Concrete Repair
Applications and Procedures
Objectives

- Identify what surface preparation is needed
- Identify typical modes of failure and testing methods
- How to choose the correct material for the repair
- Application procedures
- What it take to produce a successful repair
Why Repair or Restore?

- Restore or improve structural integrity
- Improve appearance
- Improve durability
- Restore or improve safety issues
- Improve functional performance
- Provide water tightness
Concrete Repair and Restoration

Identify the Problem. What Are The Symptoms?

- Repeating Patterns in the Cracks
- Rust Stains Around Cracks
- Spalling Over Rebar
- Quantify the % of failure or problem
Concrete Repair and Restoration

 FAILURE TO CORRECT THE CAUSE WILL RESULT IN A REPEAT OF THE PROBLEM
Causes of Concrete Corrosion

- Chemical
- Mechanical
- Corrosive
- Environmental
- Design
- Installation
What Type of Products Do I Use?

- Application Procedure
  - Hand Application
  - Rendering (Plastering)
  - Form & Pump
  - Form & Pour
  - Dry Packing

- Material Composition
  - Cement based
  - Epoxy based

- Orientation
  - Vertical
  - Overhead
  - Horizontal

- Dimensions
  - Depth
  - Width/Length
Determining Factors When Choosing a Material

- Root cause of the problem
- Severity of the issue
- Location
- Service condition
- Application procedures
Material Properties

- Vertical / overhead
- Horizontal
- Permeability
- Resistance to Freeze-Thaw
- Abrasion
- Sulfates
Material Selection

- Working time
- Consistency – flow
- Exothermic conditions
- Compatibility with:
  - Substrate
  - Surface treatment
- Strength
- Speed of strength gain
Jobsite Conditions

- Direct Sun
- Heat
- Humidity
- Wind
- Rain
- Heavy vibration

All of these factors come into play when choosing the correct product for a successful repair.
Surface Preparation

What is Surface Preparation?
Methods must be selected that will achieve the desired cleaning and profiling that will allow the specified material to reach an adhesive strength that equals or exceeds the cohesive (axial tensile) of the substrate or other material it has been applied to.
Surface Preparation

International Concrete Repair Institute (ICRI): an association in the concrete industry devoted solely to repair and restoration

ICRI GUIDELINE NO. 03732

“Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings and Polymer Overlays.” In depth description of various types of surface prep, substrate condition survey & selection of specifying methods of surface preparation.
Surface Preparation

- Defines 12 different preparation methods
  - Provides concrete surface profiles for each method
- CSP Roughness Standards (profile chips)
  - Range from 1 a Light Etch, to 9 A Heavy Scarification
Surface Preparation

- Concrete Surface Profile chips are available from ICRI that replicate typical surface profiles; they provide a visual standard for specification, execution and verification purposes.
- “A repair material is only as good as what it’s applied over”.

**Surface Prep Methods**

- Detergent scrubbing
- Low-pressure water cleaning
- Acid etching
- Grinding
- Sand blasting
Surface Prep Methods

- Water blasting (High)
- Scarifying
- Scabbing
- Shotblasting
- Rotomilling
- Planing
- Needle Gun
Surface Preparation

- Structurally sound substrate
- Defined edges – avoid feather edge
- Free of grease, oil, contaminants
- Sufficient profile (+/- 1/16”-1/8”) for mechanical bond
- Saturated Surface Dry/Damp (SSD) substrate
**Repair Geometry**

- **Delaminated, cracked areas**
- **Incorrect layout**
- **Recommended layout**

- **Weakened planes**
- **Better Yet – eliminates ALL inside corners**
Mixing Methods

- Drill and paddle
- Mortar mixer
- Concrete mixer (when stone added)
- Pump
- By hand (small amounts less than a bag)
Mixing

- When mixing less than a full bag of ANY powdered material ALWAYS mix the material first by shaking, rolling or by any other method to blend the ingredients.
- When mixing by hand, add liquid to the powder.
- When using mechanical means, add the powder to the liquid.
Porosity - SSD
(Saturated Surface Dry - Damp)

SSD...concrete substrate to be in a Saturated-Surface-Dry/Damp condition so that the concrete will not absorb water from the repair mortar. This creates a moist, less absorptive, surface with no standing water.

SSD Surface prevents robbing moisture from repair material
Application Methods

Repairing
- Hand Application
- Form and Pump
- Form and Pour
- Dry Packing
Application Methods

Hand Applications

- Substrates
  - Vertical
  - Overhead
  - Horizontal

- Method
  - Hand
  - Trowel
Application Methods

Form and Pump

Vent Holes to Allow Air to Escape

Vibrator Helps Consolidation
Form and Pump Applications

Closed Area
Application Methods

Form and Pour

Pour from the top
Form and Pour Applications

- Area at top that acts as area for pouring and air escape
- Seal form edges - prevent leakage
- Use form release
Curing

- All repairs should be cured.
- For polymer modified materials it is best to water cure for +/- 2hrs. If this is not possible use a water based curing compound as you would with non-polymer modified materials.
Concrete Repair Products
Concrete Repair Mortars

Vertical/Overhead Repairs

- Recrete™ 5 Minute / Recrete™ 20 Minute
- Architectural Finish™
- Perma Patch™ VO
- HD 25
- Polyfast™ FS
- Civil / Structural VO
Concrete Repair Mortars

Form and Pour Repairs

- Civil / Structural FPX
- Perma Patch™ FP
Concrete Repair Mortars

Horizontal Repairs

- Thin Resurfacer
- Special Patch
- HD 50
- Pave Patch 3000
- Rapid Resin Repair
- Sure Patch™
**Architectural Finish™**

- Single component, polymer modified
- Fine silica provides smooth finish
- Maximum thickness ¼”
- OK exposed to weather, not sensitive to moisture
- Apply by trowel
- 30 minute working time
- Dries to light gray color
- Can be tinted and sanded
Recrete™ 5 Minute or 20 Minute

- Minimum thickness 1/8”
- Maximum thickness 2”, neat
- Extend with clean washed stone > 2”
- Water substitution with J40 (1:1) suggested for improved performance
- 20 Minute available in light colored formulation
**Perma Patch™ VO** (Vertical and Overhead)

**Vertical / Overhead Applications**

- Single component, Polymer modified
- Minimum ¼” thickness
- Maximum thickness 2-3” within a patch
- Apply with Hand or Low Pressure Spray
- Excellent workability
HD 25 VO

- Single component with dry polymers
- Vertical / Overhead
- Rapid set 20 min +/-
- Minimum ¼” thickness
- Maximum 2” thickness, neat
- Extend with clean washed stone > 2”
Polyfast™ FS

- Vertical / Overhead / Horizontal
- Single component with dry polymers
- 30 minute set time
- Thickness
  - ¼” Minimum
  - 2” Maximum, neat
  - > 2” Extend with clean
  - washed stone
One component; just add water

Unique corrosion inhibitor protects reinforcing steel from chloride intrusion and carbonation

Excellent resistance to freeze-thaw Shrinkage compensated

Thermal expansion similar to concrete for long term durability

Can be pumped and sprayed
Civil/Structural FPX

- Pre-extended with coarse aggregate
- Unique corrosion inhibitor protects reinforcing steel from chloride intrusion and carbonation
- High bond strength; not a vapor barrier
- Increased resistance to freeze/thaw
- Excellent for deep structural repairs
- Extended working time
**Perma Patch™ FP (Form and Pour)**

- Pourable consistency
- Form and Pour or Pumpable Repair Mortar
- Use as Horizontal Repair Mortar
- Single Component, Polymer Modified
- **Thickness**
  - ½” Minimum
  - 2” Maximum, neat
  - > 2” Extend with clean washed stone
- Natural concrete color
Thin Resurfacer

- Horizontal applications
- Polymer modified
- Thin applications:
  - Minimum thickness 1/16”
  - Maximum thickness ½”
- Cannot be extended with aggregate
HD 50 Horizontal Repair

- Rapid setting – 15 minutes
- Polymer modified, fiber reinforced
  - 1 hour 2000 psi
  - 3 hours 3500 psi
- Thickness
  - ½” minimum
  - 2” maximum, neat
  - > Up to 6” can be extend with clean washed stone, 60% per bag
- Excellent for fast turn around – DOT Repair
**Pave Patch 3000**

- Heavy duty horizontal repair mortar
- 1 component requiring water only
- Fast setting 15-25 minutes, traffic in 1-3 hours
- Latex polymer modified
- Flowable consistency
- High compressive strength
  - Up to 4000 psi in 3 hours
  - Up to 8000 psi in 28 days
Special Patch

- 2 component package includes powder and liquid
- Polymer modified for enhanced adhesion
- Horizontal interior and exterior, thin or thick repairs and overlays
- High early strength for fast repair and turn-around
  - Foot traffic in 1-2 hrs, tire in 4-6
- Versatile, easy to trowel consistency for flat work
Rapid Resin Repair

- Epoxy/urethane hybrid
- 3-Component
- 100% solids low modulus
- Very rapid setting
- Cures in temperatures as low as -20°F (-29°C)
- Pot life: 3 minutes @ 73°F
- Traffic opened in 10-15 minutes
Sure Patch™

- 100% solids, low modulus epoxy
- 3-Component
- Solvent free
- Open to foot traffic in 2 hours
- Open to vehicle traffic in 3-5 hours
- Pot life: 15 minutes @ 73°F
Anchor All

- Pourable anchoring cement
- Fast drying, early strengths, mix with water only
- Ideal for setting handrails, fence posts, signs, etc.
**Waterstop™**

- Hydraulic Cement
- Stops active water
- 3-5 minute set time
- Sets up underwater
- Interior or Exterior
- Non-corrosive
Points to Remember

- Treat the Cause not the Effect
- Surface Prep is a Key Component
- Repair Geometry
- Porosity/ Profile/ SSD
- Right Material For The Right Job
- Cure the Repair Mortar
**Instructions**

NEVER assume ALL the pertinent information is on the packaging. ALWAYS read the printed instructions on the material packaging AND the Technical Data Sheet.
ASK QUESTIONS OF MANUFACTURER
For More Information

Dayton Superior’s reputation as the industry leader in the design, manufacturing and distribution of specialized concrete construction products is the result of innovation backed by more than 100 years of experience.

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