

**BRIDGE**



**CAPITAL  
SCHEDULED  
MAINTENANCE**

**Manual**



## Chapter 1

### **INTRODUCTION**

The Capital Scheduled Maintenance program (CSM) was conceived in committee in late 1997 and approved by Leadership 1998 as part of the development of MDOT's Strategic Investment Plan for Trunkline Bridges. A portion of the overall budget within the Bridge Preservation template was set aside to establish resources for preserving bridges in their current condition state for a longer period of time. The CSM program is new to the Bridge Preservation template and this document is intended to give guidance for use of these resources.

Typical CSM work activities include:

- ✓ Superstructure Washing
- ✓ Vegetation Control
- ✓ Drainage System Cleaning / Repair
- ✓ Spot Painting
- ✓ Joint Repair
- ✓ Concrete Coating / Sealing
- ✓ Minor Concrete Patching and Repair
- ✓ Concrete Crack Sealing & Healer/Sealer
- ✓ Approach Pavement Relief Joints
- ✓ Slope Paving Repair

The bridge CSM program is administered by the Bridge Operations Unit of the Construction and Technology Division. Questions or comments may be directed to:

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## Chapter 2

### **SCOPING GUIDELINES FOR CSM WORK**

#### **A. INITIAL PROJECT SELECTION**

From the Strategic Investment Plan for Trunkline Bridges: “Scheduled maintenance activities maintain the existing serviceability, and reduce deterioration rates on bridges”. CSM work activities sustain the current bridge condition longer, whether the current condition is good, fair, or poor. Use the following general concepts when setting up projects for CSM work:

- The anticipated work should have little or no impact to traffic and have very little traffic control costs.
- The work should be of short duration, typically completed within one working day.
- The work should be focused on activities that if left unattended will cause deterioration of the structure leading to more expensive repairs.
- Priority should be given to corridors where the same small task can be performed on many bridges.

From the definition above, starting with “worst bridges first” will not work. The intended outcome from this program is to delay structural deterioration as long as possible, and to accomplish this, certain work activities must be performed on the bridge system.

Therefore, the first step in the process is to identify bridges that are good candidates for CSM work activities and are fairly close together so they can be grouped as one project. From these groups, evaluate the most appropriate work activities by reviewing the inspection comments on the NBI Inspection Reports.

There are two ways to bundle projects for these work activities: set up a project to do one work activity on a group of bridges, or take a group of bridges and do all of the work activities that are necessary to that group. The Region Bridge Engineer may package the contract as it best suits their bridge network.

**B. TYPICAL CSM WORK ACTIVITIES**

- ◇ Superstructure Washing
- ◇ Vegetation Control
- ◇ Drainage System Cleaning / Repair
- ◇ Spot Painting
- ◇ Joint Repair
- ◇ Concrete Coating / Sealing
- ◇ Minor Concrete Patching and Repair
- ◇ Concrete Crack Sealing & Healer/Sealer
- ◇ Approach Pavement Relief Joints
- ◇ Slope Paving Repair

Each individual work activity is defined in the following chapters, along with a brief description of how to scope it, special provisions to use, and appropriate pay items.

Please note: The first two activities listed (superstructure washing and vegetation control) are not currently eligible for federal funding and thus cannot be contracted out at this time.

**C. SCOPING SITE VISIT**

After the bridges have been identified as potential candidates for a CSM project, each bridge must be visited to confirm the appropriateness of the proposed work activity and to determine the estimated quantity of each pay item at that structure. This data is entered into the electronic version of the CSM Bridge Project Cost Estimate Worksheet, explained below and in Chapter 14.

**D. ESTIMATING**

Chapter 14 contains a copy of the CSM Bridge Project Cost Estimate worksheet, with unit prices of all of the work activities and applicable pay items. Some work activities will require the combining of several pay items, such as when making slope paving repairs where structure embankment may be necessary to fill the voids prior to placing new slope paving and headers.

On the worksheet, fill in the bridge number, the location, and quantities for the selected work activities or pay items, and the estimated project cost for that bridge will be calculated. The Excel file for this estimating workbook includes 30 Bridge Estimate Sheets and a Project Summary. For multiple bridge entries, the information on the Estimate Sheets will be transferred to the Project Summary and totaled.

#### **E. SCOPING PACKAGE SUBMITTAL** (to Bridge Operations Unit of C&T)

The following scoping documents are to be turned in to the Bridge Operations Unit of the Construction and Technology Division for Project Programming:

1. Program Revision Request
2. Project Concept Statement (MPINS)
3. CSM Bridge Project Cost Estimate
4. Current Inspection Report (BIR or CIR)
5. Photographs of the Bridge (note: photographs are needed only if project is being designed by the Bridge Design Unit in Lansing)

In a cover memo, list the bridges that are to be packaged together for each CSM project.

*Note - Until MPINS is set up with a cost estimate form specifically for CSM projects, input only the total cost per structure on the Project Concept Statement under "bridge cost", work item "miscellaneous", unit cost "other".*

#### **F. OEC MEETING**

An Omissions / Errors, and Check meeting must be held for all bridge CSM projects. This meeting is usually arranged by the Project Manager and held in the TSC or Region office. The Bridge Quality Assurance Engineer from Lansing Design must be in attendance. Prior to the OEC meeting, the proposal package must be sent to the following, (at minimum) for review:

Bridge Quality Assurance Engineer – Design	(currently Jennifer Transue)
Bridge Scoping Engineer – C&T	(currently Linda Reed)
Bridge Construction Engineer – C&T	(currently Eric Burns)
Lansing Traffic and Safety	





## Chapter 3

### **SUPERSTRUCTURE WASHING**

This work activity cannot be contracted out at this time. Expect to do this work with state forces.

## Chapter 4

### **VEGETATION CONTROL**

This work activity cannot be contracted out at this time. Expect to do this work with state forces.

## Chapter 5

### DRAINAGE SYSTEM CLEANING / REPAIR

CLEANING - Drainage system flushing is not to be contracted out at this time due to environmental concerns by the Department of Environmental Quality (DEQ).

REPAIR - The purpose of this work activity is to ensure that all aspects of drain systems on a bridge are operational and performing as designed or as modified.

Inspect each drain casting, supporting deck structure, downspout, and collection box (if applicable) from both the surface and the underside. If the deck structure around the casting is delaminated on the surface or on the underside, estimate the area of hand chipping and patching required to provide better support for the drain casting and the downspout (see also Chapter 9 of this manual). Determine the need for deck drain extensions, downspout replacement, and end header box systems.

For CSM projects involving drain casting replacement, or any complex drainage system repair, **it is highly recommended that a bridge design unit in Lansing be contacted for assistance.** The design engineer will determine the proper number, size, and layout of epoxy coated steel reinforcement and adhesive anchored horizontal bars. Replacement of drain casting systems are estimated by calculating the following quantities:

1. Number of castings to be removed, to be paid for as *Structures, Rehabilitation, Remove Portions*. A note should be placed on the plans that sawcutting and removal of concrete adjacent to the drain casting (limits to be called out in the plan details) are included in the pay item *Structures, Rehabilitation, Remove Portions*. This item will be bid lump sum but estimated as "each".
2. Amount of deep chipping necessary for removal of delaminated concrete beyond that necessary for drain casting removal, to be paid for as *Hand Chipping, Deep*.
3. Number of new castings required, to be paid for as *Drain Casting, Type \_\_\_\_* or *Drain Casting Assembly, Type \_\_\_\_*. The cost of furnishing and installing the downspout and lower bracket (if necessary) is included in the pay item *Drain Casting Assembly, Type \_\_\_\_*.
4. Amount of concrete and epoxy coated steel reinforcement necessary to form around the new casting, to be paid for as *Concrete, Grade D; Patch Forming; Reinforcement, Steel, Epoxy Coated; and Adhesive Anchoring of Horizontal Bars, \_\_\_\_ inch*.



**B. POLYETHYLENE (PE) END HEADER BOX SYSTEM**

The bridge drainage system may include a drainage trough or end header box system to collect runoff from the deck drain or scupper and connect it to a funnel linked to an outlet pipe or downspout. Use the following special provision if this end header box system is in need of replacement.

Pay Item: PE End Header Box System [Each]

MICHIGAN  
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION  
FOR  
POLYVINYL CHLORIDE (PVC) DOWNSPOUT

C&T:LMR

1 of 1

C&T:APPR:POJ:EMB:05-19-09

**a. Description.** Furnish and install a rigid PVC downspout to the limits shown on the plans and as described herein. Removal and disposal of the existing cast downspouts will be included in this pay item. The connection into the existing sewer system at or below ground elevation near the pier as well as any excavation and backfill required will be included in this pay item. This work includes all fittings and anchoring materials. This work also includes the clean out and disposal of all material in each drainage system.

**b. Materials.** Provide pipe and fittings that conform to the requirements of ASTM D 2665, Schedule 40.

All plastic pipe and fittings used throughout the project must be of the same brand name (same manufacturer). Proposed pipe must match the diameter of the existing pipe to be removed.

Supply solvents and glues compatible with the pipe and fittings as recommended by the manufacturer.

Galvanize all anchor bolts/connectors according to AASHTO M-232 and select the adhesive anchoring system from the MDOT qualified products list. Remove the existing anchors and patch the concrete according to other Special Provisions in this contract. Design the anchor bolts to meet or exceed those shown on the existing drawings. Submit design calculations with the shop drawings to the Engineer 7 calendar days prior to installation.

**c. Construction.** Installation must conform to section 717 of the Standard Specifications for Construction. Join the pipe and fittings in the manner recommended by the manufacturer.

**d. Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price using the following contract item (pay item):

<b>Contract Item (Pay Item)</b>	<b>Pay Unit</b>
PVC Downspout.....	Each

**PVC Downspout** includes payment in full for furnishing all labor, equipment, and materials necessary to complete the installation of the downspouts as detailed, including fittings, anchor bolts, straps, connection to existing, minor excavation and backfill at existing outlet locations, and miscellaneous hardware. **PVC Downspout** also includes payment in full for removing and disposing of existing cast downspouts, abandoning the existing connection into the sewer system, and cleanout and disposal of all material in each drainage system.

MICHIGAN  
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION  
FOR  
**POLYETHYLENE (PE) END HEADER BOX SYSTEM**

C&T:LMR

1 of 1

C&T:APPR:POJ:EMB:05-19-09

**a. Description.** Furnish and install a rigid PE end header box system at the locations shown on the plans. Remove and dispose of the existing cast end header box systems from the existing bridge scupper pipe to the existing funnel as part of the downspout. This work includes all fittings and anchoring materials. This work also includes the clean out and disposal of all material in each drainage system.

**b. Materials.** Provide pipe and fittings that conform to the requirements of ASTM D 3350, Schedule 40. All plastic pipe and fittings used throughout the project will be of the same brand name (same manufacturer).

Supply solvents and glues compatible with the pipe and fittings as recommended by the manufacturer.

Galvanize all anchor bolts/connectors according to AASHTO M-232 and select the adhesive anchoring system from the MDOT qualified products list. Remove the existing anchors and patch the concrete according to other Special Provisions in this contract. Design the anchor bolts to meet or exceed those shown on the existing drawings. Submit design calculations with the shop drawings to the Engineer 7 calendar days prior to installation.

**c. Construction.** Installation must conform to section 717 of the Standard Specifications for Construction. Join the pipe and fittings in the manner recommended by the manufacturer.

**d. Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price using the following contract item (pay item):

<b>Contract Item (Pay Item)</b>	<b>Pay Unit</b>
PE End Header Box System .....	Each

**PE End Header Box System** includes payment in full for furnishing all labor, equipment, and materials necessary to complete the installation as described, including fittings, anchor bolts, straps, and miscellaneous hardware. **PE End Header Box System** also includes payment in full for removing and disposing of existing cast end header box systems, and cleanout and disposal of all material in each drainage system.

## Chapter 6

### **SPOT PAINTING**

The purpose of this work activity is to repair small localized areas of paint failure to prevent further decline of the paint system and corrosion of the steel. Spot painting is appropriate when there are isolated areas of paint failure (less than 5% of the painted area).

Spot painting should only be performed on structures with existing zinc based coatings. **Do not spot paint bridges with lead based paint systems.**

See the following Special Provision. Download the most current version from **ProjectWise** under *Reference Documents, SP Originals, Non-Job Related Unique SP's, Approved for Use*.

#### **SPOT CLEANING & COATING EXISTING STEEL STRUCTURES**

This special provision differs from the special provision for Partial Painting Existing Steel Structures only in that negative pressure within the containment is not required.

The Site Identification numbers for all bridges scheduled for painting must be placed on the project title sheet. These numbers can be obtained from the Bridge Management Section of the Construction and Technology Division. See the Bridge Design Manual sections 8.02.F and 12.07.08 for more information.

To determine a lump sum cost estimate for this work, measure the areas of the bridge to be spot painted and enter that value on the CSM cost estimate worksheet. On this worksheet, the unit cost per area includes cleaning and coating of the structural steel to be painted.

To determine a cost estimate for design, apply 80% of this lump sum value to cleaning and 20% to coating.

Since the contractor will be bidding this item as lump sum, the designer must **include an informational quantity** for the areas to be spot painted in the plans or proposal. This quantity, in square feet, will essentially be the same as that used for estimating purposes.

Pay Items: Steel Structure, Cleaning, Spot, Type 4 (structure no.) [Lump Sum]  
Steel Structure, Coating, Spot, Type 4 (structure no.) [Lump Sum]

MICHIGAN  
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION  
FOR  
**SPOT CLEANING AND COATING EXISTING STEEL STRUCTURES**

C&amp;T:BDB

1 of 2

C&amp;T:APPR:EMB:DBP:05-19-09

**a. Description.** Partially clean and coat metal surfaces of existing steel structures coated with non-lead paint systems to the limits, and including the details, as shown on the plans. Clean and coat areas of bare steel and damaged coating in accordance with section 715 of the Standard Specifications for Construction, except as modified herein. Use due care to prevent damage to the existing coating system.

**b. Materials.** Use clean and potable water for power washing and power rinsing structural steel in accordance with section 911 of the Standard Specifications for Construction.

Mix an industrial, non-sudsing, biodegradable detergent with the wash water at the manufacturer's recommended rate. Submit product data sheets to the Engineer.

**c. Equipment.** Equip the spray wand(s) used in power washing with a 0 degree spinner nozzle. Provide a tee fitting and pressure gauge to measure line pressure at the spray wand. Such measurements will be made at the direction of the Engineer. Equip the power washer(s) with properly placed gauges and pressure regulators to ascertain and regulate water pressure. Size the power washers so that no combination of hose length or power washer placement will result in an output pressure of less than 900 psi or more than 1150 psi as measured at the spray wand in any power wand location.

**d. Construction.**

1. Negative Pressure. Negative pressure within the containment is not required.

2. Power Washing. Before power washing surfaces to be top coated, remove all oil and grease deposits by solvent cleaning according to SSPC-SP 1. Clean all steel to be coated by power washing with a detergent and water solution to remove all visible oil, and debris. The detergent will be added to the wash water at the manufacturer's recommended rate by means of a siphon device or pressure pump capable of overcoming the inlet line pressure. Install a back flow prevention device in the supply line prior to the detergent introduction point. A premixed holding tank may also be used. Wash the beams from top to bottom with the nozzle held at a maximum of 6 inches from and perpendicular to the steel surface. Move the nozzle properly (slowly) to prevent missed areas or visible swirl lines on the paint surface. Clean as necessary to remove all visible swirl lines, dirt, chalked paint, oil, grease, diesel fumes, diesel smoke, tar, road salt, and bird contamination, or other natural foreign matter prior to painting. On all surfaces not cleaned satisfactorily by power washing, remove foreign matter by one or a combination of the following: brush with stiff fiber or wire bristles, abrade, scrape, steam clean or clean with solutions of appropriate cleaners.

3. Feathered Edges. Feather the edges of the existing coating, which are created by the method of surface preparation, prior to the application of the spot repair coats.

4. Profile Existing Sound Top Coat. For structural steel coated with Type 3, 4 or 4S systems, roughen the existing urethane top coat to create a surface for the new urethane to adhere. Roughen existing urethane prior to power rinsing.

5. Power Rinse. Rinse all steel surfaces to be top coated with water at a minimum of 900 psi and a maximum of 1150 psi to remove detergent residue, debris, and chloride contamination from the steel surfaces. Wash the beams from top to bottom with the nozzle held at a minimum of 4 inches to a maximum of 8 inches from and perpendicular to the steel surface. Move the nozzle slowly to prevent missed areas on the paint surface. A minimum of two passes of the stream is required over each area being cleaned.

6. Stenciling Requirement. If the fascia beam is completely coated the stenciling requirements are the same as in subsection 715.03.D.5 of the Standard Specifications for Construction except that the coating type designation will be preceded by the letter S (e.g., 10/00-S4).

If the fascia beam is not completely coated, stencil the completion date (month and year), the spot cleaning and coating designation, and the coating type (e.g., 10/00-S4) on the traffic side of each fascia beam in the lower right corner of the newly painted section. Put the two required markings completely within the partial coating limits, no closer than 3 inches above the bottom flange and with the stenciling ending within 3 inches of the right edge of the newly painted area. If these locations are not applicable to the structure, the Engineer will designate the locations of the markings.

**e. Measurement and Payment.** The completed work, as described and measured as lump sum, will be paid for at the contract price using the following contract items (pay items):

<b>Contract Item (Pay Item)</b>	<b>Pay Unit</b>
Steel Structure, Cleaning, Spot, Type 4 ( <u>Structure number</u> ).....	Lump Sum
Steel Structure, Coating, Spot, Type 4 ( <u>Structure number</u> ).....	Lump Sum

**Steel Structure, Cleaning, Spot, Type 4 (Structure Number) and Steel Structure, Coating, Spot, Type 4 (Structure Number)** includes all labor, materials, and equipment necessary to complete cleaning and coating of the structure as shown on the plans.

Stenciling is part of the work and will not be paid for separately. Where called for on the plans, cleaning and coating existing utility conduits (including all brackets and hangers), is included in the work and will not be paid for separately.

## Chapter 7

### **JOINT REPAIR**

The purpose of this work activity is to repair bridge construction, expansion, or compression seal joints, and end headers.

#### **A. Resealing Bridge Construction Joints**

See the following Special Provision. Download the most current version from **ProjectWise** under *Reference Documents, SP Originals, Non-Job Related Unique SP's, Approved for Use*.

#### **RESEALING BRIDGE CONSTRUCTION JOINTS**

The repair method is to remove the gland (if there is one) or existing joint seal, install a backer rod, and place hot poured rubber. See Section 914.04 and Subsection 602.03.S.4 of the MDOT Standard Specifications for Construction.

Measure the length of the joints and enter this quantity on the CSM cost estimate sheet. The unit cost covers removal of the existing joint material, cleaning the joint, and furnishing and installing the backer rod and hot-poured rubber.

Pay Item:     Resealing Bridge Construction Joints                     [Foot]

#### **B. End Header Replacement**

Bridge end header replacement is a standard pay item found in Section 712 of the MDOT Standard Specifications for Construction. All work necessary for this activity, (including removal), is included in the pay item:

- End Header Replacement   [Foot]

Descriptions for pay items associated with this work can be found in the Standard Specifications for Construction.

MICHIGAN  
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION  
FOR  
**RESEALING BRIDGE CONSTRUCTION JOINTS**

C&T:ARB

1 of 2

C&T:APPR:EMB:TES:05-05-09

**a. Description.** Remove existing joint sealants, clean the joint, and seal the joint with a low-modulus hot-poured joint sealant. Reseal joints at locations shown in the proposal, or as directed by the Engineer. All work and materials must conform to the Standard Specifications for Construction with exceptions and additions specified herein.

**b. Materials.** Use hot-poured sealant and backer rod conforming to subsections 914.04.A and B of the Standard Specifications for Construction.

**c. Construction.**

1. Seal Removal. Remove all existing joint seals from the joint grooves. If removing neoprene, the portion of the seal in the vertical joint groove at the barrier or sidewalk need not be removed. For joint grooves that have closed beyond their design limits, run a single saw cut through the length and depth of the joint seal to relieve the pressure and facilitate removal, as needed. Remove hot-poured sealant and silicone by plowing or sawing.

2. Joint Preparation. Immediately prior to sealing, clean the joint to remove all dust and contamination from the joint faces and reservoir. The surface of the concrete must be completely dry at the time of sealing.

3. Cleaning. Cleaning consists of dry abrasive blast cleaning of each joint face, followed by a final cleaning with compressed air free of oil and water and having a minimum pressure of 90 psi. After the final cleaning, insert the backer rod into the transverse joint groove to the depth shown in figure 1 "Detail for Resealing Bridge Construction Joints with Low-Modulus Hot-Poured Rubber".

4. Joint Sealing. Seal the joints with the hot-poured sealant as specified in subsection 602.03.S.4 of the Standard Specifications for Construction. The top of the sealant (after cooling) must be flush to 1/8 inch below the surface of the bridge deck.

**d. Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price using the following contract item (pay item):

<b>Contract Item (Pay Item)</b>	<b>Pay Unit</b>
Resealing Bridge Construction Joints .....	Foot

**Resealing Bridge Construction Joints** includes all labor, equipment, and materials required to remove all existing sealants, clean the joints, and reseal the joints. The Hot-Poured Rubber used to reseal the joints is included in the above contract unit price.

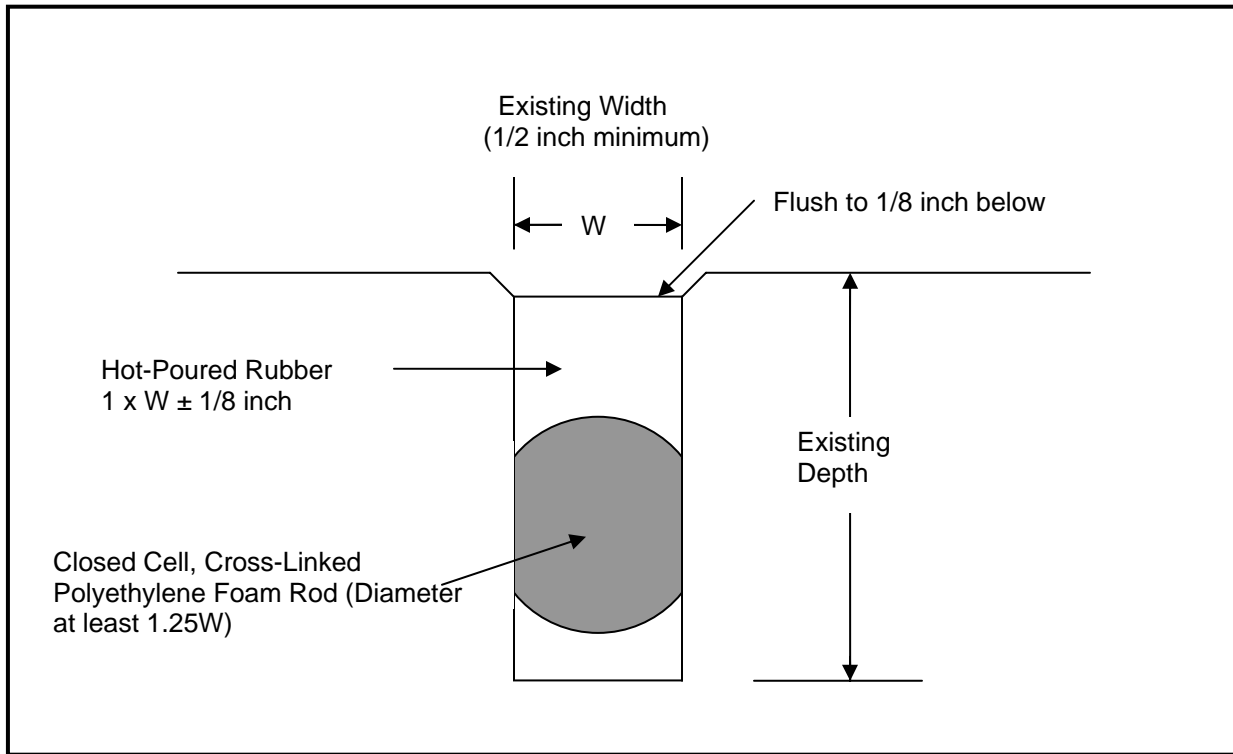


Figure 1  
Detail for Resealing Bridge Construction Joints  
with Low-Modulus Hot-Poured Rubber

## Chapter 8

### **CONCRETE COATING / SEALING**

The purpose of concrete sealing is to slow water intrusion into the concrete and therefore better protect the steel reinforcement. It is important to note that each of these materials requires that the concrete cure for a minimum of 28 days prior to sealing. This constraint can become the critical path in a concrete patching and sealing contract.

There are three different materials used for concrete sealing, as outlined in the paragraphs below.

#### **A. PENETRATING WATER REPELLENT TREATMENT**

This is a standard pay item described in Subsection 706.03.S of the MDOT Standard Specifications for Construction.

This is a clear sealer with the consistency of water that provides a level of water repellency to horizontal and vertical concrete surfaces. Typically it is used on the vertical surface of substructure units, or concrete fascia beams, but can also be applied to deck surfaces that are relatively new and may need the protection of a water sealant. It may also be used on the top, horizontal surface of a substructure if there is no deck joint directly above. Penetrating Water Repellent Treatment offers no aesthetic value, so should only be used where aesthetics are not important.

All concrete to be sealed must be at least 28 days old. The surface of the concrete to be sealed is to be prepared using high pressure power washing or, for a relatively new deck surface, sandblasted to remove curing compound. Once the surface has dried, the material is applied using rollers. When used on the deck surface, the curing time of penetrating water repellent treatment is estimated to be 4 hours (before re-opening to traffic).

Measure the surface area and enter the quantity on the CSM estimating sheet. The unit price includes the surface preparation and the application of the material.

- Water Repellent Treatment, Penetrating [Square Yard]

See the following Special Provisions, to be used as appropriate. Download the most current version from **ProjectWise** under *Reference Documents, SP Originals, Non-Job Related Unique SP's, Approved for Use*.

## B. SUBSTRUCTURE HORIZONTAL SURFACE SEALER

This material is an opaque, epoxy sealer that offers a nearly impenetrable barrier. It is used to provide a sealed surface on the top horizontal surface of pier caps or abutments that have a joint in the deck above. This material is not appropriate for a deck surface and should not be applied to substructure units where there is no joint above it, such as on pier caps of structures with pin & hangers or continuous spans.

This material should not be used to encapsulate the entire substructure unit as it does not “breathe” and can cause concrete degradation in such instances. It is also unsightly and should not be used in visible locations. Care should be taken to prevent the sealer from running beyond the edge of a horizontal surface and down a visible vertical face, such as the sides of a pier cap. It may be used on the vertical surface of an inconspicuous abutment backwall with slight modifications to the special provision.

All concrete to be sealed must be at least 28 days old. The surface is to be prepared by using a light abrasive blasting and the material is then applied using the manufacturer’s recommendations.

Measure the surface area and enter the quantity on the CSM estimating sheet. The unit price includes the surface preparation and the application of the material.

Payment for this item is by lump sum. Note that an **informational quantity must be provided** in the plans or proposal for the contractor to estimate the lump sum bid amount.

This pay item now has a standard item number (see pay item codes in Chapter 14 “Estimating”), but still requires the special provision.

- Substructure Horizontal Surface Sealer (structure no.) [Lump Sum]

## C. CONCRETE SURFACE COATINGS

This material is an acrylic based elastomeric sealer that provides a rubberized coating to the concrete. It can be used to seal all surfaces of concrete except traffic bearing surfaces. Besides sealing, it creates a uniform color and texture, and is recommended for use in areas where aesthetics are important.

Elastomeric coatings are often used to provide a uniform appearance to concrete elements that have been patched. A light concrete gray color is often selected to blend in with surrounding unsealed structural concrete, but other colors are available. Before selecting an original color, a consultation with Lynn Lynwood in the Roadside Development unit of the Design Division is recommended. Many Regions and TSCs have developed color schemes for specific corridors to maintain aesthetic continuity. It is highly recommended that the Contractor be required to provide a coating test section so the Engineer can review and approve the color prior to application on the structure.

Concrete Surface Coatings are typically used on the vertical surfaces of substructure units, retaining walls, concrete fascia beams, concrete bridge barrier railing, and deck slab fascia. The treatment lasts longer than five years, but once coated the concrete elements must be kept coated.

All concrete to be sealed must be at least 28 days old. The surface must be carefully prepped by using a light abrasive blasting. The material is then applied using the manufacturer's recommendations.

Measure the surface area and enter the quantity on the CSM estimating sheet. The unit price includes the surface preparation and the application of the material.

Payment for this item is by lump sum. Note that an **informational quantity must be provided** in the plans or proposal for the contractor to estimate the lump sum bid amount.

This pay item now has a standard item number (see pay item codes in Chapter 14 "Estimating"), but still requires the special provision.

- Conc Surface Coating (structure no.) [Lump Sum]

MICHIGAN  
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION  
FOR  
**SUBSTRUCTURE HORIZONTAL SURFACE SEALER**

C&T:DEB

1 of 1

C&T:APPR:JAB:JFS:05-05-09

**a. Description.** Furnish and apply penetrating epoxy resin based concrete sealers to the top horizontal surface of concrete pier caps, abutment bridge seats, and other locations as specified on the plans. The Standard Specifications for Construction shall apply except as modified herein.

**b. Materials.** Select the two-component penetrating epoxy concrete sealer from the approved list below:

<u>Company / Product</u>	<u>Phone No.</u>
Polycarb / Mark 124	800-225-5649
Master Builders / Masterseal GP	800-924-6400
E-Bond / E-Bond 120	954-566-6555
Conspec / Spec-seal	800-348-7351
Tamms / Dural 333 (Federal color gray #16376)	734-667-3338
Unitex / Pro-Poxy 200T (Federal color gray #16376)	800-821-5846

**c. Construction.** Surface preparation and application shall conform to the manufacturer's recommendations, except as modified by this specification.

1. Surface Preparation. All concrete to be sealed must be at least 28 days old. All concrete to be sealed must be dry and free from contamination such as oil, grease, laitance, and curing compounds. Light abrasive blasting followed by oil-free compressed air cleaning is required. Water blasting or wire brushing is not permitted.

2. Application. Apply the concrete sealer according to manufacturer's recommendations. Two coats of sealer, at the manufacturer's recommended application rate, are required.

**d. Measurement and Payment.** The completed work as described and measured as a lump sum will be paid for at the contract price using the following contract item (pay item):

<b>Contract Item (Pay Item)</b>	<b>Pay Unit</b>
Substructure Horizontal Surface Sealer (Structure Number____) .....	Lump Sum

**Substructure Horizontal Surface Sealer (Structure Number\_\_\_\_)** includes all labor, equipment, and materials to prepare the substrate concrete surface and apply two coats of sealer according to this specification. No compensation will be made to the Contractor for surplus materials.

**THIS SPECIAL PROVISION IS USED TO SPECIFY AN AESTHETIC TREATMENT FOR STRUCTURES AND APPURTENANCES. ENTER THE PROJECT SPECIFIC COLOR IN MATERIALS SECTION. DO NOT CHANGE APPROVAL CODE OR DATE.**

MICHIGAN  
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION  
FOR  
**CONCRETE SURFACE COATINGS**

C&amp;T:DEB

1 of 3

C&amp;T:APPR:TES:DBP:11-20-08

**a. Description.** Furnish and apply an acrylic based concrete surface coating to concrete structures, including but not limited to barriers, fascias, cheekwalls, piers and substructure locations as specified on the plans. Conform to the Standard Specifications for Construction except as modified herein.

**b. Materials.** Select the acrylic based concrete surface coating from the products listed below. On any single structure, use the same product for all areas to be coated with a specified color. Do not mix colors or products from more than one source.

For this project, furnish and apply a smooth textured, **(NOTE TO DESIGNER: INSERT PROJECT SPECIFIC COLOR HERE)** or other colors as approved by the Engineer.

Submit color samples to the Engineer for review and approval. If required by the Engineer, complete a test section to demonstrate the final color prior to application of the coating to the structure.

<u>Company</u>	<u>Product</u>
Carboline Company	Carbocrylic 600
ChemMasters	Colorcoat
ChemMasters	Colorlastic
Conspec	Permacoat
ICI Dulux Paints	Decra-Flex 300
Sika Corporation	Elastocolor
Sika Corporation	Sikagard 550W Elastic
Sonneborn	Super Color Coat
Tamms Industries	Tammolastic
Thoro	Thorocoat
Thoro	Thorolastic
O'Leary Paint Company	O'Leary 1375 Elastomeric

**c. Construction.**

1. Surface Preparation. Cure new concrete a minimum of 28 days before coating. Following the curing period, and prior to coating, test for moisture content in the concrete as described below.

All concrete to be coated must be tested for the presence of moisture after surface preparation has been completed and prior to application of the coating. Testing shall be in accordance with ASTM D 4263. An 18 inch by 18 inch sheet (4mil) of transparent polyethylene shall be taped to the concrete surface to be coated. All edges will be sealed with tape that will stick to the concrete substrate and not allow the infiltration of air. Leave the plastic sheet in place a minimum of 16 hours to detect the presence of moisture in the concrete. There must be no moisture visible on the polyethylene sheet after the minimum period of time has elapsed. This will be verified by the Engineer before application of the coating begins. This test may not be reliable in cooler conditions. Alternate methods to detect moisture shall be approved by the Engineer. This test should be performed a minimum of once every 100 feet on barriers, walls etc., and a minimum of once on columns, piers, etc. Prepare the surface, including removing fins and projections and filling surface voids and cracks (if required), according to manufacturer's recommendations, except as modified by this specification.

The surface to be coated must be dry and free from all contamination including, but not limited to: dirt, form release agents, oil, grease, laitance, loose material and curing compounds. Clean surface by low-pressure water cleaning, steam cleaning, or abrasive blasting (followed by oil-free compressed air cleaning) or by combination to achieve an acceptable cleaned surface. When low-pressure water cleaning or steam cleaning is used, the concrete surface profile (CSP) shall be CSP 1 in accordance with the International Concrete Repair Institute Guideline for Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays (Guideline No. 03732). When abrasive blasting is used, the concrete surface profile shall be CSP 3. Low-pressure water or steam-cleaning primarily removes water soluble contaminants. Aged concrete with contaminants such as hardened curing compound may require light abrasive blasting to completely remove the curing compound. Since many curing compounds contain wax, even well adhered residue shall be removed prior to coating to ensure a good bond between the surface coating and the concrete.

When low pressure water cleaning or steam cleaning is used, the power washer must deliver 3000 - 4500 psi and utilize a 15 degree or smaller nozzle tip held perpendicular to the surface being cleaned. When using light abrasive blasting to remove contaminants on new construction, be careful not to remove excessive concrete material.

2. Visual Inspection. Check surface cleanliness by lightly rubbing with a dark cloth or by pressing translucent adhesive tape onto the concrete surface in the presence of the Engineer. An acceptable level of residual dust can be agreed upon by the Engineer and the contractor. Perform a water drop test in the presence of the Engineer prior to coating the concrete surface to detect for the presence of any hydrophobic contaminants. Hydrophobic contaminants include materials such as form release agents, curing compounds, oil, grease, wax, and resins. If contaminants are detected, as evidenced by a lack of rapid absorption of the water drop into the concrete, remove the contaminants and perform the tests again until no contaminants are detected.

3. Application. Apply two coats (do not dilute) of the acrylic based concrete surface coating. Apply each coat to provide the minimum wet film thickness as recommended by the manufacturer. A primer is not required unless stated as required in the product list under part B. Temperature limitations for application will follow manufacturer's recommendations without exceeding an ambient temperature of 45-90 degrees F and the temperature must be at least 5 degrees F above the dew point when relative humidity is below 90 percent.

**d. Measurement and Payment.** The completed work as described will be measured as a lump sum and paid for at the contract unit price using the following contract item (pay item):

**Contract Item (Pay Item)**

**Pay Unit**

Conc Surface Coating (Structure No.) .....Lump Sum

**Conc Surface Coating (Structure No.)** includes all labor, equipment, and materials to prepare the substrate concrete surface, conduct the visual inspection and apply the primer (if required) and two top coats of surface coating. No additional payment will be made for the test section.



## B. Standard Concrete Patching Mixtures

See Section 703.01.B and Table 703-1 of the MDOT Standard Specifications for Construction for the appropriate use of standard concrete patching mixtures. These concrete mix pay items are appropriate for larger deck patches, pier or abutment repairs, repairs to concrete barrier railing or concrete beams, or other repairs that require patch forming.

Descriptions for other pay items associated with this type of work can also be found in the MDOT Standard Specifications for Construction. Some of those items are listed below:

- |                                  |               |
|----------------------------------|---------------|
| • Hand Chipping, Deep            | [Square Yard] |
| • Hand Chipping, Shallow         | [Square Yard] |
| • Hand Chipping, Other Than Deck | [Cubic Foot]  |
| • Patch, Forming                 | [Square Foot] |
| • Patching Concrete, C-L         | [Cubic Yard]  |

*Note – High Early Strength (HE) concrete is not recommended unless shorter cure time is absolutely necessary. Under no circumstances should HE concrete be used for concrete beam repair.*

## C. Patching Concrete Type C-L Special

See also the following Special Provision. Download the most current version from **ProjectWise** under *Reference Documents, SP Originals, Non-Job Related Unique SP's, Approved for Use*.

### **STRUCTURE REPAIR WITH LATEX MODIFIED CONCRETE – SPECIAL**

This Special Provision is applicable for small quantities (1-2 cubic yards) of C-L concrete mix. It allows for the use of an on-site portable drum mixer and is paid for as lump sum instead of cubic yards.

Pay Item:     Patching Concrete, (Type C-L) – Special           [Lump Sum]

### Summary of Patching Mix Usage:

Bridge Deck Surface Repair (SP required)	Deck patches less than 5 sft Depth less than 4" Fast set mortar
Patching Concrete C-L	Deck patches greater than 5 sft Superstruct. or substruct. patches Depth 1.5" or more 5 day min cure time
Patching Concrete, (Type C-L)–Special (SP required)	96 hour (4 day) min cure time

### **Historic Bridges** –

Bridges eligible or already on the National Historic Register (contact Lloyd Baldwin in Planning for assistance in making this determination) require more precise workmanship. Please add the following concrete repair notes to your plans / proposal.

***Preparation:*** All areas to be patched / repaired will be saw cut, providing squared edges and avoiding over-cutting. Remove all unsound material using conventional methods (hand work with chipping hammer). Prior to applying patching material, the work area must be well cleaned to remove all contaminants. Bonding agents are not allowed.

***Patching Material:*** The mix design will match the existing concrete for texture, finish, and as close as possible, color. If an exact color match cannot be attained, the mix should be slightly lighter in hue.

***Finish:*** As best as possible, remove the laitance that rises to the surface during the initial curing. Stippling the surface with a stiff brush before the concrete has fully hardened is the preferred method for achieving a weathered finish.

MICHIGAN  
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION  
FOR  
**CONCRETE BRIDGE DECK INTERMEDIATE SURFACE REPAIR**

C&amp;T:ARB

1 of 2

C&amp;T:APPR:EMB:TES:06-27-08

**a. Description.** Repair bridge deck spalls at locations sounded and outlined by the Engineer, not adjacent to joints in the surface, using prepackaged hydraulic fast set mortar. All work must conform to the Standard Specifications for Construction, except as modified herein.

**b. Materials.** Select the prepackaged hydraulic fast set repair mortar from the Department's Qualified Products List for Prepackaged Hydraulic Fast-Set Mortar.

Follow the manufacturer's recommendations for a minimum depth of the repair before extending with aggregate. Do not exceed the maximum aggregate extension rates specified on the Qualified Product's List. Use natural aggregates from MDOT approved sources of the type, size, and gradation recommended by the manufacturer of the prepackaged hydraulic fast set mortar.

**c. Equipment.** Use light weight (35 lb Class, maximum) chipping hammers to prepare the repair area, unless otherwise approved by the Engineer.

Use a paddle type mortar mixer for mixing the prepackaged hydraulic fast set mortar.

**d. Construction.** The maximum surface area included within the limits of an individual repair must not exceed 5.0 square feet. The maximum depth of repair must not exceed 4 inches.

1. Repair Area Preparation. The Engineer will sound and outline the repair areas using an appropriate steel hammering device to ensure thorough detection of all unsound areas. Requirements for saw cutting the perimeter of the repair must be as specified by the manufacturer of the prepackaged hydraulic fast set mortar.

Remove all unsound concrete and bituminous patching material from the repair area with chipping hammers. Sound all surfaces of the repair area using an appropriate steel hammering device to ensure thorough detection, and thus complete removal of all unsound materials. Remove exposed reinforcing steel flush with the sound concrete surface. Sandblast all surfaces of the repair area to remove all contamination, followed by a final cleaning with oil-free compressed air having a minimum pressure of 90 psi.

2. Mortar Placement. Mix, place, consolidate, finish and cure the mortar as specified by the manufacturer of the prepackaged hydraulic fast set mortar.

3. Opening to Traffic. The cure time required for opening to vehicular traffic must be as specified by the manufacturer of the prepackaged hydraulic fast set mortar and in accordance with the Maintaining Traffic Requirements for this contract.

**e. Measurement and Payment.** The completed work as described will be measured and paid for at the contract unit price using the following contract item (pay item):

<b>Contract Item (Pay Item)</b>	<b>Pay Unit</b>
Bridge Deck Surface Repair.....	Square Yard

**Bridge Deck Surface Repair** includes all material, labor, and equipment required to prepare, place, consolidate, finish, and cure the prepackaged hydraulic fast set mortar according to this special provision.

MICHIGAN  
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION  
FOR  
**STRUCTURE REPAIR  
WITH LATEX MODIFIED  
CONCRETE – SPECIAL**

C&T:TES

1 of 2

REVISED: 05-11-04  
C&T:APPR:JFS:RDT 12-05-01

**a. Description.**-This work consists of furnishing and placing latex modified concrete to repair the prepared portion of bridge substructure and/or superstructure. All work shall be according to the Standard Specifications for Construction, except as modified herein.

**b. Materials.**-The materials will meet the requirements specified in the designated section of the Standard Specifications for Construction. The concrete patching mixture will be Type C-L as specified in Table 703-1 of the Standard Specifications for Construction.

**c. Equipment.**-The Contractor will supply latex modified concrete that has been prepared in a continuous mixer (mobile mixer).

Equipment for producing concrete by continuous mixing will conform to ASTM C 685. The Contractor will be required to demonstrate that the equipment is properly calibrated for yield and proportions by certification or by field tests. Use of this equipment will be permitted provided that a satisfactory product is obtained as determined by the Engineer.

For small quantities, the Engineer may permit the use of an on-site portable drum mixer to produce the concrete mixture. In this case, all materials shall be individually proportioned by weight according to the repair concrete mix requirements included in this specification. Prior to placing concrete, the Contractor must demonstrate to the satisfaction of the Engineer that the proposed batching and mixing protocol will produce the concrete mixture conforming to specification requirements.

The Contractor will supply hand held vibrating equipment capable of consolidating the repair concrete.

**d. Construction Methods.**- Mixing, placing, finishing, and curing concrete patches will be according to Subsection 712.03.O of the Standard Specifications for Construction, except as modified below.

No more than 48 hours will elapse from time of air blast cleaning of substrate to placement of repair concrete. The substrate will be clean and free of dust, laitance, and other loose material.

The patch concrete will be placed and vibrated within forms in uniform layers.

Immediately after finishing the concrete, apply a layer of wet burlap to the exposed concrete surface. This burlap will be soaked in water for a minimum of 12 hours prior to its use. Place plastic sheeting securely over the burlap to protect the top surfaces from evaporation. For a minimum of the first 48 hours, the concrete will be kept continuously damp by the curing system. Concrete forms and wet burlap will serve to wet cure the concrete and will remain in place for at least 48 hours after placement of the Latex Modified Concrete. After 48 hours of cure, the plastic sheeting, the wet burlap, and concrete forms will be removed. The repair concrete will be allowed to air cure for another 48 hours, for a total of 96 hours of cure.

**e. Measurement and Payment.-**

Contract Item (Pay Item)	Pay Unit
Patching Concrete, (Type C-L) - Special .....	Lump Sum

Payment for the **Patching Concrete, (Type C-L) - Special** will be lump sum and includes furnishing, placing, consolidating, finishing, and curing (96 hour) the repair concrete with no additional compensation permitted.





MICHIGAN  
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION  
FOR  
**SEALING LOCALIZED CRACKS IN BRIDGE DECKS**

C&T:TDM

1 of 1

C&T:APPR:EMB:JB:06-19-08

**a. Description.** Seal localized cracks (a minimum 8 mils in width) in bridge deck surfaces using an epoxy based healer/sealer material in accordance with the Standard Specifications for Construction, except as modified herein.

**b. Materials.** The epoxy based healer/sealer shall be one of the following:

<u>Product</u>	<u>Company</u>
Masterseal GP	Master Builders Inc.
Bridge Seal	Unitex
Sikadur 55 SLV	Sika Corp.
Dural 335	Tamms
E-Bond 120	E-Bond

**c. Construction.** Apply the localized crack healer/sealer at locations determined by the Engineer. Surface preparation and application shall be according to manufacturer's recommendations, except as modified by this specification. The concrete substrate must be thoroughly dry with no sign of moisture emissions in the cracks.

1. **Surface Preparation.** Lightly sandblast all areas to be treated with the localized crack healer/sealer to remove contamination such as dirt, grease, and oils, to expose the surface of the cracked area, and to enhance penetration and visibility. Blow all cracks clean with oil-free compressed air.

2. **Application.** Proportion and mix the localized crack healer/sealer materials according to manufacturer's recommendations. Apply the localized crack healer/sealer using a squeeze bottle with a tip opening configuration sufficient to continually apply the healer/sealer to the crack, thus resulting in no greater than a 1 inch overband onto the deck surface. Visually demonstrate, to the satisfaction of the Engineer, that the healer/sealer is being applied with sufficient quantity to ensure penetration of the material into the crack by gravity feed. Immediately remove any spillage or application over the 1 inch overband width, prior to set, to the satisfaction of the Engineer.

**d. Measurement and Payment.** The completed work as described will be measured and paid for at the contract unit price using the following contract item (pay item):

<b>Contract Item (Pay Item)</b>	<b>Pay Unit</b>
Crack Sealer .....	Foot

**Crack Sealer** includes all labor, equipment and materials to prepare surface and seal localized cracks. Final quantity will be measured and paid for based on the length of cracks sealed.





**e. Measurement and Payment.** The completed work as described will be measured and paid for at the contract unit price using the following contract item (pay item):

<b>Contract Item (Pay Item)</b>	<b>Pay Unit</b>
Penetrating Floodcoat on Bridge Deck .....	Square Yard

**Penetrating Floodcoat on Bridge Deck** includes all labor, equipment and materials necessary to prepare and apply the floodcoat to the bridge deck.

## Chapter 11

### APPROACH PAVEMENT RELIEF JOINTS

The purpose of this work activity is to provide pressure relief joints in the concrete pavement at the bridge approach. It is recommended that Approach Pavement Relief Joint details be prepared with the assistance of a bridge or road design unit.

Ordinarily, the best location for a pavement relief joint is beyond the first approach pavement joint and preferably half way between the next two transverse joints. Avoid creating a narrow, discontinuous pavement slab that may eventually "rock".

There are at least three options in providing a pressure relief joint in approach pavement, depending on the width of joint required. The width of the sawcut for the joint is determined by the amount of pressure to be relieved - use engineering judgment. One wider joint (see option 3) is preferable to a series of narrower joints. The sawcut must be made completely through the concrete pavement thickness for the joint to function as intended. Place a note on the plans specifying that payment for the sawcut is included in payment for the joint.

See Road Standard Plan R-44 series and Section 603 of the MDOT Standard Specifications for Construction.

- A. Option 1** - width of joint is 1"  
Use the "Erg Expansion Joint" detail from Standard Plan R-44, sheet 2 of 5.
- Joint, Expansion, Erg [Foot]
- This is a standard pay item covered in the Standard Specifications for Construction.
- B. Option 2** - width of joint ~4"  
See the following Special Provision. Download the most current version from **ProjectWise** under *Reference Documents, SP Originals, Non-Job Related Unique SP's, Approved for Use*.

#### **APPROACH PAVEMENT JOINTS**

Use the "Pressure Relief Joint" detail from Standard Plan R-44, sheet 5 of 5.

Pay Item: Joint, Pressure Relief, 4 inch [Foot]

- C. Option 3** - width of joint 8"-12" or wider  
Sawcut and fill full depth with bituminous asphalt. Must be wide enough to get bituminous properly compacted. Seek assistance from Design regarding pay item.

MICHIGAN  
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION  
FOR  
**APPROACH PAVEMENT JOINTS**

DES:JAG

1 of 1

C&amp;T:APPR:EMB:TES:05-01-09

**a. Description.** Provide pressure relief joints in the concrete pavement at the bridge approach. Perform this work in accordance with the sections 602 and 603 of the Standard Specifications for Construction except as modified herein.

**b. Materials.** Provide a cellular polyurethane joint filler designed for pressure relief joints in concrete pavements that conforms to the requirements of ASTM D 3204, and exhibits the following physical properties:

Property	Test Method	Required Value
Average Density		7 - 10 pounds per cubic foot
Weight per foot		1.625 - 2.0 pounds
Compressive Strength, psi At 25 percent deflection At 65 percent deflection	ASTM D 3574 & ASTM D 1056	5 ± 2 12 ± 4
Recovery, percent min	ASTM D 2406	90
Water Absorption	AASHTO T-42	30 percent void Max

Materials supplied shall be new Tamms Flex Lok® or approved equal.

**c. Construction.** Extend saw cut through the underlying Portland cement concrete as shown on the plans. Construct all relief joints to the limits and dimensions shown on the plans and installation requirements of the joint filler manufacturer as approved by the Engineer.

**d. Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price using the following contract item (pay item):

**Contract Item (Pay Item)****Pay Unit**

Joint, Pressure Relief, 4 inch .....Foot

**Joint, Pressure Relief, 4 inch** includes all materials, equipment, and labor necessary to complete the work according to this special provision. The length of **Joint, Pressure Relief, 4 inch** will be measured and paid for in feet.

## Chapter 12

### SLOPE PAVING REPAIR

The purpose of this work activity is to repair or replace spot locations of failed or damaged slope paving.

See Standard Plan B-102 series "Standard Slope Paving Details" and Sections 205, 206, 712 and 813 of the MDOT Standard Specifications for Construction.

A detail showing the limits of slope paving to be removed and replaced is to be provided with the design package. The slope paving needing repair shall be replaced in kind.

Removal of the damaged slope paving shall be paid for as *Structures, Rehabilitation, Rem Portions (structure no.)*. The portion of slope paving to be removed is to be measured in cubic yards, and then entered on the CSM estimating sheet to determine the cost of removal (to be bid by the contractor as "lump sum"). This same quantity, in cubic yards, should be called out on the plans as an informational quantity for the contractor.

**NOTE** - The "as built" quantity for removal, fill, and slope paving usually ends up being twice the amount initially measured in the field. Therefore, consider doubling the field measured quantity for the cost estimate.

Voids up to 12 inches deep shall be filled with Structure Embankment, CIP. Voids deeper than 12 inches shall be filled with Structure Backfill, CIP. This must be identified on the plans.

Slope Paving Headers, if needed, will be paid for separately.

Descriptions for pay items associated with this type of work can be found in the Standard Specifications for Construction. Some of those items are listed below:

- Slope Paving, Concrete [Square Yard]
- Slope Paving, Precast Concrete [Square Yard]
- Slope Paving Header [Foot]
- Embankment, Structure, CIP [Cubic Yard]
- Backfill, Structure, CIP [Cubic Yard]
- Structures, Rehabilitation, Rem Portions (structure no.) [Lump Sum]

## Chapter 13

### **MAINTAINING TRAFFIC**

One of the parameters that sets CSM work apart from CPM work is the short duration of the project, typically one day or less, and therefore the ability to keep the cost and complexity of traffic control to a minimum. Nevertheless, each bridge site will require some form of traffic control and the best resource for that is the Region Traffic and Safety Engineer.

For CSM projects, traffic control may be paid for as LUMP SUM. However, estimated quantities of work items must be provided for informational purposes. A project specific special provision for maintaining traffic must be included in the Proposal, as well as appropriate traffic control Typical. An example of a special provision for maintaining traffic for a road CPM project, as well as a couple of sample Typical, are provided at the end of this chapter.

#### **Maintaining Traffic Special Provision (format)**

- General
- Construction Influence Area
- Traffic Restrictions
- Construction Staging Guidelines - (if applicable)
- Traffic Control Device
  - ◇ General
  - ◇ Temporary Signs
  - ◇ Channelizing Devices
  - ◇ Temporary and Permanent Pavement Markings
- Measurement and Payment
  - ◇ Pay Item. . . . . Maintaining Traffic . . . . . Lump Sum
  - ◇ Estimated Quantities - Informational quantities for work items must be provided in the proposal so the contractor can estimate the amount to bid as lump sum. Note: Some Frequently Used Special Provisions for traffic control list pay items separately, which may conflict with the traffic control special provision. Therefore, it is important to add a disclaimer note to the special provision, such as:

***Estimated quantities are for informational purposes only. These items will not be paid separately but are included in the pay item Maintaining Traffic. In the event of a conflict between pay items listed in this Maintaining Traffic Special Provision and those on other special provisions, the Maintaining Traffic Special Provision shall govern.***

### **Traffic Control Typicals**

Upon consultation with the Region Traffic and Safety Engineer, include the applicable traffic control Typicals in the project proposal. Some examples of Typicals are presented at the end of this chapter.

### **Estimating**

Scoping and design cost estimates for traffic control should come from the Region or TSC Traffic and Safety staff, based on the informational quantities developed.

**MICHIGAN  
DEPARTMENT OF TRANSPORTATION**

**SPECIAL PROVISION  
FOR  
MAINTAINING TRAFFIC**

**UNIV:AAH**

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**9/12/01**

**GENERAL**

Traffic shall be maintained throughout the project in accordance with Section 103.05, 103.06 and 812 of the MDOT Standard Specifications for Construction, including any supplemental specifications, and as herein specified.

The Contractor shall notify the Resident Engineer a minimum of 72 business hours prior to the implementation of any detours, road closures, bridge closures, ramp closures or lane closures and major traffic shifts.

The Contractor shall coordinate his operations with Contractors performing work on other projects within or adjacent to the Construction Influence Area (CIA).

MDOT maintenance crews and/or Contract Maintenance Agencies may perform maintenance work within or adjacent to the Construction Influence Area (CIA). The Maintenance Division of MDOT and/or Contract Maintenance Agency will coordinate their operations with the Engineer to minimize the interference to the Contractor. No additional payment will be made to the Contractor for the joint use of the traffic control items.

**CONSTRUCTION INFLUENCE AREA(CIA)**

The CIA shall include the right-of-way of the following roadways, within the approximate limits described below:

US-23, in Livingston County, from 2,000 feet north of the RR Bridge (X03 of 47013) to 4,000 feet south of Silver Lake Road. This will include the ramps at Silver Lake Road and Lee Road interchanges. Located in Green Oak Township.

In addition, the CIA shall include the rights-of-way of any intersecting roads adjacent to the work zone for a distance of approximately 500 feet in advance of the state trunkline.

**TRAFFIC RESTRICTIONS**

No work shall be performed or lane closures allowed during the Memorial Day, Ann Arbor Art Fair, July 4th, or Labor Day holiday periods, as defined by the Engineer.

C.S. 47013 J.N. 55675A

The contractor shall not be permitted to have a "full width roadway" closure at any time on mainline US-23.

The contractor may close one lane per direction on US-23 from Monday morning at 6am to Friday afternoon at 3pm. Work on weekends only as approved by the Engineer. These closures must follow Typical M57e and use lighted plastic drums with high intensity sheeting. Posted speeds for this closure to be 50 mph, stepped down in 10 mph increments. Night work on mainline to be as directed by the Engineer.

Shoulder closures on US-23 to follow Typical M68e and use lighted plastic drums with high intensity sheeting.

The US-23 ramp work to Lee Road and Silver Lake Road to be done at night with a total closure, as per Typical M47e. The hours of night work are defined as Monday evening 8pm-6am to Thursday evening 8pm-6am. Two (2) Changeable Message boards have been included for this work. Closure of ramps in one direction only and at only one of the interchanges at a time. Ramp work to be in conjunction with mainline closure.

Typical M44e and M48e address the traffic control needed when a mainline lane is closed and the ramp is open to traffic. All active ramp work to be milled and completed in one-night closure.

No conflicting lane closure shall be permitted on any one roadway (all lane closures must originate from the same side of the road). Only one lane closure per direction is permitted.

The contractor shall notify the Engineer at least 24 hours in advance of erection or removal of overlays on existing signs.

When lane closures are in place, the contractor shall completely cover all conflicting warning, regulatory, and guide signs. The sign covers shall be in accordance with 812.03 of the Standard Specifications for Construction.

Storage of equipment or materials on the shoulder shall not be permitted. Storage of equipment within the right-of-way and outside of the clear zone shall be at the discretion of the Engineer.

The workman's private vehicles may be parked within the project limits in areas designated by the Engineer. Access for construction vehicles between the travel lanes and work areas will be restricted to specific locations. The number of access points and their locations will require the prior approval of the Engineer.

## **TRAFFIC CONTROL DEVICES**

### **General**

All traffic control devices and their usage shall conform to the Michigan Manual of Uniform Traffic C.S. 47013 J.N. 55675A

Control Devices (MMUTCD), current edition as revised, and as specified herein.

UNIV:AAH

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Attached to this provision are Traffic Control Typical M1e, M44e, M47e, M48e and M57e, and M68e. These typical shall be used for all lane closures. The signing for the single lane closure shall be as shown in Typical M57e. The signing for entrance and exit ramps shall be as shown in Typical M44e and M48e respectively, ramp closure shall be as shown in Typical M47e.

Tables for "D", "B" and "L" values are shown on attached Typical M1e.

### **Temporary Signs**

For lane closures, traffic shall be maintained using traffic control devices placed similarly as shown in Typical M57e in the proposal.

"TRAFFIC FINES DOUBLED IN WORK ZONES" signs (as shown in Typical M57e) shall be placed on US-23 on each side of the road 700 feet beyond the W21-4("ROAD WORK AHEAD") signs.

All temporary signs shall be faced with prismatic Retro reflective sheeting unless otherwise noted.

All diamond-shaped warning signs shall be 48" x 48" mounted at a 5 feet minimum bottom height.

All temporary warning, regulatory, and guide signs not required for that particular lane closure, shall be either removed, completely covered, or laid down with legs off as directed by the Engineer.

Distances shown between construction warning, regulatory and guide signs shown on the typicals are approximate and may require field adjustment, as directed by the Engineer.

The contractor shall place W21-4 signs ("ROAD WORK AHEAD"), 48" x 48", on all ramps within the lane or shoulder closure area where construction activities may be encountered.

Static signs (four) shown in Advanced Construction Signing Typical to be placed on eastbound and westbound I-96 and northbound and southbound US-23 two weeks prior to scheduled lane closures. Signs to be black on orange and have the following information "US-23 Construction Silver Lake Rd to I-96 Monday-Friday" as shown on Typical. This work is included in the pay item for Maintaining Traffic.

All temporary signs shall be constructed with legends and symbols flush to the signs face and not extending beyond the sign borders or edges.

Fabrication, installation and removal of temporary overlays to be affixed to existing signs shall be the responsibility of the Contractor and shall be included in the pay item for Maintaining Traffic. Fastening devices such as nails, staples, screws or adhesive materials shall not be applied in direct contact with the reflective sheeting.

# SAMPLE

## Channelizing Devices

Lighted plastic drums with high intensity sheeting shall be used for all closures.

Type C Lighted Arrow Panels shall be used where lighted arrow panels are called for and located at the beginning of the taper unless physical limitations restrict its placement. The Lighted Arrow Panel shall then be located as near as possible to the beginning of the taper.

Spacing of channelizing devices shall be 50 feet on tangent sections, 25 feet on shifts and tapers, and 10 feet where tighter control is required by the Engineer.

All channelizing devices used within a construction sequence, i.e., lane closure, shoulder closure, etc. on this project, shall be the same type of device. No intermixing of different types of channelizing devices will be allowed within a construction sequence on this project.

### **Temporary and Permanent Pavement Markings**

Temporary pavement marking shall consist of:

- 4" white Type R Temporary Pavement Marking
- 4" yellow Type R Temporary Pavement Marking
- 4" white Type NR Temporary Pavement Marking (mainline only)
- 4" yellow Type NR Temporary Pavement Marking (mainline only)

Placement of temporary pavement markers shall be conducted inside a lane closure. The markers shall be spaced at 50 feet along the centerline and shall be as specified in the Materials Sampling Guide, Qualified Products List. Lane lines and edge lines are 4 inch solid stripes.

All existing longitudinal pavement markings that are removed for traffic control or obliterated during construction operations shall be replaced with 4 inch yellow or 4 inch white Waterborne Pavement Marking. Permanent pavement markings shall be a part of this contract and shall be waterborne paint for lane lines and edge lines.

### **MEASUREMENT AND PAYMENT**

The estimate of quantities for maintaining traffic is based on signing and related traffic control devices for single lane closures.

No additional compensation will be paid for contractor delay on construction and coordination of their operations due to traffic maintenance conflicts with other construction projects except for

adjusted unit prices for pay items required during authorized extensions of contract time.

SAMPLE

Delays on construction and coordination of their operations due to traffic maintenance conflicts with other construction projects will be considered as a basis for extension of contract time, but will not be considered a basis for extra compensation for suspensions of work, idled equipment, or labor.

<b>Contract Item (Pay Item)</b>	<b>Pay Unit</b>
<b>Maintaining Traffic .....</b>	<b>Lump Sum</b>

The estimate of quantities for maintaining traffic is based on signing and related traffic control devices for two-single lane closures.

Any additional signing or maintaining traffic devices required to expedite the construction shall be at the Contractor's expense

**Estimated Quantities\***

Minor Traffic Devices	1	lump sum
Lighted Arrow, Type C, Furn	2	each
Lighted Arrow, Type C, Operated	2	each
Plastic Drum with High Intensity Sheeting, Lighted-Furnished	1140	each
Plastic Drum with High Intensity Sheeting, Lighted-Operated	1100	each
Barricade, Type III, Lighted, Furnished	4	each
Barricade, Type III, Lighted, Operated	4	each
Sign, Type A, Temp	130	sft
Sign, Type B, Temp	750	sft
Sign Covers	16	each
Sign, Portable, Changeable, Furn	2	each
Sign, Portable, Changeable, Oper	2	each
Pavt Mrkg, Type R, 4" White, Temp	1640	ft
Pavt Mrkg, Type R, 4" Yellow, Temp	985	ft
Pavt Mrkg, Type NR, Paint, 4" White, Temp	985	ft
Pavt Mrkg, Type NR, Paint, 4" Yellow, Temp	650	ft

\*These quantities are for informational purposes only. They shall be included in the pay item Maintaining Traffic.











## CERTIFICATION & ACCEPTANCE – Type 2

(Page 2 of 5)

### Utility Coordination

(To be initiated by Region/TSC Utility Coordinator or Utilities Coordinator-Real Estate Division)

\_\_\_\_\_  
(Yes or N/A)

The Utilities Status Report is included in the proposal. All private and municipal utility relocation(s), if required, will either be relocated prior to contract award or have been identified in the proposal's Notice to Bidders – Utility Coordination document. Some utility work may be included in the contract. Authorization has been given to utility(s) that meet the eligibility requirements for relocation cost reimbursement.

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### Materials

\_\_\_\_\_  
(Yes or N/A)

Guarantee Clauses and Warranties. Bridge painting and landscaping are approved for warranty clauses. Also, other materials may have warranties if properly justified and approved by FHWA (see FAPG 635.413).

\_\_\_\_\_  
(Yes or N/A)

Salvaged Highway Materials(guardrails, signs, etc.) delivered to MDOT or other public agencies.

1. A non-federal participating item must be set up to cover cost of transporting salvaged material to an off-site location.
2. A salvage value must be credited to the project if the item's value is more than \$5000. (No credit is necessary if the material will be used on another federal-aid project).

\_\_\_\_\_  
(Yes or N/A)

Materials furnished by a public agency. A public interest finding is necessary to document that the cost of material is not more than a contract average bid price (See FAPG 635.407).

\_\_\_\_\_  
(Yes or N/A)

Alternate products. When necessary to specify a brand name material, a minimum of two brand names "or approved equal" must be specified. Single brand names can only be specified if one of the following apply:

1. Certification is made to FHWA that there are no suitable alternatives.
2. Certification is made to FHWA that the item is needed for synchronization with existing highway facilities. For example: the item is needed to match existing items for ease of maintenance.
3. The item is part of an experimental work plan (See FAPG 635.411).

\_\_\_\_\_  
(Yes or N/A)

Non-standard items are covered by special provisions, supplemental specifications or special details in proposal or plans. { All 7000 code numbers not covered in the current Standard Specifications for Construction must have a special provision included in the proposal. All items with item code numbers that are not presently covered by the current Standard Specifications for Construction should have either a Supplemental Specification or a Special Provision written to cover this item (Contact the Specifications and Estimate Unit for information).}

\_\_\_\_\_  
(Yes or N/A)

If experimental features are included, an approved work plan has been approved for the experimental feature (FAPG sec.511).

## CERTIFICATION & ACCEPTANCE – Type 2

(Page 3 of 5)

### Design

\_\_\_\_\_ The design of the project is in compliance with the Program Guidelines included in the  
(Yes) current Capital Preventive Maintenance Program Manual.

\_\_\_\_\_ The format of the plans is in compliance with FAPG 630B, Supplement.  
(Yes)

\_\_\_\_\_ Clear roadside cross sections are provided according to 3R guidelines or AASHTO  
(Yes) Roadside Design Guide criteria.

\_\_\_\_\_ Landscaping projects where there is a separate job number for landscaping, should  
(Yes or N/A) have at least 1/4% of the expenditure for planting native wildflowers. A waiver must be requested for exceptions (See FAPG sec. 752.11). **{Attach a copy of the waiver, if appropriate (see Roadside Development Section for information).}**

### Review by Others

\_\_\_\_\_ Lighting, if required, is in accordance with AASHTO Guide. The Design Engineer -  
(Initials or N/A) Electrical Unit has reviewed any electrical items included in the plans.

\_\_\_\_\_ Water main and sanitary sewers relocated within the project limits have been reviewed  
(Initials or N/A) by the Design Engineer-Municipal Utilities. The Municipal Utilities unit has reviewed any water main or sanitary sewer items included in the plans.

\_\_\_\_\_ Project drainage, floodplain encroachments, and waterway crossing modifications  
(Initials or N/A) requiring a DEQ permit and hydraulic information in the plans have been reviewed by the Design Engineer-Hydraulics/Hydrology (See FAPG Sec. 650).

### Governmental and Railroad Coordination

\_\_\_\_\_ Required city, county, township, and/or private party agreements have been initiated.  
(Initials or N/A)

AGRMNT NO. \_\_\_\_\_ Name of party \_\_\_\_\_ Purpose \_\_\_\_\_

AGRMNT NO. \_\_\_\_\_ Name of party \_\_\_\_\_ Purpose \_\_\_\_\_

\_\_\_\_\_ Any construction that impacts an at grade railroad crossing or railroad-highway grade  
(Initials) separation has been coordinated with the Governmental and Railroad Coordination Unit. All required agreements, special provisions, coordination clauses and railroad force account authorizations have been completed.

### **FORCE ACCOUNT WORK**

\_\_\_\_\_ An affirmative finding of cost effectiveness for force account work (if required under the  
(Yes or N/A) program responsibilities of the division) has been transmitted to Design Division. The document includes who will do the work and how it should be coordinated with the contractor.

### Consultants

(For CPM projects prepared by MDOT Consultants)

\_\_\_\_\_ Items of work included in the plans that were prepared by an MDOT Consultant have  
(Yes or N/A) been reviewed for compliance with MDOT standards, guidelines and procedures.

\_\_\_\_\_  
CPM - Project Manager

\_\_\_\_\_  
Date

**CERTIFICATION & ACCEPTANCE – Type 2**  
4 of 5)

**Region/TSC Traffic And Safety Project Review**

Control Section \_\_\_\_\_ Date \_\_\_\_\_

Job Number \_\_\_\_\_ Route Number \_\_\_\_\_

Location \_\_\_\_\_

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Traffic Signs and Delineation

\_\_\_\_\_ Permanent Signing has been reviewed and found in compliance with the MMUTCD,  
(Yes or N/A) except as noted under comments below.

\_\_\_\_\_ Permanent Pavement Marking has been reviewed and found in compliance with the  
(Yes or N/A) MMUTCD, except as noted under comments below.

Traffic Signals

\_\_\_\_\_ Traffic signal control devices have been reviewed and found in compliance with the  
(Yes or N/A) MMUTCD, except as noted under comments below.

Geometric Design

\_\_\_\_\_ Any geometric design changes or additions have been reviewed and found in  
(Yes or N/A) accordance with current Geometric Design Guides, except as noted under comments below.

Force Account Work

\_\_\_\_\_ An affirmative finding of cost effectiveness for force account work (under the program  
(Yes or N/A) responsibility of this Division, e.g. traffic signals, pavement markings) has been transmitted to the Project Manager. The document includes who will do the work and how it should be coordinated with the contractor.

Guardrail

\_\_\_\_\_ Any cable guardrail, blunt and/or turned down guardrail endings, and guardrail  
(Yes or N/A) connections to bridge rails and/or piers within the project limits have been upgraded to current standards.

Consultant

\_\_\_\_\_ All work performed by an MDOT Consultant in any of the above areas has been  
(Yes or N/A) reviewed for compliance with MDOT procedures and policies.

Comments

\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
Signature - Region/TSC Traffic & Safety

\_\_\_\_\_  
Date

**CERTIFICATION & ACCEPTANCE – Type 2**  
(Specifications and Estimates Unit)

(Page 5 of 5)

Control Section \_\_\_\_\_ Date \_\_\_\_\_

Job Number \_\_\_\_\_ Route Number \_\_\_\_\_

Location \_\_\_\_\_

\_\_\_\_\_

**QUALITY ASSURANCE**

\_\_\_\_\_ The plan/proposal package has been reviewed for compliance with MDOT standards, policies and procedures.

**SPECIFICATION AND ESTIMATE UNIT PROJECT REVIEW**

\_\_\_\_\_ This project (does or does not) have the capability to support Disadvantaged Business Enterprises. The percent of DBE participation assigned to this project is \_\_\_\_\_%.

\_\_\_\_\_ Approval has been given by the Engineer of Design for an advertising period which is less than three (3) weeks for the following reasons:

**Comments**

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ The estimated unit prices are reasonable.

\_\_\_\_\_ Engineering and contingency charges are not more than 5 percent.

The above project is authorized for advertising.

\_\_\_\_\_  
Supervisor, Specifications & Estimates Unit

\_\_\_\_\_  
Date