



WATER MANAGEMENT REPAIRS

Presented By:

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Director of Product Management
Infrastructure

BUILDING TRUST



AGENDA

- INTRODUCTION
- Water Treatment Market & Overview
- Concerns & Typical Problems
- The Repair & Protect Strategy
 - Identify the Problem
 - Determine the root (s) cause
 - Assess the condition
- ✓ Sika Solutions
- CONCLUSION



WATER TREATMENT MARKET – I.R.C.

- There are 16,000 publicly owned water treatment plants in the US
 - Treat 62.5 billion gallons per day
 - 15% are at or exceeded their threshold
- Average lifespan is 40 to 50 years
 - Many constructed in the 70's due to Clean Water Act (1972)
 - Nearing end of estimated lifespan



SOME OF THE MANY ELEMENTS OF WATER TREATMENT PLANTS

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- Screen
- Sedimentation tanks
- Oil separator
- Primary sedimentation
- Bioreactor
- Final sedimentation
- Sludge digesters
- Technical Buildings



CONCERNS AT WATER TREATMENT FACILITIES

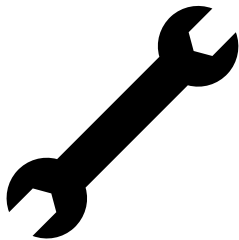
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- ANSI/NSF 61 Potable Water Approval
 - Drinking water treatments, reservoirs, tanks etc.
- Chemical Resistance
 - Concern for all water retaining structures
- Durability/Abrasion Resistance
 - Often repeated and constant abrasion at water treatment
- Down time
 - Little to no opportunity to shut facility down, constant need and use.



SELECTING A REPAIR & PROTECTION STRATEGY

1. **Identify the problem(s)**
2. Determine the root cause(s)
3. Assess the conditions



Repair

- ☐ Identify and remove the unsound concrete
- ☐ Repair the cracks
- ☐ Repair the spalls
 - ☐ Clean or replace the reinforcement
 - ☐ Coat the reinforcement
- ☐ Strengthen

Protect

- ☐ Treat the latent corrosion
- ☐ Apply protective coatings/sealers
- ☐ Seal the joints

CAUSES FOR DETERIORATION OF WATER TREATMENT PLANTS

- Biological (micro organisms)
- Reactive aggregates (ASR)
- Dissimilar metals
- Freeze/thaw cycles
- **Impact/Abrasion**
- **Steel corrosion**
- **Chemicals/sulfates attack**



CAUSES OF CORROSION – THE 3 C'S



Chlorides



Carbonation

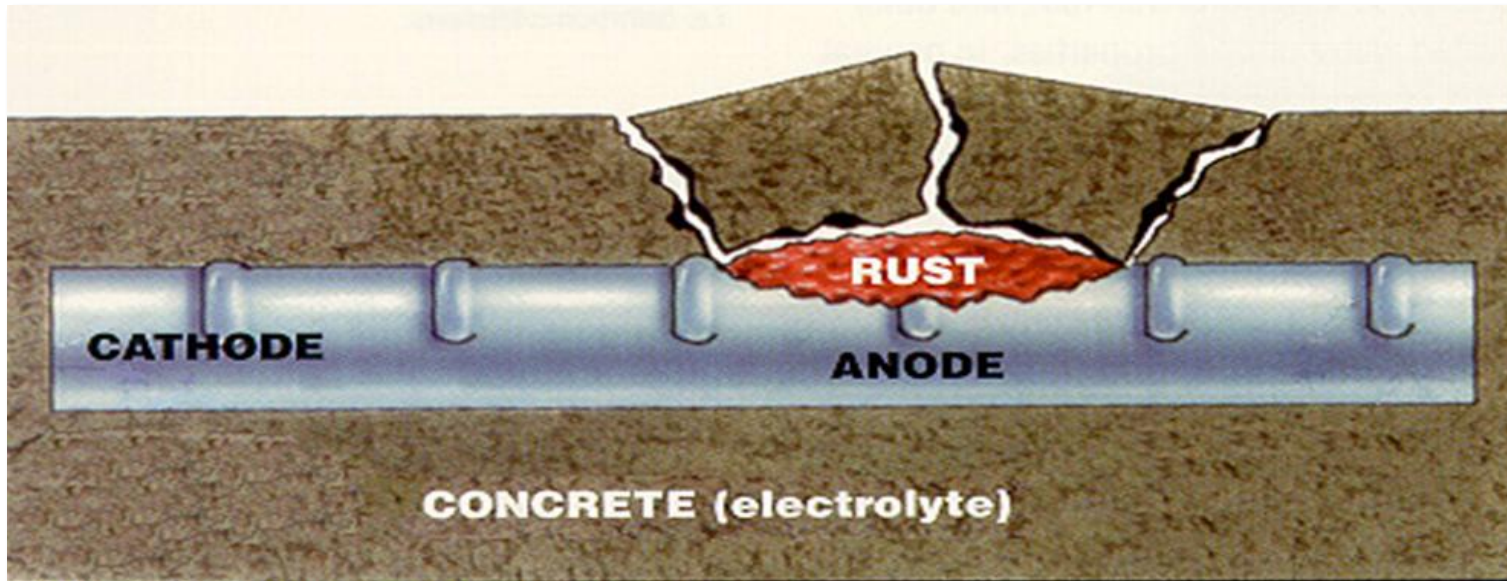


Chemical
Attack



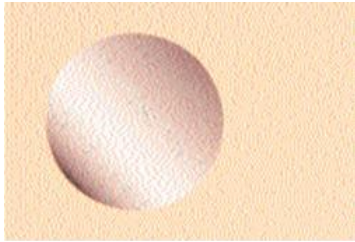
ROOT CONCERN OF STEEL CORROSION

- Anode sites form rust . . .
- Rust expands causing cracks & spalls to occur . . .

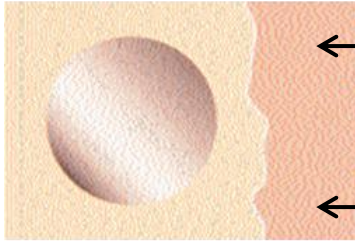


- Two things necessary to initiate corrosion: **Water & Oxygen**

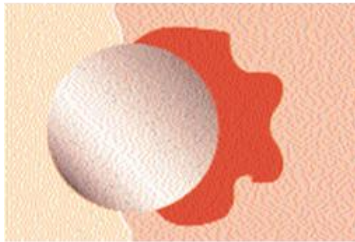
CARBONATION



- Good quality concrete ($\text{pH} = 12.7\text{-}13.2$) steel is passivated



- Carbon dioxide enters, pH begins to drop, steel is not yet affected



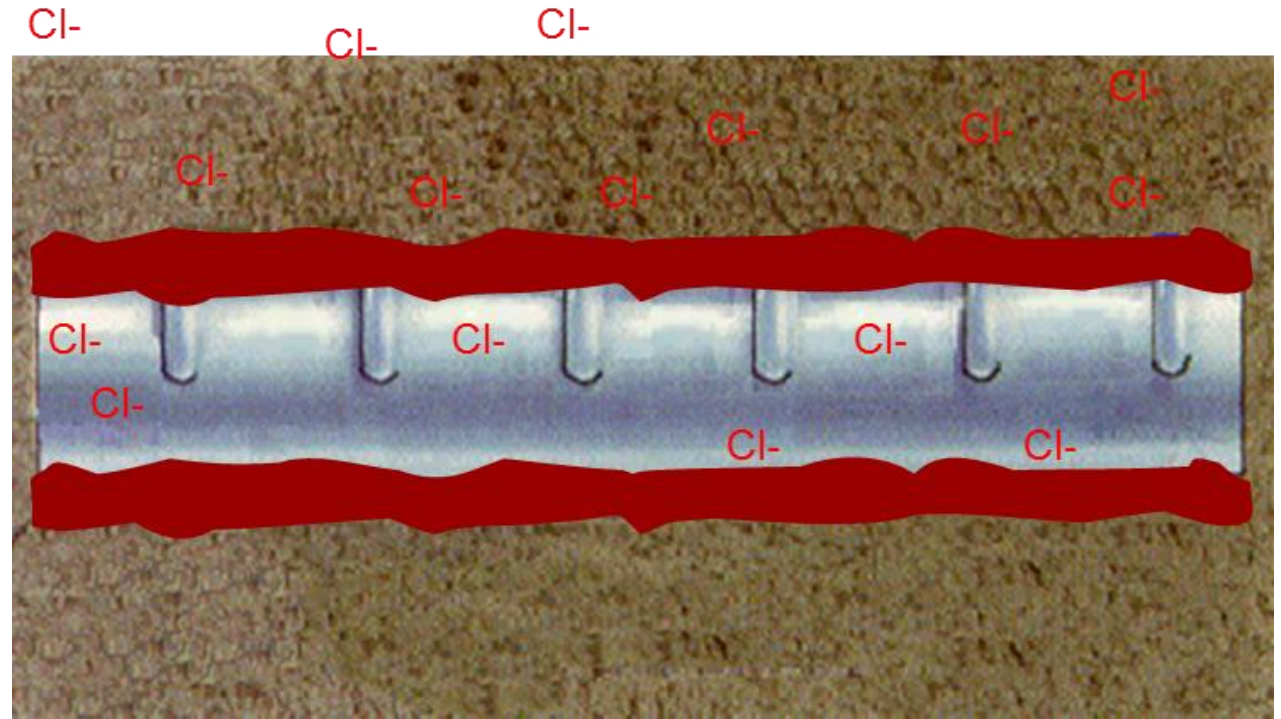
- pH at steel drops below 9.5, corrosion begins



- Volume expansion of rust causes cracking and spalling

CHLORIDE EXPOSURE

- Common threshold limit = 1.3 lbs./y³ concrete
 - ACI – 222 recommends a lower limit
- Chlorides require water and oxygen to continue to cause corrosion.



SULFATE ATTACK!

- Sulfates are chemical compounds derived from natural sources as well as from manufacturing processes. (SO_4^{2-})
- In nature, sulfates of various metals, such as sodium, potassium, magnesium, and calcium occur in;
 - Internal sources
 - hydraulic cements,
 - fly ash
 - Aggregate
 - admixtures
 - External Sources
 - Soil
 - groundwater
 - seawater
 - decaying organic matter
 - industrial effluent



SULFATE ATTACK!



- Sulfates destroy cement paste, breaking it down over time
- Creates new compounds;
 - Most commonly, Ettringite, that expands and cause cracking & spalling

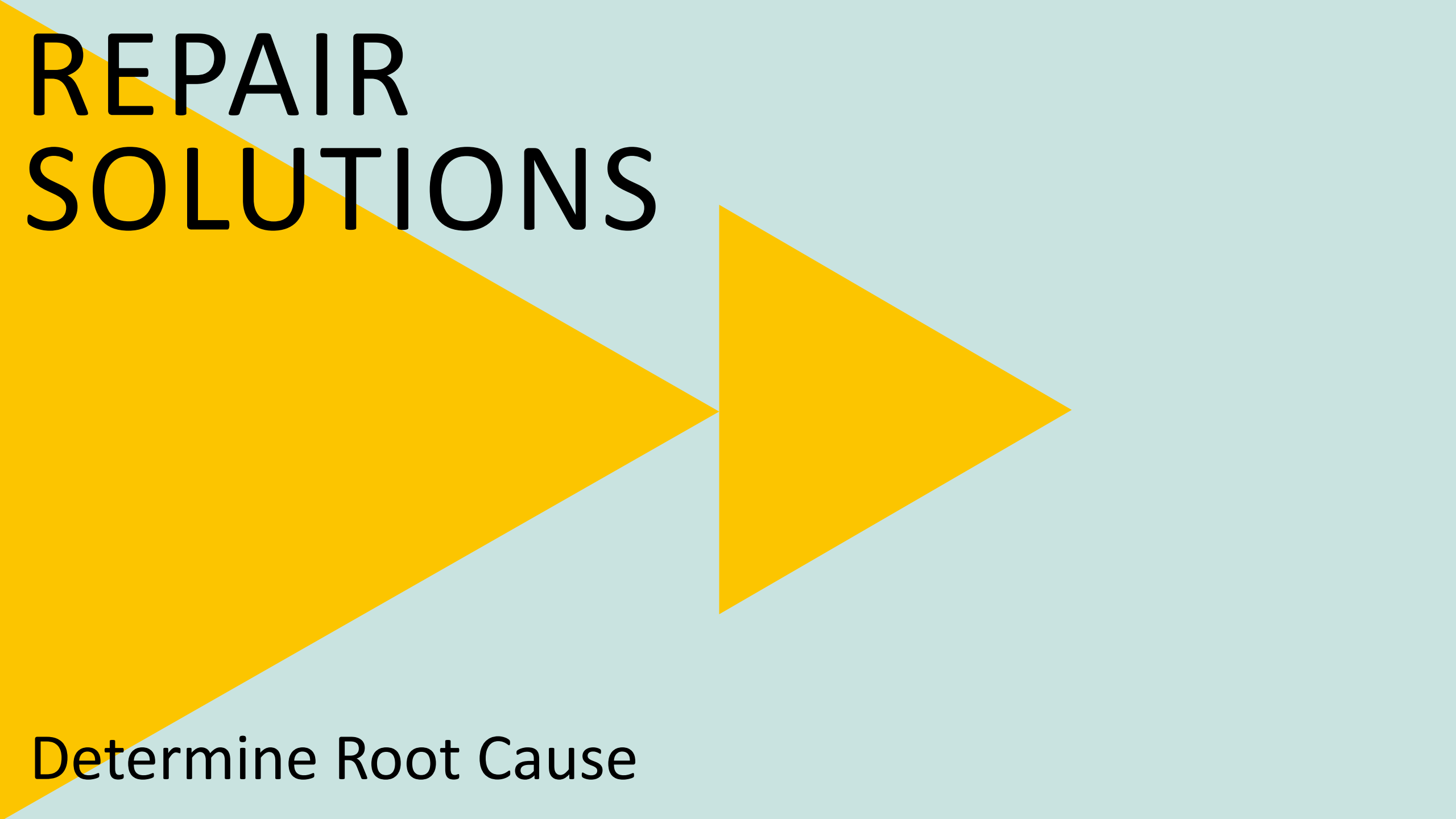
Chemical Sulfate Attack



- Evidenced by “Bloom”, salts precipitate on the surface and cause it to scale
- White salt crystallization can be seen on surface

Physical Sulfate Attack

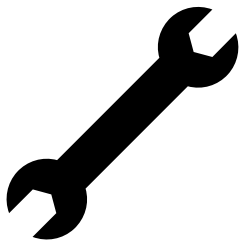
REPAIR SOLUTIONS



Determine Root Cause

SELECTING A REPAIR & PROTECTION STRATEGY

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2. **Determine the root cause(s)**
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- ☐ Seal the joints

TESTING

- Check for substrate quality
 - Scratch Test
 - Absorption
 - Rebound hammer (Schmidt)
 - Direct Tensile Pulls
- Check for moisture
 - Tramex
 - “Plastic Sheet” Test
 - Calcium Chloride
 - Relative Humidity (In Situ Probes)
- Check Ambient Conditions
 - Relative Humidity
 - Ambient Temp.
 - Substrate Temp.
 - DEW POINT

OVERVIEW OF COMMON TESTING PROCEDURES



Scratch Testing



Pull-Off Testing



Moisture Testing



Rebar Hammer Testing



Calcium Chloride Testing



RH Testing



Plastic Sheet Test

Air Temp °C	% Relative Humidity																			
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170	180	190	200
43	42	41	40	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23
41	39	38	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20
39	37	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18
37	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
35	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14
33	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12
31	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10
29	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8
27	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6
25	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4
23	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2
21	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
19	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0		
17	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0				
15	13	12	11	10	9	8	7	6	5	4	3	2	1	0						
13	11	10	9	8	7	6	5	4	3	2	1	0								
11	9	8	7	6	5	4	3	2	1	0										
9	7	6	5	4	3	2	1	0												
7	5	4	3	2	1	0														
5	3	2	1	0																
3	1	0																		
1	0																			
0																				

Dew Point Testing

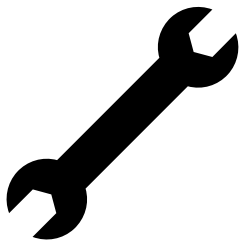
REPAIR & PROTECTION

Three large, solid yellow triangles are arranged horizontally, overlapping each other from left to right. They are all pointing towards the right side of the frame.

Assess the Conditions

SELECTING A REPAIR & PROTECTION STRATEGY

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TYPICAL REPAIRS OF A WATER TREATMENT PLANT

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- Grouting
- Joint Sealing
- Structural Strengthening
- Concrete Repair
- Crack Repair
- Protective Coatings



PRODUCT SELECTION CRITERIA

- Movement requirements
- Chemical Resistivity
- Moisture Conditions
- Substrate quality
- Life Cycle expectations
- Sustainability/Environmental Impact
- Potable Water exposure



SUBSTRATE PREPARATION



SURFACE PREPARATION

- Industry Focus & Aid
 - Extremely Sensitive Topic
- ICRI => 30+ years Servicing Industry
 - www.icri.org
- Useful Guides:
 - Surface Prep for Deteriorated Concrete = #310.1R
 - Surface Prep Methods = #310.2R



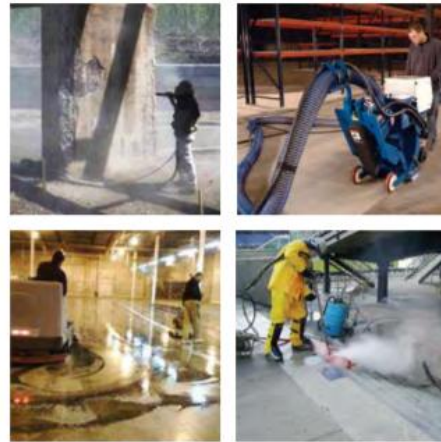
SURFACE PREPARATION



TECHNICAL GUIDELINES

Prepared by the International Concrete Repair Institute

October 2013



Guideline No. 310.2R-2013

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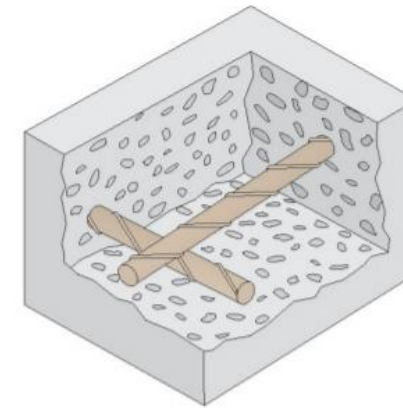
**Selecting and Specifying Concrete
Surface Preparation for Sealers,
Coatings, Polymer Overlays, and
Concrete Repair**



TECHNICAL GUIDELINES

Prepared by the International Concrete Repair Institute

December 2008



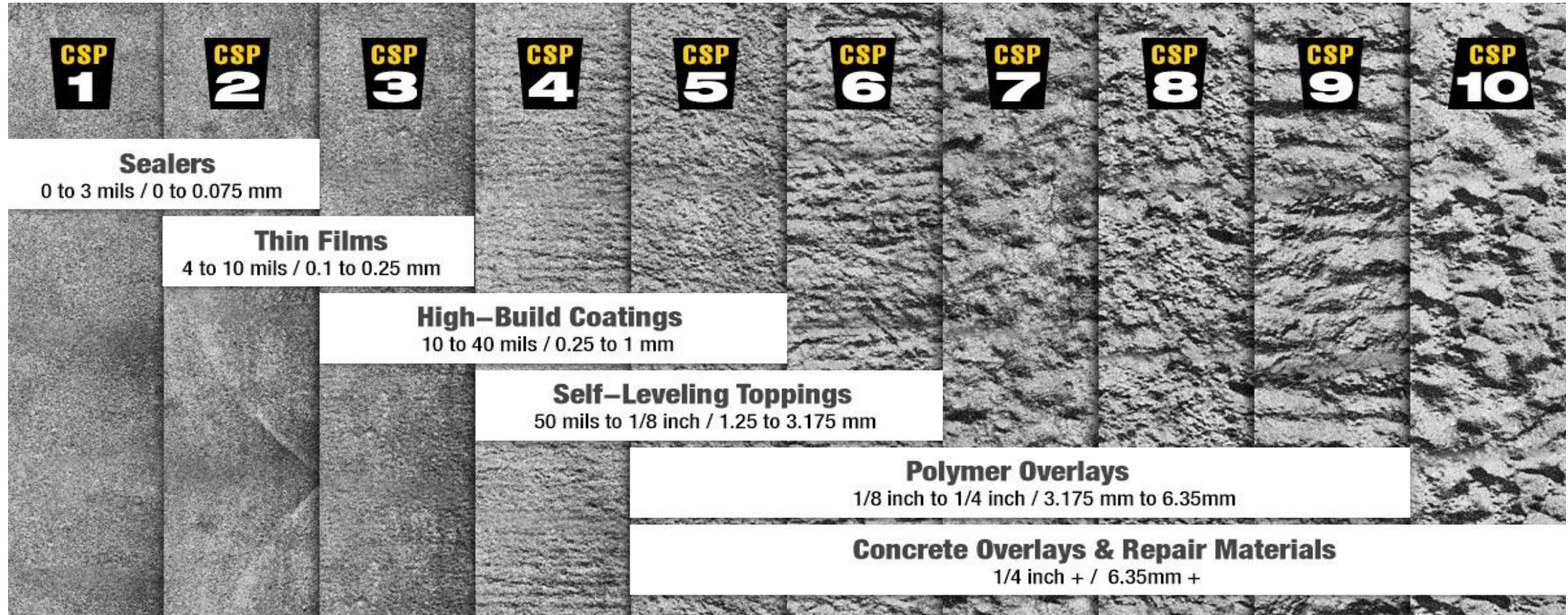
Guideline No. 310.1R-2008 (formerly No. 03730)

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**Guide for Surface Preparation
for the Repair of Deteriorated
Concrete Resulting from
Reinforcing Steel Corrosion**

INTERNATIONAL CONCRETE REPAIR INSTITUTE (ICRI)

Recommended preparation for each material



Introduction – Causes – Substrate – Application – Example – Range – Initiatives

COMPARISON OF PREPARATION METHODS FOR FLOORING



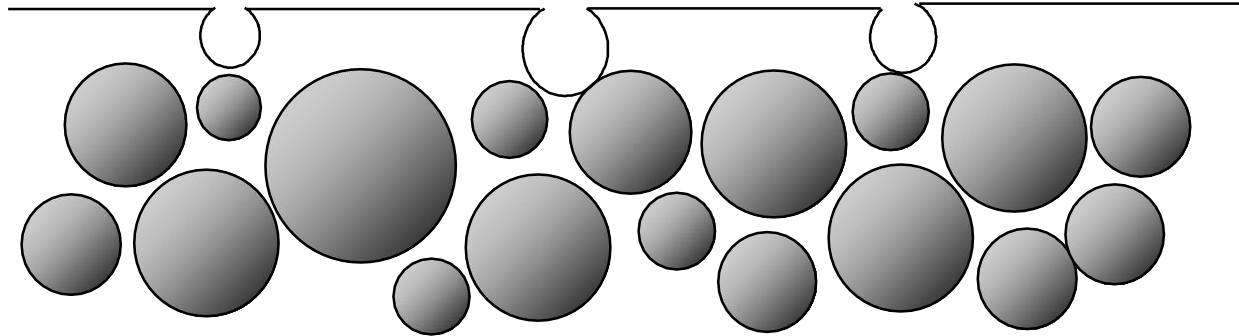
After bush hammering



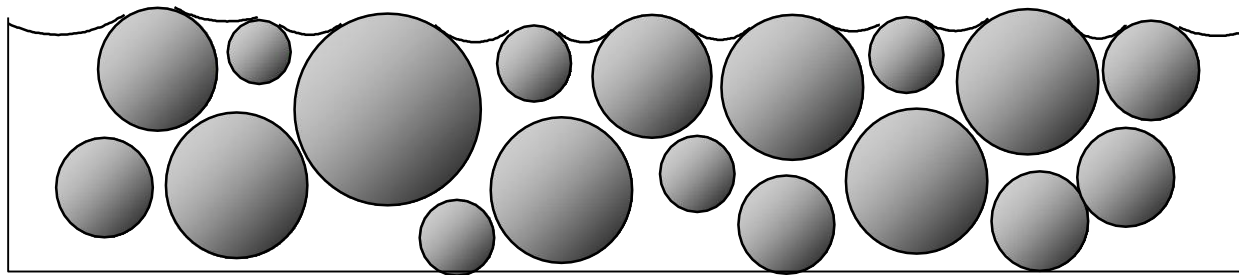
After shot/sand
blasting

THE REASON FOR SURFACE PREPARATION

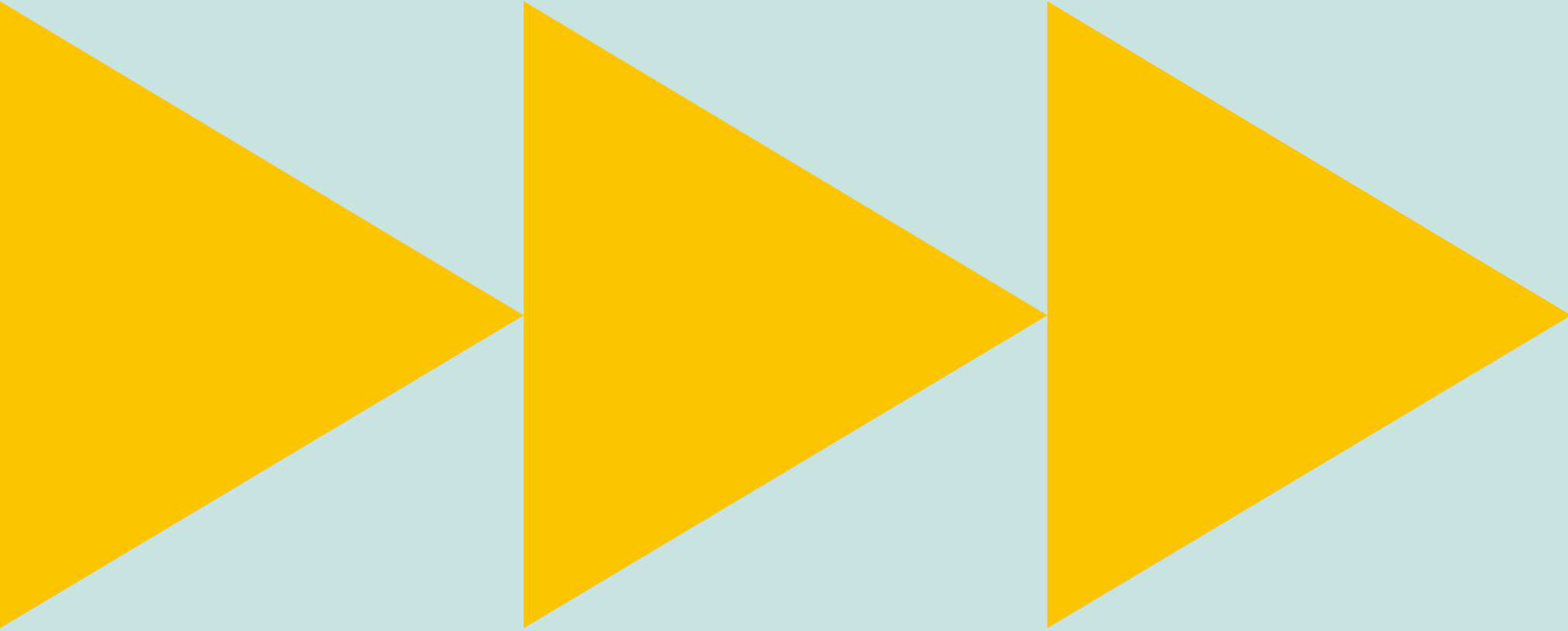
SUBSTRATE BEFORE PREPARATION



SUBSTRATE AFTER PREPARATION



SPALL REPAIR



SPALL REPAIR BASICS

- Why cementitious?
 - Thermally compatible with existing concrete
 - Freeze thaw resistant
 - Cost efficient

APPLICATION STEPS FOR REPAIRING CONCRETE

Removal of damaged concrete



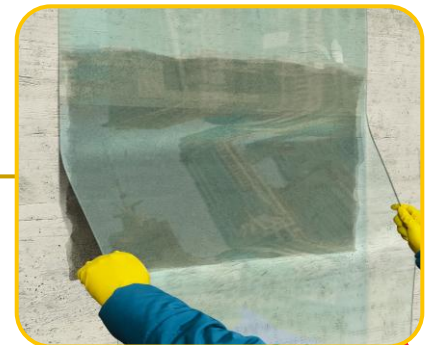
Substrate preparation



Application



Finishing and curing

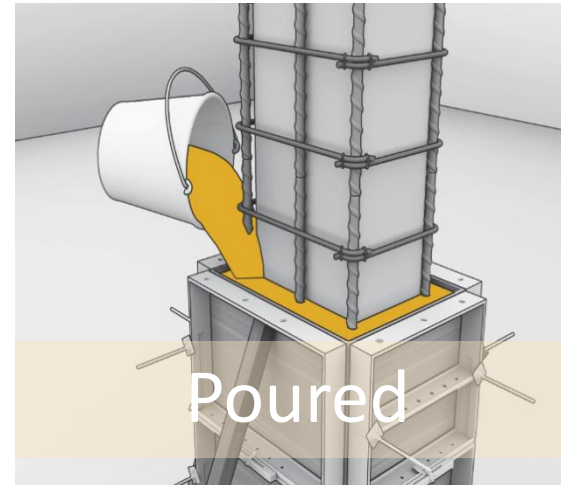
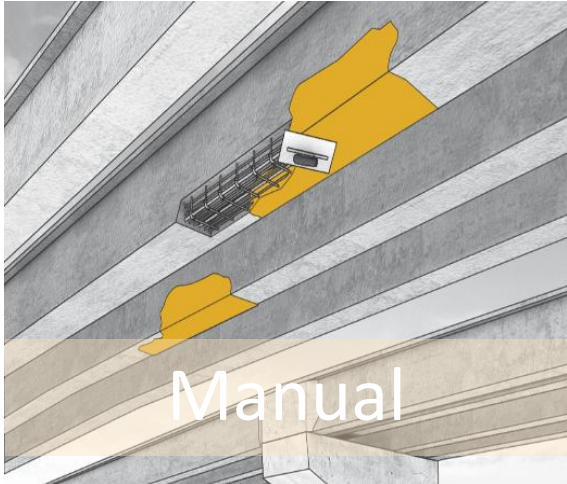


SURFACE PREPARATION

- Sawcut perimeter of patches
- Simple square/rectangular shape
- Fractured-aggregate profile
 - Min. CSP 4-5
- Clean and sound
- Saturated, surface dry



APPLICATION TECHNIQUES



SPALL REPAIR BASICS

Hand/Trowel
Applied

- Small patches

Form and
Poured

- Large patches/replacement
- May be screed finished

Spray Applied

- Large scale repair and resurfacing

REBAR COATING

- Protect new and existing rebar
- Acts as a barrier to protect the reinforcing steel
- Promotes adhesion between the reinforcing steel and the repair material

SIKA ARMATEC 110 EPOCEM – OUR WORK HORSE

- 3 component, epoxy-modified cement
 - Contains corrosion inhibitor
 - Used for coating reinforcing steel and as a bonding agent
 - The product was launched in 1994
 - Has a tremendously long and successful track record
-
- This is the premium product for this application



Note: 1.65 gallon kit is shown



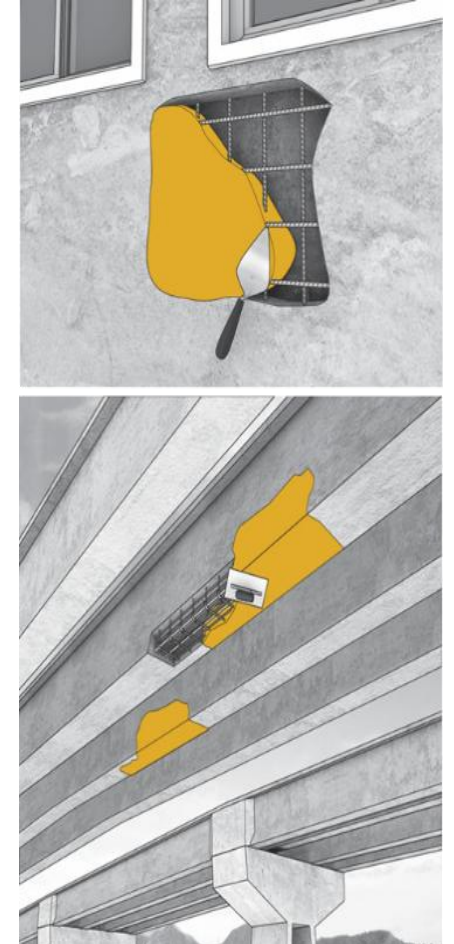
MANUAL APPLICATION

ADVANTAGES

- Perfect for small repair areas
- No problems with access or space available
- No need of special tools
- One worker can do it alone
- Easy to work with fast setting mortars
- Easy trowel finishing

HOW IT WORKS

- Mortar is first mixed and then applied in place with manual tools like trowels or spatulas.



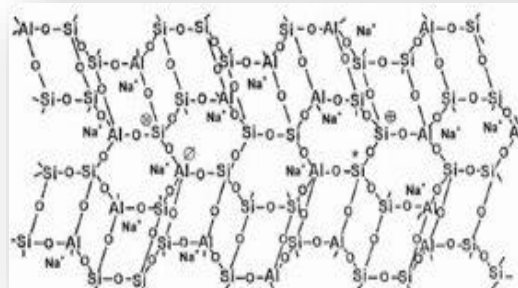
HAND/TROWEL APPLIED

- Small/medium patches
- Isolated areas
- Bonding agent or at least scrub coat
- Force repair material into the pores
- Get good compaction
- Provide mechanical locking between lifts
- Finish as desired without excess water
- Cure



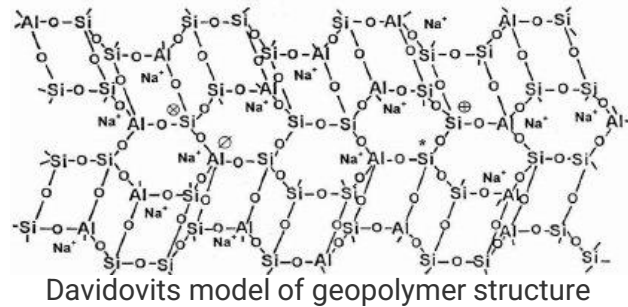
INTRO TO TECHNOLOGY

- Sika Monotop®-4500 Geo Hybrid is a new cementitious mortar based on Geo Hybrid binder technology rather than OPC
- Geo Hybrid polymers are an alkali-activated, alumino-silicate binder with high mechanical and durability properties
- Concrete repair product which can be used in several different applications
- A sustainable alternative to OPC

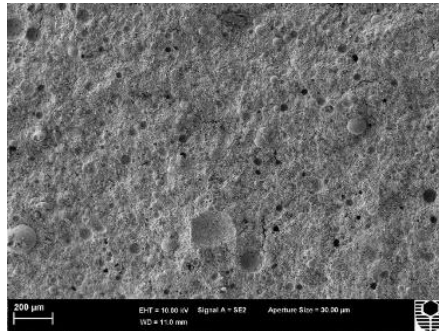
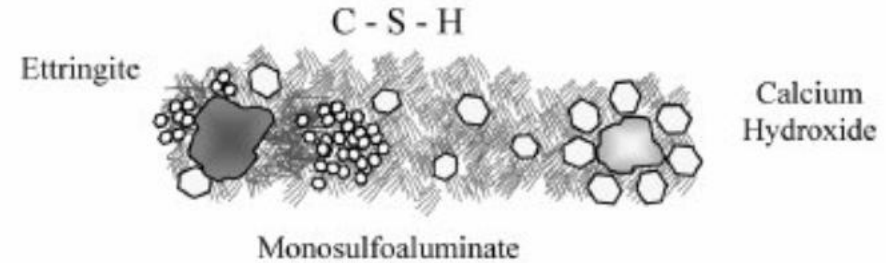


WHAT IS GEOPOLYMER, WHAT IS GEOHYBRID TECHNOLOGY CEMENT REPLACEMENT TECHNOLOGY

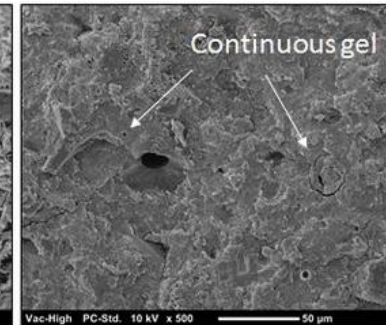
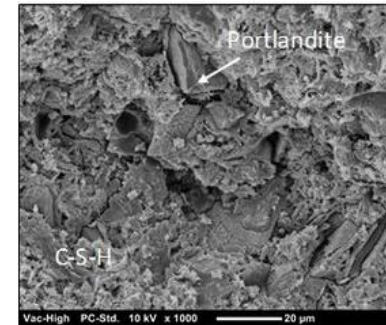
GEOPOLYMER



Ordinary Portland Cement (OPC)



Cement (OPC) is the adhesive bonding the sand and rocks in mortar/concrete



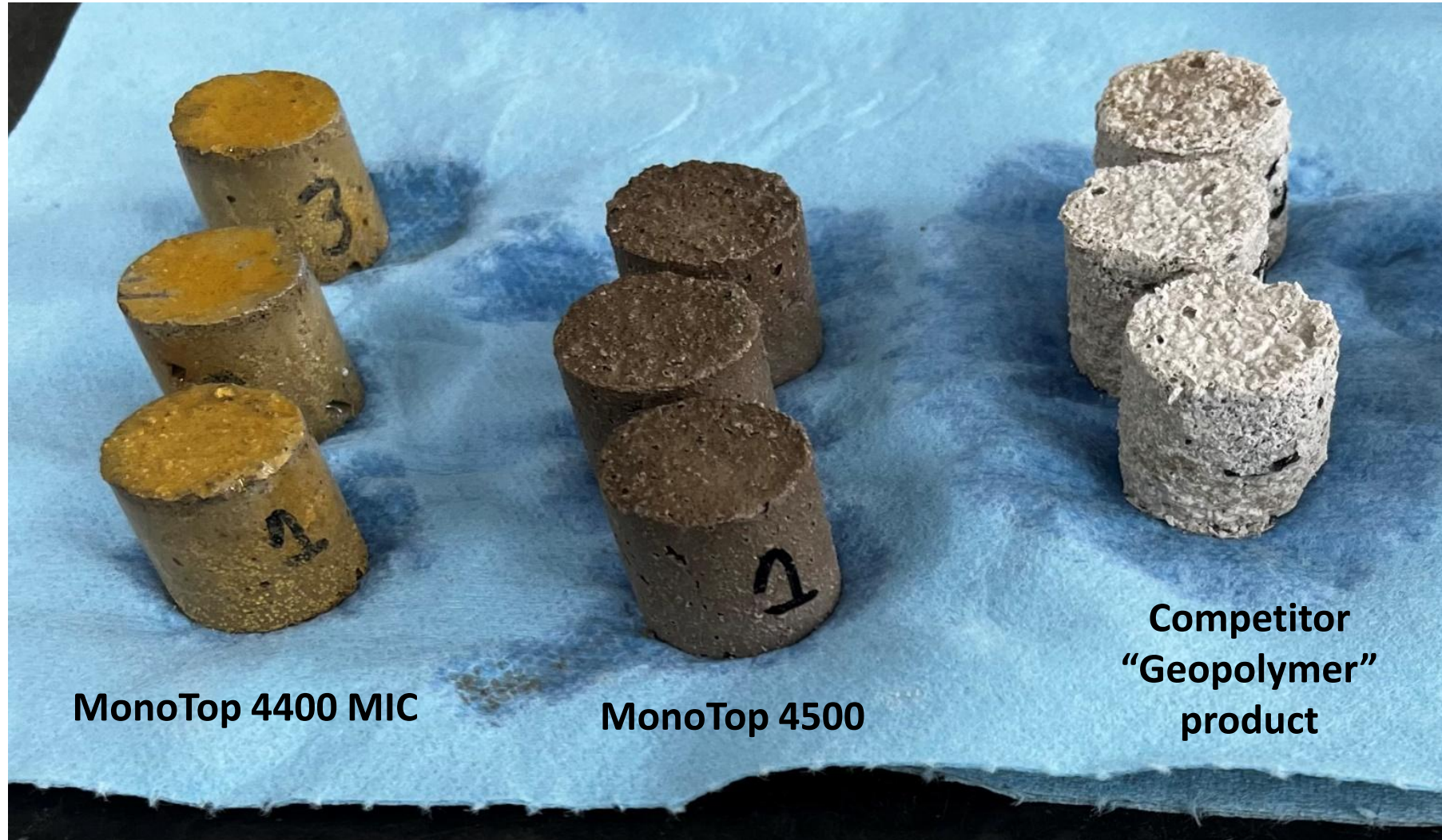
GEOHYBRID TECHNOLOGY

NEW GEOHYBRID PRODUCTS

- Sika MonoTop®-4500 GeoHybrid
 - Geopolymer vertical / overhead
 - Low Velocity Spray applications
 - Up to 3" vertical in one application
 - 1" overhead without reinforcement
 - Excellent chemical resistance (H₂S)
 - Waste water applications
 - Can be used for horizontal applications w/ higher H₂O
- Sikacrete 900 Geo
 - Wet spray - High velocity
 - Sewer / Waste Water
 - Larger depths, greater coverage



ACID (H_2SO_4) ATTACK COMPARED TO OTHER BINDER TYPES (NEEDED FOR SEWER REHAB)



SPRAY APPLICATION TRIALS



- Wet Spray, Corpus Christi

HAND/TROWEL APPLIED

- SikaTop 123 PLUS
 - Vertical/Overhead
- SikaTop 122 PLUS
 - Horizontal
- Highest performance
- Potable Water Approved
- Latex Modified
- Penetrating corrosion inhibitor



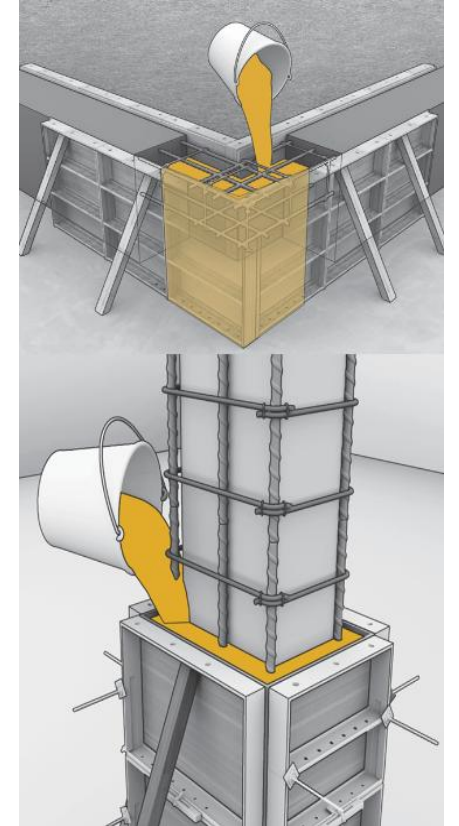
POURED APPLICATION

ADVANTAGES

- No application tools are needed
- No vibration required
- Easy to place once the formwork is prepared

HOW IT WORKS

- A formwork is built to hold the pourable repair mortar until it hardens. This formwork is watertight and capable of resisting the pressure of the mortar. Then the mixed mortar is poured inside it. No tools are required. No vibration is needed.



FORM AND POUR

- Large/deep spall areas
- Isolated repairs



NEW GEOHYBRID PRODUCTS

- SikaCrete®-6000 GeoHybrid
 - Geopolymer micro-concrete
 - Formulated with 3/8" pea gravel
 - SCC formulation
 - Low permeability
 - Excellent freeze-thaw durability
 - Improved chemical resistance
 - Deep pour applications (up to 12")



FORM AND POUR

- Sikacrete 360 SCC
 - One Component, just add water
 - Self Consolidating
 - Polymer Modified
 - Corrosion Inhibitor
 - Silica Fume
 - Low Chloride Permeability
 - Thickness = 1 - 24"



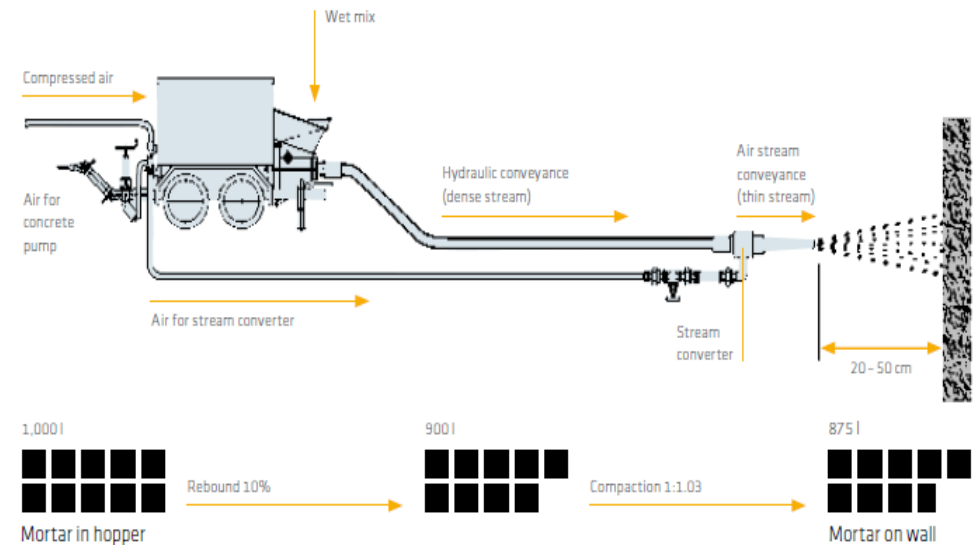
WET SPRAY APPLICATION

ADVANTAGES

- Constant mortar consistency
- Easier quality control procedures
- Reduced dust generation
- Better yield
- Suitable for application in confined spaces
- Minimum rebound
- Easy trowel finishing

HOW IT WORKS

- Mortar is first mixed and then fed to the pump. Air is added at the nozzle where it is sprayed onto the substrate



SPRAY APPLIED

- Large/widespread repair areas
- Resurfacing prior to coating



SPRAYING

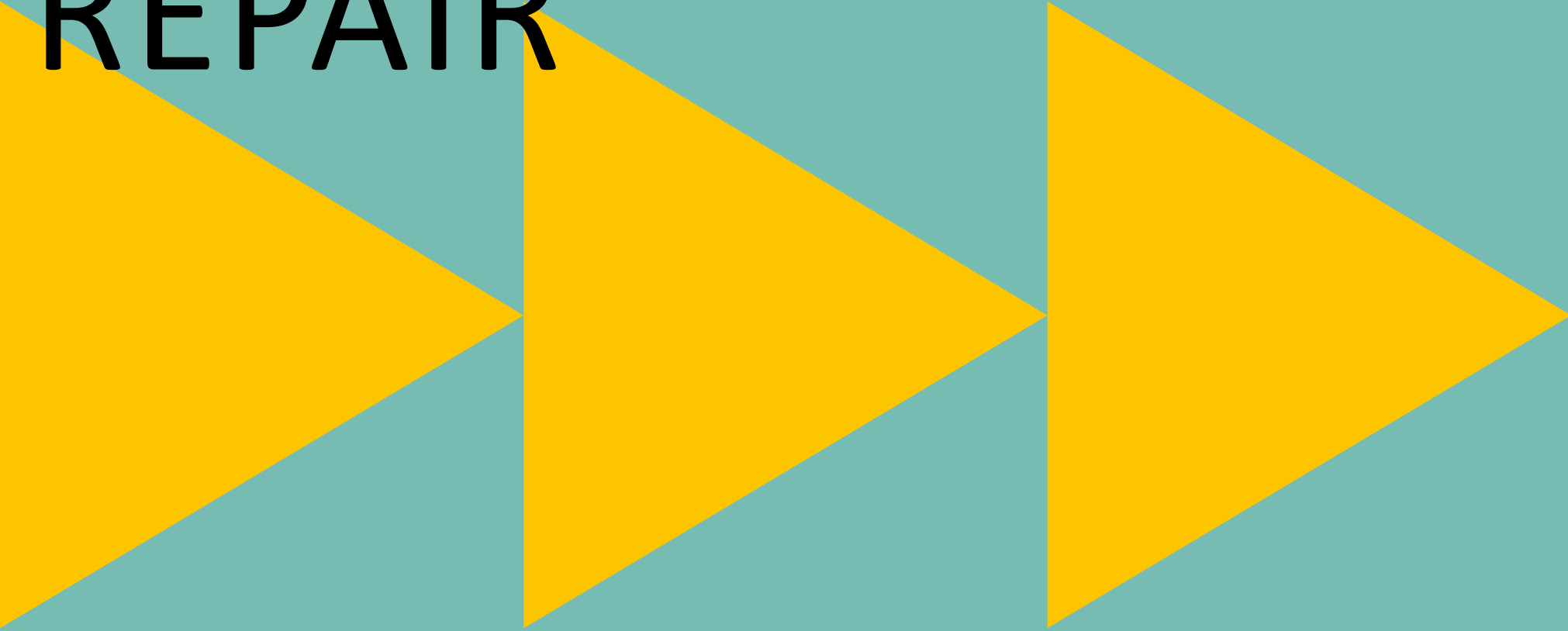


SPRAY APPLIED

- Sikacem 226 CI
 - Easy to use spray applied mortar
 - Low permeability
 - Fiber reinforced
 - Silica fume enhanced
 - Low dust, low rebound



JOINT & CRACK REPAIR



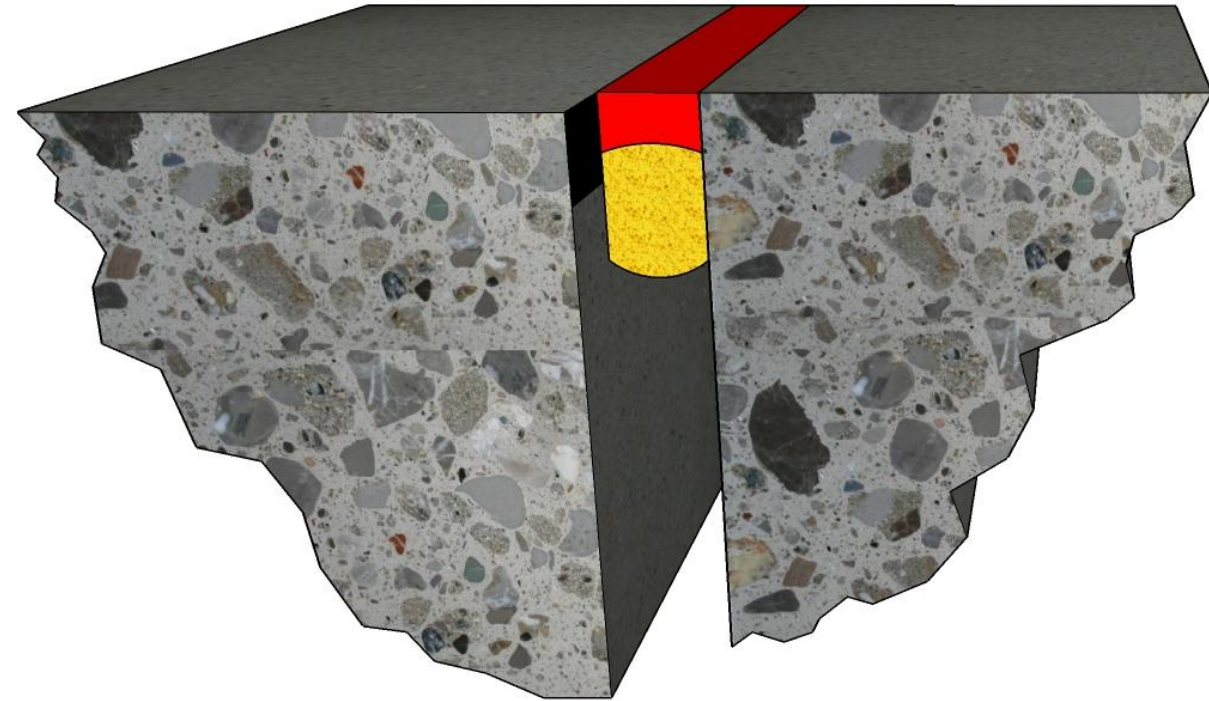
JOINT & CRACK CONSIDERATIONS

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Dynamic/Moving

Rigid/Structural

Leaking/Wet



JOINT SOLUTIONS

Property	Polyurethane	Polysulfide	Polyolefin
Type	Conventional extruded	Conventional extruded	Sheet and structural adhesive
Location	In the joint	In the joint	Surface over joint
Bond strength	Excellent	Excellent	Outstanding
Joint Movement	35-50%	25%	Extreme
Maximum Moving Joint Width	~ 1.5"	~ 1.5"	4", 8", or 12" widths
Chemical Resistance	Very good – appropriate in wastewater	Excellent – for acids & higher chemical concentrations	Outstanding
ANSI 61 Potable Water Approved	Yes	yes	Yes

WASTE WATER TREATMENT: JOINT SEALANT SELECTION

- Sikaflex 2c NS EZ Mix/SL
 - 2 component polyurethane sealant
 - +50%/-25% Movement capability
 - Meets ANSI/NSF 61 for potable water
 - Commonly used when overcoating



- Sika Duoflex NS/SL
 - 2 component polysulfide sealant
 - ± 25% Movement capability
 - Meets ANSI/NSF 61 for potable water
 - High Chemical resistance



JOINT DESIGN

Sealant dimensions

- 2 wide : 1 deep is preferred
- 1 wide : 1 deep is acceptable
- Avoid deeper than wide
- Maximum depth $\frac{1}{2}$ ", possible to go deeper with 2 component sealant
- Minimum depth $\frac{1}{4}$ ", to endure traffic
- minimum depth $\frac{1}{2}$ "

Width	$\frac{1}{4}$ "	$\frac{1}{2}$ "	$\frac{3}{4}$ "	1"	1 $\frac{1}{4}$ "	1 $\frac{1}{2}$ "
Depth	$\frac{1}{4}$ "	$\frac{1}{4}$ "- $\frac{1}{2}$ "	$\frac{1}{2}$ "	$\frac{1}{2}$ "	$\frac{1}{2}$ "	$\frac{1}{2}$ "

Prevent 3-sided adhesion with backer rod or bond-breaker tape

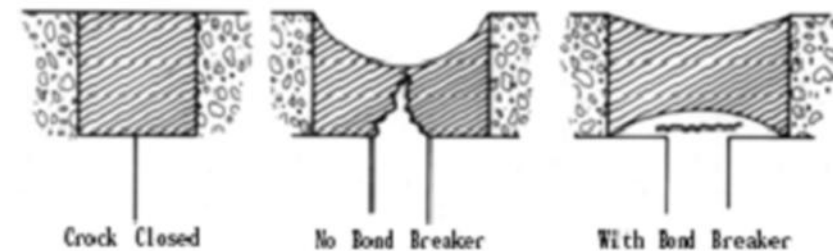
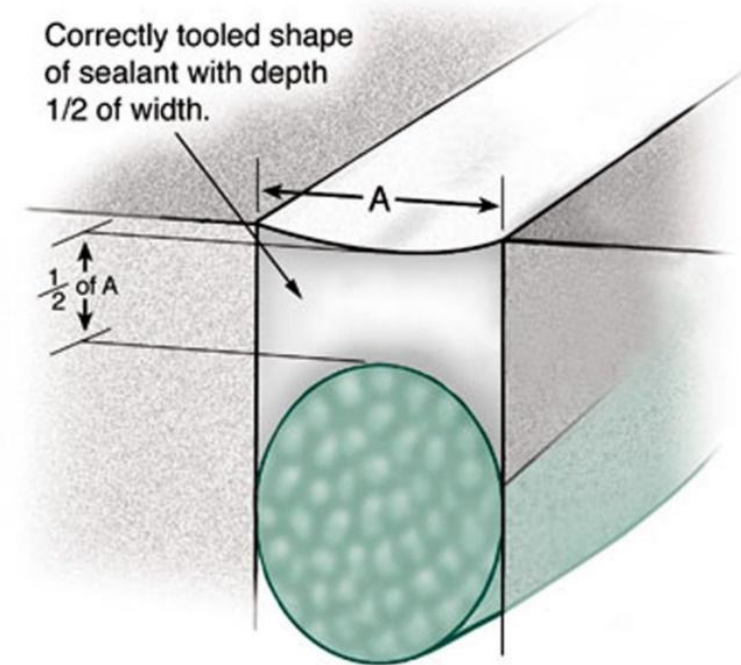


Fig. 3.2-Effect of bond breaker

POLYURETHANE & POLYSULFIDE SEALANT INSTALLATION



- Joint surface cleaned & prepared
- Primed
- Backed with rod or tape
- Gunned & tooled

COVE JOINT SEALING



- Bond surface cleaned & prepared
- Primed
- Backed with rod or tape
- Gunned & tooled

POLYURETHANE & POLYSULFIDE SEALANT INSTALLATION

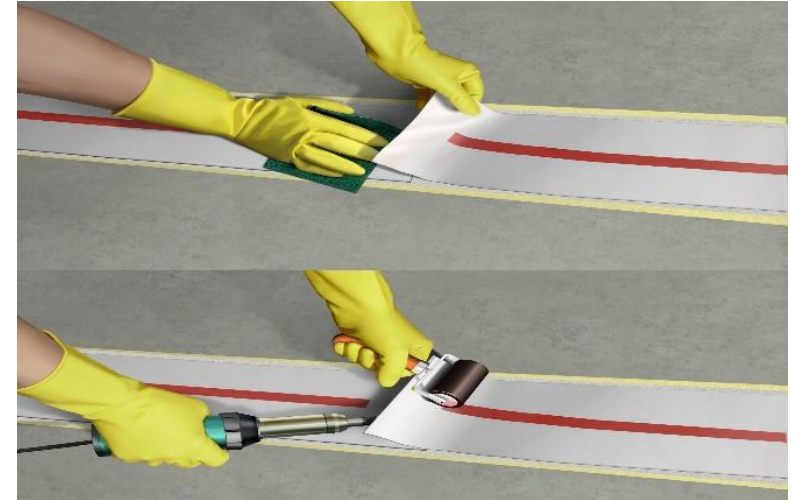
- Completed joint



SIKADUR COMBIFLEX SG SYSTEM

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- High performance joint sealing system for construction, expansion and connection joints as well as for cracks.
- Allows irregular and high movement in more than one direction, while maintaining a high quality seal.
- Consists of a modified flexible Polyolefin (FPO) waterproofing tape with advanced adhesion using Sikadur 31, Hi-Mod Gel (1:1 Mix Ratio)

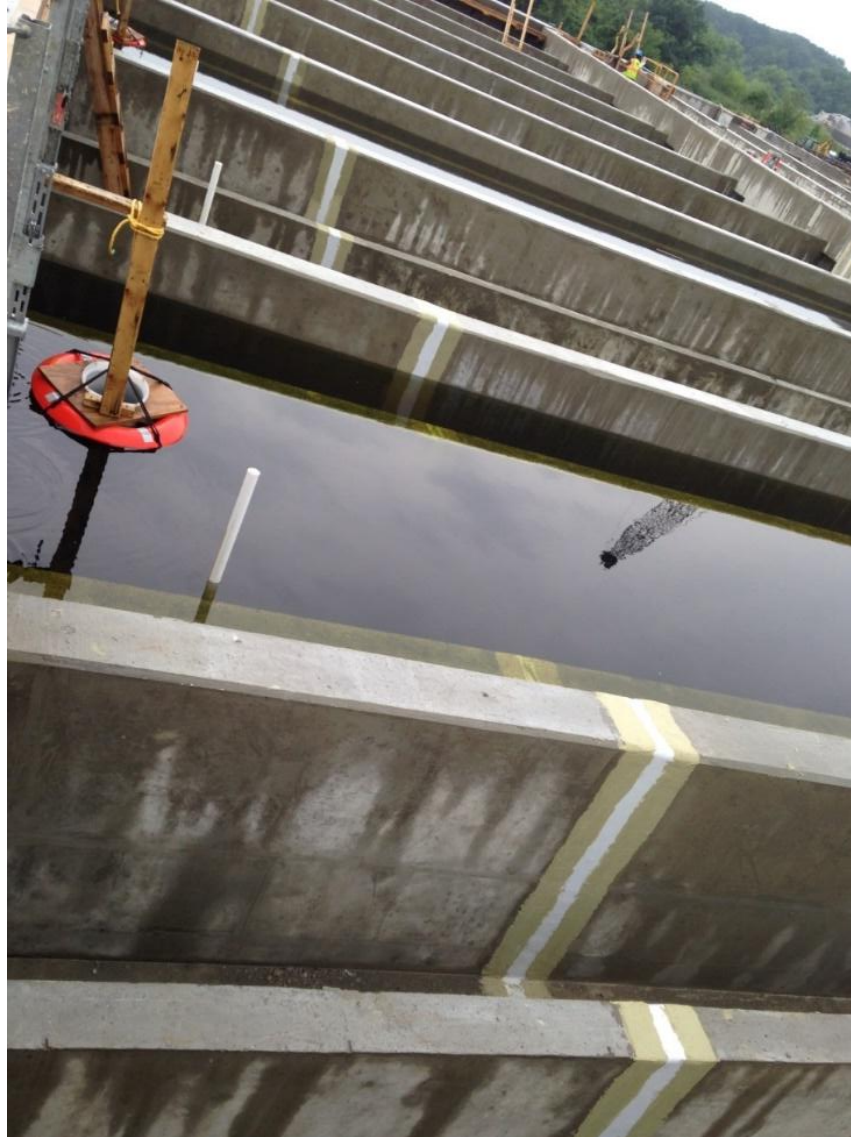


POLYOLEFIN SHEET SEALING SYSTEM – COMBIFLEX SG



- Surface cleaned & prepared
- Joint typically filled with polyurethane sealant as backing and prevent edge rubbing
- Epoxy gel applied to both sides
- Polyolefin sheet embedded (4", 8", or 12" wide)

POLYOLEFIN SHEET SEALING SYSTEM – COMBIFLEX SG



- Epoxy gel repeated to sandwich sheet
- 82' roll lengths
- Heat weld to join

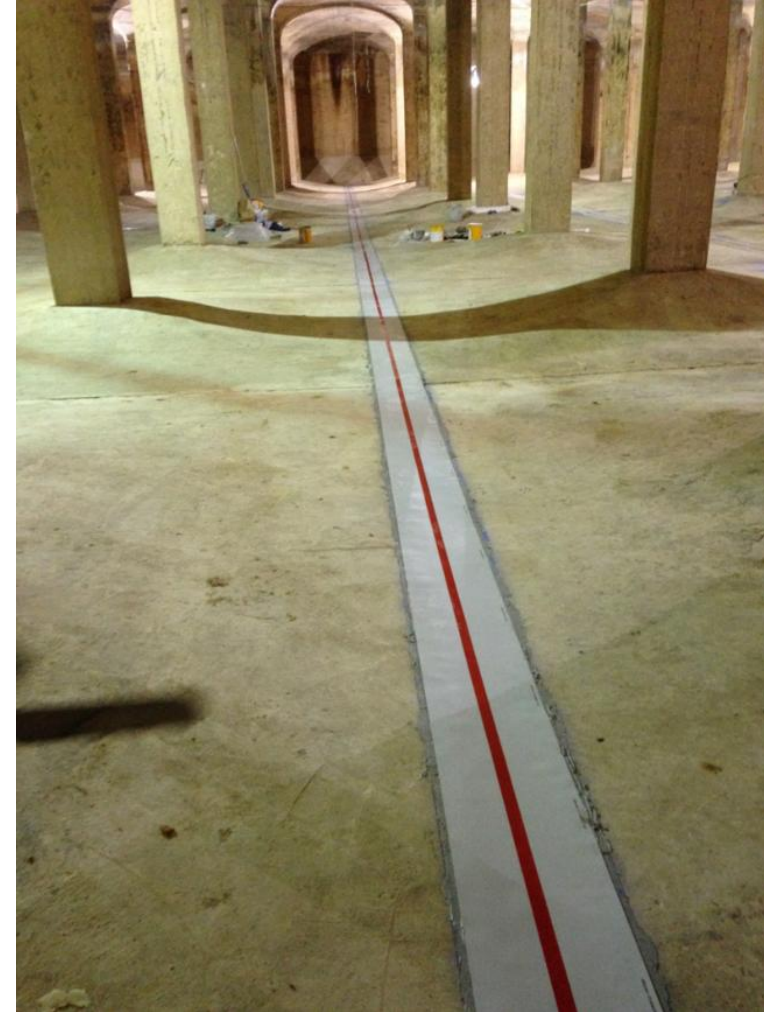
Back River WWTP

FIRST HIGH RESERVOIR, DCWSA – SIKADUR COMBIFLEX SG

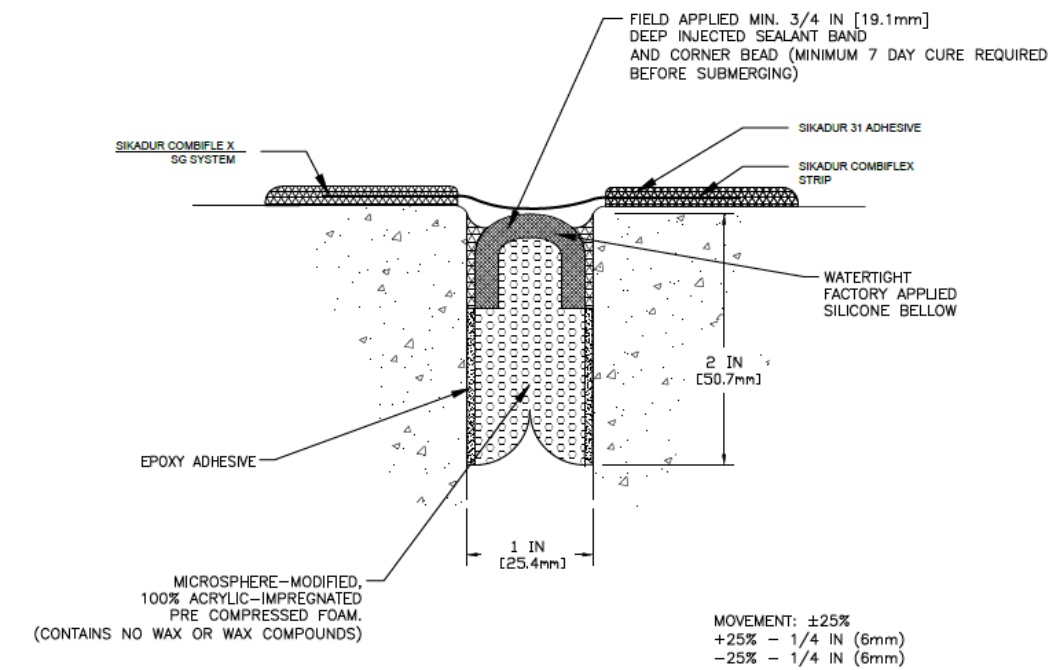


- Stop leakage out
- Stop seepage in
- Prevent old joint material contamination

FIRST HIGH RESERVOIR, DCWSA – SIKADUR COMBIFLEX SG



SIKADUR COMBIFLEX SG



 BUILDING TRUST		JOB NAME:			
		DETAIL TITLE SIKADUR COMBIFLEX SG SYSTEM			
		SCALE:	DATE:	FILE NO.:	DRW. NO.:
		N.T.S.	11/7/2019		XXX

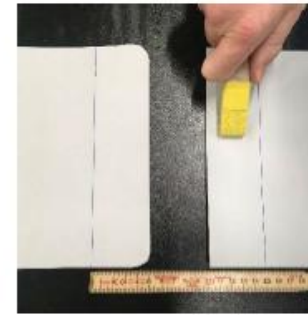
1-800-933-SIKA (7452)
www.sikausa.com



6. WELDING INSTRUCTION

The Sikadur Combiflex® SG tape ends are connected by hot air thermal welding.

- The welding area must be prepared by abrading and roughening the surface with scotch-brite pads or sandpaper. Roughen the tapes in the welding area only otherwise their adhesive bond can be affected.
- Welding temperature: 260-360°C
- Welding parameters, such as speed and temperature shall be established with trials on site, prior to any welding
- Overlaps to be 50 mm
- Hand welding in the overlap area is carried out in three steps.
 1. Spot weld the overlap
 2. Pre-weld: weld the rear overlap area so that a 20 mm flap (using a 20 mm nozzle) remains for the final welding
 3. Final weld; weld the remaining flap. Guide the roller at a distance of 20 mm parallel to the air outlet of the welding nozzle. Roll the pressure roller fully across the seam.
- Solvents such as Sika® Colma Cleaner do not improve the welding properties



6.1 EQUIPMENT - TOOLS

Professional tools and equipment are required for safe application and to produce a watertight joint / detailing installation.

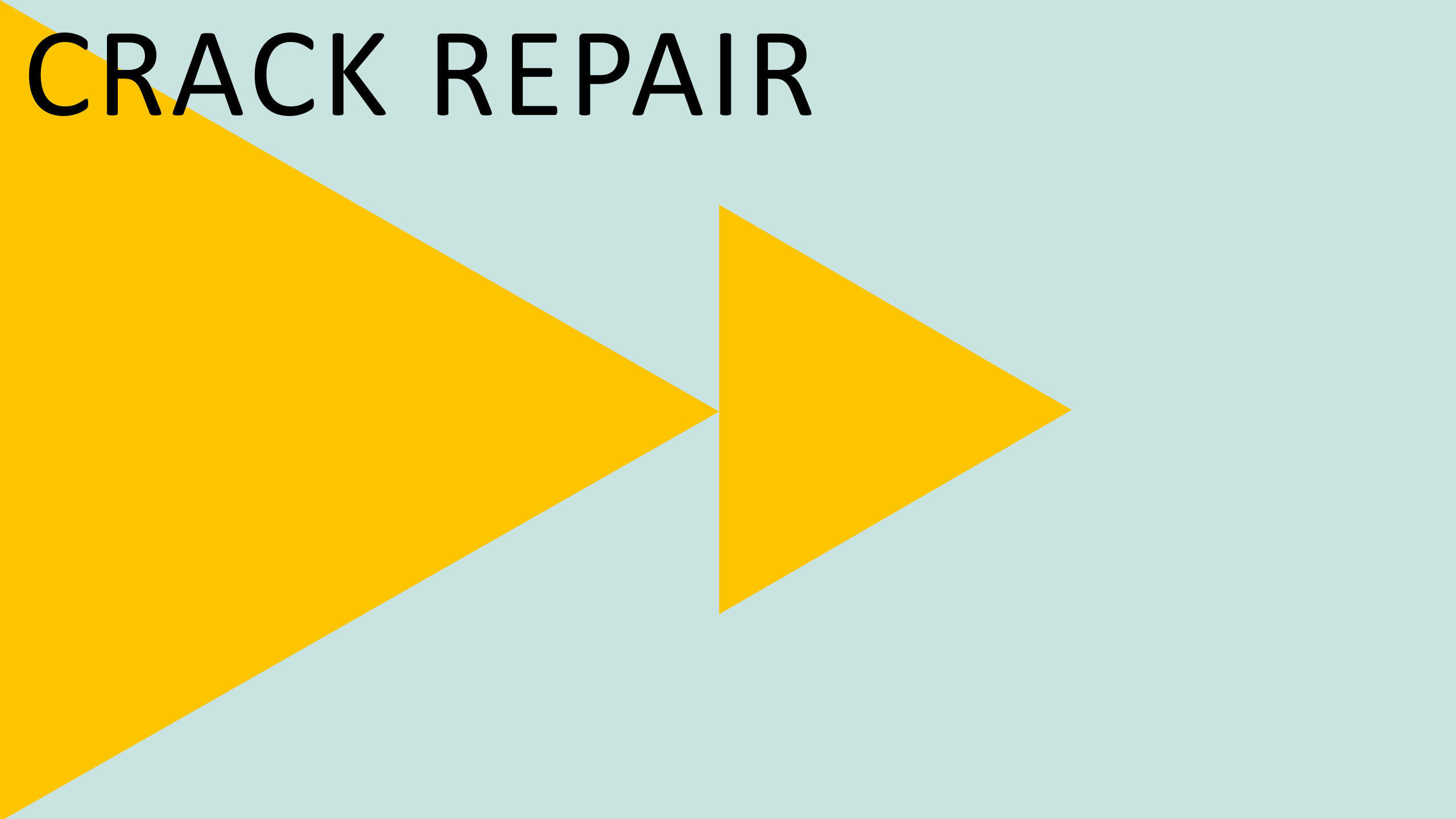
Application of the Sikadur® adhesive

- Mixing paddle (twisted bar – non air entraining)
- Trowel / spatula / brush
- Masking tape

Welding equipment

- Sandpaper / scotch bride pads
- Hot air gun for tape welding
- Wire brush to clean the hot air gun.
- Roller to apply pressure whilst welding





CRACK REPAIR

CRACK REPAIR USING REACTIVE RESINS

■ Why Do Cracks Occur in Concrete?

- Drying shrinkage
- Poor concrete practice
- Inadequate joint design
- Settlement
- Corrosion
- Inadequate structural design
- Dynamic loads (e.g. vibration, earthquakes)

Why are cracks a concern?

- Leak water and/or chemicals in or out
- Worsen with freezing/thawing
- Allow entry of water, chlorides, & CO₂ to cause corrosion of reinforcing steel resulting in further cracking and spalling of the concrete
- Hasten sulfate attack

CRACK REPAIR METHODS

- ✓ Rout and seal with polyurethane
- ✓ Rout and fill with epoxy
- ✓ Flood and fill with epoxy
- ✓ Epoxy injection
- ✓ Urethane/Acrylate injection
- ✓ Elastomeric coatings

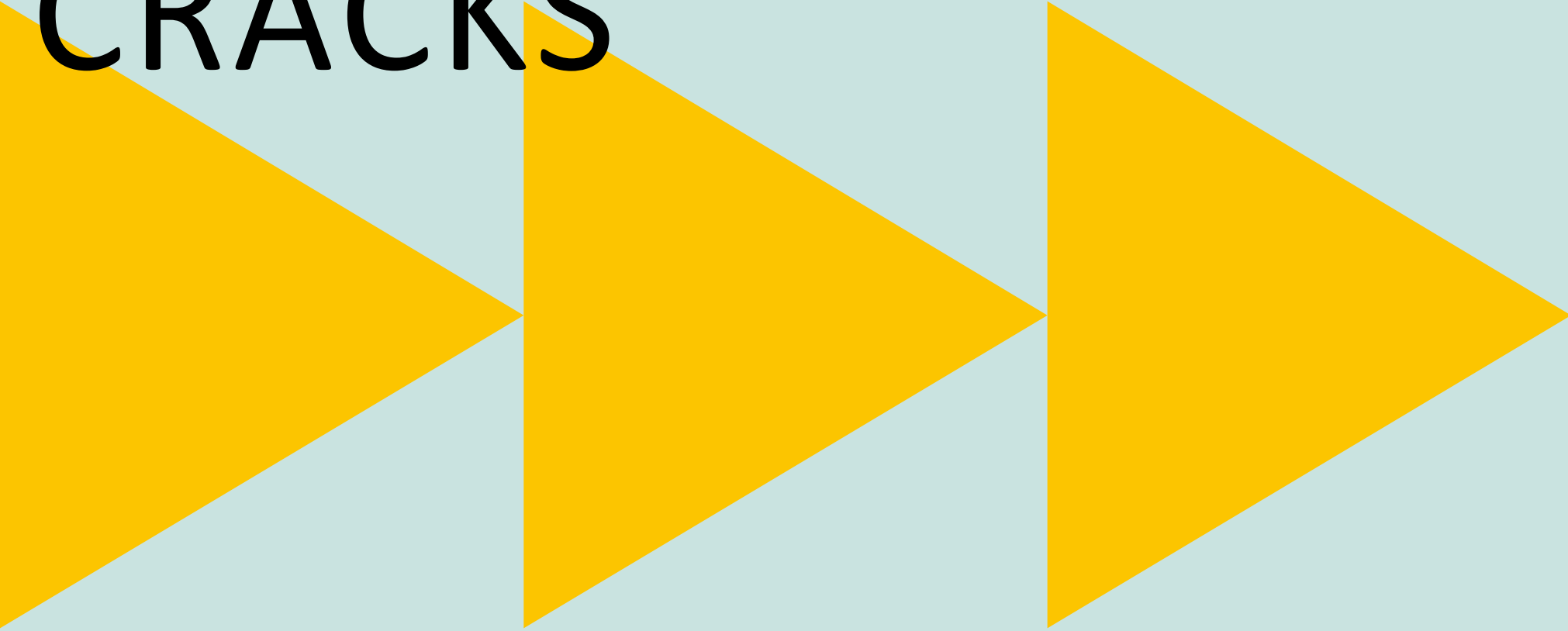


ALLOWABLE CRACK WIDTHS

ACI 224R-TABLE 4.1-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	0.004	0.10

LEAKING CRACKS



LEAKING CRACKS

MAIN CHEMISTRIES

- Polyurethane Foams
- Acrylate Gels

WHERE TO USE PU FOAMS

SIKAFIX HH, SIKA INJECTION 101RC

- Reacts with water and foams rapidly to seal leak path
- Expands approximately 35-40 times
- Expansion can start less than 20 seconds after contact with water
- Considered a temporary solution
- Requires solvents to clean injection equipment and tools
 - Should be used for active leaks with high water pressure



URETHANE INJECTION



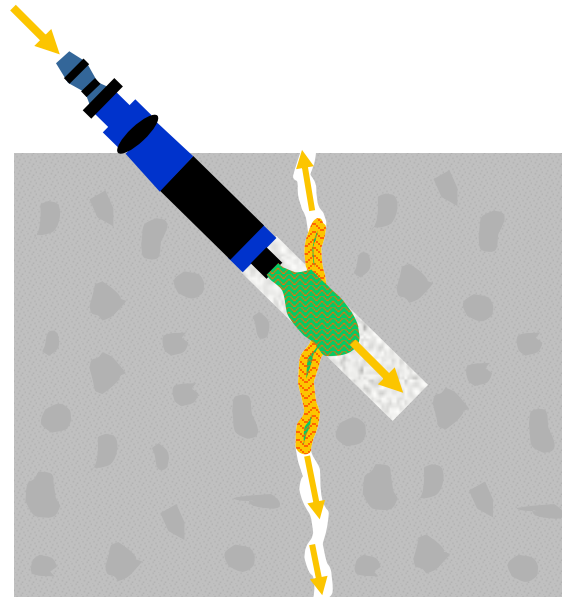
- Also known as chemical grouting
- Effective negative side waterproofing
- Works even with very active leakage
- Allows for some movement
- ANSI 61 potable water compliant



URETHANE INJECTION

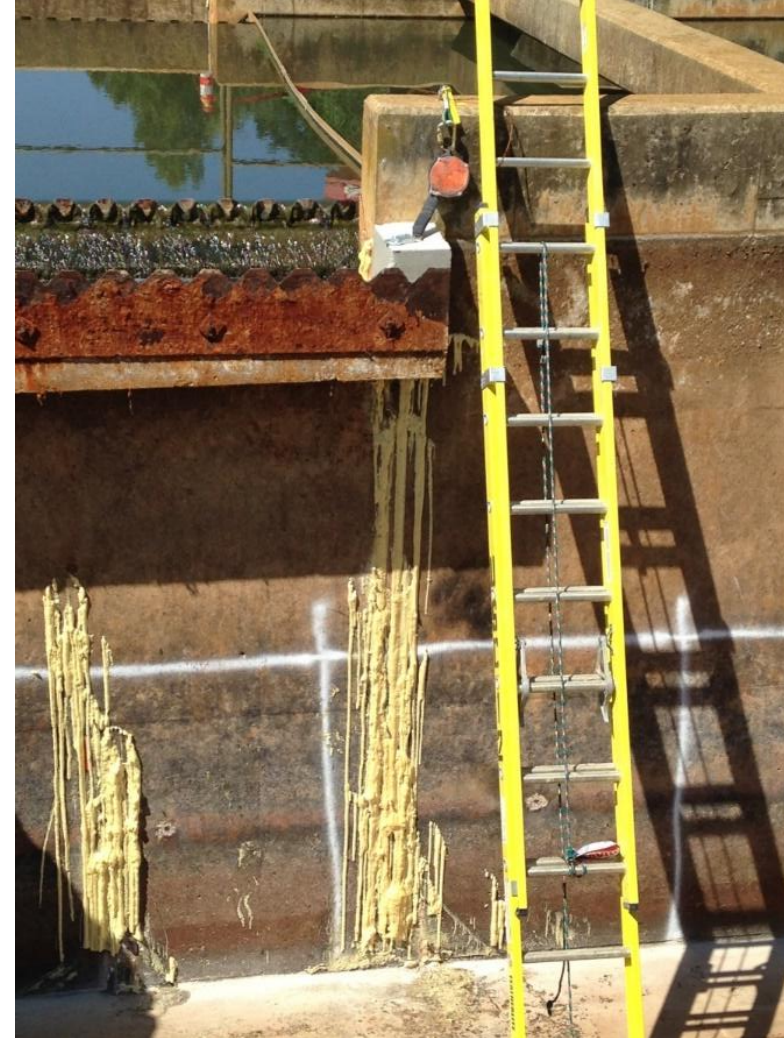


- Holes drilled on 45 degree angle to intersect crack at midpoint of wall
- Packers are secured in the holes
- Urethane resin is injected through packers into crack



URETHANE INJECTION

- Material will react, foam, and flow back out of the crack
- Because injection started at the middle, it will flow out the other side for a full depth and positive side seal
- Foam grout will cure to stiffer state
- Shave urethane grout off to concrete surface



WHERE TO USE ACRYLATE RESINS

(INJECT 215, INJECTION 304, 307, 310US)

- Adjustable reaction time
 - Does not need contact with water to react once mixed
 - Very low viscosity similar to water
 - Considered a permanent solution
 - Easily cleaned with water
- Should be **NOT** used for active leaks with high water pressure



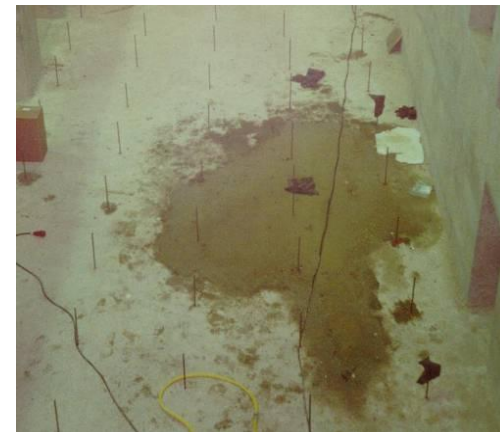
EXISTING/OLD STRUCTURES

- Area injection work of old structures



AREA INJECTION WORK

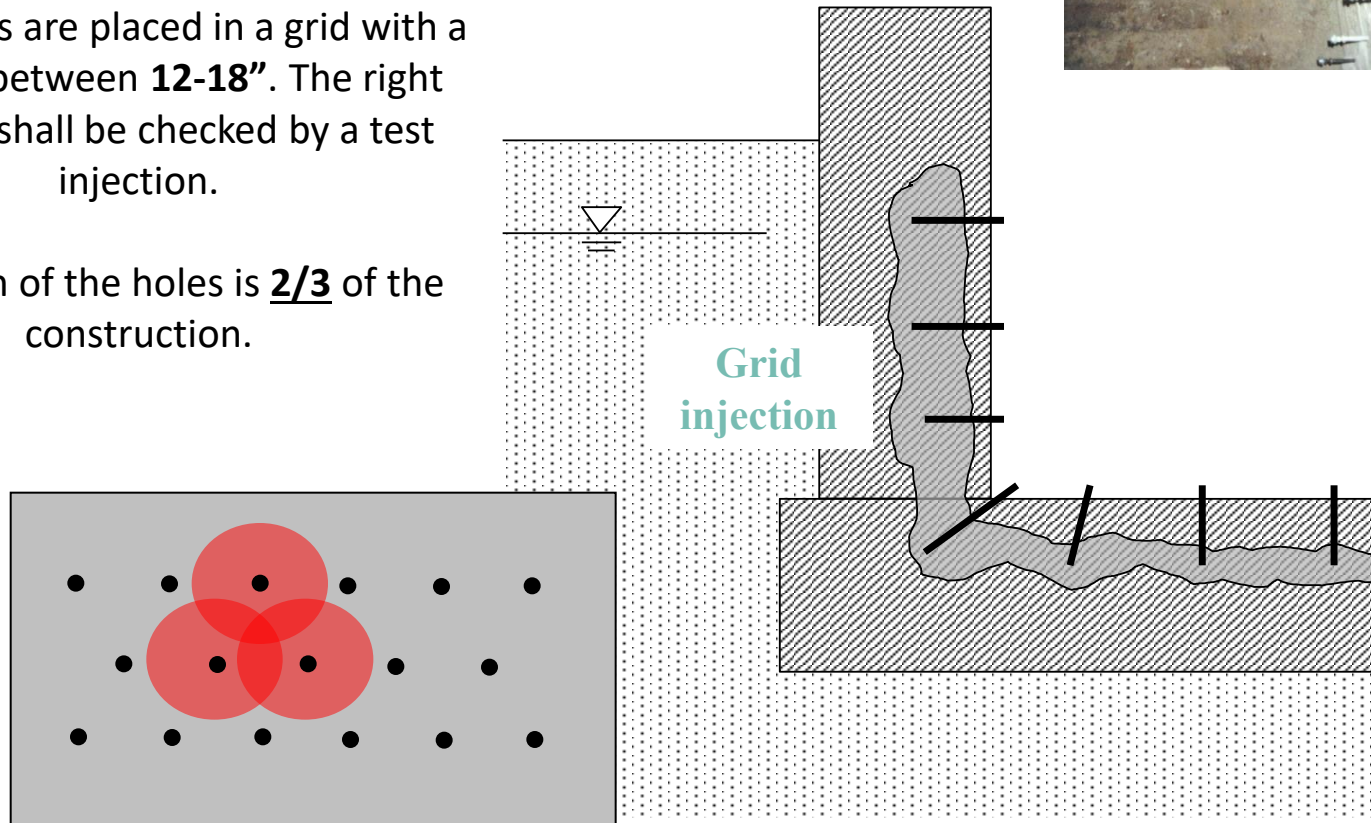
- **Leaking concrete structures**
 - Insufficient concrete quality (mixture, compaction ...)
 - Insufficient construction – thickness of the structure
- Missing or damaged waterproofing
- **Leaking brick walls**
 - Missing or damaged waterproofing
 - Changing groundwater level
 - New utilization



AREA INJECTION WORK

■ Grid Injection

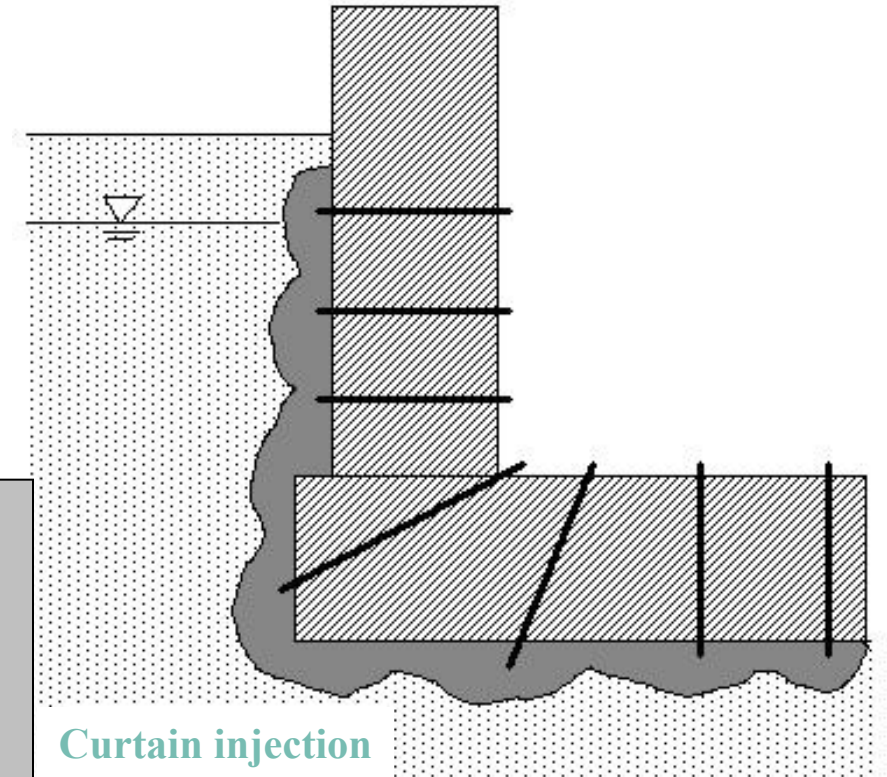
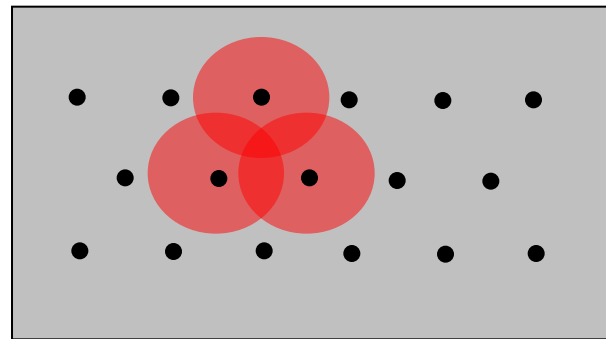
- The packers are placed in a grid with a distance between **12-18"**. The right distance shall be checked by a test injection.
- The depth of the holes is **2/3** of the construction.



AREA INJECTION WORK

■ Curtain Injection

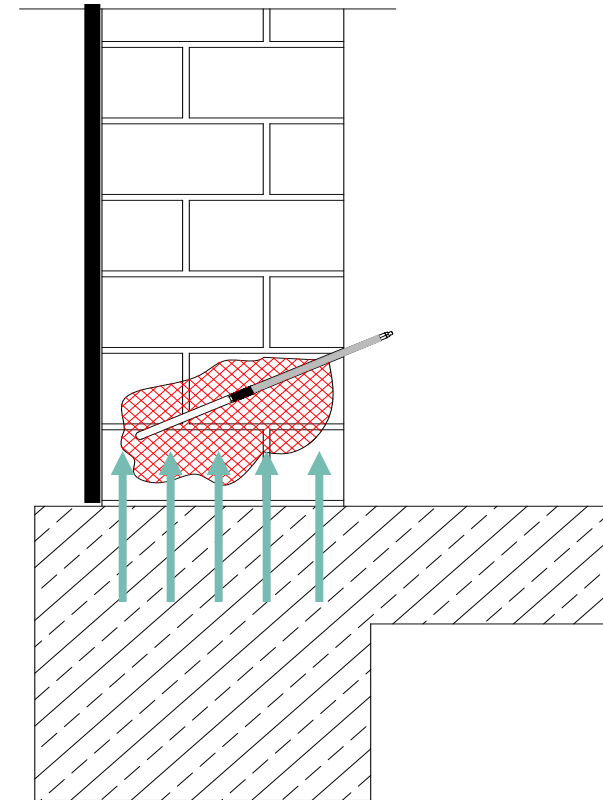
- ➔ The packers are placed in a grid with a distance between **12-20"**. The right distance shall be checked by a test injection.
- ➔ You need detailed information of the soil to choose the right material, the right packer distance and the right way of application.



AREA INJECTION WORK

■ Block Wall Injections

- ➔ The packers are placed with a distance between **6-8"**.
- ➔ Depending on the brick construction a two step injection could be necessary.



JOINT WATERPROOFING

INJECTABLE ACRYLATE RESINS



Sika Inject-215

- Reaction Time of 2-15 Minutes
- Three Component
- Hydrophilic Material Creates Additional Seal



Sika Injection-307

- Set Reaction Time of 15-45 Minutes
- Three Component
- Corrosion Inhibitor Included
 - Only One on the Market



Sika Injection-310

- Pre-Set Reaction Time of 30 Minutes
- Single Component Powder

AVAILABLE SIKA WATERPROOFING INJECTION PRODUCTS

Polyurethane foams

- Sika®Fix HH, HH+, and HH LV foaming material with homogeneous cell structure
- Sika® Injection-101us Quick reacting material with flexible foam and low viscosity

Acrylic resins

- Sika® Injection-307: Corrosion inhibitor
- Sika® Injection-304: Fast curing material
- Sika® Injection-215: 2-15 min – standard acrylate resin
- Sika® Injection-310 US: 1-C-Powder based, Easy to use

RIGID/STRUCTURAL CRACKS



STATIC (NON-MOVING) CRACKS

- Typically Determined: After Monitoring / By Design Professional
- When Root Cause is Known (e.g. Shrinkage, Over Loading, Impact, etc.)
- When Structural Repairs Are Required
 - Prevent Infiltration of Moisture, Chlorides, Chemicals
- Concrete Crack Treatment with High Modulus Epoxies
 - Gravity Feed
 - Pressure Injection: Manual / Automated

EPOXY RESIN

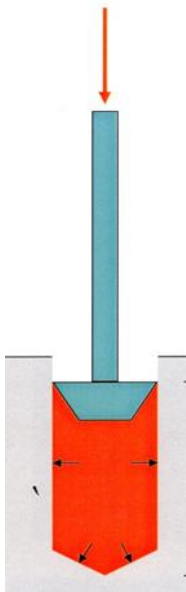
CRACK REPAIR REQUIREMENTS

- Cracks must be dormant (non-moving) or they may re-appear.
- Cracks subject to active hydrostatic or osmotic pressure (i.e., running water) should not be treated with epoxy products.
- Cores should be taken to ensure proper penetration and adhesion.

REPAIR PROCEDURE

1. Port Installation

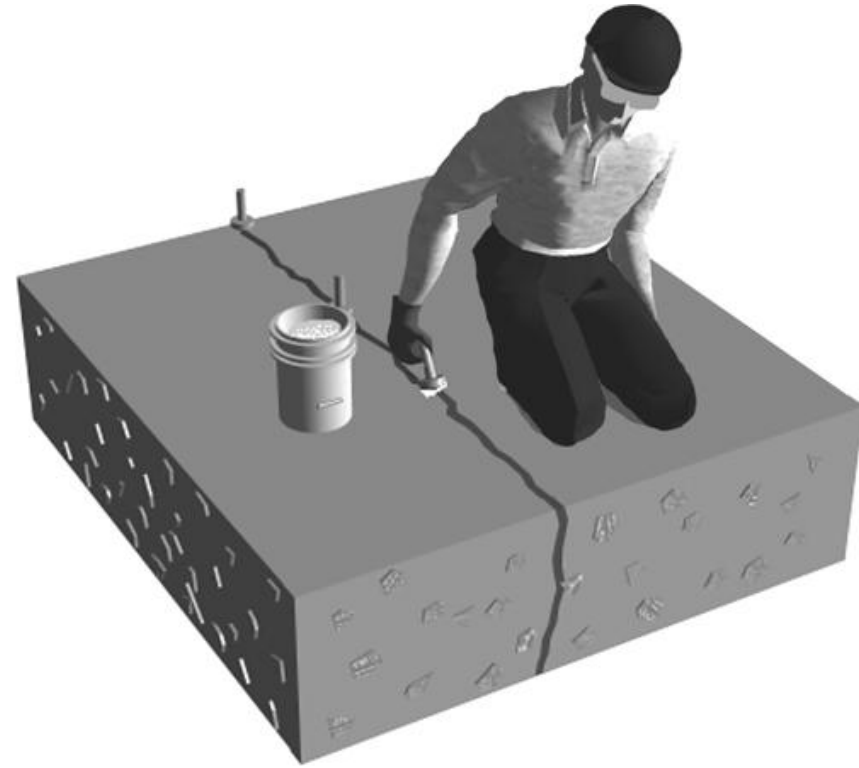
- Surface mounted or Socket
- May be connected with manifold
- How far apart do we space ports?



REPAIR PROCEDURE

1. Port Installation

- Surface mounter or Socket
- May be connected with manifold
- How far apart do we space ports?



As far apart as possible

but no closer than 6"

(we can assume a 3" travel of resin in direction).

On Average 8"

Thinned slabs may allow for 12"

REPAIR PROCEDURE

1. Port Installation



REPAIR PROCEDURE

2. Install the Capseal

- Mark largest portion of crack
- Must install on both sides of crack
- “More is better”
- Material Selection Criteria:
 - Non-sag consistency (for vertical or overhead)
 - Moisture-tolerance
 - Working life
 - Rigidity (modulus of elasticity).



REPAIR PROCEDURE

2. Install the Capseal



REPAIR PROCEDURE

3. Inject the Epoxy

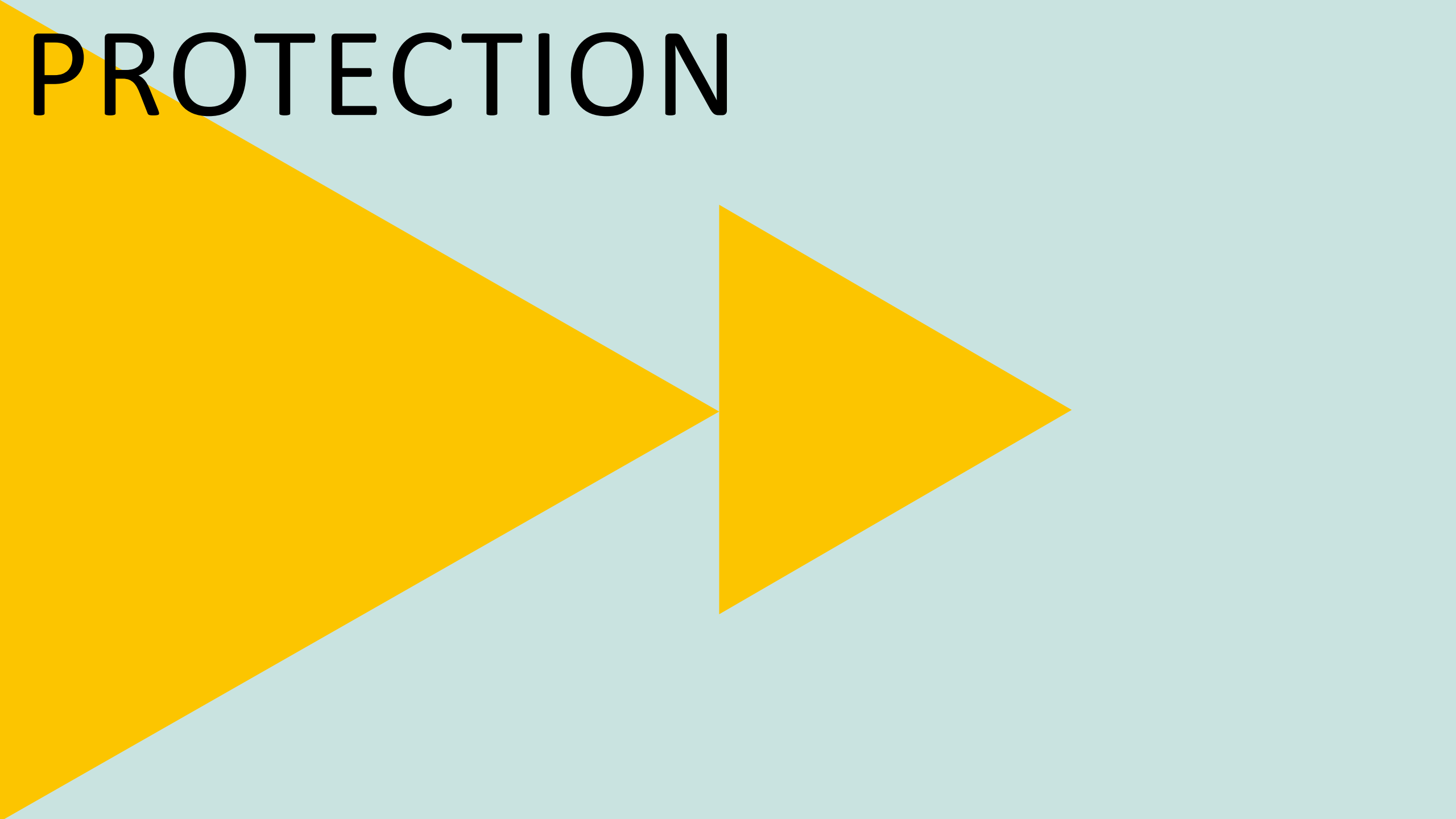
- Double check cap seal and ports
- Mix epoxy according to manufacturer
- For horizontal – start at widest point
- For vertical – start from bottom
- Continue until refusal, cap immediately
- If hairline crack, try increasing pressure to 200 psi for 5 min. (must be managed to prevent blowout)



REPAIR PROCEDURE

4. Remove Ports & Capseal





PROTECTION

ROUTES TO PROTECTION

- Protective Coatings
 - Cementitious
 - Epoxy
 - Urethane



CEMENTITIOUS COATINGS



SIKATOP SEAL 107

100

- Polymer modified cementitious coating
- Great for storage tanks
- Waterproofing
 - Positive & Negative side
- Freeze thaw resistant (similar to base substrate)
- Chloride & Carbonation resistant
- NSF/ANSI 61 Approved for Potable Water



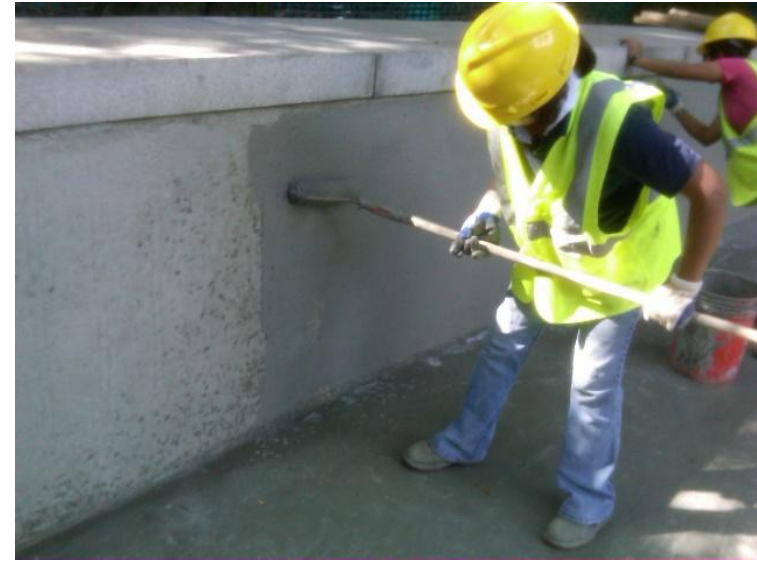
SIKATOP SEAL 107

- Bonds to damp concrete
- Fills in bug holes and surface defects



SIKATOP SEAL 107

- Multiple applications methods
 - Roller
 - Squeegee
 - Spray

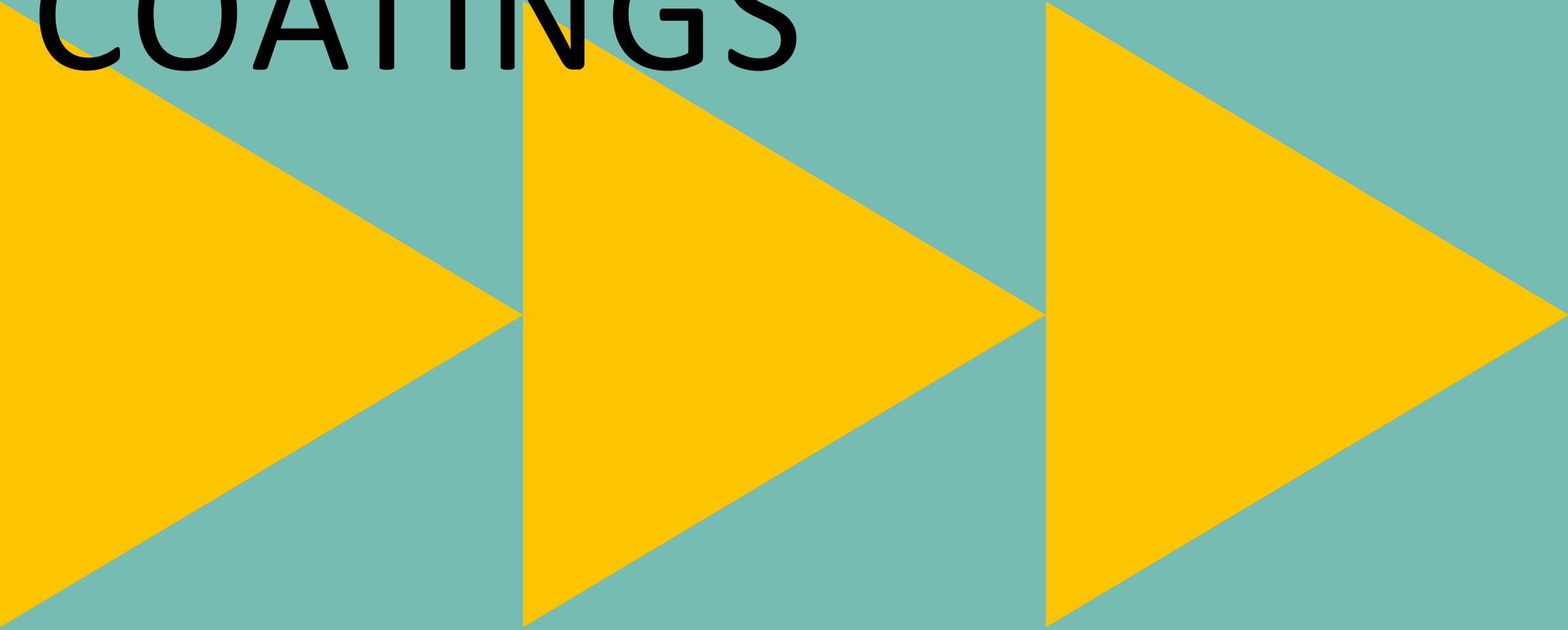


SIKATOP SEAL 107

- Also good for pedestrian traffic
- Breathable for on-grade applications



EPOXY COATINGS



WHY EPOXY COATINGS?

- Extremely durable
 - Superior abrasion resistance
- Corrosion resistant
 - Non permeable, non breathable
- Chemical resistant
 - Long term protection



WHERE TO USE



Digesters



Sedimentation basins



Coagulation/Flocculation



Filters



Secondary Containment



Maintenance areas

APPLICATION

Roller

- The wider the better!

Squeegee (used in conjunction with roller)

- Small notch

Pin Rake

- Reduces pin holing in thicker applications

Brush (or small roller)

- Detailing

Spray

- Fastest

EPOXY COATINGS

SIKAGARD 62

Protective, Solvent Free, Colored Epoxy Coating

- 100% solids epoxy coating
- High build
- Good chemical resistance (WTP / WWTP mechanical rooms & containment areas)
- USDA-certifiable & **Potable Water Approved**
- Receive broadcast aggregate for slip resistance (seamless flooring)

EPOXY COATINGS

SIKAGARD 62

- Viscosity ~3500 cps
- Mix Ratio = 1:1
- Coverage = 150-250 sq. ft /gallon
- Mill thickness –10 Mills Minimum
- Colors – Gray, Red and Tan.
- Application
 - Roller
 - Spray



EPOXY COATINGS

SIKAGARD 62 - WTP



EPOXY COATINGS

SIKAGARD 62 - WTP



OBJECTIVES:

- High build epoxy coating for WWTP to supersede legacy Sikagard 62 and compete with Tnemec.
- Spray 90-120 mils in one coat
- Microfiber reinforced
- Extreme Chemical resistance
- Full repair system – compatible with Sikacem 226

Packaging:

- 3 gal or 150 gal kits
- Production: Marion, OH

PRODUCT DATA SHEET	
Sikagard® 120 HB	
Chemical Resistant, High Build Coating, Topping or Containment Lining	
PRODUCT DESCRIPTION Sikagard® 120 HB is a two-component, high solids, epoxy coating/topping/ lining which possesses outstanding resistance to strong inorganic acids, concentrated sulfuric acid and oxygenated solvents.	CHARACTERISTICS / ADVANTAGES • The material is convenient to proportion, 2:1 by volume, Component A to Component B ratio. • Sikagard® 120 HB is specifically formulated to be sprayed through plural component spray equipment. • Sikagard® 120 HB provides a high build and effective barrier of protection for concrete and steel against a wide range of aggressive substances. • Sikagard® 120 HB exhibits excellent Adhesion, Hardness, Abrasion Resistance, and Compressive Strength values. • The systems provide excellent protection for steel and concrete against a wide range of chemicals. See product specific Chemical Resistance Guide located on usa.sika.com or by contacting Sika Technical Services.
USES Sikagard® 120 HB may only be used by experienced professionals. • As a smooth, chemical-resistant lining on concrete or steel substrates subject to concentrated acids. • Protection of containment tanks, machine bases, plant floors and walls exposed to aggressive chemicals. • As a high build tank liner for water or waste water facilities.	
PRODUCT INFORMATION	
Packaging	3 gal. (11.34 L) unit
Shelf Life	24 months when stored in original, unopened packaging
Storage Conditions	Store dry between 41 °F and 90 °F (5–32 °C)
Appearance / Color	RAL 7046 Tele Grey, RAL 3009 Oxide Red, Clear
Solid content by mass	Approx. 96 %
Solid content by volume	Approx. 95 %
Product Data Sheet Sikagard® 120 HB December 2023, Version 03.03 0218513.021852.0000009	
1 / 7	

SIKAGARD 120 HB

FOCUS - CHEMICAL RESISTANCE

- Sikagard 120 HB coverage
 - 12.5 sq.ft./gal. per coat @ 120 mils
 - 25 sq.ft./gal. per coat @ 60 mils
 - 2 coats recommended, 1 coat possible @ 120 mils
- Where to Use
 - Concrete or Steel
 - Containment tanks
 - Machine bases
 - Plant floors or walls
 - Ground water contamination
 - General exposure to aggressive chemicals



FOCUS - CHEMICAL RESISTANCE

- Chemical Resistance Summary
 - Sulfuric Acid (80%) – Slight discoloration
 - Hydrochloric Acid – Non Affected
 - Diesel/Gasoline – Non Affected
 - Xylene – Non Affected
 - Solvents – Soften initially but recuperate after drying
 - Acetone
 - MEK
 - Methanol



Acetic Acid 5%
• Ammonium Hydroxide 5%
• Diesel Fuel
• Ferric Chloride 1%
• Fresh and non potable water
• Gasoline
• Hypochloric Acid 10%
• Kerosene
• Nitric Acid 10%
• Sodium Carbonate
• Sodium Chloride 10%
• Sodium Hydroxide 25%
• Sodium Hypochlorite 1%*
• Sulfuric Acid 20%

Chemical

Toluene

Ethanol

10% Acetic Acid

70% Sulfuric Acid

50% Sodium Hydroxide

Distilled Water

Methanol

Xylene

Butyl Cellosolve

Methyl Ethyl Ketone

10% Lactic Acid

Bleach

1,1,1 Trichloroethane

10% Nitric Acid

30% Nitric Acid

Water Treatment Chemicals

- Aluminum Sulfate
- Ammonium Sulfate
- Anhydrous Ammonia
- Bleach (Sodium Hypochlorite)
- Bioaugmentation
- Calcium Chloride
- Calcium Stabilization Products
- Calcium Hypochlorite
- Carbon
- Caustic Soda (Sodium Hydroxide)
- Chlorine
- Coagulant Aids
- Corrosion Control
- Deposit Control Products
- Ferric Chloride
- Ferric Sulfate
- Ferrous Chloride
- Ferrous Sulfate
- Fluorosilicic Acid
- HTH
- Hydrochloric Acid
- Hydrofluosilicic Acid
- Iron Stabilization
- Lead Corrosion Control
- Lime
- Lime Build-Up Control
- Manganese Stabilization
- Nitric Acid
- Paper/Pulp Water Products
- Phosphoric Acid
- Polymers
- Potassium Permanganate
- Soda Ash
- Sodium Aluminate
- Sodium Bicarbonate
- Sodium Bisulfite
- Sodium Fluorosilicate
- Sodium Hydrosulfite
- Sodium Hydroxide
- Sodium Hypochlorite (Bleach)
- Sodium Permanganate
- Sodium Silicate
- Sulfur Dioxide
- Sulfuric Acid

WATER/WASTEWATER TREATMENT

116



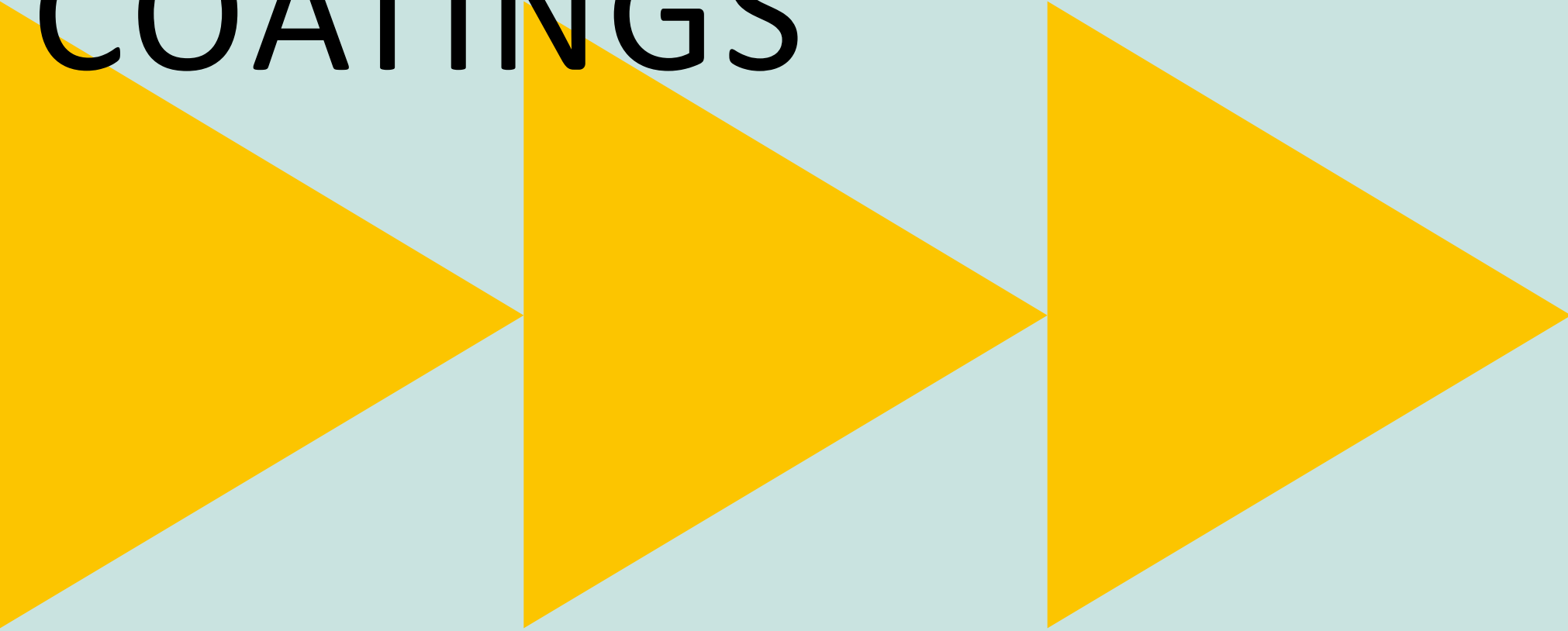
WATER/WASTEWATER TREATMENT

117





POLYURETHANE COATINGS



SIKAGARD 7600



What is Sikagard 7600?

- A two-component asphalt extended polyurethane waterproofing membrane

Key Attributes:

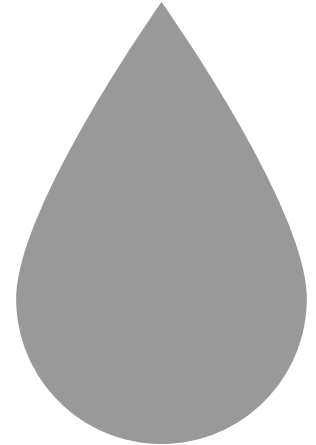
- Elastomeric
- Approved for continuous immersion conditions
- NSF/ANSI 61 Potable Water Approved
- Excellent Chemical resistance
- UV resistant
- Low VOC

Available in 2 grades:

- ✓ Horizontal-Grade (HG)
- ✓ Vertical-Grade (VG)



Property	Value	Test Method
Solids Volume Content	89 +/- 2%	ASTM D-2697
VOC Content	78 g/L	ASTM D-2369-81
Adhesion	350 psi	Elcometer
Shore A Hardness	60 +/- 5	ASTM D-2240
Tensile Strength	1000 +/- 50 psi	ASTM D-412
Elongation	450 +/- 50%	ASTM D-412
Tear Strength	180 +/- 50 pli	ASTM D-624
Permeability to Water Vapor	0.03 perms	ASTM D-751
Elastomeric Waterproofing	Exceeds	ASTM C-836 & C-957
Service Temperature	-60 – 220 F	



SIKAGARD 7600:CHEMICAL RESISTANCE CHART



Sikagard 7600 CHEMICAL RESISTANCE CHART



The following chemical resistance data was obtained from a 60-70 mils film of Sikagard 7600 immersed in each chemical listed at 75-80°F for a period of 7 days. Like other industrial maintenance coatings, Sikagard 7600 has chemical and temperature limitations. For Continuous exposure, maximum service temperature tested was 140°F.

Please read the disclaimer below. For chemicals other than those listed below, proper testing must be completed prior to application of the coating system. It is advisable to consult your local Sika representative.

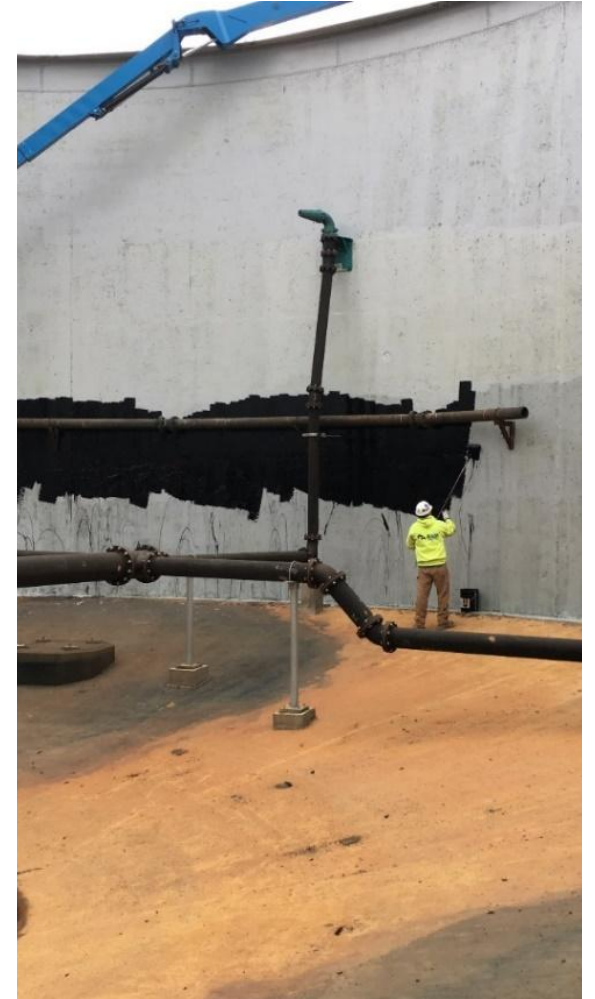
CHEMICAL SOLVENTS			
Xylene	NR	Motor Oil	S
Toluene	NR	Gasoline (unleaded)	S
Acetone	NR	Diesel	S
Ethylene Glycol	R1*	Hydraulic Oil	S
Tri Sodium Phosphate (TSP)	R	Methanol	NR

ACIDS AND BASES			
Sewage	R	Sulphuric Acid 60%	NR
Hydrogen Sulphide gas (H S gas)	R	Sulphuric Acid 30%	S
Hydrochloric Acid 35%	NR	Sulphuric Acid 10%	R
Hydrochloric Acid 10%	R1	Sulphuric Acid 5%	R
Hydrochloric Acid 5%	R1	Potassium Hydroxide 10%	R
Copper Sulphate (sat)	R	Potassium Hydroxide 20%	R1
Hydrofluoric Acid, 10%	S	Sodium Hydroxide 10%	R
Phosphoric Acid, 10%	R	Sodium Hydroxide 20%	R1
Ammonium Hydroxide 10%	R1	Sodium Hydroxide 50%	R1*

- ✓ Solvent resistant including:
 - Motor Oil, Gasoline, Diesel, Methanol, Ethylene Glycol, TSP.
- ✓ Acid resistant including:
 - Hydrogen sulfide gas, Hydrofluoric Acid, Sewage, Sodium Hypochlorite, Sulphuric Acid 10%, Phosphoric Acid 10%



SIKAGARD 7600: WATER TREATMENT FACILITIES



SIKAGARD 7600

Application Steps

PRIMING

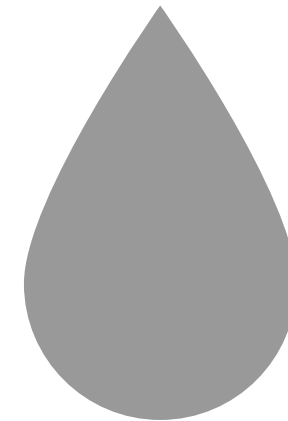
Sikadur 22 Lo Mod FS for concrete, plywood, and recoats with coating window between minimum 2-4 hours and maximum 36 hours.

Sikalastic FTP Lo-VOC Primer for concrete and plywood with coating window between minimum 4-6 hours and maximum 24 hours.

Sikalastic PF Lo-VOC Primer for concrete, metal, and plywood with coating window between minimum 3-5 hours and maximum 16 hours.

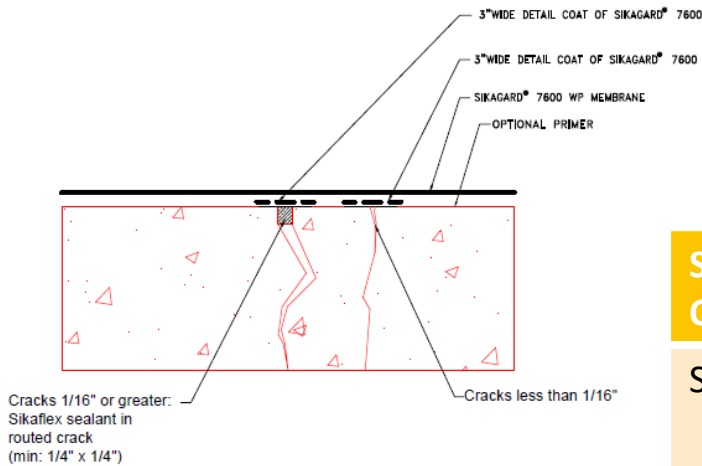
Sikalastic EP Rapid Primer for remnants of old asphaltic coating, concrete, metal, and wood with coating window from min 3-7 hours to max 72 hours.

Sikalastic Recoat Primer for applying 7600 to 7600 beyond overcoat window, with window of minimum 2-4 hours and maximum 12 hours.



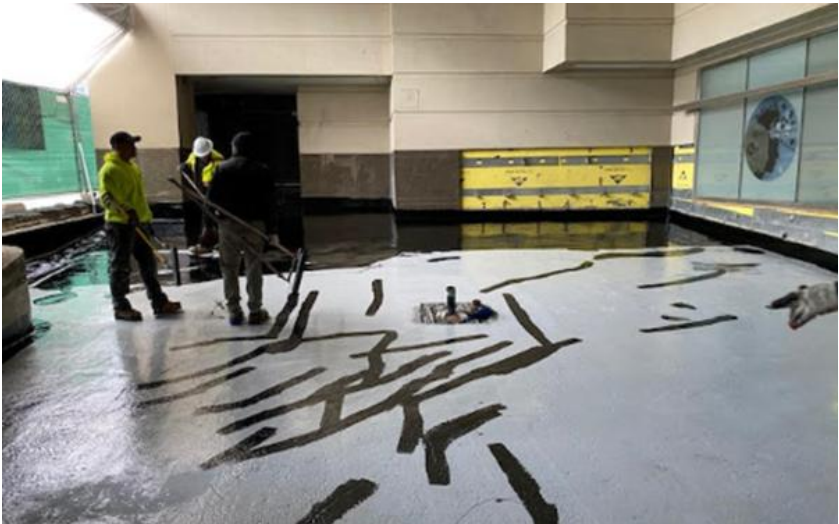
DETAILING

- Apply 4" wide 30 mil detail coat of Sikagard 7600 to cracks < 1/16"
- Rout cracks $\geq 1/16"$ to at least 1/4" by 1/4" and seal with Sikaflex 1a which is also good for green concrete. After 1a is tack-free (~ 3 hours) apply the 3" wide 30 mil detail coat.
- Also seal all joints and coves with Sikaflex 1a



NOTES: REFER TO SYSTEM GUIDE FOR PRIMING, SIKAGARD 7600 THICKNESS REQUIREMENTS

Sealant Options	Substrate	Tack-free
Sikaflex 1a	Dry or damp	~ 3 hours
Sikaflex 11 FC	Dry	~ 1-2 hours



INSTALLATION – SIKAGARD 7600 HG



Designed for application on horizontal surfaces

Easy application; Roll, brush, or squeegee apply

Horizontal-Grade (HG) grade can be applied up to 120 mils in single coat horizontally, and will hang 30 mils vertically



INSTALLATION – SIKAGARD 7600 VG



Designed for application on vertical surfaces

Roll, brush, or trowel, apply

VG grade can be applied up to 120 mils in single coat horizontally, and will hang 90 mils vertically



INSTALLATION – SIKALASTIC 7600 VG AND HG

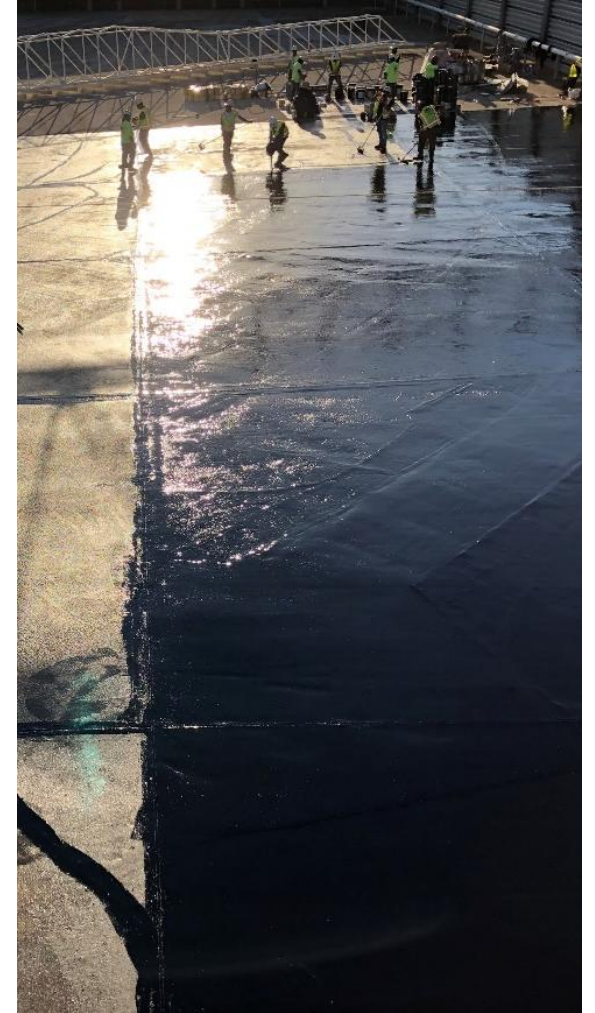


Cures in about 4 - 6 hours to be ready for another coat

Must apply additional coat within 16 hours – or clean, solvent wipe and prime



INSTALLATION – SIKALASTIC 7600 VG AND HG



Best to complete primer & coats in sections to avoid missing coating windows

WARRANTY

COVER – NO UV EXPOSURE

SLOPE TO DRAIN – NO PONDING WATER

Application	Warranty Length	Sikard® 7600 Build	Primer	Protection Course	Drainage Mat
Liner	5 years	60 mils	Sikalastic® PF Lo-VOC or Sikalastic® FTP Lo-VOC Primer***		
	10 years	90 mils	Sikalastic® PF Lo-VOC or Sikalastic® FTP Lo-VOC Primer***		
	20 years	120 mils	Sikalastic® PF Lo-VOC or Sikalastic® FTP Lo-VOC Primer		
Foundation Walls*	5 years	60 mils			Sika® Drainage Mat 420
	10 years	90 mils			Sika® Drainage Mat 420
	20 years	90 mils	Sikalastic® PF Lo-VOC or Sikalastic® FTP Lo-VOC Primer	GreenGuard® PB4	Sika® Drainage Mat 420
Split Slab, Pavers**	5 years	60 mils			Sika® Drainage Mat 1000/720
	10 years	90 mils			Sika® Drainage Mat 1000/720
	20 years	120 mils	Sikalastic® PF Lo-VOC or Sikalastic® FTP Lo-VOC Primer		Sika® Drainage Mat 1000
Planter		Floor/Wall			
	5 Years	60/60 mils			Sika® Drainage Mat 420/GRS
	10 Years	90/90 mils	Sikalastic® PF Lo-VOC or Sikalastic® FTP Lo-VOC Primer		Sika® Drainage Mat 420/GRS
	20 Years	120/90 mils	Sikalastic® PF Lo-VOC or Sikalastic® FTP Lo-VOC Primer		Sika® Drainage Mat 420/GRS
Green Roof	10 Years	90/90 mils	Sikalastic® PF Lo-VOC or Sikalastic® FTP Lo-VOC Primer		Sika® Drainage Mat 420/GRS

PASCO COUNTY SOLID WASTE: LEACHATE STORAGE TANK SIKAGARD 7600



Project Details:

Pasco County Solid Waste

Pasco County, FL

Leachate Storage Tank

Interior Lining

- **PRODUCTS:** SIKAGARD 7600, SIKATOP 123 PLUS,SIKA COMBIFLEX SG SYSTEM,SIKADUR 31,SIKAFIX HH
- **QTY:** \$210,000.00
- **CONTRACTOR:** Crom Corporation



Persistent leaks caused by vibrations and deteriorating concrete.

Providing support to the County with product specifications and guiding contractors through the application process.

SIKAGARD 7600

PARTNERSHIP CROM CORPORATION



Clayton County Water Authority

Jonesboro GA

Water Storage Tank

Interior Repair to Seal Leak

Dunes WTP

Palm Coast, FL

Water Storage Tank

Interior Lining



Greenville, NC

Potable Storage Tank

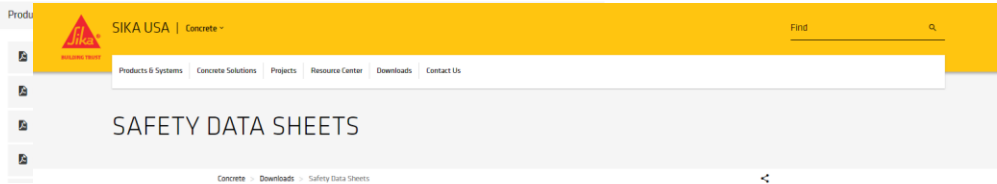
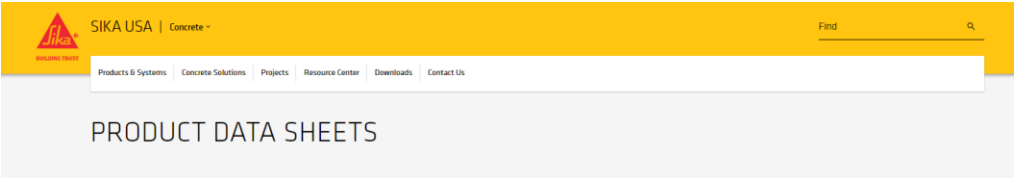
Interior Crack Repair

City of Cape Canaveral, FL

Reclaim Storage Tank

Interior Crack Repair

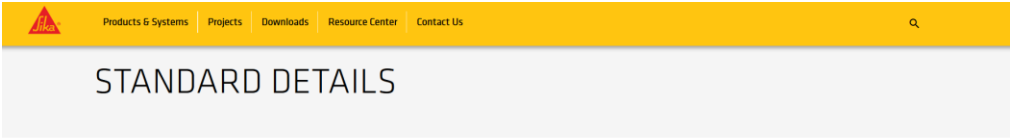
ADDITIONAL RESOURCES



Safety Data Sheets			
	Safety Data Sheet (SDS)	PDF - 139 KB (EN)	 
	Safety Data Sheet (SDS)	PDF - 508 KB (EN)	 
	Safety Data Sheet (SDS)	PDF - 527 KB (EN)	 
	Safety Data Sheet (SDS)	PDF - 157 KB (EN)	 



SIKA WATER AND WASTE
WATER SOLUTIONS
PRODUCTS AND CAPABILITIES

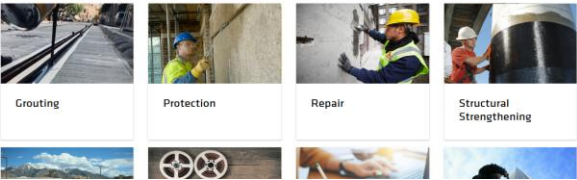


Repair & Protection > Downloads > Standard Details



Sika Knowledge Center

Get started now! Click on one of the category options below that fits your next or typical application and you will be directed to the Sika Knowledge Center.



Sika Technical Services
Phone: 1-800-933-7452 ext. 5



REMINDER: WEBINAR CERTIFICATE

- Certificates will be distributed via email.
- All attendees will receive a copy and recording of the webinar, this may take up to a week to distribute. We appreciate your patience.

THANK
YOU.