

# BUREAU of BRIDGES



## and STRUCTURES

**Priority Preservation Support Unit  
Bridge Preservation  
Bureau of Bridges and Structures**

## Bridge Deck Patching



2023 Michigan Bridge Week Conference – Maintenance Track



# Agenda

- Bridge Maintenance Manual
- Deck Patch Scoping
- Patch Preparation
- Patch Installation
- Material Selection
  - Rapid Set Concretes

Jason DeRuyver, P.E  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710



# Bridge Maintenance Manual

## Table of Contents

MICHIGAN MAINTENANCE MANUAL  
BRIDGE & STRUCTURE MAINTENANCE

TABLE OF CONTENTS

<b>1</b>	<b>INTRODUCTION .....</b>	<b>#</b>
1.1	PURPOSE OF MANUAL .....	#
1.2	BRIDGE COMPONENTS .....	#
1.3	CULVERT COMPONENTS .....	#
1.4	ENVIRONMENTAL CONSIDERATIONS .....	#
	<i>Placeholder.....</i>	#
	<i>Placeholder.....</i>	#
	<i>Placeholder.....</i>	#
1.5	MOBILITY CONSIDERATIONS .....	#
	<i>Placeholder.....</i>	#
	<i>Placeholder.....</i>	#
	<i>Placeholder.....</i>	#
1.6	GENERAL .....	#
1.7	GLOSSARY & ABBREVIATIONS .....	#
<b>2</b>	<b>BRIDGE MAINTENANCE AND REPAIR.....</b>	<b>#</b>
2.1	ACTIVITY 1510 – BRIDGE MAINTENANCE – CUBIC YARDS .....	#
2.1.1	ABUTMENT REPAIR .....	#
2.1.2	PIER REPAIR.....	#
	2.1.2A Circular Column Repair .....	#
	2.1.2B Square Column Repair .....	#
	2.1.2C Pier Cap Repair .....	#
2.1.3	CONCRETE DECK PATCHING.....	#
	2.1.3A Concrete Deck Patching- Shallow .....	#
	2.1.3B Concrete Deck Patching- Deep .....	#
	2.1.3C Concrete Deck Patching- Full Depth .....	#
2.2	ACTIVITY 1520 – BRIDGE MAINTENANCE – SQUARE FEET .....	#
	<i>Thin Epoxy Polymer Bridge Deck Overlay.....</i>	#
	<i>Healer Sealer.....</i>	#
	<i>Spot Painting – Steel.....</i>	#
	<i>Silane .....</i>	#
	<i>Substructure Horizontal Surface Sealer.....</i>	#
	<i>Slope Protection.....</i>	#
2.3	ACTIVITY 1540 – MOVABLE SPANS.....	#
	<i>Inspect and Clean Electrical Equipment.....</i>	#
	<i>Inspect Clean and Grease Mechanical Equipment.....</i>	#
	<i>Grease Gears.....</i>	#
2.4	ACTIVITY 1560 – BRIDGE MAINTENANCE – LINEAL FEET .....	#
	<i>Crack Chasing.....</i>	#
	<i>Top of Bridge Railing Repair.....</i>	#
	<i>Bridge Railing Curb Repair.....</i>	#
	<i>Full Height Railing Repair.....</i>	#
	<i>Deck Fascia Repair .....</i>	#
2.5	ACTIVITY 1561 – BRIDGE JOINT REPAIR AND REPLACEMENT .....	#
	<i>Full Depth Strip Seal Replacement.....</i>	#
	<i>Strip Seal Gland Repair and Replacement.....</i>	#
	<i>End Header Replacement .....</i>	#
	<i>Pressure Relief Joint Installation.....</i>	#
	<i>Pressure Relief Joint Replacement.....</i>	#
	<i>Resealing Bridge Construction Joints.....</i>	#
2.6	ACTIVITY 1590 – BRIDGE MAINTENANCE HOURS.....	#

Jason DeRuyver, P.E  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710



# Bridge Maintenance Manual

## Table of Contents

### MICHIGAN MAINTENANCE MANUAL BRIDGE & STRUCTURE MAINTENANCE

<i>Bridge Washing and Cleaning</i> .....	#
<i>Bridge Drain and Scupper Cleanout</i> .....	#
<i>Bridge Scaling</i> .....	#
<i>Maintenance Sheeting Installation</i> .....	#
<i>Brush Cutting and Vegetation Removal</i> .....	#
<i>Approach Repairs</i> .....	#
<i>Rip Rap Placement</i> .....	#
<i>Channel Clean-out and Debris Removal</i> .....	#
<i>Crack Injection</i> .....	#
<b>3 CULVERT REPAIR</b> .....	#
<b>3.1 PLACE HOLDER</b> .....	#
<i>Place Holder</i> .....	#
<i>Place Holder</i> .....	#
<i>Place Holder</i> .....	#
<b>APPENDIX A</b> .....	#
<b>REFERENCE DOCUMENTS</b> .....	#
<b>REFERENCE SPECIAL PROVISIONS</b> .....	#
<b>WHITE PAPERS</b> .....	#
<i>Epoxy Overlays and Healer Sealers</i> .....	#
<i>Pressure Relief Joints</i> .....	#
<i>Carbon Fiber Wrapping Bridge Elements (Proposed)</i> .....	#
<b>APPENDIX B</b> .....	#
<b>PLACEHOLDER</b> .....	#
<i>Placeholder</i> .....	#

Jason DeRuyver, P.E  
 Engineer Manager  
 Priority Preservation  
 Support Unit  
 Bridge Preservation  
 (517) 242-2988

Jacob Creisher, P.E.  
 Statewide Bridge  
 Engineer  
 (517) 243-7821

Aaron Porter  
 Statewide Bridge  
 Support &  
 Maintenance  
 Coordinator  
 (517) 242-5788

Thomas Ranck  
 Statewide Bridge  
 Engineer  
 (517) 242-2077

Cliff Graves  
 Statewide Concrete  
 Specialist  
 (517) 275-1710



# Bridge Maintenance Manual

## Concrete Deck Patching

Jason DeRuyver, P.E  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710

<b>2</b>	<b>BRIDGE MAINTENANCE AND REPAIR.....</b>	
2.1	ACTIVITY 1510 – BRIDGE MAINTENANCE – CUBIC YARDS.....	
2.1.1	ABUTMENT REPAIR .....	
2.1.2	PIER REPAIR .....	
2.1.2A	<i>Circular Column Repair</i> .....	<u>    </u>
2.1.2B	<i>Square Column Repair</i> .....	<u>    </u>
2.1.2C	<i>Pier Cap Repair</i> .....	<u>    </u>
2.1.3	CONCRETE DECK PATCHING.....	
2.1.3A	<i>Concrete Deck Patching- Shallow</i> .....	<u>    </u>
2.1.3B	<i>Concrete Deck Patching- Deep</i> .....	<u>    </u>
2.1.3C	<i>Concrete Deck Patching- Full Depth</i> .....	<u>    </u>

# Bridge Maintenance Manual

## Shallow Deck Patching

Jason DeRuyver, P.E  
 Engineer Manager  
 Priority Preservation  
 Support Unit  
 Bridge Preservation  
 (517) 242-2988

Jacob Creisher, P.E.  
 Statewide Bridge  
 Engineer  
 (517) 243-7821

Aaron Porter  
 Statewide Bridge  
 Support &  
 Maintenance  
 Coordinator  
 (517) 242-5788

Thomas Ranck  
 Statewide Bridge  
 Engineer  
 (517) 242-2077

Cliff Graves  
 Statewide Concrete  
 Specialist  
 (517) 275-1710

MICHIGAN MAINTENANCE MANUAL  
 BRIDGE & STRUCTURE MAINTENANCE  
 ACTIVITY 1510 – BRIDGE MAINTENANCE – CUBIC YARDS

Section 2.1.3A – Concrete Deck Patching - Shallow



General Notes

- Verify all dimensions in the field prior to ordering materials or building forms.

Prior to Commencement of Work

- Field review of deck surface. Check for delamination / spalls on the surface. The deck bottom should be in good condition with only a few minor cracks.

Concrete Material Selection

- Transpo T-17- 100% reactive, rapid setting, solvent free methyl methacrylate (MMA) polymer concrete patching material used for repair of partial depth decks.
- Kwik Bond – PPC 1121 – a premixed polymer concrete made of a Polyester binder resin and graded aggregates with a High Molecular weight methacrylate primer system that creates a bond line of the substrate for a rapid setting, concrete patching material used for repair of partial depth decks.
- EChem – EP Patch – three component, high performance, multi-purpose, non-shrink, epoxy patching mortar material used for repair of partial depth decks

Safety

Review environmental, training and safety procedures.  
 Review MMUTCD prior to setting up traffic control.

Michigan Department of Transportation 2020 Standard Specifications for Construction

- Section 712 – Bridge Rehabilitation – Concrete
- Section 905 – Steel Reinforcement
- Section 1004 – Concrete Grade Mixtures
- Section 1005 – Mortar and Grout Mixtures
- Section 1006 – Concrete Patching Repair

Special Provisions and Supplemental Specifications

N/A

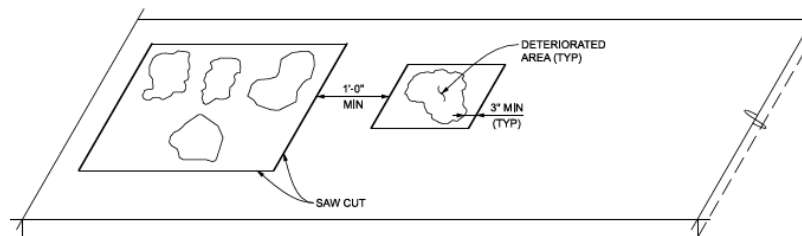


# Bridge Maintenance Manual

## Shallow Deck Patching

RECOMMENDED EQUIPMENT  
5 (2 TRAFFIC REGULATORS INCLUDED)

MATERIALS	EQUIPMENT		
CONCRETE	QTY	CODE	DESCRIPTION
MISCELLANEOUS BRIDGE TOOLS	1	02/03	DUMP TRUCK
SOUNDING HAMMER	1	03	BRIDGE/TOOL TRUCK
CONCRETE SAW	1	04	TRUCK
60LB PNEUMATIC HAMMER(S)	1	12	FLASHING ARROW
BLASTING ABRASIVE	1	19	COMPRESSOR
STRUCTURAL ADHESIVE	1	04	SHADOW VEHICLE
#4, #5, AND #6 REBAR (TYP)	1	53	SANDBLASTER
GALVANIC ANODES			
FAST-SETTING CONCRETE			OPTIONAL
FORM LUMBER	1	04	CRANE TRUCK
FORM FASTENERS	1	04	SCISSOR BED/AERIAL TRUCK
COATED WIRE TIES	1	04	REACHALL
	1	12	PORTABLE SIGNALS
<u>AVERAGE DAILY PRODUCTION</u>	1	38	SKID LOADER
2 CUBIC YARDS	1	67	TRAILER
	1	04	ATTENUATOR



**STEP 1**

1. SOUND DECK, MARK DELAMINATED, SPALLED AND/OR DETERIORATED AREAS ON THE DECK SURFACE.
2. MARK LIMITS OF REMOVAL TO ENCOMPASS DETERIORATED AREA PLUS 3" MINIMUM ON ALL SIDES. PATCHES MUST BE AS SQUARED OFF WITH NO ACUTE ANGLES. IF TWO PATCHES THAT ARE LESS THAN 1 FT APART, THE TWO PATCHES MUST BE COMBINED INTO ONE PATCH.
3. SAW CUT THE DECK TO A DEPTH OF 1" ALONG THE LIMITS OF REMOVAL. EXTEND SAW CUT 1" BEYOND INTERSECTION LINES.

Jason DeRuyver, P.E  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710



# Bridge Maintenance Manual

## Shallow Deck Patching

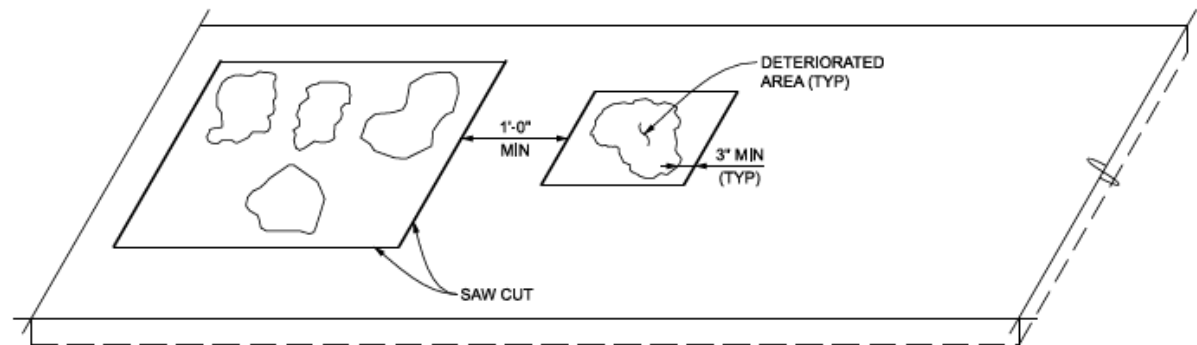
Jason DeRuyver, P.E.  
 Engineer Manager  
 Priority Preservation  
 Support Unit  
 Bridge Preservation  
 (517) 242-2988

Jacob Creisher, P.E.  
 Statewide Bridge  
 Engineer  
 (517) 243-7821

Aaron Porter  
 Statewide Bridge  
 Support &  
 Maintenance  
 Coordinator  
 (517) 242-5788

Thomas Ranck  
 Statewide Bridge  
 Engineer  
 (517) 242-2077

Cliff Graves  
 Statewide Concrete  
 Specialist  
 (517) 275-1710



### STEP 1

1. SOUND DECK, MARK DELAMINATED, SPALLED AND/OR DETERIORATED AREAS ON THE DECK SURFACE.
2. MARK LIMITS OF REMOVAL TO ENCOMPASS DETERIORATED AREA PLUS 3" MINIMUM ON ALL SIDES. PATCHES MUST BE AS SQUARED OFF WITH NO ACUTE ANGLES. IF TWO PATCHES THAT ARE LESS THAN 1 FT APART, THE TWO PATCHES MUST BE COMBINED INTO ONE PATCH.
3. SAW CUT THE DECK TO A DEPTH OF 1" ALONG THE LIMITS OF REMOVAL. EXTEND SAW CUT 1" BEYOND INTERSECTION LINES.





# Bridge Maintenance Manual

## Shallow Deck Patching

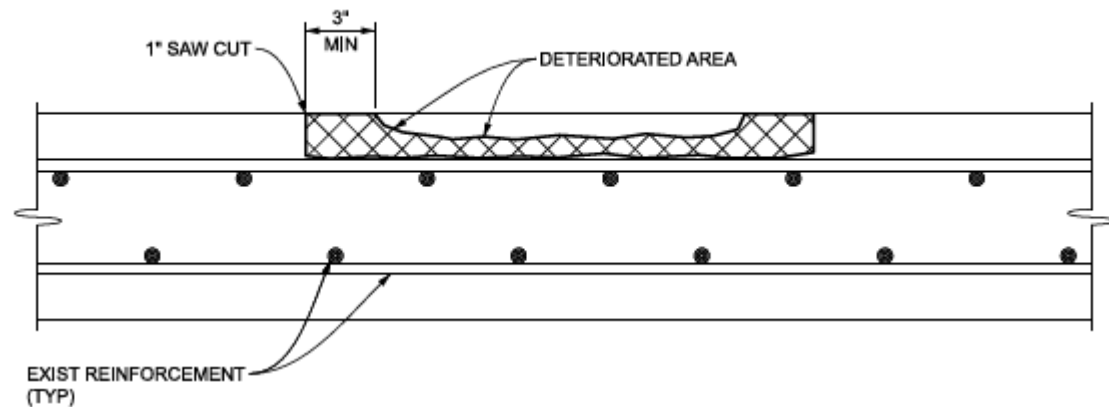
Jason DeRuyver, P.E  
 Engineer Manager  
 Priority Preservation  
 Support Unit  
 Bridge Preservation  
 (517) 242-2988

Jacob Creisher, P.E.  
 Statewide Bridge  
 Engineer  
 (517) 243-7821

Aaron Porter  
 Statewide Bridge  
 Support &  
 Maintenance  
 Coordinator  
 (517) 242-5788

Thomas Ranck  
 Statewide Bridge  
 Engineer  
 (517) 242-2077

Cliff Graves  
 Statewide Concrete  
 Specialist  
 (517) 275-1710



### STEP 2

1. FOR REMOVING SUPERSTRUCTURE CONCRETE ON STEEL BEAM BRIDGES, MACHINE-MOUNTED HYDRAULIC OR PNEUMATIC EQUIPMENT MAY BE USED. USE MANUAL PNEUMATIC HAMMERS TO REMOVE THE BRIDGE DECK OVER CONCRETE BEAMS. LIMIT MANUAL PNEUMATIC HAMMER TO 60 POUND MAXIMUM.
2. SANDBLAST CONCRETE TO REMOVE LOOSE DEBRIS AND ESTABLISH PROFILE FOR CONCRETE ADHESION.



# Bridge Maintenance Manual

## Shallow Deck Patching

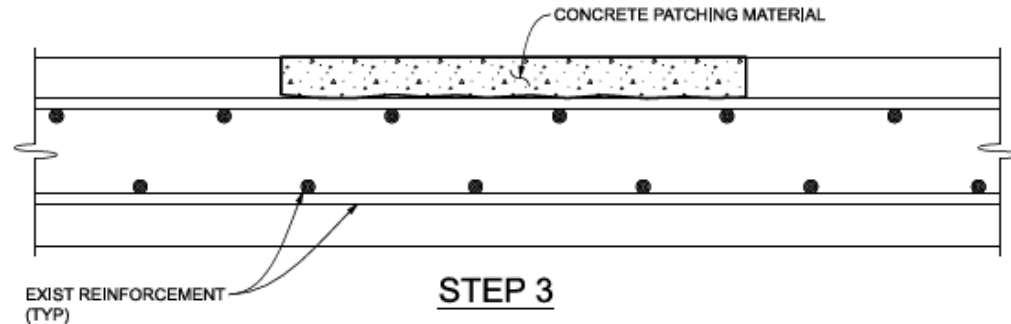
Jason DeRuyver, P.E  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710



1. IF PATCH IS ADJACENT TO EXISTING JOINT INSTALL EDGE FORMS ADEQUATE TO MAINTAIN THE EXISTING JOINT LINE. APPLY PRIMER PER MANUFACTURER'S RECOMMENDATIONS.
2. FOR RAPID SET CONCRETE PATCHING MIXTURES, PLACE, CONSOLIDATE, FINISH AND CURE PER MANUFACTURER'S RECOMMENDATIONS. AFTER FINISHING BROOM THE CONCRETE.
3. SHORTENED CURE TIMES MAY BE ALLOWED FOR NON-SCHEDULED EMERGENCY REPAIRS.



# Bridge Maintenance Manual

## Appendix

Jason DeRuyver, P.E  
 Engineer Manager  
 Priority Preservation  
 Support Unit  
 Bridge Preservation  
 (517) 242-2988

Jacob Creisher, P.E.  
 Statewide Bridge  
 Engineer  
 (517) 243-7821

Aaron Porter  
 Statewide Bridge  
 Support &  
 Maintenance  
 Coordinator  
 (517) 242-5788

Thomas Ranck  
 Statewide Bridge  
 Engineer  
 (517) 242-2077

Cliff Graves  
 Statewide Concrete  
 Specialist  
 (517) 275-1710



### Technical Data Sheet

#### MMA Polymer Concrete Patching Material

#### T-17

T-17 is a 100% reactive, rapid setting, solvent-free methyl methacrylate (MMA) polymer concrete system that can be used as a repair for partial or full depth patching, grouting, and structural repairs. This system is to be used on horizontal concrete surfaces, on grade, above and below grade.

The polymer concrete consists of a two-component system. The T-17 liquid component consists of a solvent free 100% reactive, low viscosity methyl methacrylate (MMA). The T-17 powder component consists of a prepackaged blend of sand, inert fillers, polymers, and initiators. The material can be applied at a minimum 1/2" (13mm) thickness. For deeper patching, the T-17 should be extended with a special aggregate.

#### Application Procedure

**Surface Preparation:** All surfaces that are to receive T-17 must be thoroughly clean, dry and free of all dirt, grease, rust and other contaminants that might interfere with the proper adhesion of the polymer concrete. All damaged or deteriorated concrete shall be removed using jack-hammers or any other means and cut back to sound concrete. All surfaces must be thoroughly shot-blasted or sandblasted prior to applying T-17.

**Priming:** Priming is done with T-41s MMA primer using either rollers or brushes at a rate of 0.01gal/ft<sup>2</sup> (0.4L/m<sup>2</sup>). The primer resin is mixed with an appropriate amount of powder hardener (BPO) as shown in Table 1. The primer coat must be allowed to cure tack-free before application of the patching material.

Table 1: Mixing Instructions for T41-s Primer

Ambient Temperature °F (°C)	No. of 1oz (30g) Bags of BPO per gal (3.79L) of T41-s Resin
14 – 35 (-10 – 2)	6
36 – 55 (2 – 13)	5
56 – 75 (13 – 24)	4
76 – 104 (24 – 40)	3

**T-17 Mixing:** For small batches, the material can be mixed in a polyethylene bag that is available upon request. This is done by adding the powder, a pre-measured amount of liquid component to the bag, twisting the top with both hands so as to leave a small air space above the material, holding the bag closed with one hand and using the other to agitate the components in the bag until completely mixed. After powder and liquid are mixed, additional aggregate should be added and repeat mixing procedure.

For larger mixing, a rotary drum mortar mixer may be used. The inside of the mixer should be clean and dry. Add appropriate amount of Transpo T-17 liquid to the mixer, the Transpo T-17 powder component, and mix until uniform consistency. Next, add the additional coarse aggregate and re-mix for another minute. The amount of aggregate and resin added per bag of Transpo T-17 powder depends on the depth of the patch. Refer to Table 2:

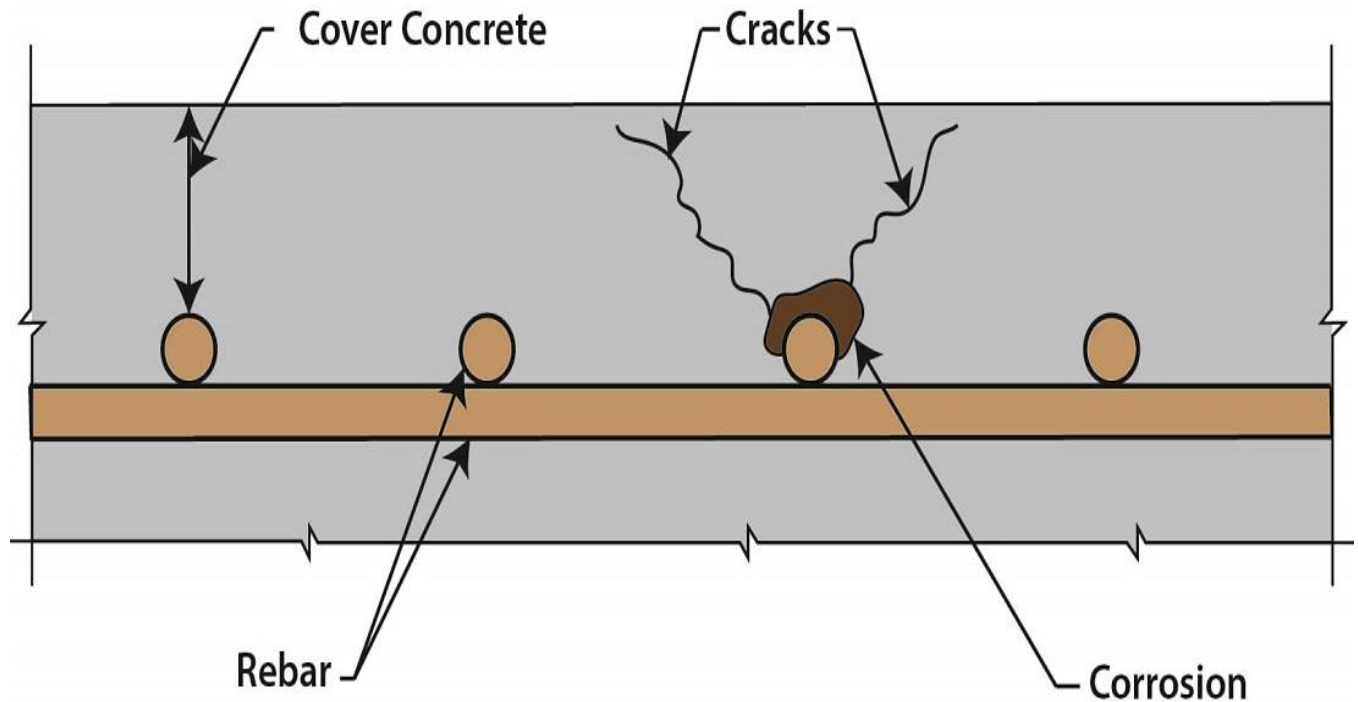
Table 2: Mixing Instructions for T-17 per 50 lb (22.7 kg) bag of T-17 Powder

Depth of Patch in (mm)	Amt. Extension	Agg. Size in (mm)	Amt. Agg. lb (kg)	T-17 Liquid gal (L)	Yield ft <sup>2</sup> (m <sup>2</sup> )
2 (51) and above	100%	3/4 x 3/8 (19 x 10)	50 (22.7)	0.875 (3.3) 112 OZ	0.72 (0.07)
1/2 - 2 (13 – 51)	50%	3/8 x 3/16 (10 x 5)	25 (11.3)	0.75 (2.8) 96 OZ	0.56 (0.05)
Less than 1/2 (13)	0%	-	-	0.625 (2.4) 80 OZ	0.40 (0.03)



# Deck Patch Scoping

## Deck Deterioration



Jason DeRuyver, P.E.  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710



# Deck Patch Scoping

## Deck Deterioration

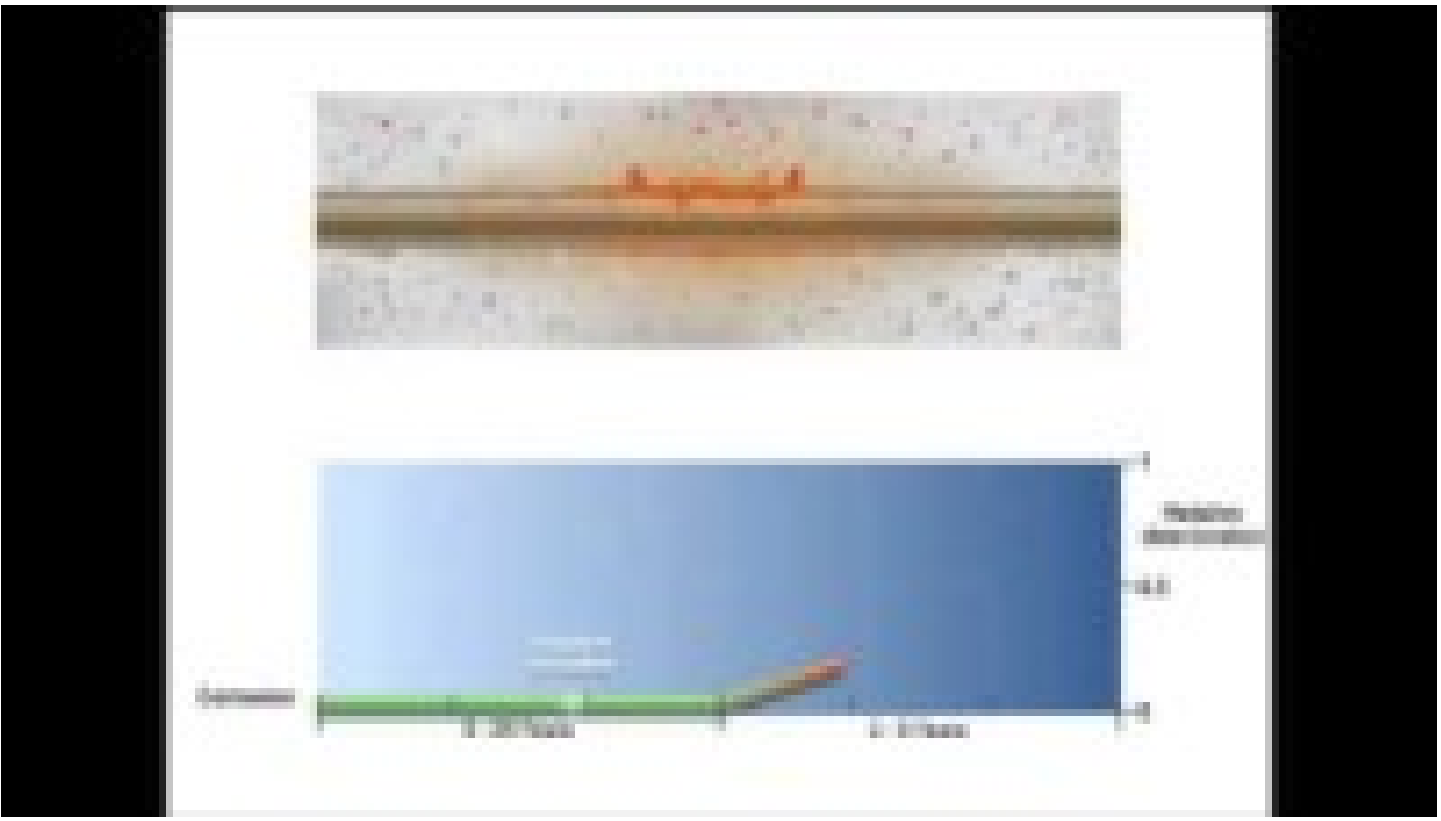
Jason DeRuyver, P.E  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710





# Deck Patch Scoping

Visually inspect deck surface & bottom for all areas of deterioration



Jason DeRuyver, P.E.  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710



# Deck Patch Scoping

Sound area to be patched and/or around patch area to identify all unsound concrete



Jason DeRuyver, P.E.  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

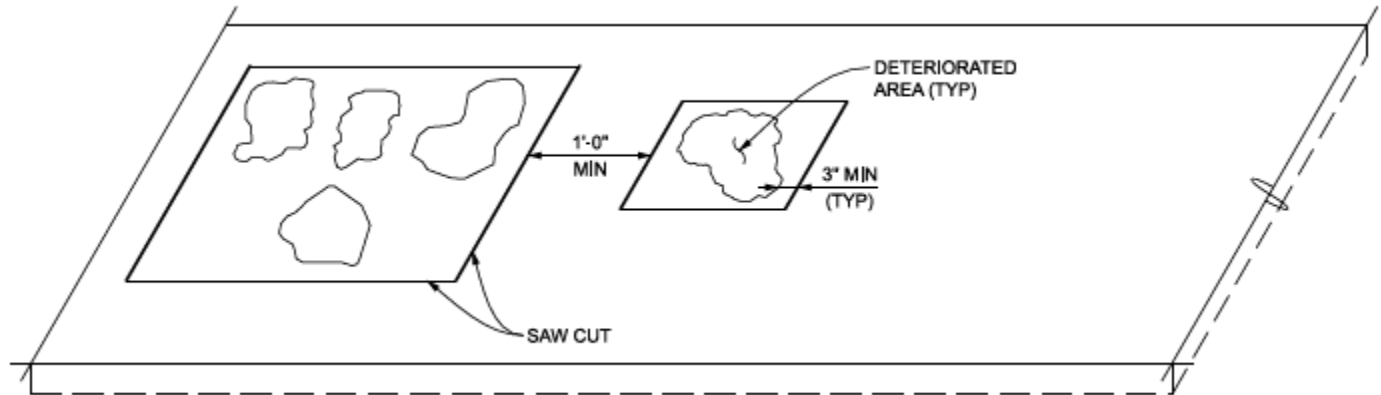
Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710



# Deck Patch Scoping

Sound area to be patched and/or around patch area to identify all unsound concrete



Jason DeRuyver, P.E  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710





# Patch Preparation

## Saw Cutting



Jason DeRuyver, P.E.  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710



# Patch Preparation

## Chip Limits of Deterioration

Jason DeRuyver, P.E  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710





# Patch Preparation

Ensure to chip all unsound concrete



Jason DeRuyver, P.E.  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710



# Patch Preparation

## Ensure to chip all unsound concrete



Jason DeRuyver, P.E.  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710



# Patch Preparation

## Check Edges



Jason DeRuyver, P.E  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710



# Patch Preparation

## Clean Patch Areas

Jason DeRuyver, P.E  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710





# Patch Preparation

## Clean Patch Areas



Jason DeRuyver, P.E  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710



# Patch Preparation

## Reinforcement Steel



Jason DeRuyver, P.E  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710





# Patch Preparation

## Full Depth Patch



Jason DeRuyver, P.E.  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710



# Patch Preparation

## Poor Formwork



Jason DeRuyver, P.E  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710



# Patch Preparation

## Proper Bracing



Jason DeRuyver, P.E.  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710

# Patch Preparation

## Galvanic Anodes



Jason DeRuyver, P.E.  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710

# Patch Preparation



Jason DeRuyver, P.E.  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

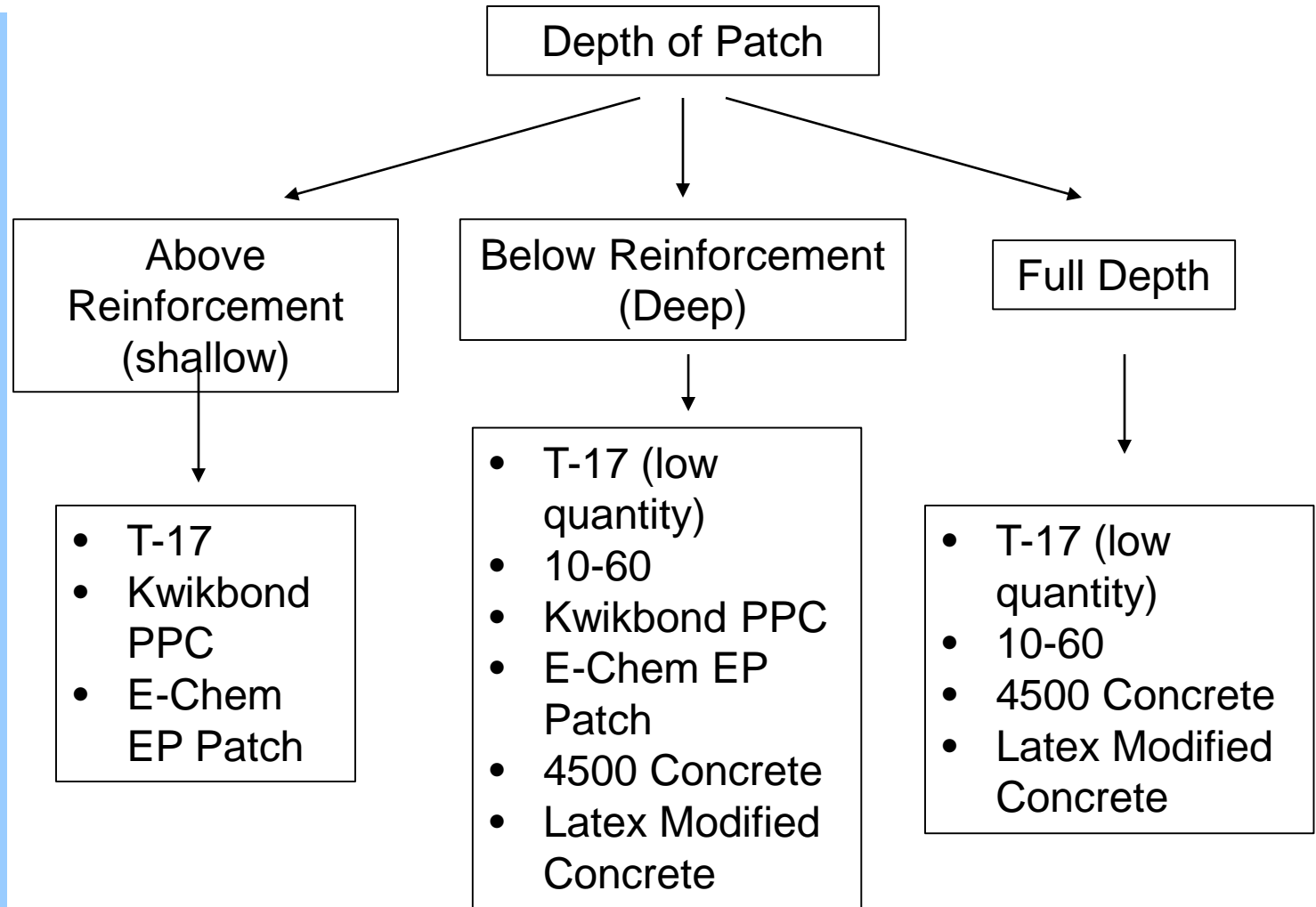
Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710



# Material Selection



Jason DeRuyver, P.E  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710



# Material Selection

## Rapid Cure Time

- MasterEmaco T 1060 by BASF – Rapid Mortar
  - 2-3 Hours
- Castek T-17
  - 2-3 Hours
- Kwikbond Polymers – PPC Easy Patch
  - 2-3 Hours
- Echem – EP Patch
  - 3-5 Hours

## Longer Cure Time

- MDOT – 4500 Concrete
  - 7 Day (wet)
- Latex Modified Concrete
  - 48 Hours wet & 48 hours dry

Jason DeRuyver, P.E.  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710



# Patch Installation

## Material Placement

Jason DeRuyver, P.E  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710

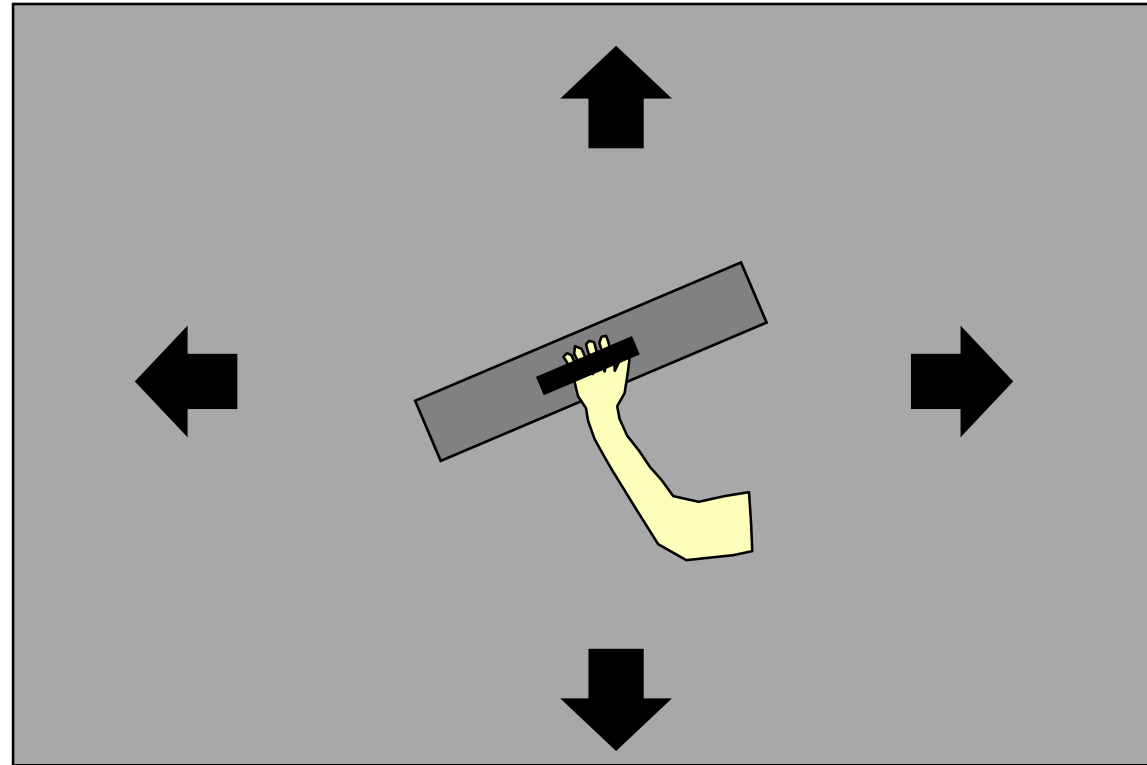






# Patch Installation

## Finishing



Jason DeRuyver, P.E.  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

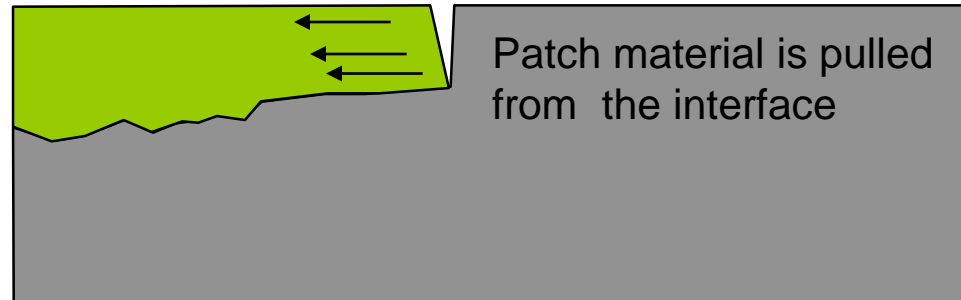
Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710



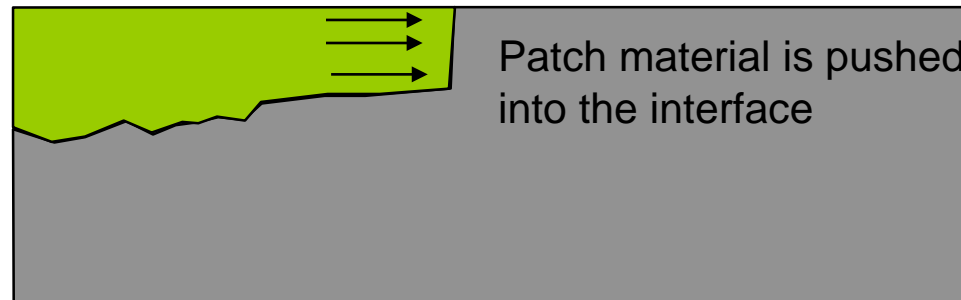
# Patch Installation

## Finishing

← Finishing Direction



Finishing Direction →



Jason DeRuyver, P.E.  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710

# Patch Installation

## Curing



Jason DeRuyver, P.E.  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710



# Patch Installation

## Deck Patching

SFT Partial Depth QTY: \_\_\_\_\_

SFT Full Depth QTY: \_\_\_\_\_

Qty Anodes QTY: \_\_\_\_\_

LFT Epoxy Reinforcement QTY: \_\_\_\_\_

Product Trial

### Concrete Mixture

BASF – 10-60 Rapid Mortar

MDOT -7 Sack Latex Patching Concrete C-L

MDOT - Concrete Grade D

Castek - T17

MDOT -9 Sack High Early Latex Patching Concrete - C-L-HE

Other - MDOT QPL

Equipment:

Material:

Cost:

<input type="text"/>	<input type="text"/>
----------------------	----------------------

Personnel:

Hours:

<input type="text"/>	<input type="text"/>
----------------------	----------------------

Comment:

Jason DeRuyver, P.E  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710



# Rapid Set Concretes

## BASF 1060

Jason DeRuyver, P.E  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710





# Rapid Set Concretes

## BASF 1060

Jason DeRuyver, P.E  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710





# Rapid Set Concretes

## BASF 1060

Jason DeRuyver, P.E.  
 Engineer Manager  
 Priority Preservation  
 Support Unit  
 Bridge Preservation  
 (517) 242-2988

Jacob Creisher, P.E.  
 Statewide Bridge  
 Engineer  
 (517) 243-7821

Aaron Porter  
 Statewide Bridge  
 Support &  
 Maintenance  
 Coordinator  
 (517) 242-5788

Thomas Ranck  
 Statewide Bridge  
 Engineer  
 (517) 242-2077

Cliff Graves  
 Statewide Concrete  
 Specialist  
 (517) 275-1710

Technical Data Guide



3 03 0100  
 Maintenance of  
 Concrete

### MasterEmaco® T 1060

Very rapid-setting cement-based concrete repair mortar

FORMERLY 10-60 RAPID MORTAR

#### PACKAGING

MasterEmaco T 1060  
 50 lb (22.6 kg) polyethylene-lined bags  
 3,000 lb (1,360 kg) bulk bags

MasterEmaco T 1060DR  
 50 lb (22.6 kg) polyethylene-lined bags

#### YIELD

0.43 ft<sup>3</sup> (0.012 m<sup>3</sup>) per 50 lb (22.6 kg)  
 - WHEN EXTENDED 50%:  
 0.57 ft<sup>3</sup> (0.016 m<sup>3</sup>)  
 - WHEN EXTENDED 100%:  
 0.77 ft<sup>3</sup> (0.022 m<sup>3</sup>)

#### STORAGE

Store in unopened containers in cool, clean, dry conditions

#### SHELF LIFE

- 50 LB BAGS:  
 1 year when properly stored  
 - 3,000 LB BULK BAGS:  
 6 months when properly stored

#### VOC CONTENT

0 g/L less water and exempt solvents

#### DESCRIPTION

MasterEmaco T 1060 is a one-component, shrinkage-compensated, very rapid-setting, cement-based mortar. It is designed for repairing horizontal concrete surfaces where high early strength gain is required. MasterEmaco T 1060DR is a reduced dust version available separately.

#### PRODUCT HIGHLIGHTS

- Extra low permeability helps minimize chloride intrusion
- Very rapid-setting so that structures can be opened to vehicular traffic in 1 hour
- Low residual moisture, can be coated in as little as 4 hours
- Excellent resistance to freeze/thaw cycling
- Shrinkage-compensated, minimizing cracking from drying shrinkage, reducing stress at the bond line
- Can be extended up to 100% by weight, providing higher yields
- Proprietary cement blend bonds to carbonated and noncarbonated concrete substrates

#### APPLICATIONS

- Interior and exterior
- Horizontal surfaces
- Applications requiring high early-strength gain
- Structural concrete repairs
- Partial and full-depth repairs

#### SUBSTRATES

- Concrete

#### HOW TO APPLY

##### SURFACE PREPARATION CONCRETE

1. Concrete must be structurally sound and fully cured (28 days).
2. Saw cut the perimeter of the area being repaired into a square with a minimum depth of 1/2" (13 mm).
3. Refer to current ICRI Guideline no. 310.2R for surface prep requirements to permit proper bond.

##### REINFORCING STEEL

1. Remove all oxidation and scale from the exposed reinforcing steel in accordance with ICRI Technical Guideline No. 310.1R.
2. For additional protection from future corrosion, coat the prepared reinforcing steel with MasterProtect P 8100 AP.



# Rapid Set Concretes

## BASF 1060



Jason DeRuyver, P.E  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710





# Rapid Set Concretes

## Transpo – T-17



Jason DeRuyver, P.E.  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710



# Rapid Set Concretes

## Transpo T-17



### Technical Data Sheet

#### MMA Polymer Concrete Patching Material T-17

T-17 is a 100% reactive, rapid setting, solvent-free methyl methacrylate (MMA) polymer concrete system that can be used as a repair for partial or full depth patching, grouting, and structural repairs. This system is to be used on horizontal concrete surfaces, on grade, above and below grade.

The polymer concrete consists of a two-component system. The T-17 liquid component consists of a solvent free 100% reactive, low viscosity methyl methacrylate (MMA). The T-17 powder component consists of a prepackaged blend of sand, inert fillers, polymers, and initiators. The material can be applied at a minimum 1/2" (13mm) thickness. For deeper patching, the T-17 should be extended with a special aggregate.

#### Application Procedure

**Surface Preparation:** All surfaces that are to receive T-17 must be thoroughly clean, dry and free of all dirt, grease, rust and other contaminants that might interfere with the proper adhesion of the polymer concrete. All damaged or deteriorated concrete shall be removed using jack-hammers or any other means and cut back to sound concrete. All surfaces must be thoroughly shot-blasted or sandblasted prior to applying T-17.

**Priming:** Priming is done with T-41s MMA primer using either rollers or brushes at a rate of 0.01 gal/ft<sup>2</sup> (0.4L/m<sup>2</sup>). The primer resin is mixed with an appropriate amount of powder hardener (BPO) as shown in Table 1. The primer coat must be allowed to cure tack-free before application of the patching material.

Table 1: Mixing Instructions for T41-s Primer

Ambient Temperature °F (°C)	No. of 1oz (30g) Bags of BPO per gal (3.79L) of T41-s Resin
14 – 35 (-10 – 2)	6
36 – 55 (2 – 13)	5
56 – 75 (13 – 24)	4
76 – 104 (24 – 40)	3

**T-17 Mixing:** For small batches, the material can be mixed in a polyethylene bag that is available upon request. This is done by adding the powder, a pre-measured amount of liquid component to the bag, twisting the top with both hands so as to leave a small air space above the material, holding the bag closed with one hand and using the other to agitate the components in the bag until completely mixed. After powder and liquid are mixed, additional aggregate should be added and repeat mixing procedure.

For larger mixing, a rotary drum mortar mixer may be used. The inside of the mixer should be clean and dry. Add appropriate amount of Transpo T-17 liquid to the mixer, the Transpo T-17 powder component, and mix until uniform consistency. Next, add the additional coarse aggregate and re-mix for another minute. The amount of aggregate and resin added per bag of Transpo T-17 powder depends on the depth of the patch. Refer to Table 2:

Table 2: Mixing Instructions for T-17 per 50 lb (22.7 kg) bag of T-17 Powder

Depth of Patch in (mm)	Amt. Extension	Agg. Size in (mm)	Amt. Agg. lb (kg)	T-17 Liquid gal (L)	Yield ft <sup>3</sup> (m <sup>3</sup> )
2 (51) and above	100%	3/4 x 3/8 (19 x 10)	50 (22.7)	0.875 (3.3) 112 OZ	0.72 (0.07)
1/2 - 2 (13 – 51)	50%	3/8 x 3/16 (10 x 5)	25 (11.3)	0.75 (2.8) 96 OZ	0.56 (0.05)
Less than 1/2 (13)	0%	-	-	0.625 (2.4) 80 OZ	0.40 (0.03)

Jason DeRuyver, P.E  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710



# Rapid Set Concretes

## Transpo – T-17

Jason DeRuyver, P.E  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710





# Rapid Set Concretes

## Transpo – T-17

Jason DeRuyver, P.E  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710





# Rapid Set Concretes

## Transpo – T-17

Jason DeRuyver, P.E  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710





# Questions?????

Jason DeRuyver, P.E.  
Engineer Manager  
Priority Preservation  
Support Unit  
Bridge Preservation  
(517) 242-2988

Jacob Creisher, P.E.  
Statewide Bridge  
Engineer  
(517) 243-7821

Aaron Porter  
Statewide Bridge  
Support &  
Maintenance  
Coordinator  
(517) 242-5788

Thomas Ranck  
Statewide Bridge  
Engineer  
(517) 242-2077

Cliff Graves  
Statewide Concrete  
Specialist  
(517) 275-1710

