfu on the Dairy Tile). Pictures to the left represent the 10-1 dilution on Nutrient Agar.

Dairy Tile Sample
234,000 cfu/ml



Cornerstone Flooring
Sample 80 cfu/ml

Additional Study: Zone of Inhibition



Bacteria is clearly visible in the areas immediately surrounding and underneath the epoxy control sample.

In an additional study, a CS5000SB floor piece and an epoxy control was tested using a spread-plate technique. The CS5000SB sample prevented the growth of bacteria immediately around and under the sample. The epoxy control allowed growth under and around the sample.

Cornerstone Flooring's Anti-Microbial flooring systems do not allow bacteria to multiply on or around the surface. The zone of inhibition (shown in green) around the CS 5000SB flooring system sample provides a visual explanation of how the area immediately surrounding and underneath the sample is not growing any bacteria.

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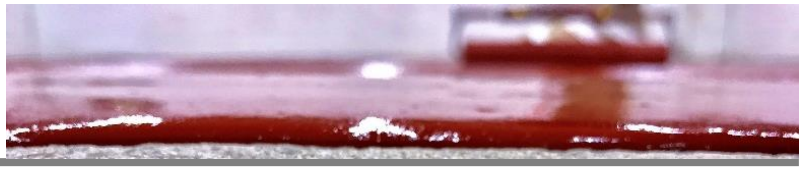


Not all floors are built the same.

Cornerstone Flooring is more than a flooring installer, we are your single source for walls and floors.

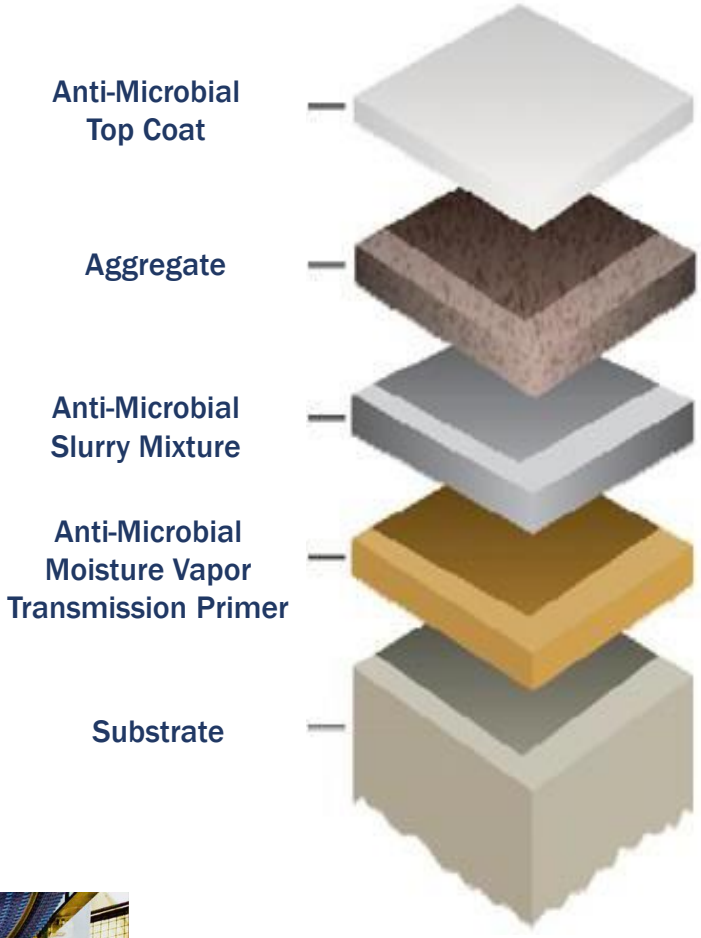
Manufactures our proprietary products in-house for our installers only.

Designs and develops new products based on demand and customer need.

Provides project evaluation and technical assistance on-site when necessary.

Installs a fully anti-microbial floor or wall system using our own installers and offers a full warranty to protect your facility and reduce the risk of 483.

Cornerstone CS5000SB



Cornerstone Flooring is looking for participation in a peer-reviewed study and is available for on-site Audits.

For more information on this article, interest in a peer-reviewed study, audits or questions on any Cornerstone Flooring product, please contact us at 1.800.659.7699.