Super-Krete® Products
Crack Repair Guide

Concrete Cracks. Simply stated, concrete cracking is a complete or partial separation of a concrete element into two or more parts known as breakage or fracturing of the concrete. Some material scientists do not believe concrete cracks, they prefer to call a "crack" … a "fabric tear".

Arizona Polymer Flooring makes this general guideline for the repair of cracked concrete. However, for the rehabilitation of "structural concrete cracks in critical elements" Arizona Polymer Flooring endorses that it be done in conjunction with the sound judgment of a professional engineer.

This document is intended to be an impartial pragmatic review of why concrete cracks and what work should be performed prior to topping it with a coating or surfacing systems. It is intended to reject the construction industry's misnomer that states: "All cracks in concrete must be repaired before …"

Arizona Polymer Flooring believes that before attempting to restore "all cracks" the owner, specifier, general contractor and specialty subcontractor need to be familiar with American Concrete Institute's documents and recommendations. The ACI 224R means cracks equal to or larger than 0.012 inch (0.30 mm) should be addressed when placing coatings or surfacings on concrete slabs on grades. By definition ACI 24R does not state all cracks!

American Concrete Institute ACI 224R.01 Control of Cracking in Concrete Structures		
Guide to reasonable crack widths, reinforced concrete under service loads		
Exposure condition	***Crack width***	
	in.	mm
Dry air or protective membrane	0.016	0.41
Humidity, moist air, soil	0.012	0.30
Deicing chemicals	0.007	0.18
Seawater and seawater spray, wetting and drying	0.006	0.15
Water-retaining structures (Exclusive non-pressure pipes)	0.004	0.10

(Also see ACI 224.1R Causes, Evaluation and Repair of Cracks in Concrete Structures and ACI 224.2R Cracking of Concrete Members in Direct Tension.)

Cracks in concrete have a number of causes which may affect the aesthetic appearance of the concrete and not the performance of the concrete element, or the crack can indicate structural distress within the element which can lead to additional distress. Cracked concrete can be characterized as the total extent of the damage, or they may point to problems that if not taken care of can become a greater problem.

Arizona Polymer Flooring makes the distinction between repairing a cracked concrete element and fixing a crack so it can be coated or surfaced successfully.

a. To repair cracked concrete is to return the element to its original design intent.
b. To fix or restore cracks in concrete is to route and fill it, bridge it or patch it.

In order to "repair it" or "fix it" it is important to understand why the concrete cracked. The proper repair or fix of concrete cracks depends on knowing the causes of the cracks and selecting the best or most economical procedures into account; otherwise, the repair may only be temporary. Successful long-term repair

procedures must deal with the causes of the concrete cracks and the long-term resulting crack repairs or fixes. To aid the owner, specifier, general contractor and specially contractor in pinpointing the best solution to a cracking problem, this guideline discusses the causes, evaluation procedures, and methods of repair or fixing cracks in concrete.

Concrete Cracks Before it Hardens and After it Hardens:

Listed below is a brief and limited overview of when concrete cracking occurs (before or after hardening). Arizona Polymer Flooring acknowledges that it does not address every reason for concrete cracking.

1. Before Hardening
   a. Plastic
      (1) Shrinkable Aggregate
      (2) Drying Shrinkage
      (3) Crazing
   b. Freeze
      (1) Early Frost Damage
   c. Movement
      (1) Plastic Shrinkage
      (2) Plastic Settlement
2. After Hardening
   a. Physical
      (1) Shrinkable Aggregate
      (2) Drying Shrinkage
      (3) Crazing
   b. Chemical
      (1) Corrosion of Reinforcement Steel
      (2) Alkali-Silica Reaction
      (3) Cement Carbonation
   c. Thermal
      (1) Freeze-Thaw Cycles
      (2) External Seasonal Temperature Variation
      (3) Early Thermal Contraction - External Restraint
      (4) Early Thermal Contraction - Internal Temperature Gradients
   d. Structural
      (1) Accidental or Intentional Overload (Exceeding Design Loads)
      (2) Creep
      (3) Restrained from Movement
      (4) Loss of Reinforcement (Post tension strands relaxed, loss of rebar coverage, etc.)
      (5) Raw Material(s) Below Design Minimum Requirement

Not all of the concrete cracks should be repaired or fixed if the concrete itself is deemed not sound or durable. See ACI 201.2R Guide to Durable Concrete.

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Arizona Polymer Flooring understands that it necessary to understand the definitions (names) of the types of concrete cracking to facilitate proper communication between individuals in the field and your APF representative. Arizona Polymer Flooring recognizes that there may be additional definitions.

A. ***Checking*** – Shallow cracks closely spaced at irregular intervals on the surface of the concrete slab.
B. ***Craze Cracks*** – Fine random cracks at the surface of the concrete.
C. ***D-Cracking*** – Cracks at or near the perpendicular (right angle - 90 degree) joints that visually appear as the letter "D", usually associated with edge curl of the concrete slab.
D. ***Delamination Cracks*** – Delamination cracks occur horizontally to the surface in the concrete.
E. ***Dynamic and Static Cracks*** – The sophist argument of Dynamic and Static Cracks. Static cracks subjected to thermal movement are always dynamic cracks. Dynamic cracks subject to no loads or thermal changes are static cracks. There are two outcomes:
    1. A dynamic crack that is structurally repaired ceases to function as a dynamic crack and the concrete element is restored to its design intent.
    2. A dynamic crack may require that other structural elements be repaired or the load redesigned prior to repairing the crack.
F. ***Hairline Cracks*** – Cracks having a width that is less than 10 mils when the concrete is at its coolest point.
G. ***Non-Structural Cracks*** – Cracks that do not initially represent a failure, only a potential nuisance, however, over time can cause major problems.
H. ***Plastic Cracks*** – Cracks that occur in the concrete surface that appear while the concrete is in the plastic state (uncured).
I. ***Shrinkage Cracks*** – Cracks that occur due to tension caused by external or internal restraints, such as, volume changes, rapid loss of moisture, excessive carbonation, etc.
J. ***Structural Cracks*** – A cracked element that results in the concrete's failure to perform as designed, which may lead to catastrophic failure of the element.
K. ***Temperature Cracks*** – Cracking due to tensile failure, caused by temperature gradients in the concrete subjected to external restraints or by temperature differential of concrete slabs subjected to internal restraints.
L. ***Transverse Cracks*** – Cracks that develop at right angles to the direction of the concrete element.

The intent of this guide is help the specialty contractor familiarize themselves with the industry terminology in order to help them in their communication with APF sales and technical service representatives.

Please refer to ***Appendix A*** which includes fourteen (14) drawings of crack restoration.

DISCLAIMER:

Arizona Polymer Flooring Technical Bulletins are developed in good faith for the sole purpose of assisting others with products, systems and industry standards. The information published herein is gathered from different sources that are thought to be reliable, but the reader should not assume that the information absolves the reader from validating information from other sources, such as listed below, before making a decision. Since information from others can change without notice, Arizona Polymer Flooring cannot be held at fault if

any of the information conveyed in good faith is deemed in error. Listed below is a number of trade association organizations that can provide additional assistance to the reader.

AMERICAN CONCRETE INSTITUTE STANDARDS

ACI 201.1R	Guide for Making a Condition Survey of Concrete in Service
ACI 201.2R	Guide to Durable Concrete
ACI 302.1R	Guide for Concrete Floor and Slab Construction
ACI 302.2R	Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials
ACI 318	Building Code Requirements for Structural Concrete
ACI 364.1R	Guide for Evaluation of Concrete Structures Prior to Rehabilitation
ACI 503R	Use of Epoxy Compounds with Concrete
ACI 503.1	Standard Specification for Producing a Skid Resistant Surface on Concrete by the Use of a Multi Component Epoxy System
ACI 503.4	Standard Specification for Repairing Concrete with Epoxy Mortars
ACI 546R	Concrete Repair Guide

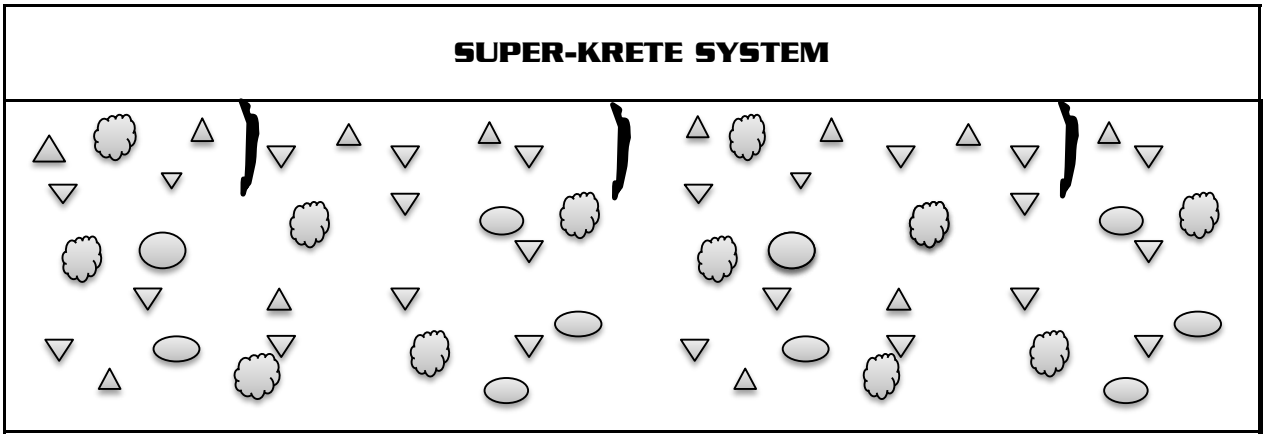
ACI (American Concrete Institute)
P.O Box 9094
Farmington Hills, MI 48331
www.aci-int.org

CRACK RESTORATION 1

SMALL TIGHT CRACKS NOT FULL DEPTH SUBJECTED TO SLIGHT MOVEMENT

Interior Small Cracks, Such As, Crazing Cracks Subjected Small Amout of Thermal or Load Movement

1. SK-400 Clear or VaporSolve® depending on moisture mitigation, with or without 30 mesh aggregate for anchoring of next application.
2. Joint and crack filler - SK-E300 Flex or SK-E300 Flex Paste (Regular or Fast Cure) or VaporSolve Joint Filler.
3. Might require several pours since material will slump

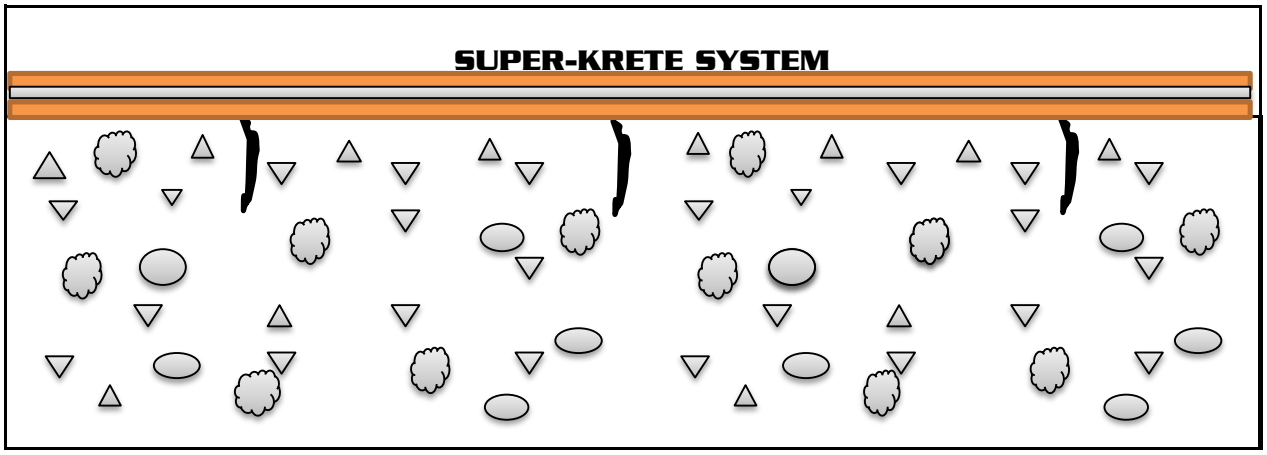


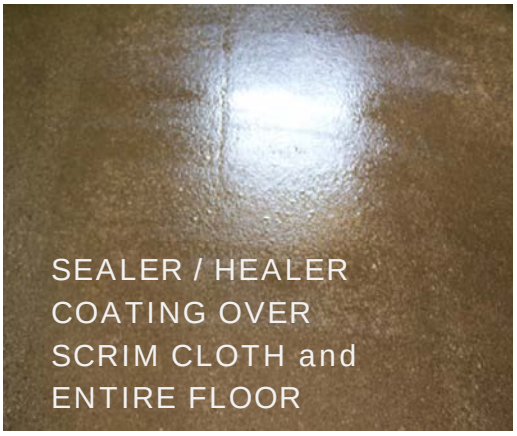
CRACK RESTORATION 2

SMALTIGHT AND NON-MOVING CRACKS DESIGNED TO ADDRESS THE POTENTIAL SIESMIC CRACK DAMPENING OR OTHER MOVEMENT

Small Cracks Potential Subjected To Unknown, but Expected Seismic Movement
Small Cracks Subjected To Machine Vibration, Such as, Mechanical Equipment Rooms

1. SK-E400 Clear or VaporSolve Primer depending on moisture mitigation considerations.
2. S-3500 Elastique Matting (Scrim Cloth), dimensional reinforcement, cost effective crack suppression.
3. SK-400 Clear scrim coat saturant coat, with or without 30 mesh aggregate.



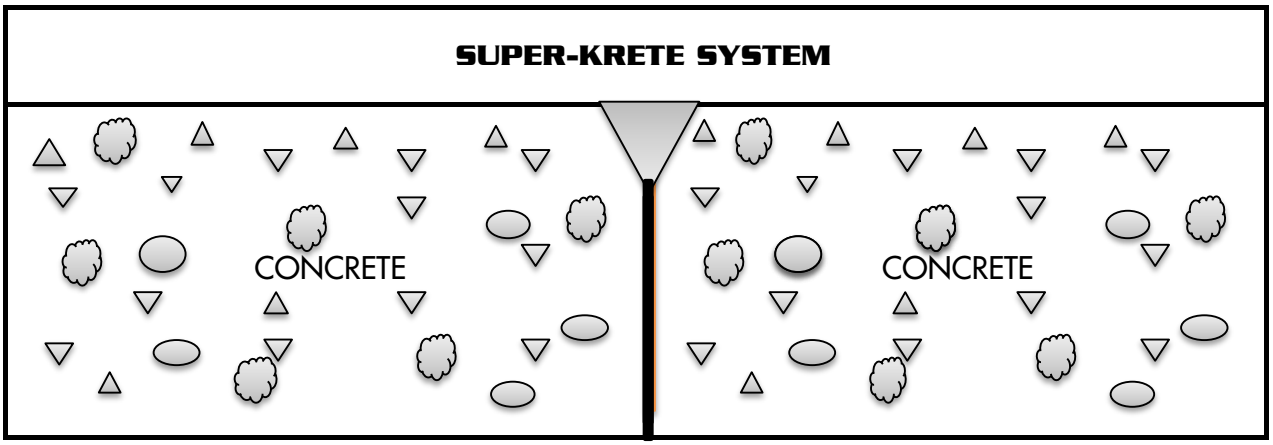


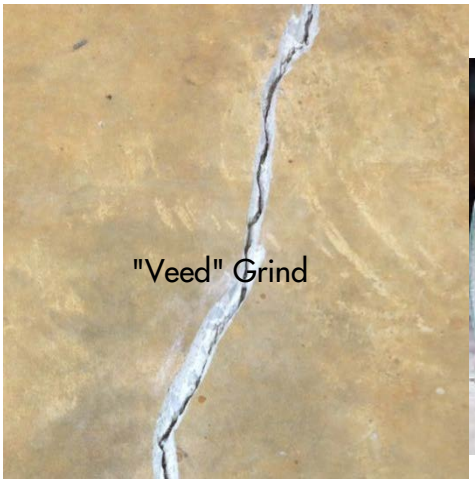
CRACK RESTORATION 3

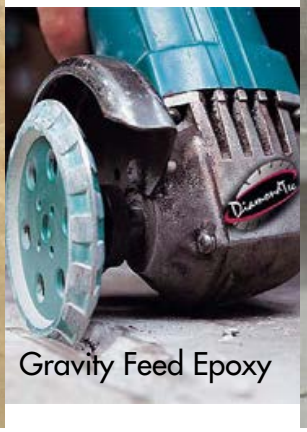
NON-MOVING CRACKS ARE "Veed" OUT and FILLED

Non-Moving Cracks Are Not Subjected to Thermal or Load Movement

1. "Veed" OUT CRACK
2. Fill Joint & Crack Filler - SK-E300 Flex or SK-E300 Flex Paste (Regular or Fast Cure) or VaporSolve Joint Filler.
3. Might require several pours since material will slump





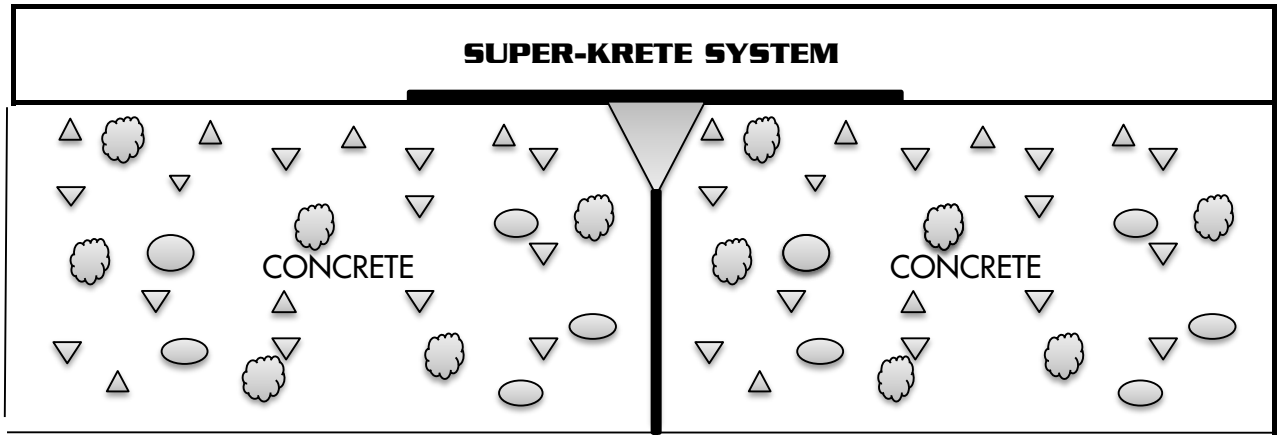


CRACK RESTORATION 4

CRACK REPAIR BY SEMI-RIGID EPOXY JOINT and CRACK FILLER

Slight Movement Expected at Crack - Crack is "Veed" Out, Filled and Bond Breaker Tape

1. "Veed" OUT CRACK
2. Fill Joint & Crack Filler - SK-E300 Flex or SK-E300 Flex Paste (Regular or Fast Cure) or VaporSolve Joint Filler.
3. Might require several pours since material will slump
4. Bond breaker tape spreads dimentional stress.



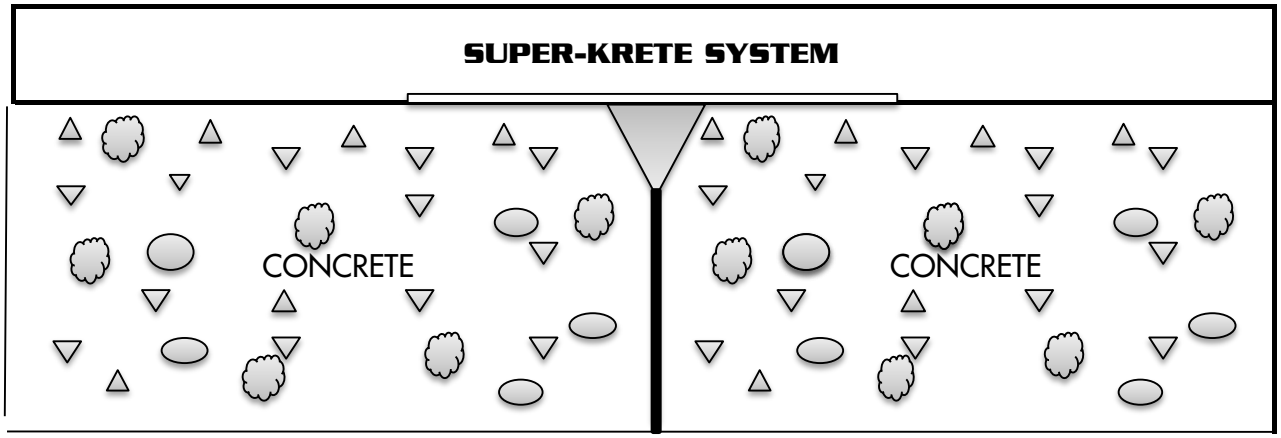

Gravity Feeding of Cracks

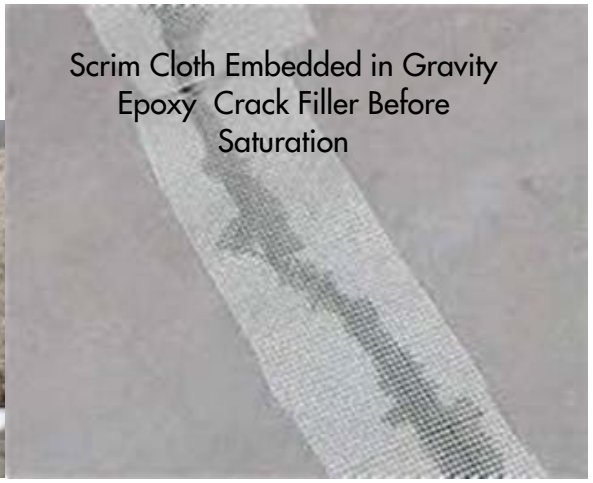
CRACK RESTORATION 5

DIMENSIONAL STABILITY REINFORCED With SCRIM CLOTH

Slight Movement Expected at Crack - Crack is "Veed" Out, Filled and Scrim Cloth

1. "Veed" OUT CRACK
2. Joint & Crack Filler - SK-E300 Flex or Paste (Regular or Fast Cure) or VaporSolve Joint Filler
3. Might require several pours since material will slump
5. SCRIM CLOTH - S-3500 Elastique Matting



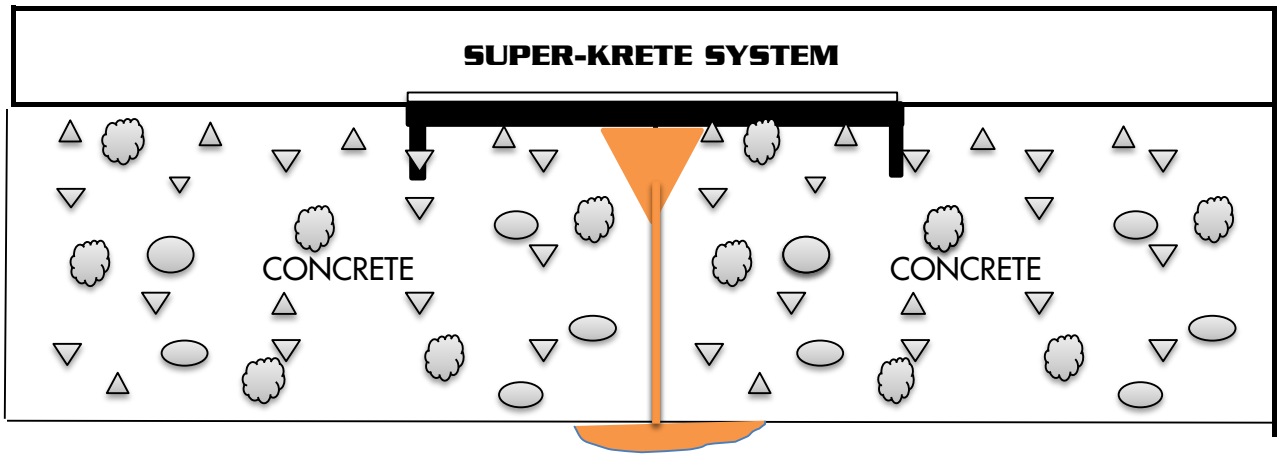


CRACK RESTORATION 6

DIMENSIONAL STABILITY With STEEL STAPLES

Rigid Crack Repair With Gravity Pour Epoxy, Steel Staples and Scrim Cloth

1. "Veed" OUT CRACK
2. Joint & Crack Filler - SK-E400 Clear (Regular or Fast Cure)
3. Might require several pours since material will slump
4. Load transfer device - Steel staples
5. SCRIM CLOTH - S-3500 Elastique Matting

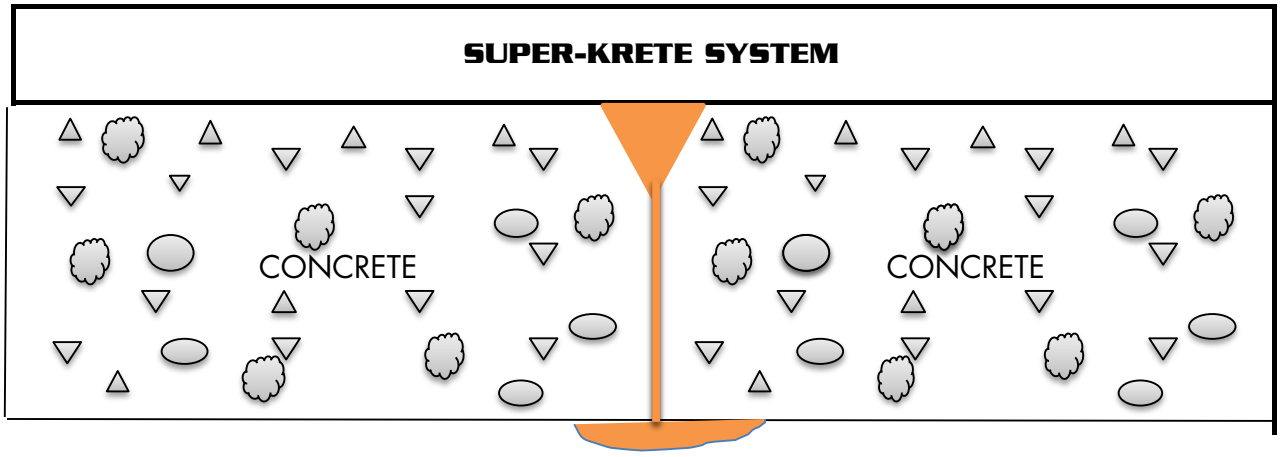


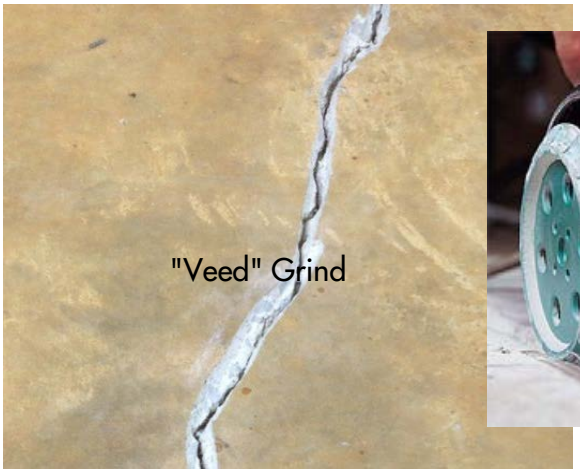
CRACK RESTORATION 7

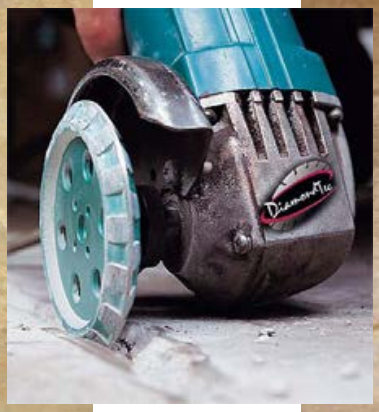
CRACK REPAIR BY GRAVITY POUR

Non-moving crack - Crack is "Veed" out and filled

1. "Veed" OUT CRACK
2. Gravity feed epoxy - SK-E400 Clear (Regular or Fast Cure)
3. Might require several pours since material will slump





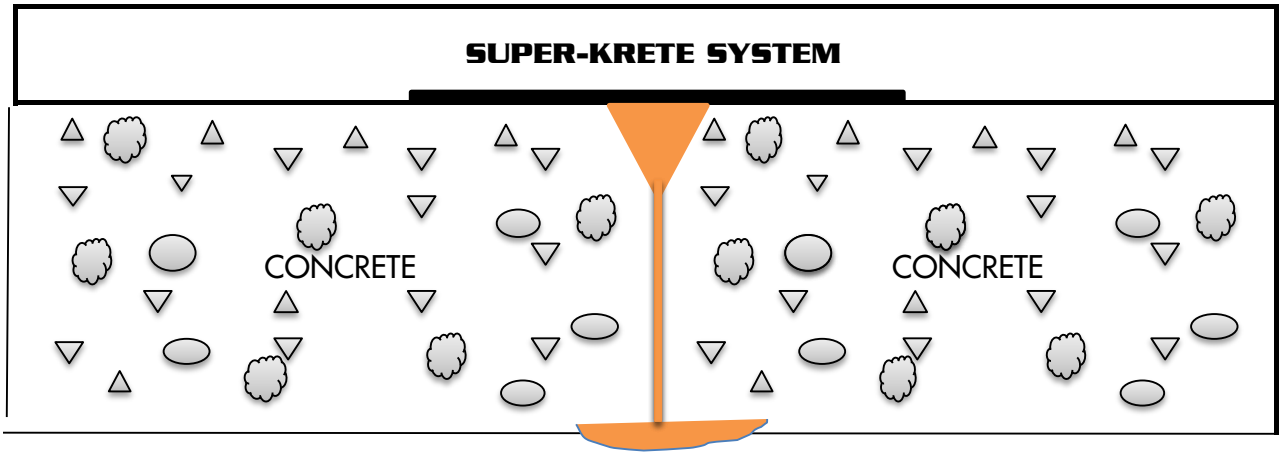


CRACK RESTORATION 8

CRACK REPAIR BY GRAVIY POUR WITH BOND BREAKER TAPE

Slight movement expected at crack - Crack is "Veed" out, filled and bond breaker tape

1. "Veed" OUT CRACK
2. Gravity feed epoxy - SK-E400 Clear (Regular or Fast Cure)
3. Might require several pours since material will slump
4. Bond breaker tape spreads dimentional stress

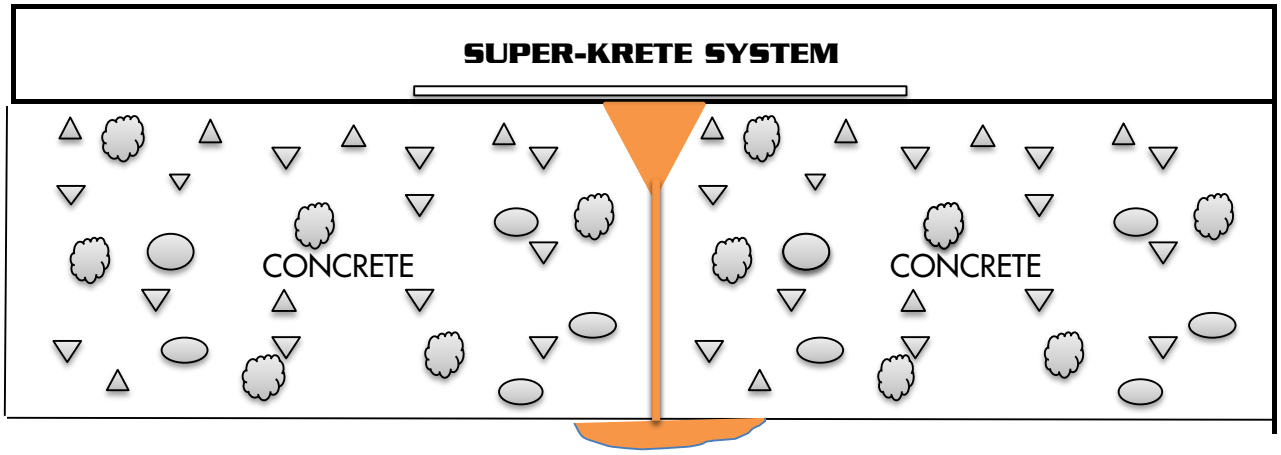


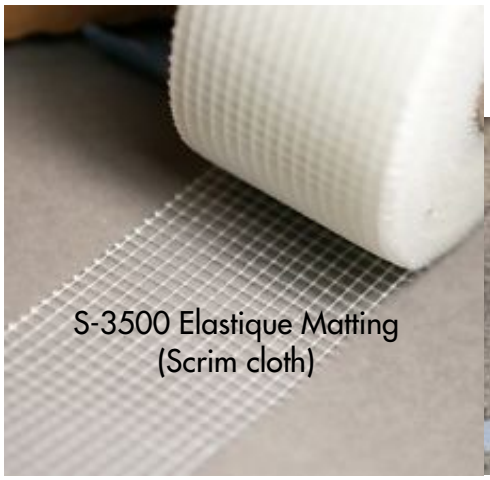
CRACK RESTORATION 9

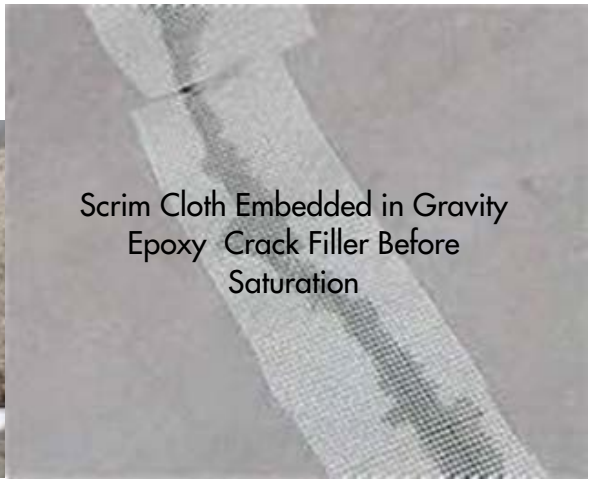
DIMENSIONAL STABILITY REINFORCED WITH SCRIM CLOTH

Slight movement expected at crack - Crack is "Veed" out, filled and scrim cloth

1. "Veed" OUT CRACK
2. Gravity feed epoxy - SK-E400 Clear (Regular or Fast Cure)
3. Might require several pours since material will slump
4. S-3500 Elasique Matting (Scrim Cloth)





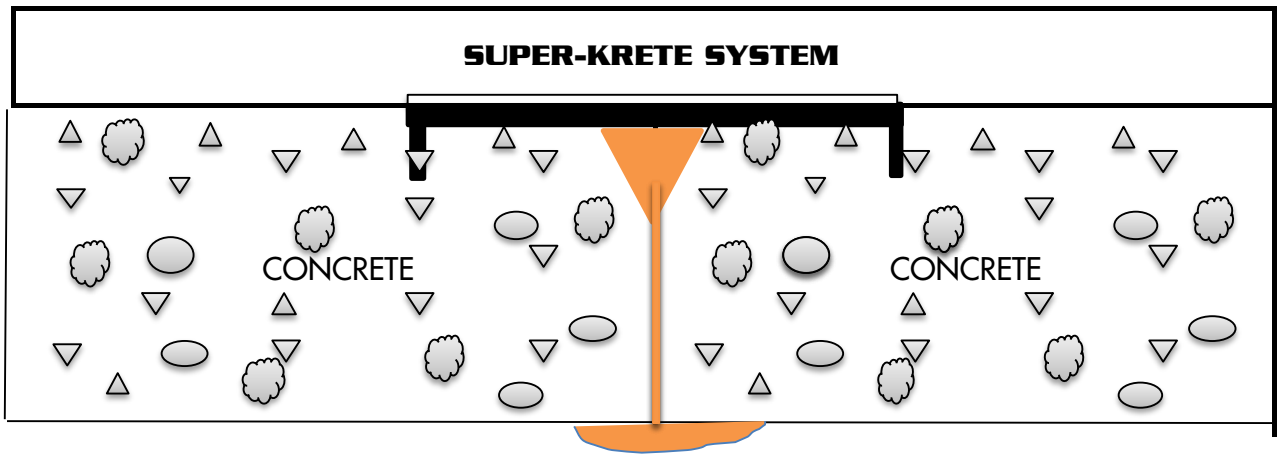


CRACK RESTORATION 10

DIMENSIONAL STABILITY REINFORCED WITH STEEL STAPLES AND SCRIM CLOTH

Rigid crack repair with graviy pour epoxy, steel staples and scrim cloth

1. "Veed" OUT CRACK
2. Gravity feed epoxy - SK-E400 Clear (Regular or Fast Cure)
3. Might require several pours since material will slump
4. Load transfer device - Steel staples
5. S-3500 Elasique Matting (Scrim Cloth)

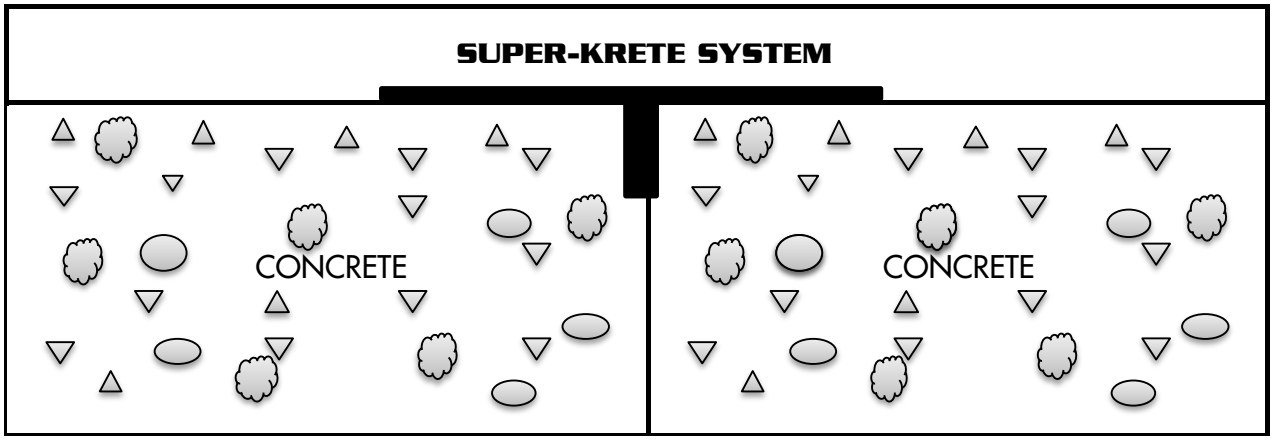


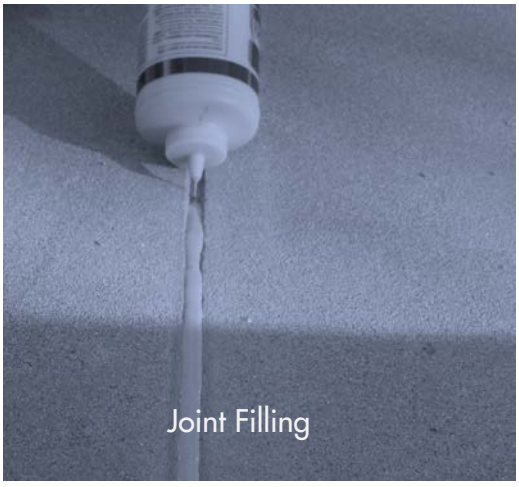
CRACK RESTORATION 11

CONTROL JOINT "WISE CRACK" FILLER

Bond breaker tape allows minor movement to be transferred over greater surface area.

1. Saw cut control joint
2. Gravity feed epoxy - SK-E300 Flex or SK-E300 Flex Paste Clear (Regular or Fast Cure)
3. Might require several pours since material will slump
4. Bond breaker tape



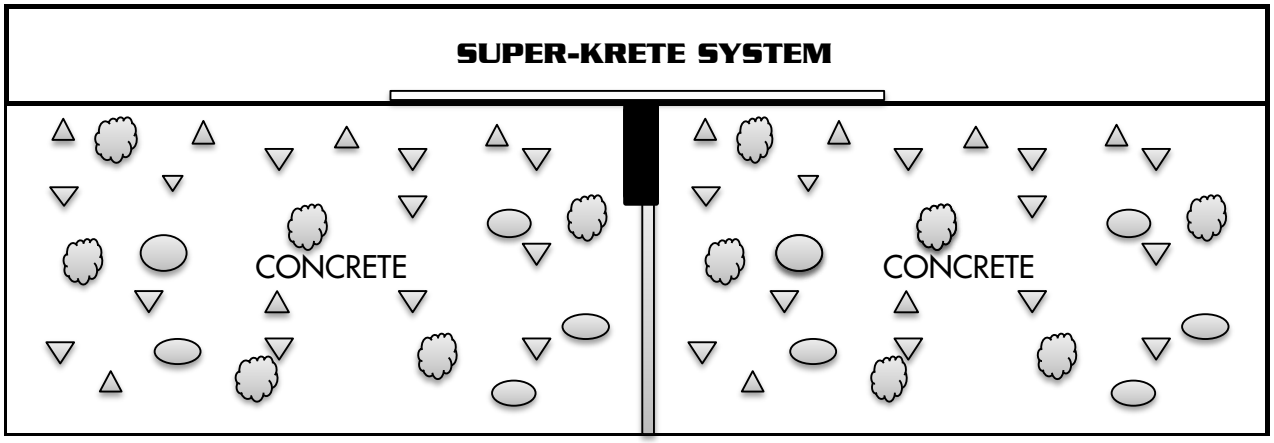


CRACK RESTORATION 12

CONTROL JOINT "WISE CRACK" FILLER

Dimensional reinforced with scrim cloth to restrict movement

1. Saw cut control joint
2. Fill bottom of control joint with fine aggregate or bond breaker tape
3. Gravity feed epoxy - SK-E300 Flex or SK-E300 Flex Paste Clear (Regular or Fast Cure)
4. Might require several pours since material will slump
5. S-3500 Elasique Matting (Scrim Cloth)

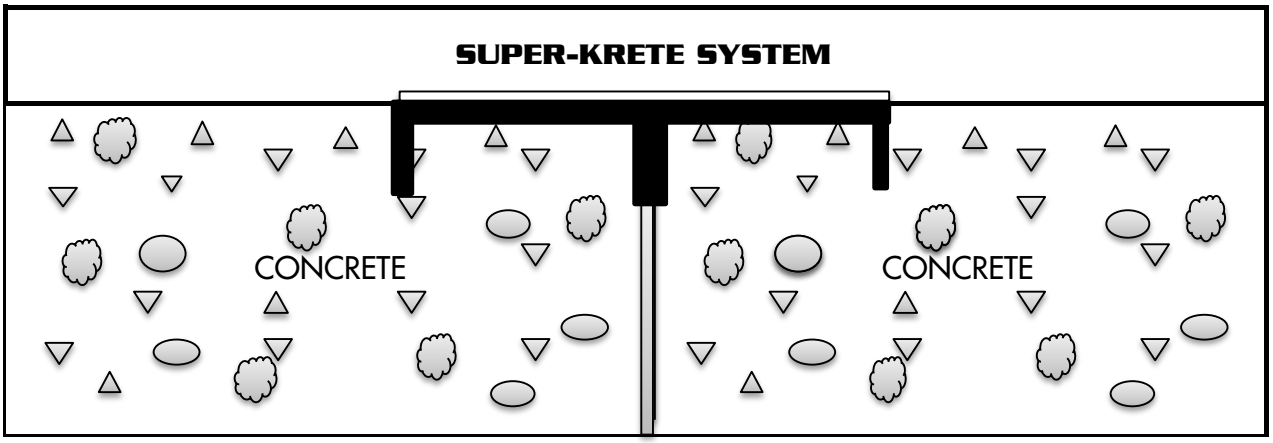


CRACK RESTORATION 13

CONTROL JOINT "WISE CRACK" FILLER

Dimensional reinforced with steel staples and scrim cloth to restrict movement

1. Saw cut control joint
2. Fill bottom of control joint with fine aggregate or bond breaker tape
3. Gravity feed epoxy - SK-E300 Flex or SK-E300 Flex Paste Clear (Regular or Fast Cure)
4. Might require several pours since material will slump
5. Load transfer device - Steel staples
6. S-3500 Elasique Matting (Scrim Cloth)



CRACK RESTORATION 14

CONTROL JOINT "WISE CRACK" FILLER

Honoring the control join subject to movement

1. Mark saw cut location and place Super-Krete material
2. Re-cut saw cut through Super-Krete material
3. Fill bottom of control joint with fine aggregate or bond breaker tape
4. Protect Super-Krete system with tape from joint filler material
5. Gravity feed epoxy - SK-E300 Flex or SK-E300 Flex Paste (Regular or Fast Cure)
6. Might require several pours since material will slump