Flowcrete
for the world at your feet

TIPS & CONSIDERATIONS FOR AVOIDING FLOOR FAILURE IN THE FOOD & BEVERAGE INDUSTRY

www.flowcreteasia.com

With so many options to choose from, selecting a **fit-for-purpose flooring solution** that can withstand the operational demands of food manufacturing, processing and packaging environments can be challenging...

On top of this, stringent **health**, **safety** and **hygiene standards** as well as **budget constraints** must be considered.

Yet the fact remains that floor failure resulting from inadequate or cheap materials will have a negative impact on food plant productivity.

Understanding the reasons or triggers that can lead to floor failure in the food and beverage industry can help to prevent such instances from occurring.

As they say, **prevention in the first instance is always better than a cure**!

This guide has been designed to offer practical advice on floor failure avoidance as well as to provide surface recommendations for clients working in the food and beverage production, processing and packaging industries.

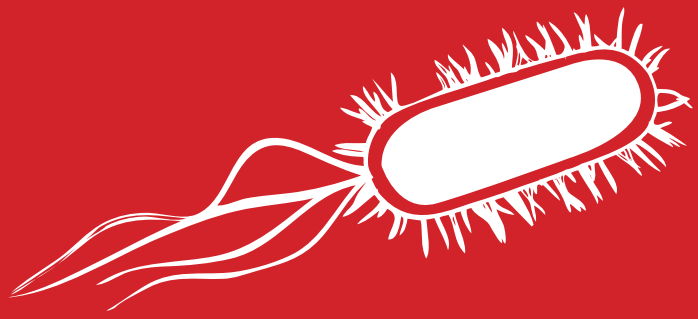
- TYPICAL REASONS FOR FLOOR FAILURE
- WHAT RESIN FLOORING OPTIONS ARE AVAILABLE?
- OPERATIONAL CONSIDERATIONS
- TALK TO THE EXPERTS

REASON #1

INADEQUATE HYGIENE CONTROL

Seams, joints, grout lines and cracks in the surface of the floor are a breeding ground for bacteria, fungi, moulds, mildew and pests.

All of these nasties pose a threat to indoor environmental air quality as well as any consumable goods being prepared or processed on the premises.



In extreme cases this can lead to the outbreak of foodborne illness, culminating in death, irreversible damage to brand reputation and costly lawsuits in the worst cases.

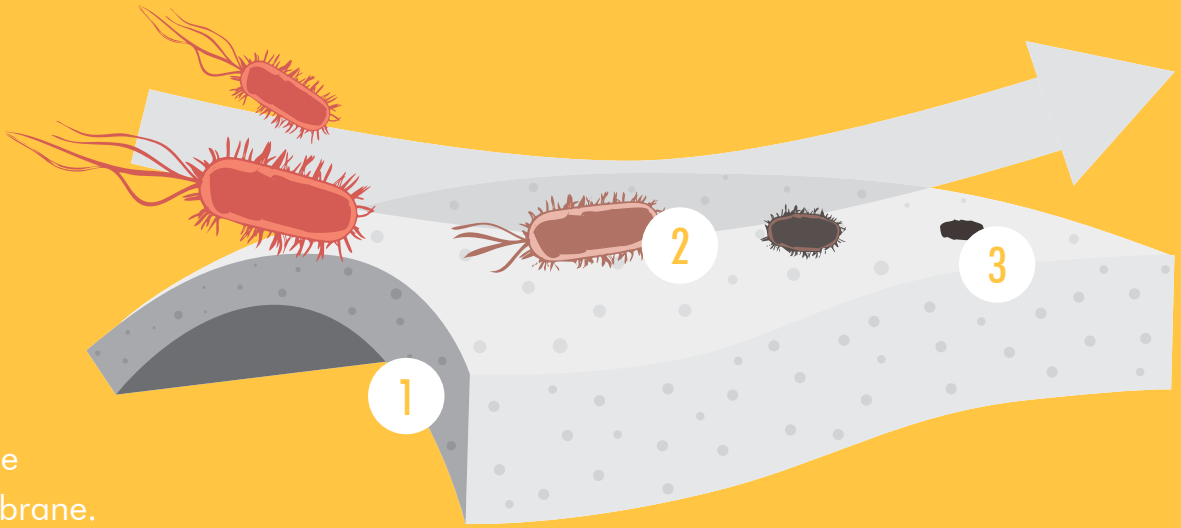
Seamless resin flooring minimises the risk of microbiological contamination, providing a monolithic, hygienic surface that is free from the cracks or crevices where dirt, dust, bacteria and even pests can dwell and breed.

The addition of antimicrobial additives designed to inhibit bacterial growth will provide an added level of protection. Additives, which are homogenously distributed throughout the resin material, can destroy up to 99.9% of surface bacteria between wash cycles.

Unlike many antimicrobial alternatives, this protection remains active for the lifetime of the floor, even if worn or damaged, offering clients' a long-term, long-lasting hygiene performance.

POLYGIENE®
Antimicrobial Additive

1. The silver ions are homogenously distributed throughout the floor.
2. The silver ions migrate to the surface of the floor.
3. The silver ions kill the bacteria on the surface by penetrating the cell membrane.



REASON #2

INSUFFICIENT CHEMICAL RESISTANCE

The organic acids, alkalis and salts as well as hot oils, blood, sugars, lubricants and fats that form part of food and beverage industry processes will invariably end up on the floor and risk corroding the surface if it is not suitably protected.

Ensure that any flooring material you are considering comes backed by supporting data that demonstrates a sufficient level of resistance to the chemicals to which it is likely to be exposed within your workspace.

The temperature of the chemical contaminants or harmful substances will need to be considered. For example, grease is fairly inert at room temperature but highly corrosive when heated to high temperatures.

On top of this, the nature of exposure to which the floor will be subjected is also important.

This is typically categorised into three types; immersion, intermittent spillage or infrequent contact.

A full risk audit should provide an idea as to how many chemicals or corrosive substances a floor is likely to come into contact with throughout its lifetime.

CHEMICAL RESISTANCE OF POLYURETHANE RESIN

- ✓ 50% Sodium Hydroxide
- ✓ 20% Ammonia
- ✓ Vinegar
- ✓ 50% Ethyl Alcohol
- ✓ 10% Sulfuric Acid
- ✓ 5% Nitric Acid
- ✓ 25% Citric Acid
- ✓ All-purpose Cleaner
- ✓ Mustard
- ✓ 25% Lactic Acid
- ✓ Red Wine
- ✓ Beer
- ✓ Butter
- ✓ Coffee & Tea
- ✓ Swine Urine & Faeces
- ✓ Oils
- ✓ Pickle Juice
- ✓ Distilled Water

REASON #3

POOR THERMAL SHOCK RESISTANCE

Food and beverage plants are subject to punishing cleaning and wash down processes that can involve very hot water or even steam in order to remove blood, grease and other unruly chemical contaminants from the surface.

However, the majority of food and beverage plants operate at ambient room temperatures and therefore during cleaning and wash down processes become subject to thermal shock as the floor is suddenly exposed to temperatures in excess of 180 degrees centigrade.

Hard floors based on epoxy, vinyl ester or MMA chemistry are not equipped to deal with thermal shock conditions and as a result can crack or delaminate when exposed to extreme temperature swings, weakening the surface and invariably leading to the early onset of floor failure.

Thermal cycling, whereby a floor's temperature is slowly or seasonally lowered or raised due to climatic or service conditions as well as periodic cleaning programmes, can also be problematic. Again, inadequately specified materials will lead to problems including cracking and other damage.

WHAT IS THERMAL SHOCK?

All flooring material expands and contracts with changes in temperatures. Only when it occurs at a rate significantly different than that of the concrete substrate underneath, though, does it lead to delamination, cracks, bubbles and other deterioration.

Thermal shock resistant flooring and coatings expand and contract at a rate very similar to that of the concrete slab below, helping to ensure that your seamless, hygienic industrial floor functions exactly as it should.

REASON #4

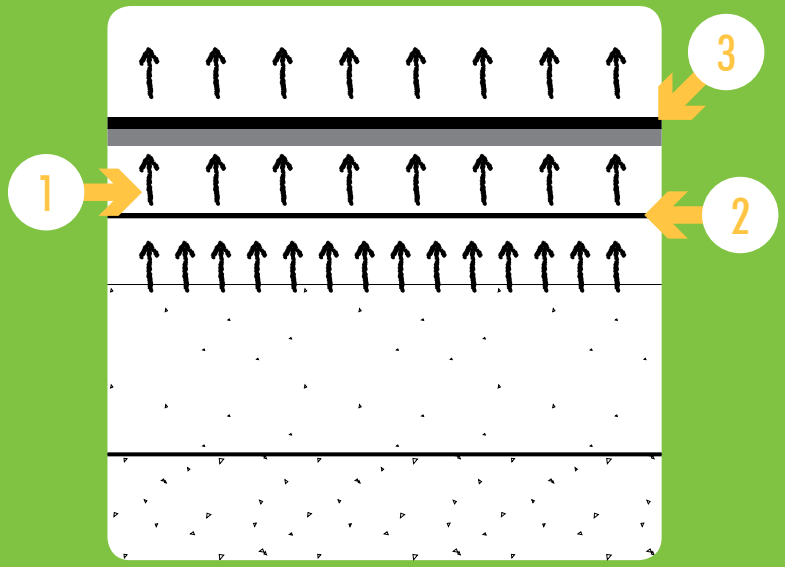
EXCESSIVE MOISTURE TRANSMISSION

Another common causes of floor failure within food plants is excessive moisture vapour transmission through the under-lying concrete slab. Left untreated prior to floor coating, this can lead to blistering or de-bonding of the final surface.

Although all concrete retains some degree of moisture that is not all you need to be concerned about. It is critical to determine the level of moisture transmission the slab may be subject to, particularly if it is low grade or located close to high water tables.

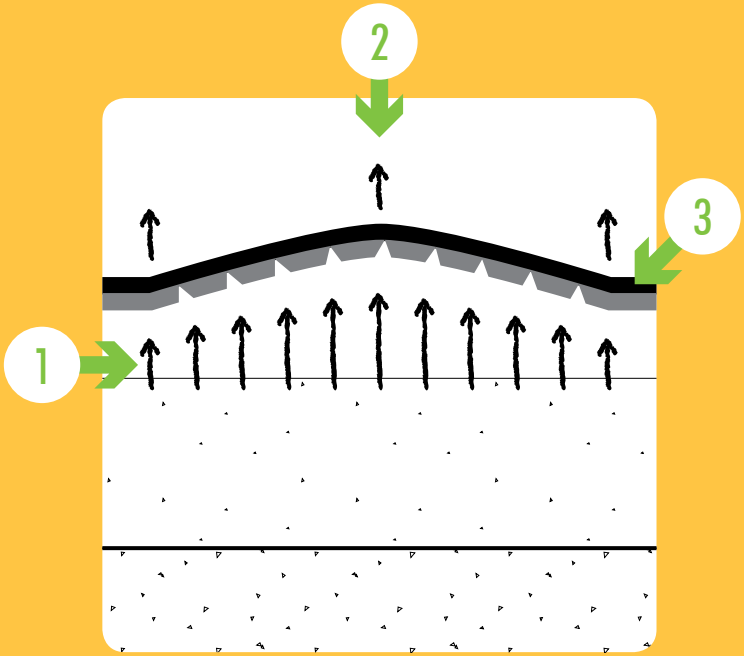
If cyclical moisture levels are too high, there are a number of ways to treat the concrete substrate including applying a damp proof membrane prior to the application of resin materials.

WITH VAPOUR TRANSMISSION CONTROL



1. Moisture Vapour
2. Vapour Transmission Layer
3. Floor Finish

WITHOUT VAPOUR TRANSMISSION CONTROL



1. Moisture Vapour
2. Blistering Occurs
3. Floor Finish

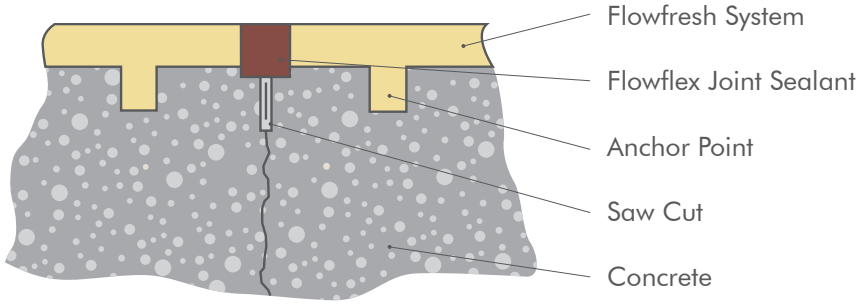
REASON #5

FAILURE TO IDENTIFY JOINTS

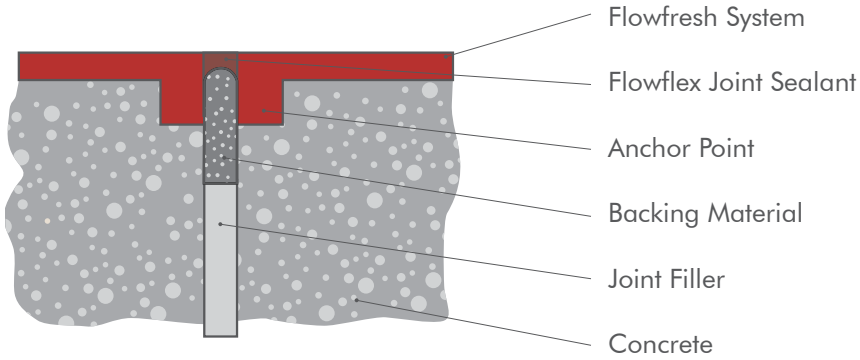
The weakest links in a typical floor are the expansion and control joints as well as termination points located around drains, doorways, hot stoves or other details and equipment. These construction details should be identified prior to construction to prevent undercutting, cracking or de-bonding of the surface from its substrate.

Expansion joints and control joints are best saw cut after the floor surface is in place. Termination points should be keyed to prevent lifting and undercutting.

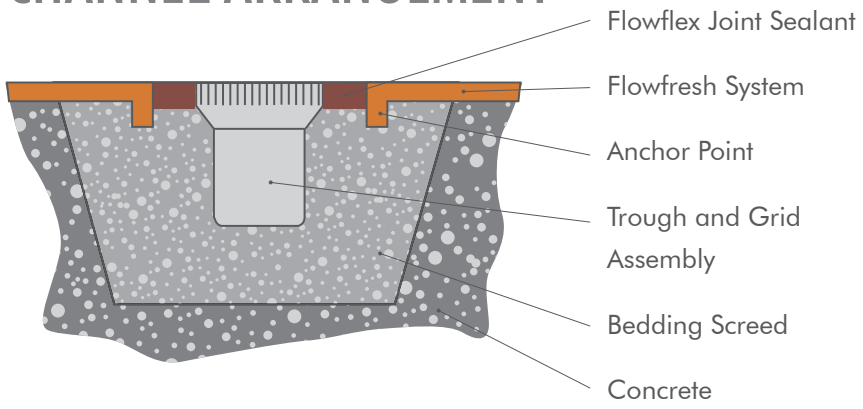
TYPICAL (INDUCED) MOVEMENT JOINT



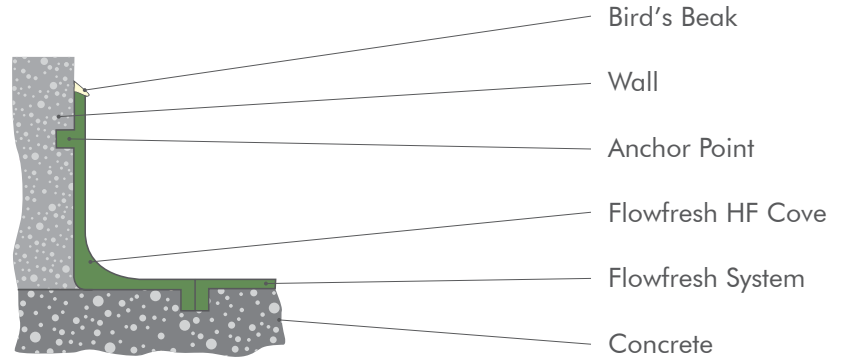
TYPICAL (EXPANSION) MOVEMENT JOINT



TYPICAL DRAINAGE CHANNEL ARRARNGEMENT



TYPICAL FLOOR TO WALL DETAIL



WHAT RESIN FLOORING OPTIONS ARE AVAILABLE?

This is a big question asked by industrial facilities managers and plant operators working within the food and beverage industry.

Resin flooring systems are available in a wide range of shapes and sizes and have been designed to best meet the different working areas within a food or beverage plant - all of which will be subject to different operating conditions.

CEMENTITIOUS POLYURETHANE

METHYL METHACRYLATE (MMA)

EPOXY

LOOKING FOR A CEMENTITIOUS POLYURETHANE SYSTEM?

Ask your local Flowcrete Representative about our Flowfresh range.

CEMENTITIOUS POLYURETHANE

- ✓ Impressive impact resistance
- ✓ Resistant to thermal shock & cycling
- ✓ Bacteria resistant, non-porous finish
- ✓ Can contain antimicrobial additives
- ✓ Hygienic seamless application
- ✓ Slip resistant

Cementitious polyurethane systems are a popular choice for clients working in the food industry. A typical polyurethane material used in this application comes in mortar form combining cement and water-based technologies that exhibit a high cross-linked density, making them ideal for abusive environments subject to prolonged chemical attack.

Polyurethane resin systems exhibit a thermal co-efficient of expansion, which is similar to that of concrete. This offers excellent benefits when installed directly over concrete in environments subject to thermal shock and thermal cycling as it prevents the material from cracking when subject to large temperature swings.

Cementitious polyurethane resin flooring solutions are non-porous, preventing bacteria and mould spores from surviving in joints or cracks typical of alternative flooring systems such as tiles or acid bricks. They are also low odour as well as non-toxic and non-hazardous.

Polyurethane resin flooring can be adjusted to suit slip resistance requirements to ensure safety underfoot.

METHYL METHACRYLATE (MMA)

- ✓ Cures in under two hours
- ✓ Resistant to acids and alkalis
- ✓ Includes attractive flakes or aggregates
- ✓ Hygienic seamless application
- ✓ Slip resistant

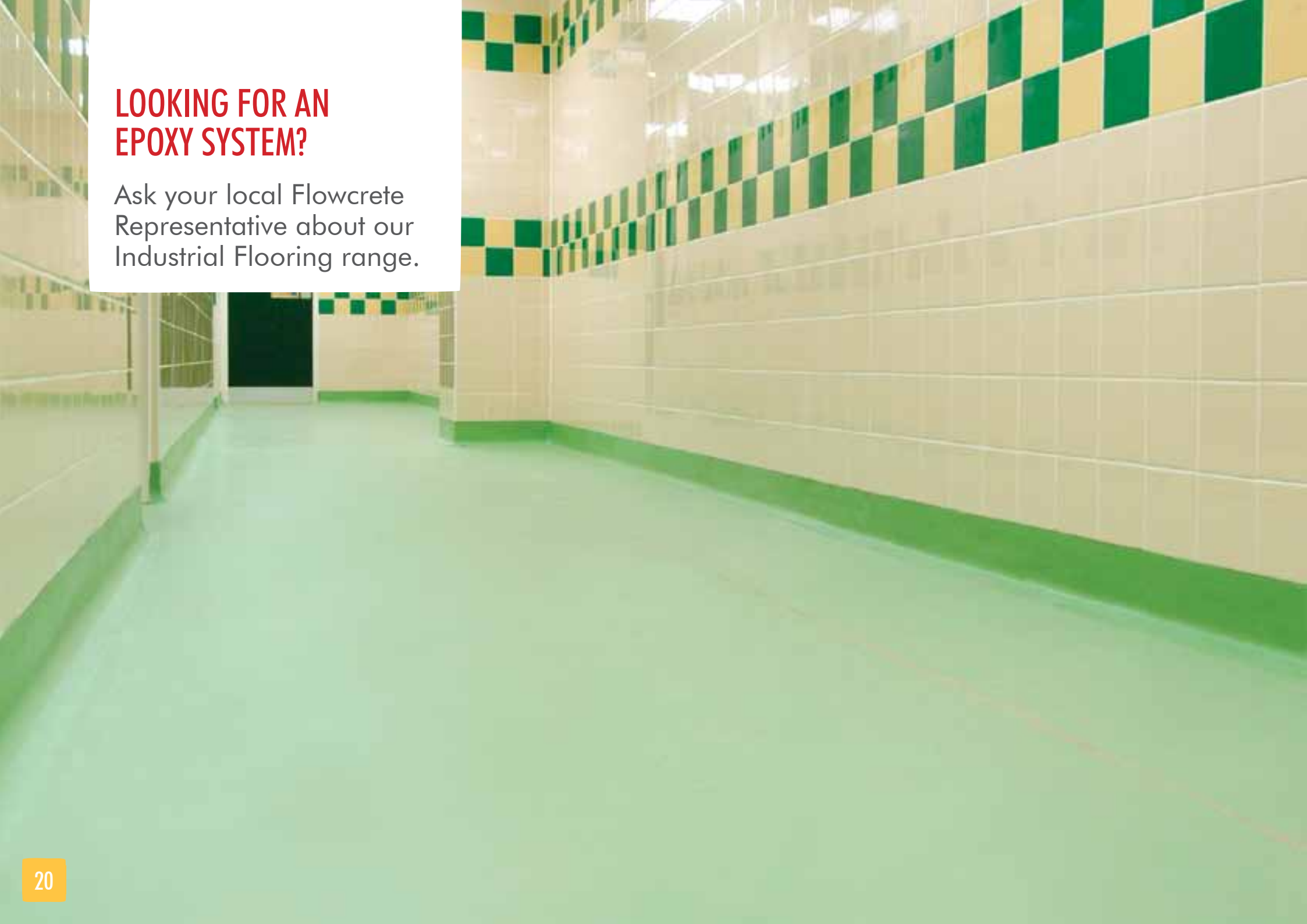
Methyl methacrylate (MMA) systems offer food manufacturing and processing environments certain performance advantages compared to alternative resin materials, most notably their ability to cure at an incredible speed and be installed at extremely low temperatures.

MMA resin can fully cure in just one to two hours, making it an ideal choice for operational facilities looking to minimise downtime and disruption as well as fast-track new-build construction projects.

MMA resin material demonstrates a high level of resistance to a range of acids and alkalis. Although MMAs have a unique odour during installation, the odour is harmless and can be minimised during installation with proper ventilation.

LOOKING FOR A METHYL METHACRYLATE SYSTEM?

Ask your local Flowcrete Representative about our Flowfast range.



LOOKING FOR AN EPOXY SYSTEM?

Ask your local Flowcrete Representative about our Industrial Flooring range.

EPOXY

- ✓ Attractive with varied finishes
- ✓ Well suited to non-processing zones
- ✓ Hygienic seamless application
- ✓ Chemical resistant
- ✓ Slip resistant

Epoxies are typically trowel or roller-applied, two or three-component systems that are available in a wide variety of colours. Epoxies can also be broadcast with aggregates to deliver a slip-resistant finish.

Epoxies offer limited resistance to organic acids, which are found in a large quantity of natural foodstuffs. However, epoxies offer no resistance to thermal shock making them more susceptible to cracking and de-bonding in more rigorous food and beverage environments.

Epoxy resin surfaces are a good choice for non-processing zones of a food manufacturing facilities such as packaging, maintenance and staff break-out areas as well as corridors, lobbies and office spaces, which are not subject to the same high protection demands.

OPERATIONAL DEMANDS

Understanding the most important operational criteria and service requirements of the facility or area in question is central to specifying a resin flooring system that will best meet your needs.

DRY SERVICE CONDITIONS

WET SERVICE CONDITIONS

SLIP RISKS

HIGH TEMPERATURE EXPOSURE

CHEMICAL RESISTANCE

HEAVY IMPACT & TRAFFIC

HYGIENE REGULATIONS

AESTHETIC REQUIREMENTS

SAFETY UNDERFOOT

It is imperative that all floors in food manufacturing and preparation zones, as well as staff breakout areas and amenities, have a non-slip surface, so as to prevent slips and trips.

Considering the floor finish in terms of risk management is even more critical in wet service environments as is ensuring the flooring system is tested under these conditions to determine if it will provide the correct level of safety.

In wet service environments, it is essential that flooring is laid to falls leading to an efficient drainage system in order to prevent the pooling of water and heighten the risk of slips. This is best acheived by shaping the concrete or screed substrate prior to the installation of a final floor finish.

Resin flooring is available in a range of textures and can be graded with broadcast aggregates in order to increase the anti-slip profile of the product.

It is important to note that coarsely textured surfaces, such as positively graded resin systems, are more difficult to keep clean, therefore a compromise may need to be made where heavy slip resistance and ease of cleaning are both of critical importance.

Slips and **trips** account for an average of

20%

of reported injuries.

An estimated 391,000 people die each year, world wide, due to falls.

Slips and trips in the workplace result in an average of

21 SICK DAYS

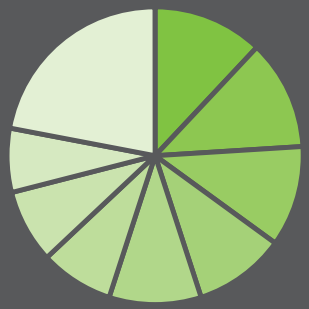
Of all reported injuries from slips, trips and falls in 2003-2004,

63% involve fractures.

Slips, trips and falls injury claims cost an average of

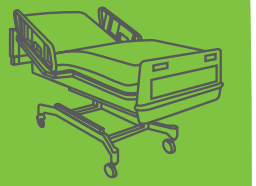
$16,500

There are just eight industries that make up **78%** of all injury claims resulting from slips, trips and falls.



- MANUFACTURING (12%)
- MEDICAL (12%)
- CONSTRUCTION (11%)
- RETAIL (10%)
- TRANSPORT & STORAGE (10%)
- PROPERTY (8%)
- ACCOMMODATION (8%)
- EDUCATION (7%)
- ALL OTHER INDUSTRIES (22%)

In the United States, slips, trips & falls account for



11% OF HOSPITAL BED DAYS

FLOOR ZONING & SEGREGATION PLAN

A zoning plan on the surface of the floor is a good idea if a food plant has identified any areas at risk of cross contamination or other hazards and is looking to segregate areas or zones by different processes or procedures or alternatively to designate different levels of hygiene through a simple colour coded system.

Although there is no universal system or language in place, pigmented flooring materials can be used to designate walkways or hazard risks in line with individual company policies and practises.

LOBBY AREAS

Flowshield Quartz

Flowfast Kristalina

CORRIDORS

Flowfresh SL

DRY PROCESSING AREAS

Flowfresh MF

WET PROCESSING AREAS

Flowfresh SR

FREEZERS & COLD STORES

Flowfresh HF

WAREHOUSE SPACES

Flowtex PT with Flowcoat HS

DRAINAGE

HYGIENE

The floor of a food processing plant can be a reservoir for microorganisms and a breeding ground for bacterial types and strands that can contaminate the working environment as well as the food product leading, in instances, to grave consequences.

Statistically, flooring materials are usually more microbiologically contaminated than any other inert surface of food processing premises and therefore great attention should be given to the choice and application of a flooring material.

Resins containing antimicrobial additives, particularly those that are homogenously distributed throughout the resin material, can play a big role in a contamination control strategy - destroying up to 99.9% of surface bacteria landing on the surface of the floor.

Other ways in which to maintain a strong hygiene barrier is to consider the transition between walls and floors through the use of coving or cleanable sealed junctions – again to eliminate any space that could be susceptible to dust, dirt or bacterial build-up.

FOODS MOST PRONE TO BACTERIAL CONTAMINATION ARE:

Meat products

Soft Cheeses

Poultry

Raw shellfish

Eggs or food made with raw eggs

Cold cooked seafood

FLOWFRESH CONTAINS POLYGIENE®; A SILVER-ION ADDITIVE THAT REMAINS ACTIVE FOR THE LIFETIME OF THE FLOOR, AND KILLS 99.9% OF BACTERIA ON CONTACT, INCLUDING:

- ✓ E-coli
- ✓ Pseudomonas Aeruginosa
- ✓ Staphylococcus Aureus
- ✓ Salmonella Typhi
- ✓ MRSA
- ✓ Streptococcus Pyogenes
- ✓ Proteus Vulgaris
- ✓ Enterococcus Faecalis
- ✓ Listeria Weshimen
- ✓ SARS Coronousitus

COMMON TYPES OF BACTERIA THAT CONTAMINATE FOOD ARE:

- ✓ E-coli
- ✓ Staphylococcus Aureus
- ✓ MRSA
- ✓ Proteus Vulgaris
- ✓ Listeria Weshimen
- ✓ Pseudomonas Aeruginosa
- ✓ Salmonella Typhi
- ✓ Streptococcus Pyogenes
- ✓ Enterococcus Faecalis
- ✓ SARS Coronousitus

CLEANING & MAINTENANCE

An effective cleaning and maintenance routine should be in place to preserve the aesthetic and performance of the resin finish but more importantly to reduce the risk of microbial contamination. Between wash cycles, resin based flooring materials should, where possible, be maintained in a dry state and at low relative humidity conditions. Flooring must be sloped at around 1.5-2% in order to allow water to drain correctly.

Resin flooring will not be affected by most special purpose cleaning materials, when these are used in accordance with the Chemical Cleaning Manufacturers' instructions. Specific cleaning instructions should also be sought from the resin flooring manufacturer.

A small spot test in an inconspicuous area is a worthwhile precaution before applying any new cleaning product. The cleaning regime should specify the type of equipment to be used, the type of cleaning chemicals to be used and the frequency of the cleaning and temperature.

It is important to note that cementitious polyurethane systems are compatible with steam cleaning and hot water washdown cleaning methods, whereas this is not recommended for epoxy or MMA systems.

TALK TO THE EXPERTS

This guide has been produced to give an overview of the resin choices available and factors to consider when specifying a resin flooring system within the hygienic design of a food or beverage processing facility.

Flowcrete has been successfully manufacturing and supplying flooring material to the food industry for over 30 years, securing high profile installations at Unilever, Kraft, Coca-Cola, McVities and Cadbury amongst other blue-chip food manufacturers and agribusiness brands.

Flowcrete's Flowfresh range has been specially formulated for this industry and can play a critical role in preventing microbiological build-up or contamination. Based on cementitious polyurethane chemistry, Flowfresh also incorporates Polygiene® – a silver ion based antimicrobial additive, which not only destroys up to 99.9% of surface bacteria but continues to remain active for the lifetime of the product.

Detailed recommendations and advice is available from our network of regional technical and sales representatives.

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