MICHIGAN CONCRETE ASSOCIATION

Repair and Maintenance of Concrete Pavements

Local Concrete Pavement Design seminar

Friday, April 25, 2025

Lawrence Tech Univ., Southfield

Overview – Outline

- Specifications, Special Provisions
- Techniques:
  - Full-Depth Repairs
  - Full-Depth Centerline Repairs
  - Diamond Grinding
  - Joint/Crack Resealing
- 602 & 603 item numbers / quantities
- Scoping & Inspection

MDOT Spec Book

Current Version: 2020

Division 6 – Portland Cement Concrete Pavements

- Section 601 PCC Pavement Mixtures
- Section 602 Concrete Pavement Construction
- Section 603 Concrete Pavement Restoration

Repair/Restoration Techniques

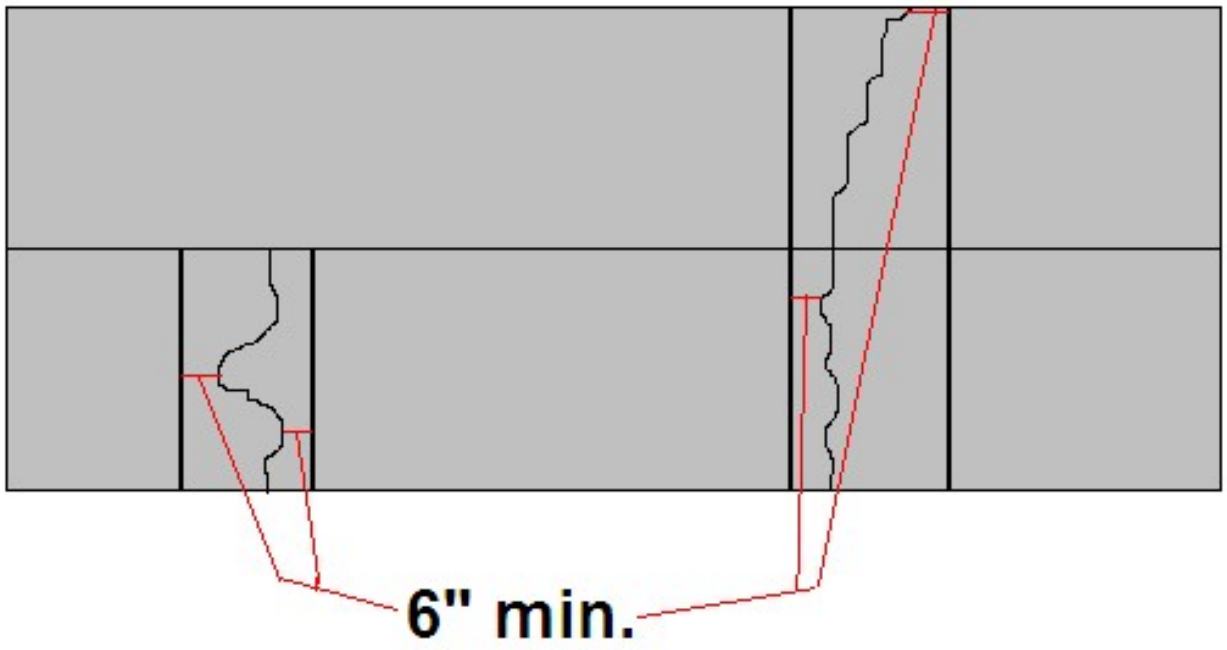
Standard Specs

- Full-depth repairs
- Diamond grinding
- Resawing & sealing joints/cracks

Special Provisions

- Full-depth centerline repairs
- Partial-depth repairs (not commonly used)

Full-Depth Repair Patch Sizing



Combine Patches

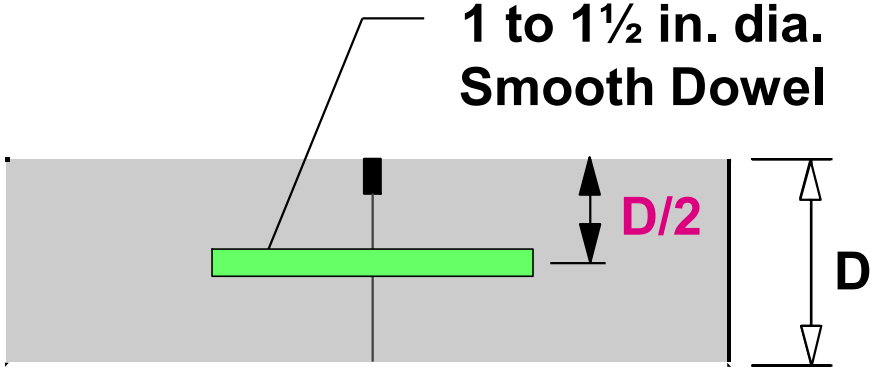
If, for a 12 ft. lane width patch:

Slab Thickness	Distance between Patches should be at least:
6-7 in.	13 ft.
8 in.	11 ft.
9 in.	10 ft.
10 in.	9 ft.
11 in.	8 ft.
12 in.	8 ft.
14-15 in.	6 ft.

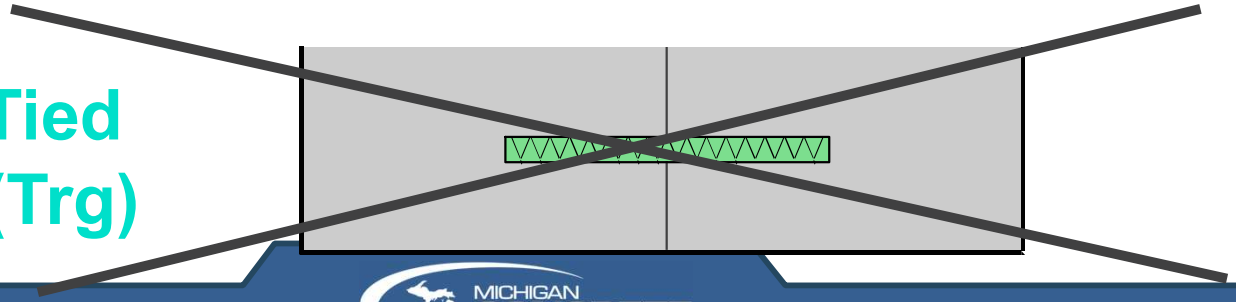
Combine Patches!!

Transverse Joints – Repairs

Doweled (Crg)

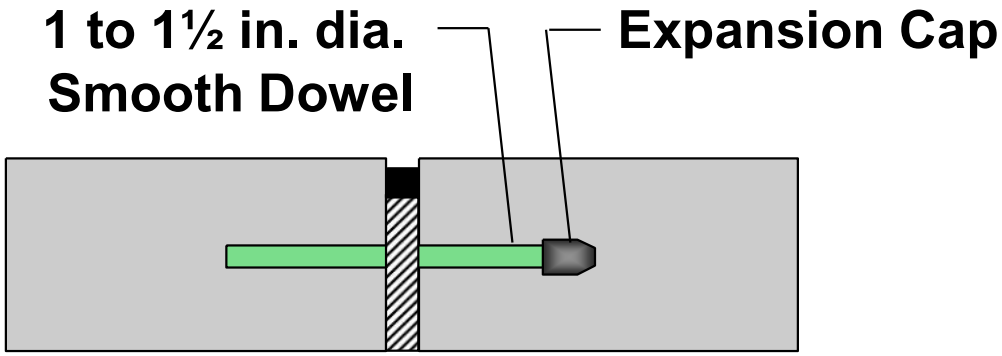


Tied (Trg)



Transverse Joints – Repairs

Doweled (Erg)



* Use Erg joints only when repairing or replacing an existing expansion (typ. E2) joint

Dowel Sizes

Pavement Thickness, in.	Dowel Diameter, in.	Drilled Hole Diameter, in. *	
		Cement-Based Grout	Epoxy-Based Grout
6	1.0	1.2	1.125
7	1.0	1.2	1.125
8	1.0	1.2	1.125
9	1.25	1.45	1.375
10	1.25	1.45	1.375

* Cement-based, Dowel diam. + 0.2”
Epoxy-based, Dowel diam. + 1/8”

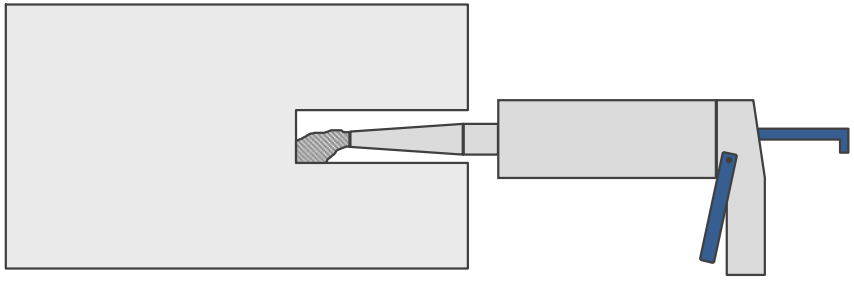
Drill Rigs

Cleaning Holes

- Compressed air (90 PSI)
- Insert air wand to back of hole
- Check compressor for moisture and oil contamination with clean cloth

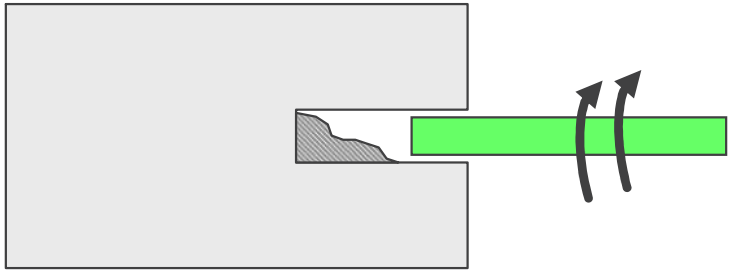
Installing Dowels

1



Inject Grout
to Back of Hole

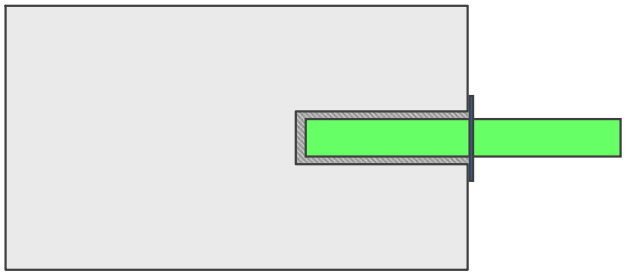
2



Twist one turn
while pushing
in dowel

Place grout
retention disk to
hold in grout or
use more viscous
grouts

3



Injecting Epoxy

Injecting Epoxy

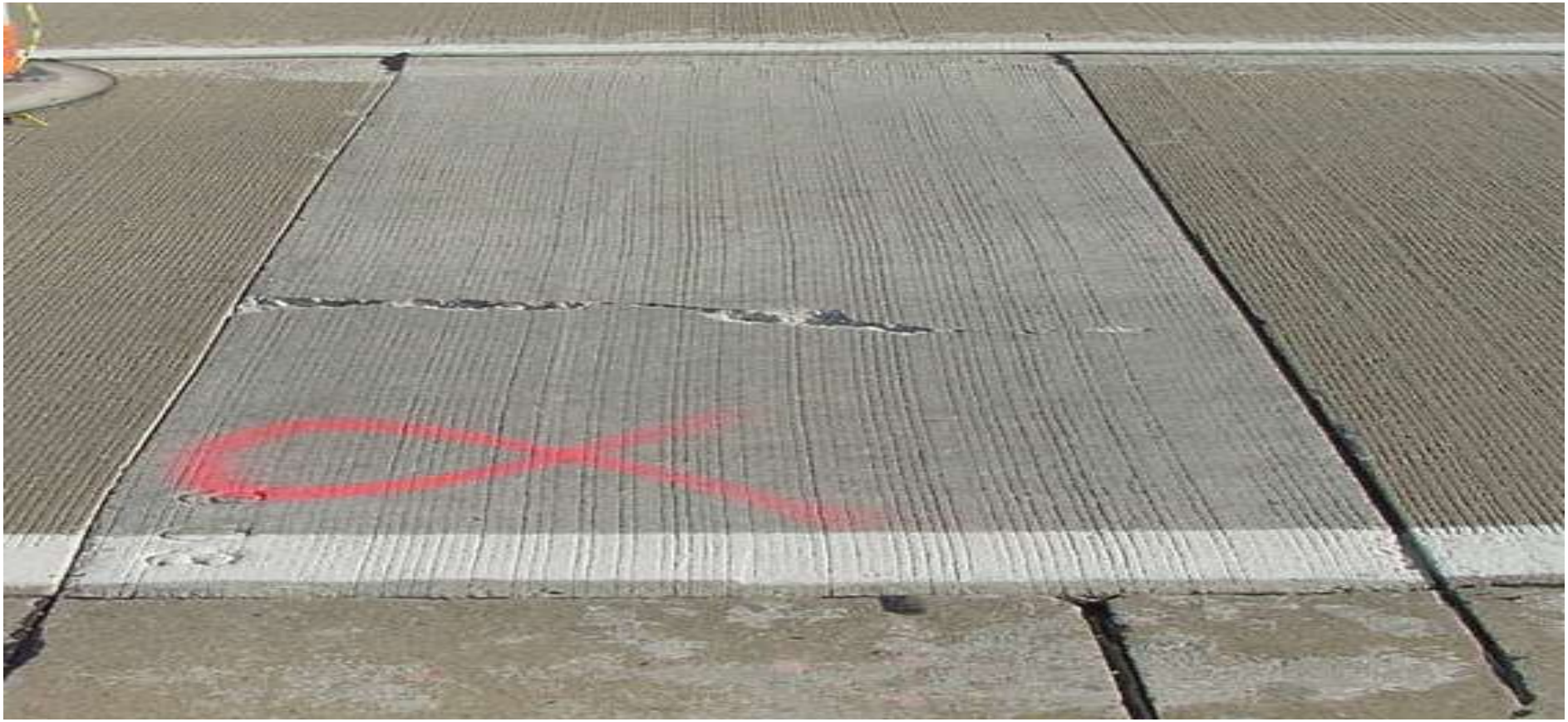
DO NOT USE RAMS!

Rams can cause the grout to shoot out which results in insufficient filling of the void.

Bond Release

MDOT uses a product called RC250 as a bond breaker to allow the dowels to move freely in the new concrete repair.

Loose Dowels can result in poor performance



Transverse Joint (Erg/Crg)

Transverse Joint (Cp Joint)

for long repairs or to match existing joints/cracks that are adjacent

Transverse Joint vs. New Joints

MDOT Concrete Patch Mixes

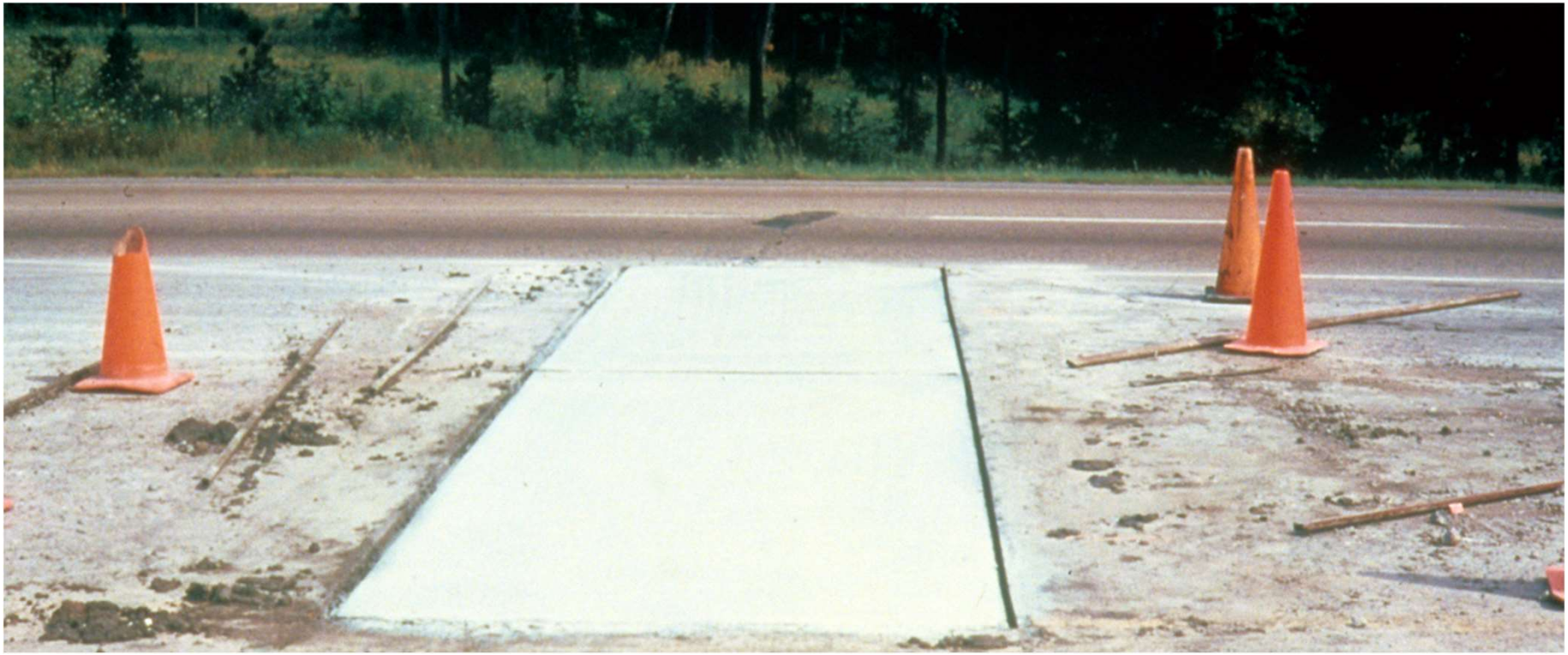
- 3500 or 3500HP (Slower Set / Longer Life) – open at **550 psi flexural**
  - 470 to 611 lbs/cyd (5.0 to 6.5 sack)
  - Target Slump = 2 – 4 in. / Target Air = 5.5% – 8.5%
  - 0.45 max w/cm

- P-NC (Faster Set / Moderate Life) – open at **300 psi flexural**
  - Air Temperature above 50°F, 658 lbs/cyd (7.0 Sack)
  - Air Temperature 49°F and below, 752 lbs/cyd (8.0 sack) – at Engineer's discretion
  - A non-chloride accelerator from MDOT QPL allowed when necessary
  - Target Slump = 2 – 4 in. / Target Air = 5.5% – 8.5%

Roller Screed Strikeoff

Texturing

Curing



Longitudinal FDR's

Placement

Highlights of Section 603

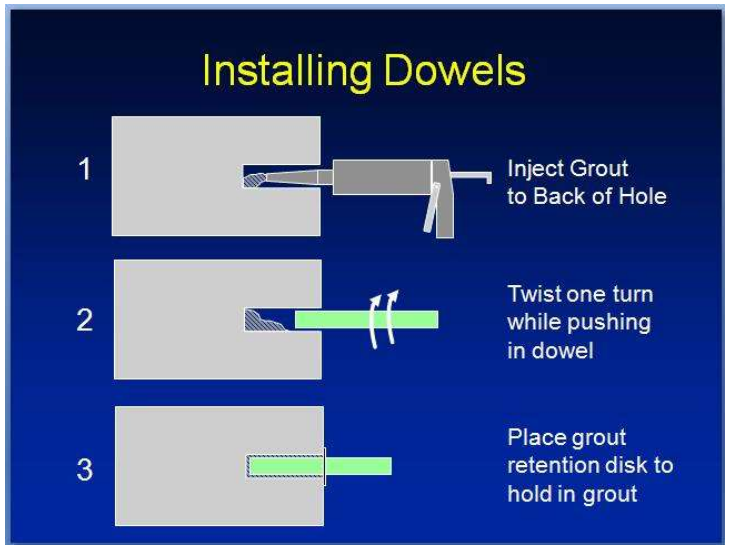
Section 603 – Concrete Pavement Restoration

- Defines the length of a pavement **repair** as less than 100 foot long; >100 feet = 602 bid item
- Only requires a specified minimum **flexural strength** prior to opening to traffic; 28-day compressive strength test cylinders <u>not required</u>

Highlights of Section 603

Section 603 – Concrete Pavement Restoration *(cont.)*

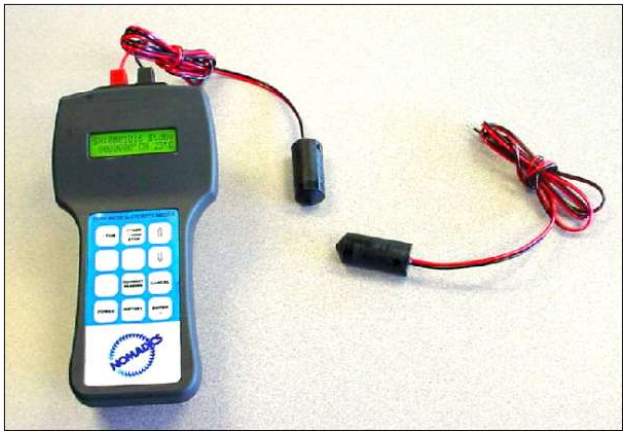
- Concrete patching mixture (grade) selection:
  - <72 hours opening to traffic: Grade P-NC at 300 psi flexural strength
  - ≥72 hours opening to traffic: 3500 or 3500 HP, and open at 550 psi flexural
- Engineer required to verify that the grout has been properly installed into the dowel hole prior to insertion of the dowel



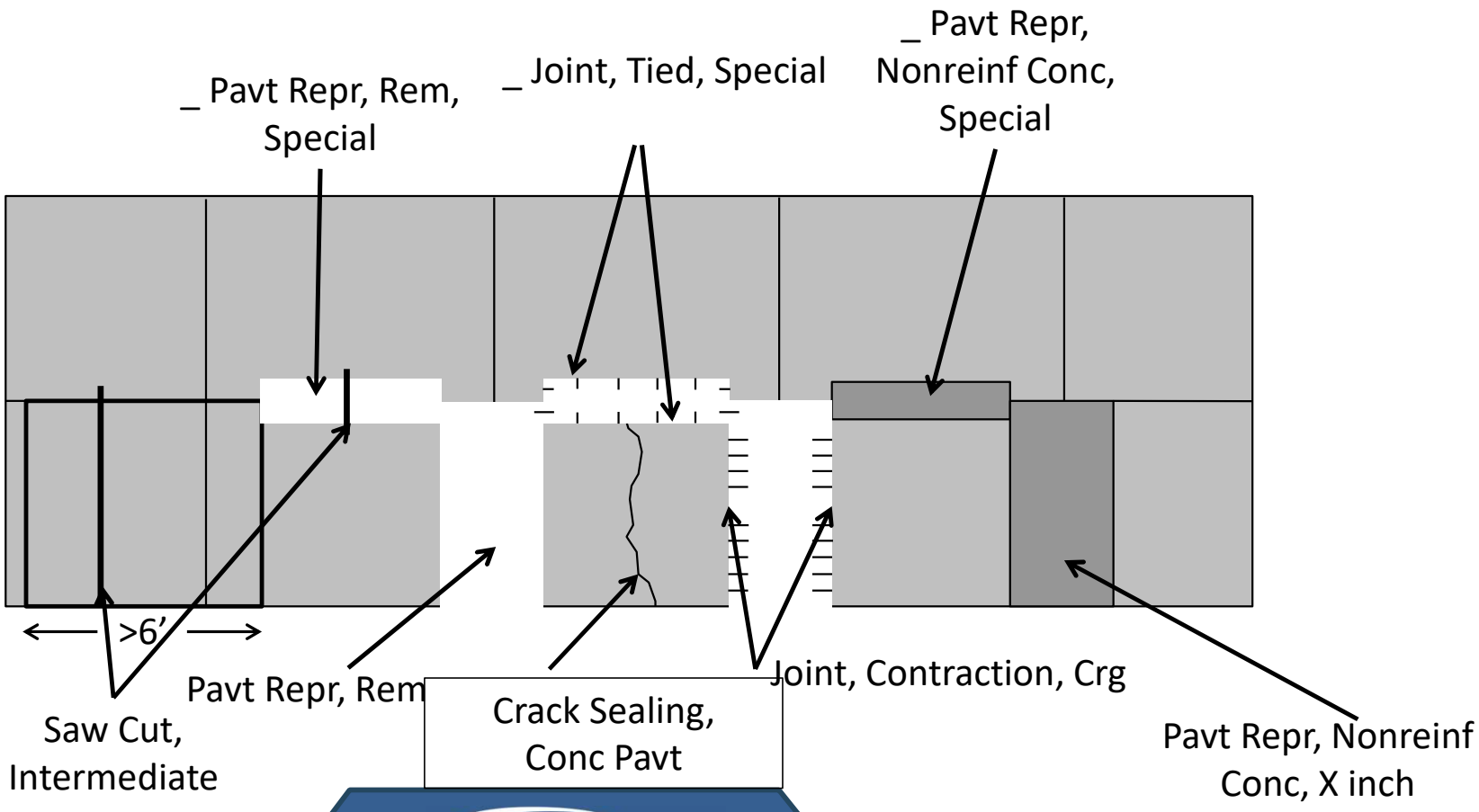
Highlights of Section 603

Section 603 – Concrete Pavement Restoration *(cont.)*

- Includes Maturity Method for opening to traffic strength determination for pavement repairs
- Includes the "sand patch test" requirements for measuring surface texture for diamond grinding of concrete pavements



Repair Items & Locations



Key Points for Repair

- Scoping / Layout
  - If long lag time between scoping/quantities and actual project, plan for increases
- Joints
  - Proper layout and usage of joint types is critical
  - Build them right! (drilling holes, installing dowels)
- Concrete mix
  - If possible, use longest closure time and lowest cement content for durability (P1, P1M)
- Curing
  - All concrete requires curing, all year round

Diamond Grinding

- Diamond Grinding is a concrete restoration technique.
- Diamond Grinding can help worn surface, and can help blend existing concrete to newly repaired concrete.
- Diamond Grinding
  - Improves ride quality
  - Reduces noise
  - Enhanced skid resistance

Benefits of Diamond Grinding

- Improved Ride Quality = Smoother Pavements = satisfied travelers
- Noise Reduction accomplished by eliminating surface irregularities
- Increases skid resistance = enhanced safety for travelers
- Cost-Effective: diamond grinding extends the lifespan with out needing a full reconstruction.

Where is Diamond Grinding used?

- Typically performed on pavements that have:
  - Joint faulting
  - Poor ride quality
  - Warping
  - Uneven surface wear or scaling
  - Cross-Slope Correction
  - Drainage issues
  - Improve pavements that have become polished or slippery

Sealing Repaired Concrete

What Type of Sealer is Recommended?

- Silane or Siloxane Penetrating Sealers
- These sealers react with in the concrete to form a hydrophobic barrier
- They reduce water absorption, help prevent freeze-thaw damage and salt penetration
- They are breathable and allow moisture vapor to escape to increase chance of resistance to surface delamination.

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QUESTIONS?

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