

BRIDGE DECK JOINT & SPALL REPAIR PATCHING

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MY BACKGROUND:

- CONSULTING FIRMS - MANY YEARS OF GEOTECHNICAL/ENVIRONMENTAL ENGINEERING & MATERIALS TESTING
- CONSULTING FIRMS - TESTING/INSPECTIONS & PROJECT MANAGEMENT ON TRANSPORTATION PROJECTS AND ACQUIRED SEVERAL CONCRETE/SOILS/AGGREGATES CERTIFICATIONS
- KBP TECHNICAL REP - 13 YRS OF APPLIED PPC 1121 POLYESTER POLYMER CONCRETE & HMWM DECK SEAL MATERIALS ON SMALL/LARGE BRIDGE DECK INSTALLATION PROJECTS AND MANY JOINT HEADER, SPALL PATCHING, AND RUT REPAIR JOBS

BRIDGE DECKS ARE AFFECTED BY MANY ELEMENTS

- LOADS — DEAD, LIVE, WIND, SEISMIC — ACCOUNTED FOR IN DESIGN
- TRAFFIC IMPACT STRESSES — TRUCKS/CARS CHAINS, STUDDED TIRES THAT HAMMER AND ABRASE THE SURFACE
- CLIMATE — RAIN, SNOW, ICE (FREEZE-THAW)
- CHEMICALS — DEICING SALTS
- CONCRETE CRACKS ARE DIRECT CONDUITS TO REINFORCING STEEL WHERE WEAKENING/RUST STARTS THE SPALLING PROCESS THAT REQUIRES PATCHING

OUCH!
(MAYBE A LOT OF PATCHING)



CONCRETE REPAIR MATERIALS = BINDER AND AGGREGATE MIXING COMPONENTS

- **PORTLAND CEMENT CONCRETE, CEMENTITIOUS (STANDARD OR POLYMER MODIFIED) BINDERS**
 - STRONG IN COMPRESSION
 - WEAK IN TENSION
 - **RIGID**
- **POLYMER CONCRETE, THERMO-SET PLASTIC BINDERS (VISCO-ELASTIC, REMAINS IN HARDENED STATE)**
 - STRONG IN COMPRESSION & TENSION
 - VERY LOW PERMEABILITY
 - **FLEXIBLE**
- **ASPHALT CONCRETE, THERMOPLASTIC BITUMINOUS BINDERS (CAN MELT AND REHARDEN)**
 - STRONG IN COMPRESSION
 - WEAK IN TENSION
 - TYPICALLY POLYMER-MODIFIED COLD MIX FOR PATCHING- EASY PLACEMENT, NO COMPONENT MIXING, SOME VERY WATER RESISTANT
 - TYPICALLY MORE TEMPORARY THAN ABOVE MATERIALS

SELECT MATERIAL APPROPRIATE FOR TASK

- **CEMENTITIOUS CONCRETE** - IS PLACED AS PERMANENT STRUCTURAL REPAIRS TO MAINTAIN BRIDGE DECK CAPACITY, ESPECIALLY AS FULL-DEPTH DEPTH REPAIR
- **ASPHALTIC CONCRETE** - GOOD FOR TEMPORARY REPAIRS TO BUY TIME, WATER RESISTANT VERSIONS GREAT FOR WINTER PATCHING IN ADVANCE OF SUMMER SPALL REPAIRS
- **POLYMER CONCRETE** – PERMANENT NON-STRUCTURAL REPAIR TYPICALLY PLACED IN DECK SACRIFICIAL (WEARING COURSE) SECTION, OFTEN VERY TOUGH & RESILIENT

WHERE DO YOU GO FOR PRODUCTS?

DO YOUR HOMEWORK

- NOT ALL CEMENTITIOUS, ASPHALTIC, AND POLYMER MATERIALS ARE THE SAME QUALITY IN THEIR RESPECTIVE CLASSES
- FIND TRUSTED SOURCES, I.E., STATE QPLs, TSP2, AND ESPECIALLY STATE MAINTENANCE CREW SUPERVISORS (THEY REALLY KNOW WHAT WORKS)
- MAINTENANCE SUPERVISORS MAY TRY NEW MATERIALS BY FIELD DEMO FROM SUPPLIERS WILLING TO DONATE MATERIAL

QUALIFIED PRODUCTS LISTS

- STATE AGENCIES TEST VARIOUS PRODUCTS FOR ACCEPTANCE
- SUCCESSFUL PRODUCTS ARE ALLOWED FOR USE ON STATE CONTRACTS
- SOME LOOK GOOD ON PAPER, BUT NOT SO GOOD IN THE FIELD, CONSULT KNOWLEDGEABLE BRIDGE MAINTENANCE SUPERVISORS
- LISTED PRODUCTS ON ITD QPL CAN BE FOUND AT:
[HTTPS://APPS.ITD.IDAHO.GOV/APPS/MATERIALS/SEARCHBYMANU.ASPX](https://apps.itd.idaho.gov/apps/materials/SearchByManu.aspx)

WESTERN BRIDGE PRESERVATION PARTNERSHIP

- A GREAT EDUCATION RESOURCE FOR UNDERSTANDING THE GOALS OF BRIDGE PRESERVATION
- MANY PRODUCTS CAN BE FOUND IN THE BRIDGE PRODUCTS DATABASE
[HTTP://BRIDGEPRODUCTDB.COM/DECK-PATCHING-PRODUCTS/](http://bridgeproductdb.com/deck-patching-products/)

YOUR LHTAC RESOURCES

- AS SEEN AT THIS WORKSHOP THEY ARE COMMITTED TO YOUR SUCCESS

AND OF COURSE REACH OUT TO MANUFACTURERS

- WILL KNOW THEIR PRODUCTS INTIMATELY
- HAVE THE UNDERSTANDING OF ADVANTAGES AND LIMITATIONS OF THEIR MATERIALS
- WILL PROVIDE ALL PRODUCT TECHNICAL SHEETS, SAFETY DATA SHEETS, SUBMITTALS, ETC.

ONCE A PRODUCT IS FOUND...

IMPORTANT!

FOLLOW MANUFACTURES INSTALLATION RECOMMENDATIONS

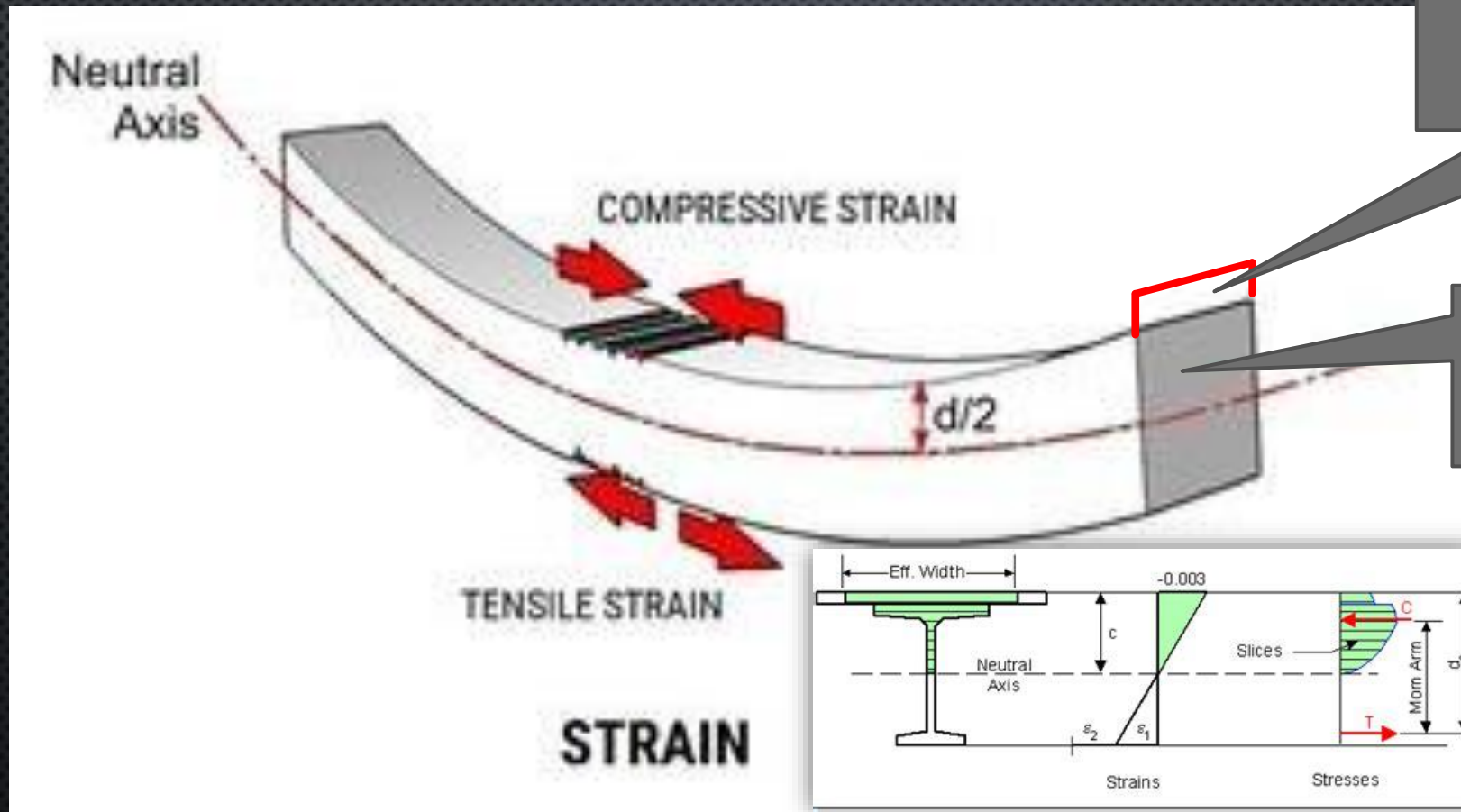
- OPTIMAL PRODUCT PERFORMANCE REQUIRES FOLLOWING THE PRESCRIBED RATIOS/MIXING ON TECHNICAL DATA SHEETS
- FOR SOME CEMENTITIOUS PRODUCTS - WHEN THE PROPER RATIOS ARE FOLLOWED, THE CONCRETE CONSISTENCY MAY BE STIFF
 - WORKERS MAY WANT TO MAKE IT WETTER THAN PRESCRIBED FOR EASIER FINISHING – DON'T DO IT!
 - IMPROPERLY MIXED CEMENTITIOUS CONCRETES CAN RESULT IN EXCESSIVE SHRINKAGE, CRACKING AND DEBONDING
- INCORRECT MIXING AND CONSOLIDATION/COMPACTION OF ALL PRODUCTS CAN RESULT IN A DEFECTIVE PATCH
- FOLLOW ANY APPLICABLE PRE-WETTING OR PRIMING REQUIREMENTS BEFORE CONCRETE PLACEMENT
- READ THE PRODUCT TECHNICAL DATA SHEETS BEFORE USING PRODUCT AND CONTACT THE REP FOR ASSISTANCE

EXAMPLES OF STIFF AND FLOWABLE PRODUCTS

(BOTH PLACED PER MANUFACTURERS RECOMMENDATIONS)



DECK STRESS STATE AFTER CONSTRUCTION – COMPRESSIVE, NEUTRAL & TENSILE



Sacrificial (wearing course) Section

Rigid or Flexible Material here

Structural Section

High Strength Rigid Material here

DECK PREPARATION **IMPORTANT!** (BEFORE PATCHING)

- SOUND THE DECK FOR DELAMS BY CHAINING AND HAMERING
- MARK THE PERIMETER WITH SPRAY PAINT
- SAW CUT THE MARKED OFF AREAS
- USE APPROPRIATE CHIPING, GRINDING, ABRASIVE BLASTING, AND SCARIFICATION TOOLS TO REMOVE UNSOUND CONCRETE
- CARE SHOULD BE TAKEN TO AVOID DAMAGE TO THE DECK AND STEEL REINFORCEMENT
- PROTECT PERSONNEL AND TRAFFIC FROM CONCRETE REMOVAL EFFECTS

EXAMPLE OF PROPERLY REPAIRED DECK SPALL



EXAMPLE OF PROPERLY PREPARED JOINT HEADER



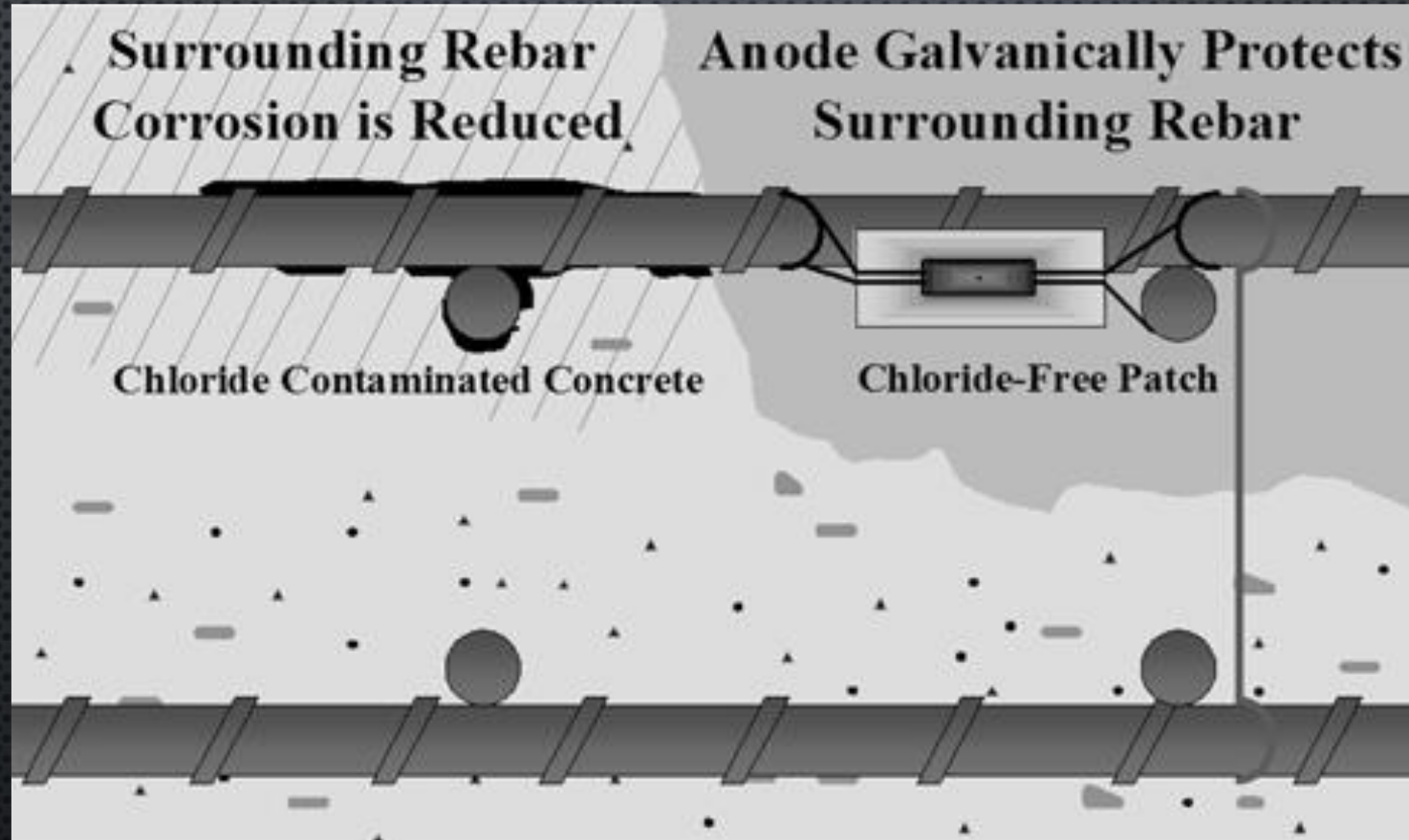
OOPS!

SOMETIMES SAWCUTS ARE PATHWAYS FOR CORROSION



Freeze-Thaw and Chloride
Ion enter here causing
premature patch failure
and rebar corrosion

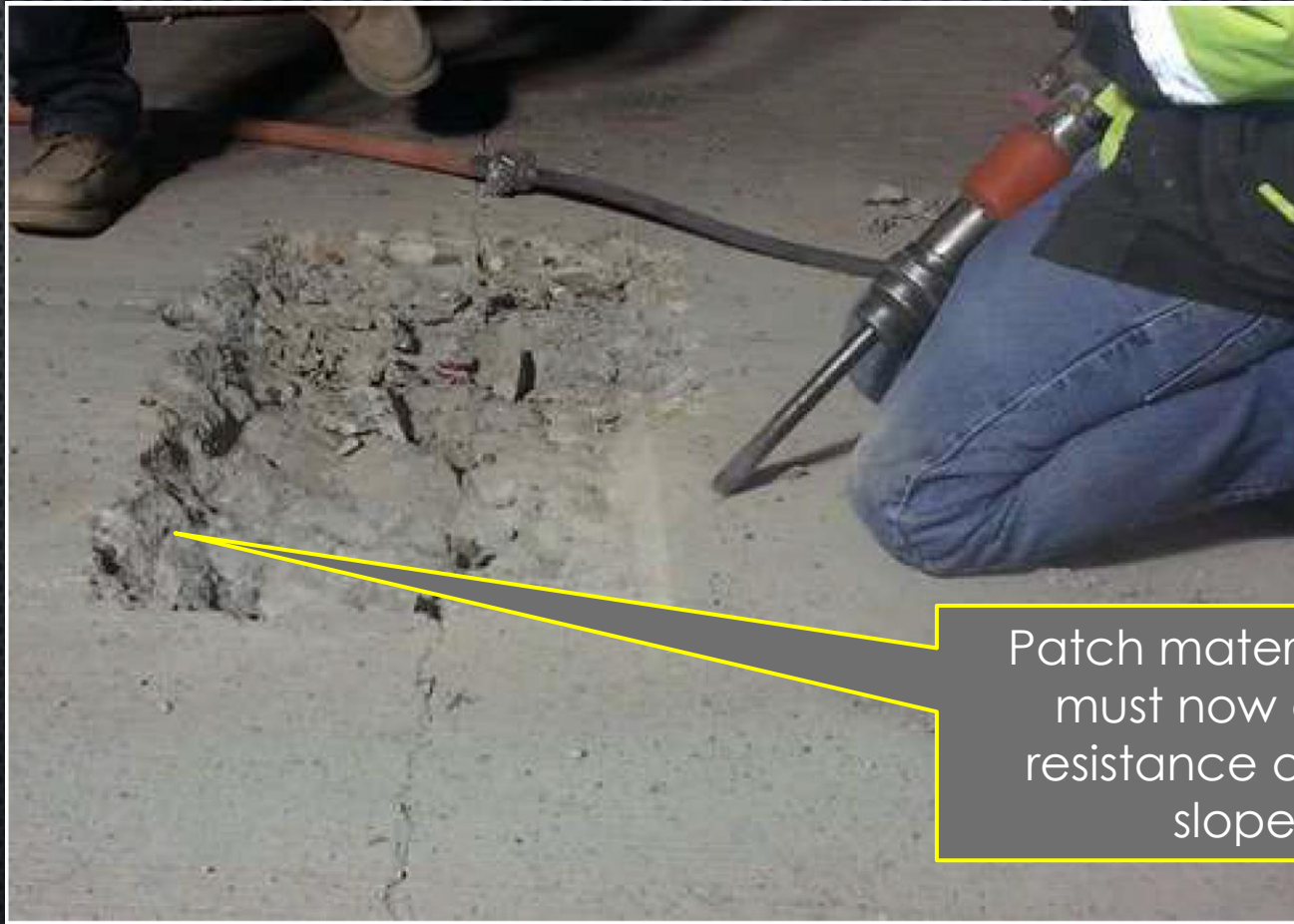
RING ANNODE (HALO) EFFECT



Caused by Electrochemical incompatibility between steel in patch
steel of surrounding concrete patch

CONSIDER CALTRANS BACK-CHIPPING METHOD FOR OPTIMUM MECHANICAL BOND

For more information go to: http://www.dot.ca.gov/hq/maint/Pavement/Offices/Pavement_Engineering/CPG/CPG_Ch310_Spall_Repair.pdf
or contact Caltrans' Doran Glauz at: doran.glauz@dot.ca.gov



Patch material shrinkage strain must now overcome shear resistance of roughened and sloped interface

Contact your rep first to be sure this is acceptable

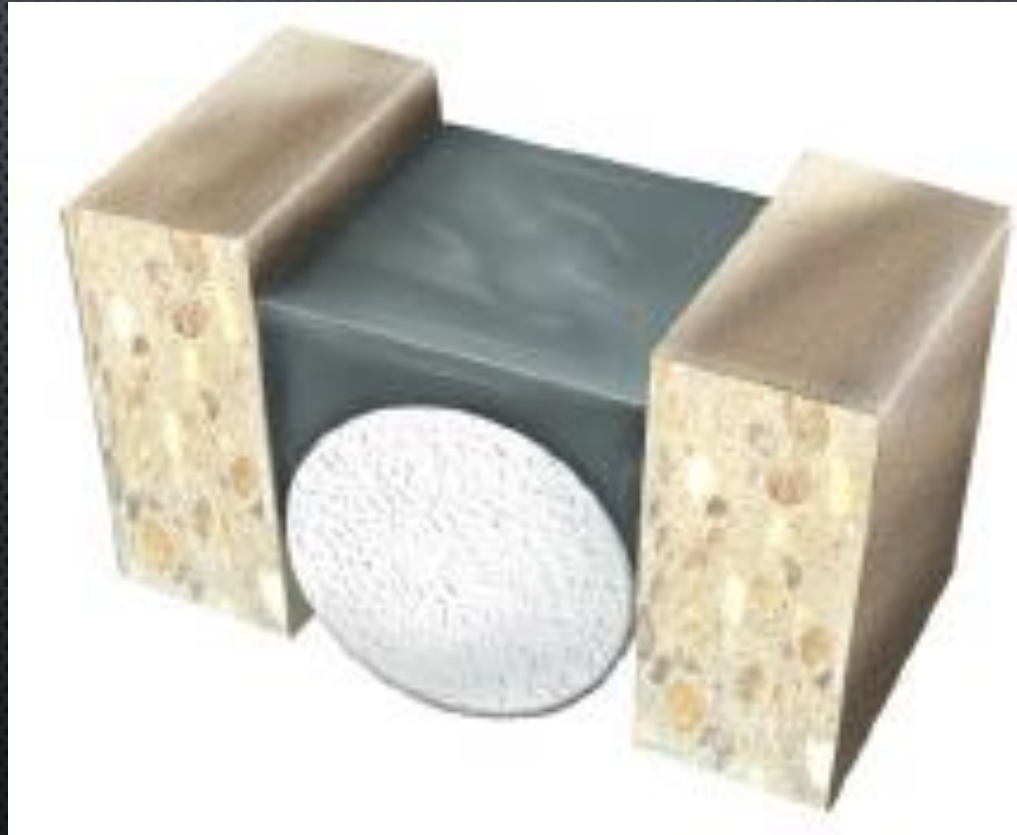
PATCH/JOINT INSTALLATION

- MIX MATERIAL ACCORDING TO MANUFACTURES TECHNICAL DATA SHEETS
- SOME MATERIALS MAY BE PLACED DIRECTLY ON DRY SUBSTRATE
- SOME MANUFACTURERS MAY RECOMMEND PRE-WETTING OR PRIMING
- CONSOLIDATION – TAMP OR VIBRATE TO ENSURE SOLID SUBSTRATE CONTACT AND PATCH COMPATCTION
- FINISHING – TROWELL TO A SMOOTH FINISH MATCHING DECK GRADE
- BUMPY PATCHES WILL DRAW IMPACT STRESSES POTENTIALLY AFFECTING LONGEVITY

JOINT HEADERS:

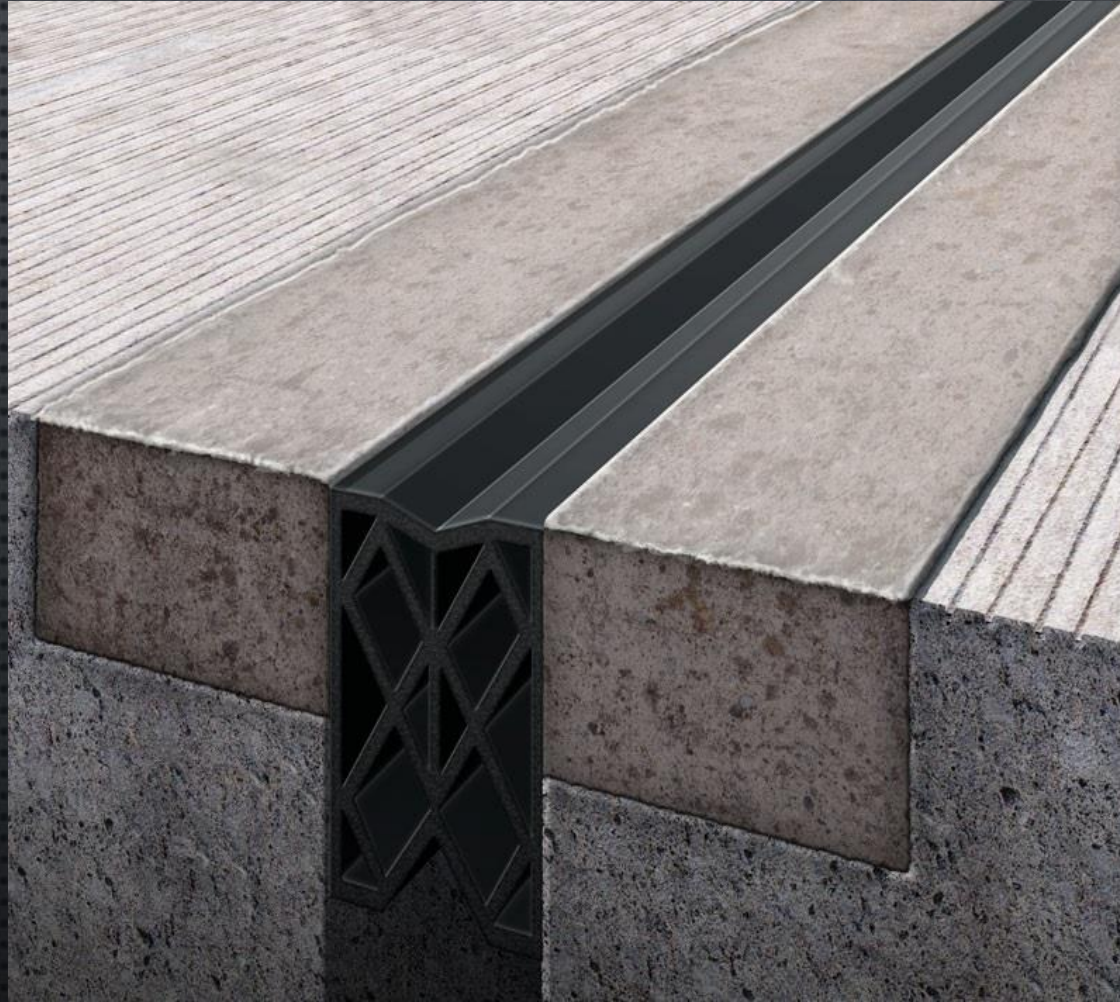
- ONE OF THE MOST CRITICAL LOCATIONS OF DECK AND SUBSTRUCTURE CORROSION
- LEAKING JOINTS ALLOW CONTAMINANTS TO ENTER THE DECK AND RESULTING IN SEVERE CORROSION
- ENSURE ALL REPAIRS ARE AS SOUND AS POSSIBLE
- MAKE SMOOTH & LEVEL TO MINIMIZE TRAFFIC IMPACT STRESSES
- ENSURE JOINT FACES ARE STRAIGHT, NOT CURVEY, FOR PROPER SEAL SEATING
- ENSURE JOINT FACES ARE PROPERLY PREPARED FOR SEAL, I.E., SANDBLASTED, ETC., PER JOINT SEAL TECH SHEETS
- FOLLOW MANUFACTURERS TECH SHEETS/RECOMMENDATIONS

EXAMPLE OF SILICA SEAL JOINT CONSTRUCTION



Watson-Bowman Acme WABO Silicone Seal

EXAMPLE OF COMPRESSION SEAL



DS Brown Delastic Preformed Compression Seal

IN CLOSING...

IN THE REAL WORLD NOT ALL PATCHES ARE PERFECT



Questions?

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