Sikafloor White Paper

Joint Treatments
For Resinous Floor Systems

BUILDING TRUST

Editor's Note: This white paper was researched and written by James C. Ziegler, an independent consultant specializing in resinous flooring and protective coatings. The technical observations and conclusions reflect the author's professional assessment.

Joint Basics

Concrete joints present a significant challenge when resinous flooring systems are installed in critical environments such as pharmaceutical and life sciences facilities, food and beverage processing areas, and advanced manufacturing spaces. Although joints are necessary to accommodate concrete movement and control cracking, they can become points of weakness in the finished flooring system when their function, movement, and service conditions are not properly considered.

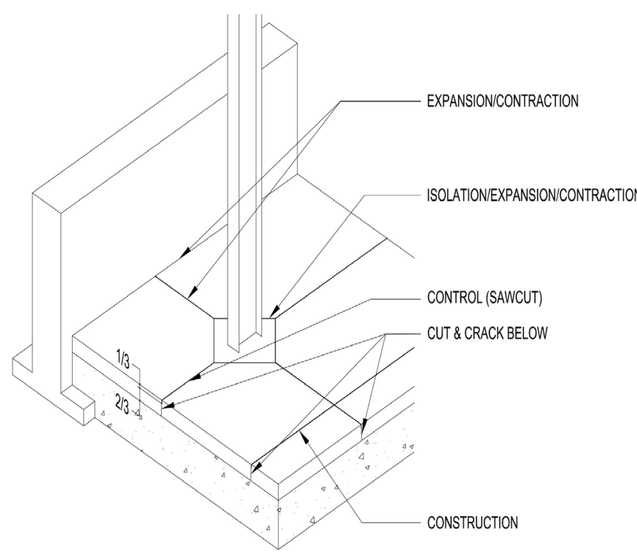
Successful joint treatment involves more than filling or sealing an opening in the concrete. The joint must be evaluated as part of the complete flooring assembly, considering expected movement, traffic, chemical and thermal exposure, hygiene requirements, substrate condition, and compatibility between the joint treatment and surrounding resinous flooring.

This paper examines concrete joint types and functions, joint optimization, movement, service conditions, material selection, common failure mechanisms, and design considerations. Particular attention is given to integrated flooring assemblies, including reinforced and prefabricated joint treatments, and to the value of coordinating joint treatment and resinous flooring through a compatible, single-source approach.

Introduction

Resinous flooring systems are frequently selected for environments where durability, cleanability, chemical resistance, and long-term performance are critical. Pharmaceutical and life sciences facilities, food and beverage processing areas, and advanced manufacturing environments may also expose flooring to heavy traffic, aggressive sanitation procedures, temperature changes, chemical exposure, and increasingly, automated material-handling equipment.

Within these environments, the concrete substrate and its joints are integral parts of the flooring system.



It's important to note that a resinous flooring system should never be expected to restrain structural or dimensional movement within a concrete slab. The flooring and joint treatment must instead be designed to accommodate or respond appropriately to anticipated movement while maintaining the required performance of the finished floor.

This distinction is critical. A joint that performs adequately in unfinished concrete may present very different challenges after installation of a resinous flooring system. If the joint treatment is too rigid, movement can transfer into the flooring and cause cracking or delamination. If it is too soft, recessed, or poorly supported, it may deteriorate under traffic or become difficult to clean.

The objective, therefore, is not simply to make the joint disappear. It is to understand why the joint exists, determine how it is expected to behave, and integrate an appropriate treatment into the complete resinous flooring assembly.

Concrete Joint Types, Functions and Optimization

Understanding the type and intended function of a concrete joint is the first step in selecting an appropriate treatment. ACI 224.3R, Joints in Concrete Construction, provides terminology and guidance for construction, contraction, isolation, and expansion joints.

A **contraction joint**, commonly referred to in the field as a control joint, is an intentionally created plane of weakness intended to regulate the location of cracking associated with dimensional changes in concrete. (See Figure 1)

A **construction joint** occurs where concrete placement is intentionally interrupted and later resumed. Depending on its design and construction, it may also perform other functions. (See Figure 2)

An **isolation joint** separates a slab from an adjoining element, such as a wall, column, equipment base, or adjacent slab, and allows relative movement between those elements. (See Figure 3)

An **expansion joint** provides separation between concrete sections where dimensional movement must be accommodated.

Because joint terminology is sometimes used inconsistently in the field, the actual function and anticipated movement of the joint are more important to the flooring system than the name assigned to it.

This distinction is particularly important with resinous flooring. A relatively stable contraction joint may permit treatment options that would be inappropriate for an active isolation or expansion joint. A joint designed to accommodate significant movement should not be rigidly bridged simply to create a seamless appearance.

The best opportunity to address joints may occur before the resinous flooring system is selected. During slab design, the project team should consider joint location and frequency in relation to equipment, traffic patterns, sanitary areas, doorways, drains, and other critical floor transitions.

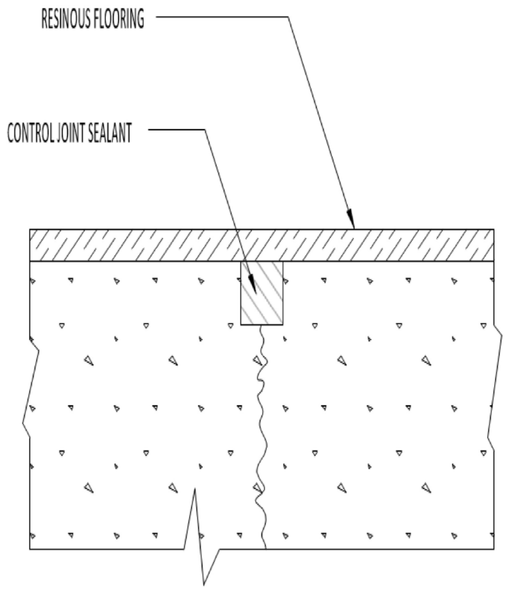


Figure 1. Contraction Joint

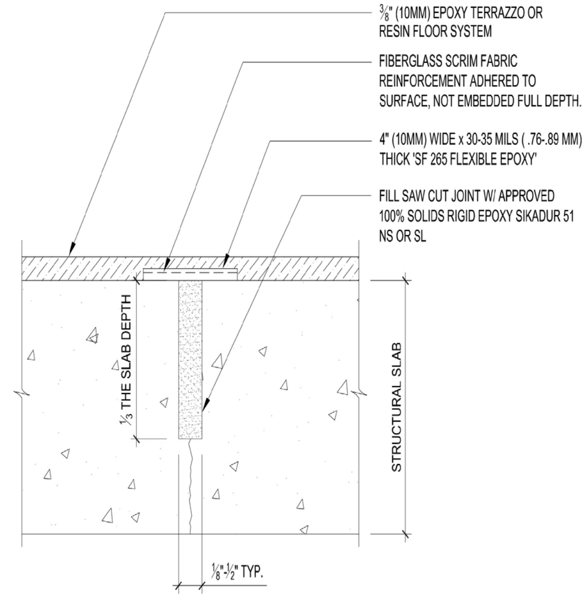


Figure 2. Construction Joint

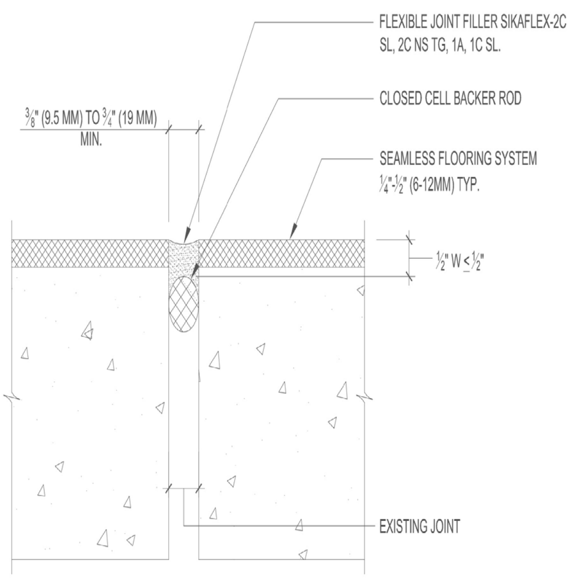


Figure 3. Isolation Joint

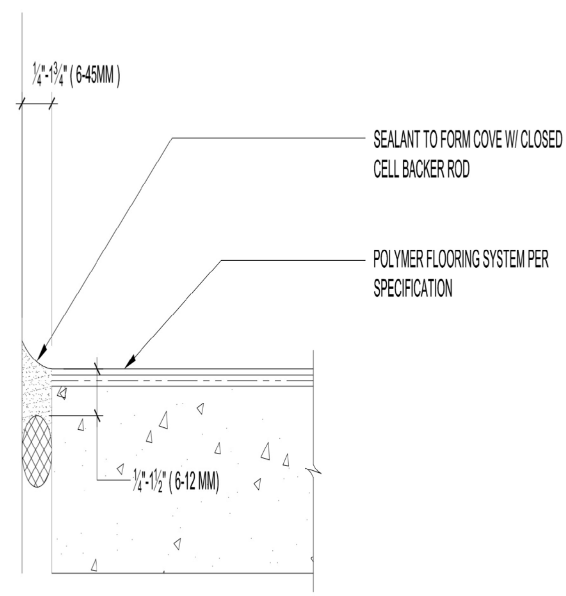


Figure 4. Expansion Joint

Advances in concrete mixture design, reinforcement strategies, fibers, admixture technologies, and slab design practices may, in appropriate applications, allow designers to optimize joint spacing or reduce the number of joints required. Detailed design of these systems is outside the scope of this paper, but early coordination can reduce the number of transitions that ultimately must be addressed within the resinous flooring system.

A concrete joint should not be viewed as an isolated interruption in a resinous floor. Its treatment becomes part of the finished flooring assembly and must perform under the same environmental and operational conditions as the surrounding system.

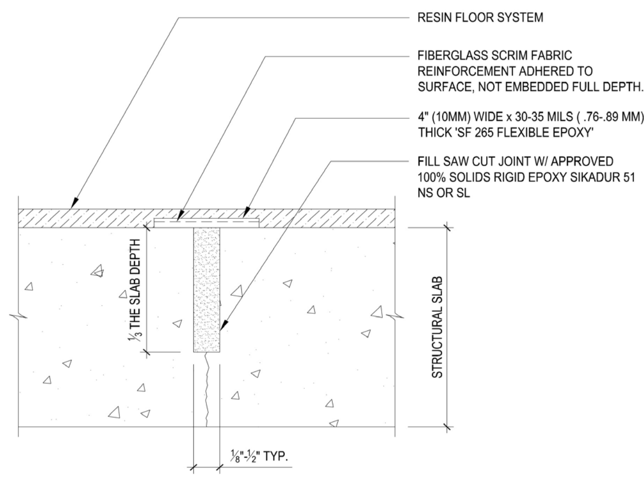
Several treatment approaches may be appropriate depending on joint function and anticipated movement. These may include semi-rigid joint fillers, elastomeric sealants, reinforced resinous details, prefabricated joint assemblies, or combinations of materials.

The appropriate solution depends first on the function of the joint and its expected movement.

A contraction joint may permit a semi-rigid or reinforced treatment intended to protect the joint and distribute stresses into the surrounding flooring. Where continued movement is expected, a flexible or movement-accommodating detail may be necessary. Isolation and expansion joints experiencing significant movement generally require the joint to remain functional through the finished flooring rather than being

Reinforced Resinous Treatments

In some applications, reinforcement can be incorporated into the resinous flooring detail **bridging the joint**. Fiberglass or other suitable reinforcement can provide additional tensile capacity and help distribute stress over a broader area of the flooring system.



Reinforcement should not, however, be interpreted as a means of eliminating concrete movement. Its effectiveness depends on the resin chemistry, reinforcement properties, joint configuration, surrounding substrate, and magnitude of anticipated movement. A reinforced detail suitable for a contraction joint may not be suitable for an isolation or expansion joint experiencing substantial movement.

Where movement is expected to remain active, the treatment may require a flexible or other movement accommodating component rather than a rigid bridge that transfers movement into the surrounding flooring.

Flexible Joint Treatments

Where movement must be accommodated at the finished floor surface, an elastomeric sealant or other flexible material may be appropriate. ASTM C920, Standard Specification for Elastomeric Joint Sealants, establishes classifications for elastomeric sealants based on characteristics including type, grade, class, and intended use. ASTM C1193, Standard Guide for Use of Joint Sealants, provides additional guidance regarding joint design, backing materials, primers, substrate preparation, and installation.

This creates an important balance. A soft material may accommodate movement effectively but perform poorly under concentrated wheel traffic. Conversely, a harder material may provide better edge support and wheel resistance but accommodate less movement. The joint treatment must satisfy both the movement requirements and the operational requirements of the facility.

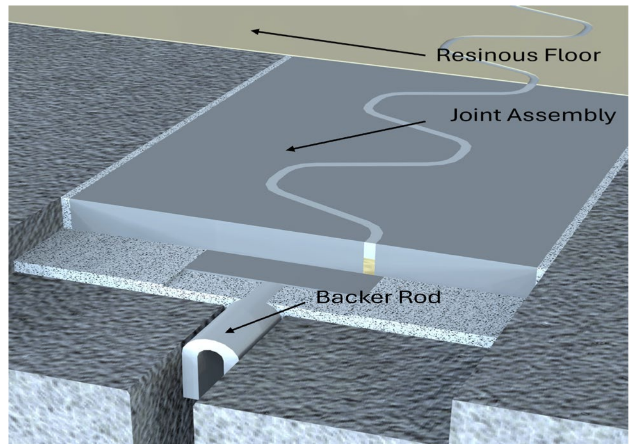
Prefabricated Joint Assemblies

In demanding applications, prefabricated joint assemblies specifically designed for integration with resinous flooring can provide another treatment option.

These assemblies may incorporate **reinforced composite construction** to improve durability and protect the joint under repetitive wheeled traffic. Properly designed systems can establish controlled joint geometry and provide a smoother transition across the joint, helping reduce impact and potential damage to forklifts, pallet jacks, AGVs, AMRs, and other material-handling equipment.

Where the assembly can be coated or otherwise integrated with the surrounding resinous flooring system, it can also help maintain continuity in appearance, cleanability, and performance.

As with field-constructed details, a prefabricated assembly must be selected according to anticipated movement, loading, chemical and thermal exposure, hygiene requirements, and compatibility with the surrounding flooring system.



The Value of an Integrated, Single-Source Assembly

Joint performance depends on more than the material placed within the joint. Primers, repair materials, reinforcement, fillers or sealants, joint assemblies, resinous flooring layers, and finish coats may all interact at the joint.

Where practical, specifying these components as a **tested or documented compatible assembly from a single source** can provide important advantages. Material compatibility can be evaluated as a system rather than assumed between independently selected products. Installation details can be coordinated, technical support is simplified, and responsibility for system performance is more clearly defined.

This approach does not eliminate the need for appropriate joint design, proper installation, or recognition of concrete movement. It does, however, reduce uncertainty at one of the most vulnerable transitions in a resinous flooring system.

Service Conditions in Critical Environments

Selecting a joint treatment requires consideration not only of concrete movement but also of the conditions the finished floor will experience throughout its service life.

Traffic and Automated Vehicles

Forklifts, pallet jacks, carts, automated guided vehicles (AGVs), and autonomous mobile robots (AMRs) can impose concentrated and repetitive loads at floor joints. Small-diameter or hard wheels can be particularly demanding.

Wheel impact becomes significant when traffic crosses a joint perpendicular to its direction. Even a relatively small joint opening, recessed treatment, or elevation difference can create repetitive impact. Over time, this can damage joint edges, joint materials, the adjacent resinous flooring, and potentially the material-handling equipment itself.

The finished joint detail should therefore minimize abrupt elevation changes while maintaining the required movement capability. Joint-edge strength is equally important; weak or deteriorated concrete edges can become increasingly susceptible to damage under repetitive traffic.

Traffic patterns should be considered during design whenever possible. Joint locations and configurations that reduce repetitive direct wheel impact may improve long-term performance.

Hygiene, Cleanability, and Contamination Control

In pharmaceutical, life sciences, food and beverage, and other controlled environments, joint treatment is not solely a movement or durability issue. It is also a hygiene and contamination-control consideration. Resinous flooring is frequently selected to provide a continuous, cleanable surface. Open, cracked, recessed, or deteriorated joints can collect soils, process residues, cleaning solutions, moisture, and other contaminants.

Joint treatments should therefore remain securely bonded, minimize unnecessary ledges and recesses, and allow the floor to be effectively cleaned and maintained. Where sanitation or contamination control is critical, the ability of the joint treatment to remain intact and cleanable throughout its service life should be considered during material selection.

Chemical and Thermal Exposure

Cleaning agents, sanitizers, process chemicals, hot liquids, steam, and temperature cycling may expose joint materials to conditions different from those encountered by a conventional floor joint.

The chemical resistance of the joint treatment should be evaluated together with the surrounding resinous flooring. Temperature changes can also influence both material properties and concrete movement. Where thermal shock or significant temperature cycling occurs, the ability of the complete assembly to tolerate those conditions should be considered rather than evaluating individual components independently.

Common Failure Mechanisms
Joint failures in resinous flooring frequently result from a mismatch between the treatment selected and the actual movement or service conditions.

Cracking can occur when an active joint is rigidly bridged and movement is transferred into the resinous flooring. The flooring system does not eliminate the underlying movement; the stress is simply transferred to another location.

Delamination may result from inadequate joint preparation, contamination, incompatible materials, moisture conditions, or insufficient bond to the surrounding substrate

Joint-edge deterioration can develop when weak concrete is subjected to repetitive wheel impact or when the joint configuration leaves the edges inadequately supported.

Sealant or filler deterioration may occur when the selected material is too soft for traffic, too rigid for anticipated movement, chemically incompatible with the environment, or installed with inappropriate geometry.

Loss of cleanability can occur when a joint becomes recessed, cracked, separated, or otherwise creates an area capable of collecting contaminants.

A common underlying problem is treating the joint as a cosmetic interruption rather than as a functional component of the concrete slab and finished floor. Making a joint visually disappear does not eliminate its movement or structural function.

Design, Specification, and Long-Term Performance
The most successful joint treatments are generally considered before flooring installation begins.

Specifications should identify joint type and location where possible and define anticipated movement, traffic, chemical and thermal exposure, cleaning requirements, and finished-floor expectations. The flooring contractor should not be expected to determine the structural function or movement requirements of a joint after installation has begun.

Specifications should also establish the required treatment approach. Depending on the application, this may include a semi-rigid filler, flexible sealant, reinforced resinous treatment, prefabricated joint assembly, or another engineered detail.

Where multiple materials form the joint and flooring assembly, compatibility should be documented. A **single-source** approach can be particularly valuable in critical environments by allowing the project team to evaluate the joint treatment, primers, repair materials, reinforcement, resinous flooring, and finish as an integrated assembly rather than as unrelated products.

For particularly demanding or repetitive conditions, a representative mock-up may also be beneficial. The joint detail can be evaluated for appearance, cleanability, traffic transition, and integration with the surrounding flooring before being repeated throughout the facility.

Long-term maintenance must also be considered. Joint materials may have different service lives from the surrounding flooring. Flexible materials, in particular, may eventually require replacement even while the adjacent resinous floor remains serviceable.

Periodic inspection should identify cracking, separation, loss of adhesion, edge deterioration, or changes in joint profile before they develop into larger flooring problems. Whenever practical, joint details should also allow repair or replacement without unnecessary removal of otherwise sound resinous flooring.

Conclusion

Concrete joints are necessary components of many slabs supporting resinous flooring systems. Successful flooring design does not depend on eliminating those joints but on understanding their function and incorporating them appropriately into the finished flooring assembly.

The process begins with joint planning and optimization during slab design. For joints that remain, anticipated movement must be balanced with traffic, chemical and thermal exposure, hygiene, cleanability, and maintenance requirements.

No single joint treatment is appropriate for every condition. Semi-rigid materials, flexible sealants, reinforced resinous details, and prefabricated joint assemblies each have appropriate applications and limitations. The correct treatment is one that responds appropriately to the joint's function and anticipated movement while maintaining the performance expected of the surrounding floor.

Most importantly, **a resinous flooring system should not be expected to restrain movement within the concrete slab**. Joint movement must be recognized and appropriately addressed within the flooring design.

The joint should therefore be considered as part of the complete resinous flooring assembly rather than as a separate concrete repair. Where practical, an integrated, single-source approach can help establish material compatibility, coordinated detailing, technical support, and clearer responsibility for system performance.

The objective is not simply to make the joint disappear. It is to create a joint detail capable of functioning with the concrete slab while maintaining the durability, cleanability, and reliability expected of the resinous flooring system throughout its service life.

References

1. American Concrete Institute. ACI 224.3R, Joints in Concrete Construction. ACI Committee 224. Guidance addressing construction, contraction, isolation, and expansion joints in concrete construction.
2. ASTM International. ASTM C920, Standard Specification for Elastomeric Joint Sealants. ASTM International, West Conshohocken, PA.
3. ASTM International. ASTM C1193, Standard Guide for Use of Joint Sealants. ASTM International, West Conshohocken, PA.

About the Author

James C. Ziegler
Ziegler Industrial Coatings Consulting (ZICC)
AMPP Senior Certified Coatings Inspector
ESD Association TR53 Certified
jim.ziegler.zicc@gmail.com

Jim Ziegler has more than 41 years of experience in the resinous flooring and protective coatings industry, with a career spanning technical, operational, product management, marketing, business development, and sales leadership roles. His positions have included Territory Manager, Business Development Manager for ESD Flooring, Technical Manager, Business Development Manager for Life Sciences, Architectural and Sales Specialist, Product Manager, Marketing Manager, Field Technical Manager, R&D Manager, Customer Service Manager, Quality Control Manager, and Production. Also includes managing resinous flooring installation crews, installation sales, and developing quality programs and installation standards for flooring contractors and applicators.

His specialized technical expertise includes ESD auditing and static-control flooring, resinous flooring application, moisture and substrate analysis, failure analysis, field evaluation, product evaluation, and contractor development. He is an AMPP Senior Certified Coatings Inspector and ESD Association TR53 Certified.

As an independent consultant, he provides technical education, presentations, contractor and applicator training, specification and system guidance, and field-based expertise focused on improving the selection, application, and long-term performance of resinous flooring systems.

Need help with your next project? Scan the QR code and speak with a Sika Floor, Wall and Joint expert.

WE ARE SIKA

Sika AG is a globally active specialty chemicals company. Sika supplies the building and construction industry as well as manufacturing industries (automotive, bus truck, rail, solar and wind power plants, facades). Sika is a leader in processing materials used in sealing, bonding, damping, reinforcing, and protecting load bearing structures. Sika's product lines feature high quality concrete admixtures, specialty mortars, sealants and adhesives, damping and reinforcing materials, structural strengthening systems, industrial flooring as well as roofing and waterproofing systems.

Sika Corporation • Flooring
201 Polito Avenue
Lyndhurst NJ 07071
Tel: 800 933 7452
www.SikaFloorUSA.com

BUILDING TRUST