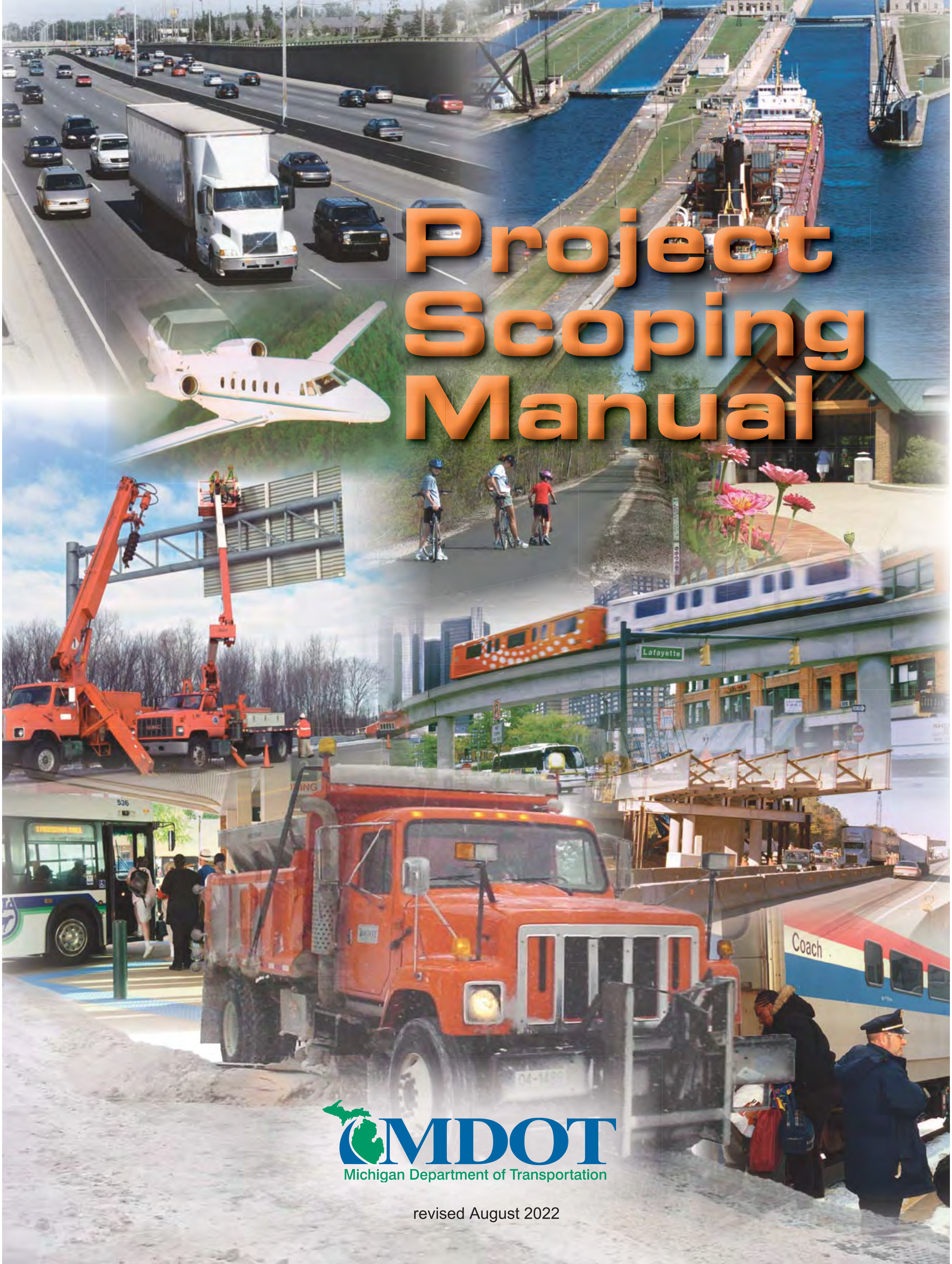
Project Scoping Manual



MDOT
Michigan Department of Transportation

revised August 2022

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Chapter 1

Introduction (revised 6-24-2019)

Consistency is an important concept. Sharing ideas and learning from the experience of others can be a great help in everything we do, including scoping projects. The purpose of the Statewide Scoping Process is to establish a uniform, documented statewide process that improves the internal consistency while reducing the number of changes to projects and the 5 Year Plan during design. It provides process guidelines while allowing flexibility for differences in regions and project's uniqueness.

The process begins with an identified need and ends with a selected project supported by a complete scoping package. The project analysis considers a variety of issues such as existing condition, strategy, mix of fixes, constraints, constructability, stakeholder input, integration of legal multi-modal alternatives, project coordination, budget, special considerations, etc.

This process is the result of collaboration of representatives from all seven MDOT regions (University, Bay, Southwest, Metro, Superior, North, and Grand), as well as from the Design Division, the Bureau of Transportation Planning (BTP) Statewide Planning Division, the BTP Environmental Section, the Traffic Operations Section, the Construction & Technology (C&T) Division and Federal Highway Administration (FHWA). Also providing input were MDOT advocates for constructability, senior mobility and context sensitive solutions (stakeholder engagement). The collaboration was sponsored by the Performance Excellence Division.

What the Scoping Process Can Do For You

Below are just a few examples, among other reasons, of the benefits to following the scoping process:

- Helps you remember everything you need to do
- Alerts you to possible project additions and complications
- Ensures effective use of resources by defining roles and responsibilities
- Helps you integrate all legal users and incorporate initiatives such as the MDOT Mobility Policy, Stakeholder Engagement and Safe Route 2 School
- Helps you document and justify decisions
- Ensures new initiatives are considered
- Assists with the development of a consistent and reliable deliverables
- Helps develop a product with a comprehensive estimate

About This Manual

This manual explains how to follow the scoping process defined by the Michigan Department of Transportation. "Scoping" is defined as "a multi-disciplinary effort to analyze transportation system needs and define projects in alignment with MDOT policies and goals."

This manual is comprised of the following sections: Program Development; Strategy Development for Roads and Bridges; Condition Rating and Measurement Systems; Signs of Pavement Distress and Fix Selection Guidelines; Items to Consider While Scoping; Project Scoping and Package Requirements; Cost Estimating; Scoping Tasks and Timelines; Following Programming of the Job; Changes to the Scoping Package; Best Practices; Appendices and Glossary.

ICON KEY
Best practice
Suggested schedule
Form or checklist
Computer software
Helpful documentation
Guideline
Coordination Opportunity

Icons throughout the book, shown at left, indicate when best practices, a suggested schedule, forms (or checklists), computer software, documentation or guidelines are available to help you and when coordination is needed from a team.

Chapter 2, Program Development, describes how, why and what to consider when developing a program and the projects selected within the program.

Chapter 3, Strategy Development for Roads and Bridges, describes the strategies for the various templates and introduces approved fixes.

Chapter 4, Condition Rating and Measurement Systems, describes the tools available in evaluating the condition of roads and bridges.

Chapter 5, Signs of Pavement Distress and Fix Guidelines, gives examples of different pavement and bridge distress and explains some of the optional fixes available for specific issues.

Chapter 6, Items to Consider While Scoping, lists the multitude of items that should be considered when scoping a project, however, are sometimes overlooked as they do not directly relate to the pavement or structure but benefits all legal users.

Chapter 7, Project Scoping and Package Requirements, introduces the checklists to be used during the scoping process, and what must be included in the scoping package.

Chapter 8, Cost Estimating, details the estimating process, introduces tools to be used while estimating and provides resources for costs and quantities of specialty items.

Chapter 9, Scoping Tasks and Timelines, describes the steps that should be taken when scoping and estimating for the yearly Call For Projects (CFP) process. Suggested timelines for the CFP process are provided, but the steps in the process apply to any project being scoped.

Chapter 10, Following Programming of the Job, describes some of the next steps in a project's life.

Chapter 11, Changes to the Scoping Package, discusses the effects of change in policy or design standard on the scoping package. Impacts or effects of changes to the project scope and the methods to update the scope are also included in this chapter.

Chapter 12, Best Practices, describes many best practices in detail.

The Appendix contains explanations of acronyms, a glossary of MDOT terms, and helpful contact information.

The following books, manuals, documents and guides are among the items referenced in the development of this Scoping Manual:

- MDOT Road Design Manual
- MDOT Bridge Design Manual
- MDOT Drainage Manual
- MDOT Design Survey Manual
- MDOT Capital Preventive Maintenance Manual
- MDOT Bridge Capital Scheduled Maintenance Manual
- MDOT Pontis Bridge Inspection Manual
- MDOT Work Zone Safety and Mobility Manual
- MDOT Guidance Document #10202 – Uniformed Law Enforcement in Work Zones
- MDOT Guidelines For Stakeholder Engagement
- Asset Management's Road quality documents
- FHWA website http://www.fhwa.dot.gov/pavement/pres.cfm

- *The Preventive Maintenance Concept*, Pavement Preservation, http://www.fp2.org/why-pavement-preservation/
- *Preservation Toolbox* Foundation for Pavement Preservation website, http://www.fp2.org/preservation-toolbox/
- MDOT FY2017-2020 State Transportation Improvement Program
- MDOT State Long Range Transportation Plan 2005-2030 Highway/Bridge Technical Report
- MDOT Soil Erosion and Sedimentation Control Manual
- MDOT Sufficiency Report
- AASHTO Guide for Development of New Bicycle Facilities
- AASHTO Highway Safety Manual
- AASHTO Guide for the Planning, Design and Operation of Pedestrian Facilities
- MDOT Research Record, Construction and Technology, Issue Number 88, March 2000, www.michigan.gov/documents/**mdot**_c&t_rr-88_67046_7.pdf

Chapter 2

MDOT's Program Development

MDOT's Area of Responsibility (revised 6-24-2019)

MDOT is responsible for all the roads and bridges on MDOT's highway system, known as the trunkline system. MDOT's roads are those that start with "M", "I", or "US" (and some unsigned or old routes), such as M-43, M-59, I-94, I-96, US-131, etc. The MDOT jurisdiction includes approximately 9,700 route miles of state trunkline highways and approximately 4,413 bridges.

Michigan's transportation system, including roads, transit, non-motorized facilities, aviation, marine and inter-modal facilities, play an integral role in supporting the state and region's economy and quality of life for residents. Transportation investments are part of the state's overall economic development strategy.

FHWA's Area of Responsibility

The Federal Highway Administration (FHWA) carries out the federal highway programs in partnership with the state and local agencies, to meet the Nation's transportation needs. FHWA adds value to the delivery of the federal highway programs, by administering and overseeing these programs, to ensure that federal funds are used efficiently, consistent with laws, regulations and polices. In administering these federal funds, FHWA applies flexible and innovative financing techniques permissible under the law, and uses efficient administrative processes. FHWA and MDOT work cooperatively through a Stewardship Agreement. This agreement allows MDOT to act on FHWA's behalf for certain federal-aid funded projects, while other projects require full FHWA oversight and involvement. FWHA oversight begins at scoping and continues through construction.

The Federal-Aid Highway Program provides Federal financial resources and technical assistance to State and local governments for constructing, preserving and improving the National Highway System, a 160,000 mile network that carries 40 percent of the Nation's highway traffic. The program also provides resources for one million additional miles of urban and rural roads that are not on the System, that are eligible for Federal-aid.

Asset Management at MDOT

Asset management is a process to strategically manage the transportation system in a cost-effective and efficient manner.

Asset management consists of five major elements:

The major elements of asset management

1. Developing policy goals and objectives
2. Data collection
3. Planning and programming
4. Program delivery
5. Monitoring and reporting results

How transportation plans are communicated

It is critical to communicate expectations to all involved, both within the Michigan Department of Transportation (MDOT) and with governmental partners. MDOT's process incorporates three such plans: the Michigan Transportation Policy Plan, MDOT Business Plan, the State Long-Range Plan and other means of communication.

Michigan Transportation Policy Plan establishes the mission for Michigan's transportation system and provides a common framework within which this may be accomplished. In addition, this provides the role that the State Transportation Commission has for oversight for MDOT and it provides the public forum for transportation policy development.

MDOT Business Plan embodies the values of quality, teamwork, customer orientation, integrity and pride. It establishes specific strategic objectives for achieving MDOT's mission of providing the highest quality transportation services for economic benefit and improved quality of life.

The State Long-Range Plan/MI Transportation Plan (SLRP) is a guiding document for the public sector transportation investment decisions in Michigan, including those involving federal aid. These goals and objectives provide the framework for the MDOT to determine its core business processes and products, while maintaining financial constraint.

The SLRP is required by a federal planning regulation. It includes an extensive public involvement process through which stakeholders have input. The process is critical to the efforts which include a varied customer base in the development of a consensus on overall state transportation policy.

Mix of Fixes

When making candidate project selections for the highway program, MDOT strives to design programs that have a balanced "Mix of Fixes" framework as well as other strategic considerations.

What "Mix of Fixes" means

The "Mix of Fixes" strategy combines long-term fixes (Reconstruction or Replacement - 4R), medium-term fixes (Rehabilitation - 3R) and short-term fixes (Capital Preventive Maintenance). Reconstruction/Replacement and Rehabilitation are often referred to together as "R&R". Each fix category has a critical role in improving the future condition or maintaining the existing condition of the state highway network.

Brief definition of each category

- **Reconstruction** is the entire rebuilding of the roadway.

- **Replacement** refers to a bridge deck replacement, a superstructure replacement or to the entire rebuilding of a bridge.

- **Rehabilitation** is the application of structural enhancements, such as multiple course resurfacing or concrete pavement repair, that improves the roadway or overlaying a bridge deck and superstructure repair to improve a bridge.

- **Capital Preventive Maintenance (CPM)** consists of minor work to the roadway; for example, crack sealing or one course resurfacing; or bridge; for example, patching the deck or replacing pin & hangers. CPM projects are used to extend the pavement and bridge life

Why mix of fixes is used

MDOT's goal is to perform long-term fixes on the system, depending upon funds available, and use medium and short-term fixes as needed elsewhere. This mix of fixes is necessary because of strategy development, overall system health, the application of the appropriate fix at the correct time and accommodations of funding limitations. Utilizing a "Mix of Fixes" strategy, also varies the time when projects will need to be reconstructed, and therefore manages the pavement and bridge assets in the most efficient and cost effective way possible.

How Mix of Fixes is Determined

MDOT's Road and Bridge strategy is to select the most cost effective roadway and bridge treatments that will achieve and maintain MDOT's network condition goals. This selection is developed with input from the following:

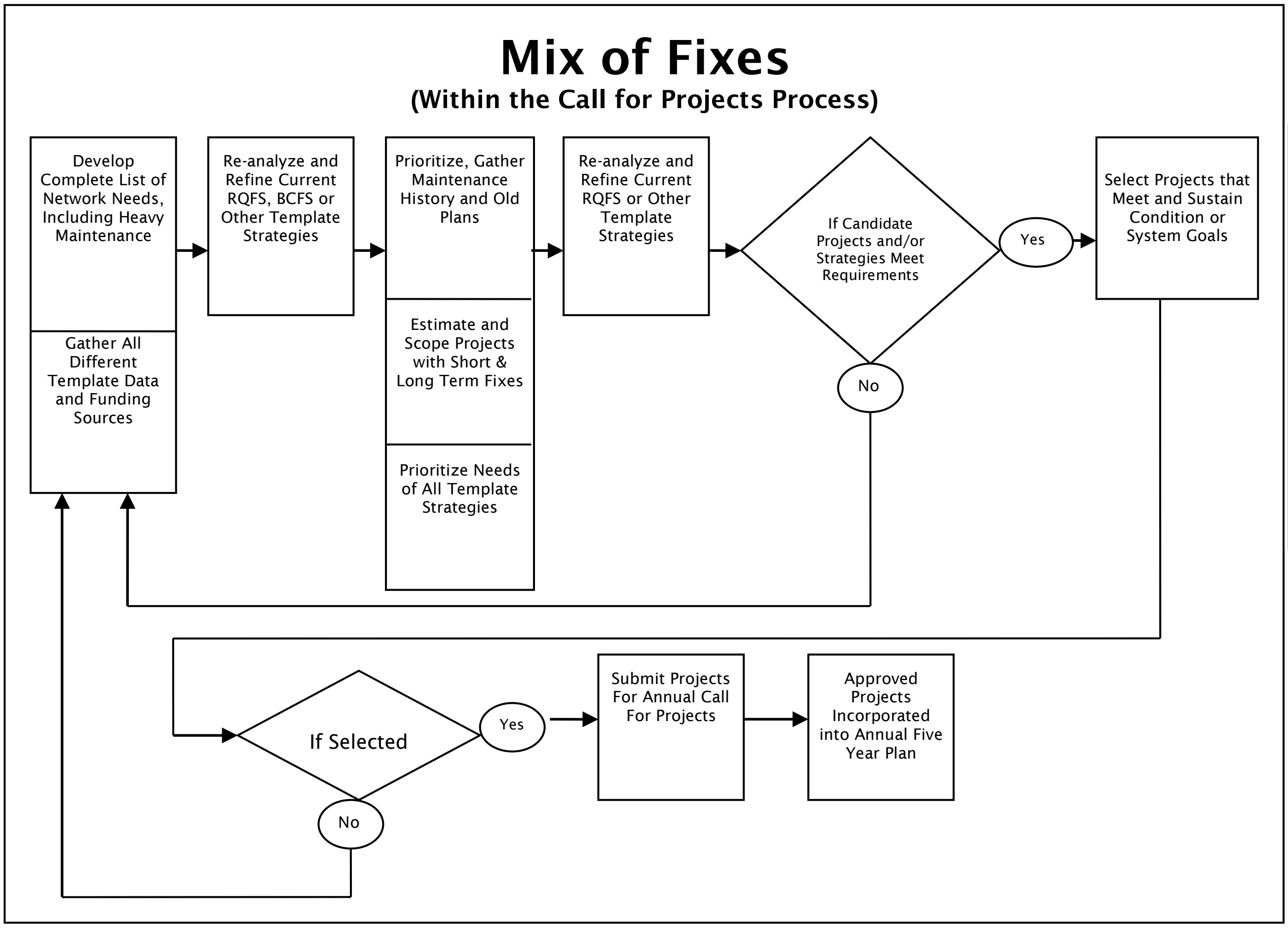
RQFS and BCFS

- Approved Road Quality Forecasting System (RQFS) or Bridge Condition Forecasting System (BCFS) Strategies. RQFS and BCFS are software programs that forecast future pavement and bridge conditions based on existing pavement and bridge conditions, funding levels and accepted MDOT strategies.
- Communication with Metropolitan Planning Organizations (MPOs), counties, cities, townships, tribal governments and stakeholders
- Pavement or Bridge Condition Data
- TSC/Region Field Reviews
- Template Funding Allocations
- Asset Management Plan

This mix of fixes is necessary because of strategy development, overall system health, the application of appropriate fixes at the correct time and accommodations of funding limitations.

The final selection is reviewed and approved in MDOT's annual Call For Projects Process and incorporated into MDOT's annual Five Year Program. Figure 2-1 illustrates a typical path for the program development and the use of the mix of fixes strategy.

Figure 2-.1: Mix of Fixes within the Call For Projects Process



Road Rehabilitation & Reconstruction

How long R&R projects last

Reconstruction and Rehabilitation (R&R) fixes are applied to Remaining Service Life (RSL) Category I pavements.[1] Though it is a goal to delay the need for major rehabilitation as long as it is economically feasible, R&R is eventually needed to replace structural integrity of pavements. R&R consists of longer-term fixes for a pavement, generally extending its life from 10 to 25 years. Because of the greater pavement life extension they generate, R&R projects are more costly per mile than capital preventive maintenance (CPM).

[1] *RSL Category 1 indicates pavements that have 2 or fewer years of remaining service life*

Advantages and disadvantages of rehabilitation alone

Rehabilitation applies structural enhancements to improve a pavement's load-carrying capability and extends the service life. Most rehabilitation projects are designed to last 10 to 20 years. Although less costly than reconstruction, rehabilitation of the entire network still requires a prohibitive level of investment.

Advantages and disadvantages of reconstruction alone

Reconstruction involves the complete replacement of the pavement structure with a new long-term action that is designed to last at least 20 years, but is also the most costly fix. Like most transportation agencies, MDOT does not have sufficient funds to sustain the level of investment for continual reconstruction of the highway network.

Bridge Rehabilitation & Replacement

Bridge Deck Preservation Matrix

The condition of a bridge deck is usually the key indicator leading to a structure being considered for rehabilitation or replacement. The Bridge Deck Preservation Matrix is a tool that Bridge Engineers use when selecting the deck repair options. There are times when issues other than the condition of the deck will influence the rehabilitation or replacement of a bridge. These other indicators include (but are not limited to) super-structure deterioration, sub-structure deterioration, corridor coordination and functional obsolete issues such as underclearance or bridge width. For projects that include bridge reconstruction on the NHS roadways, that are functionally obsolete, early concurrence from FHWA may be requested to prevent changes in scope during the design phase.

Road and Bridge Capital Preventive Maintenance

Purpose of CPM

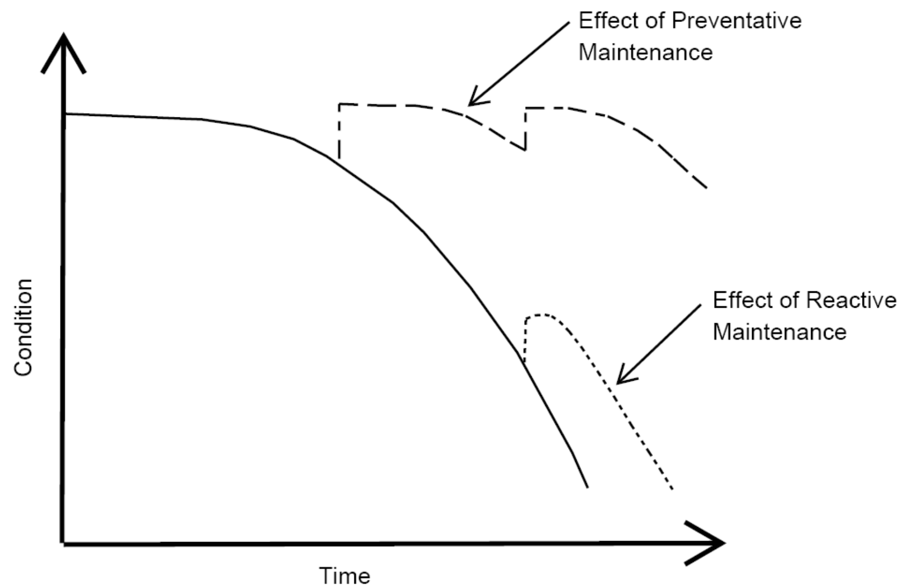
The Capital Preventive Maintenance (CPM) program was established in 1992 to keep good roads and bridges in good condition and address problems before the segment reached poor condition. CPM projects are cost effective, shorter-term fixes used to delay the deterioration of pavements to Category I. CPM projects are fixes aimed at preventing small problems from becoming critical. They are intended to address pavement problems before the structural integrity of the pavement has been severely impacted.

Advantages of CPM

Preventive Maintenance applies lower-cost treatments to slow the deterioration rate, maintain or improve the functional condition and extend the pavement's service life. With various short-term treatments, preventive maintenance (functional enhancement fix types) can extend pavement life an average of 5 to 10 years. Applied to the right road at the right time — when the pavements are mostly in good condition — Preventive Maintenance can maintain or slightly improve the network condition at a lower unit cost.

Figure 2-2 shows the benefit of Preventive Maintenance vs. Reactive Maintenance.

Figure 2-2: Effect of CPM or RM on Condition



The Preventive Maintenance program meets public expectations for safe, smooth, and well-maintained roads by applying cost-effective treatments to correct minor pavement deficiencies before the problems become major.

Examples of CPM

Road fixes include treatments such as crack sealing, surface seals, thin asphalt overlays, diamond grinding, concrete patching, joint repair and pavement profiling to improve ride quality. Bridge fixes include joint replacement, pin & hanger replacement, deck patching, beam painting and HMA caps. CPM projects usually move pavements starting in category II, III, IV or V and increase their RSL (remaining service life) by one or occasionally two categories. Nonetheless, these are not "Band-Aid" fixes. They are proven asset management options which mitigate or delay highway asset deterioration, thus keeping pavements in good riding condition.

Limitations of CPM

CPM fixes can only be applied a limited number of times. Eventually, pavements reach a level where deterioration leads to the breakdown of a pavement's structural integrity.

Road and Bridge Reactive Maintenance

Reactive Maintenance (RM) is used to mitigate pavement problems that need attention and to address routine deficiencies that occur over time. Examples include filling potholes and replenishing shoulder gravel.

As discussed previously, for the benefit of road quality and cost, it is preferable to apply CPM fixes rather than to wait and use RM. Reactive and/or Routine Maintenance are not eligible for federal funding and use Michigan funding sources.

Bridge Capital Scheduled Maintenance

Purpose of CSM

Bridge Capital Scheduled Maintenance (CSM) 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 or poor. The work proposed and performed is generally short in duration with little or no impact to traffic. The outcome from this program is to delay structural deterioration as long as possible.

Combining Fix Methods (Projects with Multiple Fix Types)

Combining the fix methods into a single comprehensive strategy achieves the most manageable highway network.

Projects with multiple fix types within a single project may appear more complex, but this often helps achieve the most cost effective fix for the roadway. Statewide, Region and TSC strategies are set up to include a "Mix of Fixes". Therefore a variety of fix types should be chosen by each TSC/Region and may be mixed within a project(s) and/or a balanced yearly program.

CPM is an important component of the network strategy, allowing the Department to manage pavement condition. CPM delays costly R&R activities by extending the service life of the original pavement. The challenge is to ascertain the right time to apply a treatment to achieve maximum benefit or return on investment.

The Importance of Strategy (revised 6-24-2019)

What a pavement and/or bridge strategy should do and how it is expressed

A pavement and/or bridge strategy is a collection of fixes. The most desirable strategy extends as much infrastructure life as possible over time given available funding. Strategies are expressed as the percentage of lane miles and/or numbers of bridges in a year that will undergo improvement.

MDOT funds are allocated through the Highway Capital Program, from the State MTF and Federal HTF revenues, which are overseen by the State Transportation Commission (STC). Each MDOT region develops a strategy for improving its roads and bridges using the Road Quality Forecasting System (RQFS) and Bridge Condition Forecasting System (BCFS) tools, as well as input from partners and stakeholders.

RQFS and BCFS

The RQFS and BCFS systems are software programs that forecast future pavement and bridge conditions based on user entered pavement and bridge funding levels and strategies and are an important part of MDOT's asset management strategy.

Working from the current pavement or bridge condition, age, type, deterioration rates and fix strategies, RQFS and BCFS estimate future condition of a road and bridge network (respectively). Once a recommended strategy is identified, candidate road and bridge projects are selected that are consistent with the strategy and funds available. Road and bridge candidate projects are identified in concert, whereby project scheduling can be coordinated.

Note: The strategy should include how bridge work could affect the adjacent road (or vise versa). Some examples of this are increasing the vertical clearance of a structure may raise the adjacent road elevation or substandard road geometrics could affect the proposed bridge work (such as extending ramp acceleration/deceleration features could widen or lengthen a bridge). The strategy should also take into consideration opportunities for incorporation of or connectivity to other modes of transportation (pedestrian, bicycle, transit, etc.).

Strategic Factors

Remaining Service Life

Definition of RSL

Strategies for managing the pavement network are developed using a pavement condition measure known as Remaining Service Life (RSL). RSL is the estimated number of years of remaining life in a pavement, until CPM treatments would no longer be cost effective and where R&R treatments would then be more appropriate (RSL of two years or less). RSL is derived from analysis of historical attributes including project history (treatment type & date), standardized service life benefit values per treatment type, and, when sufficiently available, mathematically modeled surface condition data (the MDOT Distress Index).

Pavement Condition Data (revised 6-24-2019)

MDOT has a variety of means for monitoring network level pavement condition. The Planning Asset Management Section manages both the Sufficiency Report's Pavement Rating and the PASER (Pavement Surface Evaluation & Rating). Both of these condition measures are obtained by windshield surveys, performed annually. The Sufficiency Rating is provided by an evaluation and using a scale from 1 (best) to 5 (worst). The PASER Rating is based on a scale ranging from 10 (best) to 1 (worst). PASER is used to support the work of the Michigan Transportation Asset Management Council. The Construction Field Services Division's Pavement Management Section manages bi-annual collection of pavement imaging and laser measurements of surface roughness, wheel path rutting and crack/joint faulting. Detailed observation of imaging results in recorded distress types & severity levels, which are then translated into the Distress Index (DI) on a scale from 0 (best) to beyond 50 (poor threshold). Laser measures are translated into the International Roughness Index (IRI) and detected rut/fault magnitudes.

RSL categories

For purposes of analysis and reporting, pavements are grouped based on RSL by category:

Table 2-1: RSL Categories and Ratings

RSL Category	Amount RSL	Rating
I	0-2 years	Poor
II	3-7 years	Fair
III	8-12 years	Good
IV	13-17 years	Good
V	18-22 years	Good
VI	23-27 years	Good
VII	28-32 years	Good

Determining a Pavement and Bridge Strategy

The three types of road fixes

There are three basic categories of road fixes:

- Reconstruction and Rehabilitation (R&R)
- Capital Preventive Maintenance (CPM)
- Reactive Maintenance (RM) (RM is not usually specified in defining a strategy)

The four types of bridge fixes

There are four basic categories of bridge fixes:

- Replacement and Rehabilitation (R&R)
- Capital Preventive Maintenance (CPM)
- Capital Scheduled Maintenance (CSM)
- Reactive Maintenance (RM) (RM is not usually specified in defining a strategy)

Each pavement and/or bridge strategy has an associated cost. A variety of fixes will be more cost effective, when applied to pavement or bridges in various conditions. This is one of the important reasons that MDOT has determined the most effective network pavement strategies are those employing a Mix of Fixes.

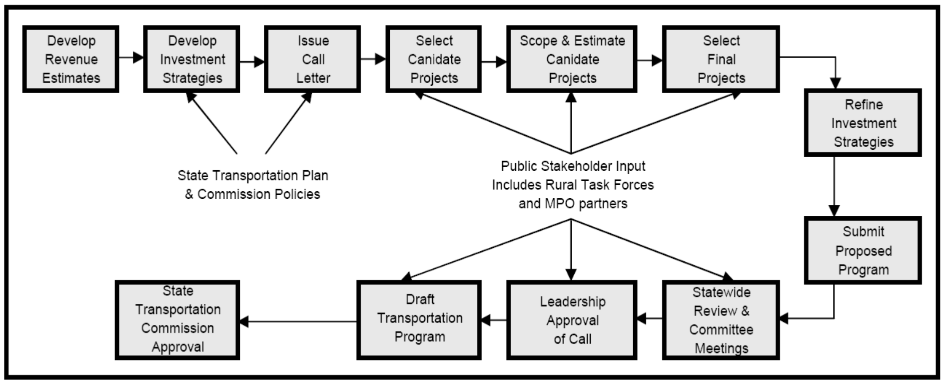
Call For Projects

MDOT issues an internal Call For Projects (CFP) annually (generally in December) for the Highway Program. The CFP memo and instructions are issued to all seven MDOT regions, which are responsible for proposing preservation projects. The CFP process guides the technical process of preservation project identification and is the mechanism used to implement State Transportation Commission (STC) policies and align MDOT's strategic direction. Key emphasis areas and strategic objectives are outlined and detailed technical instructions are issued. Target funding levels derived from the investment strategy are also included in the instructions to MDOT regions.

Figure 2-3 illustrates the basic CFP process and high level steps required.

Figure 2-3: Call For Projects Process

CFP Process



Capacity Increase and New Road projects are selected and advanced through project development on the basis of statewide priorities. They are not handled through the annual CFP process.

Introduction to Funding Templates

A funding template is a source of money for proposed work. Template categories represent the type of work activities, facilities or features that receive an allocation of financial resources to accomplish approved transportation improvement strategies.

The most commonly used templates are listed below and comprise the majority of MDOT's projects. Construction projects may contain funding from multiple templates within the same project. Other, smaller, specialized template categories are not listed here.

Road Rehabilitation and Reconstruction

The R&R Program is the major instrument used to preserve pavements along MDOT's trunkline system. Implementing construction programs comprised of a balanced "Mix of Fixes" continue to be the major emphasis areas for this program. The intent of the R&R Program is to maintain the highest sustainable system health possible with available resources.

Road Capital Preventive Maintenance

The intent of the CPM Program is to implement planned strategies of cost effective treatments to existing roadway systems that preserve the system, slow pavement deterioration, and maintain or slightly improve the functional condition of the system.

Bridge Rehabilitation and Replacement, CPM and CSM

The purpose of the Bridge program is to preserve MDOT's trunkline bridges. It is a balanced strategy made up of bridge Replacement, Rehabilitation, Capital Preventive Maintenance and Capital Scheduled Maintenance. The emphasis area of this program is to address the needs of all structures of critical concern.

Safety (revised 6-24-2019)

The Safety Program is a major component in the department's emphasis of addressing locations with safety concerns as part of the transportation program. The safety program includes safety improvements, median barrier, rumble strips, traffic signals, pavement markings and signs.

Safety improvements (i.e. addition of a center left turn lane, addition of a right turn lane, median improvements and low cost safety improvements.) are the types of projects that support key focus areas of Michigan's Strategic Highway Safety Plan (SHSP). These locations are identified through the High Crash List, Fatality and Serious Injury Regionwide Maps, 3R/4R Safety Reviews, pedestrian safety concerns, customer concerns and Pavement Friction Analyses. The project can also be combined with Road R&R projects.

Cable Median Barrier

As traffic volumes and congestion rise, the demand for effective median safety features increases. Cable median barrier is an adaptable traffic device ideally suited for use in existing medians to prevent cross-over crashes. It is one of the most effective safety measures that can be deployed to protect motorists.

An option for use of cable median barrier

Across the country, roadway agencies that have installed these types of barriers report a significant decrease in fatalities and in the severity of cross-over median crashes. Cable median barrier works as a retrofit on existing, relatively flat median areas and is also effective on sloped terrain. It generally costs less to install than other barrier systems, with low repair and maintenance costs, easily offset by the life saving and injury reducing benefits.

Other types of median barrier can be considered and includes guardrail and concrete barrier.

Rumble Strips

Rumble strips are a proven and cost effective countermeasure to lane departure crashes brought on by driver drowsiness, distraction and/or inattention. Since the late 1990s, MDOT has been systematically installing rumble strips on freeway shoulders, to the benefit of Michigan motorists.

In accordance with the March 8, 2007 decision of the Engineering Operations Committee and the Director, MDOT has expanded the application of rumble strips onto the rural, non-freeway system. This decision was made, in part, due to a national safety movement to expand rumble strip use to the non-freeway system to reduce fatalities and serious injuries. Evaluation of the initiative will be ongoing and details adjusted where necessary.

Where rumble strips are used

Rumble strip construction will be incorporated in the annual pavement marking program (after FY 2010 it will be incorporated in the project) and coordinated with the Region Pavement Management Engineers (for roadway condition data). Candidate locations are rural trunkline roads with 55 mph speeds and paved shoulder widths of 6' or greater. Proposed locations could be included in all construction contracts or combined into a Region-wide (or TSC-wide) contract. These should be identified as candidates for centerline and/or shoulder rumble strips.

Freeway Lighting

The intent of the Freeway Lighting Rehabilitation Program is to rehabilitate existing freeway lighting. MDOT owns over 200 miles of continuous freeway lighting utilizing either median-mounted lights or shoulder-mounted lights. The majority of freeway lighting is in Metro, Grand, Bay and University Regions.

Intelligent Transportation Systems

The Intelligent Transportation Systems (ITS) program encompasses the application of technology to improve the efficiency and safety of the transportation system. ITS applications use information, communication and sensor technology with the goal to achieve improved levels of safety and performance on all transportation modes.

Examples of ITS technology

Examples of this include changeable message signs, level of service indicators (traffic congestion), traffic cameras, ITS Operations Centers and etc.

Carpool Parking Lot

The purpose of the Carpool Parking Lot (CPL) Program is to provide Michigan citizens a safe and convenient facility for parking vehicles and sharing rides. This effort promotes the saving of fuel costs.

Secondary benefits associated with CPL facility usage include contributions to congestion mitigation, energy conservation and air quality improvement. The aforementioned purpose and benefits, along with growing demand, warrant continued program expansion and maintenance of assets. CPL facilities also have the potential for serving as multi-modal hubs (bike racks, bus stops and etc.).

Pump Station Capital Rehabilitation

Pump stations

Stormwater pump stations are necessary to remove stormwater from highway sections that cannot be drained by gravity. Because of high costs and the potential problems associated with pump stations, their use is recommended only where other drainage systems are not feasible. When operation and maintenance costs are capitalized, a considerable expenditure can be justified for a gravity system.

Alternatives to pump stations

Alternatives to pump stations include deep tunnels, siphons, and infiltration systems (infiltration systems are often less than aesthetically pleasing and can create maintenance problems).

Where to find out more about pump stations and their rehabilitation

In 2005, the Pump Station Capital Rehabilitation program was created. To find out the location and condition of MDOT pump stations, contact your Region Maintenance staff.

Type II Noise Abatement (revised 6-24-2019)

This program is to help abate traffic noise for those residences that were in place at the time a freeway was constructed and prior to 1976. The State Transportation Commission Policy #10136 authorizes the program. As stated by the State Transportation Commission Policy, funding is dependent on the size of the Road and Bridge Program. In years where the Road/Bridge Program, excluding Maintenance, is greater than $1 billion, no more than one half of one percent may be spent on Type II Noise Abatement.

Commercial Vehicle Enforcement

The Commercial Vehicle Enforcement (CVE) Program is to promote highway safety and security, protect highway infrastructure and enforce the general laws of the state as they pertain to Commercial Motor Vehicle operations.

CVE CFP and Infrastructure Strategy

The **CVE Call For Projects and Infrastructure Strategy** is a document to improve the commercial vehicle enforcement infrastructure. The primary goals of the strategy are to ensure the safety and security of the public while protecting the roads from deterioration, due to overweight vehicles. This strategy is the result of a joint partnership between the MDOT and the Michigan State Police Traffic Safety Division (MSP/TSD).

Enforcement Tools

MSP/TSD primarily uses four different types of tools for detecting and enforcing vehicle weight limits:

Weigh Stations are locations with fixed permanent scale decks to detect axle, tandem and gross vehicle weights. They are also used to perform safety/security checks and ensure regulatory compliance. In addition, weigh stations have available room to place vehicles out of service, until their deficiencies are corrected.

Weight in Motion (WIM) is a sensor that is placed within the pavement of a roadway's traveled lane. WIMs record vehicle weight and other information from vehicles traveling at normal highway speeds. The WIM can also transmit the vehicle's information wirelessly in real time to a laptop computer from a short distance away. The use of the wireless WIM is an effective method to isolate potential overweight vehicles. WIMs are also used for data collection of volume counts and commercial vehicle classification. This data can then be used by planning and engineering staff to analyze traffic trends and characteristics.

Safe Enforcement Sites (SES), are locations where MSP/TSD officers can perform safety inspections and/or weight enforcement operations in a safe manner. These sites may consist of rest areas, roadside parks, county road commission garages and wide shoulders. Ideally these sites should have a flat level area, for Weight and Safety.

Portable Intermittent Truck Weight Stations (PITWS) may be installed at a SES. A PITWS is a set of depressions designed for placement of portable scales. To obtain an accurate reading, it is essential that all axles be in the same plane. When PITWS are unavailable, blocks are placed under the vehicle by the officer to align the axles. Subsequently, with out a PITWS, labor and time to weigh a vehicle is greatly increased.

Enforcement Strategies

The current strategies used by the MSP/TSD vary depending on what type of enforcement operation is taking place.

A permanent weigh station can be operated by one officer and is capable of weighing 700 trucks per hour. Hours of operation of a weigh station will vary.

When other planned operations are not being performed, officers are often in their patrol vehicles patrolling for individual commercial vehicles in violation.

An effective field enforcement strategy is to use wireless WIM in conjunction with a SES. The strategy involves vehicles traveling along the roadway passing over a WIM. Information is transmitted to a laptop computer in a patrol vehicle. The WIM sensor is ± 5 percent accurate. Therefore, it is not used for enforcement but allows the officer to identify only an overweight vehicle without reducing the traffic flow. A reasonable location (approximately two miles between WIM and the SES is ideal according to the Motor Carrier Division) should be provided between the WIM and SES to allow the officer to stop the suspected overweight vehicle prior to the SES. This strategy increases the efficiency of the officer and greatly reduces the impact to other commercial vehicles.

The MSP/TSD also operates a Special Transportation Enforcement Team (STET). A STET is an operation where a MSP/TSD officers target specific violations. The location, time, and duration of these operations will vary. The STET provides the ability to monitor routes without weigh stations or locations where vehicles may try to bypass a permanent weigh station. The use of STET and SES provides the advantages of being mobile and eliminates the investment of constructing permanent locations. While the STET are in operation, other officers may be patrolling other roads for vehicles attempting to bypass an enforcement zone.

Roadsides (revised 6-24-2019)

The Roadsides program is vital to Michigan citizens. The constructing, improving and restoring Michigan's rest areas, which are visited daily by the motoring public, are funded with this program. Additionally, Michigan residents utilize and enjoy miles of non-motorized facilities that have been constructed for pedestrians and bicyclist alike. Streetscaping and landscaping are among some of the beautification initiatives that are provided by this template funding, in keeping Michigan a great place to live and work. Each of these project types are contained within the Roadsides template. This template may include standalone projects, work that is packaged with other templates or work combined with TAP (See Chapter 6) grants.

Chapter

3

Strategy Development for Roads and Bridges

Goal Redefinition

In the spring of 2007, Director Steudle and the Director's Executive Team (DET) requested the establishment of a team to redefine and broaden our department's goals. To that end, the Performance Measurement Team (formerly known as the Goal Redefinition and Measurement for Roadway (GRAMR) Team) was created. The Team created interim focus areas and identified goals, objectives and measures within them by utilizing the Goals, Objectives and Performance Measures Report from the MI Transportation Plan (also known as the State Long-Range Plan).

Four goal areas

Four goal areas have been identified with objectives within each goal area.

- **Goal Area 1: Stewardship** - Preserve transportation system investments, protect the environment and utilize public resources in a responsible manner.
- **Goal Area 2: Safety and Security** - Continue to improve transportation safety and ensure the security of the transportation system.
- **Goal Area 3: System Improvement** - Modernize and enhance the transportation system to improve mobility and accessibility.
- **Goal Area 4: Efficient and Effective Operations** - Improve the efficiency and effectiveness of the transportation system and transportation services, and expand MDOT's coordination and collaboration with its partners.

Road Network Strategy Development

Rehabilitation and Reconstruction for Roads

The Rehabilitation and Reconstruction (R&R) Program, along with Capital Preventive Maintenance (CPM), are the major instruments used to preserve pavements along Michigan's trunkline system. Implementing a construction program with a balance of "Mix of Fixes", along with a focus on the freeway system, continues to be the major emphasis areas for this program. The intent of the R&R Program is to maintain the highest sustainable system health possible with available resources.

Road R&R Project Identification and Selection

R&R projects should be targeted for pavements that are no longer cost effective or feasible for improving with CPM fixes. These R&R projects should be targeted toward pavements that meet all of the following:

- Remaining Service Life (RSL) of 0-2 years, or Category I

- Locations with poor ride quality - International Roughness Index (IRI) greater than 170 inches/mile
- Sufficiency Surface Condition Rating equal to or greater than 4
- Distress Index (DI) equal to or greater than 50 is associated with RSL = 0. R&R can have RSL =2.
- Cost effective fix of less than $70,000 per lane mile, in 2009 dollars (i.e. lane mile cost/project fix life value)
- Cost effective fix per Vehicle Miles Traveled (VMT) of less than 0.05 (i.e. total project cost/VMT/project fix life value)
- Cost effective fix per Commercial Vehicle Miles Traveled (CVMT) of less than 1.0 (i.e. total project cost/CVMT/project fix life value)
- Locations that benefit from coordination with safety enhancements, capacity improvement and/or expansion/local participation

For more details on the condition factors listed above, see Chapter 4.

In addition, locations that can be preserved for extended periods with cost effective rehabilitation, delaying the need for reconstruction, should be given priority.

Freeway R&R Projects

As mentioned above, selecting appropriate locations for R&R will ensure that projects needing reconstruction will be cost effective and constructed at the appropriate time.

Avoid putting HMA over concrete

When feasible, avoid creating new composite pavements (hot mix asphalt (HMA) over concrete). Composite pavements tend to deteriorate faster than non-composite pavements, requiring more maintenance and shorter pavement life in most cases.

A current MDOT goal, as defined by the Project Screening Committee and the Call For Projects Instructions, is to achieve an average annual rate of reconstruction (or long term major rehabilitation) of 1.5 percent of each region's freeway network lane miles. This recommended goal has been reduced from previous years in an effort to address the projected increase in Category I and II pavements, while still attempting to maintain the long term health of the system.

Non-Freeway R&R Projects

The focus for the Non-Freeway system should be rehabilitation and CPM type projects, in order to improve the overall network condition. This concept is important to maintain, given the priority of the Freeway network strategy.

Currently, as defined by the Project Screening Committee and the Call For Projects Instructions, a region is limited to one small town (or less) of reconstruction per year. A small town is defined as an area outside of an urbanized area boundary with population less than 50,000. The purpose of this requirement is to keep the limited available funds from being allocated in just a few areas, since MDOT has a significant statewide network to maintain.

Avoid putting HMA over concrete

Like with freeways, when feasible, avoid creating new composite pavements (HMA over concrete) and target locations to cost-effectively reduce the number of composite pavements.

Approved Road R&R Fixes

Potential R&R fixes include, but are not limited to, the following:

Rigid (Concrete) Pavement

- Patching concrete pavement and repairing joints
- Restoring concrete pavement through full-depth pavement patching, joint and surface spall repair, joint/crack resealing and/or diamond grinding
- Rubblizing concrete pavement and applying a multiple-course HMA overlay
- Applying an unbonded concrete overlay
- Placing aggregate course 6" to 8" and applying a multiple-course HMA overlay
- Repairing existing pavement and applying a multiple-course HMA overlay
- Removing pavement and inserting a concrete inlay
- Reconstructing concrete pavement

Flexible (HMA) Pavement

- Repairing existing pavement and applying a multiple-course HMA overlay
- Milling existing pavement and applying a multiple-course HMA overlay
- Crushing and shaping pavement and applying a multiple-course HMA overlay
- Placing aggregate course 6" to 8" and applying a multiple-course HMA overlay
- Milling and/or removing pavement and inserting a HMA/concrete inlay
- Reconstructing HMA pavement

Composite (HMA over Concrete) Pavement

- Repairing and/or milling existing pavement and applying a multiple-course HMA overlay
- Placing aggregate course of 6" to 8" and applying a multiple-course HMA overlay

- Milling HMA and placing an HMA bond breaker and an unbonded concrete overlay
- Milling and removing pavement and inserting a HMA/concrete inlay
- Reconstructing pavement

Capital Preventive Maintenance for Roads

The performance of a highway depends upon the type of material, age of pavement and the quality of the preventive maintenance it receives during the lifetime of the pavement.

Types of Pavement Maintenance

Pavement maintenance are classified into three groups: Capital Preventive, Reactive and Routine.

Capital Preventive Maintenance is the planned strategy of cost effective treatments to an existing roadway system and its appurtenances that preserves the system, retards the future deterioration, and maintains or improves the functional condition of the system without (significantly) increasing structural capacity. In essence, preventive maintenance activities protect the pavement and decrease the rate of deterioration. Examples of preventive maintenance include crack sealing, surface and joint seals, thin asphalt overlays, diamond grinding and concrete patching.

Reactive Maintenance consists of activities that must be done in response to events beyond the control of the Department. Some events require response as soon as possible to avoid serious consequences because a present or imminent danger exists. Reactive maintenance cannot be scheduled because some problems occur without warning and often must be immediately addressed. Examples of reactive maintenance activities include pothole patching, removing and patching pavement blowups, joint failures, unplugging drainage facilities or repairing washouts.

Routine Maintenance is the day-to-day maintenance activities that are scheduled or whose timing is within the control of maintenance personnel. Examples of routine maintenance include filling cracks in pavement, painting pavement markings and cleaning ditches.

Road CPM Project Identification and Selection (revised 3-17-14)

Delays in performing CPM work allow the quantity of pavement defects and their severity to increase, which in turn leads to an increase in cost to perform the fix. Consequently, this causes considerable increases in the life-cycle costs of the pavement (i.e. the cost of maintaining the pavement throughout its service life).

Emphasis should be placed on life cycle work (the effort to extend a pavement's service life), for both rigid and flexible pavement.

Appropriate CPM should be done until repair costs exceed the benefits derived from such activities or until the pavement structure needs to be reconstructed. This may require that CPM is performed on pavements at a more frequent interval. The basis of CPM should be consistent with the Region's overall preservation strategy.

CPM Guidelines

Selection for CPM projects can be assisted by using pavement condition data. Recommended pavement condition levels, for each preventive maintenance treatment, are listed in MDOT's CPM Program Guidelines and are shown in the Appendix. The condition levels listed have been identified to aid the engineer in determining the cost effectiveness for specific preventive maintenance treatments given an existing pavement condition.

On CPM mill and overlay/inlay projects the need for ADA improvements shall be considered when scoping the project (refer to Chapter 6 for sidewalk ramp upgrade warrants).

Timing for CPM Activities

CPM should be performed on pavements with:

- RSL of greater than or equal to 3 years — RSL categories II, III, IV, V and VI
- DI of less than 40

Routine maintenance should be performed on all pavements, including those which may require rehabilitation or reconstruction.

When NOT to perform CPM

Normally, CPM should not be performed:

- On RSL Category I pavement
- On severely distressed pavement structures or pavements with a severely rutted cross section
- Beyond the outside edges of the shoulders or curbs

Limitations of CPM

Minor safety work can be included in CPM projects, but such work should not be extensive. Examples of minor safety work include:

- Modification of pavement cross sections, by either milling or placing a HMA wedge course

- Replacement of non-standard, blunt and turned-down guardrail endings with standard guardrail endings
- Connection of guardrail to bridge rails and/or bridge piers
- Rumble strip placement and railroad crossing pavement markings

Approved Road CPM Fixes

Potential CPM fixes include, but are not limited to:

Flexible and Composite Pavement

- Applying a single course of 1 ½ inch (165 lbs/syd) non-structural hot mix asphalt (HMA) overlay
- Milling the pavement surface and applying a single course of 1 ½ inch (165 lbs/syd) non-structural HMA overlay (Concrete Joint Repair and/or Detail 8 Joint repair as needed)
- Chip sealing (spraying the surface with asphalt then immediately covering with aggregate and rolling)
- Micro-surfacing (applying a mixture of polymer modified asphalt emulsion, mineral aggregate, mineral filler, water and other additives)
- Overband crack filling (overfilling a crack such that a thin layer of sealant is spread onto the pavement)
- Applying HMA shoulder ribbons (if existing shoulder is gravel)
- Applying an ultra-thin HMA overlay (an overlay of less than 1 inch in thickness)
- Applying a paver-placed surface seal
- Cleaning and repairing underdrain outlets

Rigid (Concrete) Pavement

- Full-depth patching (removal and replacement of a segment of pavement to the level of the subgrade in order to restore areas of deterioration)
- Resealing joints
- Repairing spalls
- Sealing cracks
- Diamond grinding (shaving the pavement surface with diamond-tipped saw blades to remove bumps, improve rideability and surface friction)
- Retrofitting dowel bars (placing dowel bars across joints and/or cracks that exhibit poor load transfer)
- Concrete pavement restoration
- Applying HMA shoulder ribbons (if existing shoulder is gravel)
- Cleaning and repairing underdrain outlets

Safety Programs for Roads (revised 6-24-2019)

How MDOT supports Michigan's Strategic Highway Safety Plan, and the goals of that plan

The safety program is a major component in MDOT's emphasis of addressing locations with safety concerns as part of the Transportation Program. More importantly, the Safety Program is a means by which MDOT can support the goals of Michigan's Strategic Highway Safety Plan (SHSP). The purpose of a SHSP is to identify the key safety needs in the state and guide investment decisions to achieve significant reductions in highway fatalities and serious injuries on all public roadways. The Emphasis Areas in Michigan's SHSP include:

The Safety Template and Safety focus areas

- Alcohol/Drug Impaired Driving
- Commercial Vehicle Safety
- Drivers Age 24 and Younger
- Driver Behavior and Awareness
- Emergency Medical Services
- Intersection Safety
- Lane Departure
- Motorcycle Safety
- Occupant Protection
- Pedestrian and Bicycle Safety
- Senior Mobility and Safety
- Traffic Records and Information Systems

Michigan's SHSP was adopted in June 2008 by the Governor's Traffic Safety Advisory Commission and endorsed by the Governor in 2008.

For MDOT, the SHSP provides guidance in the allocation of the annual Safety Template to reduce crashes and fatalities, and to improve the safety and operational efficiency of the state trunkline system. Emphasis areas that are predominately addressed by the Safety Program are intersection safety and lane departure.

Toward Zero Deaths (TZD) is a statewide safety campaign based on the National Strategy on Highway Safety intended to influence driver behavior and improve safety. With more than 37,000 fatalities occurring on U.S. highways each year, roadway safety remains one of the most challenging issues facing Michigan and the nation. In 2013, Toward Zero Deaths: A National Strategy on Highway Safety (TZD National Strategy) was released, laying out a national vision of eliminating fatal crashes. It's a vision in which all U.S. highway safety stakeholders work collaboratively on a single initiative to save lives. The TZD National Strategy is meant to unify the many diverse efforts occurring around the nation to reduce and eventually eliminate fatal and serious-injury highway crashes. The national strategy outlines strategies and tactics that any group, organization or agency can use to reduce roadway fatalities for six emphasis areas: Drivers and Passengers, Vulnerable Users, Vehicles, Infrastructure, Emergency Medical Services and Safety Management. For MDOT it is the incorporation of safety into all of our projects as part of the Infrastructure emphasis area. In addition, we contribute to the remaining five areas by our efforts on projects and interactions with our partners. This is accomplished though using the state's Strategic Highway Safety Plan (SHSP) as our guide.

How to identify unsafe locations

Locations are identified where safety improvements can be made in support of key focus areas in Michigan's SHSP. Safety improvements include adding a center left turn lane, right turn lane, median protection and low cost safety improvements. These locations can be identified through a review of the current High Crash List, 3R/4R Safety Reviews, customer concerns and Pavement Friction Analyses.

How to qualify for safety funding

To qualify for safety funding, proposed projects must meet a Time-of-Return (TOR) as stated in the current Call For Projects instructions. For proposals in conjunction with another construction project, a separate job number is needed to fund the proposed safety improvement.

Safety projects are included in an MDOT region's pavement strategy analysis and condition goals where applicable.

Bridge Network Strategy Development

Rehabilitation and Replacement for Bridges

The purpose of the bridge program is to preserve MDOT's trunkline bridges. It is a balanced strategy made up of Replacement, Rehabilitation, CPM and Capital Scheduled Maintenance (CSM). The emphasis area of this program is to address the needs of all structures of critical concern, and maintain the freeway and non-freeway bridges in good or fair condition.

MBRS

As a priority on the network, MDOT must identify all the structures of critical concern. MDOT must continue to provide long-term fixes for these structures, removing them from the poor category when possible. The Michigan Bridge Reporting System (MBRS) can be used to download a spread sheet identifying serious and critical bridges.

An additional priority is to improve the overall condition of the bridge network to meet and sustain MDOT's current condition goal. Emphasis should be placed on targeting poor rated elements of freeway bridges when utilizing replacement and rehabilitation funds.

The Bridge Deck Preservation Matrix, in Appendix A-6, should be used when determining repair options for structures, and the average daily traffic (ADT) of the route carried by the bridge should be considered when determining the type of fix.

An additional priority is to provide sound long term management of MDOT's designated Big Bridges*. At present, there are 29 Big Bridges identified in the network. These structures are managed centrally by the

* "Big Bridges" are defined as: those with a deck area greater than 100,000 square feet (there are 13); moveable bridges (there are 12); or those with segmental concrete girders or other unique construction (there are 4).

Bridge Operations Unit of Construction and Technology in Lansing, with input from Regions.

As with roads, MDOT follows the "Mix of Fixes" strategy for bridges. Implementing a balanced mixture of CPM, CSM and R&R projects will increase the number of bridges improved each year and preserve the overall health of the bridge network.

The condition of the bridge network varies among MDOT regions. Each region has developed a strategy tailored to meet the network needs. The Bridge Operations Unit is available to assist in the development of region bridge strategies. The R&R and CPM targets are based upon the number of bridges each region has that are candidates for that type of work. As each region nears or exceeds the bridge network goal, the region strategy is adjusted to focus more on bridge CPM in order to maintain the good condition of the network.

Bridge R&R Project Identification and Selection

Rehabilitation (3R) is defined as work undertaken to extend the service life of an existing bridge. The intent of this work is to return a bridge to a condition of structural or functional adequacy. This work may include upgrading geometric features such as bridge widening (no increase in number of through lanes). Examples of this work are shallow and deep concrete overlays, superstructure repairs, extensive substructure repairs and substructure replacement.

Replacement (4R) involves substantial changes to the existing structure, such as bridge deck replacement, superstructure replacement or complete structure replacement. Bridge Projects with proposed work of 3R & 4R, on the NHS network, may require a meeting with the FHWA to discuss oversight requirements. Early coordination with FHWA is recommended to avoid changes to the scope during the design phase. FHWA oversight is generally determined by the Region System Managers in the fall of every year. This is accomplished by meeting together with the FHWA area engineer and discussing the Five Year Program and following the guidelines in the FHWA Oversight Matrix.

Approved Bridge R&R Fixes

- Applying a shallow overlay on the deck (hydro-demolishing the deck surface to a depth of ¾ inch, then applying a latex-modified concrete that is typically 1 ½ inch thick)
- Applying a deep overlay on the deck (hydro-demolishing to remove the deck concrete below the top reinforcement, replacing deficient rebar, and placing a Grade 45 D Modified concrete such that a depth of 3 inches covers the top transverse reinforcement)
- Repairing the bridge superstructure (the part of the bridge above the piers and abutments, typically steel or concrete beams, girders and stringers that support the deck)

- Repairing the bridge substructure (the piers and abutments which carry the superimposed load of the superstructure to the underlying soil or rock)
- Replacing the deck
- Replacing the bridge rail
- Replacing and widening the superstructure (to maintain same number of lanes)
- Replacing the entire bridge
- Replacing a culvert (10-20 feet)
- Adding lanes to the bridge via one or more of the following:
    - Widening the bridge
    - Replacing and widening the deck
    - Replacing and widening the superstructure
    - Replacing the bridge

Capital Preventive Maintenance for Bridges

CPM work is defined as bridge activities that will repair and preserve the bridge. CPM is performed with the understanding that future rehabilitation or replacement projects contain appropriate safety and geometric enhancements. Design Exceptions are not required for CPM or CSM work.

CPM Project Identification and Selection

Bridge CPM projects are identified as bridges with elements that are rated in fair condition with the intent of the project as improving these elements to a good rating. CPM projects deal with limited bridge elements, as indicated below with the list of CPM fixes for bridges.

Approved Bridge CPM Fixes

CPM bridge activities include:

- Replacing pins and hangers
- Painting zones of the bridge beams
- Complete painting of beams
- Patching the deck
- Patching the bridge substructure (minor)
- Applying a hot mix asphalt (HMA) cap (with no waterproofing membrane)
- Applying an HMA overlay (with waterproofing membrane)
- Installing scour countermeasures

- Replacing joints
- Applying an epoxy overlay

Capital Scheduled Maintenance for Bridges

MDOT's Bridge Capital Scheduled Maintenance Manual

The Capital Scheduled Maintenance (CSM) program is 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 for a longer period of time. More information about the CSM program can be found in MDOT's Bridge Capital Scheduled Maintenance Manual, online at www.michigan.gov/documents/mdot_CSM_Manual04_89342_7.pdf

Bridge CSM Project Identification and Selection

What to consider when choosing a CSM project

When identifying and selecting a CSM project the following general concepts should be considered:

- The anticipated work should have little or no impact to traffic and have very little maintaining traffic 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

Bridges that are good candidates for CSM work activities should be fairly close together so they may be grouped into one project. 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 the bridge network.

Approved Bridge CSM Fixes

CSM activities include:

- Washing the superstructure
- Removing vegetation
- Cleaning and/or repairing the drain system
- Spot-painting
- Resealing bridge construction joints
- Sealing concrete

- Sealing deck cracks
- Minor concrete patching
- Repairing bridge deck spalls
- Provide pressure relief joints in the concrete bridge approach
- Repairing or replacing spot locations of failed or damaged slope paving

Other Strategies

The Department has strategies for public transportation, aviation and bike/pedestrian safety and accessibility included in the MDOT State Long Range Transportation Plan.

Road Diet

This is a strategy employing a reduction in existing lanes or lane widths to accommodate evolved transportation needs within or along the roadway. These needs may include among other features, center turn lanes, bicycle lanes, sidewalks or to induce traffic speed reduction (traffic Calming) within a corridor. Use of road diet techniques must be presented to the Engineering Operations Committee for information only. Support for the road diet must be locally supported in the form of a city council resolution. Also see "Geometric Considerations" in Chapter 6.

Roundabouts

This should be considered as a potential intersection option within MDOT-sponsored or funded planning studies/design projects since they offer improved safety, cost savings, and enhanced traffic operations in many situations. The option to include the roundabout requires Engineering Operations Committee approval.

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Chapter

4

Condition Rating and Measurement Systems

Background Information on Condition Rating and Measurement Systems

Understanding Pavement and Bridge Condition Data

The key road performance measure used by MDOT is called Remaining Service Life (RSL). It is defined as the estimated number of years until it is no longer cost effective to perform preventive maintenance on a pavement section. MDOT combines pavement RSL into categories according to ranges of RSL values see table 1, page 2-9, RSL Categories and Rating. For example, Category I pavements have RSL values of 0-2 years, which MDOT identifies as poor.

RSL and Repair Methods

Roads with RSL of 0-2 years (Category I pavement) should be considered for Rehabilitation or Reconstruction (R&R), while roads with RSL of 3 to 25 (Category II+) years should be considered as candidates for Capital Preventive Maintenance (CPM) or Reactive Maintenance (RM). A list of R&R, CPM, and RM fixes is listed in Chapter 3.

How to extend RSL

CPM is a method to extend the RSL of a pavement currently in good or fair condition. CPM allows MDOT to address approximately four to five times the amount of pavement as R&R, with the same amount of money. As with R&R projects, CPM delays road deterioration by preventing moisture and incompressible materials infiltration and further deterioration. CPM also allows MDOT to manage the timeframe in which a reconstruction project becomes necessary.

How RSL is calculated

Factors used to determine RSL

Estimation of RSL involves analysis of historical factors including project history (treatment type & date), standardized service life benefit values per treatment type and, when sufficiently available, mathematically modeled surface condition data (the MDOT Distress Index) for projection of future deterioration (generally involving pavement deterioration analyzed over a six-year period using at least three pavement factors).

Calculating Distress Index

Distress Index (DI) values are calculated from specific distress type/severity/extent observations. When DI equals zero, the surface is described as distress-free. When DI is equal to or greater than 50, the surface condition is considered to be too bad for preventive maintenance work, suggesting that rehabilitation or reconstruction is needed. A DI ≥ 50 correlates to a RSL of zero. Therefore, DI=50 corresponds to RSL=0, as they both indicate the same threshold idea – when R&R work should be considered.

When there is not enough historical DI data collected to forecast the RSL for a specific pavement section, standard RSL values are assigned based on the treatment type history and commercial average daily traffic (ADT) values for the section.

The Pavement Surface Evaluation Rating System

The Pavement Surface Evaluation Rating (PASER) system has been adopted by Michigan's Transportation Asset Management Council to measure Michigan's entire federal aid paved surface network and is used by most of the local road agencies throughout Michigan. PASER is a visual, windshield, survey to make an assessment of current pavement surface condition. PASER works on a scale from 1 to 10, with 1 being poor and 10 being good.

The International Roughness Index

The International Roughness Index (IRI) is an estimate of the roughness of a stretch of roadway. The lower the IRI number, the smoother the ride is. MDOT has adopted the following general quality ranges for IRI (inches/mile):

- Good 0 – 94
- Fair 95-170
- Poor >170

The Sufficiency Surface Condition rating subjectively evaluates the surface condition on a scale of 1 to 5, with 1 being a segment with an excellent surface condition showing little or no surface deterioration.

The performance measure of RSL and condition measures such as Sufficiency Surface Condition, IRI, DI, PASER, wheel path rutting and joint/crack faulting, are used together to help transportation professionals cost-effectively manage Michigan's trunkline highway network.

Pavement and Bridge Condition Tools

(revised 6-24-2019)

Below is a list of existing pavement and bridge condition tools or resources currently utilized by MDOT to evaluate the condition of MDOT's assets.

Table 2: Pavement and Bridge Condition Tools

Tool Name	Description
Pavement Condition File	Generated (annually) by the MDOT Construction Field Services (CFS) office in Lansing; provided to Region Pavement Engineers for data verification, extraction, and condition map creation. The Pavement Condition File is the primary source for RSL estimate assignments.
Road Quality Forecasting System (RQFS)	Software program used by Region Pavement Engineers, Region System Managers and Statewide Planning Staff. This is for program strategy development, analyze/optimizing and monitoring, in line with MDOT pavement network condition goals. RQFS analyzes RSL data~~,~~ project costs, expected inflation and user-created program strategies to estimate~~s~~ the future conditions of State trunkline pavement networks.
Bridge Condition Forecasting System (BCFS)	Microsoft Excel spreadsheet program used for program strategy development to analyze/optimize network conditions in line with MDOT bridge condition goals. Using National Bridge Inspection (NBI) condition ratings, bridge deterioration rate, project cost, expected inflation, and fix strategies, BCFS estimates the future condition of the state trunkline bridge system. BCFS can compare a mix of fixes by modeling different percentages of preventive maintenance, rehabilitation and replacement projects. Strategies can be modeled on the statewide trunkline network or by region.
Bridge Management System (BMS)	BMS links data, strategies, programs and projects into a systematic process to achieve desired results.
Pontis	Pontis (Latin for bridge) is an AASHTOWare computer program and relational database designed to be a comprehensive bridge management system. Pontis stores element - level bridge inventory and inspection data; formulates network-wide preservation and improvement policies for use in evaluating the needs of each bridge in a network; and makes

Tool Name	Description
	recommendations for what projects to include in an agency's capital plan for deriving the maximum benefit from limited funds.

Existing Road and Bridge Data (revised 6-24-2019)

Below is a list of existing pavement and bridge condition data that can be obtained through the condition tools.

Remaining Service Life

Data Scale	Description
Good = 8+ (Cat III+) Fair = 3-7 (Cat II) Poor = 0-2 (Cat I)	A combined indicator of pavement condition and performance: provides an estimate of remaining time (in years) until a given pavement section's most cost-effective treatment would be either reconstruction or major rehabilitation.

International Roughness Index

Data Scale	Description
Good = 0-94 Fair = 95-170 Poor ≥171 (inches/mile)	IRI estimates the amount of roughness. It is calculated from longitudinal profiles measured by laser sensor in both the inside and outside wheel paths of a pavement section (by a rapid-travel profiler (RTP) vehicle). MDOT reports a pavement section's roughness as the average of the two wheel paths' individual IRI values (also known as the Mean Roughness Index – MRI).

Distress Index

Data Scale	Description
Good = 0-25 Fair = 26-49 Poor ≥50	The total accumulated distress point value for a given pavement section normalized to a 0.1-mile length. It is a unitless value that gives a "snapshot" indication of a pavement's present surface distress condition.

Rutting

Data Scale	Description
Low = 0.0 to 0.25 inches Medium = 0.25 inches to 0.50 inches High ≥ 0.50 inches	Rutting is longitudinal surface depressions in the wheel path of an HMA pavement, caused by plastic movement of the HMA mix, inadequate compaction or abrasion from studded tires.

Faulting

Data Scale	Description
Low = 0.0 inches to 0.25 inches Medium = 0.25 inches to 0.75 inches High ≥ 0.75 inches	Faulting is differential vertical displacement of a slab or other member adjacent to a joint or crack. Faulting commonly occurs at transverse joints of concrete pavements that do not have adequate load transfer.

Pavement Surface Evaluation and Rating (PASER)

Data Scale	Description
Good = 6-10 Fair = 4-5 Poor = 1-3	PASER is based on visual inspection to evaluate pavement surface conditions.

Friction

Data Scale	Description
Friction Number (FN) less than 30 requires additional review (such as crash numbers)	Surface friction is measured with a locked wheel skid trailer. Values for friction are complicated by macro-texture (texture that allows drainage, in order to prevent hydroplaning), micro-texture (the actual texture of the stone aggregate particles), changes in micro-texture due to aggregate polishing, the tire type (including its rubber composition), and tread pattern. MDOT does not have a minimum required friction level due to several factors, including varying traffic volumes, speeds and road geometrics which all have an impact on the minimum required friction levels (Making engineering judgments about pavement friction based on friction testing alone is not recommended).

National Bridge Inspection Standards (NBIS) Rating

Data Scale	Description
Good = 9, 8, 7 Fair = 6, 5 Poor = 4 Serious = 3 Critical= 2 Closed = 0, 1	The NBIS is a visual survey to determine bridge condition and ensure safety. The NBIS rating system goes from 0 to 9, with 0 being the worst and 9 being a new structure.* Note: The NBIS ratings are used to develop the Bridge Safety Inspection Reports (BSIR).

* Descriptions for each rating are provided by FHWA's *Recording and Coding Guide for the Structural Inventory and Appraisal of the Nation's Bridges*.

Condition ratings are given for the three major elements of a bridge: the deck, the superstructure and the substructure.[1] MDOT also collects over 20 other Michigan specific condition ratings using the NBIS 0 to 9 rating scale.

NBI ratings are given to all highway bridges, pedestrian bridges and railroad bridges. MDOT is required by federal regulations to inspect each bridge having a span length greater than 20 feet at least once every two years. The NBI information from each inspection is collected, stored, and reported to the FHWA annually. In accordance to state law, MDOT also inspects and inventories culverts/structures with span lengths 10 to 20 feet.

Using the NBI scale, an element rated 7 through 9 is considered as being in good condition. Structures that are good or fair are candidates for Capital Scheduled Maintenance (CSM) (See Preservation guidelines in Chapter 5 of this manual for further information).

Bridge elements rated 5 and 6 are considered in fair condition. Structures that are fair are candidates for Capital Preventive Maintenance (CPM) (See Preservation guidelines in Chapter 5 of this manual for further information).

A bridge element rated 4 or less is considered poor, and requires rehabilitation or replacement of the poor elements or the entire bridge.

Pontis

Data Scale	Description
Good = 1 Fair = 2-3 Poor = 4 Serious = 5	Pontis independently evaluates various components or elements of a structure. In General a Condition State of 1 is good and as an element deteriorates the condition state rating increases to a higher number. Some elements will have 5 condition states, and some elements will only have 3 condition states. It is important to be aware that the condition ratings are specific to the element's material type. Note: Pontis "condition states" are quantity based, that elements of a bridge can have quantities in multiple condition states, and shouldn't be used in the same way as NBIS ratings.

[1] There is a separate overall condition rating for culverts, since this type of structure does not have the same elements as typical bridge structures.

Scour-Critical Bridges (Structural Inventory and Appraisal Item 113)

Bridges that cross over waterways are evaluated for their susceptibility to scour. Scour is the erosion of streambed or bank material due to flowing water; often considered as being localized around piers and abutments of bridges. A scour critical bridge is a structure with a foundation element that has been determined to be unstable for the observed or evaluated scour condition.

Data Scale	Description
Stable for Scour = 4, 5, 6, 7, 8, 9	The scour evaluation is performed by hydraulic/geotechnical/structural engineers to determine the structure's vulnerability to scour. U – Bridge with "unknown" foundation 9 - Bridge foundations (including piles) on dry land well above flood water elevations. 8 - Bridge foundations determined to be stable for the assessed or calculated scour condition. Scour is determined to be above top of footing by assessment, by calculation or by installation of properly designed countermeasures. 7 - Countermeasures have been installed to mitigate an existing problem with scour and to reduce the risk of bridge failure during a flood event. 6 - Scour calculation has not been evaluated. 5 - Bridge foundations determined to be stable for assessed or calculated scour condition. Scour is determined to be within the limits of footing or piles, by calculations or by installation of properly designed countermeasures. 4 - Bridge foundations determined to be stable for assessed or calculated scour conditions; field review indicates action is required to protect exposed foundations.
Scour Critical = 3, 2, 1, 0	3 - Bridge is Scour Critical; bridge foundations determined to be unstable for assessed or calculated scour conditions: - Scour within limits of footing or piles. - Scour below spread-footing base or pile tips. 2 - Bridge is scour critical; field review indicates that

	extensive scour has occurred at bridge foundations. 1 - Bridge is scour critical; field review indicates that failure of piers/abutments is imminent. 0 - Bridge is scour critical. Bridge has failed and is closed to traffic.

The Hydraulics Unit in the Design Division in Lansing should be consulted for assistance with all bridges which may be considered scour critical.

Fracture-Critical Bridges

MBIS

A Fracture Critical (FC) bridge is a structure containing a steel member in tension or with a tension element, whose failure would probably cause a portion of or the entire bridge to collapse. MDOT has a fracture critical bridge inspector who inspects the fracture critical elements on all of MDOT's fracture critical bridges annually. A fracture critical inspection report is filed in the Michigan Bridge Inspection System's (MBIS) special inspection reports, and the condition ratings are taken into consideration when the inspector assigns an overall superstructure NBI condition rating (as described above). Fracture critical bridge elements should be maintained in good or fair condition.

Data Scale	Description
Good = 9, 8, 7 Fair = 6, 5 Poor = 4 Poor (Critical) ≤ 3	A fracture-critical bridge is a structure containing a steel member in tension or with a tension element, whose failure would probably cause a portion of or the entire bridge to collapse.

Bridge Inspection Reports are developed using the NBI Ratings to issue a report format. See additions to NBI below.

Structurally Deficient Rating

NBI condition ratings, along with Federal Structural Inventory and Appraisal (SI&A) ratings, can also be used to classify a bridge as Structurally Deficient (SD) or Functionally Obsolete (FO). SD and FO are long-standing and very common performance measures for bridges. They are required by the FHWA and used by all the states. Following are definitions for each.

Generally, a bridge is SD if any major component is in poor condition or if the structure has insufficient load carrying capacity or insufficient waterway (beneath the structure). If any one or more of the following are true, then the bridge is SD:

- Deck rating is less than 5
- Superstructure rating is less than 5
- Substructure rating is less than 5
- Culvert rating is less than 5

- Structural evaluation is less than 3
- Waterway condition is less than 3

Functionally Obsolete Rating

Generally, a bridge is FO, if its geometrics are significantly below current design standards for the volume of traffic being carried on or under the bridge. Bridges that are FO no longer meet current highway design standards, often because of narrow lanes, inadequate under clearances or poor alignment. If any one or more of the following are true, then the bridge is FO:

- Structural evaluation (SI&A Item # 67) is equal to 3
- Deck geometry (SI&A Item # 68) is less than 4
- Under clearance (SI&A Item # 69) is less than 4 and there is another highway under the bridge
- Waterway adequacy (SI&A Item # 71) is equal to 3
- Approach roadway alignment (SI&A Item # 72) is less than 4

A bridge may not be classified as both SD and FO. If a bridge qualifies for both, then it is reported as SD.

Summary

MDOT's management systems and rating tools ensure that MDOT employees can develop a cost effective, yet high-quality method of maintaining Michigan's trunkline system, using a mix of fixes.

For information about mix of fixes, see Chapter 2, "MDOT's Program Development." For information about putting condition data into use, see Chapter 3, "Strategy Development for Roads and Bridges" and Chapter 5, "Signs of Pavement and Bridge Distress and Fix Selection Guidelines."

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Chapter 5

Signs of Pavement and Bridge Distress and Fix Selection Guidelines

Introduction

This chapter is intended as a general guideline, for which fixes are appropriate for the various distresses on Michigan's pavements. Although many of the fixes listed have been successful, they may not apply in all cases. Determining the treatment to use in rehabilitating a particular segment of highway is primarily a matter of engineering judgment. Progress has been made in quantifying certain intangibles, matching structural numbers with proposed traffic volumes and calculating cost/benefit analyses, but the major factor remains - engineering judgment.

The contents of this chapter include information, text, diagrams and guidance documentation referenced from the US Department of Transportation Federal Highway Administration Manual named, "Distress Identification Manual for the Long-Term Pavement Performance Program (Publication No. FHWA-RD-03-031, June 2003)".

Signs of Pavement Distress

Michigan has three pavement types; flexible, rigid and composite. Flexible pavements are constructed using hot mix asphalt (HMA) mixtures, which are typically placed on a combination of granular and dense graded aggregate bases.

Rigid pavements are constructed using concrete mixtures, which are commonly placed on a combination of dense graded aggregate bases and granular bases or on open graded aggregate bases and granular bases. Rigid pavements have unique qualities. The concrete may be plain or reinforced with steel wire fabric reinforcement. Additionally, rigid pavement is poured with joints to allow for contraction and expansion of the concrete. Joint spacing can vary from trunkline to trunkline.

Composite pavements are HMA mixtures placed on a rigid pavement.

The following provides examples of common distresses and potential fixes for pavements with various type of distresses. It should be noted that some of the fixes can address the distress itself while others will address the pavement as a whole. In most cases, it is assumed that the distress is prevalent throughout the pavement section and not an isolated location. All of the types of distresses in a given section of pavement will need to be considered when choosing a fix.

Flexible Pavement

Primary types of distress associated with flexible pavements are transverse cracking, longitudinal cracking, block cracking, fatigue or alligator cracking, rutting, raveling, shoving and flushing. A description and cause of each, with possible fixes are as follows:

Transverse Cracking

Description
Transverse cracks are predominantly perpendicular to the pavement centerline. Cracks are often regularly spaced and are caused by the movement of the pavement due to temperature changes and hardening of the asphalt with age.

Severity Levels

Low Severity Description: A low severity transverse crack is defined as an unsealed crack, with a mean width of ¼ inch or less or a sealed crack with sealant material in good condition and indeterminate width.

Possible Fix Options:
- Cut and Seal
- Overband Crack Fill
- Chip Seal
- Microsurface
- HMA Ultra-thin Overlay

Moderate Severity Description: A moderate severity transverse crack has a mean width of ¼ to ¾ inches or is any crack with a mean width of ¾ inches or less and adjacent low severity random cracking.

Possible Fix Options:
- Overband Crack Fill
- HMA Patch
- Chip Seal
- Microsurface
- HMA Ultra-thin Overlay
- Mill and Resurface
- Crush and Shape
- HMA Overlay with or without Repairs

High Severity Description: A high severity transverse crack is wider than ¾ inch on average or has a mean width of ¾ inches or less with adjacent moderate to high severity random cracking.

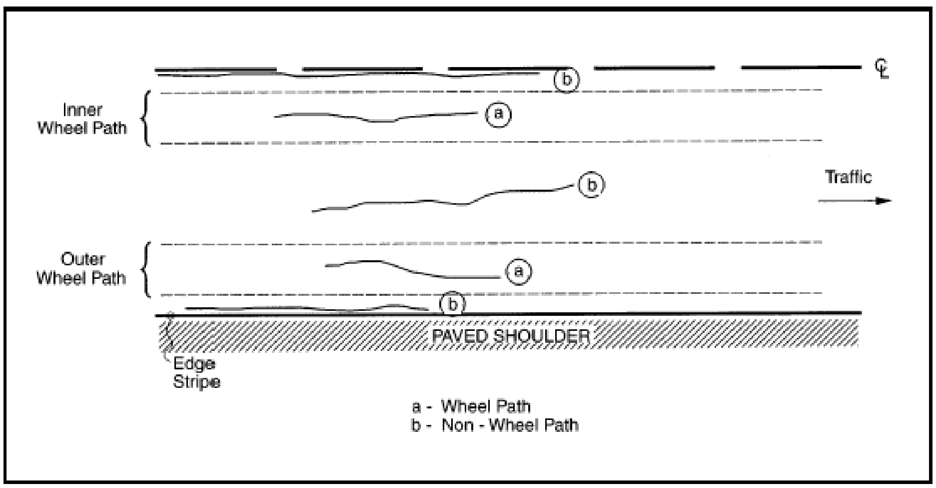
Possible Fix Options:
- Mill and Resurface
- Crush and Shape
- HMA Overlay with Repairs
- Reconstruct

Longitudinal Cracking

Description

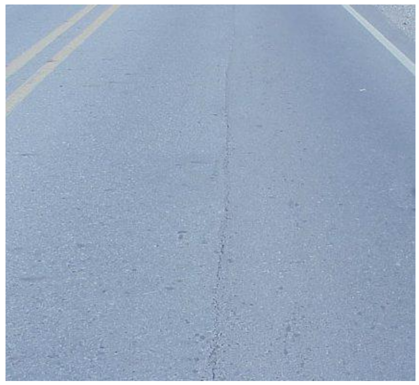
Longitudinal cracks are predominantly parallel to the pavement centerline (wheel path ⓐ versus non-wheel path ⓑ). These cracks are especially significant if they are within the wheel path. Any wheel path longitudinal crack that has associated random cracking is rated as fatigue cracking, which is considered a major structural distress in flexible pavements. See "Fatigue Cracking" on page 5-7 for more information.

In flexible pavement, probable causes include a poorly constructed paving lane joint, shrinkage of the asphalt due to temperature changes, hardening of the asphalt and/or reflective cracks beneath the surface course.



Severity Levels

Low Severity Description: A low severity longitudinal crack has a mean width of less than ¼ inch or is a sealed crack of indeterminate width with sealant in good condition.



Possible Fix Options:
- Cut and Seal
- Overband Crack Fill
- Chip Seal
- Microsurface
- HMA Ultra-thin Overlay

Moderate Severity Description: A crack, with an average width of greater than ¼ inch to less than or equal to ¾ inch or any crack with a mean width less than or equal to ¾ inch and adjacent low severity random cracking.

Possible Fix Options:
- Overband Crack Fill
- Chip Seal
- Microsurface
- HMA Ultra-thin Overlay
- Mill and Resurface
- Crush and Shape
- Overlay with or without Repairs

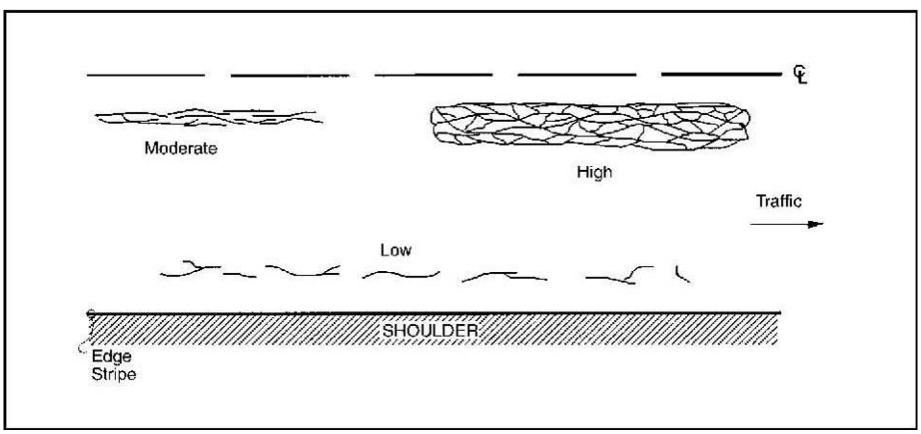
High Severity Description: A crack width > ¾ inch or any crack with a mean width ≤ ¾ inch and adjacent moderate to high severity random cracking.

Possible Fix Options:
- Mill and Resurface
- Crush and Shape
- Overlay with Repairs
- Reconstruct

Fatigue Cracking (or Alligator Cracking)

Description

Fatigue cracking occurs in areas that are subjected to repeated traffic loadings (wheel paths). It can be a series of interconnected cracks in early stages of development. The cracks may develop into many-sided, sharp-angled pieces, usually less than one foot on the longest side, characteristically with a chicken wire/alligator pattern, in later stages. In flexible pavement the pattern must have a quantifiable area. The cracking is caused by fatigue failure of the asphalt concrete surface under repeated traffic loading.



Severity Levels

Low Severity Description: An area of cracks, with no or only a few connecting cracks, cracks are not spalled or sealed and pumping is not evident.

Possible Fix Options:
- Cut and seal
- Overband crack fill
- Chip seal
- Microsurface
- HMA Ultra-thin Overlay
- Patching

Moderate Severity Description: An area of interconnected cracks, forming a complete pattern, cracks may be slightly spalled, cracks may be sealed and pumping is not evident.

Possible Fix Options:
- Chip Seal
- Microsurface
- HMA Ultra-thin Overlay
- Mill and Resurface
- Patching

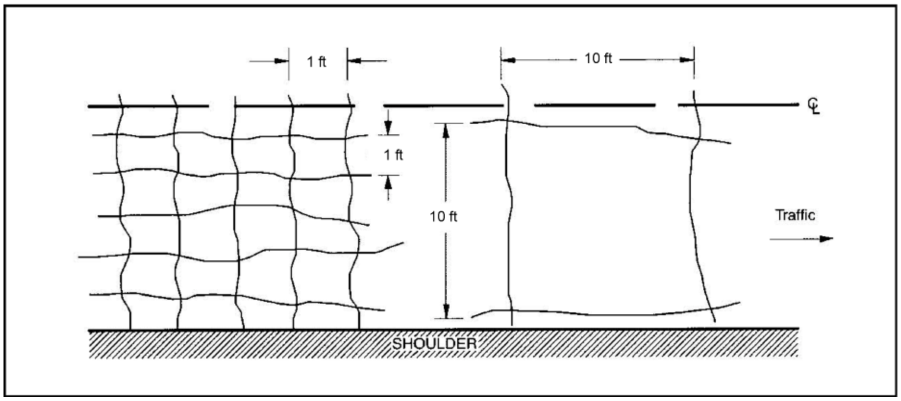
High Severity Description: An area of moderately or severely spalled interconnected cracks forming a complete pattern, pieces may move when subjected to traffic, cracks may be sealed and pumping may be evident.

Possible Fix Options:
- Mill and Resurface
- Crush & Shape
- Reconstruction

Block Cracking

Description

In flexible pavement, block cracking is a pattern which divides the pavement into pieces that are approximately rectangular. These rectangular blocks range in size from about one square foot to one hundred square feet.



Severity Levels

Low Severity Description: Cracks with a mean width ≤ ¼ inch or sealed cracks with sealant material in good condition and with a width that cannot be determined.

Possible Fix Options:
- Chip Seal
- HMA Ultra-thin Overlay

Moderate Severity Description: Cracks with a mean width > ¼ inch and ≤ ¾ inch or any crack with a mean width ≤ ¾ inch and adjacent low severity random cracking.

Possible Fix Options:
- Mill and Resurface
- Crush and Shape
- Overlay without Repair
- Reconstruct

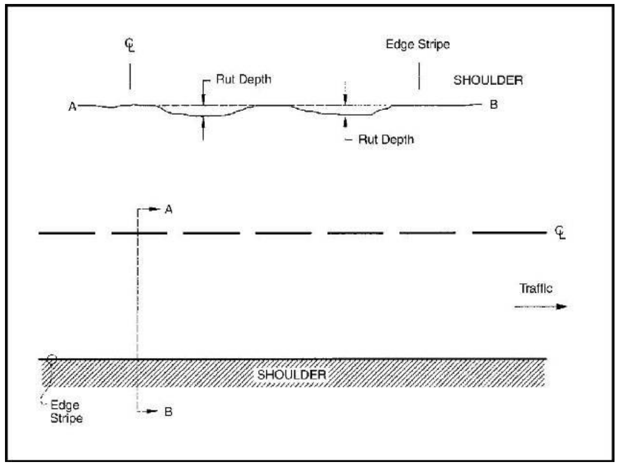
High Severity Description: Cracks with a mean width > ¾ inch or any crack with a mean width ≤ ¾ inch and adjacent moderate to high severity random cracking.

Possible Fix Options:
- Mill and Resurface
- Crush and Shape
- Reconstruct

Rutting

Description

Rutting is the formation of longitudinal depressions in the wheel paths that result when an HMA pavement or underlying base has insufficient stability to support traffic. It usually appears as two continuous wheel "tracks" in the traveled lane, sometimes only visible during a rain or when measured with a straightedge.



How to determine the cause of the problem based on rutting shape

The shape of the rut can be an indicator of the cause. Rutting due to HMA mix instability will have gently sloping sides and a rounded bottom. The HMA may also be “humped up” next to the rut. Rutting due to poor support will have sides that drop abruptly and a flatter bottom.

How to determine the correct fix based on the cause of the problem

Possible Fix Options:

- For rutting due to HMA mix instability, a mill and resurface of affected layers will typically address the problem.
- For rutting due to poor support, a reconstruct is recommended, although a mill and resurface can temporarily restore the pavement to a smooth surface.
- Other options include microsurface with rut fill preparation and crush and shape.

Raveling

Description

Raveling is the wearing away of the pavement surface, caused by the dislodging of aggregate particles and loss of asphalt binder. Raveling ranges from the loss of fines to the loss of some coarse aggregate and ultimately to a very rough and pitted surface with obvious loss of aggregate.

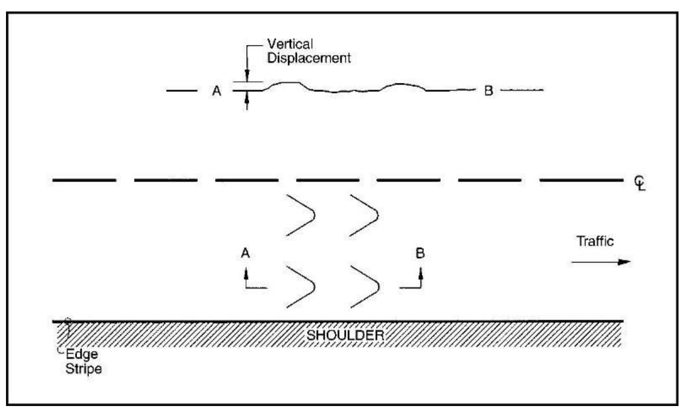
Possible Fix Options:

- Low to medium raveling (surface texture is low to moderately rough and pitted) can be addressed with a surface seal
- High amount of raveling (surface texture is severely rough and pitted) can be addressed with cold milling and resurfacing

Shoving

Description

Shoving is a longitudinal displacement of a localized area of the pavement surface. It is generally caused by braking or accelerating vehicles, and is usually located on hills, curves or intersections. It also may have associated vertical displacement.



Possible Fix Options:

- Cold milling and resurfacing with either a high stress HMA mixture or concrete white topping

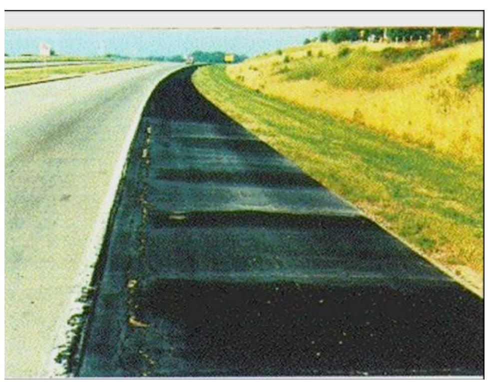
Flushing

Description
Flushing is the excess of bituminous binder, occurring on the pavement surface, usually found in the wheel paths. It may range from a surface discolored relative to the remainder of the pavement, to a surface that is losing surface texture because of excess asphalt, to a condition where the aggregate may be obscured by excess asphalt possibly with a shiny, glass-like, reflective surface that may be tacky to the touch.

Possible Fix Options:
- Chip Seal
- Microsurface
- HMA Overlay (ultra-thin or one-course)
- Mill and Resurface

Pumping

Description
Pumping is the seeping or ejection of water from beneath the pavement through cracks. In some cases, detectable by deposits of fine material left on the pavement surface, which were eroded (pumped) from the support layers and have stained the surface.



Possible Fix Options:
- Joint/Crack Sealing
- Full Depth Repair/Replace
- Underdrain Retrofit

Rigid Pavement

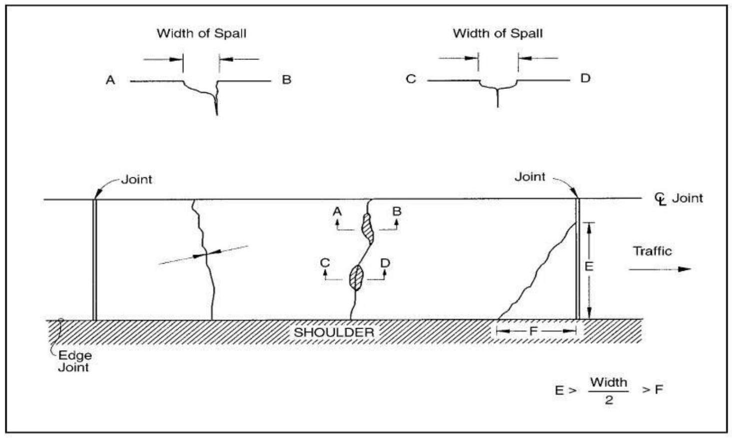
This section describes distresses in Jointed Plain Concrete Pavement (JPCP) and Jointed Reinforced Concrete Pavement (JRCP). Since most Continuously Reinforced Concrete Pavement (CRCP) in Michigan has been removed or resurfaced, it will not be discussed in this section. If a CRCP is in need of repair, consult with the Construction and Technology Division for recommendations.

Typical distresses in JPCP and JRCP pavements are transverse cracking, longitudinal cracking, joint faulting, joint spalling, mid-slab spalling, joint seal failure and pumping.

Transverse Cracking

Description

Transverse cracking is predominantly perpendicular to the pavement centerline. In rigid pavement, these are often caused by a combination of heavy load repetition, thermal and moisture gradient stresses and drying shrinkage stresses.



Severity Levels

Low Severity Description: Crack widths < 1/8 inch, no spalling and no measurable faulting or well-sealed and the width cannot be determined.

Possible Fix Options:
- No repair (if it is very tight)
- Cut and Seal
- Dowel Bar Retrofit
- Full-Depth Repair

Moderate Severity Description: Crack widths ≥ 1/8 inch and < ¼ inch, with spalling < 3 inches or faulting up to ¼ inch.

Possible Fix Options:
- Dowel Bar Retrofit
- Full-Depth Repair
- Diamond Grinding
- Overlay
- Reconstruct

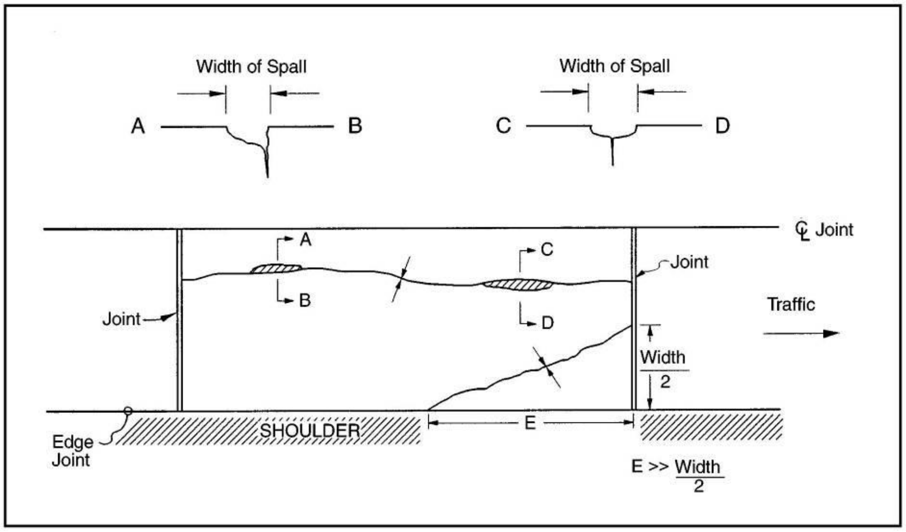
High Severity Description: Crack widths ≥ ¼ inch, with spalling ≥ 3 inches or faulting ≥ ¼ inch.

Possible Fix Options:
- Full-Depth Repair
- Overlay
- Reconstruct

Longitudinal Cracking

Description

Longitudinal cracking is predominantly parallel to the pavement centerline. In rigid pavement, causes may be improper construction of longitudinal joints, a combination of heavy load repetitions, loss of foundation support, thermal and moisture gradient stresses and inappropriate design of tie bars.



Severity Levels

Low Severity Description: Crack widths < 1/8 inch, no spalling and no measurable faulting, or well-sealed and with a width that cannot be determined.

Possible Fix Options:
- Cut and Seal
- Remove and Replace
- Cracked Slabs

Moderate Severity Description: Crack widths ≥ 1/8 inch and < ½ inch, with spalling < 3 inches or faulting up to ½ inch.

Possible Fix Options:
- Remove and Replace Cracked Slabs
- Overlay
- Reconstruct

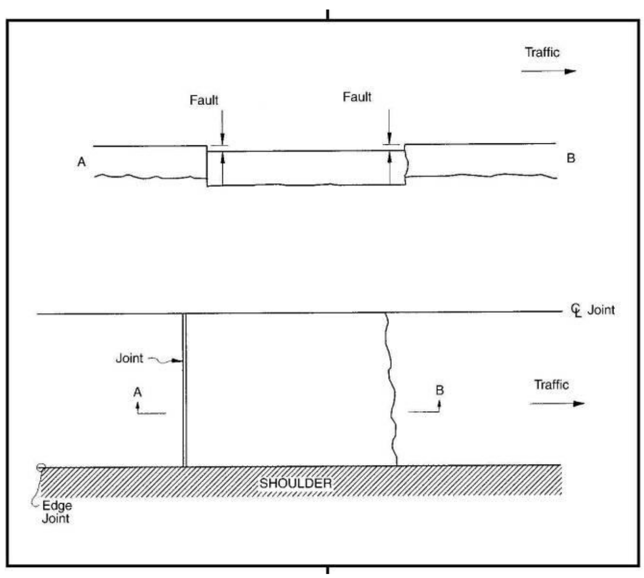
High Severity Description: Crack widths ≥ ½ inch, with spalling ≥ 3 inches or faulting ≥ ½ inch.

Possible Fix Options:
- Remove and Replace Cracked Slabs
- Overlay
- Reconstruct

Joint Faulting

Description

Joint faulting occurs in rigid pavement only and is the difference in elevation across a joint or crack. It is usually an indicator of loss of support and can be located at the transverse or longitudinal joints. This may be caused by the buildup of loose material under the approach slab and depression in the leave slab or curling and warping of the concrete slab.



Severity Levels

Low Severity Descriptions: Average faulting is < ¼ inch.

Possible Fix Options:
- Full Depth Repair
- Diamond Grinding

Moderate Severity Description: Average faulting is ≥ ¼ inch and < ½ inch.

Possible Fix Options:
- Jacking
- Full-Depth Repair
- Diamond Grinding
- Overlay
- Reconstruct

High Severity Description: Average faulting is ≥ ½ inch.

Possible Fix Options:
- Jacking
- Full Depth Repair
- Overlay
- Reconstruct

Joint Spalling

Description

Joint Spalling occurs in rigid pavement only and is the cracking, breaking, chipping or fraying of slab edges along the face of a longitudinal or transverse joint. A joint spall usually does not extend vertically through the whole slab thickness, but intersects the joint at an angle. Joint Spalling usually results from excessive stresses at the joint caused by infiltration of incompressible materials and subsequent expansion, freezing and thawing water, or by traffic loading. Also, a poorly designed or constructed load transfer device can contribute to joint spalling.

Severity Levels

The size of a joint spall is determined from the following criteria:

Small Spall = less than three inches along the joint and less than one inch from face of joint

Medium Spall = three to twelve inches along the joint and within one to three inches from face of joint

Large Spall ≥ twelve inches along the joint and > three inches away from face of joint

Low Severity Description: A joint with an occasional small or medium spall.

Possible Fix Options:
- No Fix
- Joint Spall Repair

Moderate Severity Description: A joint with nearly a continuous small spalling, several medium spalls or one large spall.

Possible Fix Options:
- Joint Spall Repair
- Full Depth Repair

High Severity Description: A joint with many medium spalls and/or several large spalls.

Possible Fix Options:
- Full Depth Repair
- Full Depth Repair with an Overlay
- Reconstruct

Mid-Slab Spalling

Description

Mid-Slab Spalling occurs in rigid pavement only and is the breaking and/or loss of material at the surface, not immediately adjacent to one of the joints. Large pop-outs of material and corrosion of high reinforcing steel are two causes of mid-slab spalls.

Severity Levels

Low Severity Description: A spall less than ten square inches.

Possible Fix Options:
- Leave As Is
- Spall Repair

Moderate Severity Description: A spall > ten square inches, but < one hundred square inches.

Possible Fix Options:
- Spall Repair

High Severity Description: A spall > one hundred square inches.

Possible Fix Options:
- Spall Repair
- Full Depth Repair
- Spall Repair with an Overlay
- Reconstruct

Joint Seal Failure

Description

Description of "cohesive failure", "adhesive failure' and "compressive set'

Joint seal failure occurs in rigid pavement only and is either the tearing of the sealant (cohesive failure) or loss of adhesion to the joint side walls (adhesive failure). When adhesive failure occurs the sealant might get pulled out or drop down in the joint, due to adhesive and contact failure. Sometimes with preformed sealants, the sealant permanently compresses (takes a compression set) from the joint being closed tightly for extended periods. Compression set results in loss of contact with the joint walls. These failures enable incompressible materials or water to infiltrate the joint from the surface.

Severity Levels

Low Severity Description: Less than six inches of failure along the transverse joint length or less than five percent of failure along the longitudinal joint length.

Possible Fix Options:
- Leave As Is
- Joint Reseal

Moderate Severity Description: Six inches to three feet of failure along the transverse joint length or five to twenty percent of failure along the longitudinal joint length.

Possible Fix Options:
- Joint Reseal

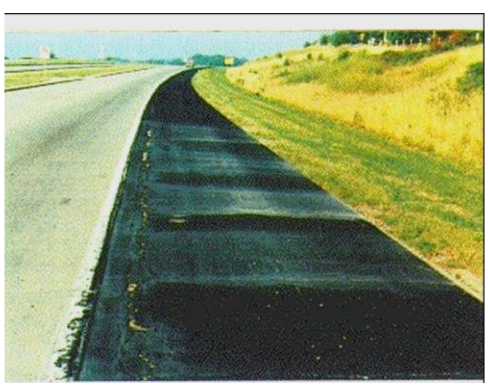
High Severity Description: Greater than three feet of failure along the transverse joint length or greater than twenty percent of failure along the longitudinal joint length.

Possible Fix Options:
- Joint Reseal

Pumping

Description

Pumping is the seeping or ejection of water from beneath the pavement through cracks. It can occur in rigid and flexible pavements. In some cases, it is detectable by deposits of fine material left on the pavement surface, which were eroded (pumped) from the support layers and have stained the surface.



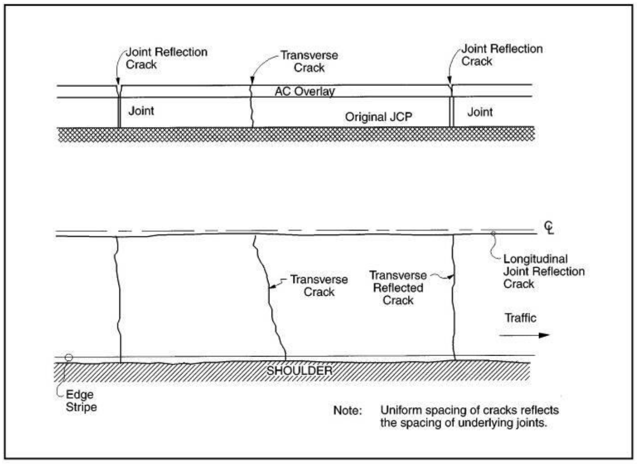
Possible Fix Options:
- Joint/Crack Sealing
- Full Depth Repair
- Underdrain Retrofit

Composite Pavement

Composite pavements consist of HMA over concrete or concrete over HMA. The most common in Michigan is HMA over concrete.

HMA Over Concrete

Distresses and recommended fixes for HMA over concrete pavements are the same as those for flexible pavements with the addition of joint reflective cracking from concrete slab and crush & shaping, respectively. In general, fix lives are lower and distress quantities are higher for composite pavements than for flexible pavements.



Reflective Cracking at Joints

Description

Reflective cracking at joints is unique to HMA over concrete pavements and includes all longitudinal and transverse cracks that appear on top of the concrete joints. Knowledge of the slab dimensions beneath the HMA surface will help identify these cracks. These cracks are caused by movements in the concrete slab beneath the HMA surface because of thermal and/or moisture changes. It is generally not load initiated distress. However, traffic loading may accelerate the deterioration of the cracks and may cause a breakdown of the HMA surface near the initial crack, resulting in spalling.

For severity levels and recommended fix options, see transverse cracking for flexible pavements (page 5-4).

Concrete over HMA

Distresses and recommended fixes for concrete over HMA are the same as those for rigid pavements (pages 5-13 to 5-23) with the exception that dowel bar retrofit is not recommended. This is due to the fact that concrete over HMA overlays are usually much thinner than 8 inches. It should also be noted that full-depth repairs are much more difficult in concrete overlays due to the bond between the concrete and HMA.

Rehabilitation and Reconstruction Fix Life Guidelines

CFP In each year's Integrated Call For Projects (CFP) Letter of Instructions a current Road Rehabilitation and Reconstruction Fix Life Guideline table is provided. Appendix A-3 has an example of this table.

The tables in Appendix A-1 show Recommended Corridor Pavement Management Strategies. These tables show possible work types for various pavements, based on existing pavement type, age of pavement and Commercial Average Daily Traffic (CADT) volumes. In addition, Work Type Codes (WTC) are given at the end of Appendix A-2.

Distress Index Based Fix Guidelines

The following tables provide Fix Guidelines for the three pavement types (flexible, rigid and composite) based on the pavement's current distress index (DI).

Table 5-1: Fix Guidelines for Flexible Pavement

Flexible	
DI Rating	Fix Options
< 15	Crack Treatment Micro-Surfacing (Single Course)
< 20	Overband Crack Filling Ultra-Thin Overlay
< 25	Single Chip Seal
< 30	Double Chip Seal Micro-Surfacing (Double Course) Micro-Surfacing (Heavy Single Course)
< 40	HMA Overlay HMA Mill & Overlay
> 50	Rehabilitation or Reconstruction

Table 5-2: Fix Guidelines for Rigid Pavement

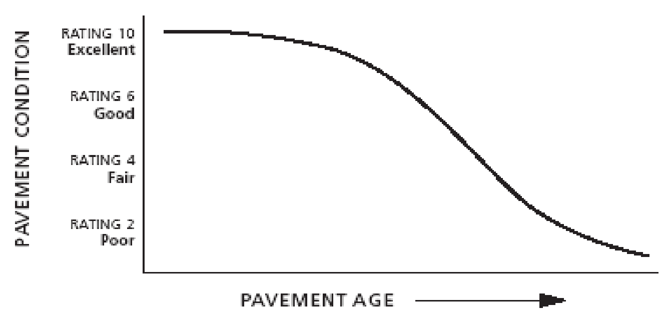
Rigid	
DI Rating	Fix Options
< 10	Diamond Grinding
< 15	Joint Resealing Concrete Spall Repair Crack Sealing Dowel Bar Retrofit
< 20	Full Depth Concrete Pavement Repair
< 40	Concrete Pavement Restoration
> 50	Rehabilitation or Reconstruction

Table 5-3: Fix Guidelines for Composite Pavement

Composite	
DI Rating	Fix Options
< 5	Crack Treatment
< 10	Overband Crack Filling Ultra-Thin Overlay
< 15	Micro-Surfacing (Double or Heavy Single Course) Double Chip Seal
< 25	HMA Overlay
< 30	HMA Mill & Overlay
> 50	Rehabilitation or Reconstruction

Recommended Fix Guidelines for PASER Ratings

A Pavement Condition versus Pavement Age Curve and Ratings are shown on the graph below. The curve shows the rate that pavement condition deteriorates, as the pavement ages. The chart lists PASER ratings (Pavement Surface and Evaluation Ratings) and Maintenance Guidelines that may be associated with it.



In addition to indicating the surface condition of a road, a given rating also includes a recommendation for needed maintenance or repair. This feature of the rating system facilitates its use and enhances its value as a tool in ongoing road maintenance.

RATINGS ARE RELATED TO NEEDED MAINTENANCE OR REPAIR

Rating 9 & 10	No maintenance required
Rating 8	Little or no maintenance
Rating 7	Routine maintenance, cracksealing and minor patching
Rating 5 & 6	Preservative treatments (sealcoating)
Rating 3 & 4	Structural improvement and leveling (overlay or recycling)
Rating 1 & 2	Reconstruction

Figure 5-1: Pavement condition vs. pavement type curve and ratings

PASER HMA Rating System

The following table uses PASER ratings (as described in Chapter 4) to categorize HMA pavements and recommend possible fix alternatives.

Table 5-4: PASER HMA Rating System

PASER HMA Rating system		
10 Excellent	None	New construction.
9 Excellent	None	Recent overlay. Like new.
8 Very Good	No longitudinal cracks except reflection of paving joints. Occasional transverse cracks, widely spaced (40' or greater). All cracks sealed or tight (open less than ¼").	Recent seal coat or new cold mix. Little or no maintenance required.
7 Good	Very slight or no raveling, surface shows some traffic wear. Longitudinal cracks (open ¼") due to reflection or paving joints. Transverse cracks (open ¼") spaced 10' or more apart, little or slight crack raveling. No patching or very few patches in excellent condition.	First signs of aging. Maintain with routine crack filling.
6 Good	Slight raveling (loss of fines) and traffic wear. Longitudinal cracks (open ¼"– ½"), some spaced less than 10'. First sign of block cracking. Sight to moderate flushing or polishing. Occasional patching in good condition.	Shows signs of aging. Sound structural condition. Could extend life with sealcoat.
5 Fair	Moderate to severe raveling (loss of fine and coarse aggregate). Longitudinal and transverse cracks (open ½") show first signs of slight raveling and secondary cracks. First signs of longitudinal cracks near pavement edge. Block cracking up to 50% of surface. Extensive to severe flushing or polishing. Some patching or edge wedging in good condition.	Surface aging. Sound structural condition. Needs sealcoat or thin non-structural overlay (less than 2").
4 Fair	Severe surface raveling. Multiple longitudinal and transverse cracking with slight raveling. Longitudinal cracking in wheel path. Block cracking (over 50% of surface). Patching in fair condition. Slight rutting or distortions (½" deep or less).	Significant aging and first signs of need for strengthening. Would benefit from a structural overlay (2" or more).
3 Poor	Closely spaced longitudinal and transverse cracks often showing raveling and crack erosion. Severe block cracking. Some alligator cracking (less than 25% of surface). Patches in fair to poor condition. Moderate rutting or distortion (1" or 2" deep). Occasional potholes.	Needs patching and repair prior to major overlay. Milling and removal of deterioration extends the life of overlay.
2 Very Poor	Alligator cracking (over 25% of surface). Severe distortions (over 2" deep) Extensive patching in poor condition. Potholes.	Severe deterioration. Needs reconstruction with extensive base repair. Pulverization of old pavement is effective.
1 Failed	Severe distress with extensive loss of surface integrity.	Failed. Needs total reconstruction.

** Individual pavements will not have all of the types of distress listed for any particular rating. They may have only one or two types.*

PASER Concrete Pavement Rating System

The following table uses PASER ratings (as described in Chapter 4) to categorize concrete pavements and recommend possible fix alternatives.

Table 5-5: PASER Concrete Pavement Rating System

PASER Concrete Pavement Rating system		
10 Excellent	None	New pavement. No maintenance required.
9 Excellent	Traffic wear in the wheel path. Slight map cracking or pop-outs.	Recent concrete overlay or joint rehabilitation. Like new condition. No maintenance required.
8 Very Good	Pop-outs, map cracking, or minor surface defects. Slight surface scaling. Partial loss of joint sealant. Isolated meander cracks, tight or well sealed. Isolated cracks at manholes, tight or well sealed.	More surface wear or slight defects. Little or no maintenance required.
7 Good	More extensive surface scaling. Some open joints. Isolated transverse or longitudinal cracks, tight or well sealed. Some manhole displacement and cracking. First utility patch, in good condition. First noticeable settlement or heave area.	First sign of transverse cracks (all tight); first utility patch. More extensive surface scaling. Seal open joints and other routine maintenance.
6 Good	Moderate scaling in several locations. A few isolated surface spalls. Shallow reinforcement causing cracks. Several corner cracks, tight or well sealed. Open (¼” wide) longitudinal or transverse joints and more frequent transverse cracks (some open ¼”).	First signs of shallow reinforcement or corner cracking. Needs general joint and crack sealing. Scaled areas could be overlaid.
5 Fair	Moderate to severe polishing or scaling over 25% of the surface. High reinforcing steel causing surface spalling. Some joints and cracks have begun spalling. First signs of joint or crack faulting (¼”). Multiple corner cracks with broken pieces. Moderate settlement or frost heave areas. Patching showing distress.	First signs of joint or crack spalling or faulting. Grind to repair surface defects. Some partial depth patching or joint repairs needed.
4 Fair	Severe polishing, scaling, map cracking, or spalling over 50% of the area. Joints and cracks show moderate to severe spalling. Pumping and faulting of joints (½”) with fair ride. Several slabs have multiple transverse or meander cracks with moderate spalling. Spalled area broken into several pieces. Corner cracks with missing pieces or patches. Pavement blowups.	Needs some full depth repairs, grinding, and/or asphalt overlay to correct surface defects.
3 Poor	Most joints and cracks are open, with multiple parallel cracks, severe spalling, or faulting. D-cracking is evident. Severe faulting (1”) giving poor ride. Extensive patching in fair to poor condition. Many transverse and meander cracks, open and severely spalled.	Needs extensive full depth patching plus some full slab replacement.
2 Very Poor	Extensive slab cracking, severely spalled and patched. Joints failed. Patching in very poor condition. Severe and extensive settlements or frost heaves.	Recycle and/or rebuild pavement.
1 Failed	Restricted speed. Extensive potholes. Almost total loss of pavement integrity.	Total reconstruction.

Road CPM Treatment Options & Condition Criteria

Refer to Appendix A-4 and A-5 for guidelines for CPM fixes based on pavement type, Distress Index (DI), Ride Quality Index (RQI), International Roughness Index (IRI) and rutting.

Capital Preventive Maintenance Program (Safety Criteria)

Safety history and road measurements needed for HMA resurfacing projects

Projects that have been selected for CPM funding do not require a crash history analysis, except for HMA resurfacing projects. On those projects, the regions will be required to accurately report superelevation measurements for curves that have a history of crashes. A correlation of crashes to deficient geometry may require a modification of superelevation.

Shoulder and guardrail specifications

The following criteria apply, to <u>all CPM projects:</u>

- A gravel shoulder shall require paved shoulder ribbons that are at least three feet wide.
- The regions are to conduct roadside hardware inspections to determine the amount of guardrail that has severe post and guardrail deterioration. The region will determine whether the guardrail should be upgraded on the capital preventive maintenance project or delayed until a future project. Replacement of deficient guardrail on freeways should be coordinated through the Region Development Engineer and the Lansing Traffic and Safety Division.
- Cable-Type guardrail (not Cable Median Barrier) shall be upgraded to current standards or appropriate slope modifications.
- Blunt and turned down guardrail endings shall be replaced with an appropriate ending from the Road and Bridge Standard Plans.
- Guardrails shall be connected to bridge rails and piers.
- The pavement markings, advance warning signs and crossbucks for all railroad crossings shall be upgraded to meet current standards. However, railroad crossbucks with active signals or gates do not require upgrading by the capital preventive maintenance program. The railroad company is responsible for replacing signals and gates with prioritization independent of the roadway projects.

Current CPM Fix Life Extensions (revised 6-24-2019)

In each year's Integrated Call For Projects (CFP) Letter of Instructions a CPM Fix Life Extension table is provided for use in that year's CFP. Below is an example of this table (FY 2007). Refer to the current version of the CPM Manual and the instructions of the current CFP Letter, for the up to date information.

Fix Type	Life extension (in years)	Life extension (in years)	Life extension (in years)
	Flexible	Composite	Rigid
HMA Crack Treatment***	1-3	1-3	N/A
Overband Crack Filling***	1-2	1-2	N/A
One Course HMA Overlay	5-10	4-9	N/A
Mill and One Course HMA Overlay	5-10	4-9	N/A
Single Course Chip Seal	3-6	N/A	N/A
Double Chip Seal	4-7	3-6	N/A
Single Course Micro-Surface	3-5	**	N/A
Multiple Course Micro-Surface	4-6	**	N/A
Ultra-Thin HMA Overlay	3-6	3-6	N/A
Paver Placed Surface Seal	4-6	**	N/A
Full Depth Concrete Repair	N/A	N/A	3-10
Concrete Joint Resealing****	N/A	N/A	1-3
Concrete Spall Repair	N/A	N/A	1-3
Concrete Crack Sealing****	N/A	N/A	1-3
Diamond Grinding	N/A	N/A	3-5
Dowel Bar Retrofit	N/A	N/A	2-3
Concrete Pavement Restoration	N/A	N/A	5-10

2009 (FY 2007) Call For Projects CPM Fix Life Extensions*

*The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.
** A life extension will be provided, however, data is not available to quantify the life extension.
*** The life extension values for crack treatments on HMA surfaces should not be added to the values in the R&R Fix Life Chart when determining fix lives for entry into RQFS and JobNet. The life extension values for actual crack sealing jobs should still be programmed in JobNet but should not be included in RQFS.
**** The life extension values for concrete joint resealing and concrete crack sealing should **not** be added to the values in the R&R fix life chart when determining fix lives for entry into RQFS and JobNet. If the fix is applied in reaction to a poor performing pavement and the intent of the job is to get the original life expected out of the pavement, the fix should not be included in RQFS and the life extension value in JobNet should be limited to avoid overestimating the life of the pavement. Otherwise, the life extension value should be programmed in JobNet and included in RQFS.

Signs of Bridge Distress

Bridges are inspected at a maximum interval of 2 years and when they are in poor condition or structurally deficient, the inspection frequency is more often. A Bridge Inspection Report (BIR) is comprised of several reports, as discussed in chapter 4.

Bridge Safety Inspection Report

The Bridge Safety Inspection Report (BSIR) includes the National Bridge Inventory's 0 to 9 (NBI) bridge rating scale and major structural condition ratings for the deck, superstructure and substructure, along with over 20 Michigan specific condition ratings. The inspector comments, that accompany each NBI condition ratings, are important information that should be used for identifying bridge distress.

Pontis Bridge Inspection Report

The Pontis Bridge Inspection report provides element level condition ratings for distinct components (or elements) of a bridge. The Pontis element will be a certain type of material, such as concrete, steel or timber. In addition, it will have a quantity associated with it, such as lineal feet of beam. Pontis condition ratings can have quantities of the element in different condition states, thus the Pontis condition rating is more descriptive than the overall NBI condition rating. The Pontis Bridge Inspection Manual demonstrates how to examine various bridge elements and rate them based on the current condition (see Chapter 4 for additional information). Additionally, this manual provides some guidelines for recommended fixes based on the Pontis condition rating system. The Pontis Bridge Inspection Manual may be found on the MDOT website at:
http://www.michigan.gov/mdot/0,1607,7-151-9625_24768_24773---,00.html

Pontis Bridge Inspection Manual

A Commonly Recognized or CoRe element is a component of a bridge made of a singular material, in normal service, can be expected to deteriorate in a very similar fashion and at the same rate. It can also be inventoried (quantitatively) with units that are easily assessed by the field inspector and that have meaningful interpretation at the network level.

A Smart Flag is used to identify local problems that may not be reflected in the CoRe element condition state language, or a specific type of distress that the agency would like to track. A smart flag is treated like an element in order to record the quantity or percentage of the distress feature and to track deterioration rates. Smart flags allow MDOT to track distress conditions in elements that do not follow the same deterioration or do not have the same units of measure as the distress described in the CoRe element.

Referencing the MDOT Pontis Bridge Inspection Manual is recommended for condition state language, for all elements. The following pages illustrate example bridge elements in various conditions and provide guidelines for repair options.

Deck Spalling

Description
Deck Spalling is a condition where there is delamination of the bridge deck and concrete spalls on the top surface of bare concrete bridge decks, or bridge decks having rigid overlays.

Severity Levels (according to the 2007 Pontis Bridge Inspection Manual)

Condition State 1 Deck surface area is in good condition.

Condition State 2 Deck surface area has delaminations, however are not visible. Delaminated areas may not be seen. The delaminated area is measured by sounding the bridge deck. The perimeter of the delaminated area is often marked with spray chalk paint and photographed for future repairs and inspections. Deck delamination will often indicate locations where there is potential of future spalling.

NOTE: In most delaminated concrete slab surfaces, the top 1/8 to ¼ inch is densified and separated from the base slab by a thin layer of water or air

Possible Fix Options:
- No Action Required

Condition State 3 Deck surface area has spalled, and concrete or HMA patches in poor condition.

Possible Fix Options:
- Deck Patching *

* Patch the deck when 90% plus portion of the other areas of the deck are in good condition to maintain ride quality, until a more extensive repair can be done.

Deck Fascia

Description
The deck fascia is the vertical surface of the bridge deck that can be seen from the side of the bridge. It is just below the bridge barrier, but it is not part of the barrier. This smart flag is only triggered when there is noticeable deficiency to the deck's fascia.

Severity Levels (according to the 2007 Pontis Bridge Inspection Manual)

Condition State 1 **Fair Condition** - Minor cracking or spalling of the fascia is observed but there is no effect on the strength of the railing and there is no danger of large spalls dropping off the bridge.

Possible Fix Options:
- No Action Required

Condition State 2 **Poor Condition** - The fascia has significant cracking and/or spalling. The deteriorating fascia has potential for compromising the strength of the railing and/or dropping large spalls off the bridge.

Possible Fix Options:
-Sound Fascia and Remove All Loose Concrete

Condition State 3 **Serious Condition** - Deterioration of the fascia is serious and the strength of the railing system has been reduced and/or there is serious danger of large spalls dropping off the bridge.

Possible Fix Options:
- Sound Fascia and Remove All Loose Concrete
- Rehab Element

Unpainted Pin & Hanger Assembly

Description
The pin and hanger element is rated by the condition of link plates (hangers) and pin assemblies. There are separate elements for painted and unpainted pin and hangers. The quantity is each assembly.

Severity Level (according to the 2007 Pontis Bridge Inspection Manual)

Condition State 1 **Good Condition** - There is little or no corrosion of the unpainted steel. Weathering steel is coated uniformly and remains in excellent condition. Oxide film is tightly adhered.

Possible Fix Options:
- No Action Required

Condition State 2 **Fair Condition** - Surface rust, surface pitting, has formed or is forming on the unpainted steel. Weathering steel has not corroded beyond design limits.

Possible Fix Options:
- No Action Required

Condition State 3 **Poor Condition** - Steel has measurable section loss due to corrosion but does not warrant structural analysis.

Possible Fix Options:
- Clean and Paint

Condition State 4 **Serious Condition** - Corrosion is advanced. Oxide film has a laminar texture with thin sheets of rust. Section loss may be sufficient to warrant structural analysis to ascertain the impact on the ultimate strength and/or serviceability of either the superstructure or the portion over this beam area.

Possible Fix Options:
- Replace all Pin and Hanger Assemblies on Structure

Reinforced Concrete Bridge Railing

Description
Reinforced concrete bridge railing element, include all types and shapes of reinforced concrete bridge railing. All elements of the railing must be concrete. Concrete barriers with decorative metal rails are included here. Example in use: Open concrete parapet with metal rail or solid concrete parapet rail.

Severity Level (according to the 2007 Pontis Bridge Inspection Manual)

Condition State 1 **Good Condition** - The element shows little or no deterioration. There may be discoloration, efflorescence and/or superficial cracking but without effect on strength and/or serviceability.

Possible Fix Options:
- No Action Required

Condition State 2 **Fair Condition** - Minor cracks, surface scaling or spalls may be present but there is no exposed reinforcing or surface evidence of rebar corrosion.

Possible Fix Options:
- Patch Concrete Seal Cracks

Condition State 3 **Poor Condition** - Some delaminations and/or spalls may be present and some reinforcing may be exposed. Corrosion of rebar may be present but loss of section incidental and does not significantly affect the strength and/or serviceability of the element.

Possible Fix Options:
- Clean Rebar and Patch/Repair Concrete

Condition State 4 **Serious Condition** - Advanced deterioration. Corrosion of reinforcement and/or loss of concrete section may be sufficient to warrant analysis to ascertain the impact on the strength and/or serviceability of the element.

Possible Fix Options:
-Replace or Repair Rebar and Patch/Repair Concrete

Bridge Deck Preservation Matrixes User Guidelines

Bridge Deck Preservation Matrixes

The Bridge Deck Preservation Matrixes are tools that were developed to guide bridge scopers in determining the appropriate fix for a bridge deck given specific characteristics and ratings. One matrix is for bridge decks with uncoated "black" rebar and the other is for bridge decks with epoxy coated rebar (ECR). Primarily, the type of fix best suited for a bridge deck is determined by the percent of deficiencies of the top surface and bottom surface of the deck. Simply, if the bottom surface of the deck is in good condition, then the deck may be a candidate for top surface treatments, such as deck patching, epoxy overlays or rigid overlays. However, if the bottom surface of the deck has large percentages of deficiencies, then a deck replacement project may be more suitable. The Bridge Deck Preservation Matrixes are located in Appendix A-6. As this document is periodically updated, it is best to ensure the most current version is being used by looking for the Bridge Deck Preservation Matrixes at the following website:
http://www.michigan.gov/mdot/0,1607,7-151-9625_24768_24773---,00.html

Why you cannot rely solely on the Bridge Deck Preservation Matrixes to determine rehabilitation needs

The condition of the deck is usually the driving force, or the key indicator, leading to a structure being considered for rehabilitation or replacement. However, there are times when other issues affecting the bridge may elicit the need for a rehabilitation project and the Bridge Deck Preservation Matrixes do not address those situations. Examples of such situations are super-structure deterioration, substructure deterioration, and functional issues such as under-clearance and/or bridge width. The Bridge Deck Preservation Matrixes also do not address some functional issues, including roadway stopping sight distance (SDD), approach widths, design/posted speeds, interchange geometrics and etc. So the scoper is cautioned to interpret the information from the matrixes in the context of each specific case and use engineering judgment.

When the Bridge Deck Preservation Matrixes are used in conjunction with the Bridge Safety Inspection Report (BSIR), Pontis CoRe Element Data, inspector recommendations and Detailed Bridge Project Scoping Report, the matrixes can be an accurate guide in the majority of situations and will lead to a repair option that is economical and consistent with the Department's goals.

Bridge Preservation Guidelines

The preservation of bridges is important. To develop a fix strategy, the condition of the structures (and network) must be analyzed. It is important to review expansion joints to insure that the ADA plate covers are installed, a requirement of ADA compliance (the ADA plate covers were not installed for various reasons over the past few years and will need to be addressed). The basic types of projects and the condition to be addressed are as follows:

Type of Project	Condition to be Addressed
Replacement and Rehabilitation	Poor structures
Capital Preventive Maintenance/ Capital Scheduled Maintenance	NBI 5- or 6-rated structures (joint replacements, deck patching, and substructure repair)
Shelf projects	NBI 5- or 6-rated structures (groups of P/H replacements, zone painting, joint replacements, deck patching and substructure repair)
Maintenance	Joint replacement, deck patch, scaling and substructure repair

The preservation of bridges is one of the Department's primary goals, and specific performance measures have been developed to meet these goals. Through the Call For Projects process, more specific objectives are developed and each Region develops a fix strategy and projects are selected in accordance with the statewide objectives and goals. MDOT divides bridge projects into three types of capital projects; replacement projects, rehabilitation projects and preventive maintenance projects. MDOT also uses state and county maintenance crews to do routine bridge maintenance. The following describes each of these project types and shows how the project type fits into MDOT's "Mix of Fixes" strategy.

- Replacement Projects - Addresses poor structures where the most economical long term fix is to replace the bridge or one of the major elements. Replacement projects include deck replacement, superstructure replacement and entire bridge replacement.
- Rehabilitation Projects – Addresses the needs of bridges having poor elements that require extensive work in order to improve their condition to good or fair ratings. Rehabilitation projects include rigid overlays of bridge decks, extensive superstructure repairs and substructure repairs.
- Capital Preventive Maintenance (CPM)/Capital Scheduled Maintenance (CSM) Projects - Addressing good and fair structures in order to slow the deterioration rate and keep them from dropping into the poor category for as long as possible. CSM projects include work types, such as superstructure washing, expansion joint repairs or drainage system cleaning that can be done on good or fair bridges. CPM projects are typically done on fair bridges (NBI 5 or 6 rated Structures) and the work types tend to be more extensive, such as expansion joint replacements, pin and hanger replacements, structural steel painting or deck patching.
- Routine Maintenance Projects – Addresses good or fair rated structures. This work, which preventive maintenance activities such as joint replacements, deck patching, scaling and

substructure repair, is done by either MDOT Maintenance Crews or contracted to County Maintenance Crews. It is an important component of MDOT's bridge preservation strategy.

Bridge Preservation Rules

The importance and examples of using preservation rules in context with other conditions

These rules are listed as stand alone rules. However, when more than one need is identified on a bridge, most often one fix is related to another and the interrelationship between the elements must be considered. For example, when replacing pin and hangers, the expansion joints will be also replaced at the same time.

Average Daily Traffic (ADT) and corridor issues should be considered. For example, even if a bridge expansion joint is leaking 20 percent of the length and the rule states replace when 40 percent is leaking, if work is being done in the corridor, we should take advantage of the traffic control and reduce user impact by replacing the joint along with the corridor work.

Deck

As much as possible these preservation rules coincide with the Bridge Deck Preservation Matrixes and they should be used in conjunction with the Matrix.

You will need to know NBI (National Bridge Inventory) surface condition ratings as well as Pontis ratings.

Concrete Crack Sealing

Concrete crack sealing should be considered when:

- The concrete is in good or fair condition, but has cracks that likely reach the depth of the steel reinforcement. Note – concrete must be more than 28 days old before it can be sealed.
- The cracks are greater than 0.010 inch wide.
- Crack can be seen from a standing position.
- The Pontis smart flag for deck cracking has been triggered and the condition state is 2, 3 or 4.
- The NBI rating for the deck surface is 5, 6 or 7 and 2 to 5 percent of the deck surface has deficiencies.
- Unsealed cracks exist which are narrow and/or are less than an 1/8 inch wide and are spaced more than 8 feet apart.
- When the bridge inspector has provided the size and frequency of the cracks on a good and fair deck surfaces warrant sealing, based on Work Recommendation.

Deck Patching

Deck patching should be considered when:

- Deck surface spalls or delaminations are between 2 and 5 percent of the deck surface has spalls or delaminations. A smaller percentage may need to be patched dependent also depending upon the severity of the defect.
- The NBI rating for Deck Surface is 5, 6 or 7. Comments should indicate between and 2 and to 5 percent of the deck surface has spalls.

- When the Pontis smart flag, for deck spalling (bare concrete surface), shows 2 to 5 percent of the deck in condition state 3 or when the Pontis smart flag for deck spalling (with protective surface) shows 2 to 5 percent of the deck surface rated 4.
- The bridge inspector has provided a Work Recommendation indicates a need for deck patching.

Epoxy Overlays Epoxy overlays or flood coats should be considered when:

- Between 2 and 5 percent of the deck surface has deficiencies or is in fair condition.
- Deck surface is rated good to fair condition with the NBI rating for Deck Surface is rated 5, 6 or 7 with only small areas of delamination or spalls and the deck surface has moderate to extensive cracking. Repair of the delaminated areas and spalls should be done before the overlay is performed.
- The deck surface has moderate to extensive cracking with multiple thin cracks but minimal delaminations or spalls.
- The entire deck should be sealed after deck patching.
- The surface of the existing epoxy overlay is in poor condition and a repeat epoxy overlay is needed.
- Note: for epoxy overlays and overlapping staged construction areas are a challenge in high ADT areas with tight lane widths. Repeat epoxy overlay when surface condition of existing epoxy overlay is in poor condition. The Pontis smart flag for deck spalling (with protective surface) can be used to identify epoxy overlay repair needs (quantity of condition state 2).

HMA Overlay with Waterproofing Membrane HMA overlay with waterproofing membrane should be considered when:

- Deck surface deficiencies are between 15 and 30 percent of the deck surface has deficiencies and between 15 and 30 percent of the deck bottom has deficiencies.
- A HMA overlay may be maintained, with a waterproofing membrane. This can be used as an alternative to epoxy overlays or rigid overlays.
- The NBI Surface rating is 5 (fair) or less.
- When full depth pre-cast deck panels are used.
- If the bridge is poor and will be replaced in the near future and the most cost effective fix is HMA overlay.

HMA Overlay with No Membrane HMA cap with no membrane should be considered when:

- Deck surface deficiencies greater more than 30 percent of the deck surface and the deck underside has greater than 30 percentage deficiencies. This is usually recommended only with a road project in the area, primarily on structures with existing HMA overlay, as surface conditions usually match approach conditions. A possible exception to this would be multiple bridges needing resurfacing.
- NBI Surface rating = NBI of the deck is 3 (serious).
- NBI surface rating of the Deck bottom surface rating = NBI is 3 (serious).
- Bridge is in 5-year plan for major rehabilitation, and ride

quality improvement is an immediate need. This is used as a last resort to hold over a high ADT location until replacement is possible.

Note: All HMA caps should have membranes unless the bridge is programmed for replacement.

Concrete Overlay - Shallow A shallow Concrete overlay – shallow should be considered when:

- Deck Surface has deficiencies of more than 15 percent.
- Deck underside has deficiencies of 5 to 30 percent.
- NBI Surface Rating of the Deck is 5 (fair) or less.
- NBI Surface Rating of the Deck bottom surface is 5 (fair) or 4 (poor).
- When the bridge inspector has provided a Work Recommendation of a rigid 'overlay' is flagged (see comments and deck ratings to determine type of overlay).

Concrete Overlay - A Deep Concrete Overlay – deep should be considered when:

- Deck surface has more than 15 percent of the deck surface with deficiencies.
- Deck underside has up to 10 percent of the deck underside with deficiencies.
- Surface rating is less than or equal to NBI 5.
- Deck bottom surface rating is NBI 5 (fair) or NBI 6 (fair).
- When the bridge inspector has provided a work recommendations for rigid 'overlay' (see comments and deck ratings to determine what type of overlay).

Note: Some decks with poor bottom surfaces can be deep overlaid if joint or railing replacement removes the majority of the deficiencies.

Barrier Patching Barrier patching should be considered when less than 10 percent of the barrier is spalled.

- The barrier is spalled less than 30%.
- When the Pontis condition rating is 2 or 3.

Barrier Replacement Barrier replacement should be considered when:

- Deck rating is rated in good or fair condition, and the barrier is in poor condition, with more than 30 percent of its surface having spalls or other deficiencies.
- Sidewalk or brush block width is more than 2½ feet wide and an overlay is planned (a retrofit per, Standard B-23, can be done for a sidewalk or brush block less than 2½ feet wide).
- When the Pontis condition rating is rated 4.
- Safety upgrade is needed.

Deck Replacement Deck replacement should be considered when:

- Deck bottom surface has more than 25 percent of the deck bottom surface with deficiencies.
- Deck surface NBI rating of the deck surface and deck bottom is 4 (poor) or less.
- All the deck rehabilitation needs will cost so much that deck replacement cost is competitive in comparison.
- Slag Aggregate is identified in the existing deck and the bridge meets the criteria for deep concrete overlay.

Deck Joints

Always replace joints when doing deep or shallow overlay.

Strip Seal Joint Repair

Repair of Seal Joints should be considered when:

- Leaking Joints.
- NBI rating of the Expansion Joint is 5 (fair).
- Pontis rating of the Strip Seal Expansion Joint is rated 2.
- Work Recommendation for 'joint repair' is flagged.

Strip Seal Joint Replacement

Replacement of strip seal joints should be considered when the joint is leaking and:

- The Rail is damaged so that the joint can not be sealed.
- More than 40 percent of adjacent concrete is damaged.
- NBI rating of the Expansion joint is rated 4 (poor) or less.
- Pontis rating of the Strip Seal Expansion Joint (Pontis Element 400) is rated 3.
- Pin & Hangers are being replaced and can not cannot be supported from below (this applies to any expansion joint with pin & hanger).

Pourable Joint Seal Repair

Repair of ~~P~~ourable ~~J~~oint ~~S~~eals should be considered when:

- Leaking joints.
- NBI rating of the ~~E~~xpansion ~~J~~oint is rated 5 (fair).
- Pontis rating of the ~~P~~ourable ~~J~~oint ~~S~~eal (Pontis element 401) is rated 2.
- Work Recommendation for 'Joint Repair is flagged.

Note: Pourable joint seals should be set up for routine reseals, perhaps on a biannual basis.

Pourable Joint Seal Replacement

Replacement of Pourable Joint Seals should be considered when the joint is leaking and:

- More than 30 percent of the adjacent concrete is damaged.
- NBI rating of the expansion joint is rated 4 (poor) or less.
- Pontis rating of the Pourable Joint Seal (Pontis Element – Pourable Joint Seal 401) is rated 3.
- Work Recommendations – Joint Repair comments.
- Pin & Hangers are being replaced and cannot be supported from below (this applies to any expansion joint with Pin & Hanger).

Compression Joint Seal Repair

Repair of Compression Joint Seal should **not** be considered.

- Do not repair. If leaking replace.

Compression Joint Seal Replacement

Replacement of Compression Joint Seals should be considered when:

- Joint is leaking.
- NBI rating of the Compression Expansion Joint rating is 4 or less.
- Pontis rating of the Compression Joint Seal is (Element Compression Joint Seal 402) is rated 2 or 3.
- Work Recommendation for 'joint replacement' is flagged.
- Pin & Hangers are being replaced and cannot be supported from below (this applies to any expansion joint with pin & hanger).

Assembly Joint Seal (Modular) Repair

Repair of the Assembly Joint Seals (Modular) repair should **not** be considered.

- Do not repair if leaking. Should replace joint.

Assembly Joint Seal (Modular) Replacement

Replacement of Assembly Joint Seals (Modular) should be considered when:

- Joint is leaking.
- NBI rating of the expansion joint seal is 4 or less.
- Pontis rating of the expansion joint is 3.
- Work Recommendation for 'joint replacement' is flagged.
- Pin & Hangers are being replaced and cannot be supported from below (this applies to any expansion joint with pin & hanger).

Steel Armor Expansion Joints (open) Repair

Repair of Steel Armor Expansion Joints should **not** be considered, if they are leaking. Some of these joints were sealed when installed, but the seal does not last.

- Do not repair. If leaking the joint should be replace.

Steel Armor Expansion Joints (open) Replacement

Replacement of Steel Armor Expansion Joints should be considered when:

- Joint is leaking.
- NBI rating of the Expansion Joint is 4 or less.
- Pontis rating of the expansion joint is rated 3.
- Work Recommendation for 'joint replacement' is flagged.
- Pin & Hangers are being replaced and cannot be supported from below (this applies to any expansion joint with pin & hanger).

Polymer Block Out Expansion Joint Repair

Repair of Polymer Block Out Expansion Joints should be considered when:

- Joint is leaking.
- NBI rating of the Expansion Joint is 5.
- Pontis rating of the Expansion Joint is 3.
- Work Recommendation for 'joint repair' is flagged.

Polymer Block Out Expansion Joint Replacement

Replacement of Polymer Block Out Expansion Joints replacement should be considered when:

- 30 percent of the concrete or polymer is damaged.
- NBI rating of the Expansion Joint is 4 or less.
- Pontis rating of the Block Out Expansion Joint is 3.
- in a Work Recommendation for 'joint replacement' is flagged.
- Pin & Hangers are being replaced and cannot be supported from below (this applies to any expansion joint with pin & hanger).

Block Out Expansion Joint Replacement

Repair of Block Out Expansion Joints should **not** be considered.

- Do not repair. Joint should be replaced.

Block Out Expansion Joint Repair

Replacement of Block Out Expansion Joints should be considered when:

- Leaking joints.
- NBI rating of the expansion Joint is 4 or less.
- Pontis rating is rated 3.
- Work Recommendation for 'joint replacement' is flagged.
- Pin & Hangers are being replaced and cannot be supported from below (this applies to any expansion joint with pin & hanger).

Superstructure

Superstructure Washing

Superstructure Washing should be considered when:

- Salt contaminated dirt and debris has collected on the superstructure and is causing corrosion or deterioration by trapping moisture.
- Expansion or construction joints are to be replaced, and the steel is not to be painted.
- Prior to a detailed inspection.
- When the bridge inspector has provided a work recommendation for superstructure washing.
- Note: A superstructure washing can only be performed by in-house crews, not under contract.

Concrete Surface Washing

Concrete surface coating should be considered when:

- Surface of the concrete is exposed to salt contamination and it needs to maintain the appearance.
- The concrete has been patched and it needs to maintain the appearance.
- Widespread map cracking, possibly superficial, or there are vertical cracks and sealing may retard corrosion of reinforcement (barriers).
- Multiple thin cracks are forming.

Pin and Hanger Replacement

Pin & Hanger replacement should be considered when:

- The Pin & Hangers have excessive section loss, when there is pack rust between the hanger and the beam web and/or when there are signs of out-of-plane distortions.
- Pontis elements Pin & Hanger Assembly (Steel Unpainted) or Pin and Hanger Assembly (Steel Painted) are in rated 3 or 4.
- Pontis rating of a frozen or deformed pin & hanger assembly is rated 1, 2 or 3.
- The existing pins are not stainless steel and the assemblies do not have non-metallic washers.
- Consider when full or zone painting is being done.

Spot Painting Spot painting should be considered when:

- The existing paint is zinc based. Do **not** spot paint on lead based paint systems. If SIA Item 78 – Paint Type is 1, then it is lead based. Bridges painted before 1978 typically have lead based paint systems (unless they have already been repainted). SIA Item 202 – Year Painted can also be used to determine if structure has lead based paint.
- Less than 5 percent of paint area has failed paint, in isolated areas.
- Between 2 to 5 percent of a steel beam has a Pontis rating of condition state 3 or 4, while the remainder of beam is rated 1.
- When the bridge inspector has provided a work recommendation for spot or zone painting.

Zone Painting Zone painting should be considered when:

- Less than 15 percent of the existing paint area has failed, the remainder of paint system is in good or fair condition and the area of failed paint is grouped together (such as at beam ends).
- Pin & Hangers are being replaced.
- Beam end repairs are being made.
- NBI rating for paint condition is 5 (fair) or 4 (Poor) and having 3 to 15 percent paint failure.
- 3 to 15 percent of the steel painted elements have a Pontis rating of 3 (poor) or 4 (serious).
- Expansion or construction joints are to be replaced and full painting is not in the scope.
- When between 3 and 10 percent of unpainted A-588 steel beams area shows failure of the protective patina (flaking and weathering steel surface is dark brown or black) or steel is showing measurable section loss.

Complete Painting Complete painting should be considered when:

- Painted steel beams have greater than 15 percent of the existing paint area failing.
- Active corrosion evident on more than 20 percent of the steel beam area on the A-588 beams.
- BSIR Paint rating is 3 (serious) or worse.
- Pontis Steel Painted Elements have 15 percent or greater rated 3 or 4.
- When the bridge inspector has provided a work recommendation for complete painting.

Superstructure Repairs Superstructure repairs should be considered when:

- Steel beam ends should be repaired when there is more than 25 percent section loss in areas of the beam that affect load carry capacity.
- Prestressed Concrete, I-Beam Ends should be repaired when there is more than 5 percent spalling. (there is not a current repair option for repairing the beam ends on a side-by-side prestressed box beam).
- NBI condition rating for section loss is rated 1 (Note: the NBI section loss rating provided on the BSIR is on a 0 to 3 rating scale).
- When hit by high loads. When Pontis, Traffic Impact section is

rated 3 (impact damage has occurred and the strength of the member is impaired).

Superstructure Replacement Superstructure replacement should be considered when:

- When more than 30 percent of the superstructure is in poor or serious condition.
- When the cost to rehabilitate the superstructure and deck exceeds the cost of replacement (either construction cost or life cycle cost).

Note: consider long-term maintenance when concrete beams are an option to replace steel having existing section loss.

Substructure

Concrete Sealing Concrete sealing should be considered when:

- Top surface of the pier or abutments are below deck joints and when dirt contaminated with salt can collect on the surface.
- Surface of the concrete is exposed to heavy salt exposure. Horizontal surfaces of substructure elements are directly below expansion joints (i.e. independent backwalls, piers supporting simply supported spans and etc.).
- Consider if corridor work is being done and if the substructure condition is fair.

Concrete Surface Coating Concrete surface coating should be considered when:

- Surface of the concrete is exposed to salt contamination and it needs to maintain appearance.
- The concrete has been patched and it needs to maintain appearance.
- Piers and abutments are in good or fair condition.
- Consider if corridor work is being done and if the substructure condition is fair.
- Thin cracks with high density are forming.

Substructure Concrete Patching and Repair Substructure concrete patching and repair should be considered when:

- Less than 30 percent of the concrete substructure is spalled and delaminated.
- NBI rating for abutments or piers is 5 (fair) or 4 (poor) and comments indicate less than 30 percent of their surface has deficiencies.
- Pontis rating of the Column or Pile Extension, Pier Wall and/or Abutment Wall is rated 3 (poor) or condition state 4 (serious) and between 2 to 30 percent of their surface has deficiencies.
- Work recommendation for ‘substructure patching’ is flagged.

Scour Countermeasures Scour countermeasures should be considered when (consult with the Hydraulic Section):

- Local scour holes are found.
- Structure is categorized as scour critical and there are no long term plans to replace the bridge.
- Pontis rating for Scour is rated 2. Scour exists at the structure site and if left unchecked could adversely impact the structural integrity of the bridge.

- NBI comments in the abutment and pier ratings indicate scour holes are present.
- Pontis rating for scour is 3 (scour is significant enough to warrant analysis of the structure).

Substructure Replacement or Partial Substructure Replacement

Substructure replacement or partial substructure replacement (such as pier cap) should be considered when:

- More than 30 percent of the area has spalling or other deficiencies. This rule must be considered carefully, because for some substructure types, very little surface area of the element is exposed.
- There are open vertical cracks and signs of differential settlement, especially if the settlement or substructure appears to be actively moving (scour may drive pier replacement when deck or superstructure replacement is needed).
- NBI rating for abutments or piers is 4 (poor), 3 (serious) or 2 (critical) and more than 30 percent of the area has deficiencies.
- more than 30 percent of the substructure has a Pontis rating of 3 (poor) or 4 (serious).

Miscellaneous (revised 6-24-2019)

Vegetative Control

Vegetation control should be considered when:

- Brush, tree limbs or other vegetation grow against the structure keeping it moist for long periods of time. When grass and vegetation is growing from joints and cracks, such as within slope paving.
- Inspection recommendation and comments indicate "Brush Cut."

These items should have a duration attached to them. Depending on the location of the structure, these items should be done every year in some locations and every two years in others.

MDOT maintenance crews perform these activities and can not be done under contract.

Drainage System Cleaning

Drainage system cleaning / repair should be considered when:

- The drainage structures are full of debris. This may be evident by ponding on the bridge deck.
- The drainage structure or concrete adjacent to the drainage structure is damaged.
- Drainage structure comments on the BSIR may have comments that indicate the drainage system needs cleaning or repair.

Approach Pavement Relief Joints

Approach pavement relief joints should be included in all projects that contain a significant amount of concrete roadway (in excess of 1,000 ft) adjacent to a structure. The purpose is to alleviate the effects of pavement growth that may cause distress to the structure. Signs of distress from pavement growth include:

- Abutment spalling under bearings
- Beam end contact

- Closed expansion joints and/or pin and hangers
- Damaged railing and deck fascia at joints
- Severely tilted rockers
- Cracking in deck at reference line (45 degree angle)

Slope Paving Repair Slope paving repair should be considered when:

- The slope paving has areas of distress or failure or when there is settlement beneath the slope paving.
- NBI rating for Slope Protection is 5 (fair) or below. Comments must be reviewed to determine where repairs are needed.

Note: This work is most often done with other work unless done by our forces or the problem is serious.

Structure Replacement Structure replacement should be considered when:

- When the cost to rehabilitate the structure exceeds the cost of replacement (either construction cost or life cycle cost).
- Removal of spans is an option.
- Existing superstructure and substructure are in serious condition with an NBI rating of 3 or less and substructure repairs are not feasible.
- When a substructure is scour critical and all scour retrofit options have been exhausted.
- Replacing the superstructure increases the load on substructure beyond capacity.
- Deck replacement or superstructure replacement requires changes to address functional issues (i.e. vertical clearance, width and etc.).

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Chapter 6

Items to Consider When Scoping a Project

Scoping to Appropriate Design Standards (3R, 4R & CPM), Polices and the Flexibility of Design Guidelines (revised 6-24-2019)

While scoping a project, it is very important to understand the bigger picture. How does this project impact future projects? Will there be crash types or patterns to consider? Are there opportunities to provide appropriate access to all legal users and consideration of connectivity for multiple modes? Does the community or communities affected by the project have a Complete Streets policy? What Stakeholder Engagement plan is needed? Is there an opportunity to partner with local agencies to address mutual transportation needs? Will it impact the community other than just the construction? Will there be environmental impacts? Keeping this in mind, there are items that may not be analyzed based on the scope, work type or strategy being used. Based on the issues mentioned above, there may be work that should be avoided or not constructed and a design exception/variance may be appropriate. An important factor in the scoping of a project is a focus on purpose and need with complete documentation of decisions that relate to the project scope.

Each project will have its own set of design standards, policies and guidelines depending on the type of work (4R, 3R, CPM, etc.).

New construction/reconstruction (4R) projects are mainly comprised of projects that involve:

- Complete removal and replacement of pavement (including the subbase)
- Major alignment improvements
- Adding lanes for through traffic
- New roadways and/or bridges
- Complete bridge deck or superstructure replacement, and complete bridge replacement
- Intermittent grade modifications (used to correct deficiencies in the vertical alignment, by changing the paving profile for short distances while leaving the existing pavement in service for less than 50% of the total project length)
- Providing accommodations for all legal users to meet existing or future needs anticipated during the design life of the project (i.e. bridges)

Resurfacing, Restoration and Rehabilitation (3R) projects are defined as construction that extends the service life of an existing roadway or bridge and enhances highway safety. The intent of this work is to return an existing roadway or bridge, including shoulders, the roadside and appurtenances to a condition of structural and functional adequacy. This work may include upgrading geometric features such as roadway/bridge widening (no capacity increase or increase in number of through lanes), flattening curves or improving sight distance. Examples of this work include:

Road

- Resurfacing, milling or profiling, concrete overlays and inlays (with or without removing subbase)
- Lane and/or shoulder widening (no capacity increase or increase in number of through lanes)
- Roadway base correction
- Minor alignment improvements
- Roadside safety improvements
- Signing, pavement marking and traffic signals
- Intersection and railroad crossing upgrades
- Pavement joint repairs
- Crush and shape and resurfacing
- Rubblize and resurface
- Intermittent grade modifications (used to correct deficiencies in the vertical alignment by changing the paving profile for short distances) while leaving the existing pavement in service for more than 50% of the total project length
- Passing relief lane
- Lane conversion for multi-modal accommodation.

Bridge

- Shallow and deep concrete overlays
- Superstructure repairs
- Railing replacements
- Extensive substructure repair
- Substructure replacement

Capital Preventive Maintenance (CPM) involves work that will repair and preserve the roadway or bridge. Examples of CPM work include:

Road

- Crack sealing
- Surface seals
- Thin asphalt overlays
- Concrete patching
- Diamond grinding
- Joint repair and replacement
- Pavement profiling to improve ride quality

Bridge

- Joint replacement
- Pin and hanger replacement
- Complete painting
- Zone painting
- Thin epoxy overlays
- Deck patching
- Hot Mix Asphalt (HMA) overlays
- Scour countermeasures

Gathering Information (revised 6-24-2019)

Where to find MDOT standards, guides, and policies

Standards, guides and policies for each of these different types of work can be found in the MDOT Road Design Manual (Chapter 3), MDOT Bridge Design Manual (Chapter 12), MDOT Road CPM Program Guidelines and MDOT Bridge CSM Manual. Prior to starting the estimating process, a complete review of the appropriate section should be performed. In Chapter 3, the guidelines for 3R Freeway, 3R Non-Freeway NHS and 3R Non-Freeway Non- NHS are shown. Additional information can be obtained from AASHTO documents such as "A Policy on Geometric Design of Highways and Streets" and/or "A Policy on Design Standards Interstate System". During the scoping process it is important to be familiar with the standards for each type of work and scope the project according to the detailed bridge inspection/scope, proposed corridor work, applicable standards, guidelines and polices.

The design speed used for 3R freeway projects (interstate and non-interstate) may be the design speed approved at time of original construction or reconstruction, whichever is most recent. Likewise, for 3R freeway projects, the design values for horizontal and vertical alignment, and widths of median, traveled way and shoulders may be the values approved at the time of the latest previous construction. Otherwise, standards for new construction apply for all freeway projects regardless of work type. See RDM 3.06 & 3.11 for additional information.

3R/4R freeway projects should be reviewed to determine the need for safety improvements such as: alignment modifications, superelevation modifications, sight distance improvements, ramp lengthening, shoulder widening, slope flattening, increasing underclearances, guardrail upgrading and bridge railings, shielding of obstacles and the removal or relocation of obstacles to provide a traversable roadside. See the RDM 3.11.01 for additional information.

Design speeds used for non-freeway 3R projects are shown in Section 3.09.02 of the RDM. However, if the original posted speed has been raised, the designer may use the design speed approved at the time of original construction or reconstruction, whichever is most recent. See RDM 3.06.

How to determine project classification

If a project includes, both 3R and 4R work types, the project is assigned a single classification. The single classification is derived from the work type that is greater than 50% of the total cost of the project and is considered the "controlling" classification. The single classification of combined work does not dictate the standards that apply to the project. The Applicable standards are governed by the guidelines that correspond individually to each work type (3R or 4R). The logical limits of each work type will be identified on the project information sheet to distinguish which standards apply. Work type overlap between separation limits may cause a default to 4R standards within the overlap.

How to apply standards for non-3R/4R project packed with 3R/4R projects

Projects categorized by work types such as CPM, CSM, Signal Corridor and Signing Corridor projects are governed by guidelines that differ from 3R and 4R guidelines. For information related to specific requirements for these categories of work, use the appropriate reference guides and manuals. When other work types are packaged with a 3R or 4R project, the portion of the project (separate job number combined into one proposed project) that is outside the 3R or 4R work limits is governed by the guidelines that pertain to the other work type. When describing the work type, identify the logical limits, so that the appropriate requirements are considered within those limits. Work type overlap within these separation limits may cause a default to 3R or 4R requirements. Reference RDM 3.08.01D for additional information.

When CPM minimum design requirements are applied

The use of CPM minimum design requirements is contingent on the roadway condition and program eligibility. Regardless of the funding source, CPM minimum design requirements are applied to work done on roadways that would otherwise be eligible for funding under the CPM program. Reference RDM 3.08.01D for additional information.

Importance of Project Estimates (revised 6-24-2019)

An estimate developed as part of the project scoping process is used to program the funding of the design and construction of a project. If an estimate does not take into account all items on the scoping checklist and cost participation with other agencies, cost associated with an estimate will not be accurate. When the scoping estimate is not accurate, a lack of funding may arise during the design phase of the project. A lack of funding may cause project delay, the necessity to request funds from other sources, the modification of the project scope, the need to shorten the project or potential conflicts with the region or statewide strategies and goals.

Importance of Documenting Decisions

Record project decisions and why they were made

As noted previously, and can not be stressed enough, a complete record should be kept of all items discussed, investigated and/or decided upon during the scoping process. This provides a project history that will go forward to the designers. By keeping a complete log of decisions made, the designers can be assured that all items were discussed during the scoping phase. Also, if an item comes up during design, there is a reference as to why the item was or was not included in the scope. This reference will assist in eliminating budget issues, save employee time and reduces the re-working of a problem. See Chapter 7 for additional information on documentation during the scoping process.

Items to be Considered When Scoping All Projects

Complete Streets (added 6-24-2019)

Complete Streets are roadways planned, designed and constructed to provide appropriate access to all legal users in a manner that promotes safe and efficient movement of people and goods whether by car, truck, transit, assistive device, foot or bicycle.

In compliance with the State Transportation Commission Policy on Complete Streets, dated July 26, 2012 all projects regardless of scope, or length should be considered for the accommodation of bicyclists, pedestrians and all legal users of the roadway.

Complete streets are achieved by using the principles of Context Sensitive Solutions described later in this chapter. Opportunities should be considered during planning and scoping to allow for funding consideration and meaningful stakeholder input.

Template Criteria (revised 6-24-2019)

The importance of using the correct funding template

As discussed in Chapter 2, MDOT funding is divided into several categories or "Templates", each having its own criteria for qualifying projects. The type of project and the funding template criteria must be considered when scoping a project because the proposed work may be limited by the template guidelines and policies as described in the annual CFP instructions. Typically, projects will not be able to make every desired fix on a given roadway but may be more directed to specific improvements for different strategies and goals. For instance, a CPM project will not fund the complete reconstruction of a roadway, because the strategy of CPM is to provide a life extension of a pavement or bridge in good or fair condition.

3R/4R Road Projects

Criteria for 3R/4R

Chapter 3, MDOT Road Design Manual

Road - Rehabilitation and Reconstruction template projects are classified as either 3R or 4R. Resurfacing, Restoration, and Rehabilitation projects are considered 3R. New Construction or Reconstruction projects are considered 4R. Criteria for work requirements regarding 3R and 4R fixes may be found in Chapter 3 of MDOT Road Design Manual.

Road CPM Projects

Criteria and treatment options for CPM projects

CPM Program Guidelines

Criteria for Road - CPM projects are outlined in the CPM Program Guidelines. Treatment options from the CPM Manual are included in Chapter 3 and in the Appendix. Typically, CPM fixes are limited to thin surface treatments such as HMA overlays or resurfacing (limited to an application rate of no more than 165lbs/syd), chip seals, micro-surfacing, diamond grinding, joint repairs, sealing, etc. Minor safety and drainage repairs may be included in CPM projects, however they are determined on a case by case basis.

Traffic and Safety Projects (revised 6-24-2019)

How TOR (time of return) affects funding

Traffic and Safety (Safety Project) funding is typically determined by using a Time of Return Analysis (TOR). Projects with a TOR of 10 years or less are eligible for Safety funding. Projects with a TOR of more than 10 years may still be eligible for safety funds up to the TOR of 10 years, but will require supplemental funding from other sources such as R&R, CPM for the remaining costs.

Freeway Lighting Replacement, Noise Abatement, Carpool Parking Lot, Pump Station, and Intelligent Transportation Systems (ITS)

Freeway Lighting Replacement, Noise Abatement, Carpool Parking Lot, Pump Station and Intelligent Transportation Systems (ITS) funding is typically limited to repairs or construction of only those respective physical assets or miscellaneous items that are directly affected by the repairs or construction of those features.

Bridge Projects

Bridge - The primary bridge templates include Bridge-R&R (Replacement and Rehabilitation) and Bridge-CPM and CSM (Capital Preventive Maintenance and Capital Scheduled Maintenance). Other, more specific bridge templates include Bridge - Big Bridge, Bridge - Blue Water Bridge and Bridge - Special Needs.

Work Zone Safety and Mobility (revised 6-24-2019)

Information on how to reduce traffic congestion during construction

In 2007 MDOT adopted a policy regarding user mobility. The focus of this policy is to reduce, to the greatest extent possible, the delay to the motoring public during construction projects. Heavy traffic congestion impacts both the environment and the economy. The Policy states that all projects will be reviewed for their impact to mobility and will be analyzed to reduce, eliminate or mitigate user delay as a result of construction projects. The MDOT Work Zone Safety and Mobility Manual is available and should be used as a reference. See MDOT Work Zone Safety and Mobility Manual Section 2.2

MDOT online PDF

http://www.michigan.gov/documents/mdot/MDOT_WorkZoneSafetyAndMobilityManual_233891_7.pdf

Performing a capacity analysis

Performing a baseline crash analysis

At the time a road segment is being considered for possible improvements, safety and mobility impacts of all users, including bicyclist and pedestrians of all abilities, for the proposed project and corridor are to be analyzed. A capacity analysis shall be done for the existing condition once the preliminary project limits are determined. At a minimum, the existing capacity for peak and non-peak hours shall be determined for the selected project location. This analysis shall include determination of the existing volume to capacity ratio, the existing travel times and the current operating level of service (LOS). In addition, a base line crash analysis is to be performed. Capacity, travel time and LOS will be estimated for the proposed project work-zone during construction and compared with the existing condition data.

Assessing construction alternatives

Creating/reviewing a TTCP (Temporary Traffic Control Plan)

The proposed project work type(s) should be analyzed, assessing the various construction alternatives available for each work type, as part of the scoping process. Each work type and construction alternative requires a review of the appropriate Temporary Traffic Control Plan (TTCP), taking into consideration existing operational factors within the project limits. A capacity analysis and estimate of traffic diversions for the approved project work type and construction alternative must be completed. The results of the analysis are to be compared with the existing conditions for use in the development of the TTCP. The Temporary Traffic Control Plan is also important for the environmental clearance process. For example, potential detours, especially any possible upgrades of detour routes, must be examined as part of the overall project. Early identification of the TTCP is essential for timely environmental classification. Baseline maintenance of traffic costs will be estimated, and mobility issues identified during the scoping process. The detailed scope will also include maintenance of traffic costs.

Determining whether a TMP (Transportation Management Plan) is needed

During the scoping phase, if the approved project capacity analysis yields a volume to capacity ratio greater than 0.80, an increase in travel time greater than 10 minutes, or the LOS drops below the threshold outlined in the Work Zone Safety and Mobility Policy, the project is deemed "significant" and a Transportation Management Plan (TMP) must be developed.

Developing a TMP

The TMP for a significant project must include the concept for the TTCP, the Transportation Operations Plan (TOP) and the Public Information Plan (PIP) in enough detail so a reasonable cost estimate can be developed and included in the cost of the project scope. If there are additional state or local projects being developed along the corridor or within the network influence area around the proposed project, the TMP should consider these impacts. However, local schedules may not be known at the time of scoping. The influence area generally will include an area where traffic volumes on other roadways change by 10 percent or more as a result of the proposed MDOT work.

Assessing mitigation needed to reduce traffic delay

Mitigation techniques Chapter 5, MDOT Work Zone Safety & Mobility Manual

In an effort to reduce delay on significant projects, all reasonable mitigation measures should be assessed in an effort to keep the delay below the threshold limits. Potential mitigation techniques are identified in Chapter 5 of the MDOT Work Zone Safety and Mobility Manual.

SMPT

If these mitigation measures result in the TMP costs exceeding 25% of the project costs, the project shall be submitted to the Safety and Mobility Peer Team (SMPT) for review.

CO3

Region/TSC is responsible for ensuring that the proposed project scope addresses work zone safety and mobility. TSC staff is responsible for developing the complete project level TMP, TTCP, TOP and PIP for significant projects, during the design phase. The final scoping document shall include, at a minimum, the existing capacity analysis, the information used to develop a proposed TMP, the proposed capacity analysis using the preliminary TTCP and the cost estimates for the proposed TTCP components. This is done by Region and TSC staff using the Construction, Congestion and Cost software (CO3) or comparable project level models as noted in Chapter 11of the MDOT Work Zone Safety and Mobility Manual.

Coordination with the BTP/PPS

During the design phase the Metropolitan Planning Organization (MPO) or Bureau of Transportation Planning (BTP) statewide travel demand models can be used for corridor and network level impact assessment, to identify potential alternate routes and assess detour options. The BTP/PPS is to be contacted to coordinate network and corridor modeling for major projects and traffic data for all significant projects. For projects not requiring BTP/PPS modeling, Region and TSC staff should refer to procedures in Chapter 3 of the MDOT Work Zone safety and Mobility Manual.

Guidelines for cost review

If after all mitigation measures have been evaluated, the project still exceeds the threshold limits or the TMP costs exceed 25% of the projects costs, the Region Engineer and Region System Manager should be notified. The region is then responsible for contacting the SMPT for a project review, and later approval by the Chief Operations Officer.

Alternatives for MOT during construction

Alternatives for maintaining traffic and non-motorized user movements (where allowed) during construction should be developed during the scoping process, such as part width construction, detour routes, flag control, use of crossovers to shift traffic, temporary pavement widening, etc. An estimate for the maintaining traffic cost must be included in the scoping budget for the project.

Mitigation options

The mobility analysis may indicate that mitigation is required to improve the work schedule for the project. Some possible mitigation options include Incentive/Disincentive for early completion or open to traffic dates, lane and/or ramp rental, incentives or A+B bidding (for additional information, see the Work Zone Safety and Mobility Manual). Additional incentives are listed in Chapter 5 of the MDOT Work Zone Safety and Mobility Manual. If it is determined that a mitigation measure would be appropriate for the project, the cost for that mitigation measure must be included in the project budget at the scoping phase.

Creating a PIP

Public input needed

Communication with the public, in a planned manner, is important to getting and maintaining buy-in from the public for roadway and bridge projects. The degree to which public information campaigns are needed will depend on the project location and the potential impact to the traveling public. The Public Information Plan (PIP) of the Transportation Management Plan (TMP) is intended to create an organized and systematic process to communicate work zone information to the traveling public and respective stakeholders. The PIP will include public/stakeholder information, communications strategies and methods of delivery. The most effective means and methods for delivery of project information to the affected groups should be discussed in the PIP.

Internal Traffic Control Plan

Contractor plan needed

To help ensure the safety of the contractors working on a project, an Internal Traffic Control Plan must be developed by the contractor prior to beginning work on the project. Although this may seem like it will have little bearing on the scoping of a project, the potential cost for separating the workers and work zone from the traveling public must be considered when scoping and estimating a project.

Design Survey (revised 6-24-2019)

Coordinate Project Needs with Land Surveyor

During the scoping of a project, it is very important to consider the amount and type of survey that may be required in a project. Not only are these important items of information needed for a successful design, it is very important to have the correct cost and possible schedule impacts accounted for, during the design of a project. Some of the questions that need to be answered are:

- Do you need a partial survey?
- Do you need a full survey?
- Do you need aerial photography?
- Do you need to purchase ROW, obtain easements or obtain grading permits?
- Do you have or need a Survey Alignment?
- Do you have or need a Legal Alignment?
- Do you have or need a Construction Alignment?
- Do you need cross-section data (to obtain roadway slope or existing super-elevation information)?
- Do you need proposed drainage work?
- Do you need any hydraulic analysis for this project?
- Do you need bridge underclearance information?
- Are you going to reconstruct the roadway (or segments)?
- Do you need utility information?
- Do you need existing storm sewer or stormwater information?
- Are you proposing ditches?
- Are you proposing storm sewer?
- Are you widening the roadway (or segments - i.e. turn lanes)?
- Are you milling and resurfacing only?
- Will curb ramps be upgraded to accommodate for ADA?
- What are the existing or future needs of multimodal transportation in the project area?

The above are some of the questions that will help you understand the type and level of survey that may be needed for a project. This information should be discussed with the Region Surveyor and an estimate of hours, with cost, can then be generated for the scope. For additional information, reference Chapter 14 (14.12) of the Road Design Manual.

Design Exceptions and Variances (revised 6-24-2019)

Roadway geometrics should meet AASHTO/MDOT design criteria. It is recommended that a strategy of removing the geometric deficiency is developed, if this is not possible, proceeding to the design exception or variance process may be necessary. All possible alternatives should be reviewed to minimize the design deficiency. When designing a project, it may not be feasible to design the project to meet all current design standards. During the scoping process of 3R or 4R projects, areas of a roadway that may not be able to meet current standards for 10 controlling criteria, should be identified as needing a design exception. Other specific elements and conditions may require a less formal design variance process when standards cannot be met. The table below defines the elements and conditions under which design exceptions and design variances are required.

Non-Standard Design Element (NHS and Non-NHS)	Applicability of Design Exception (DE) Design Variance (DV) — Design Speed: ≥ 50 MPH	< 50 MPH
Design Speed < Posted Speed	DE	DE
Lane Width*	DE	DV
Shoulder Width	DE	DV
Horizontal Curve Radius*	DE	DV
Superelevation Rate*	DE	DV
Superelevation Transition*	DV	DV
Maximum Grade*	DE	DV
Stopping Sight Distance (Horizontal and Vertical) *	DE	DV
Cross Slope	DE	DV
Vertical Clearance	DE	DE
Design Loading Structural Capacity	DE	DE
Ramp Acceleration/Deceleration Length*	DV	DV

**Values based on design speeds less than posted. See previous section on Gathering Information and RDM Sections 3.08, 3.09, 3.11.01 for minimum 3R design speeds and 3R standards.*

A draft list of possible DE's and DVs is included in the scoping package for the designer. It is understood that not all design exceptions will be discovered due to the limited amount of information that may be available regarding an existing roadway or structure at the time of scoping

Documenting Design Exceptions and Variances

Scoping Report & Details Worksheet

DE Request Form DE 26

DV Request Form DV26

During the scoping of a project, the DEs and DVs shall be identified and noted on the Scoping Report & Details Worksheet. If there is sufficient information to complete the DE Request Form (DE26) or the DV Request Form (DV26), for any individual item identified, then this should be done, and a draft shall be included in the scoping documentation. Any of the remaining DEs and DVs that cannot be addressed during the scoping phase will be completed during the design phase.

The Design Exception/Variance Approval Process

Initial request and review

The Scoper/Designer initiates the DE request(s) during the scoping of a project or development of the Base Plans (Structure Study for bridge projects). The Project Manager (PM) will review the request and discuss all options with the Scoper/Designer. If merit exists, the PM will discuss all proposed DEs and DVs with the Region System Manager for concurrence or modifications.

Design Exception requests are submitted on Form DE26 and require approval by the Engineer of Design. With the exception of low speed (< 50 mph) vertical clearance, FHWA approval is required for DE elements specifically designated for federal approval in the Project Specific Oversight Agreement (PSOA). DE review and concurrence, with FHWA, should be achieved as soon as possible and official approval no later than at Plan Review.

Similarly, the Design Variance requests are submitted on form DV26. The DV requires only region level review and approval by the Associate Region Engineer, Development (System Manager).

Crash analysis and review

Region and Lansing Geometrics Traffic & Safety Engineers

At this point the PM will request that the TSC T&S Engineer provide a site specific crash analysis. The crash analysis is reviewed with the Region and Lansing Geometrics Engineers. A separate DE/DV is needed for each geometric element requested. The crash analysis must be site specific relative to the location of the geometric element(s) in question.

Completion of DE using Form DE26 – Design Exception Requests and other data

The DE or DV is completed using the latest form (DE26 or DV26) located on the MDOT website. The DE form is submitted in ProjectWise (unsigned) to the Design Exception Coordinator for review and comment. An appropriate preliminary plan (old plans if in scoping phase), profile and/or typical sheet should be included with the DE submittal. The DV form is submitted to the System Manager in ProjectWise.

Ample time must be given for review

Early DE submittal is needed to allow timely review by the Lansing Design Division and the FHWA (on FHWA oversight projects) and to provide follow up information or a re-submittal that may be required. The approved DEs and DVs are required to be included with supporting documents submitted for the Plan Review and FPC meetings in ProjectWise.

Possible Causes of DE or DV Rejection

Additional information on the design exception/variance process and DE26/DV26 form instructions

Approvals of DE or DV requests are not an absolute and should not be expected. Disapproval of a DE or DV request can result from a number of deficiencies in the request. Grounds for rejection can range from insufficient justification to the use of an outdated request forms. It should be understood that meeting a project letting date is not acceptable justification for a design exception or a design variance and special consideration is not given for requests submitted late in the design process. Additional information on the design exception/variance process is provided in the MDOT Road Design Manual Chapters 3 and 14, and instructions for completing the DE form are available on the MDOT website (DE26 - Design Exception Request Instructions).

Safety Review, Crash Analysis and Road Safety Audit

(revised 6-24-2019)

Source of crash data

A preliminary Safety Review and Crash Analysis is done as part of the scoping process. Further reviews and detailed analysis are completed during the design phase of the project. All projects, except the sealing category of Capital Preventive Maintenance projects, should have a crash analysis and safety review by the TSC Traffic & Safety Engineer. Crash data is available in RoadSoft and is analyzed by each TSC's Traffic & Safety Engineer.

TOR calculation needed

The Safety Program is a means by which MDOT can support the goals of Michigan's Strategic Highway Safety Plan (SHSP). Proposed Safety projects and requesting Safety funding require a Time of Return (TOR) calculation be performed and submitted, usually during the Call For Projects Process. All projects are justified through this cost benefit analysis and typically involve improving safety at high crash locations, crash reduction, reducing fatalities and improving the safety and operational efficiency of the state trunkline system. To ensure equality in the identification of projects throughout the state, the Safety Improvement Program is part of MDOT's Call For Projects.

Road Safety Audits (RSAs) are warranted based on the conditions defined in the Road Safety Audit (RSA) Guidance Document, An RSA is a formal safety performance examination of an existing or future road or bridge project by an independent, multi-disciplinary RSA team. RSAs should be conducted during the scoping process and are highly recommended to be scheduled prior to the Scope Verification meeting and include consideration for all users of the roadway to help achieve strategic safety goals. RSAs contribute to road safety by providing a fresh, unbiased assessment of the area or intersection in an effort to identify potential safety issues and solutions.

Highway Safety Considerations (revised 6-24-2019)

The AASHTO Highway Safety Manual (HSM) provides methods and tools to quantitatively estimate crash frequency and severity for safety related decisions made in the planning, project alternative analysis and program development and evaluation phases. Even with it's limitations, the HSM is the state of the art tool and can aid in the decision making process. The HSM helps identify areas and possible countermeasures for reducing crashes, potential severity and frequency levels. MDOT is utilizing this capability through its biannual high crash process. Every other Fall each Region receives a high crash list from Safety Programs. Beginning with the Fall of 2012 high crash locations were developed utilizing HSM methods.

HSM analysis is an optional method to document the safety impacts of a design exception or variance. A predictive crash analysis can be completed to demonstrate the future safety impacts of the design exception or variance itself (what will not be provided) as well as the impacts of the proposed countermeasures.

For additional information or training on the HSM methods please contact the MDOT Safety Programs unit or visit http://www.highwaysafetymanual.org.

Permanent Traffic Recorder

Determining whether PTR will need to be replaced

Region and Lansing Planning Staff

As projects are selected, the locations of any existing Permanent Traffic Recorders (PTRs) should be identified**.** If it is determined that there should be replacement of existing PTR(s) or new PTR locations within the proposed project limits, costs estimates for these should be included in the project estimates. The decision for new PTR installation should be done after consultation with the Region and Lansing Planning Staff and the Commercial Vehicle Enforcement Plan within each Region. Available funding for the proposed work should be discussed and identified during the project scoping, before moving forward to design.

Seeing where PTRs are located

A map that details the PTR location, including control section and milepoint information, can be provided by each Region's Development Staff and is also available on the Connect MDOT Intranet. A link named Permanent Traffic Recorders is on the Transportation Planning main web page, displaying a map of the PTR information within each region.

For bridge projects, a PTR may be found between bridge piers or near the slope. At these locations, MDOT has loops and/or sensors usually within 20 to 100 feet of the structure.

Traffic Count Request, Timing and Process

(revised 7-18-2016)

Requesting traffic counts

TAR Form 1730

When traffic counts are required (for mobility analysis, pavement design, intersection signal warrants, turn lanes, etc.) and/or requested, fill out the Traffic Analysis Request (TAR) form (Form#1730).

Project Planning Section

TAR form information

The goal of the Project Planning Section is to provide the requested information within 30 days of TAR receipt, depending on data availability. Items such as turning movements and diverted detour traffic will often need a field survey and/or model runs, which require additional time and analysis. A Traffic Call For Projects Committee comprised of staff from the Data Collection Unit (Asset Management), Traffic Analysis Unit (Project Planning), Statewide and Urban Travel Analysis (SUTA) and the Region meet once a year (if needed) to discuss traffic needs. This allows the Data Collection and SUTA areas (for potential model runs on diverted traffic) to schedule/optimize their staff and prioritize their schedule based on the Region's needs. For additional information on how to complete the TAR form see Appendix for the Traffic Analysis Guidelines.

Federal Highway Administration Oversight

Importance of including FHWA oversight in the scoping package

Oversight Matrix

FHWA

Although Federal Highway Administration (FHWA) oversight on a project may not affect the determined fix or the estimated cost for a project, it is information that should be included in the scoping package for the project designer. Inclusion of and coordination with FHWA on federal oversight projects is required. Oversight of projects is determined on a project basis by agreement between the FHWA and the Region System Manager, reviewed on a yearly basis. For many projects, oversight will be defined as in the "Oversight Matrix". Omission of FHWA coordination on pre-determined federal oversight projects can have negative impacts to cost and project schedule.

During the scoping process, any previous discussions or agreements with FHWA should be reviewed and included in the project scoping package and be part of the documentation in the scoping record.

FHWA may be invited to the preliminary scope review, for those projects that are anticipated to be FHWA oversight. Early coordination helps to achieve FHWA concurrence with the scope and any potential DEs. This early concurrence reduces potential scope changes after a project has been selected and proceeds to design.

Hydrology/Hydraulics (revised 6-24-2019)

Culverts

Failure to identify and plan for hydrology and hydraulic issues can be one of the reasons for scope creep during design. Culverts that are undersized or in poor condition, which are not discovered during the scoping process (depending on the proposed project work type) are replaced and or resized during the design of the project, or worse, during the construction of the project. This can often lead to an increase in project cost related to excavation, soils, peat or muck excavation and maintenance of traffic either in design or construction overruns. Additionally, culvert changes can impact natural resources such as streams, wetlands and floodplains, and require resource agency coordination and possible permits (Michigan Department of Environmental Quality, MDEQ).

As part of the scoping process (depending on the proposed project work type), existing drainage features should be identified and reviewed (actual sizing and analysis to be done during the design phase). Additional existing condition information can be obtained from the TSC or Region Maintenance Coordinators and the information documented on the Culvert Inspection Form (see Chapter 7). Culverts and sewers are reviewed for adequacy of size, length, proper end treatment and condition. An option of videotaping the culverts or sewer system as part of the design may be included in the project scope (if videotaping is recommended, it will be noted in the Scoping Report & Details Worksheet). For road 4R projects, the expected remaining life of the culverts should be considered. For example, if the culverts were placed when the segment of roadway was first built and the roadway is now proposed to be reconstructed, the removal and replacement of culverts may be considered, depending on the condition of the culverts. This could aid in coordinating the projected life span of the culverts with that of the roadway.

Pump Stations

Determining whether pump stations need upgrades or improvements

If pump stations exist within the project limits (depending on the proposed project work type), an inquiry to the Region Maintenance and/or Lansing Transportation Systems Maintenance Operations (TSMO) staff is recommended to determine the need for any upgrades or improvements. If a need has been identified, an estimate is developed during the scoping phase. Funding for the proposed work should be discussed during scoping and determined if there will be additional funds added to the project by other sources (or as a part of existing region template budgets).

Drainage

Determining whether drainage issues are causing impacts

Often, poor pavement condition is the result of poor drainage. Existing ditches should be examined for erosion issues (depending on the proposed project work type), for grades that may be too flat, the need for re-ditching or ditch clean out. If widening is to be included in the project, including ramp extension, the impacts to existing ditches must be considered (including additional ROW that may be required). In addition, grade raises greater than 4" will require a hydraulic analysis to be done. This will provide information and possible design options for drainage that may need to be addressed.

On reconstruction (4R) the drainage system needs to be designed to accommodate the runoff and to meet current standards. In some cases, this may require additional ROW for detention.

State and Federally Regulated Waterways

Determining whether a permit is required

If a culvert within the proposed project limits is part of a county drain, cold water trout stream, state designated waterway, state designated natural river or federally regulated waterway, it should be identified during the scoping process. A federally regulated waterway could include the Great Lakes, rivers, streams, tributaries and/or wetlands that are connected to a navigable waterway. Any proposed work for the culvert and/or ditch, drain, stream or channel may require permitting. For additional information or assistance to determine if a ditch or channel is defined as any of these above, contact the Region Permit Specialist and/or the Environmental Clearance Coordinator (ECC) or use the applicable quadrangle map.

County Drains

Determining whether to coordinate is required

A county drain may require coordination with the County Drain Commissioner. For example, if any of the following exist it may be beneficial to coordinate with the County Drain Commissioner (these issues may be the result of modifications made to the stream by natural or manual factors):

- The downstream drain does not have enough capacity for stormwater
- Debris sources upstream can be eliminated
- Issues or problems exist outside of MDOT Right-of-Way that affect the drain
- Any future plans for modifications or expansion could be coordinated

Flood History

Determining whether there is a history of flooding

If there is a history of flooding within or adjacent to the project limits, an effort should be made during the scoping process to determine the cause of the flooding. TSC Maintenance Coordinators may provide information about flood history. Also high water marks on structures or nearby buildings may indicate a flooding history. Flooding that overtops the roadway may be caused by culverts that are too small, ditches that are blocked (either temporarily or with a permanent obstruction), a lack of capacity of a structure that is part of the ditch or channel or other factors outside the Right-of-Way. If the culvert is the cause, it may need to be replaced. If the cause of flooding is outside of the Right-of-Way, MDOT may have little ability to resolve it.

Culvert Undermining

Cause of culvert undermining

Downstream channel head cutting may cause undermining. Head cutting is the process of a stream bottom elevation dropping along the entire length, starting downstream and working upstream (a downstream grade control may have been removed). If culvert undermining is caused by head cutting, coordination with the maintaining agency may be beneficial.

MDOT has little influence on land use zoning changes affecting upstream watersheds; although signs of changes to land use or water diversion in the upstream watershed may be reviewed at during the scoping process. An MDOT project can address the unstable conditions caused by a development by stabilizing the stream and/or slopes in MDOT right-of-way or by increasing the size of a cross culvert. These are the project improvements that may be recommended (depending on the scope of the project) to address these issues.

Floodplains

Identifying floodplains

FEMA Maps

Can a defined floodplain be identified adjacent to the project limits? Floodplains may appear as the flat area above the stream channel where water is stored during large storm events. Federal Emergency Management Agency (FEMA) floodplain maps may identify some of the larger areas. If there are obstructions, buildings or walls near the channel or within the floodplain area, these may obstruct the flow of water.

Ensuring municipal ordinances are considered

In consideration of the existing condition, the local municipality's ordinances should be reviewed. With floodplain areas within or adjacent to the proposed project limits, there may have to be consideration of balancing the removal and replacement of fill material quantities. This is done to ensure that there is a net zero difference to the high water elevation level, as a result of the project.

Stormwater Best Management Practices (BMP)

(revised 6-24-2019)

The transportation network accumulates contaminants from vehicles, road construction and maintenance. Common contaminants include sediment, oil, polyaromatic hydrocarbons (PAH) grease, deicers and fertilizer.

Water contaminant concerns

These contaminants are washed from the pavement and enter surface water during rain events and snow melts. These pollutants may cause public health concerns, harm aquatic and animal life, lead to excess growth of vegetation and produce unpleasant odors.

Reducing stormwater pollution

Stormwater Mgmt Plan

In response to this issue, MDOT is required to have a current National Pollutant Discharge Elimination System (NPDES) permit to discharge water to a waterbody. MDOT developed a Stormwater Management Plan (SWMP to achieve compliance with this permit). The SWMP is designed to enhance the way MDOT does business so that stormwater pollution is reduced or eliminated. Solutions in the SWMP are as simple as following applicable operational best management practices (BMP), or as complex as building new stormwater management structures.

Six measures to reduce stormwater pollution

The SWMP describes the procedures and practices MDOT uses throughout the planning, design, construction, operation and maintenance of transportation infrastructure to limit the discharge of pollutants from its storm drainage systems. Procedures to comply with each of the six minimum measures stated in the NPDES Permit are reviewed with MDEQ as part of the annual reporting process. The six minimum measures include the following:

- Education and outreach on stormwater impacts- public education program (PEP)
- Public involvement/participation
- Illicit discharge elimination program (IDEP)
- Post construction stormwater management program for new development and redevelopment projects
- Construction stormwater runoff control
- Pollution prevention/good housekeeping for MDOT operations

MDOT utilizes best management practices (BMPs) to minimize pollutants and control runoff from entering waterbodies. They may be structural, or operational in nature.

The post construction stormwater management portion of the SWMP requires that all MDOT projects be reviewed for stormwater impacts. If the project disturbs more than an acre or discharges to a waterbody with an established total maximum daily load (TMDL) of a particular pollutant, post construction Best Management Practices (PC-BMPs) be incorporated, to the maximum extent practicable. Additionally, projects that increase impervious area require PC-BMPs to retain the additional runoff from the newly paved areas.

PC-BMPs cost must be accounted for in estimating a project during the scoping process. A PC-BMP screening tool has been developed to aide in developing cost estimates for stormwater controls. The latest version of the tool can be found on the Stormwater Program SharePoint site:

https://stateofmichigan.sharepoint.com/sites/mdot/Organizational/development/environmental/SitePages/Stormwater.aspx

Include the results from the PC-BMP screening tool as part of the scoping package.

The Aquatic Resource Specialist and/or Stormwater Program Manager should be consulted on this issue.

Utilities (Public and Private)

Coordinating with local authorities to replace watermain and sanitary sewer

Utility information is important to gather during the scoping process. This is true for both public and private utilities and is especially true for underground utilities. Identifying municipal water and sanitary sewer lines that may need improvement within a similar timeframe as the proposed project will provide early opportunities to coordinate the municipal utility work with the MDOT project. Early identification of potential utility relocations may be critical to the successful completion of the proposed project. Utility companies need adequate time to plan and finance utility relocations, particularly major relocations. A list of potential utility companies and the contact information should be obtained from the TSC Utility Coordinator to facilitate the information gathering activities.

ADA Compliance / MDOT Sidewalk Policy

(revised 6-24-2019)

Accessibility (i.e. curb ramps) is mandated by Act 8, P.A. of 1973. Federal mandates followed this State Law in conjunction with the Americans with Disabilities Act of 1990. The United States Access Board published the Americans with Disabilities Act Accessibility Guidelines (ADAAG) in 1991 and subsequently extended its application to Public Rights of Way in 1994. The Access Board later published the Public Rights of Way Accessibility Guidelines (PROWAG) to address issues specific to public rights of way. See MDOT's Sidewalk Policy and ADA Transition Plan to see what aspects should be considered. On projects that are within local agency jurisdiction, coordination with the local agency's ADA Transition Plan should also be attained.

Curb Ramp Design

Specs for curb ramp design

The design of curb ramps must follow Standard Plan R-28-series. There are limited acceptable exemptions for not constructing a curb ramp on a road construction project, if a sidewalk meets a curb in an obvious crosswalk situation. An "obvious crosswalk situation" would be at a street intersection, regardless of whether or not there are painted crosswalk lines or a traffic signal present. The FHWA requires that, where prepared surface pedestrian routes exist, curb ramp construction or curb ramp upgrades be incorporated with new roadway construction projects as well as alteration / resurfacing. In addition, ADA compliance shall be reviewed for bus stops within the project limits and on-street parking, for 3R, 4R and most CPM projects.

Warrants for Curb Ramps and Curb Ramp Upgrades

The FHWA requires that curb ramp construction and/or curb ramp upgrade be incorporated with new construction and roadway alterations.

- New Construction refers to the initial construction of a new facility.
- Alteration refers to changes that affect or could affect the usability of an existing roadway facility.
- Maintenance refers to routine maintenance activities that do not affect the usability of an existing roadway facility.

Curb Ramp upgrades are not required in conjunction with routine maintenance treatments. Two or more maintenance treatments may be combined and still be considered a maintenance treatment. However, if two or more of those treatments contains aggregate and/or filler, the combination will be considered an alteration.

Examples of Alterations include:

- Reconstruction
- Rehabilitation
- Open-Graded Surface Course (open graded friction course)
- Micro-surfacing (including rut filling)
- Double Chip Seal
- HMA Overlay (regardless of thickness)
- Cape Seal - (Chip seal capped with a slurry seal, micro surfacing or other treatment to fill voids in a chip seal)
- In-Place Asphalt Recycling

Other conditions requiring upgrades include;

- Altered Commercial Driveways
- Independent shared use path crossings

Examples of Maintenance Treatments include;

- Crack Filling and Sealing
- Surface Sealing (liquid sealant)
- Chip Seals
- Slurry Seals
- Fog Sealing
- Joint Crack Seals
- Joint Repairs
- Dowel Retrofit
- Spot High Friction Treatments
- Diamond Grinding
- Pavement Patching

Other operations not requiring curb ramp upgrades include;

- Signing, pavement marking projects
- Guardrail/Safety upgrade projects
- Landscape/Streetscape projects (except where existing sidewalk or curb ramp is altered)
- Independent Utility Work/Maintenance (except where an existing sidewalk or curb ramp is altered or when work is extensive such that an entire cross walk is reconstructed)

More info about curb ramps and detectable warnings

Additional warrants, examples and information on curb ramps and detectable warnings may be found in the MDOT Road Design Manual Section 6.08.05 and Standard Plan R-28-series and Bridge Design Manual Section 7.02.27 and 12.01.01.

Sidewalk

Sidewalk requests from cities, villages, and townships

Sidewalks will seldom be constructed retroactively, but will predominately be coordinated and constructed in conjunction with ongoing road or bridge work. For projects where a reasonable expectation of need cannot be determined at the time of design or over the design life of the project, the city or village shall be allowed to construct sidewalks in MDOT right-of way with their Act 51 or other funds, provided they sign an agreement as described below. Where there is a request or a demonstrated need for a sidewalk along a trunkline in a township, MDOT should work with the township to enter into an agreement as described below, prior to sidewalk construction. For more information see the Road Design Manual section 6.08.01

The local agency or MDOT can pursue grants or other federal funding to pay for sidewalks or non-motorized facilities. These grants can be coordinated with proposed projects or be developed as stand alone projects, such as streetscaping or aesthetic projects. The planning for and construction of sidewalks or non-motorized facilities shall be done per the specifications, guidelines and/or MDOT policies.

Sidewalk Maintenance

Agreements needed before sidewalks can be built

The sidewalk and curb ramp maintenance shall be the responsibility of the local unit of government, including liability, removal of debris, snow and ice and replacement of damaged segments. Any sidewalk construction shall be contingent on a written agreement that addresses ownership, liability and future maintenance. This agreement must be signed by the local agency prior to construction and the need for such an agreement shall be noted in the scoping documents.

Constraints to Meeting ADA Requirements

In situations where it is impracticable to fully achieve the current ADA requirements, either due to the scope of work proposed or due to physical barriers (such as buildings), these situations will need to be reviewed on a case-by-case basis. MDOT will need to document justification and determination of practicable compliance. This justification and determination is documented and signed on form 0370 and becomes part of the permanent project file. On FHWA oversight projects, FHWA would have to be in concurrence and approval by Plan Review.

Environmental Clearance Process (revised 6-24-2019)

Analyzing projects for environmental impact

Every project must be analyzed for environmental impacts and an environmental clearance obtained through the National Environmental Policy Act (NEPA) process before the funding is released. The depth of analysis of a project is determined by the severity of its impact upon the environment, not by the size of the project. It is possible to have a small project which has such severe impacts that extensive analysis is required. Conversely, it is possible to have a very large project which has very little impact and which requires relatively little analysis. In general, large and complex projects often require more analysis than small, simple projects, but it should be kept in mind that this is a coincidental connection, not a procedural one. The environmental clearance process is coordinated through the MDOT BTP/Environmental Section.

The Environmental Clearance Coordinator (ECC) in the Environmental Section assigned to your Region should be contacted during the scoping process and invited to attend van tours of the project, as indicated in Chapter 9 in this manual. Early coordination, especially when known resources exist (e.g. a wetland, stream, or historic property), can help to streamline the environmental classification and certification processes.

Three types of environmental analysis: CE, EA and EIS

There are three levels of environmental analysis: Categorical Exclusion (CE), Environmental Assessment (EA) and Environmental Impact Statement (EIS). Typically the R&R, CPM, Bridge and T&S templates (Call For Project Templates) are classified as CE, while the Capacity Improvement and New Roads templates will fall into either an EA or an EIS category.

The effects of the various environmental impacts can and should be mitigated by a thoughtful design process, which begins with the scoping of the project. This principle is intended to produce highways that are safe and efficient for all legal users, acceptable to non-users and are in harmony with the environment.

The two components of the Environmental Clearance process are *Environmental Classification* and *Environmental Certification*.

Environmental Classification

The *Environmental Classification* is the classification of a project as a Class I, Class II or a Class III Action, as defined under the NEPA. These are defined as:

- **Class I** - Environmental Impact Statement (EIS); for projects with significant environmental impacts, typically for new roadways or major expansions of existing state trunklines.

- **Class II** - Categorical Exclusion (CE); projects without significant environmental impacts, either individually or cumulatively, unless there are unusual circumstances. Most road and bridge rehabilitation, reconstruction, and CPM projects are Class II.

- **Class III** - Environmental Assessment (EA); Projects with unusual circumstances or in which the significance of environmental impacts is not clearly established. If through the EA process, significant impacts are found, the project may require an EIS (Class I). Generally, this Class applies to capacity improvement projects within existing state-owned right-of-way or sometimes major reconstruction projects, depending on the expected impacts and removal of historic bridges.

Environmental Classification is made cooperatively with the MDOT Environmental Section, to ensure compliance with state and federal environmental laws and regulations.

Importance of correctly determining project footprint from project beginning

This classification is determined at the beginning of project development using the best available information. During the scoping process it is very important to identify the required footprint of the proposed project to allow the classification to be as accurate as possible. Classification is done between the Scope Verification Meeting and the Base Plan Meeting. This allows the project to proceed to final design and the required real estate to be purchased. This identification process is very important to complete, based on the strategy the project is scoped for. If there are changes in the design phase, the Environmental Clearance process may have to start over, causing delay to the project schedule and impacts to the project.

Environmental Certification

The *Environmental Certification* is the action that identifies that the mitigation measures are addressed, to allow a project to proceed to construction. Environmental Certification will verify that the project has been correctly classified, to verify all mitigation measures have been included and to verify all identified constraints have been avoided.

Using past EIS and EA documents is helpful

Information from previously completed and approved EIS or EA documents and the review of any previous engineering reports will also be helpful in the scoping process. General scope information provided in the completed EA or EIS should be used as a baseline, to perform the detailed scoping of the project work. The completed EA/EIS will also provide information about the projects constraints which need to be accounted for.

If the scoping footprint exceeds the footprint of what was previously cleared in the EA/EIS, discussions with MDOT BTP/Environmental Section will be needed to determine implications to the environmental clearance.

Title VI Requirements

Title VI of the Civil Rights Act of 1964 is the Federal law that protects individuals from discrimination on the basis of their race, color, or national origin in programs that receive Federal financial assistance.

Title VI requirements should be considered in scoping projects. Under Title VI MDOT will not locate or design a highway in a manner that requires the relocation of individuals, nor deny reasonable access or use to any person, on the basis of race, color, national origin or sex. It is not known at the time of scoping whether Federal financial assistance will or will not apply to the project, therefore Title VI should be considered when scoping all projects.

Title VI requirements and Environmental Justice guidelines will be complied with during the scoping process. MDOT will scope highway projects in a manner that will not discriminate, displace or deny reasonable access to any person, on the basis of race, color, national origin or sex.

Although the requirements of Title VI need to be considered when scoping any project, Title VI will come into play most likely on Capacity Improvement or New Road projects. For assistance on issues that may be related to Title VI contact the Region Planner.

Context Sensitive Solutions (revised 6-24-2019)

Consideration of scenic, historic, aesthetic, multi-modal, cultural and local issues

MDOT utilizes the adopted FHWA definition for Context Sensitive Solutions (CSS):

A collaborative, interdisciplinary approach that involves stakeholders to develop a transportation facility that fits its physical setting and preserves scenic, aesthetic, historic, and environmental resources, while maintaining safety and mobility.

Per the FHWA published guide, "Flexibility in Highway Design", consideration of the scenic, historic, aesthetic, non-motorized/multi-modal needs and other cultural values, as well as coordination with other local projects, is promoted along with the traditional safety and mobility goals.

MDOT has utilized a CSS approach to project development for many years. Though the term CSS was not initially used, MDOT has practiced many of its principles prior to the establishment of its nomenclature. Since the early 2000s, MDOT has embraced the full principles of CSS, and has done so on every project regardless of scale or type per the STC policy of 2005. The decentralized organizational structure is very supportive of CSS as the multiple Transportation Service Center offices put MDOT closer to customers and make it easier to gain input and to understand the local needs.

Instances where funding is from other sources

The purpose of this section, in combination with the Guidelines For Stakeholder Engagement, is to provide the tools necessary to consistently apply CSS in the program and project development. It also provides staff information to help better understand the definition of stakeholder engagement (see below) and its application to specific types of projects. It should be noted that MDOT retains decision making responsibility and that costs beyond the scope of the proposed project should be provided through other sources, such as local agencies, developers, foundations, the federal Transportation Alternatives Program (TAP) program or other non-traditional public sources.

Stakeholder Engagement (revised 6-24-2019)

Value of stakeholder engagement

Stakeholder engagement is one of the Key Fundamentals of CSS. There are many good reasons to seek stakeholder input, including minimizing late changes to projects, developing partnerships, better customer service, timely conflict resolution, incorporation of multi-modal considerations and projects with an improved community fit. Stakeholder input is valuable information that will improve the project. The goal is to have a plan, put into place a genuine dialogue, keep things moving and be flexible

For more information please reference MDOT Guidelines for Stakeholder Engagement.

Items that May Be Considered When Scoping Some Projects (revised 6-24-2019)

While scoping a project, it is very important to understand the bigger picture. How does this project impact future projects? Will it impact the community other than just the construction? Will there be environmental impacts? Keeping this in mind, there are items that may need to be analyzed based on the scope, work type or strategy being used. Based on the issues mentioned above, there may be work that should be avoided or not constructed and a design exception or variance may be appropriate. An important factor in scoping a project is the complete documentation of decisions that relate to the project scope.

Geometric Considerations (revised 6-24-2019)

Horizontal and vertical elements to review

During the scoping process various geometric elements must be reviewed to determine if the current standards or guidelines are met (depending on the proposed project work type). If a particular element does not meet the current standard or guideline, can it be upgraded to meet the requirements as part of the proposed project or will a design exception or design variance be required? Some of the horizontal items to review include minimum radius, stopping sight distance/horizontal sight offset, maximum rollover between pavement and shoulder cross slope, maximum rollover between pavement cross slope, and parabolic crowns. Vertical alignment items to review include maximum percent grade, stopping sight distance, and K value for both crest and sag vertical curves. Chapter 3 of the MDOT Road Design Manual is an excellent reference source for details on each of these elements.

Important considerations when the road profile is raised or lowered 4 inches or more

On projects proposing to raise or lower the profile four inches or more, a hydraulic analysis will be required. In addition, it is important to consider items outside the roadway that may be impacted by the proposed change. Impacts to drainage patterns, depth of fill over culverts or sewers, Right of Way, potential impacts to utilities, natural and cultural environmental impacts, etc. should all be discussed and addressed as necessary. Refer to section 2.9.11.1 of the MDOT Drainage Manual for more details on the hydraulic requirements when the roadway grade is raised four inches or more.

Some stakeholders, such as the local agency within the project limits, have been requesting lane reductions or "road diets" which will reduce capacity, by eliminating lanes. Consideration should be given for the accommodation of all legal users of the roadway. It is extremely important that a capacity analysis is done and the future use of the facility is determined. If the project proposes reduction in lane and pavement width, federal funds could be jeopardized. The decision shall be documented with the analysis showing the existing and future facility can handle the projected traffic and review of the Engineering Operations Committee (EOC) is required. Also see “Other Strategies” in Chapter 3.

Right Of Way Considerations

Determining the existing ROW

Right of Way (ROW) Map Books (updated ROW plansheets are on the MDOT website) should be reviewed to determine the existing ROW for the proposed project. In addition the Statewide ROW maps may be available in ProjectWise, under Reference Documents. Depending on the existing ROW width and the proposed fix, additional ROW may be required to construct the project. The ROW impacts and an estimate of cost for the projects should be included in the scope.

http://mdotcf.state.mi.us/public/ROWFiles/index.cfm

ROW impacts commonly include proposed ROW (to be purchased in fee or easement), grading permits, driveway permits, sidewalk permits and drainage easements. The Region Real Estate staff should be consulted with to estimate the cost of ROW needed for the scoping estimate. Additionally, ROW impacts can change the Environmental Classification of the project and should be identified early to maintain project schedule and budget.

Floodplain, Stream and/or Wetland Mitigation

Road widening in a floodplain or wetland

If a project will involve significant widening in floodplain and/or wetland locations, a review and analysis of the impacts needs to be done during the scoping process to determine if mitigation will be required. Mitigation can be done onsite, offsite at a newly determined location, or may be done at a preexisting wetland bank site. The cost of the mitigation will need to be included in the project scoping estimate. The Region Permit Coordinator and/or Lansing Environmental Section should be consulted with on this issue.

If a project will involve physical impact to a regulated watercourse, an Inland Lakes and Streams (Part 301) permit will be required. The cost for the permit requirements will need to be included in the project scoping budget. Steam Mitigation includes either a new stream enclosure (culvert) greater than 100 feet in length or stream relocation. For either of these items include 3% if construction cost < $1,000,000 or $100,000 if project cost > $1,000,000 for the permit requirements. The Region Permit Coordinator and/or Lansing Environmental Section should be consulted with on this issue.

FAA Obstruction Evaluation (section added 8-17-2015)

FAA notification of construction

Federal regulation (14 CFR Part 77.9) requires notification with the FAA (Federal Aviation Administration) when construction alteration or activity is planned in a zone that may impact aircraft flight operations. This may include change in grades, structure elevations, lighting, towers, crane heights, etc. A determination as to whether a notification is required can be made using a "Notice Criteria Tool" available on the FAA Obstruction Evaluation/Airspace Analysis web site. More information regarding this requirement is also available in section 14.17 of the Road Design Manual.

Life Cycle Cost Analysis

When a Life Cycle Cost Analysis is needed

A Life Cycle Cost Analysis (LCCA) will be completed for all projects where the estimated cost for mainline pavement, either concrete or HMA, exceeds one million dollars. Although the LCCA occurs early in the design phase, the scoping package should identify and document projects where the estimated pavement costs exceed one million dollars. The engineer should discuss with the System Manager which cost should be used in the estimate (HMA or concrete).

Value Engineering (revised 6-24-2019)

When to use value engineering and what it does

Value Engineering (VE) is a systematic multi-disciplined team review of function, cost and worth of the design elements that occurs when the design plans are approximately 30% complete. The VE review identifies where these design elements appear to be out of balance and develops alternatives to increase value (or decrease cost) in a product or service by accomplishing the same function more effectively. A VE review is required for a single project or a group of projects in a corridor (to be built over a number of years) with an individual or group total project cost of $25 million or greater. A VE review might encompass a longer corridor of similar work, but only the projects for which there are design plans (or sufficient scoping information) available will receive VE credit. Projects that require VE activities also require FHWA approval.

For bridges, the new federal regulations require a VE study on a "bridge projects" if its cost is $20 million or greater. These costs include the total costs of EPE, PE, ROW and CE. It is recommended to include projects of single structures of $16 million and road projects of $20 million in construction costs. This will ensure that projects will not be missed and allow for inflation or project increases.

Who must identify projects requiring a VE review

The MDOT Statewide VE Coordinator requests that the Region System Managers identify potential projects (Road, Bridge, Capacity Improvement, New Roads and Safety) that may require a VE review. Region System Managers are also responsible for coordinating with adjacent Regions for projects that extend to the boundary of the Region. Project identification can occur year round; however the project and larger corridor identification is generally done soon after the approval of the Call For Projects, usually in July. Job numbers for identified VE projects are sent to the VE Statewide Coordinator in the Design Division. Typically the VE coordinator will assure the VE study gets completed, whether done by consultants or in house; facilitates all decision meetings or communications and reports VE activity to the FHWA.

Identifying projects to be packaged together

During the scoping process it is important to identify the cost (depending on the proposed project work type) and if there is intent for projects to be packaged together. This will assist in the determination of potential VE candidates. Any proposed packaging should be identified on the "Scoping Report and Details Worksheet".

As the project moves into the Design Phase, there are thresholds used to identify and plan for potential candidate VE projects. This is done to avoid a project being delayed because it was over the $25m threshold late in the design phase. Projects may be added to the candidate list if project budgets increase, or are removed from this list if the budgets decreases or does not exceed required VE amounts. The following values are used to plan for the VE activity and will be reviewed on an annual basis:

Identifying projects which need VE

- Road Project with Construction Costs ≥ $18m
- Bridge Projects with Construction Costs ≥ $16m
- Corridor of Road Projects ≥ $25m
- Corridor of Bridge Projects ≥ $20m

It should be noted that VEs are mandatory on projects on the Federal-Aid system that equal or exceed the $25 million and/or $20 million for a bridge project, in order to receive federal funding for construction. For further information regarding the VE process see Section 14.27 in the Road Design Manual.

Corridor Coordination (revised 6-24-2019)

What corridor coordination is and why it is valuable

Corridor Coordination refers to the planning of multiple projects or series of projects on a given roadway to maximize efficient use of funds, ensure projects fit together, reduce mobility impacts and maintain the long term goal for the future needs of the corridor. Coordination of projects should not only be limited to MDOT projects, but also to local, city and county projects (as well as long term plans). Planning a series of projects along a roadway can minimize rework and impacts to the motoring public. If a series of adjacent projects is planned, project coordination can also give the motoring public a break in disruption if the projects alternate years, without losing sight of the long term vision for the corridor.

Where corridor coordination is most likely to be useful

A Corridor of Highest Significance is defined as a roadway which links multiple activity centers where population, employment, tourism, transportation and other economically important activities are concentrated. Corridors can be of local, regional, statewide, national or significance depending on what geographic areas they serve. These corridors provide the foundation for Michigan’s economy and MDOT continues to focus investments that rebuild and modernize these roadways and the transportation facilities within them.

Reference the State Long-Range Transportation Plan (MI Transportation Plan) for additional information.

Template Coordination

Instances in which additional funding may be available for a project

While a proposed project may fall into one funding template ie (Road R&R), it is possible that different aspects of the project may fall under a different funding template (an intersection within the project limits may be eligible for funding from the T&S template). It is this type of template coordination which must be considered during the scoping process. In doing this, additional funding may be available for a project as different templates have different budgets.

Maintenance Coordination

Maintenance issues

During the scoping process, coordination should be done with the Region Maintenance staff to learn if there are any recurring maintenance issues or concerns that should be addressed in the scoping package (depending on the proposed project work type). These issues may be related to drainage (including sewer or culvert issues), soil erosion, isolated pavement failure(s), etc. Document and record maintenance issues in the scoping documentation.

As a result of the information shared, it may be beneficial for the Maintenance staff to develop a plan to assist in removing trees, brush and encroachments from the clear zones. If this is a consistent work item, it will assist in the development of projects and the impacts that can be avoided in the design process of projects.

Post Construction Reviews

Learning from past projects

TSC Delivery staff is a valuable resource that should be utilized during the scoping process. Staff can share lessons learned from previous projects that may have had construction impacts, which is useful information for the projects being scoped. Ideas on what works versus what does not work should be shared among the construction staff, designers and persons developing the scopes. Construction staff may also have knowledge of specific issues or concerns with certain roadways or bridges that should be considered during the scoping process. As with all information, construction input should be documented and recorded in the scoping document along with ideas or discussions of potential fixes.

Post Construction meetings that are held for projects should include the individuals that did the original scoping and estimating, whenever possible. This will provide valuable feedback and knowledge for future scoping efforts.

Special Provision Requirements

When a Special Provision may be required

During the scoping process any items of work that are unique and require a Special Provision should be identified. Depending on the type of work, a specialist in the area may need to be consulted during the scoping phase to determine if the proposed work is feasible.

Pure Michigan Byways (revised 6-24-2019)

The Heritage Route Program was created by legislation in 1993. The program emphasizes cooperation with government officials to preserve unique scenic, historic or recreational highways. The Heritage Route Program is a grass roots program, requiring involvement by local residents to ensure that their highway and its roadsides remain in their natural and unspoiled conditions. Michigan's residents have an opportunity as individuals, groups or entire communities to become involved in this important effort to preserve Michigan's roadsides with scenic, historic and/or recreational qualities.

There are three categories of heritage routes: scenic - a state highway having outstanding natural beauty; historic - a state highway having outstanding historic buildings, and resources along its length; and recreational - maintained not only to serve the recreational driver, but also to capture that recreational setting of the facility or area itself, and set the mood for the recreational experience. MDOT is responsible for designating (through a designated process) state heritage routes.

During the scoping process it is important to determine if the project, or a portion of the project, is a designated Heritage Route. This can be done by contacting the Bureau of Transportation Planning. If the proposed project contains a Heritage Route, coordination with the local Heritage Route committees should take place.

Access Management (revised 6-24-2019)

Access Management is an effort to maintain efficient traffic flow, preserve the roadway's capacity and maintain safety (while maintaining reasonable access to land uses), by the planning and placement of access points (i.e. driveways, development approaches, etc.).

What access management achieves

Access management is a set of proven techniques that assist with the following (depending on the proposed project work type):

- Reduce the number of crashes and improve safety by reducing potential conflict points
- Reduce traffic congestion

- Preserve the flow of traffic
- Preserve the public investment in roads
- Enhance the value of private land development

Examples of poor access management

Poor access management is most obvious along major free-access roads that have concentrated commercial development and access points. Along these routes, many separate driveways may be located too close to one another or where drives are close to intersections. This raises safety concerns for all legal users and impedes the flow of traffic. To address this, MDOT seeks to promote an understanding of access management and to improve state and local coordination.

Ways to improve access management

Issues that can provide access management opportunities are:

- All road agencies need to be notified of local rezoning or changes in land use along the trunklines
- Local site plan review and approval processes should include all responsible road agencies
- Applications for driveway permits should be reviewed by road agencies prior to the site plan approval
- Roadway reconstruction and resurfacing projects need to adequately address access issues
- Access management education could enlighten local government officials about traffic impacts that result from local land use decisions

Best time to identify and solve access issues

Funding for access management

The scoping process is the time to identify potential opportunities for improved access management with a review of existing driveway spacing, configuration and the number of driveways per property. Opportunities may exist for the proposed project to close un-needed driveways, combine and/or reconfigure existing driveways, while maintaining adequate access to the business or residence and improving safety for the roadway. Funding for access management improvements should include financial partnerships with local agencies and property owners.

Operations and Mobility - Current Michigan Transportation Plan Goals (revised 6-24-2019)

MDOT's long-range goals

The goals in MDOT's current long-range plan were developed with the help of a Customers and Providers Committee working with MDOT staff to review and reassess the goals of the current state long-range plan. Changes were developed in a cooperative effort and represented the consensus of the group around eight core goal areas:

- **Preservation** - Within the constraints of state and federal law, direct investment in existing transportation systems to effectively provide safety, mobility, access, and intermodal connectivity or support economic activity and the viability of older communities and ensure that the facilities and services continue to fulfill their intended functions.

- **Safety** - Promote the safety and security of the transportation system for all legal users and passengers, pedestrians, and motorized and non-motorized vehicles.
- **Basic Mobility** - Work with the general public, public agencies and private sector organizations to ensure basic mobility for all Michigan citizens whether they move via motorized or non-motorized means by (at a minimum) providing safe, effective, efficient and economical access to employment, educational opportunities and essential services.
- **Strengthening the State's Economy** - Provide transportation infrastructure and services that strengthen the economy and competitive position of Michigan and its regions for the 21st Century.
- **Transportation Services Coordination** - Create incentives for coordination between public officials, private interests and transportation agencies to improve safety, enhance or consolidate services, strengthen intermodal connectivity and maximize the effectiveness of investment for all modes by encouraging regional solutions to regional transportation problems.
- **Intermodalism** - Improve intermodal connections to provide seamless transportation for both people and products to and throughout Michigan.
- **Environment and Aesthetics** - Provide transportation systems that are environmentally responsible and aesthetically pleasing.
- **Land Use Coordination** - Coordinate local land use planning, transportation planning and development to maximize the use of the existing infrastructure, increase the effectiveness of investment and retain or enhance the vitality of the local community.

MDOT is committed to achieving the aims represented by these goals. While some are readily achieved by MDOT acting in its own areas of responsibility, others require the action and cooperation of other agencies.

Other Funding Sources

A variety of funding sources exist for specific features or aspects of a project. During scoping of a project, these various funding sources should be considered when estimating the cost of proposed improvements and the source of money these improvements may be funded by.

Transportation Economic Development Fund – Category A

Funds to encourage economic growth in target industries

Transportation Economic Development Fund (TEDF) Category A was created to assist in the funding of highway, road and street projects necessary to support economic growth for target industries. MDOT, County Road Commissions, Cities and Villages are eligible to receive funding. Eligible projects must show a relationship between the transportation project and the development's transportation need. Contact the TEDF at 517-335-1069 to discuss potential projects with the Grant Coordinator assigned to your Region.

Transportation Alternative Program (revised 12-19-2016)

Funds for bike paths, streetscapes and historic transportation buildings

The Transportation Alternative Program (TAP) is a competitive program that funds specific projects that enhance the intermodal transportation system and proves safe alternative transportation options. Eligible activities include:

- Facilities for pedestrians and bicyclists, including traffic-calming and other safety improvements
- Safe routes for non-drivers
- Conversion and use of abandoned railroad corridors for trails
- Turnouts, overlooks and viewing areas
- Historic preservation and rehabilitation of historic transportation facilities
- Inventory, control, or removal of outdoor advertising
- Vegetation management practices in transportation rights of way
- Archaeological activities
- Environmental mitigation activities
- Boulevards in the right of way of former interstates or other divided highways

Eligible applicants include county road commissions, cities, villages, regional transportation authorities, transit agencies, state and federal natural resource or public land agencies, nonprofits responsible for the administration of local transportation safety programs, and tribal governments. MDOT may partner with a local agency to apply for funding and implement the project. Other organizations, such as townships or trail groups, may work with an eligible agency to apply.

TAP funding requires matching funds of at least 20 percent of the eligible project cost. Additional consideration is given to projects whose match exceeds the minimum required.

Contact the TAP grant coordinator at 517-335-1069 to discuss potential projects with the grant coordinator assigned to your region.

Congestion Mitigation & Air Quality

Funds to reduce emissions and improve air quality

Congestion Mitigation & Air Quality (CMAQ) funds are available for projects that will reduce emissions and improve the air quality (in designated areas, referred to as "non-attainment or attainment-maintenance areas". CMAQ funded projects generally include turning lane improvements, carpool lots, freeway ramp improvements, traffic signal upgrades or ITS.

Federal, Local and Other Sources

Funding from local agencies, developers, foundations and other state and federal non-transportation funding sources should be pursued (often by the impacted local community) for the construction and maintenance of items beyond the scope of the MDOT project.

Safe Routes to School

Funds to enable and encourage children to walk and bike to school

Safe Routes to School (SR2S) began as an international movement to make it safe, convenient and fun for children to bicycle and walk to school and to help ease traffic congestion and air pollution near schools. The Federal SR2S program, for students in grades K through 8, was created within SAFETEA-LU with limited funding to accomplish both infrastructure and non-infrastructure activities.

In Michigan, a school-based planning process must be completed as a prerequisite for federal funding eligibility. The SR2S planning process takes approximately one school year to accomplish and involves a diverse stakeholder group, including students, parents, school and local officials, and representation from all road agencies with jurisdiction over roads used or crossed by students. The resultant SR2S Action Plan lists strategies and actions expected to encourage more students to walk and bicycle to school and to increase the safety of all students walking and bicycling between home and school.

For MDOT project development, discussions with schools serving grades K through 8 about their participation in the SR2S program and the routes used by students to walk and bicycle should provide information regarding potential SR2S infrastructure improvements that should be considered when scoping a project. Typical infrastructure project components include:

- Sidewalks
- Traffic calming and speed reduction
- Pedestrian and bicycle crossing improvements
- On-street and off-street bicycle facilities
- Off-street pedestrian facilities
- Traffic diversion improvements in the vicinity of schools

The SR2S program is administered by the MDOT Office of Economic Development (OED). Call 517-335-1069 for information about the program.

Elderly Mobility

As the population ages in Michigan, the design of our transportation system must take into consideration the aging population. Older drivers can benefit from some simple changes in the design of our roadways. For example, the use of six inch edge lines for pavement markings, Clearview font on sign legends and the use of a box span design for traffic signals.

As part of the scoping process, the existing signs should be reviewed for visibility and compliance with the Clearview font. The TSC T&S engineer may check with MDOT Lansing T&S to determine when the signing on a stretch of roadway was last updated or to see if a signing contract is planned for the roadway corridor. All traffic signals that are impacted by the project will need to be redesigned to a box span layout.

Rumble Strips (revised 6-24-2019)

Use of rumble strips on freeways

Corrugations (also known as rumble strips) provide a visual and audible warning to a driver that their vehicle is either straying off the road or encroaching toward an oncoming lane of traffic. Shoulder corrugations also discourage the unauthorized use of the shoulder as a driving lane.

Freeway shoulder corrugations should be used in both the median and the outside shoulders which have a width of at least 4'. Corrugations are to be included on freeway-to-freeway ramps except for loop ramps but are otherwise not to be used on freeway exit/entrance ramp shoulders. Corrugations are also omitted where the shoulder is separated from the traveled lanes by a curb and gutter or valley gutter. See RDM 6.05.11

Use of rumble strips on non-freeways

Non-freeway shoulder corrugations should be used on all rural, 2-lane, 4-lane, and divided trunk line roadways where the posted speed is 55 mph and the paved shoulder is at least 6' wide.

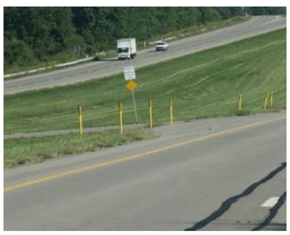
Where to use centerline rumble strips

Centerline corrugations should be used on all rural 2-lane and 4-lane trunk line roadways (in both passing and non-passing zones) where the posted speed is 55 mph and the lane plus paved shoulder width beyond the centerline corrugation is greater than 13' in width.

If safety concerns outweigh other issues such as noise and bicycle use, non-freeway shoulder and centerline corrugations can be considered for use on roadways that do not meet the criteria given above. If a project calls for placing shoulder rumble strips on a paved shoulder less than six foot in width, the State Non-motorized Coordinator must be contacted in advance of this proposed work. This is done to ensure the designation of the shoulder and if there was any funding used for non-motorized uses.

See Section 6.05.11 of the Road design Manual and Standard Plan R-112-Series for additional information.

Maintenance Crossovers (revised 6-24-2019)



If maintenance crossovers exist within the project limits of a freeway project (depending on the proposed project work type), their location should be compared to the guidelines in Chapter 12.09 of the MDOT Road Design Manual. Existing crossovers may need relocation or removal according to the current guidelines. If it is necessary to relocate the crossovers, the Region Permit Coordinator should be consulted to verify that the median does not have existing wetlands or support any endangered species, which may override the need to relocate the maintenance crossovers. When constructing new or eliminating existing crossovers, additional consideration should also be given for specific requests from local emergency response providers.

If the maintenance crossovers are located near ramps that will be extended to meet current guidelines, then the location of the crossovers should be compared to the proposed limits of the ramps.

These items shall be estimated and included in the scope.

Use of Consultants (revised 6-24-2019)

There are times when it becomes advantageous to hire consultants to assist with the scoping process, including the Call For Projects, or the design phase of a project. The need to hire consultants to assist with the scoping process or design phase may be driven by current staff workloads, time constraints, experience level of available staff or complexity of the task. The process to hire consultants may possibly take up to six months and will not relieve the MDOT staff of all responsibilities, as the staff will be responsible for the management of the consultant. The decision to hire consultants must be well thought out and planned accordingly.

The process for hiring consultants is described in Chapter 10 of this manual.

Items to Be Considered When Scoping Bridge Projects (revised 6-24-2019)

In addition to reviewing the items discussed earlier in this chapter, the following pages discuss the items which should be reviewed as part of scoping a bridge project. The NBI condition ratings and Pontis element condition ratings, discussed in earlier chapters of this manual, are most often reported as a result of the routine bridge inspection, which is primarily a visual inspection. The NBI and Pontis ratings are valuable to network bridge management and general determination of what bridges should be scoped, but in order to determine the proper fix type for a bridge, a detailed bridge inspection is needed. Each bridge and its surroundings must be visited by the scoping team. The purpose of this visit is to locate all areas of deterioration, determine feasible repair options and to compute quantities. Where necessary, high-reach equipment or an under bridge inspection crane (Michigan Structure Inspection Manual) (that will allow under the bridge inspection, from the top/deck of the bridge) must be used to get close enough to inspect the structural components.

A detailed bridge scope consists of a Site Review and Determining Repair Options. In situations where the deck, superstructure or entire bridge is beyond repair, as judged by visual indications, or where the appropriate repair option is clearly indicated, the detailed scoping inspection (site review) can be scaled back. For example, if the deck is spalled on the surface and underside to the point where deck replacement is imminent, there is no need to sound the deck for delaminations. The other bridge elements however, should still be evaluated. Likewise, when scoping for some types of CSM projects, the detailed scope may only look at the specific CSM needs of a bridge or a group of bridges, however, the scoper is always encouraged to look for unexpected deterioration.

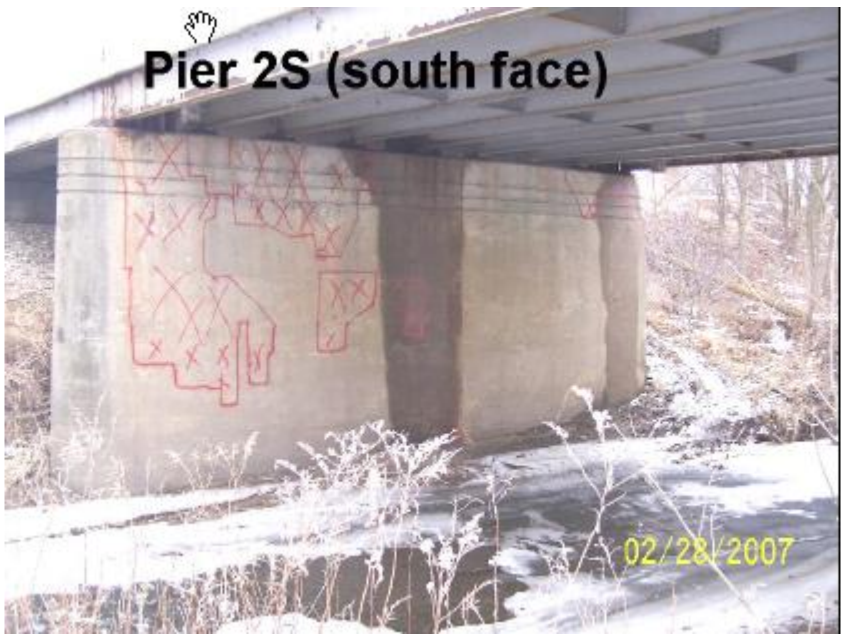
Field Site Review (revised 8-29-2022)

The information collected in the field must be sufficient to determine quantities and locations of repairs and improvements. It is important to take the most current Bridge Inspection Form (Form 2502) in the field for this detailed inspection. This information must be detailed on the Bridge Scoping Report & Details Worksheet and other applicable reports and/or forms. Some of these forms may include, Detailed Beam Survey Report (Form 0267), Beam End Thickness Table, Structure Inventory & Appraisal Sheet (Form 1717A) and any other applicable forms. These forms may be obtained on the MDOT website. Also refer to the Appendix of this manual for sample copies of these forms.

The following paragraphs describe the items and work that should be completed during the site review of the bridge.

Sound all concrete elements (deck surface and underside, superstructure, substructure, etc.) for delaminations and unsound areas. All delaminated areas are to be marked with chalk, spray chalk, crayon or kiel, that will be visible (i.e. orange, pink, yellow, etc.) in the photographs. All delamination surveys are part of the site review work (not part of testing). Sketches of the deck and substructure units mapping the areas of delamination and cracking are to be included in the appendix of the scoping report. Percent of total surface area delaminations shall be calculated and shown on the sketches. The following figure (6-2) shows after sounding with a hammer, delaminations are marked on the pier wall.

Figure 6-2: Shows after sounding, delaminations are marked on Pier wall



The underside of the deck must be visually inspected for wet areas, efflorescence, transverse cracking, longitudinal cracking, map cracking, delaminations, spalling, rust along beam edges or any other evidence of deterioration. The type of cracking and severity must be described, in detail in the report. Note areas of previous repairs or where false decking is in place. Photos of the area must be taken with a written description of the deterioration and locations documented and included in the report.

Visually inspect all substructure units for signs of settlement, lateral movement, cracking, spalling, exposed reinforcement and material defects. Note the condition of the backwalls and check the bridge seat for undermining at bearing locations. In addition, check for flexural cracks and shear cracks on all pier caps.

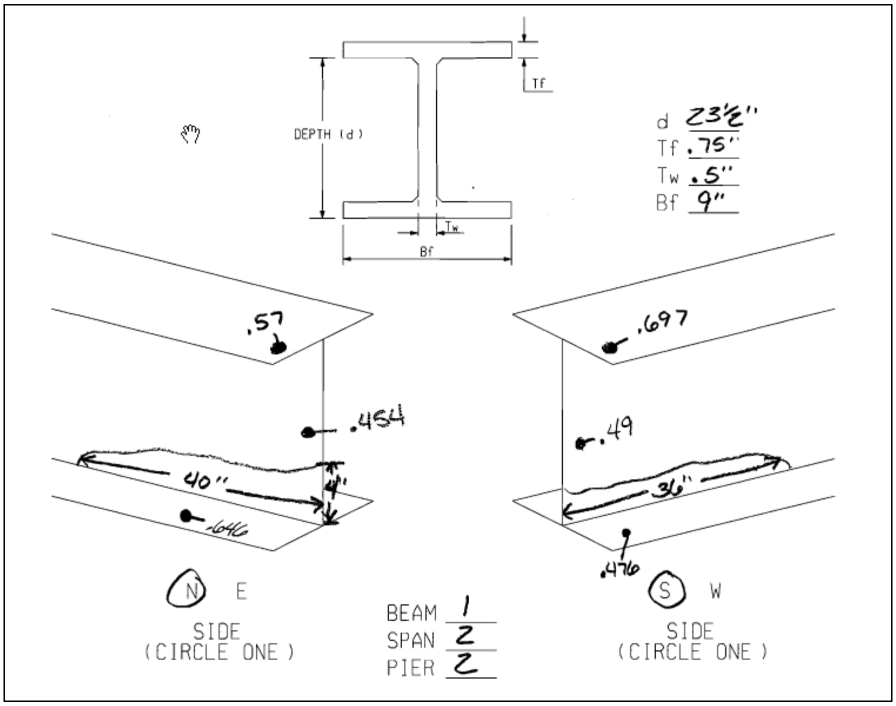
Note the type and condition of the bridge railing. Does the railing meet current standards? Is a thrie beam retrofit necessary or a railing replacement (existing condition and cost benefit must be reviewed)? Guardrail (on the structure and approaches) and pedestrian fencing, if present, should be inspected and the condition documented. In addition, the condition of brush blocks, raised shoulders/sidewalks, non-motorized pathways and how these elements transition from the approaches to the structure should be documented.

For reinforced concrete and prestressed concrete superstructures, visually inspect for shear or flexure cracking, exposed or broken prestressing strands, crushing of beam end in bearing areas, discoloration of concrete caused by corroding mild reinforcement or prestressing strands, high load hit damage and signs of previous repairs. Observe live loads crossing the structure and note excessive deflections or working cracks. Inspect the concrete diaphragms for spalling or diagonal cracking from structure movement or excessive deflection, and any other concrete defects. Document the use of temporary supports, condition of any existing temporary supports, or if temporary supports are needed for the structure until the proposed work is constructed.

For steel beam superstructures, visually inspect for areas of section loss, heavily rusted areas or any web buckling due to excessive section loss. Document any areas that are prone to trapping water or debris. Pay close attention to gusset plates. Document the condition of the paint.

Thickness readings shall be taken at each beam end using an ultra-sonic thickness gage. Preparation shall include removing all dirt, debris and rust from the ends of each of the steel beams under the joints so that the steel can be inspected for section loss. Thickness readings on the web and the bottom flange are to be taken at the thinnest locations within 12 inches of the end of the beam.
These thickness readings will be compared with the original thickness and the percentages of section loss will be calculated. This data will be tabulated in the Beam End Thickness Table (see Appendix C-3) and sketches will be prepared for major components, showing the location of the deteriorated areas. When beam end repairs are necessary, document the locations of beam ends that need to be repaired (one method would be on the existing erection diagram from the as-built plans). This information will be presented in the Appendix of the scoping report. These documents are used by the MDOT load rating engineer in the Bureau of Bridges and Structures to perform load rating analyses as needed, and by bridge design engineers to determine if repairs are needed, and to design any needed steel repairs. The following figure (6-3) shows a typical sketch of beam end section loss measurements:

Figure 6-3: Sketch of Beam End Section



Visually inspect the steel superstructure for any areas that may exhibit out of plane bending or distortion such as web to diaphragm or cross frame connections, lateral gusset plates to web connections and/or connections of any other secondary members to beams. Document any fatigue prone details, or any welding in the tension zones that are transverse to the plane of stress. Inspect all pin and hanger assemblies for proper operation. Does the pin and hanger meet current standards? Document the condition of pin plates and if the ends are touching due to pin and hanger closure.

In other areas of heavy flaking rust, clean as necessary to measure for any section loss. Thickness readings will be taken at the thinnest locations and documented. Note the condition of all bearing devices. For elastomeric bearings, check for excessive bulging of the sides (greater than 15% of bearing thickness), shear deformation due to thermal movement, splitting/tearing and discoloration from exposure to light.

For steel bearings such as rocker bearings or pedestal bearings, inspect for pack rust, rocker alignment, section loss and paint condition. For expansion rocker bearings record:

- The offset of the rocker.
- The direction of the offset.
- The average ambient temperature for the three days leading up to inspection.

If the offset of the expansion rocker bearing exceeds the values outlined in the Maximum Rocker Bearing Offset table, realignment of the rocker should be recommended.

Maximum Rocker Bearing Offset

Rocker Plate Width (in)	**Max. Rocker Offset (in)**	**Max. Rocker Rotation (degrees)**
6	1½	10
7	1¾	12
8	2	14
9	2¼	10
10	2½	12
11	2¾	13
12	3	14
13	3¼	15
14	3½	16
15	3¾	18

For timber structures, visually inspect for checks (separations of the wood fibers parallel to the grain direction), knots and splits which are natural defects that may provide openings for decay and begin to reduce the strength of the members. Inspect for fungus, insect damage or any other effects of nature. Inspect for in-service defects such as fire damage, vehicular collision, abrasion or mechanical wear, overload distress, excessive deflection of flexural members, weathering or warping and chemical damage. Perform a pick or penetration test at various locations, which involves lifting a small sliver of wood with a pick or pocket knife, and observing whether or not it splinters or breaks abruptly. Sound wood splinters, while decayed wood breaks abruptly. Inspect areas near the support to check for horizontal shear cracks along the grain of the member. Inspect bearing areas for crushing due to decay. Note the condition of fasteners and connections.

The vertical clearance of bridges over roadways must be field verified and documented on the Structure Clearance Measurements form (Form 1190), Bridge Scoping Report and Details Worksheet, in the executive summary and stated in the report. Additionally, a photo of any vertical clearance sign attached to the bridge must be taken.

For structures not meeting minimum vertical underclearance criteria, raising the structure to meet current standards must be considered in selecting the repair option. Any option including a deck replacement, superstructure replacement or bridge replacement must meet the minimum vertical underclearance requirement. If this is not a feasible option a Design Exception will be required. See the MDOT Bridge Design Manual, Section 7.01.08, for minimum vertical clearance requirements.

The Design Exception is not the first option however it may be used as a short term solution. One option that could be considered would be lowering the grade of the roadway under the structure. If lowering the grade is a feasible option, it could occur at a different time (later years of the Five Year Program). The cost of raising the grade of the bridge and/or lowering the roadway grade below the structure, to obtain acceptable underclearance must take into account additional approach work.

The width of the structure must be evaluated to determine whether it is functionally obsolete. If widening is necessary to upgrade the structure to current standards, or for maintaining traffic during construction, this must be stated in the report. Describe the widening that is being recommended and provide a plan view sketch showing the proposed widening. Specify if widening can be done within the existing deck width, or if additional beam lines and substructure width will be needed to accommodate the required deck cross section. When considering the widening, make sure the additional approach work (if needed) is documented and included in the estimate. For FHWA oversight projects potential DEs must receive FHWA concurrence. Refer to the MDOT Bridge Design Guides, Section 6.05 for bridge deck cross section guidelines.

During the scoping of a project, it must be determined if part-width construction is possible or if the entire crossing must be closed and a detour used. The estimator should contact the TSC Traffic and Safety engineer for assistance in estimating the costs for maintaining traffic and the mobility analysis required. Final detailed maintaining traffic costs for construction will be documented in the Bridge Scoping Report and the Bridge Scoping Report & Details Worksheet. For additional information and guidance, refer to earlier sections in this chapter and Chapter 8 in this manual.

If the approach pavement requires replacement, it shall be included in the bridge scoping reports and these items added to the estimate. For additional information and requirements refer to the Road Standard Plans R-43 Series.

The area immediately adjacent to the structure must be evaluated to determine if there are any site issues or constraints that may impact construction. Each quadrant of the structure is to be evaluated and photo-documented (refer to the Bridge Scoping Report & Details Worksheet for the items required). The items below are an example of what should be evaluated for impacts:

- Businesses or driveways close to the approaches
- Utilities attached to or near the bridge
- Signs or sign brackets attached to the bridge (specify if the

connections are bolted or welded)

- Poor alignment or geometrics
- Approach and departure guardrail terminals or the presence of impact attenuators
- Bank erosion or scour and/or unusual channel features
- Railroad track location
- Proximity of other bridge structures
- Is drainage sufficient
- Existing Right-of-Way width
- Recreational trails
- Proximity of adjacent buildings/structures
- Bicyclist and pedestrian access and facilities (including curb ramps).

If applicable, the following items must be evaluated and costs considered:

- Historical status
- Does this bridge have special structural design features which may affect the repair options, such as lack of load path redundancy, fracture critical members, category E' allowable fatigue stress details, etc. (see AASHTO Standard Specification for Highway Bridges, 17^{th} edition, Section 10.3, tables 10.3.1A, 10.3.1B and 10.3.1C for descriptions and illustrative examples)?
- Vertical underclearance to standard
- Is the structure functionally obsolete (any widening as a part of rehabilitation)?
- Environmental issues
- If it is a pedestrian structure, does it meet current ADA criteria?

If, during the site review, structural conditions are found that may cause the bridge to be load restricted (such as holes in beams, broken prestressing strands, etc.) or which may require other immediate action (such as lane closures or emergency repairs to holes in the deck, temporary supports, false decking due to spalled concrete, etc.), the Region Bridge Engineer and the Region System Manager shall be notified immediately. Documentation of the condition (such as beam measurements, pictures taken, etc.) will be provided to the Region Bridge Engineer as soon as possible.

If, during the site review, the scoper determines there is a need for material evaluation or more advanced non-destructive testing, the Construction and Technology Division or Region Materials Unit should be contacted. Examples of material testing include taking 2 inch or 4 inch concrete cores to evaluate the strength and material properties of the concrete. Examples of non-destructive testing include ultrasonic testing or dye penetrant testing of steel to confirm if cracks exist.

Determining Repair Options

Each bridge will be evaluated to determine the most appropriate repair option based on the physical condition of the bridge, economic considerations and sound engineering judgment.

The Bridge Deck Preservation Repair Matrix in Appendix A-6 must be consulted for reasonable deck repair options based on the condition of the deck surface and underside. This is to be used as a guide and shall not substitute for sound engineering judgment. Also refer to Chapter 5 of this manual for additional repair options.

Accelerated Bridge Construction Techniques

Accelerated Bridge Construction (ABC) is the construction that uses innovative planning, design, materials and construction methods in a safe and cost-effective manner to reduce the on-site construction time for new bridges or replacement and rehabilitation of existing bridges. ABC techniques, including Prefabricated Bridge Element Systems (PBES) and Slide-In Bridge Construction, are recognized by (MDOT) and (FHWA) as important and effective methods to construct or rehabilitate highway structures, while reducing the impact of bridge construction activities on mobility, the economy, and user delay. All major rehabilitation or reconstruction bridge projects should be evaluated to determine if ABC is suitable and provides a benefit taking into consideration safety, construction cost, site conditions, life cycle cost of the structure, MDOT's mobility policy and user delays, and economic impact to the community during construction.

When considering ABC, new technologies in the form of construction techniques, innovative project management, high performance materials, and pre-fabricated structural elements should be combined to achieve the overall goals of shortening the duration of construction impacts to the public, encouraging innovation, ensuring quality construction, and expected serviceability of the completed structure. Prefabricated bridge elements can be built on-site away from traffic if site conditions warrant, or they can be fabricated off-site and shipped to the site. Both methods offer advantages in quality control compared to cast in place construction where schedule or staging dictate the work progression. Special attention will need to be paid to the erection of prefabricated elements and the connection details.

All proposed ABC candidate projects are subject to Statewide Alignment Team Bridge (Bridge Committee) approval. Candidate projects, during the scoping or structure study phases, are to be presented at the monthly Bridge Committee meeting, The Bridge Committee will review candidate projects for further evaluation, and grant approval to pursue ABC techniques and determine availability of Bridge Emerging Technology funding.

Strategic implementation of ABC is required to ensure the application is appropriate for the project location and objectives. The following criteria should be considered during the bridge project scoping process to determine if ABC is appropriate.

Criteria Consideration

Site:

- Is the bridge located in a remote area?
- What are the existing structure characteristics and foundation type? Often, the existing substructures may be in the way of achieving full prefabricated or accelerated construction.
- Is the existing terrain difficult to traverse?

- Are there pre-casting and concrete readi-mix facilities in the area?
- Is there access for equipment and/or sufficient space for a pre-casting operation?
- Can the pre-casting site and subsequent structure move path be completed successfully without significant impacts to adjacent residents and businesses?
- Is there ROW available to build on site away from traffic then move into place?

Average Daily Traffic:
- Is the bridge located on a high ADTT route?
- Would delays have impacts to local economy and community services?

Delay or Detour Time:
- Does closure of the bridge require a long detour?
- Are large delays expected due to part-width construction?
- Are emergency services adversely impacted?
- How is the MDOT mobility policy impacted?

User Costs:
- What is the value of maintaining traffic on an interstate route?
- What is the duration of the impact for conventional construction vs. ABC?
- What is the user delay cost given the staging?
- What possible savings can be realized by shortening the construction duration?

Impact to the Local Economy During Construction:
- Will a detour or maintenance of traffic scheme result in serious impacts to the local economy and businesses?
- Will conventional construction impact any significant local/public events to where considering ABC options could avoid them?

Safety:
- Does staged construction on the interstate require working adjacent to traffic?
- What posted speed is proposed in the construction zone?
- Does complex staging expose the public and workers to unsafe conditions?

Environmental Issues:
- Are there seasonal issues limiting construction (i.e. bridges over waterways)?
- Are air quality, ambient noise, and other quality of life issues a factor?

Technical Feasibility:
- Is part width construction proposed on structure with spread footings?

- Is part width construction proposed on structure founded on sandy soils?
- Is the bridge on a river crossing with scour or hydraulic issues?
- Is the structural capacity of the existing substructure known?
- Will removal of portions of existing bridge during staged construction have an adverse impact on the remaining portions of the bridge?

Quality Concerns:

- Would part width construction affect the expected service life of the structure?
- Would the use of innovative materials increase the expected service life of the structure?
- If the initial cost of ABC construction is more than conventional construction, is there overall life cycle benefit?

The above criteria and questions must be carefully evaluated during project scoping and preliminary design to determine if ABC implementation will be of benefit. An ABC decision making tool is currently under development that will help evaluate the above criteria.

If the determination has been made that ABC will be implemented on a specific project, the next step is to choose the methods that are technically and economically feasible. ABC can be PBES or it can be full structural placement methods such as Self-Propelled Modular Transporter (SPMT) or building a bridge on temporary false work and sliding into place.

PBES can be built on site away from traffic if site conditions warrant, or they can be fabricated off site and shipped to the site. Both methods offer advantages in quality control compared to cast in place construction where schedule or staging dictate the work progression. Erection of prefabricated elements and the connection details will require special attention being paid to the following:

Detailing Considerations

Dimensional Tolerances:

- Connections between elements must accommodate field erection
- Elements fabricated off site should be test fit or otherwise confirmed to be of the correct dimensions prior to shipping
- Templates should be used to ensure correct fit up between prefabricated elements or between a prefabricated element and a cast in place element
- Connection details should be standardized

The weight and size of precast elements:

- Need to ensure elements can be erected with contractor's equipment
- Need to ensure elements can be shipped to the site

- Need to ensure elements can be erected without long term lane closures

The following prefabricated elements may be considered for use on MDOT bridge projects:

- Precast Full Depth Deck Panels
  - These may be transverse or longitudinally post tensioned
  - Panels are sensitive to skew and beam camber and haunches
  - May have long term maintenance concerns
  - Riding/wearing surface material to be used
  - Dimensional tolerances are very tight
- Decked Beam Elements
  - Two steel beams connected with deck (modular beams)
  - Decked bulb T beams
  - Decked prestressed spread box beams
  - Systems rely on full shear and moment capacity joints and closure pours
  - Camber control required
- Pier Elements
  - Precast pier caps
  - Precast columns
  - Precast pile caps
  - Systems rely on grouted or mechanical reinforcement splices to develop reinforcement sufficiently to transfer reactions from one element to the next
  - Multiple smaller caps spanning two columns as opposed to one large cap should be considered
  - Pier columns that directly support beams without pier caps may be considered
- Abutment and Other Elements
  - Precast abutment panels
  - Precast footings
  - Precast backwalls and wingwalls
  - Systems rely on grouted or mechanical reinforcement splices to develop reinforcement sufficiently to transfer reactions from one element to the next
  - Voids can be considered to reduce weight
- Precast Approach Slabs

Dimensional tolerances are very tight for all PBES. The tolerance sensitivity required when erecting prefabricated elements may require dual or independent survey contracts to ensure proper fit up, camber, deflections and finished grades.

The following full structural placement methods may be considered for use on MDOT bridge projects:

Placement Methods

Self Propelled Modular Transport (SPMT):

- Computer controlled platform vehicle with movement precision to within a fraction of an inch
- Capable of lifting 165 to 3,600 tons
- Vertical lift range of 36 to 60 inches
- Axle units can be rigidly coupled longitudinally and laterally
- Move costs range from $50,000 to $500,000 (mobilization costs are significant, so SPMTs should be considered on corridors where multiple bridges may be moved)
- Limited to use on sites with minimal grade changes
- During design, need to consider dynamic effects of move on structure
- If using multiple SPMT's, need to ensure proper bracing for overall stability during move

Lateral Bridge Slide:

- Bridge section is built on temporary supports adjacent to existing substructure
- Bridge section bears on stainless steel, or other low friction surface such as Teflon
- Existing substructure units can be reused or new units constructed with minimal impact to traffic
- Bridge section is laterally jacked into place
- Cost to slide a bridge is approximately $50,000 to $80,000 depending on the size of the bridge
- Additional stiffeners and/or diaphragms may be required on beams at point of jacking force application
- Additional reinforcement in concrete elements may be required to control jacking stresses, or other ABC related construction loads

Incremental Launching:

- Bridge section is built near approaches, then longitudinally launched into place
- Prestressing may be required for concrete elements due to alternating bending moments generated during launch

Allowing the contractor to select methods of placement may also lead to additional innovations and acceleration to the project schedule. Depending on the complexity of the overall project, innovative contracting methods may also be used in conjunction with ABC/PBES techniques. Innovative contracting methods are approved on a project by project basis by the MDOT Innovative Contracting Committee and the MDOT Engineering Operations Committee.

The Federal Highway Administration provides additional information about ABC and PBES at the following website: http://www.fhwa.dot.gov/bridge/abc/index.cfm

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Chapter

7

Project Scoping and Package Requirements

Topic	Page #

Introduction

Checklists for complete scoping

The purpose of this chapter is to help educate and create an understanding of the importance of a detailed scope and to give examples of items that are often overlooked in the scoping process.

Several checklists to use

In addition, the Scoping Report & Details Worksheet has been structured to allow the estimator to go through the scoping process in an organized fashion and collect or consider the information required for the estimate. This information will be used during the estimating, planning and decision making process of scoping. The information will be filed in ProjectWise and will then be summarized and noted for the scoping package.

Checklists

To assist in the scoping process, several checklists have been developed. Road Scoping Report & Details Worksheet, Bridge Scoping Report & Details Worksheet, Road CPM Scoping Report & Details Worksheet and Bridge CPM/CSM Scoping Report & Details Worksheet. These checklists will enable an individual to proceed through the scoping of a project in a productive and systematic manner while minimizing errors.

Where to find checklists

Checklists have been developed to assist in scoping projects, ensuring that all documents required in a scoping package are included and provide guidance for items to be reviewed during the scoping process. The checklists discussed can be found in Appendix B.

Each checklist shall be completed with the option of providing additional information and documentation where needed. Information in this chapter has been added to help guide the user. Completing each checklist that is applicable to the project/template being scoped is critical to the successful completion and approval of the scoping package.

If Innovative Contracting Concepts are considered, additional information is to be placed within the checklist. This detailed information should be placed in the space labeled "*Other General Notes on Proposed Improvement*", under the Proposed Work (typical) section, on each checklist.

The Scoping Package Master Checklist

Function of the Scoping Package Master Checklist

The Scoping Package Master Checklist is required for every project scoped. This checklist provides the information to be included in each scoping package and the order of the scoping package contents. Utilizing the checklist ensures uniformity in all scoping packages. This checklist provides spaces for signatures for reviews and approvals.

Identification Conventions

A Control Section (CS) is assigned to every section of a roadway in which MDOT has jurisdiction. The first two digits of the CS indicate which county the roadway is located in. Every project has at least one CS. The major CS associated with a job is the one having the most amount of work, based on largest amount budgeted for the work and/or length in route miles. Once a CS is selected as major, all other control sections associated with that job, are considered to be minor. A Major CS should not be revised after plan completion since it is referenced in the construction contract process as part of the Contract ID.

A Physical Reference (PR) number is another way to identify a section of roadway. All roadways have a PR number assigned to them.

MDOT bridges are identified by specific coding. Bridges are Y## of XXXXX where:

Y designates the type of crossing
- S = Grade Separation
- B = Structure over Stream
- R = Road over Railroad
- C = Culvert (10-20 feet)
- X = Railroad over Road

designates the bridge number

XXXXX designates the Control Section (CS) where the bridge is located.

Cost

Once the project estimate has been completed, all of the costs for the project shall be summarized on the Statewide Scoping Package Master Checklist. These costs include Preliminary Engineering (PE), Construction, Construction Engineering (CE) and Right-of Way. Refer to Chapter 8 of this manual for guidance in estimating project costs.

Roadway and Bridge Condition Indicators

Remaining Service Life (RSL) is the estimated number of years, from a specified date in time, until a pavement section reaches the threshold distress index. The RSL is a function of the distress level and rate of deterioration. This information will be included on the Statewide Scoping Package Master Checklist, for the roadway segment associated with the project. See Chapter 4 of this manual for additional information.

Fix life – how long fixes will last

Fix Life is the anticipated pavement life provided by the fix, excluding any future preventive maintenance treatments. The Fix Life applies to Road and Road CPM projects as well as substantial lengths of roadways modifications on Bridge projects. The Fix Life does not apply to Bridges or Bridge CPM/CSM projects.

How to calculate RSL at Construction

RSL at Construction is a theoretically projected RSL value calculated by first determining the number of years from the year of the existing RSL value to the proposed year of construction and then subtracting that value from the existing RSL value. For example, if a segment of road has an existing RSL of 5 years in 2008, and an improvement is programmed in year 2013, the RSL at construction is 0 years (5-5 = 0).

The Sufficiency Rating information for the section(s) of roadway will also be included on the Statewide Scoping Package Master Checklist. See Chapter 4 of this manual for additional information.

In addition, the National Bridge Inspection (NBI) rating will be shown on the Statewide Scoping Package Master Checklist - Bridge and Statewide Scoping Package Checklist - Bridge CPM/CSM. For additional information on the NBI rating see Chapter 4 of this manual.

Project Scoping Document Package (revised 6-24-2019)
This section of the Statewide Scoping Package Master Checklist includes a list of all the items that should be reviewed and included in the completed scoping document. Once an item is included in the final scoping document it may be checked off the list. The items to include in a scoping document may vary by template; therefore the checklist is also spilt by template. The items listed to be included in the scoping package correspond to the folders in ProjectWise where each item is to be filed.
Project Quantity Spreadsheet (PQS) will be the tool to itemize the project quantities, and AASHTOWare Project (AP) Preconstruction will be the tool used to estimate the project at the scoping phase. Refer to Chapter 8 of this manual for more information on estimating projects and the use of PQS and AP Preconstruction.

Not all items listed on the checklist will be available or applicable to the project being scoped, therefore a box marked NA appears on the checklist. For example, when a project is scoped for the first time, there will not be any Previous Call For Projects Information available to include in the scoping package.

Photos

The value of photos

The inclusion of photos, or video, in the scoping document is very useful. Certain items lend themselves more readily to photos and should be included in the scoping document. Other photos are helpful but not necessary and they may also be included in the scoping document. The photo log photos can be a valuable tool and maybe printed and included in the package. Color photos are not required, but often add clarity and detail to the item being photographed. Some items that should be photographed include (see Scoping Report & Details Worksheet):

Examples of helpful photos

- Areas showing unusual deterioration or distress relative to the remainder of the road, bridge or culvert
- Areas with erosion issues or slope stability concerns
- Sample pictures of roadway and/or shoulder condition

- Areas of proposed work for roadways, needed to describe or show the relative location of the feature (i.e. intersections, drives, guardrail, drainage structures, culverts, tree lines, sidewalks (or worn paths indicating evidence of pedestrian activity, bridge, bridge railing, bridge approach(es), utilities, ditches, waterways, building location relative to ROW/roadway, signs, ROW fence, etc.)
- Areas of proposed work for structures (i.e. elevation views (both sides of bridge), deck surface, joints, railing, approaches, underside of deck, superstructure elements (beams, bearings, pin and hanger, etc.), substructure abutments (including slope protection) and piers, waterways/railroad tracks, signs (Vertical clearance signs, load posting signs) and quadrant photos)
- Deck surface photos (if required) shall be an "aerial view" taken from a height of at least 12 feet above the surface of the deck.

How to annotate the photos

Identification of each photo is important. Where was the photo taken? What direction was the photo taken? What was photographed or what was the purpose of the photo? If the photo is of a culvert, what size is the culvert? The date a photo was taken is important information to provide.

Bridge Scoping Report (revised 6-24-2019)

This section identifies the items and order of those items that comprise the Bridge Scoping Report. The Bridge Scoping Report is a separate document that is prepared during the scoping phase (for review by Lansing C&T) and included in ProjectWise, with all the documents and items listed on the checklist.

The Bridge Scoping Report consists of five sections and an appendix. The sections are the:

- Executive Summary
- Field Site Review
- Rehabilitation Options
- Summary of Repair Recommendations
- Maintaining Traffic/Mobility Summary

The Executive Summary includes a statement of the recommended treatment for the bridge and the cost of the initial repair. The Executive Summary will be a "stand alone" section and will not reference other sections of the report, but will summarize the content of the other sections.

The information to be included in the Executive Summary shall be as follows:

- Recommended repair option and cost
- The general condition, and NBI ratings for item 58A (deck surface), item 58B (deck underside), item 58 (deck), item 59 (superstructure) and item 60 (substructure), with any of the recommended NBI ratings that may apply (based on the detailed scope evaluation that may differ from the latest rating provided) in parentheses.
- The percent of each type of deficiency (spall, delamination and map cracking) of the deck surface, deck underside and

substructure units. State if recommended repair option is consistent with the Bridge Deck Preservation Repair Matrix and justification why or why not.

- Eligibility for FHWA funding and current sufficiency rating. State whether structure is on or off the National Highway System (NHS).
- The field measured existing vertical underclearance and any utilities (that are) on the structure

The Field Site Review section will include, as a minimum, discussion of the following areas:

- Overall assessment of the condition of the bridge including an evaluation of the beam end thicknesses (webs and bottom flanges) taken during the site review. State percent deck surface and underside deficiencies.
- Sketches of beam end repair areas, all substructure elements showing repair areas for all faces and typical deck sections for widening options.
- Site issues, such as geometrics, vertical clearance, maintenance of traffic, utilities, scour, etc. In cases where no site issues that impact the rehabilitation of the structure were identified, a statement will be made that all areas were investigated, and no issues were found.
- Any testing results and implications to the repair options. If no testing was performed, this will be stated in the report.

The Rehabilitation Options section of the report will include an evaluation of the site review findings, the preparation of and evaluation of a minimum of three repair strategies, including the preparation of cost estimates and finally the selection of the best repair option. For each option, a discussion of the necessary improvements and the associated costs will be included. The report must discuss and state the reasoning and judgment for selection of the recommended option. This discussion will also include the reasoning for the elimination of all other options, as appropriate.

For the deck replacement, superstructure replacement and bridge replacement options, it is necessary to address eliminating or correcting undesirable or deficient design characteristics (i.e. structural capacity, minimum underclearance, stopping sight distance (SSD), horizontal clearances, capacity, functional operation, multi-modal accommodations, etc.). Early coordination with FHWA, on potential oversight (3R & 4R NHS) projects, will help with the proposed scoping. In addition, the roadway geometrics should be reviewed with any 4R bridge work so that the bridge does not preclude bringing the road system to standard with the current project or future road projects.
Reference to the Bridge Deck Preservation Repair Matrix is to be made, and justification as to agreement or disagreement with the rehabilitation option outlined by the Bridge Deck Preservation Repair Matrix.

The Summary of Repair Recommendations will state the recommended rehabilitation for the structure and the factors used in determining this recommendation. This section will also briefly discuss the effects of postponing the recommended improvements.

The Maintaining Traffic/Mobility Summary will include a discussion of the various options reviewed to maintain traffic, during construction, and a summary of the results mobility analysis and review that was done for the preferred maintaining traffic scheme.

The Appendix content and order for the Bridge Scoping Report are shown in Section II of the Statewide Scoping Package Master Checklist – Bridge.

General Information and Background
The contents of the scoping package must be placed in ProjectWise (including Bridge ID numbers), see Chapter 10 of this manual for additional information on the setup of ProjectWise folders. If the project being scoped is to be packaged with other projects for design and/or construction, these other projects should be noted on the Statewide Scoping Package Master Checklist.

Additional CS and PR Box
Occasionally a project may have more then one set of identification controlling numbers. When this situation occurs, the major CS or PR number will be shown on the first page of the Statewide Scoping Package Master Checklist. All secondary CS and PR numbers or other information relating to the project location shall be shown (and listed) in the comment box, on page two of the checklist and will be beneficial for project estimating.

The Road and/or Bridge Scoping Report & Details Worksheet

The function of the worksheet and where it is stored

The Scoping Report & Details Worksheet (Road, Bridge, Road CPM or Bridge CPM/CSM) is a working document that is used to assemble the existing and proposed project data. This document details the information collected and provides a single place to record the information for inclusion in the scoping package. The worksheet contains areas for notes and sketches (electronic typicals can be inserted). The Scoping Report & Details Worksheet is required for each project scope and is included in the project files, as well as in ProjectWise.

Anytime a reference is made indicating left or right, this should be referenced in the direction of stationing, which does not always correspond to the direction of traffic.

Some specific sections of the Road CPM or Bridge CPM/CSM Scoping Report & Details Worksheets may not apply to the project being scoped. For these sections, the "Not Applicable?" box on the worksheet may be checked and that section can then be skipped.

Job and Scoping Package Information

Section I is a brief general overview of the project and provides the where (control sections and locations), the who (scoped and reviewed the package) and the what (executive summary and typicals) for the proposed project.

Executive Summary

Section II provides a general description of the project. Items generally summarized here will range from the type of work being proposed to any special circumstances that will be considered within the project limits. For bridge projects, this section is similar to the executive summary included in the Bridge Scoping Report and information may be copied and pasted from the worksheet to the Bridge Scoping Report.

Typical Cross Sections

Section III provides space on the worksheet that will enable the estimator, scoper and/or scoping team to make sketches of the existing roadway or bridge approach typical section while out in the field. Existing typical sections may also be obtained from old plans and copied and pasted into the worksheet. The proposed typical section may be a sketch made while in the field or may be an electronic drawing and inserted into the checklist. The typical sections are to aid in estimating the proposed project, by providing a visual of the existing material and proposed materials.

Existing Conditions (revised 6-24-2019)

Section IV of the checklist provides a place to list the details about the various existing design elements (i.e. lane widths, lane usage, pavement section, geometric details, bridge railing type, deck condition, multi-modal accommodations, etc.) which should be reviewed as part of the scoping process. Existing information is an essential part of a project scope and is the foundation in which a project scope is started. Therefore, it is critical that this information be complete and accurate. The information found in the existing conditions section of the worksheet is often used throughout the life of the project, from the scoping and estimating to design and construction.

Proposed Work

Section V is where the details for the proposed design elements will be listed (i.e. lane widths, lane usage, pavement section, geometric details, proposed deck rehabilitation, superstructure rehabilitation needs, etc.). This section of the checklist will aid in the development of the scoping estimate and will prompt the scoping engineer to think about the work that is to be performed and how it relates to the existing conditions.

In Section V-A of the Road and CPM worksheet, list all work type(s) and the related fix life(s) within the project limits. In addition, list what various fix types were considered during the scoping process, even if later in the scoping process these alternatives were eliminated to meet the Region and/or Statewide goals.

Additionally there is an area provided to indicate the proposed density criteria for the Hot Mix Asphalt (HMA) shoulder area. It is important for the density requirement for the shoulder to be determined and documented, during the scoping process. This will ensure that the shoulder design is for the right purpose (i.e. resurfacing or rebuilding for mobility). This information is not necessary for the Road CPM or Bridge CPM/CSM Scoping Report & Details Worksheet.

If the existing shoulder is being used and it was constructed to the current standard (determined by coring and measuring the HMA/ aggregate/ subbase thicknesses), then 92% density shall be required and attainable regardless of intended use. If the existing shoulder was not built to the standard (current standard at time of construction) then 90% should be required and attainable regardless of intended use.

Innovative Contracting Concepts

If Innovative Contracting Concepts are considered, additional information is to be placed within the checklist. This detailed information should be placed in the space labeled "*Other General Notes on Proposed Improvement*", under the Proposed Work (typical) section, on each checklist.

Drainage Information to Gather (Existing and Proposed)

The following information is to assist the scoper in completing the drainage portions (existing and proposed) of the Road or and Bridge Scoping Report & Details Worksheets and does not appear on the Road CPM or Bridge CPM/CSM Scoping Report & Details Worksheet:

Culverts

- Obtain as-built records.

    Review type of soils, culvert existing foundation condition (material), length, size and location. Compare current conditions to existing plans.

- Review repair history and/or any previous inspection reports (see the specific TSC Maintenance Coordinators and the TSC Development Manager). Additional information from the Hydraulics Unit may be available.

    If repairs have not addressed the problem, identify what the issues are. Document the problem in the Culvert Scope Inspection Form or in the storm sewer section of the Scoping Report & Details Worksheet.

Ditch Information

- Review the ditch(es) for existing erosion or slope stability issues.

    Erosion and slope stability issues should be addressed with the inclusion of the appropriate soil erosion and sedimentation control items.

Issues when the culvert is part of a county drain

- Is the culvert part of a county drain (see the applicable quadrangle map, MDOT Region Drainage Coordinator or the Region Permit Coordinator)?

  A county drain may require coordination with the County Drain Commissioner. For example, if any of the following exist, it may be beneficial to coordinate with the County Drain Commissioner (these issues may be the result of modifications made to the stream by natural or manual factors):

  - The downstream drain does not have enough capacity for storm water
  - Debris sources upstream can be eliminated
  - Issues or problems that exist outside of MDOT Right-of-Way that affect the drain
  - Any future plans for modifications or expansion that could be coordinated

- Is there any flooding history within the segment (see the specific TSC Maintenance Coordinator)?

  The following are possible issues relating to flooding:

  - Has flooding ever overtopped the roadway? If the culvert is the cause, it may need to be replaced.
  - Does flooding impact upstream properties? Can the source of flooding be determined?
  - Is there a lack of capacity of a structure that is part of the stream? Is there an increase in development in the floodplain, or land use changes in the upstream watershed (that can be identified)? If the cause of flooding is outside of the right-of-way, MDOT may have little ability to resolve it.

Additional information concerning existing or proposed ditches may be found in the Channel Information section below.

Storm Sewers

- What is the condition of the storm sewer (video taping is a good method to find the condition of the pipe)?
  - Is there evidence of cracking, spalling or corrosion?
  - Does the storm sewer have any joints, gaps or open seams (i.e. sediment passing through holes in the storm sewer and sediment entering the storm sewer could develop voids under the pavement)?

    If sediment is passing through the storm sewer, this could result in sinkholes above the sewer and possible pavement or sink holes/failure. The storm sewer should be analyzed for options, such as repair, lining or replacement.
  - Does cracking or spalling expose the steel reinforcement?

    Spalling concrete should be patched.

- What is the average condition of the drainage structures (manholes, catch basins or inlets)? Issues for drainage structures are similar to those listed above for storm sewers.

Channel Information

Issues when the culvert is part of a federally regulated waterway

- Is the culvert part of a federally regulated waterway (see the applicable quadrangle map or the Permit Coordinator)?
  These regulated waterways could include the great lakes, rivers, stream and/or wetlands that are connected to the great lakes. Modifications to these types of waterways may require state or federal permitting.

Issues when the culvert is part of a cold water trout stream

- Is the culvert part of a cold water trout stream (see the applicable quadrangle map or the Region Permit Coordinator)?
  Modifications to a culvert (or a segment of the stream) that may be part of a cold water trout stream may require unique permitting, and may include construction date restrictions.

Is there a channel obstruction and does it limit hydraulic capacity?

- Review Channel Geometry (creek, stream, tributary or river)
  - Are there any obstructions in the channel such as vegetation, fallen trees, encroaching fences, utility poles, etc?
    Do the obstructions appear to impact hydraulic capacity? If downstream obstructions are limiting the hydraulic capacity, this may cause flooding. If there are obstructions in the MDOT Right of Way, contact the maintenance coordinator. If these obstructions are outside of the MDOT Right of Way, contact your supervisor for further assistance (coordination with a maintaining agency may be needed).

Are there side stream inlets in the channel which may cause erosion issues?

  - Are there stream side inlets?
    Examples of stream side inlets are storm sewers, downspouts, under drains and ditches? If these inlets cause stream scour, an erosion control measure may be important.

Is there sheet piling which constricts the stream?

  - Is there any sheet piling? If so, is it constricting the stream?
    Sheet pile may be cut off at grade to prevent channel obstruction.

  - Check upstream and downstream culvert sizes compared to MDOT's culvert in question.

Is the channel bank stable?

- Check for bank stability.

  This is done by looking for overhanging trees or shrubs falling in towards the channel, exposed roots and/or undercutting erosion along the bank. The channel can be braided and meandering, yet stable and not cause structural culvert problems. Treatment options could include re-establishment or relocation of the stream, placing riprap or engineered treatment on the affected slopes and/or proposed maintenance methods.

- Does the culvert align with the stream channel?
  - If the stream and culvert do not vertically align, there may be perched culvert (which could be the result of County Drain clean outs and/or grading) and/or erosion issues.

  - Additionally, one or both ends of a culvert may be lower than the channel. Culverts may be designed with soil in the bottom so they can convey water effectively or provide wildlife benefits. This is not a problem and does not need to be corrected. Problems may occur when one end of the culvert is too low, which may reduce flow. There are two solutions to this problem, lower the channel or raise the culvert.

  - If the stream and culvert do not horizontally align, the stream frequently runs along the road embankment and may threaten the embankment stability. Solutions could include an engineered stabilized (i.e. riprap) embankment slope or installing the culvert with a skew to the roadway, that aligns with the stream.

General Drainage Information

- In this section there are various items that will need to be identified to determine any potential impacts or modifications required. These elements (i.e. underdrains, spillways, county drains, pump stations, detention/retention basins and erosion control items) may or may not be impacted by the proposed work type, but it is very important that they be identified during the scoping process for consideration in design.

Guardrail or Concrete/Cable Median Barriers (Existing and Proposed)

The existing guardrail and/or concrete or cable median barriers shall be identified, and the condition noted on the worksheet. In addition, the proposed guardrail and/or concrete or cable median barrier shall be noted for inclusion in the scoping document and estimate of the project.

Utilities (Existing and Proposed) (revised 7-18-2016)

This section is where existing public and private utilities are identified. The TSC Utility Coordinator can provide a list of potential utilities (private and public) within the proposed project limits. Preliminary Planning/Scoping Letter (Form#2483) should be sent to all the utilities requesting preliminary locations of the existing utilities. Form#2483 also serves as notice to the utilities of a potential project. Depending on the project type, these existing utilities may be impacted by the proposed work. These known, potentially impacted, utilities are identified on the worksheet and noted in the scoping documents. The utility section is not included on the Road CPM or Bridge CPM/CSM Scoping Report & Details Worksheets, since CPM type work does not typically impact utilities.

Traffic Signals (Existing and Proposed)

Identification of existing and proposed traffic signal needs and upgrades are identified in these sections of the worksheet.

Sidewalks (Existing and Proposed) (revised 6-24-2019)

Identification of existing sidewalks, curb ramps and sidewalk condition shall be noted in this section. Additionally, if there is evidence of a footpath or the need for proposed sidewalks to close gaps in existing pedestrian networks, this too shall be noted. Region In developing the proposed work for the sidewalk and ramps, it is important to consider the existing design elements and how they relate to the current standards. Proposed sidewalk, ramp upgrades or additions are noted in the proposed section of the checklist. Bus stops and on-street parking, within the project limits, should be reviewed for ADA compliance and discussed with the local communities.

General Conditions (Existing and Proposed)

This section of the checklist is a list of other miscellaneous items that should be reviewed and discussed during the scoping process for each project.

Bridge Underclearances

Bridge Underclearance

These are identified during the scoping process. Specific road, railroad and navigatable waterway underclearances are federally mandated and must be noted in the scope if there is a possibility that the underclearance may be impacted or should be improved.

Anticipated Design Exceptions

Design exceptions must be identified early. See Chapter 6 for details on the design exception approval process.

This section will identify anticipated Design Exceptions (DEs) during the scoping process. Although it is understood that information may not be available to determine the need for all design exceptions, the identification of some potential design exceptions should be apparent. The design exception portion of the Scoping Report & Details Worksheet lists the design elements which may require design exceptions, if the proposed roadway or structure feature does not meet current standards.

Permits & Agreements Required

This section identifies permits and agreements that may be necessary for a project during the scoping process. These permits and/or agreements will vary from project to project and could include permits for a variety of environmental issues, agreements for Act 51 participation, agreements for maintenance work, etc.

Environmental Information

Information/issues should be identified and reviewed during the scoping process. Potential environmental issues could include wetland impacts, floodplain impacts, threatened or endangered species, archaeology and environmental justice, historic features, tribal coordination, recreational or park lands and potential contaminated sites. Early identification of natural and cultural environmental resources can prevent project delays and helps to maintain the project budget.

Real Estate (revised 6-24-2019)

This topic is an area that is sometimes overlooked during the scoping process yet can be a relatively costly item to forget. ROW issues range from the need for proposed fee ROW to consent to grade driveway or consent to construct sidewalk. Careful review of the existing ROW and the potential need for ROW activities should be assessed and discussed with the ROW staff during the scoping process.

Stakeholder Information

Stakeholder engagement

Stakeholder Information/Engagement is required for each project. The level of Context Sensitive Solutions (CSS) or Stakeholder Engagement varies depending on the location of the project (rural, small town or urban) and the project type. The checklist specifies which level of CSS activities could be required for the project. Refer to Chapter 6 of this manual and the Guidelines for Stakeholder Engagement for additional information.

Supplemental Information

This section is where "other" items that are important and should be identified and discussed as appropriate during the scoping process. This section is not included on the Road CPM or Bridge CPM/CSM Scoping Report & Details Worksheet, these types of projects do not involve the items covered in this section.

Site Visit Notes

Here is where notes are taken during the TSC and/or Region Van Tours and other visits taken during the scoping process. This section is the place to document site specific areas of concern, specific constraints and any other notes that may be useful in preparing the scoping package and developing the estimate.

Traffic Safety and Mobility

Maintenance of Traffic

This section is where various concepts for maintaining traffic, during construction, should be considered and discussed. Attention shall also be given to maintaining pedestrian traffic, if sidewalks or non-motorized paths exist within the project limits. Consideration needs to be given, when a segment of road requires a specific number of lanes to be maintained during construction, which may require temporary or permanent widening of structures.

Safety

Various safety elements shall be reviewed during the scoping process. This section of the worksheet identifies the items that were obtained and reviewed. A sample Scoping Level Crash Analysis memo is included in Appendix D-4, as an example of the level of work needed at the scoping phase. Please note that a more detailed review of the crashes will need to occur as the projects proceeds into the design phase. The ASSHTO Highway Safety Manual (HSM) analysis may be considered for use on some projects.

Mobility

Steps needed for Work Zone Safety and Mobility

This section outlines the steps necessary for the Work Zone Safety and Mobility phase of scoping. The worksheet only outlines what steps must be taken to complete the analysis, as defined in the Work Zone Safety and Mobility Manual, and is not a substitute for the analysis itself. The MDOT Work Zone Safety and Mobility Manual should be referred to for detailed information. This section of the worksheet also provides room for describing possible maintaining traffic concepts, mitigation possibilities and safety related items considered pertinent to scoping.

Delay Mitigations

This section lists options for mitigating potential delays during the construction of the project. One or more of these options may be applicable to a proposed project.

Draft Job Information (revised 6-24-2019)

(JobNet)

This is the information that will be input into JobNet during the programming stage of a project. This information is required for a project to move from the scoping phase to the programming phase. Design may begin after the obligation of the programmed PE phase. Refer to Chapter 10 of this manual for more information on obtaining a job number and creating a draft job.

Checklist for Constructability Review – Early Project Scoping (revised 7-18-2016)

The Constructability Checklist should be used to document that issues related to the constructability of the proposed project have been reviewed and discussed. Some issues related to the constructability of the project include a review of a site investigation, construction staging and maintenance of traffic. Early identification of non-constructable or difficult to construct projects may indicate that additional items or different work types should be analyzed (i.e. scope and schedule impacts). The Checklist for Constructability Review – Early Project Scoping form (Form#1961) shall be included in the scoping package and will be included in the project folder, as well as in ProjectWise.

Culvert Scope Inspection Form (revised 7-18-2016)

Documenting the culverts which must be inspected during scoping

Culvert guidelines

The Culvert Scope Inspection form (Form#0592) should be completed for all culverts within the project limits requiring work ranging in size from 36" in diameter to less than 10' width. Culverts 10' and greater are inspected annually and those inspections reports should be reviewed as part of the scoping process. Culverts smaller than 36" should be looked at and any issues with the culverts should be noted in the scoping notes. Instructions for completing the Culvert Scope Inspection form are included with the form.

Depending on the scope of the proposed project, and a review of the records and the Culvert Scope Inspection form, corrective actions and construction costs may need to be developed. This process may involve a structural engineer, hydraulic engineer, geotechnical engineer, right-of-way specialist, permit specialist and others as needed. Culvert Scope Inspection form items with a "Yes" answer or rating "Poor" should be considered for corrective action and/or further discussion. Scope development will include itemizing pay item quantities, construction method recommendations and costs. The required Culvert Scope Inspection form shall be included in the scoping package and will be included in the project folder, as well as in ProjectWise.

The Bridge Deck Preservation Matrix

Use and limits of the Bridge Deck Preservation Matrix

The Bridge Deck Preservation Matrix, included in Appendix A-6, is a tool for Bridge Engineers to use in the selection of bridge deck repair options. The condition of the deck is usually the key indicator, leading to a structure being considered for rehabilitation or replacement. However, there are other issues affecting a bridge that may require the need for a rehabilitation project and the matrix may not address these other situations. Some of these situations include, but are not limited to, superstructure deterioration, substructure deterioration, corridor coordination, capacity issues and functional issues such as underclearance, horizontal clearance and/or bridge width. Sometimes it is desirable for an entire corridor to be brought up to a specific condition level as part of an overall strategy. The user is cautioned when interpreting the information from the matrix, to consider the context of each specific case and to use engineering judgment.

Cost Estimates (revised 6-24-2019)

How cost estimates are generated

Cost estimates for scoped projects are required to be included in the scoping package. These estimates will be generated from AASHTOWare Project (AP) Preconstruction. The details for estimating projects and the use of AP Preconstruction for generating these estimates is discussed more in Chapter 8. The quality, clarity and depth of these estimates are very important as these are used for budgeting and programming the projects. There are two reports that may be developed as a result of AP Preconstruction scope estimating. They are "The Itemized Estimate Report" and "The Project Concept Estimate Report". These two documents shall be included in the scoping package in ProjectWise. Refer to Chapter 8 of this manual for additional information.

Documentation of Decisions (revised 6-24-2019)

Importance of making documentation thorough and understandable to others

Documentation of items discussed, and decisions reached during the scoping process should be detailed enough for others to follow later in the design and construction phases. Decisions should be documented including items that are not included in the scoping package or work types considered and dismissed, so that the designers and others reviewing the scoping package will understand the decision process (and not go through some of the same discussions that have already occurred). This documentation, Scoping Project Record form (Form#0591) shall be included in the scoping package and will be included in ProjectWise. The Scoping Project Record form is to document the scoping history in each scoping package. In addition, see Chapter 6 for more information regarding the importance of documentation. Documentation of decisions is also important in the Change Management process, as outlined in Chapter 10.

Scoping Package QC/QA (revised 6-24-2019)

Review of scoping package

Multiple QC/QA reviews

It is recommended that each scoping package have a TSC level Quality Control (QC) review and a Region level Quality Assurance (QA) review completed by an independent person who was not directly involved in the development of the scoping package. It is also recommended that the bridge scoping package have a Region level QC and QA and Lansing Bridge Operations should provide the final QA of the proposed scopes. The checklists and worksheet discussed previously can be useful tools to communicate the project's intent to the engineer(s) during the QC/QA reviews of the scoping package. The QC/QA reviews should include a review that the scoping package is complete, checklists are complete, a check of the estimate for omissions/errors and conformity with previously agreed upon scoping direction.

Scoping Accountability & Sign-Offs

Sign-off needed on scoping package

The development of the scoping package is the first step in the process of improving Michigan's infrastructure. Each TSC must be accountable for the development of the scoping package for projects within the TSC. The TSC Manager or TSC Development Engineer must sign off on the Scoping Package Checklist ensuring that the scoping package has been reviewed and meets all necessary criteria, prior to the submittal to the Region for QA and processing. The person responsible for developing the scoping package must also sign and date the Scoping Package Master Checklist. In addition, the Region staff is responsible for sign off for the QA portion of the review.

Chapter

8

Cost Estimating

Topic	Page #

The Estimating Process (revised 6-24-2019)

Importance of getting a good estimate and what happens when the estimate is bad

The Estimating Process, during the Scoping Phase, includes determining the costs associated with all phases of a candidate project. The development of a complete and accurate estimate is critical to a successful project scoping package. The estimate developed, as part of the project scoping process, is used to program the funding of the design, Right of Way (ROW) and construction for the project. When the scoping estimate is not accurate, a lack of funding may result. Consequences resulting from lack of funding may include project delay, the need to request funds from other sources, modifications to the project scope, a reduction in the project limits or potential conflicts with the Region or Statewide Strategies and Goals.

Who to communicate with when estimating, and why

Pay items are found in MDOT's Standard Specifications for Construction

It is important when estimating, and designing, the project to continually communicate with other staff (not only in the same office but at the region and statewide) to obtain/maintain information on the latest design practices. In addition, it is important to include construction staff in the discussions and incorporate the information provided for the scope. This assists in the understanding of what may be included and how the project will be constructed (the construction method may affect the pay items used in the estimate). For a better understanding of what the standard pay items are and how they are used, refer to MDOT's Standard Specifications for Construction.

What an estimate includes and a method of developing one

An estimate shall include all major aspects of the proposed project, either as individual pay items or as a lump sum category (i.e. soil erosion items). One way to develop an estimate is to look at what will be removed as part of the project and what is necessary to rebuild the roadway or bridge. To achieve a complete estimate, it is important to include the removal of existing items and the replacement or new items.

Different methods to approach estimate calculation

There are different ways to approach calculating an estimate. One way is to compute the quantities for all the removal type items first and then compute the quantities for the proposed items. Another method would be to compute the quantities by categories (i.e. pavement, drainage, traffic, etc.). The important thing is to account for all the items of work and provide as complete and comprehensive an estimate as reasonably practical for the scoping package.

Scoping Report and Details Worksheet

The information gathered on the "Scoping Report & Details Worksheet" is extremely valuable when developing the estimate. The worksheet is designed to guide a person through the scoping process and develop an estimate that includes all of the items which should be considered and included in the scope and estimate.

Here are some basic steps that will help develop a good project estimate:

- **Documentation**

  Providing documentation is important and verifies an estimate. Document all assumptions, decisions on what to include or not to include in the estimate, and all notes that will assist those that review and use the estimate and scoping documents should be recorded. Make sure the documents are well organized.

Why to avoid using old estimates, spreadsheets, or computations

- **Always Start Fresh**

  When beginning an estimate always start fresh. The use of old estimates, spreadsheets or computations can result in errors, duplications or omissions. Unit prices often change, quantities are unique to a project and the pay items to include in a project may be unique to that project. Also spreadsheets and worksheets may be revised over time.

Where to put assumptions for easy viewing

- **List Your Assumptions**

  QA/QC reviewers and designers cannot account for or follow assumptions that were made and not documented. List the general assumptions at the beginning of the calculation sheets. If other assumptions come up as the estimate progresses, state them in words and make them stand out on the calculations sheet, so they are easily seen. If using Excel for calculations, type the assumptions into the file so they will be displayed and/or print whenever the file is viewed.

Avoiding the most common problem with estimates

Tips for clarifying calculations

- **Be Clear**

  Don't assume the QA/QC reviewer or the designer will know the thought process behind the estimate. This is probably one of the biggest problems with estimates. Estimates should be prepared in such a way that someone unfamiliar with the project can clearly understand the estimate. An easy way to do this is to write a small sentence or statement before a set of calculations stating what is going to be calculated and why. When formulas are used, be sure the input into the formula is clear for everyone to follow. Formulas used in Excel spreadsheets must be clearly defined, as well.

How to organize calculations and categories of pay items

- **Be Neat**

  If the first run through of an estimate is sloppy and unclear then re-write it on another sheet of paper. This will allow reorganization of items into a logical manner that flows.

  Keep all calculations for the same pay item in the same location. It may be difficult to track a quantity that is listed in several different areas. If it makes more sense to break out the estimate into segments, use a totals sheet with columns for the different segments should be used. When the calculations are done in an Excel spreadsheet the worksheets may be tabbed for the different categories of pay items (i.e. Removals, Pavement, Drainage, Guardrail, Traffic Control and etc).

Tips on rounding and estimating HMA

Converting from cubic yards (CYD) to tons

- **Quantities & Rounding**
  - Round quantities for all items to the nearest ten after computing the total
  - Add an additional 5 percent to quantities of (Hot Mix Asphalt (HMA) for estimating purposes. Include a note that this was done.
  - Weights for conversion from CYD (cubic yards) to Tons:
    - Aggregate = 4000 lbs/cyd or 110 lbs/syd*in
    - Shoulder Class II = 4000 lbs/cyd or 110 lbs/ syd*in
    - Coldmilling = 4000 lbs/cyd or 110 lbs/ syd*in

    Note: Weights for Aggregate and Shoulder Class II are for compacted in place (CIP)

Scoping Report and Details Worksheet

Tips for including drawings

- **Sketches and Typical Sections**

  The Scoping Report and Details Worksheet provide space for existing and proposed typical sections to be drawn or inserted. If additional sheets or drawings are needed to show the existing features or proposed work, include them in the scoping documents. These drawings will be helpful in estimating the project, by showing the items to be included for removal and construction. Include a sketch of what is being proposed for construction, and show dimensions, materials and etc. In addition, include old plans in the file to show the existing road conditions.

Tips for documenting project identification

- **Project Identification**

  Always identify the project at the top of the calculation sheet or in the header of the Excel spreadsheet, and note if there are different versions or different scopes. Often the system manager may ask for two different scopes to compare costs. Identify these as different work types and different versions. The information should include the job information (job number, route, control section, limits and etc), name of the estimator, date the estimate was done, name of the reviewer and the date the calculations were reviewed.

Tips for reviewers

- **QC/QA Review of Estimate**

  The calculations, assumptions and documentation for the estimate should all be reviewed at the TSC prior to submittal to the Region. Although the region will review the estimate, it is not the intent that the Region be the sole reviewer. The Region review should be a quick review of the estimate, not a thorough review that examines all calculations. The reviewers should mark their comments in a color pen that distinguishes the review comments from other marks on the calculations. The reviewer should sign (or initial) and date the estimate when the review is complete. If the signature of the reviewer is difficult to identify, the reviewer should also print their name. Make sure the names of the QC and QA reviewers are included on both the Statewide Scoping Package Master Checklist and the Road Scoping Report and Details Worksheet.

Time spent making sure the calculations/estimate are clear and accurate will save time later on the phone. If you are not available to clarify the intent, clarity will prevent the estimate from being changed to something unintended simply because the reviewer could not understand what the original intent was.

JobNet Chapter 10

- **Project Concept Statement**
  JobNet sums the categories from the estimate spreadsheet and places them into the categories that are most typically used by the region. This information will be helpful when initiating a concept in JobNet, see Chapter 10 of this manual. Due to rounding differences and the different category breakouts, always make sure that the total on the concept statement is the same as the total on the estimate spreadsheet. The two numbers are compared on the bottom of the JobNet Concept sheet to ensure nothing is missed.

Specific Situations in the Estimating Process

Determining how long a guardrail needs to be

Guardrail - If guardrail is to be removed, replaced and/or installed, the length of the existing guardrail to be removed can be determined from field measurement, old plans or existing inventory. Current guidelines may require longer guardrails. So the guardrail length could be estimated as the existing guardrail length plus about 10 percent. The estimate should include guardrail terminal treatments, should be included in the estimate as well as reflectors and 8 foot posts if needed.

Other ROW cost considerations besides fence removal and replacement

ROW Fence - A proposed freeway project may require the existing ROW fence to be removed and replaced. In addition to providing for the cost to remove and replace the fence, it would be advisable to include a quantity of Clearing for Fence, if the project location has areas of woods or overgrowth.

What to consider if the roadway has a nonstandard cross slope or a parabolic cross section

Crown and Superelevation Modification - If an existing HMA roadway has a cross slope less than the current standard (2 percent) or has a parabolic cross section, the project may include upgrading the roadway to the current standard. This may be accomplished by profile cold-milling or the addition of a HMA wedging course. The additional HMA quantity for the wedging course must be included in the estimate, as this can have a large impact on the funding. Modification of superelevation rates must also be addressed in the estimate, if included in the project work.

The importance of identifying roads with parabolic crowns

Although existing parabolic crowns are less frequent than in previous years, an effort to modify these cross slopes has been on going, however, roads with parabolic crowns still exist in Michigan. It is important to properly identify roads with parabolic crowns to correctly estimate the HMA needed to resurface the roadway to modify the cross slopes to the standard 2 percent "A crown" cross sections.

How to get a good estimate for embankment and excavation work

Earthwork, Subbase and Aggregate – Earthwork, both embankment and earth excavation, may be difficult to estimate at the Scoping phase. Old plans, and cross sections if available, may be used to determine the existing sections at various locations and conditions (cut or fill) along the length of the project. Approximate cross sections should be developed for use in estimating the earthwork. Cut and fill sections, within the project limits, should be examined separately. Computed earthwork quantities should be increased by 15 percent and rounded up to the nearest 100 cubic yards (cyds) for inclusion in the scoping estimate.

Determining a treatment when sub-grade undercutting is needed

Soils Engineer

If a project requires sub-grade undercutting, request old plans, field investigation information and recommendations from the Soils Engineer. During the scoping process, also request soil borings, which will assist in the analysis, determination of method and recommended quantities. The Soils Engineer needs to understand the proposed scope and strategy for this project, for the appropriate recommendations for treatment. Depending on the strategy for the roadway, the fix may range from removal to managing treatments of the section.

Estimating subbase

If a project requires proposed subbase, this too should be estimated by drawing approximate existing and proposed cross sections and determining the area of the subbase for the one cross section, then multiplying by the length of the project. The estimated subbase quantity should be increased by 10 percent and rounded up to the nearest 100 cyds for inclusion in the scoping estimate.

Estimating aggregate

If aggregate is required, use a similar method as described above, with the appropriate depth. The estimated aggregate quantity should be increased by 10 percent and rounded up to the nearest 100 cyds for inclusion in the scoping estimate.

Tips for good shoulder work estimations

Shoulders – When estimating the cost for shoulder work, it is important to include both the left and right shoulders or for divided roadways, two median shoulders and two outside shoulders. Remember shoulder thickness is often less than the HMA thickness of the mainline. The TSC Manager and/or the System Manager should be consulted with respect to cold milling and/or paving shoulders. Often the shoulders are fair or good condition and are excluded from the proposed work. This best practice encourages the focus of work on the mainline of the MDOT Trunkline system. In addition, class II gravel should be considered for the 2 foot gravel ribbon.

Accounting for deterioration

Joint Repairs – For projects that are scoped to include joint and/or pavement repairs, a factor for continued deterioration should be included in the quantities of work. This deterioration factor should be approximately 10 percent, after discussion with the Region System Manager or Region Pavement Engineer.

An estimating shortcut it's OK to take

Grouping of Specific Pay Items - For the estimate at the scoping stage it is not always necessary to compute individual pay items and quantities for every item. Some items may be grouped together and estimated as a lump sum amount or as a percentage of the project. For example, a cost for soil erosion and sedimentation control items should be included in the estimate for all projects; however it is not necessary to break out each type of soil erosion control item. A single line item in the estimate for soil erosion and sedimentation and control items will indicate this work has been accounted for in the estimate.

Estimating slope restoration

Another item, where this approach is acceptable, is for slope restoration. An overall slope restoration quantity should be computed with less concern over which type (type A, B, C or D). The estimate for slope restoration on a project should be increased by approximately 5 percent, as this is often an item that is difficult to accurately estimate at the time of scoping.

Identifying which items are based on a percentage of the project costs

Lump Sum Pay Items – Some of the pay items that MDOT uses have a Lump Sum pay unit and are based on a percentage of the project costs. Although not all projects require all of these items, many of the projects do require the inclusion of these items. It is important to determine at the scoping phase which pay items should be included and which are not necessary.

Lights during night work

If night work is anticipated for the project, due to circumstances related to the maintaining traffic, a pay item to compensate the contractor for providing the necessary lights to the project site is included in the project estimate.

Pavement cleaning

Road Design Manual

Pavement Cleaning may be required on cold-milling and HMA resurfacing projects, see the Road Design Manual 6.03.04 section B 2 for more detail.

Project Cleanup and what it includes

"Project Cleanup" is cleaning up the project area, including roadsides, prior to final acceptance. Project Cleanup includes removing all debris (such as old fences, fallen timber, logs and rubbish), within the ROW, up to 50 feet beyond the grading limits. This work also includes cleaning out all culverts, sewers and drainage structures that contain sediments from the contractors operations. Project Cleanup should be included as a pay item on most projects.

Contractor staking

Discuss with TSC Delivery staff

Contractor Staking on a construction project is the surveying and staking work to lay out the alignment and other control points for the contractor. The inclusion of Contractor Staking should be discussed with the TSC Delivery staff. Not all projects require inclusion of Contractor Staking, since MDOT forces may be available to perform these duties. During the design phase of a project, contractor staking is broken down into four separate pay items. For the scoping estimate, the cost of Contractor Staking is included in one lump sum pay item and is estimated at the rate listed in the table below.

Storm Water Management BMP

The post construction storm water management portion of the Storm water Management Plan requires that all MDOT projects be reviewed for storm water impacts and Post Construction Best Management Practices (PC-BMPs). These PC-BMPs maybe structural or vegetated and range in cost. For the scoping estimate, the cost for these PC-BMPs is included in lump sum pay item and is estimated at the rate listed in the table below.

Floodplain, Stream, and/or Wetland Mitigation

The anticipated cost of floodplain, stream and/or wetland mitigation permit requirements should be accounted for in the scoping estimate. Percentages for including this lump sum item in the scoping estimate are shown in Table 8-1 below.

Mobilization and what it includes

Mobilization is to reimburse the contractor for initial costs incurred prior to starting work on the project. This all costs involved with moving personnel, equipment, supplies and incidentals to the project site, as well as the cost of establishing the contractor's offices, buildings and other facilities necessary to undertake the work. It also includes other work and operations needed, or for expenses incurred, prior to work on the project site. This item applies to all projects.

Landscaping site preparation

Dealing with watering and cultivating

For projects with landscaping and planting material, pay items for Site Preparation are included. If MDOT is requiring the contractor to maintain by water and cultivating the planting for two years period the two pay items for Watering and Cultivating, 1^{st} and 2^{nd} Season are included in the project. Often a waiver is obtained to exclude the water and cultivating from the project and then these two items are not in the estimate.

The following table (8-1) provides guidance for the percentage to use for these lump sum pay items:

Table 8-1: Lump Sum Items

Lump sum percentages

Pay Item	Percent of Cost
Lighting for Night Work and Paving	0.50% of Interim Const Total
Pavement Cleaning	0.25% of Interim Const Total
Contractor Staking (*includes* staking items)	2.50% of Interim Const Total
Storm Water PC-BMPs - Roadway widening for Capacity Improvement (<$1,000,000)	3.00% of Interim Const Total
Storm Water PC-BMPs - Roadway widening for Capacity Improvement (>$1,000,000)	$100,000
Storm Water PC-BMPs - New Drainage Outlet	$50,000
Storm Water PC-BMPs - Recon/Rehab/Creation of enclosed drainage system	$50,000 or 1.00% of Interim Const Total, whichever is greater
Floodplain, Stream, Wetland Mitigation Permit (<$1,000,000)	3.00% of Interim Const Total
Floodplain, Stream, Wetland Mitigation Permit (>$1,000,000)	$100,000
Mobilization	10% of Interim Const Total
Site Preparation	35% of Plant Material Cost
Water and Cultivating, 1st Season	17% of Plant Material Cost
Water and Cultivating, 2nd Season	21% of Plant Material Cost

Note: The interim cost is the total cost of a project before these lump sum items are included in the estimate.

Soils/Pavement Engineer

Concrete Pavement versus HMA Pavement or Concrete versus Steel Bridge Beams – During the scoping phase it may not be known whether a pavement section, for a reconstruction project, will be concrete or HMA. This is often determined during the design phase with a Life Cycle Cost Analysis. For the purpose of estimating the project completely, it is prudent to prepare an estimate for both an HMA pavement section and a concrete pavement section. Obtain the depth of the HMA or concrete and the underlying material from the Region Soils/Pavement Engineer.

Likewise, for bridge replacement projects, develop an estimate for both concrete bridge beams and steel bridge beams. The determination of beam type will be done during the design phase, but it is beneficial to know both costs for estimating purposes. The estimate should contain the higher cost, and all of the other aspects will be evaluated in the next phase, for the final decision and inclusion in the bridge study.

Alternate Pavement Design – This is a method of design for a project, MDOT bids a project as either Concrete or HMA pavement. The selection of the successful bidder is based on upon the life cycle cost of the proposed pavement section. If the candidate project is proposed to be an alternate bid projects, it is imperative that the scoped project estimate must take these details in to account. The comparison is not limited to just the direct pavement cost differences. There may be other factors, such as maintaining traffic, drainage (ditching, culverts, outlets due to thicker/thinner pavement section and etc) and underclearance corrections that will need to be accounted for.

Bridge Approach Pavement and Maintenance of Traffic on Bridge Projects – The cost for the approach pavement (on bridge projects), other roadway related items and the maintenance of traffic items will be estimated according to methods described later in this chapter. Specific pay items and quantities will be used in the estimate, instead of estimating these items on a percentage basis, as previously computed on the Bridge Repair Cost Estimate spreadsheet.

Estimating Structures/Bridges (revised 6-24-2019)

Best Practices/Tips for Successful Completion

Scoping Engineer
Region Bridge Engineer

Structures or bridges requiring work are typically estimated by the Region Bridge Engineer or by a consultant hired to perform the bridge scoping duties. If a road and a bridge job are being packaged together, the Scoping Engineer will need to discuss the project with the Region Bridge Engineer to plan, coordinate and/or combine the two projects. The Maintenance of Traffic (MOT) may dictate how the structure work is performed or may need to be revised to reflect how the structure work is being planned.

Estimating alternate fixes for bridges

As part of the Call For Projects, as many as three alternative fixes may be analyzed and estimated for each bridge. The Region Bridge Engineer will utilize the Project Quantity Spreadsheet (PQS) and AASHTOWare Project (AP) Preconstruction to provide a variety of proposed fixes for the structure. This spreadsheet is updated annually; therefore an updated spreadsheet must be obtained for each year's Call For Projects. Refer to the following links for PQS and access to AP Preconstruction.

Project Quantity Spreadsheet (PQS) Guidance Document

AP Preconstruction Users Guide

CFP Bridge Repair Cost Estimate spreadsheet and key

Also use PQS and AP Preconstruction for estimating Capital Scheduled Maintenance (CSM) for bridge work. A sample of this spreadsheet can be found in Appendix E-3. Refer to the following link to access PQS and AP Preconstruction

Project Quantity Spreadsheet (PQS) Guidance Document

AP Preconstruction Users Guide

CFP Bridge Repair Cost Estimate spreadsheet and key

Bridge Deck Preservation Matrix

The proposed fix options are based on the findings of the detailed bridge inspections, performed as part of the scoping process. For deck repair options, use the current Bridge Deck Preservation Matrixes. These documents can be found in Appendix A-6. The condition of the deck is usually the driving force, or the key indicator, leading to a structure being considered for rehabilitation or replacement. However, there are times when other issues affecting the bridge may elicit the need for a rehabilitation project and these matrixes do not address those situations. Some of these situations are superstructure deterioration, substructure deterioration, scour criticality and functional issues such as under-clearance and/or bridge width. Sometimes it is desirable for an entire corridor to be brought up to a specific condition level as part of an overall strategy. Therefore, be careful regarding the interpretation of the information from the matrixes. Evaluate each specific case and use engineering judgment applied.

Don't rely on the Matrix alone

For assistance in completing the Scoping Estimate, or any other items related to scoping of a bridge project, contact the Region Bridge Engineer or the Bridge Scoping Engineer located at Construction & Technology (C&T).

Region Bridge Engineer
Bridge Scoping Engineer at C&T

The estimate for the proposed bridge option shall be placed into AP Preconstruction as described later in this chapter. This enables all project costs to be captured in one location.

When existing structure foundations are to be replaced, widened or subjected to increased load, use old plans and existing geotechnical data to conduct a structure foundation review to analyze the increased load. Include recommendations from the review in the ProjectWise documents and incorporated them into the project scope. The Region Bridge Engineer shall coordinate this review with the Bridge Operations Unit at C&T.

If plans of the existing structure are not available, rehabilitation alternatives will be severely limited according to the Bridge Design Manual, Chapter 12. A useful tool to determine the adequacy of the superstructure is to contact the Bridge Management Unit in C&T. Furthermore, additional Preliminary Engineering (PE) funds will be required to account for a structure survey.

Bridge Scoping Report & Details Worksheet

Bridge Rehabilitation Scoping Checklist

During the detailed inspection and field review, fill out the Bridge Scoping Report & Details Worksheet with all required information and necessary repairs. Also use the Bridge Rehabilitation Scoping Checklist if there is additional information needed. Choose the repair strategy based on these findings, corridor plan, MOT options and the completed estimate. For comparison purposes, estimate additional repair strategies. For example, if a deck replacement is the chosen strategy, and steel beam end repairs and full painting of the steel beams are included, also complete an estimate for a superstructure replacement. The cost of new beams could be comparable in cost and provide a longer service life.

During scoping process, analyze the Life Cycle of the structure. Investigate all previous rehabilitation and repairs previously done, to determine where the structure is in its Life Cycle. The Bridge Preservation Timelines (see below) represent strategies for maintenance and rehabilitation work, in order to get the maximum life from a bridge.

Table 8-2: Bridge Preservation Timelines

The following fix alternatives include general assumptions regarding the expected service life of the rehabilitation option shown:

Rehabilitation Option	Expected Service Life
Structure Replacement	40 yrs
Superstructure Replacement	40 yrs
Deck Replacement	40 yrs
Deep Overlay	25-30 yrs
Shallow Overlay	10-15 yrs
HMA Overlay (with membrane)	5-10 yrs
Joint replacement and Deck Patch	10-12 yrs

It is important to recognize that situations where design exceptions will not be acceptable may exist. In those cases, enough funds to cover the cost of the approach work should be included in the estimate. Some factors that will affect the approach work on bridge jobs include:

- The length of work required for any crown correction wash out
- The length of work required to correct any geometric insufficiencies (i.e. horizontal and vertical alignments, superelevations and transitions)
- The length of approach work required to correct any underclearance deficiencies.

Bridge Repair Items to Estimate and Analyze

If a bridge is Scour Critical, investigate mitigation measures or the replacement of the structure (Bridge Engineer and Geotechnical Unit. Mitigation measures could range from installing a designed riprap section to adding micro-piles to the structure foundation and may require a hydraulic analysis for design. If mitigation measures are not feasible then the region will either have to continue to manage the structure for scour per the Plan of Action, over the long term or replace the structure. Discuss with the Hydraulics Unit the feasibility of mitigation measures. If scour countermeasures are not feasible or cost effective, the bridge should be scheduled for replacement.

If estimating a replacement structure over a river, changes to the bridge span and/or rise may be necessary. Changes to bridge span, rise, length, or grade raise may need a hydraulic survey. In addition, construction methods such as haul roads or causeways may need a hydraulic survey. It should be noted that scopes and designs of new bridges over rivers should be estimated with deep foundations so the bridges are not scour vulnerable (discussion with the Hydraulics Unit may be of assistance).

If a structure is over a waterway, it is important to include additional funding for a Hydraulic survey, contact the Region Survey Unit for assistance.

If a bridge is over a railroad, a railroad flagman will be required during construction over and/or near the railroad. The Railroad Coordination Unit within the Design Division in Lansing should be consulted for an estimate for any railroad coordination and flagging cost to be included in the scoping estimate.

Calculation for aesthetic treatments

Aesthetic treatments (concrete form liners) and concrete surface coating may be desirable in some locations. If needed, estimate the treatments as 2 percent of construction cost.

Maintaining traffic concepts and the volume of traffic on the road may influence the repair strategy. For example, in locations where traffic control costs are very high, it may not be cost effective to do deck patching and crack sealing. Or maintaining a certain number of lanes may cause the bridges to be temporarily widened or constructed under part width and the need for temporary sheet piling for the substructure.

Bridge Design Manual Chapter 12

In Chapter 12 of the Bridge Design Manual, additional information on repair strategies and how to estimate quantities are presented.

For deck repairs, the existing crown of the bridge deck may have an impact to the proposed work and may need to be analyzed. For replacements and overlays other than epoxy overlays, the crown will need to be brought to current standards which may require a grade raise (note that correcting the crown with an overlay can result in the bridge having deficient load capacity). The estimated grade raise will affect the length of approach work necessary to match the existing roadway.

Bridge Design Manual Chapter 12

Depending on the type of railing, it may be necessary to replace or retrofit the railing (see BDM chapter 12).

For deck patching, calculate the area of delamination on the deck and then multiply by 2, for the quantity that will be included in the estimate. Use this factor to account for continued deterioration.

For expansion joint repairs, determine if spalling on the fascia and barrier would need to be included in the quantities of concrete patching.

For superstructure repairs, consider the type of temporary supports needed, if new bearings are warranted and if protection of utilities (under the bridge) is required.

For substructure repairs, consider the amount of spalling and delamination on substructure elements (i.e. piers, pier caps or abutments). If there is 30 percent or greater delamination identified, consider replacing the element.

Estimate and plan for Temporary Supports for spalling areas located under beams or when replacement of a substructure element is being proposed. The placement of temporary supports could affect and/or require slope paving removal, excavation, storm sewers and guardrail. The proposed location may also require temporary concrete barrier for maintaining traffic and protection of the temporary support.

Take the following steps for a detailed inspection:

- Gather the old plans to take in the field
- Make copies and enlarge them for the substructure details
- Mark out where the delamination occurs and the appropriate quantity to be considered
- Make copies of the general plan of structure and mark out the delamination on the deck, with quantities
- When doing a detailed beam inspection, the beam detail sheets shall be utilized (this assists in documenting the locations of the required repairs and that the beams will be laid out correctly, in terms of orientation)
- Take standard set of photos of structure and photos showing areas in need of repair (see the Bridge Scoping Report & Details Worksheet for a list of suggested photos)

Inspection manuals and forms

For additional information, manuals and forms see the website:

http://www.michigan.gov/mdot/0,4616,7-151-9625_24768_24773---,00.html

Resources for Estimating Specific or Specialty Items

Various resources are available within the Department (TSC, Region, Lansing and C&T) with expertise in specific areas that may be utilized when developing an estimate at the scoping level.

Tips for successful collaboration with others

When requesting information from others, be specific in your request. Provide them all the information you have which may be beneficial to them in estimating the portion you have requested assistance on. Give a deadline for when you need the information, keeping in mind the time it will take for the specialist to perform their work and the time you will need after you have the information to incorporate it into your final estimate. Tell the specialist what the information is for (i.e. scoping estimate) and what is expected to be included in the estimate. Provide them with the opportunity to ask questions both at the time the initial request is made and during the time the specialist is developing the estimate.

Geometrics

Geometric Design Guides

Projects often propose added features such as lane drops, lane shifts, tapers, re-alignments and etc. It is important to have an estimate that includes the proper impacts, lengths and widths for these items. Prior to estimating, you should: use the Geometric Deign Guides, consider the existing conditions (for side impacts), ensure the proposed feature can be added to the roadway segment and consult with Lansing Traffic & Safety with questions or assistance on applying these guidelines. Be sure to fully consider the improvements to the roadway geometry and its impacts to the bridges and vice a versa.

Right of Way (revised 6-24-2019)

Region Real Estate staff

If a project requires any proposed permanent or temporary land or land access, contact the Region Real Estate staff to aid in the development of the ROW estimate. The cost of land differs greatly across the State and will vary within Region and TSC boundaries. Region Real Estate Staff will need project maps (often ROW map sheets found on the MDOT website can be an appropriate map) for the purpose of estimating ROW costs. During the scope development, identify on the map areas where proposed fee ROW, air rights, grading permits, drive permits, relocations, permit to close drives, sidewalk permits and drainage easements are anticipated. Also on the map the type of anticipated ROW needs and the estimated size or area of taking should be shown on the map. These maps can then be presented to the Region Real Estate staff with an explanation of the proposed project and a request to provide a ROW estimate for inclusion in the project scoping estimate. Electronic ROW maps are available on the MDOT website and in ProjectWise by County at:

Creating maps for the Real Estate staff to use

ProjectWise

pwname://MDOTProjectWise/Documents/Reference Documents/ROW Maps
or
http://mdotcf.state.mi.us/public/ROWFiles/index.cfm

Other ROW considerations

Keep in mind that sometimes grading permits are needed for temporary widening to maintain traffic. Include these ROW needs in the estimate.

What to do if Real Estate staff is not available

If the Region Real Estate staff is not available to provide an estimate in the timeframe needed, use recent projects in the area to help develop an estimate for the ROW cost. The project should be in a similar area (city, suburban or rural), with parcels or ROW activities of similar size and features.

Completing the estimate

Round up the total estimated cost for ROW on a project, including all permits and easements, to the nearest $1000, before placing it into AP Preconstruction.

AP Preconstruction

Permanent and Temporary Maintenance of Traffic Items

TSC Traffic & Safety Engineer
Region Traffic & Safety Engineer

Make the estimate, developed during the scoping phase, of the project as complete as possible. Include it in computing quantities for various permanent traffic items, such as signing, pavement marking and traffic signals. Also estimate quantities for the proposed method of maintaining traffic during the construction of the project. To obtain estimates for permanent pavement markings, signing, signals, MOT or other safety items the estimator will need to discuss the project with the TSC or Region Traffic & Safety Engineer. Include the Traffic Management Plan (TMP) that is developed in the documentation for the candidate project. Also include any traffic restrictions and the associated costs and schedule. It is also important to note that all maintaining traffic improvements require environmental review for potential environmental impacts. MOT improvements can range from temporary crossovers to temporary widening and/or detour route improvements.

Include permanent signing in the following instances,: where the proposed construction limits will impact existing signs, where new features requiring new signs (turn lanes, passing flares and etc) are designed into the project, on reconstruction projects (4R), and where signs are mounted to bridges that may require modification. Capital Preventive Maintenance (CPM), cold-mill/resurface projects and other work types that do not impact the existing signs do not require permanent signing work or quantities.

Deciding whether old signs should be replaced and where new signs should go

TSC Traffic & Safety Engineer
Region Traffic & Safety Engineer

Also consider the age and reflectivity of the existing signs, to determine if new signs are required or if the existing signs may be salvaged and then re-erected on new posts. It is important to find out if a corridor signing project is planned, and where the new signs would be included in the signing project, thereby decreasing the work and money needed for permanent signing in the project being scoped. The Region or TSC Traffic & Safety Engineer can provide information regarding the need for permanent signing on a project. Include sign and post quantities in the scoping estimate, as well as all cantilever, trusses and bridge-mounted signs.

Calculation for pavement markings

Many projects require permanent pavement markings, including CPM sealing projects, such as thin overlay or mill and one course overlay. To estimate the cost of CPM sealing projects, the Traffic & Safety Division suggests using a figure of 20 percent of the project's pavement marking cost. Projects that may not require permanent pavement markings include some CPM projects, except for thin overlay or mill/one course overlay projects. For CPM sealing projects, it has been established (with the Traffic & Safety Division) that 20% of the pavement marking quantities will be calculated as a miscellaneous quantity. If the schedule for the region wide pavement marking contract does not coordinate, then the quantities required will be included in the project. The pavement markings for the sealing projects will be included in the yearly pavement marking contract and should be coordinated with the TSC Traffic & Safety Engineer.

For projects that require shoulder and/or centerline corrugations, include the corrugation quantities and cost in the scoping estimate. Refer to

Chapter 6 of the Road Design Manual for guidelines regarding when shoulder and/or centerline corrugations are required.

Traffic Signals Unit Traffic & Safety in Lansing

Obtain estimates for work on the traffic signals and the related components should be obtained from the Traffic Signals Unit of Traffic & Safety in Lansing. This staff will need to know the limits and type of work for the proposed project. Additionally, they will need to know the anticipated method for maintaining traffic, as this may require the installation of new temporary signals or the relocation of existing signal heads. Estimates for impacts to traffic loop detectors will be provided if necessary, in addition to the estimates for the traffic signals themselves.

Traffic & Safety Engineer

Items needed beyond drums, signs, and pavement markings

The estimator should discuss, with the Traffic & Safety Engineer, the scope of work and the compatibility of different phasing or MOT alternatives to give the Traffic & Safety Engineer a thorough understanding of the scope of work and potentially viable MOT alternatives. This will allow the Traffic & Safety Engineer to analyze the best or most efficient method of maintaining traffic during the construction of the project, in accordance with MDOT's Work Zone Safety and Mobility Policy. Be aware of all the items that may be necessary to include in the estimate. Items to maintain traffic may go beyond plastic drums, temporary signs and temporary pavement markings. Depending on the proposed method of MOT, temporary widening may be needed. Include in the estimate the cost of this HMA and the cost to remove it. Also, if rumble strips need to be filled in to maintain traffic flow during construction, include the cost to fill and remove this HMA.

TSC Manager and Delivery staff

Local agency involved with detour

Rules for estimating costs of minor traffic devices and flag control

If a detour route is proposed, include in the estimate any improvements to the detour route, either before or after use by MDOT. It is very important to discuss the proposed detours with the TSC Manager and the Delivery staff. Not all detours require upgrades or modifications. The appropriate staff may have prior knowledge of the condition or agreements for a particular detour plan. It may be beneficial to have prior discussion with the local agency that will be involved with the detour. Some projects require modifications to existing traffic signals or installations of temporary traffic signals in order to maintain traffic. The cost of this signal work must be included in the estimate. The cost for Minor Traffic Devices, which is used on all projects, is 0.5 percent of the interim construction cost. To compute the cost for Flag Control, if applicable to the project, 0.5 percent of the interim construction cost should be used.

Utilities (revised 6-24-2019)

Avoiding conflicts with utility poles, street lights etc.

At the scoping stage, review old plans to investigate the presence of utilities on the project. Additionally, a field review of the site may identify the existence of utilities within the project limits. The presence of large utilities, transmissions lines or vaults can seriously impact project cost and schedule. Utilizing Preliminary Planning/Scoping Letter (Form#2483) the scoping may be used to acquire existing utility information from the utility companies. Using all three methods of obtaining existing utility information will aid in identifying potential conflicts and a more informed cost estimate for utility relocation. Private Utility companies will be contacted during the design phase, to request additional utility location maps and information.

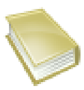
MDOT policy on utility reimbursement

MDOT will relocate municipal utilities (including sanitary sewers, storm sewers, power lines, power poles, street lights, communications lines and etc at project costs) not including betterments, only when they are in direct conflict with the proposed construction. Betterments are the responsibility of the municipality having jurisdiction over the utility.

Watermain may be a potential threat for the roadway. The current policy requires an evaluation of Evaluate the existing water main's watermain's condition (per the current policy), break/fix history and age, to estimate its potential effects on the life cycle of the proposed pavement and.

Splitting water main costs

Municipality officials Governmental Coordination Engineer



Guidance Document 10087

If it is determined that the watermain relocation will be included with the project, the municipality shall be required to participate in 50 percent of the non-federal costs of the installed price of the main and appurtenances. Initiate an agreement with the municipality, through the Governmental Coordination Engineer. Watermain betterments shall be in accordance with the Guidance Document 10087. If it is determined that watermain relocation will not be included with the project, but watermain relocations which are required due to direct construction conflicts, these costs shall be included in the project cost estimate.

TSC Utility Coordinator Municipality Utility Unit, Design Division in Lansing

For assistance in estimating municipal utility relocation work, specifically water mains, contact the TSC Utility Coordinator and/or the Municipal Utility Unit in the Design Division in Lansing.

Round up the total estimated cost, for utility relocation work, on a project to the nearest $1000, before placing it into AP Preconstruction.

Soils & Pavement Design

Region Soils Engineer

Consult the Region Soils Engineer for pavement design options to be estimated. The Region Soils Engineer may provide the proposed pay items which will make up the proposed pavement structure along with the estimated thicknesses of each layer. This estimated pavement structure is based on the proposed fix type, existing pavement information obtained from old plans, pavement cores, Average Daily Traffic (ADT) and pavement design guidelines published by MDOT. The Region Soils Engineer should also be aware of any potential peat excavation or contaminated soil within the project limits and may provide an estimate for the work necessary to deal with these situations.

In addition to providing the soil borings and/or pavement cores information, the Region Soils Engineer may provide quantities for specific soil needs (i.e. undercutting and etc). Consult the Region Soils Engineer for confirmation of the estimation for soil erosion and sedimentation control items.

Hydraulics

Dealing with drainage items such as culverts and storm sewers

The scope of hydraulic work on a proposed project can be widespread. The work can vary from extending culverts and placing new end sections to replacing culverts or placing new ones culverts or box culverts. Similarly, the scope for storm sewers can range from extending existing sewer systems to replacing existing sewers or even the adding new sewer systems. Once the magnitude of the drainage work is identified, appropriate pay items can be quantified and an estimate developed.

Thought should be given to the method of construction. For example, will the placement or replacement of a culvert be done as an open cut or will the culvert be bored and jacked under the pavement. The method of construction will impact the pay items proposed in the scoping estimate. Methods of diverting the flow of water may be required during construction. These costs should be accounted for in the estimate developed during the scoping process.

Hydraulics Section in the Design Division in Lansing

The Hydraulics Unit in the Design Division in Lansing may be consulted for input into the design and estimate for the hydraulic portion of the scoping package. However, the Hydraulics Unit must be consulted on any project that has a stream crossing with a drainage area greater than 2 square miles, if the culvert or crossing has proposed work being considered.

Hydraulics and bridges

Hydraulics and Region Surveys unit

A Hydraulic and Scour Analysis may be requested and conducted for bridges and culverts crossing regulated watercourses, during the design phase it should be requested. Additionally, an analysis may be required for bridge work over waterways, widening in a floodplain, a raise in road grade over four inches (MDOT Drainage Manual section 2.9.11.1 General Exemptions), lowering underclearance (resulting in a reduction of the hydraulic opening), culvert extensions and culvert end grates. Include this information in a hydraulic report, identifying recommended structure sizes and scour countermeasure designs, may be included in the scoping estimate. If this is not available at this time, it will be part of the design phase. Prior to any hydraulic analysis, coordinate a hydraulic survey with the Hydraulics and Region Surveys units, to determine the cost and the time needed to complete this work.

Items to Consider while Estimating and Analyzing Drainage Items

- If the stream velocity increases dramatically through the culvert or the stream width is substantially wider than the culvert it may be a sign of an undersized culvert. Complete hydraulic evaluation of the culvert during the design phase to determine if it has sufficient capacity.

- Identify the Ordinary High Water Mark (OHWM). The OHWM is generally located where staining is evident or where the bank vegetation growth starts. A design that allows for open capacity in the culvert will help debris to pass through and not block the culvert.

- If soil backfill has been washed away from downspouts it may be an indication that the downspout is undersized or is placed on too steep of a grade. Options that may be used for failed downspouts are to install drop structures (consisting of a deep manhole inlet with storm sewer outlet), install riprap on a geotextile fabric or to engineer a stable slope.

- If the downstream culverts are smaller, they may obstruct water flow. If the upstream or downstream culvert sizes are larger than the MDOT's culvert, this may indicate that MDOT's structure is undersized. Analyze issues during the design phase and make sure there is discussion of the next steps needed.

- Inspect Roadway

  a. Have pavement cracks formed parallel to the culvert?

     Cracking across roadway, almost as if outlining the culvert, may indicate culvert movement, roadway approach movement or an undermining of the culvert is present. Investigate the cause. Causes may include piping, soil entering the culvert at joints or corrosion points, roadway settlement and/or culvert settlement. Culvert replacement may be necessary if this is the case.

  b. Are there any road drainage issues?

     If storm sewers are not functioning properly, the storm sewer system may need to be evaluated as part of a separate process. If storm water is eroding the embankment, drop structures or embankment stabilization may be required.

  c. Are there sinkholes (or patched sinkholes) in the roadway, shoulder or side slope?

     This could result in displaced soil seeping into the pipe and creating a void which may lead to other structural problems including culvert and roadway settlement or the wash out during a large storm event. Culvert repair or replacement is recommended to prevent further structural damage.

Instances in which a wider road requires a larger culvert

  d. Will the road be widened?

     A widened road may require a longer culvert. A longer culvert has more friction losses, possibly causing a higher 100 year event elevation. This could be a violation of state law in watersheds greater than 2 square miles. A larger culvert may have to be considered. Therefore, further discussion and next steps will need to take place during the design phase.

Drainage Manual

e. Will the profile of the roadway be increased by more than four inches?

A road grade raise will act like a barrier for water during a flood event. Reference the Drainage Manual for the requirements and analysis required in this case.

f. Is there an adequate outlet or any history of flooding in the area?

For flooding issues, investigate the site and surrounding area to find the source of the problem. Refer to section 8.1.1 in the Drainage Manual for discussions on acceptable outlets.

g. Have best management practices (BMP's) been considered on the project?

Verify if any existing BMP's along the project length (detention basins, vegetated swales/ditches, etc.) will need to be resized due to the addition of impervious area. If none exist, verify the feasibility of placing new BMP's. See Drainage Manual section 9.4.1 for guidance on selecting BMP's.

h. Projects with capacity improvements should maintain the existing flowrates. The estimate should include additional storage cost and possible ROW.

Retaining Walls (revised 6-24-2019)

Holding back earth during construction

Occasionally a retaining wall is required on a project to hold back earth when a roadway is widened or other situations. For information and assistance with the cost estimate for retaining walls see the Region Bridge Engineer and/or a Lansing Bridge Unit. To complete the estimate for the retaining wall(s) they will need to know the location, limits and type of work of the project; the anticipated location of the wall(s) and the reason for the wall(s); the soil conditions where the wall is required; and the location of existing utilities which may impact the depth and location of the retaining wall. Another issue which should be discussed is the need for any specific or special aesthetic treatment of the retaining wall for the area.

Region Bridge Engineer
Lansing Bridge Unit

Completing the cost estimate

Round up the total estimated cost, for retaining wall work, on a project to the nearest $1000, before placing it into AP Preconstruction.

AP Preconstruction

Wetland Mitigation (revised 6-24-2019)

Projects that involve unavoidable impacts to wetland resources may require wetland mitigation. Projects impacting less than 1/3 acre of wetland or less than 2 acres, for a project total (as long as impacts to individual wetlands complexes are less than 1/3 acre each) may be mitigated at a Moment of Opportunity (MOO) site or wetland bank site anywhere in the state. Projects impacting over 1/3 acre, of an individual wetland complex, must be mitigated in the same watershed or eco-region as the impacted wetland. This often requires the creation of new wetlands within the project limits or at an offsite location. Occasionally, a wetland bank site has already been

Region Resource Specialist

created as a separate project in the same watershed as the impacted wetland that may have "credits" available for mitigation requirements. All efforts should be made to design the project and avoid or minimize the impacts to existing wetlands before mitigation is considered. Wetland impacts and mitigations requirements should be discussed with the Region Resource Specialist, in consultation with the Environmental Section's Wetland Mitigation Specialist. To accurately analyze the impacts, the Region Resource Specialist needs a description of the project, limits for the project, location of the existing wetlands that will be impacted, extent of wetland impact expressed in acres and the reason for the impacts. The Region Resource Specialist can provide an estimate for the proposed mitigation activities. This estimate should include the cost of earthwork, plant materials, and other necessary items to create a new wetland, if required. The proposed purchase of property to create the new wetland must also be included in the estimate.

Completing the estimate

AP Preconstruction

Round up the total estimated cost, for wetland mitigation work (including the potential ROW cost if mitigation is needed off-site or beyond the existing ROW), on a project to the nearest $1000, before placing it into AP Preconstruction.

Pump Stations (revised 6-24-2019)

Maintenance Division
Region System Manager

The Maintenance Division has the primary responsibility to determine which pump stations will be selected for rehabilitation. This decision is based typically on two factors: known poor condition and age of the pump station, beyond normal service life. The corridor approach should be used when selecting the pump stations to be rehabilitated to take advantage of lower mobilization costs and economies of scale. Alert the Region System Manager and Maintenance personnel to the proposed candidates, so they may provide input or suggestions if alternate pump stations should be included in the Call For Projects.

Capacity improvements to a pump station may necessitate redesign and/or reconstruction of the downstream conveyance system. This anticipated work should be included in the estimate for the project.

What to do if a pump station fails within the project limits

Contact the Maintenance Division when an existing pump station falls within the project limits. The Maintenance Division will determine if any upgrades are needed to the pump station and provide an estimate for the proposed work.

Completing the estimate

AP Preconstruction

Round up the total estimated cost, for pump station work, on a project to the nearest $1000, before placing it into AP Preconstruction.

Noise/Sound Walls (revised 6-24-2019)

Noise/sound walls help abate traffic noise for those residences that were in place at the time a freeway was constructed and prior to 1976.

Noise Abatement Specialist at Construction & Technology

To estimate the cost for a noise/sound wall (location previously studied and verified for need), provide a description of the proposed project, anticipated location of the noise/sound wall and the data which supports the need for a noise/sound wall to the Noise Abatement specialist at C&T. Another issue to discuss is the need for any specific or special aesthetic treatment of the noise/sound wall for the area. Once the Noise Abatement Specialist has confirmed that the proposed location meets the requirements for a noise/sound wall, the specialist will then analyze the height and length needed for the wall and also the depth of the supports. The specialist will provide the cost of the noise/sound wall.

Completing the estimate

AP Preconstruction

Round up the total estimated cost, for noise/sound wall, on a project to the nearest $1000, before placing it into AP Preconstruction.

At-Grade Railroad Crossings (revised 6-24-2019)

When an at-grade railroad crossing crosses a roadway, for a proposed project, examine the crossing for potential work. There are two aspects of railroad work to be considered. The first involves the physical items. The crossing may need improvements. Examine the crossing itself and also see whether the warning signs or gates require upgrading or replacement. An entirely new installation may even be needed.

The other aspect of railroad work to include in a project (whether or not actual work on the crossing is included in the project) is the cost to maintain train traffic on the tracks during construction. The contractor must provide flaggers for the train traffic during project construction. Apply the cost to maintain the train movements any time the railroad crossing is within the construction influence area. This would include a project where the railroad runs parallel to the roadway, but traffic on the cross street crosses the tracks and is impacted by the construction. Include this project cost in the estimate.

Governmental and Railroad Section of the Local Agency Unit in Lansing

Contact the Governmental and Railroad Section of the Local Agency Unit, in Lansing for assistance with the coordination and estimate.

Completing the estimate

AP Preconstruction

Round up the total estimated cost, for railroad crossing work, on a project to the nearest $1000, before placing it into AP Preconstruction.

Rest Areas (revised 6-24-2019)

Roadside Development Unit in Lansing

For project limits that include a rest area, contact the Roadside Development Unit in Lansing to determine if any work to the rest area should be included in the project. If work in the existing rest area is to be included in the project, the Roadside Development Unit will provide a cost estimate and possible funding for the proposed rest area work. If no work is anticipated for the rest area facilities, evaluate the condition of the ramps and parking areas. If the condition warrants work to be done, estimate the surfacing, sealing or pavement patches needed and include this in the scope costs.

Completing the estimate

AP Preconstruction

Round up the total estimated cost, for rest area work, on a project to the nearest $1000, before placing it into AP Preconstruction.

Carpool Lots

Region System Manager

When an existing carpool lot falls within the project limits of a road project, determine if the carpool lot requires any work, such as preventive maintenance, improvements or upgrades. Check with the Region System Manager to assist in making this determination.

Region Real Estate Staff

If an existing carpool lot requires work as part of a road project or as a stand alone project, estimate the cost for this work. The work on the existing carpool lot will depend on the existing surface (HMA or gravel) and the proposed surface. If paved, the existing carpool lot may require cold milling prior to resurfacing. The existing pavement surface should be inspected to make this determination. If it is necessary to enlarge an existing carpool lot, consider additional pay items, including earthwork and possible ROW needs. Discuss any ROW needs with the Region Real Estate staff, as mentioned earlier in this chapter.

When a new carpool lot is considered, whether as a stand alone project or to be combined with a road project, estimate and program the work to construct the carpool lot.

Carpool Lot map

Before estimating the cost to construct the new carpool lot, determine the need, location and size of the lot. Contact the Region System Manager to discuss the options for a carpool lot in a given area. Verify the location with the statewide Carpool Lot map. Also consider other factors when analyzing the location of a proposed carpool lot such as the proximity to local transit systems, availability of property in the area and any local ordinances which may play a role in the decision to build a carpool lot.

Carpool Lot Coordinator Statewide Planning Division

MDOT Road Design Manual Section 12.13

Region Soils Engineer

Once a location has been determined, property is known to be available and local ordinances will not prevent the project from being constructed; determine the size, shape and pavement structure for the lot. Base the size of the carpool lot on the anticipated use and consult with the Carpool Lot Coordinator in Statewide Planning Division. The shape of the lot will be based on the property available, the terrain, size of vehicles that will likely use the carpool lot and the overall size of the carpool lot. Also consider traffic flow patterns when considering the shape and size of a carpool lot.

Section 12.13 of the MDOT Road Design Manual discusses various aspects of carpool lot design, including number and size of parking spaces, width for aisles and other geometric issues. Contact the Region Soils Engineer to determine the most suitable pavement structure for the proposed carpool lot. See detailed information early in the chapter on Soils & Pavement Design.

When estimating an upgrade to an existing carpool lot or the construction of a new carpool lot, include similar items as a non-freeway roadway. Also include drainage items, permanent pavement markings, signing, underdrains and any improvements to the approach work on the cross road. Maintaining traffic is typically not an issue for a carpool lot, as the lot is generally closed during the construction phase of the project. Carpool lots should be evaluated to see if they are candidates for the addition of bicycle racks it enhance their usability by other modes.

Intelligent Transportation Systems

Region Intelligent Transportation Systems (ITS) Coordinator

For freeway projects, contact the Region Intelligent Transportation Systems (ITS) Coordinator to determine if any ITS work is needed within the limits of the proposed project. The work may include upgrades to the existing system, complete installation of a new system or preliminary work done in preparation for a future ITS project.

The Region ITS Coordinator will need to know the limits and type of work included in the proposed project before a determination can be made as to what type, if any; ITS work may be packaged with a road or bridge project. When a decision is made to include ITS work with a road or bridge project, the Region ITS Coordinator will provide a complete estimate of the proposed ITS costs and will provide funding from the ITS funding sources, if available. This estimate will not include cost to maintain traffic, as that will be included in the road or bridge maintaining traffic costs.

Region System Manager

The Region ITS Coordinator will plan, estimate and coordinate all stand alone ITS projects. The stand alone ITS project estimates must include all costs to construct the project, including maintaining traffic, permits, survey, PE (Preliminary Engineering), CE (Construction Engineering) and etc. These projects will then be coordinated with the Region System Manager.

Freeway Lighting

Electrical Unit of the Utility, Drainage and Roadside Section Design Division in Lansing

Freeway projects in urban settings may include freeway lighting work, whether it will be for new lighting, repair or upgrade to the existing lighting system. If the proposed project work impacts the existing freeway lighting, contact the Electrical Unit of the Utility, Drainage and Roadside Section of the Design Division in Lansing to coordinate the impacts to the existing freeway lighting system. The staff in the Electrical Unit in Lansing will need to know the limits and type of proposed work to be included in the road or bridge project, with a description of the impacts to the freeway lighting. The staff of the Electrical Unit will examine the proposed road or bridge work and develop a detailed estimate for the removal and replacement of the existing freeway lighting system. This estimate will not include cost to maintain traffic, as that will be included in the road or bridge maintaining traffic cost.

For a project that will include new freeway lighting, coordinate the type and limits of the lighting with the staff in the Electrical Unit in Lansing. Consideration of the power source for the lights and any existing or proposed utilities (underground or overhead) in the project area which may impact or be impacted by the proposed freeway lighting will be evaluated. The staff of the Electrical Unit will provide a detailed estimate for all new freeway lighting.

For a stand alone Freeway Lighting project, the staff of Electrical Unit will plan, estimate and design the project. The stand alone Freeway Lighting project estimate must include all costs to construct the project, including maintaining traffic, permits, survey, PE (Preliminary Engineering), CE (Construction Engineering) and etc.

Commercial Vehicle Enforcement (revised 6-24-2019)

Michigan State Police Traffic Safety Division

Region/TSC Traffic & Safety Engineer

Region Delivery Section

Region Development Section

The estimated cost for commercial vehicle enforcement repair or improvements depends on the type of enforcement tools (see Chapter 2) that are proposed for the site. Coordination with the Michigan State Police Traffic Safety Division, the Region/TSC Traffic & Safety Engineer, Region Delivery Section and the Region Development Section is necessary. During the Call For Project's process, on a yearly basis, the Commercial Vehicle Enforcement Committee will provide guidelines that will assist in the planning and estimating of a project.

Completing the Estimate

AP Preconstruction

Round up the total estimated cost for commercial vehicle enforcement work on a project to the nearest $1000 before entering it into AP Preconstruction.

Non-Motorized Paths

Road Design Manual Chapter 12

AASHTO Guide for Development of New Bicycle Facilities

TSC Development Engineer

Region System Manager

Items for non-motorized paths are similar to those for a roadway. The cross sectional elements (i.e. width of the path, maximum horizontal curvature and maximum vertical grades) will differ from roads. Check the elements against the information in Chapter 12 of the RDM and the AASHTO Guide for Development of New Bicycle Facilities. Conveyance of drainage must be maintained. If assistance is needed during the development of a non-motorized path estimate contact the TSC Development Engineer, Region System Manager, Department's Bicycle and Pedestrian Coordinator or the Bicycle Safety Engineer.

Survey (revised 6-24-2019)

Region Surveyor

Survey needs for a project will be determined by the Region Surveyor based on the type of work for the project. The survey needs for a mill and resurface project may be very different than those for a complete reconstruction project. It is important that the survey fit the scope of proposed work. If inadequate survey information is obtained, the project may be delayed while the required information is collected. If too much survey data is collected for a project it is a waste of funds and time that could have been utilized elsewhere. Similarly the survey needs for a bridge deck repair project are different than the survey needs for a superstructure replacement project. The Region Surveyor will need to know the type of work included in the project; limits of the project; the type of ROW (fee or permits) if anticipated; and potential maintaining traffic scheme for construction, particularly if temporary widening may be required and the projected timeframe for the project. Convey the type and extent of drainage or hydraulic work to the Region Surveyor so that the extent of hydraulic surveys can be determined.

The Region Surveyor will determine whether MDOT forces will perform the survey, how the survey may be done and basic costs for the maintaining traffic. The Region Surveyor can assist in providing an estimated cost for the project survey work. In the estimate provided by the surveyor, additional funds may be added because the work will be performed by a consultant. If extra costs are added, document this in the scope.

Stream or water crossings with drainage areas greater than 2 square miles will have the hydraulic survey scope completed by the Lansing Hydraulics Unit, if the proposed work identified affected these features. The Hydraulics Unit may be consulted for crossings less than 2 square miles for advice on developing a hydraulic survey scope. The Region Surveyor can assist in providing an estimated cost for the project survey work.

Completing the Estimate

AP Preconstruction

Round up the total estimated cost for the survey on a project to the nearest $1000, before entering it into AP Preconstruction.

Project Support Cost

Contingency (revised 6-24-2019)

Providing for the Unexpected

Use the following tables when preparing preliminary estimates for projects, during the scoping phase of the project. In general, all project estimates should include some amount of contingency to account for the unknowns that may arise during the detailed design of the project. Contingency values account for change in conditions, standards, specifications and policy implementations that occur between the time the project is scoped and time of construction, as well as other minor work items not easily estimated at the time of scoping.

AP Preconstruction

The following Table (8-3) provides recommended contingency percentages based on the size and complexity of projects. Apply the contingency percentages entered into the scoping estimate in AP Preconstruction after a project construction subtotal has been calculated.

The following definitions apply to the tables below:

- **High Complexity** projects are generally characterized as major reconstruction, major rehabilitation, major widening, realignment and/or new construction type projects. Such projects may have variable and complex cross-sections and/or site conditions, and may have an increased potential impact on environmental and/or right-of-way factors.

- **Medium Complexity** projects are characterized as minor rehabilitation, resurfacing and minor widening type projects. Such projects may have consistent cross-sections and/or site conditions, and typically have minimal impacts on environmental and/or right-of-way factors.

- **Low Complexity** projects are usually characterized as preventive maintenance and/or minor repair type projects with little or no widening. Such projects have consistent cross-sections and/or site conditions, and have little to no impacts on environmental and/or right-of-way factors.

Table 8-3: Suggested Contingency Factors for Projects

Suggested Contingency Factors for Projects			
Approximate Project Construction Cost *	Project Complexity		
	High	Medium	Low
≤$5 Million	10%	5%	5%
$5 Million to $10 Million	7%	5%	5%
≥ $10 Million	5%	3%	3%

* Note: Contingency percentages are applied to the construction subtotal. The construction subtotal is the sum of construction items prior to the PE (Preliminary Engineering), CE (Construction Engineering), Inflation and Incentive costs. These costs are added to the total project cost.

Preliminary Engineering (PE)

Preliminary Engineering includes all design activities (i.e. surveys, soil investigations, identifying ROW needs, drainage, hydraulic analysis and etc.) and plan preparation performed for the development of the construction plans and specifications for a transportation project.

Include the cost for survey items in the PE or EPE (Early Preliminary Engineering) phase (blank phase). The EPE phase makes it possible to obligate the funding for the survey work without obligating the entire PE phase. For additional information on estimating survey work, see the Survey section earlier in this chapter.

The following Table (8-4) contains factors that may impact the PE cost:

- Consultant or MDOT design
- Urban or rural area
- Number of sheets in plan set
- Surveys complexity (see the Survey section in this Chapter)
- Detours/MOT Issues
- Drainage/hydraulic analysis

- Soil investigation

The following guidance is provided for estimating PE (Preliminary Engineering):

Table 8-4: Other Factors That May Impact PE Cost

Type of Work	Estimated Cost *	% of Total Cost
Rehabilitation & Reconstruction/Replacement CMAQ/Safety (T&S)	$0 to $500,000	15
Rehabilitation & Reconstruction/Replacement	$500,000 to $3 Million	12
Rehabilitation & Reconstruction/Replacement	$3 Million to $6 Million	8
Rehabilitation & Reconstruction/Replacement	$6 Million and above	5
CPM (Road)	All	3
CPM (Road)	All (Justified)	5
CPM (Bridge)	All	10

- Note: PE percentages are applied to the construction subtotal

Also include this information in the project's ProjectWise file.

ProjectWise

Construction Engineering (CE)

Construction Engineering is the management of a project during the construction phase. This includes, but is not limited to, specification and plan interpretation, cost control, contract payment, project documentation, material testing and quality assurance.

The following Table (8-5) contains factors that may impact CE cost:

- Consultant or MDOT oversight (a slightly higher percentage should be considered if consultant oversight is planned)
- Distance between the office and project (added time and expense)
- Project schedules may be expedited, constrained or overall duration of the work may increase or decrease CE cost
- Materials and testing is part of the project's CE or an independent "As Needed" contract

Construction Engineer

The following guidance is provided for estimating the Road and Bridge project CE (Construction Engineering) and should be discussed with the Construction Engineer:

Table 8-5: Other Factors That May Impact CE Cost

Type of Work	Estimated Cost *	% of Total Cost
Rehabilitation & Reconstruction/Replacement	$0 to $2 Million	12
Rehabilitation & Reconstruction/Replacement	$2 Million to $10 Million	10
Rehabilitation & Reconstruction/Replacement	$10 Million and above	7

* Note: CE percentages are applied to the construction subtotal.

Indirect Cost Allocation Plan

In an effort to utilize all of the FHWA Federal Aid money that is available to Michigan, MDOT implemented an Indirect Cost Allocation Plan (ICAP) in October 2010. Using an indirect cost rate will allow MDOT to be reimbursed with federal aid for some of its administrative/overhead costs.

The ICAP, which was approved by FHWA, allows MDOT to develop a rate which will be applied to all MDOT direct labor costs on federally funded trunkline capital outlay projects. This rate is not applied to federal/local, State Planning and Research (SPR) funded, American Recovery and Reinvestment Act (ARRA) funded or 100 percent state funded projects. The indirect cost rate to be used for FY 2013 forward is 70.00 percent.

The indirect cost rate is to be applied to the PE and CE budgets based on the percentage of work to be completed by MDOT staff. This rate will increase the PE and CE budgets.

Inflation

How inflation rates are calculated

Every year in the annual Integrated Call for Project Instructions, all Regions are given direction for inflation. The inflation calculations may change from year to year based on the economy, material availability etc. Statewide Planning attempts to provide the Regions with a value that will be appropriate for the Five Year Transportation Plan. By using a consistent inflation standard statewide, it provides the ability to compare project costs consistently.

Where to see estimates with inflated dollars

MAP Database

Inflation is a constant and must be considered when all projects are programmed. All project estimates on the Michigan Architecture Project (MAP) Database should reflect future year dollars. This is the assumption for other systems using the MAP Database and when future year programs are reported.

Region System Manager

The Region System Manager should be consulted on all issues related to inflation.

PQS and AP Preconstruction (revised 6-24-2019)

AP Preconstruction

The first step for estimating projects include preliminary quantities being placed in the PQS spreadsheet. This spreadsheet is updated yearly and provided by the C&T Bridge Section.

Project Quantity Spreadsheet (PQS)

[Project Quantity Spreadsheet (PQS) Guidance Document]()

[Project Quantity Sheet]()

AP Preconstruction

There are two reports that need to be developed as a result of AP Preconstruction scope estimating. They are "The Itemized Estimate Report" and "The Project Concept Estimate Report". These two documents shall be included in the scoping package and will be included in the project folder, as well as in ProjectWise.

[AP Preconstruction Users Guide]

[AASHTOWare Project]

Step 8, Chapter9
Chapter 10
Project Wise

ProjectWise

Add the web reports in the Adobe PDF format into ProjectWise. If the job number does not yet exist in ProjectWise, contact your TSC/Region ProjectWise administrator and request the creation of the job number folder. Once created, add the Adobe PDF Web report and other related documents into the appropriate "0-Early Preliminary Engineering (EPE)/Project Scoping Document Package/......" folder, located under the proposed job number. See chapter 10 of this manual for ProjectWise instructions and details.

Chapter 9

Scoping Tasks and Timelines

General Overview

The majority of MDOT's projects are selected through the Call For Projects process. The scoping process and the completion of the steps are vital to a successful design and its subsequent construction as well as the MDOT program.

Scoping timelines for each region

The recommended timeline is specific to the CFP. It is understood that the seven MDOT regions (Bay, Grand, Metro, North, Southwest, Superior and University) may differ on exactly when they perform each scoping step, but there is a general pattern common to all regions. Scopes and estimates may be done as time and schedule permit.

Time between scoping and construction

The CFP process begins approximately six years prior to the letting and construction of a project, with the exception of CPM, CSM and T&S projects which are typically scoped two years before the let date. The process outlined in this manual, tools and best management practices (BMPs), are relevant guidance for scoping all projects (the timeline mentioned may not apply to projects that are not included in the CFP). The importance of a complete and detailed scoping package is valid regardless of when the scoping is performed.

Importance of completing each step in order

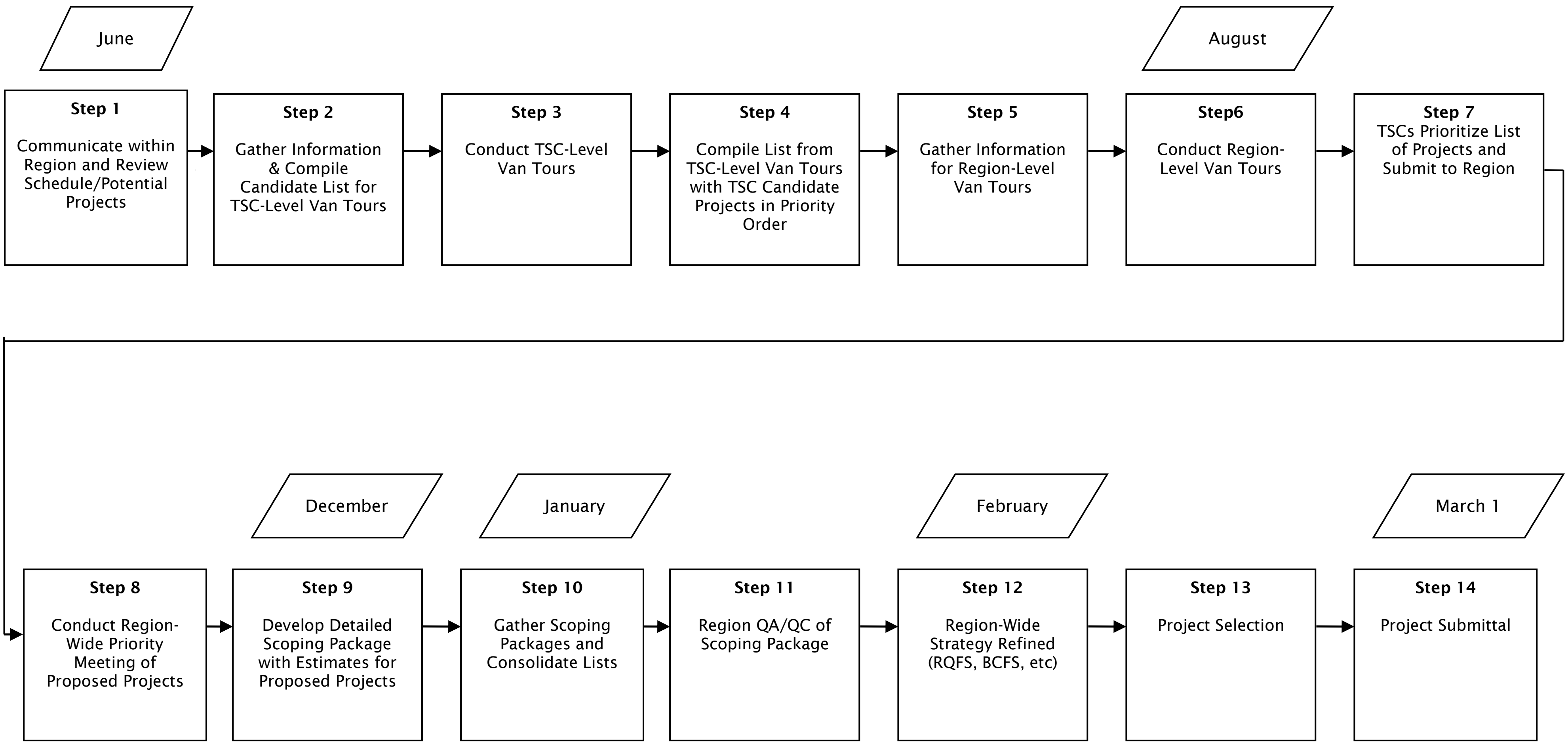
This chapter defines the scoping steps, provides a timetable for reference and defines the responsibilities and outcomes of each step in the CFP process. The steps of the scoping process must be completed in order as the information builds on the preceding step.

Steps in the CFP cycle

Scoping steps in the CFP cycle (suggested):

- Potential Project Identification and Research: Early Summer to Early Fall
- Detailed Project Scoping and Cost Estimation: Late Summer to Late Fall
- Final Review and Selection of Projects: Winter
- Call For Projects (CFP) Created and Submitted to Lansing: Late Winter to Early Spring (This is not part of the scoping process but is part of the CFP process)

Project Scoping Process - Timeline



Potential Project Identification and Research

Suggested CFP Schedule:
June

Step 1 Communicate within Region and Review CFP Schedule / Potential Projects

Generally, this step involves the Region staff gathering and providing road and bridge condition data and maps. This information allows the TSC to make an initial list of sections of road/bridges that are project candidates, based on condition, statewide goals, local project coordination, traffic and safety analysis and stakeholder input. The Region also provides road and bridge condition maps based on the previous year's data to assist the TSCs in the prioritization of their potential projects.

The Region typically reviews and/or modifies the entire schedule for the Call For Projects Process for the year (including interim due dates and responsibility breakouts).

The Goal:

To gather and analyze data in order to compile a preliminary project candidate list in accordance with Region strategies.

Responsible Party:

Region Development Staff.

Needed Information and Tools

Support Information Needed	Tools / Data	Program	Staff Resource or Location
Pavement Strategy	Network percentage requiring work (freeway/non-freeway)	RQFS	Region Pavement Engineer
Bridge Strategy	Network percentage requiring work (freeway/non-freeway)	BCFS	Region Bridge Engineer

Support Information Needed	Tools / Data	Program	Staff Resource or Location
Pavement Condition	RSL Map & Data		Region Pavement Engineer
	DI Data		
	Rut Information		
	Surface Condition Data		Sufficiency Report
Bridge Condition	NBI Map & Data	MBIS or TMS	Region Bridge Engineer
	Fracture Critical Bridge List		
	Scour Critical Bridge List		
Previous Non-selected Projects	Lists (Spreadsheets)	Excel	Prior Year's CFP Information
Project Scoping Schedule (Region Specific Timeline)	Calendar		System Manager

Suggested CFP Schedule
June

Step 2 Gather Information and Compile Candidate List for TSC-Level Van Tours

From the information provided by the Region, the TSC compiles a candidate list of proposed projects. Typically information packages are created and disseminated to the TSC-Level Van Tour attendees for notes and discussion before, during and after the actual van tour.

The Goal:

Develop preliminary candidate project package for the TSC-Level Van Tours.

Responsible Party:

TSC Development Staff.

Needed Information and Tools

Support Information Needed	Tools / Data	Program	Staff Resource or Location
Region Supplied Data & Maps from Step 1			Region Pavement Engineer
Past Projects, Historical Information, Adjacent Project Information	Old Plans, CS Maintenance Logs	Projectwise, PHD	Development or Delivery Staff, Region Pavement Engineer
	ROW Maps		MDOT Intranet, Region Real Estate Staff
Traffic Information	ADT, AADT, % Commercial, Annual Traffic Count Maps	TMIS, Maptitude	Sufficiency Report, TSC T&S Engineer, MDOT Intranet, Lansing Planning Division

Support Information Needed	Tools / Data	Program	Staff Resource or Location
Safety Issues	Guardrail Condition, location	TMS, Maptitude	Physical Feature Inventory
	High Crash (Transparency Report) Intersections/ Segments	TMS	TSC T&S Engineer
	Crash Data	TMS	TSC T&S Engineer
Stakeholder Input	Complaint File		Region or TSC
	Listening Sessions		Region or TSC Staff
	Legislative Sessions/MDOT Summits		
	FHWA		
	MPO/RTF		

In some cases it may be appropriate to gather some of the information listed below to assist in determining additional projects that may be candidates for the TSC-Level Van Tour.

Support Information Needed	Tools / Data	Program	Staff Resource or Location
Drainage Issues	Existing Problem Areas		TSC Maintenance Staff
Soils Issues	Existing Problem Areas		TSC Maintenance Staff / Region Soils Engineer
	Existing Soil Borings	MicroStation	Region Soils Engineer
Maintenance Issues	Existing Problem Areas	MARS	Region Maintenance Staff

Suggested CFP Schedule

Early Aug to Mid-Aug

Step 3 Conduct TSC-Level Van Tours

The TSC-Level Van Tour is the opportunity to review each candidate project as a group to gain a better understanding of the specific issues related to each project. Clear and concise notes must be taken for each project. Alternatives for further investigation or estimation should be discussed and a consensus reached for each project.

This van tour may include the Region Bridge Engineer for earlier coordination, but is not required. The TSC should coordinate early with the Region Bridge Engineer via a separate meeting to discuss bridge issues prior to the TSC Van Tour. After the preliminary list is developed, by the Region Bridge Engineer, this information is then brought to the Region-Level Van Tours.

The Goal:

A visual inspection by multi-disciplined staff of the preliminary candidate list of projects. This is done in order to develop a prioritized candidate list of projects and fix types for submittal to the Region Office.

Responsible Party:

TSC Development Staff is responsible for organizing the van tour, compiling the list of projects to be scoped and summarizing the van tour notes for the next step.

Needed Information and Tools

Support Information Needed	Tools / Data	Program	Staff Resource or Location
Preliminary Candidate Project Package from Step 2			
List of Invitees	Background Information From Respective Invitee (Represented Support Area)		See List

Support Information Needed	Tools / Data	Program	Staff Resource or Location
Potential Fixes			Scoping Manual Chapter 5
Fix Guidelines			Scoping Manual Chapter 5
Funding Template Criteria			Scoping Manual Chapter 2
Maintaining Traffic Issues			TSC T&S Engineer
Road/Bridge Scoping Report & Details Worksheet	Checklist		Scoping Manual Appendix

Required Attendees for TSC Van Tours:

- TSC Operations Engineer
- TSC Construction Engineer
- TSC Consultant Coordinator
- TSC Traffic and Safety Engineer
- TSC Maintenance Coordinator
- TSC Manager

Optional Invitees:

- County Road Commission or Municipality or Local Agency
- Permits or Utility Engineer
- Design Engineer
- Region Bridge Engineer

Suggested CFP Schedule
July

Step 4 Compile List from TSC-Level Van Tours with TSC Candidate Projects in Priority Order

Discussion of candidate projects and potential fix types are often discussed by TSC staff in a debriefing meeting following the TSC-Level Van Tour. Typically, it is during this meeting that a priority list is developed from the candidate list (sorted by template).

The Goal:

Prepare a priority list of potential projects with identified project issues. Develop a proposed project map.

Responsible Party:

TSC Development Staff, in consultation with TSC Staff and approval of the TSC Manager.

Needed Information and Tools

Support Information Needed	Tools / Data	Program	Staff Resource or Location
All Information from Steps 1-3			TSC Development Staff
Summary of TSC-Level Van Tour Notes	Spreadsheets and Maps	Excel Mapitude	TSC Development Staff

Suggested CFP Schedule
July

Step 5 Gather Information for Region-Level Van Tours

A prioritized candidate list from the TSCs is submitted to the Region for review a minimum of two weeks prior to the Region-Level Van Tour. The Region may obtain additional information when reviewing the list for use on the Region-Level Van Tour. The Region will analyze the candidate list (completed spreadsheet) and revised maps from all TSCs and compare it to the Region's Network Condition Strategy.

The Goal:

An information package is developed, including revised maps, for the Region-Level Van Tours.

Responsible Party:

TSC and Region Development Staff.

Needed Information and Tools

Support Information Needed	Tools / Data	Program	Staff Resource or Location
Previous info gathered from Step 1			Region Development Staff
TSC Prioritized List and Map from Step 4			TSC Development Staff
Environmental Information			Region Resource Analyst or Lansing Planning Division
Studies/ Corridor Information	Studies Road History	P^3 Projectwise	Region Development Staff

Suggested CFP Schedule
Aug thru Sept

Step 6 Conduct Region-Level Van Tours

The Region-Level Van Tour is the opportunity for the TSC and Region to discuss the proposed projects, project issues and strategic goals, while reviewing the location as a group. Clear and concise notes must be taken for each project. Alternatives for further investigation or estimation should be discussed and consensus reached for each project.

The Goal:

Visual inspection of TSC's prioritized candidate list, by multi-disciplined staff from the Region, Lansing and the TSC (and other personnel if necessary). Develop a consensus of the prioritized candidate list of projects and fix options (with supporting discussion notes).

Responsible Party:

Region Development Staff.

Needed Information and Tools

Support Information Needed	Tools / Data	Program	Staff Resource or Location
Information from Steps 4 & 5			Region & TSC Development Staff
List of Invitees			See below

Required Attendees for Region-Level Van Tour:

- Region Consultant Coordinator
- Minimum of one, maximum of 3 representative from TSC (Recommended – TSC Operations Engineer, TSC Construction Engineer and TSC Manager)
- Region System Manager
- Region Pavement Management Engineer
- Region Soils Engineer
- Lansing Environmental Clearance Coordinator
- Region Resource Specialist
- Bridge Engineer

Additional/Optional Attendee List:

- Region Real Estate
- Region Surveyor
- Lansing Geometrics Unit Representative
- Lansing Hydraulics Representative
- Region Staff Engineer
- FHWA Area Engineer

Detailed Project Scoping and Cost Estimation

Suggested CFP Schedule
Sept thru
1st week
of November

Step 7 TSC Prioritize List of Projects and Submit to Region

Following the Region-Level Van Tour, it is suggested that a follow-up meeting be held with each TSC to ensure that all participants have understood the information that was discussed with respect to each project candidate. It is essential that each participant is clear on the proposed fix. At this time each TSC can edit the candidate list, to incorporate the Region-Level Van Tour notes and discussions. After the information has been edited, it is then sent to the Region to be combined into a draft master projects list for the entire Region, separated by template and sorted by the TSC priority ranking.

The Goal:

Develop the final prioritized list of proposed projects based on general agreement from the Region-Level Van Tours.

Responsible Party:

TSC Development Staff.

Needed Information and Tools

Support Information Needed	Tools / Data	Program	Staff Resource or Location
Information from Steps 4 & 6	Project Spreadsheets	Excel	TSC & Region Staff

Suggested CFP Schedule
Sept thru Oct

Step 8 Conduct Regionwide Priority Meeting of Proposed Projects

A Project Prioritization Meeting, with the Region and TSCs, is held to discuss the combined prioritized list. The list weighs the priorities of the candidate jobs from all of the TSCs. It is recommended to assign a priority ranking at a Regionwide level, comparing candidate projects and priority rankings between the TSCs. All of the projects are discussed with the TSCs and Region staff. It is determined at this meeting which projects are to be estimated and considered for selection. It is important to preliminarily determine the highest ranked project candidates, so estimating can focus on the projects that will likely be chosen.

The above mentioned process will hold true for all templates being considered. For all templates the determination of which projects to estimate for the current year's Call For Projects is made at this meeting.

Following the meeting, the final version of the prioritized list is updated to reflect the comments and direction to be taken (including the priority ranking and fix options to estimate).

The Goal:

Regionwide priority list of candidate projects for TSCs to scope and estimate (Final Project Candidate List).

Responsible Party:

Region & TSC Development Staff.

Needed Information and Tools

Support Information Needed	Tools / Data	Program	Staff Resource or Location
Any Updated Information from Step 1			Region Staff
Information from Step 7	Final Projects Candidates List (Spreadsheet) is distributed	Excel	TSC & Region Develop Staff

Suggested CFP Schedule
Mid-Nov
to Dec 31

Step 9 Develop Detailed Scoping Package with Estimates for Proposed Projects

(revised 6-24-2019)

Statewide Scoping Master Checklist

Scoping Report and Details Worksheet

Each TSC takes the Final Project Candidate List (distributed from the Region to the TSCs in Step 8), scopes the candidate projects and develops cost estimates for the fix options agreed upon at the Project Prioritization Meeting (Step 8). All documentation from this step and the previous steps are incorporated into a detailed comprehensive scoping package. At this step the “Statewide Scoping Package Master Checklist” and the “Scoping Report and Details Worksheet” must be completed in full and the package compiled and entered into Projectwise. In addition, the projects that are selected for estimating, at the Project Prioritization Meeting, will need JNs obtained for the scoping package (for only those candidate projects being estimated). See Chapter 10 of the manual for additional information and the instructions for setting up the ProjectWise structures.

The Goal:

Develop Project Scoping Packages that are comprehensive, inclusive and detailed, with estimates and completed checklists.

Responsible Party:

TSC Development Staff

Needed Information and Tools

Support Information Needed	Tools / Data	Program	Staff Resource or Location
Information from Step 3, 6 & 8	Project Spreadsheets, Notes & Files		TSC Development Staff
Obtain Job Number	Project Spreadsheets	JobNet	Region/TSC Development Staff
Projectwise File Structure	Files, Project List, JN	Projectwise	Region/TSC Development Staff
Project Estimate	Estimating Spreadsheet	AP Pre-construction and PQS	Scoping Manual Chapter 7, 8 & Appendix
Current programmed local or state projects	STIP/TIP		Region Development/ Planning Staff
	Local Project List		Local Agencies, MPO, RTF, Region Planning Staff
	MDOT 5 Year Program	ACRS	
	Current Year CFP Book	Adobe	Region/TSC Development Staff

Support Information Needed	Tools / Data	Program	Staff Resource or Location
Strategy Guidelines	Existing Strategies		Region Development Staff
	BCFS/RQFS	BCFS RQFS	Region Development Staff
	Known Constraints (EIS or EA)		Region Development/ Planning Staff
	New Initiatives		Region System Manager
Checklists	Scoping Package		Scoping Manual Appendix
	Detailed Worksheets		
	Estimating		
	Constructability		
Associated Items	Bridge Deck Matrix Considerations, Sketches, Beam Repair Measurements, Photographs, Previous Inspections and etc		
	ADA/Sidewalk		
	Elderly Mobility		
	SR2S (Safe Routes to School)		

Support Information Needed	Tools / Data	Program	Staff Resource or Location
Work Zone Safety and Mobility Policy Analysis	Acceptable Delay Worksheet		Work Zone Safety and Mobility Manual
	LOS		Sufficiency Report
	Traffic Counts	TMIS	
	Capacity Analysis	Synchro Corsim V/C CO^3	Work Zone Safety and Mobility Manual
	Delay Mitigation Concepts		Work Zone Safety and Mobility Manual/Scoping Report & Details Worksheet
Stakeholder Engagement/ CSS	Stakeholder Engagement Activity Matrix		Guidelines For Stakeholder Engagement
CFP Instructions	Current Year Instructions		Region Development Staff
Current Guidelines	Road Design Manual; Bridge Design Manual; Geometric Design Guides		MDOT Intranet
Template Criteria			Scoping Manual Chapter 6

The Estimator (developing the scoping documents) and the TSC Manager or TSC Engineer must sign and date the Statewide Scoping Package Master Checklist when the review is completed.

Additionally, the Scoping Package and all contents must be stored in Projectwise. The file structure that will be used is described in Chapter 10 of this manual.

Final Review and Selection of Projects

Suggested CFP Schedule
Month of
January

Step 10 Gather Scoping Packages and Consolidate List

Each TSC submits the scoping packages to the Region for review. Region will combine all data into Final Project Candidate List.

The Goal:

Update of region lists, reflecting details from scoping package.

Responsible Party:

Region Development Staff

Needed Information and Tools

Support Information Needed	Tools / Data	Program	Staff Resource or Location
Scoping Package			TSC Development Manager
Prioritization Meeting Notes			TSC Development Staff
Van Tour Notes			TSC Development Staff

Suggested CFP Schedule
Late January

Step 11 Region QA/QC of Scoping Package

The Region receives the Scoping Package from the TSCs and reviews the package for completeness, omissions, errors and conformity with previously agreed upon scoping direction.

The Goal:

To obtain complete and accurate project Scoping Packages, with proposed changes and/or corrections through review and analysis.

Responsible Party:

Region Staff or other staff as assigned for review in the QA/QC process (preferably not involved with the Scoping process to date).

Needed Information and Tools

Support Information Needed	Tools / Data	Program	Staff Resource or Location
CFP Letter			Region System Manager
Detailed Scoping Packages			TSC/Region Development Staff
Timeframe/ Schedule	CFP Letter/Calendar		Region System Manager
Manuals & Guides			MDOT Intranet
Template Criteria			Scoping Manual Chapter 6

Statewide Scoping Package Master Checklist

Suggested CFP Schedule
Late Jan
to Mid-Feb

Step 12 Region-Wide Strategies Refined (RQFS & BCFS) (revised 6-24-2019)

Based on funding, goals etc., changes made to the network over the previous year and the proposed projects, a preliminary RQFS/BCFS analysis is performed and submitted to Lansing Statewide Project Planning. This will ensure the new draft project selection aligns with the previous year's strategy.

The Goal:

Direction for project selection.

Responsible Party:

Region System Manager, Region Pavement Engineer and Region Bridge Engineer.

Needed Information and Tools

Support Information Needed	Tools / Data	Program	Staff Resource or Location
Current Programmed Projects		ACRS JobNet	
Draft Selected Candidate Project List	Draft/Refined List (Spreadsheet)	Excel	Region System Manager
Condition Data			See Step 1 for details/Region Pavement Engineer/Region Bridge Engineer
Current RQFS/ BCFS Analysis		RQFS/BCFS	Region Pavement Engineer/Region Bridge Engineer

Suggested CFP Schedule
Mid – Feb to Late - Feb

Step 13 Project Selection

The Region analyzes the Project Candidate List and weighs Strategic Goals and Strategies, Template Targets, project priority ranking, project impacts, a balance of mix of fixes, stakeholder engagement, capital distribution among the TSCs, corridor strategies and estimated project costs for the various fix options to determine which projects will be selected for inclusion in the Call For Projects. The Let Dates are set in order to provide a balance of lettings within the first two quarters of the Fiscal Year. As financial constraints allow, EPE, PE, ROW and/or other necessary phases are also assigned to the fiscal years prior to the project activity.

The Goal:

Final constrained project list.

Responsible Party:

Region System Manager.

Needed Information and Tools

Support Information Needed	Tools / Data	Program	Staff Resource or Location
Strategic Direction	CFP Instructions		Region System Manager
Estimated Program Targets	Partnering/ Funding Opportunities	MMS/ACRS	Call For Projects Letter
Individual Project Estimates	Spreadsheets or Lists		From Step 9
Template Constraint	Spreadsheets	Excel ACRS MMS	Region System Manager/Lansing Planning/Lansing C&T Bridge
Strategies		RQFS/BCFS	
Stakeholder Input	Lists/Files		All

Call For Projects Submittals

Step 14 Submission to Lansing for Interim Approval of the CFP

In the CFP process, following the selection of projects (step 13), the Region submits the Proposed Project lists (by Template) to Statewide Planning Division for review and approval. Statewide Planning Division reviews and corresponds with each Region regarding the submittal, at the same time it is forwarded to the Project Screening Committee. The Project Screening Committee analyzes the statewide project list for compliance with the statewide goals, on region by region basis.

The Goal:

A draft program that is constrained, consistent with developed strategies, provides a cost effective "Mix of Fixes" plan and ready for preliminary review by the Project Screening Committee.

Responsible Party:

Region System Manager

Needed Information and Tools

Support Information Needed	Tools / Data	Program	Staff Resource or Location
CFP Letter			Region System Manager

Step 15 Final Submission of the CFP

Comments from Step 14 are sent back to each region by mid-April. The Region will incorporate comments from the Project Screening Committee and finalize the Final Project List (by Template). The CFP Notebook, with all components from the CFP instructions, is compiled for submittal in May to Statewide Transportation Planning Division in Lansing (and entered in ProjectWise).

The Goal:
Incorporate or address the March submittal's review comments, program all approved projects and develop the notebook for the CFP May submittal process.

Responsible Party:
Region System Manager

Chapter

10

Following Programming of the Job

Topic | Page #

Introduction

This chapter contains information on the steps taken after a project has been scoped. These steps are completed by MDOT staff, as consultants do not have access to the programs or tools needed to complete these tasks.

Project Selection

Region System Manager
TSC Managers

After the proposed projects have been scoped and the estimates have been reviewed (QC and QA), the final selection process occurs. The projects are analyzed according to the following: overall pavement condition strategies, budget constraints, corridor plans, template coordination and etc. This process is done by the Region System Manager in consultation with the TSC Managers and any required support staff.

Programming a Project (MPINS)

MPINS
MAP Project INformation System

Projects are programmed for funding once they have been scoped and selected to be added to the five year program, as described above. For a project to be included and considered in the five year program, the project has to be identified with a specific project number (job number) and is programmed through the MAP Project INformation System (MPINS). Development and design engineers become familiar with MPINS during the scoping and design process.

What is MPINS?

For users that require training in the use of MPINS, it is available several times a year or staff should discuss the need for the training with their supervisor. The MPINS User Guide is also available on *inside MDOT* at http://inside.michigan.gov/sites/mdot/groups-projects/mpins/Shared%20Documents/MPINS_UserGuide.pdf

Much of the information in the section of this manual was referenced from the MPINS User Guide. All MDOT employees have "Read" access to MPINS and all employees can submit Concept Statements. For additional access, a user must be granted access to the program. When a supervisor approves a staff member to have access to MPINS, the access for Trunkline Templates is granted through the Template System Manager.

Obtaining a Job Number

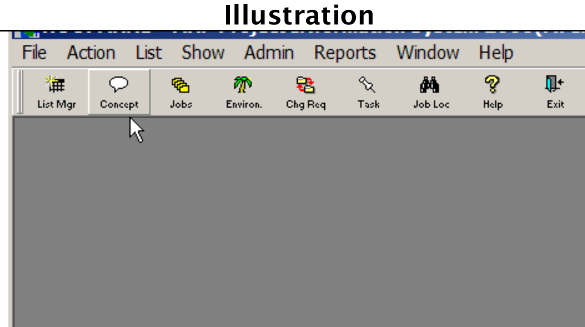
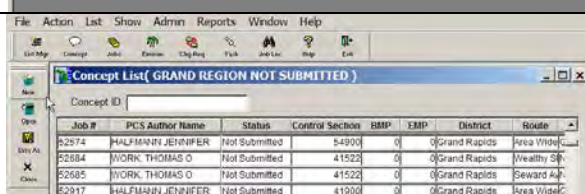
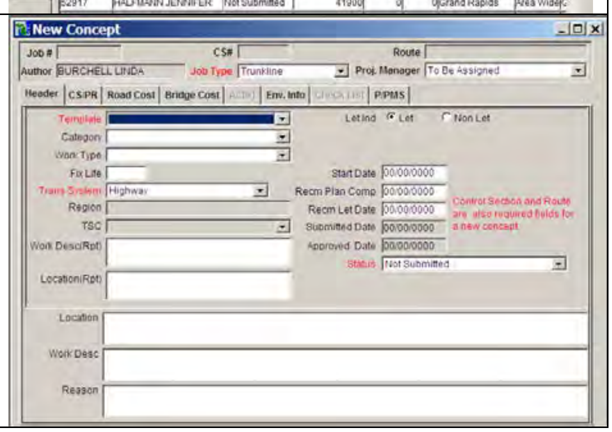
Creating a Job Number

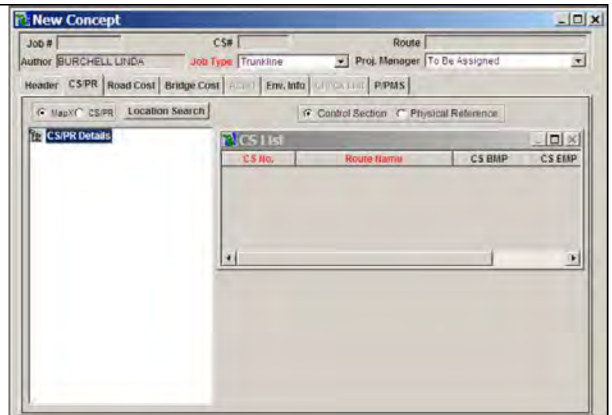
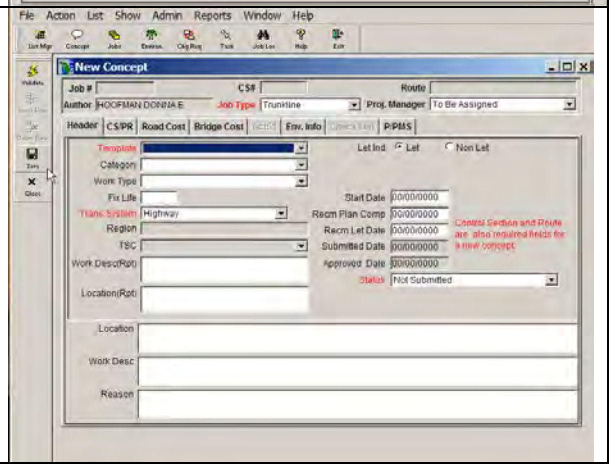
1. Obtain a Project Job Number
2. Create a Project Concept Statement
3. Program the project for funding

Authoring and submitting a new Concept Statement using MPINS begins with getting a job number assigned. It is important to write down the new job number as soon as it is assigned. This job number will be used to locate the Concept Statement and to complete any additional information prior to submission. The user can go to MPINS/Concept/New to create a job number. Another method of opening a new Concept Statement, for the purpose of getting a job number, is to begin by using the Job Locator button instead of the Concept module button. Time is saved using this method because the user isn't waiting for the current default concept list to find and filter all of the concepts before starting. This is done as a part of Step 9, in Chapter 9 of this manual, following the Project Prioritization Meeting.

To obtain an assigned JN the user should:

> *Note:* This function can be performed by any MPINS user by opening a new concept, completing all required (red-labeled) fields and then saving.

Opening a New Concept		
Step	**Action**	**Illustration**
1	Click on the **Concept** toolbar button to open the Concept List window.	
2	Click on the **New** toolbar button (located to the left) to author a new concept.	
3	In the New Concept window (on the Header tab), the <u>required</u> fields are labeled in red: • Job Type • Template • Trans System • Status (Not Submitted). Do not submit unless directed by the supervisor	

4	Click on the **CS/PR tab**, the <u>required</u> data is again labeled in red: • Control Section • Route CS/PR data can be entered manually or by using the MapX or PR/CS List buttons.	
5	Click on the **Save** toolbar button (located to the left). If all of the <u>required</u> data has been input, a JN will be assigned in the Job # field in the upper left corner of the input screen.	

When to get a job number

Caution: Once a job number has been assigned it can not be reused. Users should only initiate concepts for jobs that have been agreed upon at the Regionwide Prioritization Meeting (Step 8 of the CFP Scoping Process). Create a job number only when following Step 9 in Chapter 9 of this manual.

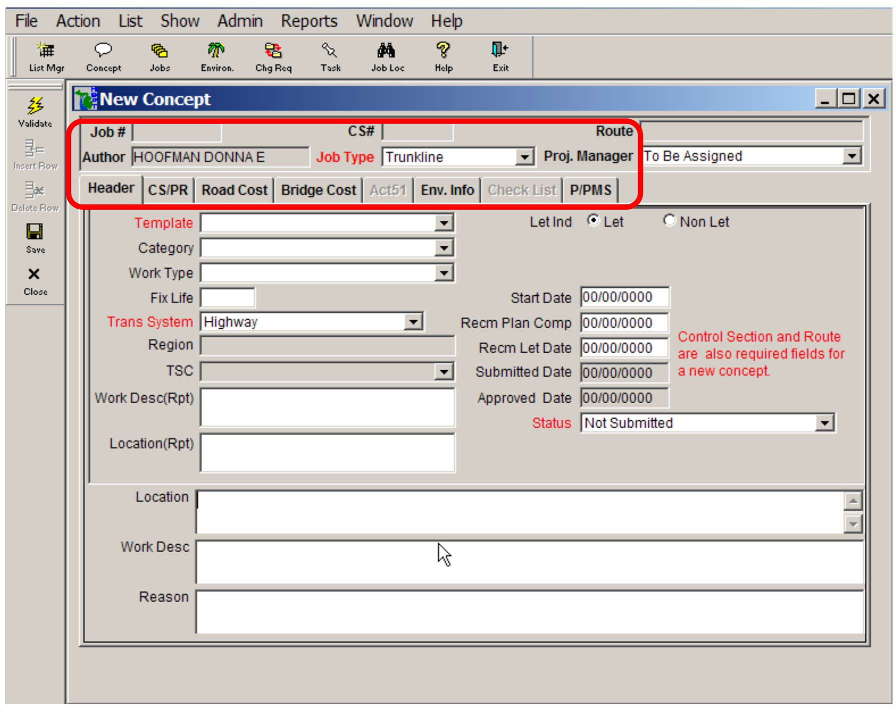
Step 9, Chapter 9

Creating a Project Concept Statement

Program Revision Request Form (form 2604)

The purpose of a Project Concept Statement, also know as MPINS Concept Statement, is to document the justification for and to identify specifics about a proposed project. The majority of this information is determined, accumulated and calculated throughout the scoping process. The funding of a project is not approved until the MPINS Concept Statement is submitted and the guidelines are then followed for a recommended funding type. This is done through the zero Sequence Number of a Program Revision Request Form (form 2604). This step is done during Step 9 (as shown in Chapter 9 of this manual), prior to the March turn in. If this is not done as a part of the Call For Projects, the process is still the same.

A MPINS Concept Statement separates information within the following tab pages.

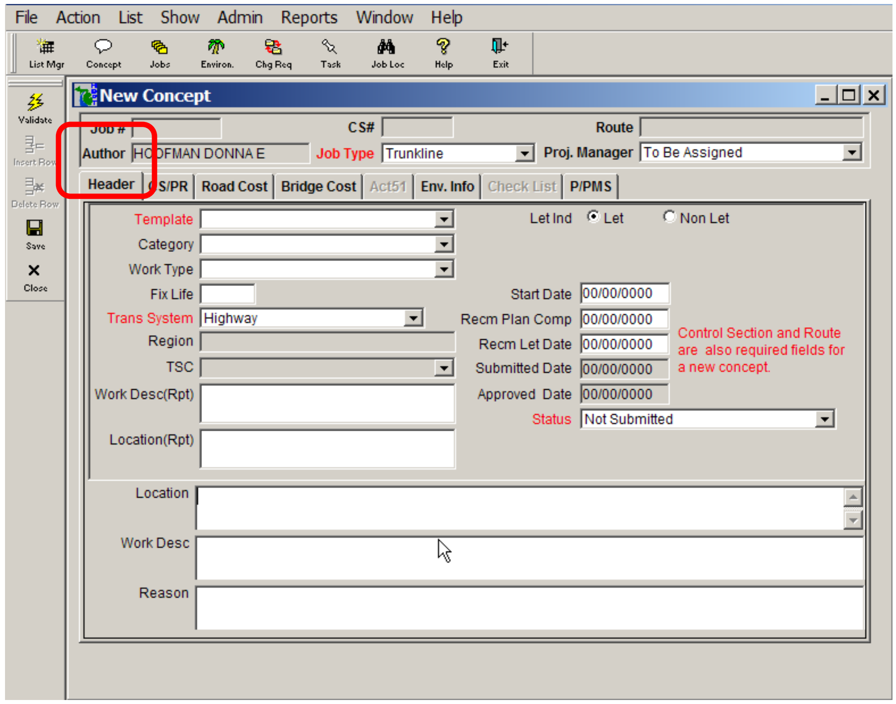


- Header
- CS/PR
- Road Cost
- Bridge Cost
- Act 51
- Environmental Information
- Check List
- P/PMS

Header Tab

Basic project information

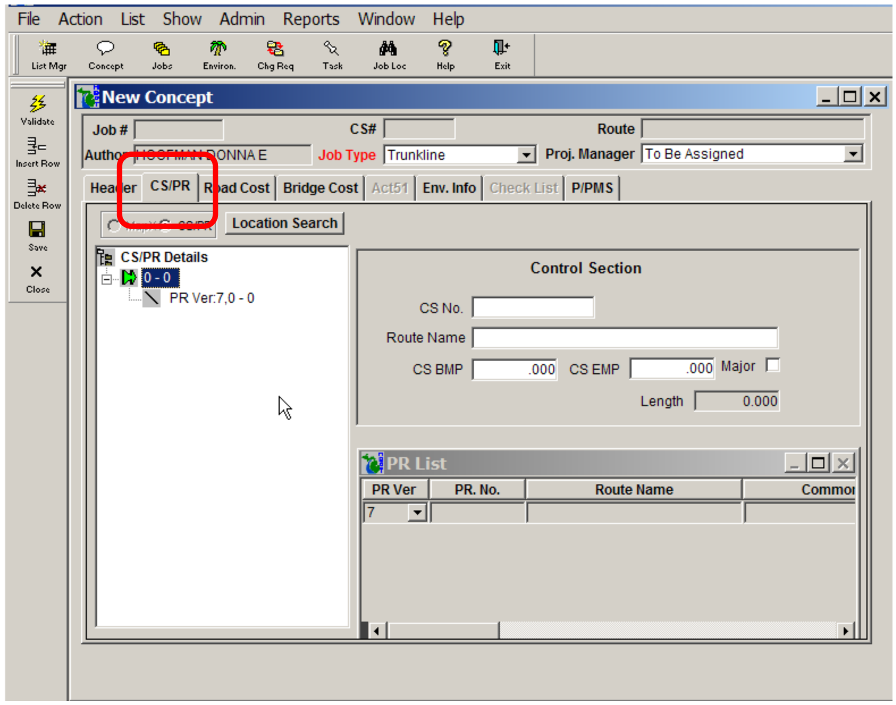
This section or tab contains basic information about the project. It provides a summary of the funding template, work category, work type, location, Region, TSC, project schedule and letting status.

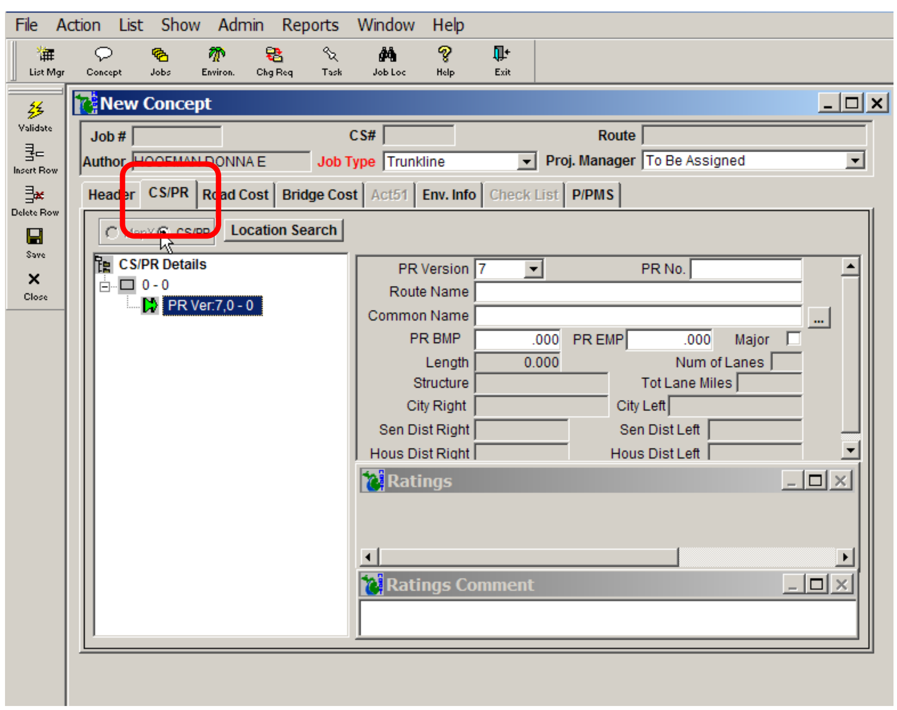


Control Section/Physical Reference (CS/PR) Tab

Exact physical location that project will take place

This section or tab identifies the exact location(s) of a project. This information is important to other databases used by the MDOT (for example RSL, RQFS and etc). Enter the project Control Section(s) (CS), the Control Section Mile Points (CS BMP & EMP), Physical Reference Number(s) (PR) and Physical Reference Number Mile Points (PR BMP & EMP). The CS is a polygon measurement and the PR is a linear measurement for the project length.

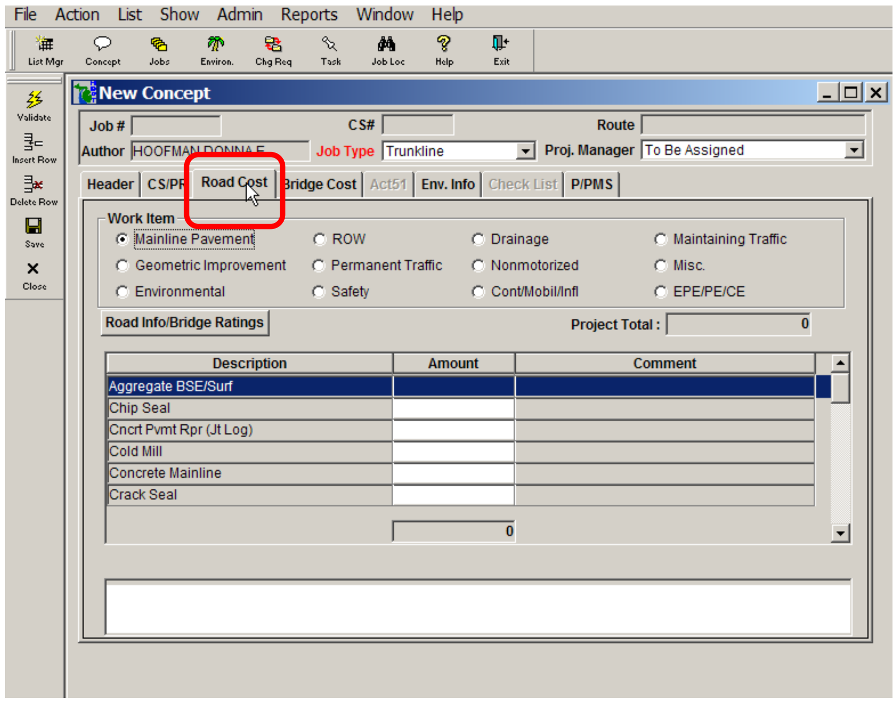




Road Cost Tab

Chapter 8
Scoping Project Concept Estimate Report

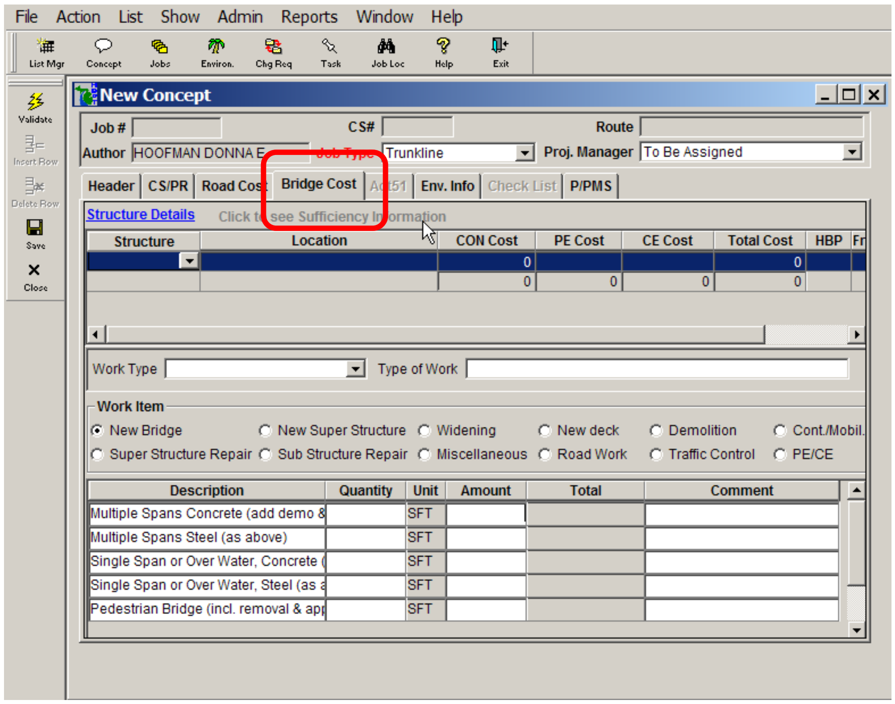
This section or tab identifies the funding of a road project and should match the scoping estimate for the road. See Chapter 8 for an example of the Scoping Project Concept Estimate Report. The Cost Summary Tool will be used for independent calculations of Project Support Costs which are then input back into Trns·port for a total project cost.



Bridge Cost Tab

Chapter 8 Scoping Project Concept Estimate Report

This section or tab identifies the funding of a bridge project and should match the scoping estimate for the bridge. See Chapter 8 for an example of the Scoping Project Concept Estimate Report. The Cost Summary Tool will be used for independent calculations of Project Support Costs which are then input back into the Trns·port for a total project cost.



Act 51 Tab

Documentation of local contributions to funding

This section or tab is a new addition to the MPINS program and is currently under development. The Act 51 tab page allows you to add or identify local contributions to the funding calculations for the job.

The Act 51 participation is an important component of programming a project. Act 51 Public Acts of 1951, as amended (1982), provides that cities having a population of 25,000 or more will participate with the Department in the cost of opening, widening and improving, including construction and reconstruction, of State trunkline highways within said cities.

Section 14.41.03 MDOT Road Design Manual

Act 51 Participation URL

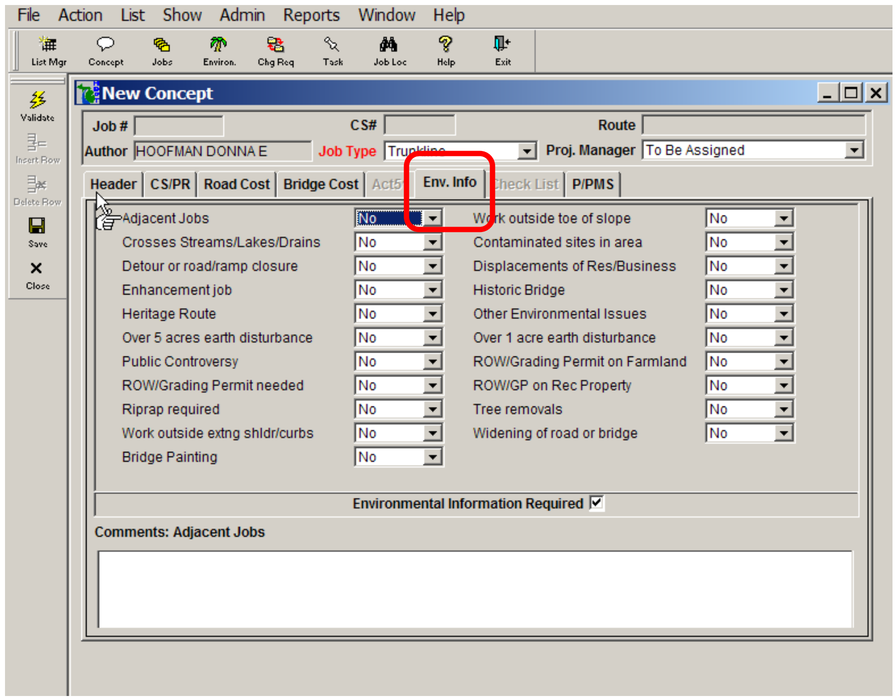
Cities required to participate, based on the 2000 census are listed in Section 14.41.03 of the MDOT Road Design Manual. Specific items of work are considered participating and non-participating under Act 51 and are listed in the Reference document Act 51 Participation on: http://www.michigan.gov/mdot/0,1607,7-151-9625_21540_36037---,00.html

Environmental Information Tab

Environmental concerns

This section or tab provides a location to note the existence, or possible existence of any environmental concerns along with related comments. This information should be readily available from the project scoping package, as shown on the last page of the Scoping Report & Details Worksheet.

Scoping Report & Details Worksheet



Check List Tab

The Check List tab is currently inactive.

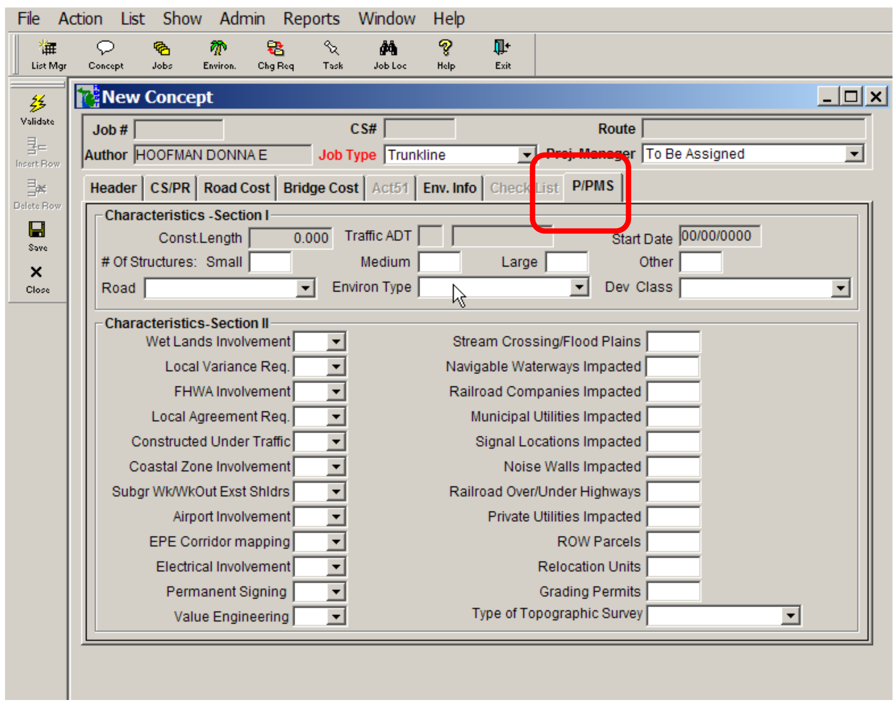
P/PMS Tab

Helps generate a structured schedule for work steps

The information in this tab is used by the Program/Project Management System (P/PMS) to generate an initial project management scheduling network for the job. The project management network is created for the development process which includes a wide variety of work steps beginning with the early study for Improve/Expand projects, and after the "Call for Projects" for Preserve Projects, ending with the construction contract award.

MDOT P/PMS Task Manual

MDOT has recognized that the development process is very complex and that managing the process can best be accomplished by using a structured scheduling and reporting system. A scheduling and reporting system makes use of standard tasks which can be linked together to form a network. The MDOT P/PMS Task Manual documents the standard P/PMS network and provides descriptions for tasks included in the network.



Concept Statement Submission

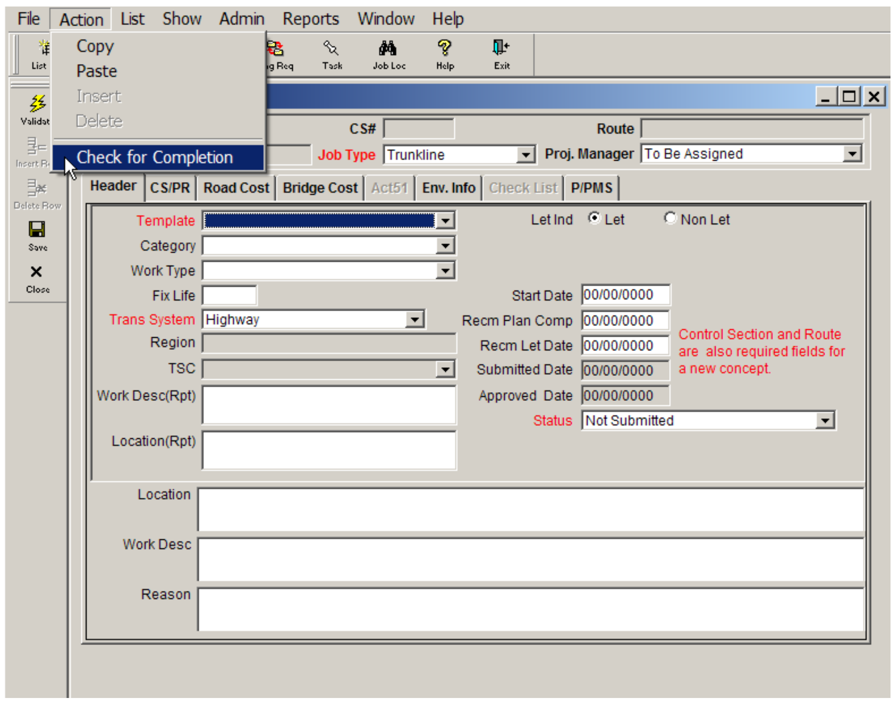
Review

Completion check

Once all of the required information, as well as all additional information, has been entered into the Concept Statement and reviewed, it is ready to be checked for completion. MPINS is programmed with a Check for Completion function that helps ensure that all information has been entered.

- Perform a visual check of the Concept Statement
- Click the Action menu and select Check for Completion

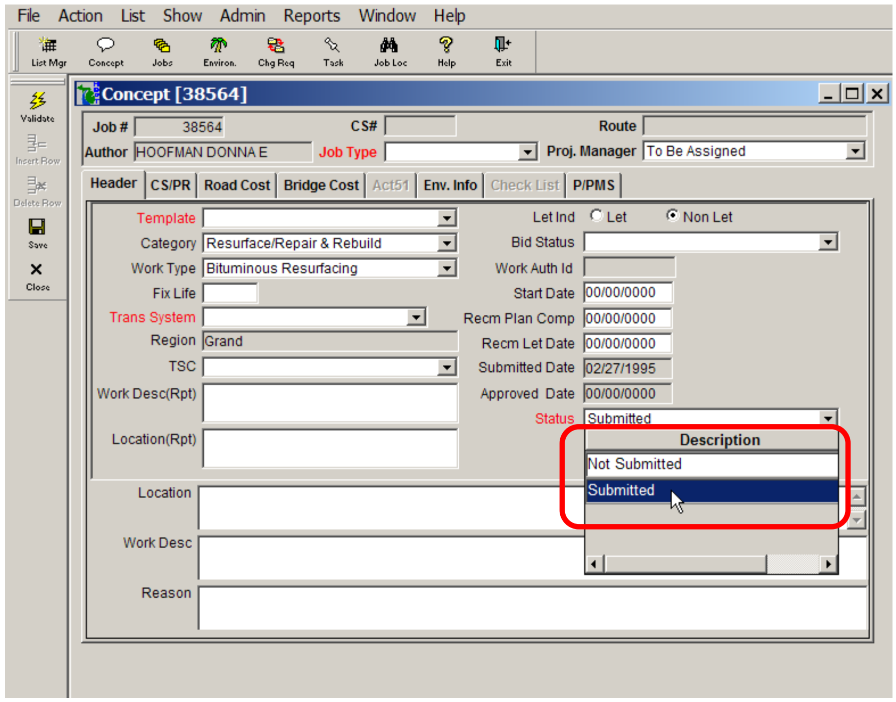
If there are errors in the Concept Statement, MPINS will display a list of problem areas.



Submit

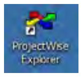
Step 14, Chapter 9

You may now submit the Concept Statement, at which time it becomes ready to be programmed. The Template System Manager is responsible for the programming. Once the job number is programmed, the project has been allocated funding. This function is done during Step 14 (as defined in Chapter 9 of this manual) prior to the March turn in.



ProjectWise

Where to keep scoping documentation



Once the JN is created for the candidate project, contact your TSC/Region ProjectWise (PW) administrator and request the creation of the job number folder. All scoping documentation will be stored in the appropriate folders in the 0 (Zero) Early Preliminary Engineering (EPE)/Project Scoping Document Package folder, located under the Templates/New Early Preliminary Engineering Template folder for each TSC and Region Job Number.

Details of ProjectWise folders can be found later in this chapter.

Creating a ProjectWise Link

ProjectWise

The Scoping Package includes the reference of As-Builts and Old Plans. You will need to create a ProjectWise link to the applicable plans for the project.

An easy way to create ProjectWise Links

Instead of copying As-Built files into a new project folder, users will create a word document that contains links to existing As-Built and/or Old Plans. This saves in duplication of files, server space and back up. Follow these steps necessary to create the document linking the As-Builts and/or Old Plans.

- Create a new Word document
- In ProjectWise, search for the As-Builts/Old Plans that apply to the project and highlight the associated folder name
- In the top part of ProjectWise is a window that shows the link

Example:

- Right click on the link and select copy
- In the open Word document, right click and select paste
- Save the Word document (use As-Built or Old Plans in the file name and the job number of the As-Builts or the Old Plans, do not save the actual plan file as the new job number)

ProjectWise Setup for Scoping Packages

The Following is the Project Scoping Document Package folder outline for ProjectWise. A PDF of this outline is attached to each new project scoping package setup under the Project Scoping Document Package folder in ProjectWise. This will help you placing documents in the correct folder locations.

- 0 - Early Preliminary Engineering (EPE)
  - Project Scoping Document Package
    - 1 - Details and Checklists
      - Statewide Scoping Package Master Checklist
      - Scoping Report & Details Worksheet
      - MPINS Project Concept Statement
      - Program Revision Request (Form 2604)
      - Culvert Scope Inspection Form (if applicable)
      - Constructability Checklist
    - 2 - Engineer's Estimate
      - Trns·port (Scoping Itemized Estimate Report & Scoping Project Concept Estimate Report)
      - Hand Calculations & Assumptions
      - Estimates for Additional Options Analyzed (not bridge template)
    - 3 - Traffic
      - Preliminary MOT Concept
      - Mobility Analysis
      - Traffic Analysis & Safety Review
      - Geometric Review Summary (reviewed and/or addressed per the 3R/4R guidelines)
    - 4 - Proposed Pavement Recommendations
      - Proposed Approach Pavement Section (if applicable)
    - 5 - Soil Information and Recommendations
      - Soil Information and Recommendations (if applicable)
    - 6 - General Items and Information
      - As-Builts/Old Plans
      - Current Sufficiency Report
      - Condition Reports for Existing Sewers (if applicable)
      - Condition Reports for Existing Culverts (if applicable)
      - Maintenance Log Sheets
      - Pavement Historical Database (PHD) Data (if available)
      - ROW Sheets with Impacts Highlighted
      - Existing Utility Information
      - Field Review Notes
      - Supporting Photos (road approach)
      - Previous Call For Projects Information
      - Correspondence
      - Additional Information Resulting From the Worksheet
    - 7 - Bridge Scoping Report (Bridge Only)
      - Executive Summary
      - Field Site Review
      - Rehabilitation Options
      - Summary of Repair Recommendations
      - Maintaining Traffic/Mobility Summary
      - Appendix
        - Photos
        - Bridge Rehabilitation Scoping Checklist (Form 1891)
        - Estimate Sheets for Each Option
        - Field Notes and Sketches
        - Existing Plan Sheets (General Plan of Site and General Plan of Structure)
        - Current Bridge Inspection Reports
          - Bridge Safety Inspection Form (Form 2502)
          - Bridge Analysis Report (Form 231)
          - Detail Beam Survey Report (Form 267) (if available/applicable)
          - Bridge Underclearance Measurements (Form 1190)
          - Diver Inspection Report (if available/applicable)
          - Load Posting Form (if available/applicable)
  - Scope Verification

ProjectWise Folders

Statewide Scoping Package Master Checklist

Chapters 6, 7, and 8

The outline above shows the folders within ProjectWise and the documents needed to be stored within each folder. This outline is also reflected on the Statewide Scoping Package Master Checklist. As much as practical the documents stored should be PDF files. Refer to Chapters 6, 7 and 8 of this manual for more information on the contents of the folders.

Trns•port

Once the Job Number (JN) is created for the candidate project, you can put the scoping estimate in Trns·port. Refer to Chapter 8 for additional information on how Trns·port helps develop the scoping estimate. The Breakdown ID numbers in Trns·port provide the appropriate output in the Scoping Project Concept Estimate Report to transfer to the MPINS Concept Statement discussed earlier in this chapter.

Program / Project Management System (P/PMS) Networks

What is P/PMS?

The Program/Project Management System (P/PMS) is an automated planning and scheduling tool, tailored to the MDOT development process. It is designed to allow Department personnel to be productive and effective in managing the planning, design and right of way activities of the Department's highway program from both short and long-term perspectives.

The P/PMS application is a customized software solution for scheduling, reporting progress and tracking the status of jobs.

The P/PMS User Manual is available on the *inside MDOT* website. The P/PMS Task Manual, which describes each of the standardized tasks which may be applicable in the project development process, is available on the web at
http://www.michigan.gov/mdot/0,1607,7-151-9625_21540_36037_54503---,00.html#
Also see text above in the Creating a Project Concept – P/PMS section.

Refining a P/PMS Network

Refining the work flow plan

When a Concept Statement has been approved by the MPINS user, an un-refined P/PMS network is generated. This network is a work flow plan consisting of all tasks and events that must be completed or accomplished to reach program objectives, showing their planned sequence of accomplishments and logical relationships.

Step 14, Chapter 9

Region or TSC Cost & Scheduling Engineer Project Manager (PM)

As part of the Call For Projects scoping process, a project's P/PMS network must be refined and submitted. This is done after step 14 (as defined in Chapter 9 of this manual), and will be done prior to the May submittal (if done with the Call For Projects process). Typically, as stated in the P/PMS User Manual, this is the responsibility of the Region or TSC Cost & Scheduling Engineer or the Project Manager (PM).

Time Frames to Hire a Design Consultant

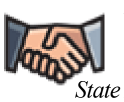
Obtaining a Consultant

How consultants are chosen

When obtaining a design consultant, one of the most important things to keep in mind is the time frame required to obtain an authorized contract. If, during the scoping process, it is determined the project will most likely be a consultant design, then the P/PMS network that is created during the Call For Projects process should incorporate the appropriate time frames and tasks.

Because MDOT follows a Quality Based Selection for the design phase of projects (vs. the Low Bid Selection that is used for the phase construction) the time required to authorize a consultant usually takes several months. This is due, in part, to the fact that the consultant must first submit a proposal (with no costs) outlining their understanding of the project and the consultant team that is being proposed to do the work. Then, once the consultant is selected, MDOT requests a price proposal which outlines the hours, direct costs, the staff hourly rates of the team, subcontractors and etc. that are being proposed to work on the project.

Central Selections Review Team (CSRT)



State Administrative Board (Ad Board)

This process requires two steps (except Tier 1) of formal authorization from MDOT. The consultant that is selected must be approved by the Central Selections Review Team (CSRT) and the final price proposal of the selected consultant must be approved by the State Administrative Board (Ad Board). Below is a brief summary of the tasks and time frames associated with securing a design contract.

Step 1 – Prepare the Scope of Services (~ 2 to 4 weeks)

This step involves detailing all of the design work that the consultant shall perform, in a single document that will be posted to the internet for interested consultants to submit proposals. The time frames for this can vary greatly depending on the size of the job and the extent of the internal review the scope will receive prior to posting. For this example, one month will be used.

Step 2 – Advertise the Scope (~ 6 weeks)


Scope e-mail destination *Forms 5100B 5100H*

Once the scope has been finalized, it should be emailed to MDOT-CSD-Selections@michigan.gov, along with Forms 5100B and 5100H. These combined documents formulate a Request for Proposal (RFP), which provide the consultants information on which proposal Tier the RFP is, where to submit the proposal and what to include in the document. Scopes will fall into one of three Tiers based on the programmed Preliminary Engineering (PE) cost for the consultant to perform the design tasks. The Tiers help the consultant determine the size and package requirement of the design. The RFP is posted online at: http://www.michigan.gov/mdot/0,1607,7-151-9625_32842---,00.html.

Location of RFP

Tier 1, 2, and 3 monetary levels

Tier 1 is for contracts between $25,000 and $99,999. Tier 1 does not require Ad Board approval. Tier 2 is for contracts between $100,000 and $250,000, and Tier 3 is for contracts greater than $250,000. For more information on the Tiers and the requirements see the MDOT Consultant-Vendor Selection Guidelines located on the Office of Contracting Services (OCS) website at: http://www.michigan.gov/documents/MDOT_Consultant-Vendor_Selection_Guidelines-0106_145222_7.pdf.

MDOT Consultant-Vendor Selection Guidelines

Six weeks is used as a general time frame because it may take up to one week for the scope to be posted once it is emailed and scopes are typically posted for 4 weeks.

Step 3 – Review the Proposals (~ 2 weeks)

Once the proposals are received, they are distributed to a selection team for review. A meeting is held to discuss the proposals and determine the consensus scoring of each proposal. Guidelines for the creation of the selection team can be found on the OCS website in the Vendor-Consultant Selections area under Guidelines.

Guidelines for the review team

Step 4 – Obtain CSRT Approval (~ 2 weeks)

Once the consensus score sheets have been finalized and signed by the review team, they are sent along with Form 5100E to the designated selections specialist in Lansing to get on the agenda for the next CSRT meeting. CSRT typically meets on a Friday every two weeks.

Consensus score sheets Form 5100E

For the OCS representative for your area see the Contract and Administration Support List in the contact area of the OCS website: http://www.michigan.gov/mdot/0,4616,7-151-9625_21539---,00.html

OCS representative

Project Manager
Approved consultant

Step 5 – Request & Negotiate Price Proposal (~ 5 weeks)
Following approval of the selected consultant by CSRT, the Project Manager will request a price proposal from the approved consultant. The time required for the consultant to compile a price proposal can vary greatly depending on the size and complexity of the scope of design services. For smaller projects 1-2 weeks may be enough, but for larger projects it may take as long as 2-3 weeks.

In addition to the consultant's time to prepare the price proposal, time should be allotted for negotiations and revisions. For this example a total of 5 weeks will be used.

Consultant meeting

Best Practice – It is often beneficial to meet with the consultant following the selection but before the preparation of the price proposal, to verify the scope of work the consultant will be performing. This extra step will ensure MDOT and the consultant are consistent with proposed work that is to be performed.

Project Manager
Contracting Administrator
Ad Board

PM Contract
Request Form
(form 5105)

Step 6 – Obtain Ad Board Approval (5 weeks)
When all of the negotiations have been completed and the price proposal has been finalized, the Project Manager will send the price proposal along with the PM Contract Request Form (form 5105) to the Contracting Administrator for their area (see contact list on OCS website or link above in Step 4). Ad board typically meets twice a month. Items must be sent to get on the agenda about 5 weeks in advance.

Typical total time needed

For the example laid out above, the total time required to obtain a consultant is up to 6 months from the start of the scope writing process. Obviously, the process can go somewhat faster depending on when some of the milestones are completed, with respect to their approval process agenda deadlines. Also, smaller contracts could be obtained more quickly, particularly if Ad Board approval is not required. A general estimate from posting to authorization is 4 to 5 months.

More information about
the approval process

For more information on the process go to the OCS website at:
http://www.michigan.gov/mdot/0,4616,7-151-9625_21539---,00.html

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Chapter 11

Changing the Scoping Package

Topic	Page #

Chapter 11: Changing the Scoping Package

Introduction (revised 6-24-2019)

The potential for change does exist with every project. Change can come from a variety of sources, both internal and external, and in many different forms. This chapter discusses the common types of change to MDOT projects and the effects of those changes. Additionally, this chapter identifies how to make, manage, and document those changes.

Original plan found in MAP Database (JobNet)

The effects of change can have a major impact to a project's scope, its associated cost (or resources), and/or the time required to design or construct the project. As a result, Change Management becomes an important tool to process and document change from a project's original baseline to its actual plan at the time of execution. A project's original baseline is the scope of work, cost and schedule as defined at the time the project concept statement is approved/programmed in MDOT's MAP Database (JobNet). The actual plan is the project's final plan/proposal package at time of project advertisement and letting. Time of execution is the date the project is awarded for construction.

Change Management is the process by which change can be processed and resulting impacts can be evaluated and decisions can be made, which are documented and communicated. Further analysis of change may even be able to detect trends and make forecasts to improve future projects. These trends can be found in the Matrix Measurement Components Report, in JobNet.

Tracking change

Change Request module JobNet

Within MDOT, changes to programmed jobs are processed and tracked through the Change Request module of JobNet. A change management plan is needed for every project that documents and tracks changes to projects from the very initial scoping stage or project conception, up to the programming of the job in JobNet. Changes to scoping packages are addressed through the annual Call For Projects and are done through the Change Request process.

Submitting changes

System Manager

Statewide Transportation Planning Division

Form 2604 Project Authorization/ Program Revision Request

After the scope has been verified, any changes to the cost, limits, work, schedule and/or funding shall be submitted to the System Manager, or the Statewide Transportation Planning Division, for concurrence and approval. This is done through communication and by submitting a "Project Authorization/Program Revision Request" form (2604) through the Change Request module of JobNet. Use this process for the following types of change requests:

- Any request to add a new project or a new project phase
- Any request to abandon either a project or a project phase
- Any complex or multiple project changes (including any splits, combines, transfers of road work or structures from one job to another, costs, length and etc)

- Any change to a currently programmed phase that is not of the type indicated in the first three listed above
- Any general project information changes to currently programmed projects

See the RDM 14.15 for more information.

Common Types of Change

Policy Changes
Policy changes at MDOT may be triggered by one of several factors, including FHWA, state government laws or policy changes, industry initiated changes or other factors. The effects of these changes may be broad and affect projects in some way. There is very little that can be done to foresee these changes. Policy changes typically affect programmed projects more than scoped projects.

For projects that have been scoped and not programmed, analyze the effects of policy or direction changes to determine the impacts at a project level, and document this accordingly in the scoping package folder. Depending on the policy change, the project scoping estimate may need to be updated to reflect the change.

Most policy changes and implementation of these changes are handled through the annual Call For Projects. If there are any changes to policy or Department direction that occur throughout the year, the Region System Manager will notify the appropriate staff and the changes will then follow through as appropriate.

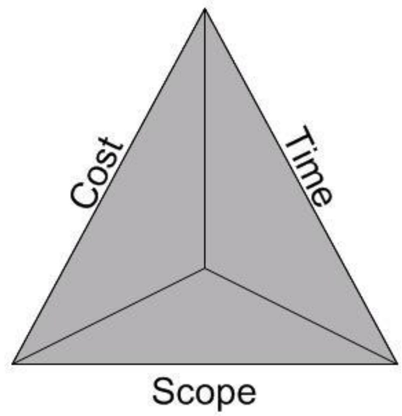
Design Details or Standards Changes (revised 6-24-2019)
Design Standard Plans and Geometric Design Guides are periodically updated to reflect new information or studies which indicate an improved method to perform or design a detail or element. Depending on the change, you may need to review the scoping package to determine what impacts the revised standard has on the proposed project. The review of the project should specifically look at items which may impact the estimate of the project, cause additional work, or require the scope of work (fix type) to be revised or require Design Exceptions or Design Variances. All changes to the scoping package must be documented.

Scope of Work Changes
Sometimes in the life of a scoping package, it becomes necessary to change the scope of work. This can be caused by some of the changes listed above, a change in the pavement strategy or prioritization, or simply by the desire to apply a more cost effective fix, given the pavement's or structure's performance or funding limitations. Scope of work changes can include changes to the proposed work for all, or a portion of the project or by changing the limits of the projects.

Effects of Change

How change to cost, time, and scope affect each other

As mentioned in the introduction, all change has the potential to impact the project's scope of work, associated cost (or resources), and/or the time required to design or construct the project. The combination of these three constraints is known as the Triple Constraint. A typical diagram depicting the Triple Constraint is shown below and is intended to show the relationship between the project constraints. Any change in one of the constraints will affect one or both of the other constraints. As can be seen, the scope has a direct impact on the cost and time of a project.



Requesting and Documenting Scope Changes (revised 6-24-2019)

Systems Manager

Development Manager/TSC Manager

Changes to the scoping package should be discussed between the Systems Manager and the Development Manager/TSC Manager to obtain concurrence. If the change is approved, the decision should be documented and communicated to the project stakeholders. Any changes in the scoping package should be documented on the Scoping Project Record form, where the scoping history is documented.

Scoping Report & Details Worksheet

The Scoping Report & Details Worksheet may need to be updated and included it in the scoping package. If the costs need to be updated, the estimator can update the bid based prices in PQS/AP Preconstruction and reprint the estimate. The previous documents should be retained in the folder to help track the history of the scoping package.

Chapter

12

Best Practices

Topic	Page #

Introduction

This chapter lists Best Practices and sound ideas that are recommended and/or supported by MDOT. The Best Practices listed in this chapter have been proven to be helpful in the scoping process.

It is intended that this chapter is refined as new ideas are shared and additional MDOT Best Practices are adopted.

Develop a Calendar for the Call For Projects Process

Within each region, create a calendar each year for the Call For Project process. The calendar should indicate when the intermediate steps should be started and completed by the various region and TSC staff. The tasks and timelines in Chapter 9 of this manual are a general guide and may be helpful as starting point in developing a detailed region specific calendar.

After the region calendar is developed, each TSC should look at the TSC's dates and refine the dates and timeframes as necessary. Account for the review times, intermediate update meetings with staff and any other items that the TSC will need to accomplish to meet the deadlines set by the region.

The development of these calendars will likely reduce some of the last minute rush to complete the Call For Projects process that is experienced throughout the state. Each calendar should be shared with everyone involved with the scoping process within the Region, TSC and central office.

Identification of Responsibilities

Identifying who is responsible for each piece of the Call For Projects (CFP) process is important for the successful completion of the CFP. These responsibilities will vary for each Region and TSC and may change year to year as staff and experience levels develop. The identification of the responsible person, the support staff and a back up to the responsible person will give all those involved in the process knowledge of what is expected.

Van Tours and Field Reviews

Conducting Van Tours or field reviews during the rain should not be viewed as a negative. Rain can highlight some deficiencies, such as rutting, drainage concerns, surface cracks in the pavement, pavement surface deformation and subbase pumping that may otherwise be more difficult to identify. Appropriate safety precautions shall be taken whenever driving or working in the field, especially in inclement weather.

Scope Review Meetings

Hold Scope Review meetings with the scoping team to discuss the progress of the scope, areas that may need additional information and need assistance from a “technical expert” in the area and the schedule for completing the scoping package. These meetings may be informal or formal; however the key is get and keep people involved in the scoping process. Projects should not be scoped by one person working in a vacuum. Multiple person teams bring diverse views and outlooks to the group and together can produce a stronger and well thought out proposed scope. Document such meetings, recommendations from specialty areas and other information where direction is decided or recommended. Invite FHWA for projects meeting the oversight requirements for 3R & 4R NHS.

Input From Other Disciplines

Gathering input from specialty areas or disciplines will make a scoping package more complete. Some of the specialty areas to look to for input, advice or guidance include: Traffic and Safety, Utilities, Surveys, Environmental, ROW, Hydraulics and etc. Construction or Delivery Staff is another discipline which may provide valuable input to the scoping process.

Documentation (revised 7-18-2016)

The importance of documenting all items discussed during the scoping process is beneficial so that items discussed and decided upon once do not get revisited later in the process; enables the designers to see why decision were made; reinforces the original scope which is connected to the programmed budget and etc.

Various tools for documenting are available. The Project Scoping Record form (Form#0591) is one alternative to recording the history of the scoping process from beginning to end and into the design phase.

Always Start Fresh

When beginning a scope or an estimate always start fresh. The use of old documents, estimates, spreadsheets or computations can result in errors, duplications or omissions. Unit prices often change, quantities are unique to a project and the pay items to include in a project may be unique to that project.

Go to the original source (often the MDOT website) to obtain the most current versions of checklists, spreadsheets, forms and other documents related to the scoping process.

List Your Assumptions

Document all assumptions made during the scoping process, whether it be an assumption about the deterioration rate of the road or structural element or the number of driveways that might require a Consent to Grade. Assumptions that are not documented can not be accounted for in the scoping process will need to be re-addressed later during the design process.

QA/QC reviewers and designers cannot account for or follow assumptions that were made and not documented. Listing the general assumptions should occur at the beginning of the calculation sheets. Other assumptions that come up as the estimate progresses may continue throughout the calculations sheet but should be stated in words and stand out so they are easily seen. If using spreadsheets for calculations, assumptions should be typed and placed in the file such that they will be displayed and/or print whenever the file is viewed.

Be Organized

Keeping organized notes and files (updated when necessary) is one of the first steps that is key to a scoping document. This allows for a straight forward and understandable review. When working on scoping multiple projects at the same time, it becomes more critical to organize the work so that notes for one project do not get mixed with another project. Placing the JN or project description on each sheet of paper or each computer document will help keep things organized. Include page numbers (1 of 4, 2 of 4, 3 of 4 and 4 of 4) on each document. This also helps the reviewer know that all documentation is provided.

One way of looking at the benefits of being organized is to place yourself in the shoes of the person(s) who will use the scoping document next or need to finish the scoping document should the original person doing the scoping becomes unavailable. Can the next person follow what has been done to this point? Can the documentation be located in the workspace or computer? The answer to these and similar questions should be yes.

Communication

Communication is a two way street which involves listening and speaking or transmitting ideas, questions, answers and etc in some format. Communication may occur in person between two people or with a group of people informally or more formally in a meeting. Communication may be in the form of discussion, e-mail, phone calls or letters.

Good communication is inclusive, positive in nature, detailed and helpful to others. It generates ideas and often can quickly solve problems through the vast knowledge of others by soliciting input.

Good communication is a method of sharing ideas with others on an idea for a new fix for an old problem, sharing a concern with others so that a possible solution can be reached. It is communicating maintenance problems that may be obvious to the maintenance worker who has to go fix the problem, but not to the scoper who may be able to develop a longer term fix to the problem.

Ask Questions & Share Ideas

The saying “No question is a bad question except the question that goes unasked.” is a very good saying which should be kept in mind while developing the scopes for projects. Ask questions of your supervisor, your co-workers, others within the office, Region or other MDOT support units. Don't forget to ask yourself if your assumptions or your answers make sense.

This manual is intended to provide direction on which questions to ask and in many cases provide the answers or suggestions on where to find the answer. Additionally, this manual offers references to other manuals (often MDOT manuals) that provide additional detailed information. Many, if not all, of the reference material is available on the intranet and/or the MDOT website.

Take notes as you discover the answer to questions. This will help the next time a similar situation arises. Note who or where the answer to the question was found. This may be a good reference for the future.

Share ideas with other people. Unique ideas that work on projects may also be useful to subsequent projects. Best Practices are developed and refined through the sharing of ideas.

Early Identification of Maintenance of Traffic and Mobility Needs

The ability and method to maintain traffic during the construction of a project may impact the proposed fix for the project and the cost of the project. Early discussions on the options for maintaining traffic versus the proposed fix options should take place during the scoping phase.

The cost to maintain traffic by shifting traffic may be very different than the cost to provide flagging sequences during construction. Likewise, the cost to maintain traffic on a detour route may be very different than the cost to widen the existing road and acquire ROW for the temporary pavement. For work on a structure or bridge, consideration will need to be given as to whether work on a structure be done while traffic uses the other half of the structure, (part width construction and assuming the structure is wide enough) will the structure need to be closed during construction or can a temporary traffic signal be installed to maintain one lane of traffic across the structure. Each of these options has a different cost associated with the work.

Anticipating the Need for ROW

When a proposed project includes widening, review the ROW maps to see the width and type of existing ROW. Review the old plans for the area, in particular the slope stake lines. If the proposed project calls for 12' widening, then the new slope stake line would be at least 12' further out then the old slope stake line. Compare this new slope stake line to the existing ROW line to determine if proposed ROW or Consents to Grade may be required for the proposed project.

Projects with proposed intersection improvements, either the addition of right turn lanes or radii improvements, will require careful examination of the existing ROW. Widening may require an existing ditch to be pushed out to beyond the existing ROW. As it is MDOT's practice to include the ditch bottom within the ROW, additional ROW may be required.

Additionally, the work of increasing a radius may create the need for additional ROW and possibly Consents to Grade. A trunkline with an existing 33' ROW on one or both sides of the road centerline, typically will require proposed ROW for any intersection improvements.

From the ROW maps determine any areas where the existing ROW is only 33' on either side of the roadway exists. During the field review of the project, pay special attention to these areas to determine the need for proposed ROW and/or Consents to Grade for the proposed project.

Mark the locations for proposed ROW or Consents to Grade on the ROW maps and include these sheets in the scoping package. These marked ROW maps will also be helpful when requesting the Region Real Estate Staff to provide an estimate for the project.

Stakeholder Engagement Opportunities

Consider driving the project with both the Transportation Maintenance Coordinator (TMC) and the Road Commission Foreman or the City Department of Public Works (DPW) Director for that area. This is recommended for projects where drainage work is being considered as part of the scope. Notes from this meeting should become part of the scoping information. Ideas and issues may have been identified that otherwise could have been overlooked or missed. This is also an opportunity to discuss schedules and potential joint ventures to improve the municipal utility system while improving the roadway. This early interaction provides an opportunity for discussion of some of the less significant drainage issues that may be addressed as part of the project (assuming the larger drainage issues were identified by MDOT prior to meeting with this group).

Corridor Data Map

During the planning and development of a project, it is helpful to have a map of the corridor or area that shows the different work that is or has taken place in that segment or in the 5-year plan. These items could range from past, current and future work, to work that will be done by local agencies. This information will help with planning the proposed work, the maintaining traffic, mobility issues and the overall relationship of work in the corridor.

Corridor Approach to Project Coordination

When considering work to be done on a roadway segment, it is important to review opportunities and needs within that corridor. The more work that can be coordinated within (and done) in the same maintaining traffic (project) limits (i.e. bridge work, maintenance work, road work and etc) the more that traffic impacts can be reduced. Efficiencies in cost savings, traffic impacts, maintaining traffic and etc can be gained with this approach.

Creating and Refining Planisware Networks (revised 6-24-2019)

The Planisware network should be created and refined, from the approved Concept Statement, to assist in validating the Recommended Plan

Completion and Letting Date, placed in the approved Concept Statement. Financial, programming, project packaging and other constraints will influence these dates, but an estimated schedule will be helpful.

Additionally, it is easier to populate some of the dates in Change Requests (from #00 on) if the corresponding Planisware Version is created and submitted first.

Constructability Issues

It is very important to understand the Constructability issues of any project. There are opportunities during the Scoping and then again during the Design Phase to review Constructability of the proposed projects. There are items, such as maintaining traffic, design details, proposed work items/elements and etc, that should be reviewed by others, including Delivery Staff. This will assist the quality of the project and reduce overruns.

FHWA Coordination

FHWA should be consulted on potential oversight (3R & 4R NHS) projects during the scoping process. It is critical that FHWA agree with the proposed scope, especially as it relates to possible design exceptions. Lack of coordination during scoping, may cause scope modifications and subsequent cost overruns, due to unacceptable scopes once the project proceeds into design. At the preliminary scope review, contact your FHWA area engineer to be included in any reviews. This coordination/consultation needs to be completed before any project is submitted for the Call for Projects.

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Appendix

A-G

Appendix

Topic	Appendix #

Appendix A

Topic	Appendix #

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Recommended Corridor Pavement Management Strategies

The following tables show possible work types for various pavements based on existing pavement type, age of pavement and commercial ADT (CADT) volumes. Work Type Codes (WTC) are given at the end of this appendix.

Multiple Course HMA Overlay on Flexible Pavement (Any CADT)

Year	WTC	Possible WTC	Description
0		140, 141, 143, 146, 147, 159, 170	Initial Construction
3	456	405	Crack Seal
7	407	400, 401, 410, 411, 414, 440	Multiple Course Surface Seal
14	408	443, 140, 141, 143, 146, 147, 149, 159	Mill 1 ½" and resurface with HMA @ 165#/syd
20	407	400, 401, 410, 411, 414, 440	Multiple Course Surface Seal
30			Rehabilitate/Reconstruct

New or Reconstructed Flexible Pavement (< 1100 CADT)

Year	WTC	Possible WTC	Description
0	164	148, 160, 161, 162, 171, 172, 173, 174, 210, 212, 213, 310, 320	Initial Construction
8	456	405	Crack Seal
16	408	443, 140, 141, 143, 146, 147, 149, 159	Mill 1 ½" and resurface with HMA @ 165#/syd
23	456	405	Crack Seal
28	408	443, 140, 141, 143, 146, 147, 149, 159	Mill 1 ½" and resurface with HMA @ 165#/syd
33	456	405	Crack Seal
40			Rehabilitate/Reconstruct

New or Reconstructed Flexible Pavement (≥ 1100 CADT)

Year	WTC	Possible WTC	Description
0	164	148, 160, 161, 162, 171, 172, 173, 174, 210, 212, 213, 310, 320	Initial Construction
7	456	405	Crack Seal
12	408	443, 140, 141, 143, 146, 147, 149, 159	Mill 1 ½" and resurface with HMA @ 165#/syd
17	456	405	Crack Seal
22	408	443, 140, 141, 143, 146, 147, 149, 159	Mill 1 ½" and resurface with HMA @ 165#/syd
25	456	405	Crack Seal
28	408	443, 140, 141, 143, 146, 147, 149, 159	Mill 1 ½" and resurface with HMA @ 165#/syd
30	456	405	Crack Seal
40			Rehabilitate/Reconstruct

Multiple Course HMA Overlay on Rubbilized Concrete (< 1100 CADT)

Year	WTC	Possible WTC	Description
0	155, 169	140, 141, 143, 146, 147, 159, 170	Initial Construction
6	456	405	Crack Seal
13	408	443, 140, 141, 143, 146, 147, 149, 159	Mill 1 ½" and resurface with HMA @ 165#/syd
16	456	405	Crack Seal
22	408	443, 140, 141, 143, 146, 147, 149, 159	Mill 1 ½" and resurface with HMA @ 165#/syd
25	456	405	Crack Seal
30			Rehabilitate/Reconstruct

Multiple Course HMA Overlay on Rubbilized Concrete (≥ 1100 CADT)

Year	WTC	Possible WTC	Description
0	155, 169	140, 141, 143, 146, 147, 159, 170	Initial Construction
5	456	405	Crack Seal
11	408	443, 140, 141, 143, 146, 147, 149, 159	Mill 1 ½" and resurface with HMA @ 165#/syd
14	456	405	Crack Seal
20	408	443, 140, 141, 143, 146, 147, 149, 159	Mill 1 ½" and resurface with HMA @ 165#/syd
23	456	405	Crack Seal
30			Rehabilitate/Reconstruct

Multiple Course HMA Overlay on Crush & Shape (< 1100 CADT)

Year	WTC	Possible WTC	Description
0	142, 167, 168	140, 141, 143, 146, 147, 159, 170	Initial Construction
4	456	405	Crack Seal
9	407	400, 401, 410, 411, 414, 440	Multiple Course Surface Seal
16	408	443, 140, 141, 143, 146, 147, 149, 159	Mill 1 ½" and resurface with HMA @ 165#/syd
19	456	405	Crack Seal
25			Rehabilitate/Reconstruct

Multiple Course HMA Overlay on Crush & Shape (≥ 1100 CADT)

Year	WTC	Possible WTC	Description
0	142, 167, 168	140, 141, 143, 146, 147, 159, 170	Initial Construction
4	456	405	Crack Seal
10	408	443, 140, 141, 143, 146, 147, 149, 159	Mill 1 ½" and resurface with HMA @ 165#/syd
12	456	405	Crack Seal
18	408	443, 140, 141, 143, 146, 147, 149, 159	Mill 1 ½" and resurface with HMA @ 165#/syd
20	456	405	Crack Seal
25			Rehabilitate/Reconstruct

Multiple Course HMA Overlay on Repaired Concrete (< 1100 CADT)

Year	WTC	Possible WTC	Description
0		140, 141, 143, 146, 147, 159, 170	Initial Construction
2	456	405	Crack Seal
10	408	443, 140, 141, 143, 146, 147, 149, 159, 404, 412, 157, 158, 450	Mill 1 ½" and resurface with HMA @ 165#/syd Joint Repair
12	456	405	Crack Seal
18	408	443, 140, 141, 143, 146, 147, 149, 159, 404, 412, 157, 158, 450	Mill 1 ½" and resurface with HMA @ 165#/syd Joint Repair
20	456	405	Crack Seal
25			Rehabilitate/Reconstruct

Multiple Course HMA Overlay on Repaired Concrete (≥ 1100 CADT)

Year	WTC	Possible WTC	Description
0		140, 141, 143, 146, 147, 159, 170	Initial Construction
2	456	405	Crack Seal
8	408	443, 140, 141, 143, 146, 147, 149, 159, 404, 412, 157, 158, 450	Mill 1 ½" and resurface with HMA @ 165#/syd Joint Repair
10	456	405	Crack Seal
14	408	443, 140, 141, 143, 146, 147, 149, 159, 404, 412, 157, 158, 450	Mill 1 ½" and resurface with HMA @ 165#/syd Joint Repair
16	456	405	Crack Seal
19	408	443, 140, 141, 143, 146, 147, 149, 159, 404, 412, 157, 158, 450	Mill 1 ½" and resurface with HMA @ 165#/syd Joint Repair
25			Rehabilitate/Reconstruct

Multiple Course HMA Overlay on Composite Pavement (< 1100 CADT)

Year	WTC	Possible WTC	Description
0		140, 141, 143, 146, 147, 159, 170	Initial Construction
2	456	405	Crack Seal
9	408	443, 140, 141, 143, 146, 147, 149, 159, 404, 412, 157, 158, 450	Mill 1 ½" and resurface with HMA @ 165#/syd Joint Repair
11	456	405	Crack Seal
16	408	443, 140, 141, 143, 146, 147, 149, 159, 404, 412, 157, 158, 450	Mill 1 ½" and resurface with HMA @ 165#/syd Joint Repair
18	456	405	Crack Seal
25			Rehabilitate/Reconstruct

Multiple Course HMA Overlay on Composite Pavement (≥ 1100 CADT)

Year	WTC	Possible WTC	Description
0		140, 141, 143, 146, 147, 159, 170	Initial Construction
2	456	405	Crack Seal
7	408	443, 140, 141, 143, 146, 147, 149, 159, 404, 412, 157, 158, 450	Mill 1 ½" and resurface with HMA @ 165#/syd Joint Repair
9	456	405	Crack Seal
13	408	443, 140, 141, 143, 146, 147, 149, 159, 404, 412, 157, 158, 450	Mill 1 ½" and resurface with HMA @ 165#/syd Joint Repair
15	456	405	Crack Seal
20			Rehabilitate/Reconstruct

New or Reconstructed Jointed Concrete Pavement (< 3600 CADT)

Year	WTC	Possible WTC	Description
0	165, 163	148, 160, 161, 162, 171, 172, 173, 174, 210, 212, 213, 310, 320	Initial Construction
8	457	406	Joint Seal
16	415	157, 158, 159, 166, 403, 404, 406, 412, 413, 450, 453, 457	Concrete Pavement Restoration
26	415	157, 158, 159, 166, 403, 404, 406, 412, 413, 450, 453, 457	Concrete Pavement Restoration
34	457	406	Joint Seal
40			Rehabilitate/Reconstruct

New or Reconstructed Jointed Concrete Pavement (≥3600 CADT)

Year	WTC	Possible WTC	Description
0	165, 163	148, 160, 161, 162, 171, 172, 173, 174, 210, 212, 213, 310, 320	Initial Construction
8	457	406	Joint Seal
12	415	157, 158, 159, 166, 403, 404, 406, 412, 413, 450, 453, 457	Concrete Pavement Restoration
18	415	157, 158, 159, 166, 403, 404, 406, 412, 413, 450, 453, 457	Concrete Pavement Restoration
26	415	157, 158, 159, 166, 403, 404, 406, 412, 413, 450, 453, 457	Concrete Pavement Restoration
34	457	406	Joint Seal
40			Rehabilitate/Reconstruct

Unbonded Concrete Overlay (< 3600 CADT)

Year	WTC	Possible WTC	Description
0	156	170	Initial Construction
12	415	157, 158, 159, 166, 403, 404, 406, 412, 413, 450, 453, 457	Concrete Pavement Restoration
20	415	157, 158, 159, 166, 403, 404, 406, 412, 413, 450, 453, 457	Concrete Pavement Restoration
25	457	406	Joint Seal
30			Rehabilitate/Reconstruct

Unbonded Concrete Overlay (≥ 3600 CADT)

Year	WTC	Possible WTC	Description
0	156	170	Initial Construction
10	415	157, 158, 159, 166, 403, 404, 406, 412, 413, 450, 453, 457	Concrete Pavement Restoration
18	415	157, 158, 159, 166, 403, 404, 406, 412, 413, 450, 453, 457	Concrete Pavement Restoration
24	457	406	Joint Seal
30			Rehabilitate/Reconstruct

Work Type Codes: 8/30/11

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		Welcome Center on New Route	314
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		Welcome Center on Relocated Route	332
		Weigh Station on Relocated Route	333
		Sound Barrier Type I (Req) - Relocated Route	334
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Work Type Codes: 8/30/11

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		Concrete Joint & Surface Spall Repair	412
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Work Type Codes: 8/30/11

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Work Type Codes: 8/30/11

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*** Inactive Work Type Codes**

2018 Call for Projects Rehabilitation and Reconstruction Fix Life Guidelines

Fix Type	Commercial ADT (two way) ≤ 3000			Commercial ADT (two way) > 3000 & < 6000			Commercial ADT (two way) ≥ 6000		
Rehab & Reconstruction Fix	Flexible*	Composite*	Rigid**	Flexible*	Composite*	Rigid**	Flexible*	Composite*	Rigid**
Repair Existing & a Multiple Course HMA Overlay	12 to 15	10 to 12	10 to 12	10 to 12	8 to 10	8 to 10	8 to 10	6 to 8	6 to 8
Mill Existing & a Multiple Course HMA Overlay	12 to 15	10 to 12	N/A	10 to 12	8 to 10	N/A	8 to 10	6 to 8	N/A
Concrete Pavement Patching	N/A	N/A	8 to 10	N/A	N/A	6 to 8	N/A	N/A	5 to 7
Concrete Pavement Restoration (Patching, Diamond Grinding & Joint Resealing)	N/A	N/A	10 to 12	N/A	N/A	8 to 10	N/A	N/A	6 to 8

Fix Type	Average Fix Life		
Rehab & Reconstruction Fix	Flexible*	Composite*	Rigid**
Crush & Shape w/ Multiple Course HMA Overlay	16	N/A	
Rubblize & Multiple Course HMA Overlay	N/A	14	
Unbonded Concrete Overlay	N/A	21	
6”+ Aggregate Lift w/ Multiple Course HMA Overlay	14		
Hot Mix Asphalt Reconstruction			
Concrete Reconstruction	26		

N/A Not Applicable

* The Life extension values for crack treatments on HMA surfaces should not be added to the values in the R&R fix life chart when determining fix lives for entry into RQFS and MPINS.

** The life extension values for concrete joint resealing and concrete crack sealing should not be added to the R&R fix life values in RQFS or MPINS.

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2013 Call For Projects CPM Fix Life Extensions*

Fix Type	Life extension (in years)	Life extension (in years)	Life extension (in years)
	Flexible	Composite	Rigid
HMA Crack Treatment***	1-3	1-3	N/A
Overband Crack Filling***	1-2	1-2	N/A
One Course HMA Overlay	5-10	4-9	N/A
Mill and One Course HMA Overlay	5-10	4-9	N/A
Single Course Chip Seal	3-6	N/A	N/A
Double Chip Seal	4-7	3-6	N/A
Single Course Micro-Surface	3-5	**	N/A
Multiple Course Micro-Surface	4-6	**	N/A
Ultra-Thin HMA Overlay	3-6	3-6	N/A
Paver Placed Surface Seal	4-6	**	N/A
Full Depth Concrete Repair	N/A	N/A	3-10
Concrete Joint Resealing****	N/A	N/A	1-3
Concrete Spall Repair	N/A	N/A	1-3
Concrete Crack Sealing****	N/A	N/A	1-3
Diamond Grinding	N/A	N/A	3-5
Dowel Bar Retrofit	N/A	N/A	2-3
Concrete Pavement Restoration	N/A	N/A	5-10

* The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

** A life extension will be provided; however, data are not available to quantify the life extension.

*** The life extension values for crack treatments on HMA surfaces should not be added to the values in the R&R fix life guidelines when determining fix lives for entry into RQFS and MPINs. The life extension values for actual crack sealing jobs should still be programmed in MPINs, but should not be included in RQFS.

**** The life extension values for concrete joint resealing and concrete crack sealing should not be added to the values in the R&R fix life guidelines when determining fix lives for entry into RQFS and MPINs. If the fix is applied in reaction to a poor performing pavement and the intent of the job is to get the original life expected out of the pavement, the fix should not be included in RQFS and the life extension value in MPINs should be limited to avoid overestimating the life of the pavement. Otherwise, the life extension value should be programmed in MPINs and included in RQFS.

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CPM Treatment Options & Condition Criteria

FLEXIBLE & COMPOSITE PAVEMENT SURFACE TREATMENT (NON-STRUCTURAL HOT MIX ASPHALT (HMA) OVERLAY)

Description: A dense graded HMA mixture limited to a 165 lbs/syd application rate.

Pavement	Minimum RSL (years)	DI	RQI	IRI	Rut
Flexible	3	<40	<70	<163	<0.50 in
Composite	3	<25	<70	<163	<0.50 in

Life Extension

Pavement	Years
Flexible	5 to 10
Composite	4 to 9

The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

FLEXIBLE & COMPOSITE PAVEMENT SURFACE TREATMENT (SURFACE MILLING WITH NON-STRUCTURAL HOT MIX ASPHALT (HMA) OVERLAY)

Description: The removal of an existing HMA surface by the cold milling method and the placement of a dense graded HMA mixture limited to a 165 lbs/syd application rate.

Pavement	Minimum RSL (years)	DI	RQI*	IRI*	Rut
Flexible	3	<40	<80	<212	<1.0 in
Composite	3	<30	<80	<212	<1.0 in

**Higher RQI and/or IRI values may be accepted in urban locations if the cause for the poor ride can be corrected.*

Life Extension

Pavement	Years
Flexible	5 to 10
Composite	4 to 9

The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

FLEXIBLE AND COMPOSITE PAVEMENT SURFACE TREATMENT (CHIP SEAL)

Description: A chip seal is the application of a polymer modified asphalt emulsion with a cover aggregate. A single or a double chip seal can be used in the Capital Preventive Maintenance Program.

Pavement	Minimum RSL (years)	DI	RQI	IRI	Rut
Flexible	**5 (double) 6 (single)**	**<30 (double) <25 (single)**	**<54**	**<107**	**<0.125 in**
Composite	**5 (double)**	**<15 (double)**	**<54**	**<107**	**<0.125 in**

Life Extension

Pavement	Years
Flexible: Single Seal Double Seal	 3 to 6 4 to 7
Composite: Double Seal	 3 to 6

The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

FLEXIBLE & COMPOSITE PAVEMENT SURFACE TREATMENT (MICRO-SURFACING)

Description: Micro-Surfacing is a mixture of polymer modified asphalt emulsion, mineral aggregate, mineral filler, water, and other additives, properly proportioned, mixed, and placed on a paved surface.

Pavement	Minimum RSL (years)	DI	RQI	IRI	Rut
Flexible	**5 (multiple or heavy single) 10 (regular single)**	**<30 (multiple or heavy single) <15 (regular single)**	**<54**	**<107**	**<1.0 in**
Composite	**5 (double)**	**<15**	**<54**	**<107**	**<1.0 in**

Life Extension

Pavement	Years
Flexible: Single Course Multiple Course	 3 to 5 4 to 6
Composite: We acknowledge that micro surfacing will provide a life extension to a composite pavement, however data is not available to quantify the life extension.	

The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

FLEXIBLE AND COMPOSITE PAVEMENT TREATMENT (CRACK TREATMENT)

Description: Crack treatment consists of both crack sealing and crack filling. Crack sealing is attained by the Cut and Seal Method. Crack filling is attained by the Overband Crack Fill Method. The Cut and Seal Method consists of cutting the desired reservoir shape at the working crack in the existing HMA surface, cleaning the cut surfaces and placing the specified materials into the cavity to prevent the intrusion of water and incompressible into the crack. The Overband Crack Fill Method consists of cleaning the non-working crack in the HMA pavement surface and placing the specified materials into and above the crack to substantially reduce infiltration of water and to reinforce the adjacent pavement.

Pavement	Minimum RSL (years)	DI	RQI	IRI	Rut
Flexible	10	<15	<54	<107	<0.125 in
Composite	10	<5	<54	<107	<0.125 in

Life Extension

Pavement	Years
Flexible	Up to 3
Composite	Up to 3

The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

FLEXIBLE AND COMPOSITE PAVEMENT TREATMENT (OVERBAND CRACK FILLING)

Description: The Overband Crack Filling consists of cleaning the crack in the HMA pavement surface and placing the specified materials into and above the crack to substantially reduce infiltration of water and to reinforce the adjacent pavement.

FOR STAND ALONE APPLICATION

Pavement	Minimum RSL (years)	DI	RQI	IRI	Rut
Flexible	7	<20	<54	<107	<0.125 in
Composite	7	<10	<54	<107	<0.125 in

Life Extension

Pavement	Years
Flexible	Up to 2
Composite	Up to 2

The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

FLEXIBLE AND COMPOSITE PAVEMENT TREATMENT (PAVER PLACED SURFACE SEAL)

Description: A special paver places a polymer modified asphalt emulsion followed immediately by a gap-graded ultra-thin HMA surface.

Purpose: A paver placed surface seal is a non-structural HMA overlay in combination with a bonding/sealing polymer modified asphalt emulsion. It will help seal the existing pavement surface to reduce the intrusion of water into the pavement structure, improve friction, slow the rate of pavement deterioration, correct minor pavement surface deficiencies and improve the ride, noise and skid qualities of the pavement.

Existing pavement condition: The existing pavement condition should exhibit good base condition and a uniform cross section. The visible surface distress may include severe raveling, moderate severity longitudinal and transverse cracks, moderate block cracking, moderate patching, or moderate bleeding. Reflection cracking at joints should not exceed the moderate severity level.

Pavement	Minimum RSL (years)	DI	RQI	IRI	Rut
Flexible	**5**	**<30**	**<62**	**<132**	**<0.25 in**
Composite	**5**	**<15**	**<62**	**<132**	**<0.25 in**

Existing pavement surface preparation: This preparation work should be limited to minor repairs. Ruts or other depressions greater than ¼ inch depth should be filled with suitable material prior to placement of the paver placed surface seal. Cracks greater than ¼ inch wide should be sealed using an approved crack sealing method. The maximum sealant "film" thickness allowed will be ¼ inch.

Performance: This treatment corrects minor rutting and low friction. The process may be used in lieu of extensive stand alone overband crack fill when the cracking meets the criteria described above. Paver placed surface seal performs well on high volume roadways to correct the pavement surface conditions described above.

Life Extension

Pavement	Years
Flexible	4 to 6**
Composite	3 to 5**
***We acknowledge that an ultra-thin HMA overlay will provide a life extension to a pavement, however data are not available to quantify the life extension.*	

The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

Performance Limitations: Paver placed surface seal should not be placed on the following existing pavement conditions: severely distressed composite pavement, severe rutted flexible pavement, pavement with a weak base, a flexible surface that is debonding or severe bleeding flexible surface. Paver placed surface seal will not stop reflective cracking. The construction season may start in early May, but should be discontinued by no later than mid October.

FLEXIBLE AND COMPOSITE PAVEMENT TREATMENT (ULTRA-THIN HOT MIX ASPHALT (HMA) OVERLAY)

Description: A dense graded HMA mixture limited to an 83 lbs/syd application rate.

Pavement	Minimum RSL (years)	DI	RQI	IRI	Rut
Flexible	7	<30	<54	<107	<0.125 in
Composite	7	<20	<54	<107	<0.125 in

Life Extension

Pavement	Years
Flexible	3 to 6**
Composite	3 to 6**
***We acknowledge that an ultra-thin HMA overlay will provide a life extension to a pavement, however data are not available to quantify the life extension.*	

The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

FLEXIBLE, COMPOSITE OR RIGID PAVEMENT TREATMENT (HOT MIX ASPHALT (HMA) SHOULDER RIBBONS)

Description: This work includes the construction of a new HMA shoulder ribbon where gravel shoulders exist or the removal and replacement of a deteriorated HMA shoulder ribbon.

REQUIREMENT

The design life of the shoulder ribbons should be equal to or less than the Remaining Service Life (RSL) of the main line pavement.

RIGID PAVEMENT TREATMENT (FULL DEPTH CONCRETE PAVEMENT REPAIR)

Description: The work consists of complete removal and replacement of the concrete pavement at the deteriorated joint or open crack. The new concrete repair should include load transfer (dowel bars), pavement reinforcement (if JRCP), contraction and/or expansion joints with joint seals.

Pavement	Minimum RSL (years)*	DI*	RQI	IRI**
Rigid	**7**	**<20**	**<54**	**<107**

*The full depth concrete pavement repair is limited to 30 per lane mile.
**Higher RQI / IRI numbers should consider Concrete Pavement Restoration.

Life Extension

Pavement	Years
Rigid	3 to 10

The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

RIGID PAVEMENT TREATMENT (CONCRETE JOINT RESEALING)

Description: This work includes the removal of the existing joint seals, and resealing the transverse and longitudinal joint with either preformed neoprene, silicones, or low-modulus hot-poured rubber.

Pavement	Minimum RSL (years)	DI	RQI	IRI
Rigid	**10**	**<15**	**<54**	**<107**

Performance: A properly placed concrete pavement seal should benefit the service life by slowing the deterioration rate of the concrete pavement.

Life Extension

Pavement	Years
Rigid	3 to 5

The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

RIGID PAVEMENT TREATMENT (CONCRETE SPALL REPAIR)

Description: The work is to repair spalled concrete by removing all unsound concrete, cleaning the area, and placing a filler material consisting of a fast-set mortar or a rapid setting polymer concrete. Spalling may occur along transverse or longitudinal joints, cracks, or be located somewhere on the pavement surface. Filler materials are typically pre-packaged and are placed according to recommendations from the supplier. Use of a filler material should be verified from the Department's Qualified Products List.

Pavement	Minimum RSL (years)	DI	IRI
Rigid	**10**	**<15**	**<107**

Life Extension

Pavement	Years
Rigid	Up to 5

The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

RIGID PAVEMENT TREATMENT (CONCRETE CRACK SEALING)

Description: Crack sealing involves the sawing or routing, cleaning and sealing of cracks in the concrete pavement that are greater than 12 inches in length and greater than 0.125 inches in width. If the crack is greater than 0.375 inches in width a backer rod must be used.

Pavement	Minimum RSL (years)	DI	RQI	IRI
Rigid	**10**	**<15**	**<54**	**<107**

Life Extension

Pavement	Years
Rigid	Up to 3

The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

RIGID PAVEMENT TREATMENT (DIAMOND GRINDING)

Description: This work consists of diamond grinding the entire lane width as specified on the plans. Diamond grinding should be considered when average IRI is greater than 95, average friction number is 30 or less, or there are more than 18 full depth repairs per mile.

Pavement	Minimum RSL (years)	DI	RQI	IRI
Rigid	**12**	**<10**	**<54**	**<107**

Life Extension

Pavement	Years
Rigid	3 to 5

The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

RIGID PAVEMENT TREATMENT (DOWEL BAR RETROFIT)

Description: Dowel bar retrofit is an operation in which slots are cut into the concrete pavement across faulted joints and cracks, and dowel bars are placed in the slots to restore the load transfer. The work consists of five operations: cutting the slots, preparing the slots, placing the dowel bars, backfilling the slots and opening the pavement to traffic.

Pavement	Minimum RSL (years)	DI	RQI	IRI
Rigid	**10**	**<15**	**<54**	**<107**

Life Extension

Pavement	Years
Rigid	2 to 3

The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

RIGID PAVEMENT TREATMENT (CONCRETE PAVEMENT RESTORATION)

Description: This work shall include full depth concrete pavement repairs and diamond grinding. A combination of additional treatments, including spall repair, dowel bar retrofit, crack sealing and joint resealing, can provide substantial benefit to the pavement.

Pavement	Minimum RSL (years)	DI	RQI	IRI
Rigid	**3**	**<40**	**<80**	**<212**

Life Extension

Pavement	Years
Rigid	7 to 15

The time range is the expected life extending benefit given to the pavement, not the anticipated longevity of the treatment.

RIGID PAVEMENT TREATMENT (OPEN-GRADED UNDERDRAIN OUTLET CLEANING AND REPAIR)

Description: This work includes the clean out and repair of the rigid PVC, corrugated plastic or steel open-graded underdrain outlets from outlet ending to the connection with the mainline open-graded underdrain.

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BRIDGE DECK PRESERVATION MATRIX – DECKS WITH EPOXY COATED REBAR (ECR)

DECK CONDITION STATE				REPAIR OPTIONS	POTENTIAL RESULT TO DECK BSIR		ANTICIPATED FIX LIFE
Top Surface		Bottom Surface			Top Surface BSIR #58a	Bottom Surface BSIR #58b	
BSIR #58a	Deficiencies % (a)	BSIR #58b	Deficiencies % (b)				
≥ 5	N/A	N/A	N/A	Hold (c) Seal Cracks/Healer Sealer (d)	No Change	No Change	1 to 4 years
	≤ 5%	> 5	≤ 2%	Epoxy Overlay	8, 9	No Change	10 to 15 years
	≤ 10%	≥ 4(k)	≤ 25%(k)	Deck Patch (e)	Up by 1 pt.	No Change	3 to 10 years
4(k) or 5	10% to 25%(k)	4(k)	10% to 25%(k)	Shallow Concrete Overlay (h, i)	8, 9	No Change	20 to 25 years
				HMA Overlay with water-proofing membrane (f, h, i)	8, 9	No Change	8 to 10 years
		2 or 3(k)	> 25%(k)	HMA Cap (g, h, i)	8, 9	No Change	2 to 4 years
≤ 3(k)	>25%(k)	4(k) or 5	2% to 25%(k)	Shallow Concrete Overlay (h, i)	8, 9	No Change	10 years
				HMA Overlay with water-proofing membrane (f, h, i)	8, 9	No Change	5 to 7 years
		2 or 3(k)	>25%(k)	HMA Cap (g, h, i)	8, 9	No Change	1 to 3 years
				Replacement with Epoxy Coated Rebar (ECR) Deck	9	9	60+ years

(a) Percent of deck surface area that is spalled, delaminated, or patched with temporary patch material.
(b) Percent of deck underside area that is spalled, delaminated or map cracked.
(c) The "Hold" option implies that there is on-going maintenance of filling potholes with cold patch and scaling of incipient spalls.
(d) Seal cracks when cracks are easily visible and minimal map cracking. Apply healer sealer when crack density is too great to seal individually by hand. Sustains the current condition longer.
(e) Crack sealing can also be used to seal the perimeter of deck patches.
(f) Hot Mix Asphalt overlay with waterproofing membrane. Deck patching required prior to placement of waterproofing membrane.
(g) Hot Mix Asphalt cap without waterproofing membrane for ride quality improvement. Deck should be scheduled for replacement in the 5 year plan.
(h) If bridge crosses over traveled lanes and the deck contains slag aggregate, do deck replacement.
(i) When deck bottom surface is rated poor (or worse) and may have loose or delaminated concrete over traveled lanes, an in-depth inspection should be scheduled. Any loose or delaminated concrete should be scaled off and false decking should be placed over traveled lanes where there is potential for additional concrete to become loose.
(k) Contact C&T's Bridge Operations section if a deck with epoxy coated rebar in poor condition is identified.

BRIDGE DECK PRESERVATION MATRIX
DECKS WITH EPOXY COATED REBAR (ECR)
USER GUIDELINES

This matrix is a tool for Bridge Engineers to use in the selection of deck repair options when the concrete bridge deck has epoxy coated rebar (ECR). All ECR decks built since approximately 1980 have epoxy coated steel reinforcement (rebar) placed in the top and bottom rows. As of the date of release of this preservation matrix, there have been few, if any, bridges decks that have reached a poor condition state. For this reason, many of the possible repair options in the matrix are shown in grey. If during a bridge inspection or detailed scope, a bridge deck with epoxy coated rebar is identified as having a deck surface or bottom surface in poor condition, please contact Linda Reed of MDOT's Bridge Operations Section at reedl@michigan.gov.

Deep concrete overlays have been removed from the matrix because the hydro-demolition will destroy the rebar's epoxy coating.

The condition of the deck is usually the driving force, or the key indicator, leading to a structure being considered for preventive maintenance, rehabilitation, or replacement. However, there are times when other issues affecting the bridge may elicit the need for a rehabilitation project and this matrix does not address those situations. Some of these situations are super-structure deterioration, sub-structure deterioration, and functional issues such as under-clearance and/or bridge width. Sometimes it is desirable for an entire corridor to be brought up to a specific condition level as part of an overall strategy. So the user is cautioned to interpret the information from the matrix in the context of each specific case and use engineering judgment.

The matrix can be used from left to right or from right to left. If you have scoping inspection data with a deck delamination survey, select the row in the left column that matches the percent of surface defects. Then select the row in the second column that matches the percent of underside defects. To the right of this you will find a repair option and the associated changes to the NBI and the expected service life of that repair, or "fix life."

If you are looking for a fix that will last for a given period of time, select a row from the right column that matches the length of service desired and scan to the left to find the repair option. Be advised that the condition of the bridge at the time of the rehabilitation affects the expected service life of the selected repair option. So if the structure is in worse condition than shown on the left side of the matrix, the repair will not last as long. Conversely, if the deck is in better condition than shown on the left, a longer service life could be expected.

This matrix has been constructed based on element deterioration data and the best knowledge of individuals from Construction & Technology, Maintenance, and Design Support Areas, and FHWA with many years of experience working with bridges. When used in conjunction with the Bridge Safety Inspection Report (BSIR), Pontis Element Data, and Detailed Bridge Project Scoping Report, the matrix can be an accurate guide in the majority of situations and will lead to a repair option that is economical and consistent with the Departments goals.

BRIDGE DECK PRESERVATION MATRIX – Decks with Uncoated "Black" Rebar

DECK CONDITION STATE				REPAIR OPTIONS	POTENTIAL RESULT TO DECK BSIR		ANTICIPATED FIX LIFE
Top Surface		Bottom Surface					
BSIR #58a	Deficiencies % (a)	BSIR #58b	Deficiencies % (b)		Top Surface BSIR #58a	Bottom Surface BSIR #58b	
≥ 5	N/A	N/A	N/A	Hold (c) Seal Cracks/Healer Sealer (d)	No Change	No Change	1 to 4 years
	≤ 5%	> 5	≤ 2%	Epoxy Overlay	8, 9	No Change	10 to 15 years
	≤ 10%	≥ 4	≤ 25%	Deck Patch (e)	Up by 1 pt.	No Change	3 to 10 years
4 or 5	10% to 25%	5 or 6	≤ 10%	Deep Concrete Overlay (h)	8, 9	No Change	25 to 30 years
		4	10% to 25%	Shallow Concrete Overlay (h, i)	8, 9	No Change	20 to 25 years
				HMA Overlay with water-proofing membrane (f, h, i)	8, 9	No Change	8 to 10 years
		2 or 3	> 25%	HMA Cap (g, h, i)	8, 9	No Change	2 to 4 years
≤ 3	>25%	> 5	< 2%	Deep Concrete Overlay (h)	8, 9	No Change	20 to 25 years
		4 or 5	2% to 25%	Shallow Concrete Overlay (h, i)	8, 9	No Change	10 years
				HMA Overlay with water-proofing membrane (f, h, i)	8, 9	No Change	5 to 7 years
		2 or 3	>25%	HMA Cap (g, h, i)	8, 9	No Change	1 to 3 years
				Replacement with Epoxy Coated Rebar (ECR) Deck	9	9	60+ years

(a) Percent of deck surface area that is spalled, delaminated, or patched with temporary patch material.
(b) Percent of deck underside area that is spalled, delaminated or map cracked.
(c) The "Hold" option implies that there is on-going maintenance of filling potholes with cold patch and scaling of incipient spalls.
(d) Seal cracks when cracks are easily visible and minimal map cracking. Apply healer sealer when crack density is too great to seal individually by hand. Sustains the current condition longer.
(e) Crack sealing can also be used to seal the perimeter of deck patches.
(f) Hot Mix Asphalt overlay with waterproofing membrane. Deck patching required prior to placement of waterproofing membrane.
(g) Hot Mix Asphalt cap without waterproofing membrane for ride quality improvement. Deck should be scheduled for replacement in the 5 year plan.
(h) If bridge crosses over traveled lanes and the deck contains slag aggregate, do deck replacement.
(i) When deck bottom surface is rated poor (or worse) and may have loose or delaminated concrete over traveled lanes, an in-depth inspection should be scheduled. Any loose or delaminated concrete should be scaled off and false decking should be placed over traveled lanes where there is potential for additional concrete to become loose.

BRIDGE DECK PRESERVATION MATRIX
DECKS WITH UNCOATED "BLACK" REBAR
USER GUIDELINES

This matrix is a tool for Bridge Engineers to use in the selection of deck repair options when the concrete bridge deck has uncoated "black" rebar. The condition of the deck is usually the driving force, or the key indicator, leading to a structure being considered for preventive maintenance, rehabilitation or replacement. However, there are times when other issues affecting the bridge may elicit the need for a project and this matrix does not address those situations. Some of these situations are super-structure deterioration, sub-structure deterioration, and functional issues such as under-clearance and/or bridge width. Sometimes it is desirable for an entire corridor to be brought up to a specific condition level as part of an overall strategy. So the user is cautioned to interpret the information from the matrix in the context of each specific case and use engineering judgment.

The matrix can be used from left to right or from right to left. If you have scoping inspection data with a deck delamination survey, select the row in the left column that matches the percent of surface defects. Then select the row in the second column that matches the percent of underside defects. To the right of this you will find a repair option and the associated changes to the NBI and the expected service life of that repair, or "Fix Life".

If you are looking for a fix that will last for a given period of time, select a row from the right column that matches the length of service desired and scan to the left to find the repair option. Be advised that the condition of the bridge at the time of the rehabilitation affects the expected service life of the selected repair option. So if the structure is in worse condition than shown on the left side of the matrix, the repair will not last as long. Conversely, if the deck is in better condition than shown on the left, a longer service life could be expected.

This matrix has been constructed based on element deterioration data and the best knowledge of individuals from Construction & Technology, Maintenance, region bridge engineers, bridge design engineers, and FHWA with many years of experience working with bridges. When used in conjunction with the Bridge Safety Inspection Report (BSIR), Pontis element data, and detailed bridge project scoping report, the matrix can be an accurate guide in the majority of situations and will lead to a repair option that is economical and consistent with the Department's goals.

Appendix B

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Appendix C

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MICHIGAN DEPARTMENT OF TRANSPORTATION

BRIDGE DIVING INSPECTION REPORT [SIA #92-B]

MDOT Bridge ID	Structure Number	Control Section

Facility	Federal Struc ID	Inspector Name	Agency Name	Inspection Date

Feature	Location	Latitude	Longitude	Insp Freq	Insp Key

Length	Width	Year Built	Yr Recon	Br	Type	Scour Eval	# of Pins

BRIDGE INFORMATION

NUMBER OF SUBSTRUCTURE ELEMENTS IN WATERWAY

SCOUR COUNTER MEASURES

INSPECTION COMMENTS

SCOUR CRITICAL ACTION PLAN AVAILABLE?

SCOUR CRITICAL ACTION PLAN LOCATION

NAVIGATION PROTECTION SYSTEMS

PROTECTION SYSTEMS

INSPECTION COMMENTS

INSPECTION STAFF & EQUIPMENT

ENGINEER
DIVER
TENDER

DIVE EQUIPMENT(S)

NEAREST BOAT LAUNCH SITE

SAFETY CONCERNS

WATERWAY & WEATHER CONDITIONS

CURRENT SPEED		TURBIDITY		WATER TEMPERATURE	
STREAM BED MATERIAL		MAXIMUM DEPTH		AIR TEMPERATURE	

MARINE GROWTH ON STRUCTURE

WEATHER CONDITIONS ON DAY OF DIVE

INSPECTION DETAILS

WATERWAY AND BANK OBSERVATIONS

MICHIGAN DEPARTMENT OF TRANSPORTATION

BRIDGE DIVING INSPECTION REPORT [SIA #92-B]

MDOT Bridge ID	Structure Number	Control Section

Facility	Federal Struc ID	Inspector Name	Agency Name	Inspection Date

Feature	Location	Latitude	Longitude	Insp Freq	Insp Key

Length	Width	Year Built	Yr Recon	Br	Type	Scour Eval	# of Pins

SUBSTRUCTURE OBSERVATIONS (Above the waterline)

SUBSTRUCTURE OBSERVATIONS (Below the waterline)

DEBRIS IN WATERWAY

RECOMMENDATIONS

UNDERWATER VIDEO AVAILABLE?

UNDERWATER VIDEO DESCRIPTION

UNDERWATER VIDEO LOCATION

STREAM BED PROFILE COMPLETED?

SITE PLAN COMPLETED?

PHOTOGRAPHS?

GENERAL NOTES

Appendix D

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Traffic Analysis Request (TAR) Guidelines

Definitions

Annual Average Daily Traffic (AADT)
The estimate of typical daily traffic on a road segment for all days of the week, Sunday through Saturday, over the period of one year. This number gives a good overall feel for the traffic on the roadway but is not used for design purposes. The raw traffic count is adjusted to take into account any seasonal or weekly traits of the corridor.

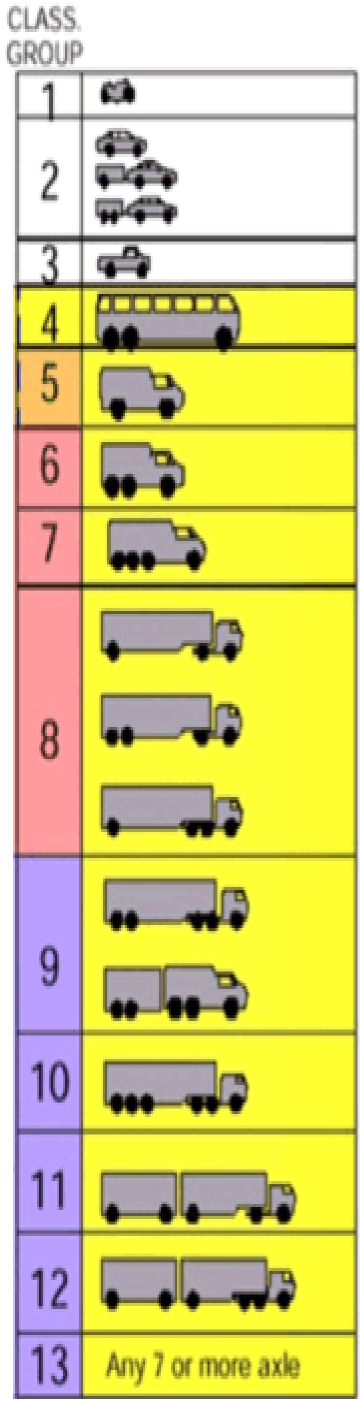
Design Hourly Volume (DHV)
The hourly traffic volume used in the design of highways, usually represented by the 30th highest hourly volume.

Directional Design Hourly Volume (DDHV)
The directional hourly traffic volume represented by the 30th highest hourly volume in each direction. This percentage may be substantially higher than DHV. For example, you might have a north/south corridor with a DHV of 13% on Friday 6PM. The DDHV could be 16% going northbound on Friday night 5 PM and 17% going southbound on a 3 PM Sunday night.

Commercial Annual Average Daily Traffic (CAADT)
The estimate of typical daily commercial traffic on a road segment for all days of the week, Sunday through Saturday, over the period of one year. Commercial traffic does not necessarily follow the same growth pattern than ADT. The economy and gasoline prices affect commercial differently than ADT. Agricultural seasons could have a greater effect on commercial.

Vehicle Classification
Vehicle Mix is used for a variety of purposes; to determine ESALs used in pavement design, noise impact studies; geometric considerations; capacity analysis; imposing weight limitations.

The following is the Federal Highway Administration (FHWA) vehicle classification breakdown:



1. Motor Cycles: All two or three-wheeled motorcycles and motor scooters with engines of approximately five horse power or more.

2. Passenger Cars: Passenger carrying automobiles, including any pulling a recreational or other light trailer.

3. Other two-axles, Four tire Single Unit Vehicles: Two axles, four-tire vehicles other than passenger cars (including pickups, panles, vans and other vehicles such as campers, motor homes, ambulances, hearses)

4. Buses: Traditional, passenger-carrying buses, both city and intercity, having two-axles and six tires or three or more axles (only traditional buses functioning as passenger-carrying vehicles fit this classification)

5. Two Axles, Six tire, Single Unit Trucks: Single frame trucks, including camping and recreational vehicles, motor homes, etc.

6. Three Axles, Single Unit Trucks: Three axles, single frame vehicles, including camping and recreational vehicles, motor homes, etc.

7. Four or more Axles, Single Unit Trucks: Any four or more axles, single unit truck.

8. Three or Four Axles, Single Trailer Trucks: Any three or four axles, truck and trailer combination.

9. Five Axles, Single Trailer Trucks: Any five axles truck and trailer combination.

10. Six or more Axles, Single Trailer Trucks: Any Six or more Axles truck and trailer combination.

11. Five or less Axles, Multi Trailer Trucks: Any combination of three or more units, one of which is a tractor or truck power unit having five or less axles.

12. Six Axles, Multi Trailer Trucks: Any combination of three or more units, one of which is a tractor or truck power unit having six axles.

13. Seven or more Axles, Multi Trailer Trucks: Any combination of three or more units, one of which is tractor

Note: Medium trucks are considered Class 4-8 while heavy trucks are considered Class 9-13.

AM Peak Period Volume and Time

The time period and volume in the morning when the greatest demand for transportation occurs. Please note *this is not a composite peak* where every movement or project section is at its highest volume. It is the morning peak period for your project area so project scope is important. Used in signal timing optimizations; capacity analysis and problem identification.

PM Peak Period Volume and Time

The time period and volume in the evening when the greatest demand for transportation occurs. Please note *this is not a composite peak* where every movement or project section is at its highest volume. It is the evening peak period for your project area so project scope is important. Used in signal timing optimizations; capacity analysis and problem identification.

Interchange/Intersection Turning movements (TMs)

Used to measure level of congestion and delay on arterial streets, intersections and interchanges. Traditionally, the counts are provided manually during the hours of 7-9AM, 11-1PM, 2-6PM. In addition, 24 hour hose counts are provided for each 'anchor' street.

Items to consider

Do you just need a ramp count or do you need the turning movements at the ramp termini? Be sure to be specific on your needs.

If you don't specify, you will get 20 design years for ESALs.

Remember the limitations and manpower issues of the Data Collection unit. Safety of the work crew is of prime consideration. This does not mean you shouldn't use them. For example, if you ask for a commercial count on a road where they can't lay hoses, you probably will not get 24 hour coverage. It is impossible to manually count all 13 classifications. Most likely, you will get the 2 bucket count (Single versus multiple trailer). Also remember you cannot get hose counts on curves (loop ramps) or on ramps where speed is variable.

Please let planner know of any unique characteristic of the corridor project. Is there a shopping area, unique factory hours, school area?

Are there any special events or affairs out of the ordinary that would skew traffic? Do you want counts more reflective of a typical period or do you want these special times counted?

Intersection Turning Movements- Traditionally, the counts are provided manually during the hours of 7-9AM, 11-1PM, 2-6PM. Are these hours reflective of the 8 highest hours? A shopping area might need more noontime (or even weekend) hours. Again, keep in mind data collection manpower concerns but if you need a weekend count, by all means, order it.

Typically, you will get AM and PM peak hours for Turning Movements. IF you have specific movements that are high in the 'off peak' hours you might want the DHV Turning Movements in addition to AM and PM peak.

On life cycle costing, do you need daily traffic distribution? Request as needed.

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Michigan Department of Transportation

OFFICE MEMORANDUM

DATE: December 8, 2008

TO: Art Green, Development Manager

FROM: Paul Arends, Traffic & Safety Engineer

SUBJECT: **Scoping Level Crash Analysis**
M-11 (The Grand River to Church Avenue)
City of Grandville, Kent County
JN 79447A, Control Section 41061

A preliminary crash analysis and safety review has been conducted for a five-year period (August 1, 2003 to July 31, 2008) for the subject location. The proposed project would involve complete reconstruction of M-11, including curbs and sidewalk. This roadway is as follows:

Control Section	Beg. M.P. End. M.P.	Type of Roadway	ADT
41061	6.681 6.907	4 lane-2 way	31,000

This 0.23 mile roadway segment is located along M-11 from the bridge over the Grand River (B01 of 41061) to Church Avenue in the city of Grandville. The segment also includes the adjacent I-196 entrance and exit ramps up to the gore with I-196. No segment of this roadway is included in the Grand Region High Crash List.

Initial review of the one-line listings from MDOT's TMS system for this roadway segment revealed a total of 223 crashes; 5 of which involved alcohol (2 rear-end straight,1 angle straight, 1 fixed object, 1 side swipe same). The remaining 218 crashes consisted of 98 (45%) rear-end straight, 37 (17%) angle drive, 26 (12%) side swipe same, 19 (8%) head on left, 14 (6%) angle straight, 10 (5%) fixed object, 10 (5%) angle turn, 2 (1%) side swipe opposite, 1 (0.5%) head on and 1 (0.5%) overturn.

A total of 150 (67%) crashes occurred during adverse (icy, snowy, wet) roadway conditions and 61 (27%) occurred during dark periods. These crashes resulted in a total of 72 injuries – consisting of 61 C's, 8 B's, 3 A's, and 0 Fatalities.

JN 101124A includes the traffic signal retiming for the entire M-11 corridor including this segment. This project is scheduled to be completed early 2009. The implementation of new signal timing, splits and offsets should help reduce crashes in this area – particularly the rear-end crashes. The project may also modify the flash schedule, which may help reduce the head-on left turn crashes.

In order to help reduce the large number of angle drive, angle straight and side-swipe crashes, this project should investigate utilizing access management techniques, such as closing, combining, or relocating the closely spaced drives onto M-11 (particularly the Shell & BP drives). Ideally, BP and Nyenhuis Collision Center would combine all drives and centrally locate a shared drive directly across from Church Street. Shell would close all access points onto M-11 and use Church Street as their only access point. If operations at the business require access onto M-11, a right-in / right-out drive may be considered.

Based on the above analysis and based on the current proposed project scope, no further safety additions will be needed. A detailed review of the individual crashes will be performed once the project is selected, programmed, and full design begins. It is possible that the existing crash patterns may change, or new patterns may develop within the time frame between scoping and design. Further analysis may reveal the need for additional mitigation measures.

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Appendix E

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2012

XXXX CALL FOR PROJECTS
BRIDGE REPAIR COST ESTIMATE

REV. 12/07/11

ENGINEER: DATE: DECK AREA: SFT STRUCTURE ID:
LOCATION: DECK DIM:
PRIMARY REPAIR STRATEGY: STR. TYPE:

WORK ITEM	QUANTITY	UNIT	UNIT COST		TOTAL
NEW BRIDGE					
Multiple Spans, Concrete (add demo. & road approach & traffic control)		SFT	$150.00	/SFT	
Multiple Spans, Steel (as above)		SFT	$180.00	/SFT	
Single Span or Over Water, Concrete (as above)		SFT	$190.00	/SFT	
Single Span or Over Water, Steel (as above)		SFT	$210.00	/SFT	
Pedestrian Bridge (includes removal, add traffic control)		SFT	$285.00	/SFT	
Other					
NEW SUPERSTRUCTURE					
Concrete (includes rem of old super, new railing, add t.c. & approach)		SFT	$110.00	/SFT	
Steel (as above)		SFT	$160.00	/SFT	
Over Water (add to new superstructure cost)		SFT	$28.00	/SFT	
Other					
WIDENING					
Added portion only. ______ ft of width (add road approach widening)		SFT	$190.00	/SFT	
Other					
NEW DECK					
Includes removal of old deck & new railing (add t.c. & approach)		SFT	$65.00	/SFT	
Other					
DEMOLITION					
Entire bridge, grade separation		SFT	$27.00	/SFT	
Entire bridge, over water		SFT	$36.00	/SFT	
Other					
SUPERSTRUCTURE REPAIR					
Concrete Deck Patch (includes hand chipping)		SFT	$33.00	/SFT	
Full Depth Patch		SFT	$70.00	/SFT	
HMA Cap (no membrane - add bridge rail if req'd)		SFT	$1.20	/SFT	
HMA Overlay with WP membrane (add bridge rail if req'd)		SFT	$4.50	/SFT	
Removal of Concrete Wearing Course (latex)		SFT	$2.00	/SFT	
Removal of HMA Overlay or Epoxy Overlay		SFT	$1.00	/SFT	
Epoxy Overlay		SYD	$34.00	/SYD	
Shallow Overlay (includes joint replmt & hydro, add bridge rail if req'd)		SFT	$23.00	/SFT	
Deep Overlay (includes joint replmt & hydro, add bridge rail if req'd)		SFT	$24.00	/SFT	
PCI Beam End Repair ($2000-$4000 per beam end)		EA	$3,000.00	EA	
Repair Structural Steel ($2000 bolted, $6000 welded)		EA	$5,000.00	EA	
High Load Hit Repair (PCI Beam)		SFT	$200.00	/SFT	
Paint Structural Steel		SFT	$9.00	/SFT	
Partial Painting		SFT	$18.00	/SFT	
Pin & Hanger replacement (includes temporary supports)		EA	$6,000.00	EA	
Other					
SUBSTRUCTURE REPAIR					
Pier repair (measured x 2) Replace unit if spalled area > 30%		CFT	$180.00	/CFT	
Pier repair over water (measured x 2)		CFT	$200.00	/CFT	
Pier replacement		CFT	$70.00	/CFT	
Abutment repair (measured x 2)		CFT	$180.00	/CFT	
Temporary Supports for Substructure Repair		EA	$1,500.00	EA	
Slope Protection repairs		SYD	$80.00	/SYD	
Other					
MISCELLANEOUS					
Expansion or Construction Joints (includes removal)		FT	$450.00	/FT	
Bridge Railing, remove and replace (type 4 $210, aesthetic parapet $260)		FT	$235.00	/FT	
Thrie Beam Railing retrofit		FT	$34.00	/FT	
Deck Drain Extensions		EA	$500.00	EA	
Scour Countermeasures		LSUM		LSUM	
Other					
ROAD WORK					
Approach Pavement, 12" RC (add C & G, GR, Slope, Shldr.) 40' ea. end		SFT	$11.50	/SFT	

BRIDGE REPAIR COST ESTIMATE WORKSHEET
- KEY -

Unit Cost Assumptions
(Revised **01/29/09**)

NEW BRIDGE

Multiple spans, Concrete - add road approach, demolition, & traffic control.
Multiple spans, Steel - add road approach, demolition, & traffic control.
Single span (or multi span over water), Concrete - add road approach, demolition, & traffic control.
Single span (or multi span over water), Steel - add road approach, demolition, & traffic control.
Pedestrian Bridge - includes demolition & approach ramps, add traffic control.
Other

NEW SUPERSTRUCTURE - includes removal of old superstructure, joints, new railing.

Add road approach and traffic control.
NOTE: Assume replace-in-kind unless specific recommendation from Design.
Concrete
Steel
Over Water - additional cost to the steel or concrete superstructure replacement if over water.
Other

WIDENING - Per square area of widened portion of deck.

Includes cost of widening substructure units, ***must add additional cost of widening road approach***.
Other

NEW DECK - includes removal of old deck, joints, new railing. Add road approach & traffic control.

Other

DEMOLITION

Entire bridge, grade separation
Entire bridge, over water
Other

SUPERSTRUCTURE REPAIR

Concrete Deck Patch - includes hand chipping.
HMA Cap (no membrane) - add bridge railing if required.
HMA Overlay with WP membrane - add bridge railing if required.
Removal of Concrete Wearing Course (latex) or Epoxy Overlay - add this to overlay costs to remove existing latex or epoxy wearing course.
Removal of HMA Overlay – add this to overlay costs to remove existing HMA overlay.
Epoxy Overlay - does not include joint replacement.
Shallow Overlay* **-** includes joint replacement & hydrodemolition; add bridge railing if req'd.
Deep Overlay* **-** includes joint replacement & hydrodemolition; add bridge railing if req'd.
*[Add "Removal of Concrete Wearing Course" to remove existing latex ovly.]
PCI Beam End Repair - per beam end, $3,000 is "average".
$2,000 for simple repairs (includes cathodic protection and concrete patching),
$4,000 for extensive repairs (includes new bearing assembly and temporary supports).
Repair Structural Steel – per repair, includes temporary supports, add painting.
$2,400 bolted, $6,200 welded. Use $5,000 if unknown.
High Load Hit Repair (PCI beam) – does not include temporary support, if needed.
Paint Structural Steel - includes clean and coat.
Partial Painting - includes clean and coat.
Pin & Hanger replacement - includes temporary supports, does not include painting.
Other

SUBSTRUCTURE REPAIR

Pier repair* **-** (measured x 2) **-** includes hand chipping, add temporary supports.
Pier repair over water* **-** (measured x 2) **-** includes hand chipping, add temporary supports.
Pier replacement - includes removal, piles, excavation, backfill, & cofferdam or sheet piling.
Abutment repair* **-** (measured x 2) **-** includes hand chipping, add temporary supports.
*assumes depth of repair is 5"-6".
Temporary Supports for Substructure Repair
Slope Protection repairs - includes demolition / removal.
Other

MISCELLANEOUS

Expansion Joints and Construction Joints - includes joint removal.
(combined per Design - construction joint usually replaced with exp. joint of some kind).
Bridge Railing, remove and replace – average.
If Type 4, reduce by $30. If aesthetic parapet railing, increase by $40.
Thrie Beam Railing retrofit
Deck Drain Extensions – only two in WIRS. Cost may vary.
Scour Countermeasures
Other

ROAD WORK

Approach Pavement, 9½" RC, 40' ea. end **-** min. approach work to tie in to new bridge deck, includes removal of existing pavement.
Approach Curb & Gutter - includes C&G removal.
Guardrail Anchorage to Bridge (<40') **-** includes GR removal.
Guardrail, Type B or T - includes GR removal.
for guardrail beyond GR Anchorage or to replace existing type B or T. Not more than $200'.
Guardrail Ending - needed unless new GR is tied into existing GR.
Roadway Approach work - when needed beyond 40', eg. transition to adjust crown or super, or add'l width needed when widening bridge or add'l length needed when raising grade.
Utilities
Other

TRAFFIC CONTROL **-** Unit costs to be determined by Region or TSC Traffic and Safety.
Note: If bridge is within a road project, traffic control will in most cases be covered by the road project. If this is the case, please make note of it on the estimate form.

Part Width Construction
Crossovers – very rough estimate.
Temporary Traffic Signals - price listed is bumped up from that provided by Lansing T&S in 2004.
RR Flagging
Detour
Other

CONTINGENCY - (10% - 20%) use higher contingency for small projects.

MOBILIZATION – Estimate at 5% but put "10% max." in pay item description, per Design Update 2009-1.

INFLATION - use 5% per year, starting with year 2009, per Planning (5% 2009, 10% 2010, 15% 2011, etc.).

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CAPITAL SCHEDULED MAINTENANCE
BRIDGE PROJECT COST ESTIMATE

2012

_______________REGION FY_________

ENGINEER: DATE: DECK AREA: STRUCTURE NO:
LOCATION: DECK DIM: XXX-XXXXX
PRIMARY WORK ACTIVITY: STR. TYPE:

WORK ACTIVITIES		QUANTITY	DIMENSION	UNIT COST	TOTAL
DECK					
Patching Concrete, C-L	(deck or barrier rail patching)		CYD	$700.00 /CYD	
Penetrating Healer/Sealer, Bridge Deck			SYD	$16.00 /SYD	
Crack Sealer			FT	$4.50 /FT	
Water Repellant Treatment, Penetrating	(deck surface)		SYD	$15.00 /SYD	
Concrete Surface Coating	(concrete barrier rail, deck slab fascia)		*SYD	$12.00 /SYD	
Resealing Bridge Construction Joints	(hot poured rubber)		FT	$15.00 /FT	
End Header Replacement			FT	$75.00 /FT	
Concrete, Grade D			CYD	$750.00 /CYD	
Reinforcement, Steel, Epoxy Coated			LBS	$1.40 /LB	
Adhesive Anchoring of Horiz. Bars __"			EA	$25.00 /EA	
Drain Casting, Type 1			EA	$800.00 /EA	
Drain Casting, Type 2			EA	$600.00 /EA	
Drain Casting Assembly, Type 1			EA	$900.00 /EA	
Drain Casting Assembly, Type 2			EA	$700.00 /EA	
Deck Drain , Extension			EA	$500.00 /EA	
Downspout Replacement			EA	$2,000.00 /EA	
Embedded Galvanic Anode			EA	$20.00 /EA	
Other					
SUPERSTRUCTURE					
Spot Painting	(80% clean, 20% coat)		*SFT	$20.00 /SFT	
Patching Concrete, C-L	(concrete beam patching)		CYD	$700.00 /CYD	
Water Repellent Treatment, Penetrating	(concrete fascia beams)		SYD	$15.00 /SYD	
Concrete Surface Coating	(concrete fascia beams)		*SYD	$12.00 /SYD	
Other					
SUBSTRUCTURE					
Patching Concrete, C-L	(substructure patching)		CYD	$700.00 /CYD	
Patch Forming	(vertical & overhead surfaces)		SFT	$32.00 /SFT	
Concrete Surface Coating	(vertical surfaces)		*SYD	$12.00 /SYD	
Substructure Horizontal Surface Sealer	(horizontal surfaces)		*SYD	$18.00 /SYD	
Water Repellent Treatment, Penetrating			SYD	$15.00 /SYD	
Other					
DEMOLITION					
Hand Chipping, Shallow	(~3" deep)		SYD	$110.00 /SYD	
Hand Chipping, Deep	(~6" deep min)		SYD	$160.00 /SYD	
Hand Chipping, Other Than Deck	(vertical & overhead surfaces)		CFT	$60.00 /CFT	
Structures, Rehabilitation, Rem Portions	(slope protection removal)		*CYD	$225.00 /CYD	
Structures, Rehabilitation, Rem Portions	(drain casting removal)		*EA	$500.00 /EA	
False Decking			SFT	$1.00 /SFT	
Other					
MISCELLANEOUS					
Joint, Expansion, Erg	(pavement joint)		FT	$11.50 /FT	
Joint, Pressure Relief, 4 inch			FT	$50.00 /FT	
Embankment, Structure, CIP			CYD	$24.00 /CYD	
Backfill, Structure, CIP			CYD	$20.00 /CYD	
Slope Paving, Header			FT	$60.00 /FT	
Slope Paving, Concrete			SYD	$60.00 /SYD	
Slope Paving, Precast Concrete			SYD	$60.00 /SYD	
Other					
TRAFFIC CONTROL					
Maintaining Traffic	(from TSC or Region T&S)		LS	LS	
Other					
MOBILIZATION		10 %		$0.00	$0

(DOES NOT INCLUDE PE & CE) **CONSTRUCTION TOTAL** **$0**

* Estimated as unit shown, Paid for as LUMP SUM
Rev. 12/6/11

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Appendix F

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Breakdown ID Numbers for Use in Trns□port

Breakdown IDs Associated with the Sub-Categories in the MPINS Concept – Road Cost Tab

(100) MAINLINE PAVEMENT

101	Aggregate BSE/Surf
102	Chip Seal
103	Cncrt Pvmt Rpr (Jt Log)
104	Cold Mill
105	Concrete Mainline
106	Crack and Seal
107	Crown Modification
108	Curb and Gutter
109	Detail 7s
110	Detail 8s
111	Diamond Grinding
112	Earth Work
113	HMA Mainline
114	HMA/Conc. Quality Initiative
115	Hand Patching
116	Longitudinal Jt Rpr
117	Micro Surfacing
118	Milled Joint Repair
119	Other
120	Other Concrete
121	Other HMA
122	Quality Control Testing
123	Remove Pavement
124	Ride Quality HMA/Conc.
125	Rubblizing/Pulver /Crush
126	Saw and Seal
127	Subbase
128	Trenching/Station Grading
129	Undercutting

(200) GEOMETRIC IMPROVEMENT

201	Commercial Driveways
202	Detail II & III Approac
203	Gore Flattening
204	Int'sctn Imp - Realign
205	Int'sctn Imp - Turn Lane
206	Int'sctn Imp-Pass Flare
207	Int'sctn Sight Distance
208	Lane Drop Taper Rev
209	Other
210	Pass Sight Distance Imp

(200) GEOMETRIC IMPROVEMENT continued

211	Ramp Extensions
212	Ramp Widening
213	Residential Driveways
214	Roadside Curbed Islands
215	Safety Related Grading
216	Stop Sight Distance Imp
217	Superelevation Mod
218	Vertical & Horizontal Alignment

(300) ENVIRONMENTAL

301	Act 307
302	Archeological Sites
303	Endangered Species
304	Hazardous Matls Testing
305	Hazmat Mitigation
306	Historical Sites
307	Non Hazardous Contaminated Materials
308	Other
309	Wetland Mitigation

(400) ROW

401	Access Rights/Agreement
402	Air Rights
403	Drainage Easements
404	Drive Relocation
405	Fee ROW
406	Grdg Permits
407	Other
408	Permit to Close Drive
409	Permit to Grade Drive
410	Fee Row - Number of Par
411	Fee Row - Num of Relocs

(500) PERMANENT TRAFFIC

501	Cantilever Signs
502	Cold/Hot Appl'd Marking
503	Delineators
504	Other
505	Paint
506	Perm Signing
507	Perm Traffic Signals
508	Raised Pavement Markers
509	Truss Signs
510	Number of Traffic Signals

(600) SAFETY

601	Advertising Signs
602	Clear Vision (Grdg/Clrg)
603	Culvert Ext/Hdwall Rmv
604	Curb and Gutter
605	Drainage Ditches
606	Filler Walls
607	Fixed Object Removal
608	Guardrail
609	Impact Attenuators
610	Mailboxes
611	Median Protection
612	Other
613	RR Xings
614	Sidewalk Ramps
615	Structures
616	Tree Removal/Trimming
617	Utility Poles

Breakdown IDs Associated with the Sub-Categories in the MPINS Concept – Road Cost Tab - Continued

(700) DRAINAGE

701	Culvert Replacement
702	Curb and Gutter
703	Ditching
704	Other
705	Paved Ditches
706	Pumpstations
707	Retention/Detention
708	Retrofitting Pavt Drain
709	Storm Sewer Adjust/Cons
710	Underdrains
711	Video Taping Sewers

(800) NON-MOTORIZED

801	Independent
802	Other
803	Shoulder
804	Sidewalk
805	Surfacing NM Path

(900) CONT/MOBIL/INFL

901	Road - Contingency
902	Road - Mobilization
903	Road - Inflation

(1000) MAINTAINING TRAFFIC

1001	Barricades
1002	Changeable Message Sign
1003	Detour Imp - Marking
1004	Detour Imp - Signals
1005	Detour Imp - Signing
1006	Detour Imp - Surfacing
1007	Flag Control
1008	Incentive/Disincentive
1009	Lighted Arrows
1010	Minor Traffic Devices
1011	Night Work

(1100) MISC.

1101	Berm (Shldr Edge) Rmv
1102	Carpool Lot
1103	Contractor Staking
1104	Erosion Control
1105	Fencing
1106	Intelligent Transportation Systems
1107	Landscaping (General)
1108	Lighting
1109	Blank
1110	Other
1111	Public Utilities
1112	Restoration: Seed/Sod/e
1113	Retaining Walls
1114	Roadside Park/Rest Area
1115	Sound Walls
1116	Tree Replacement

(1200) EPE/PE/CE

1201	Study (EPE)
1202	Road - PE
1203	Road - CE

Non-Standard Pay Item Numbers

With Trns•port, pay item code numbers for non-standard, miscellaneous pay items (project specific pay items not found in the Code Book) do not have a unique pay item code number. The item description is the primary key, not the code number.

Miscellaneous item code numbers depend on the unit of measure. Unique code numbers are assigned for each sub-section of the Standard Specification Book, for each unit of measure that is likely used in that subsection. The following format is used to designate miscellaneous pay items:

XXX7YYY

XXX	Designates the subsection of the Standard Specifications that the item is associated with
7	Designates that the item is a miscellaneous item
YYY	Designates the number that is associated with the unit of measure

The following numbers are used:

YYY	Unit of Measure	YYY	Unit of Measure
001	Foot	030	Pound
002	Station	031	Ton
003	Mile	040	Hour
004	Lane Mile	041	Calendar Day
005	Roadbed Mile	042	Work Day
007	Inch	043	Month
008	Square Inch	044	Week
010	Square Foot	050	Each
011	Square Yard	051	Lump Sum
012	Acre	052	Unit
020	Cubic Foot	054	Intersection
021	Cubic Yard	055	Set
022	Gallon	060	Dollar
023	Thousand Board Foot		

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Appendix G

Topic	Appendix #

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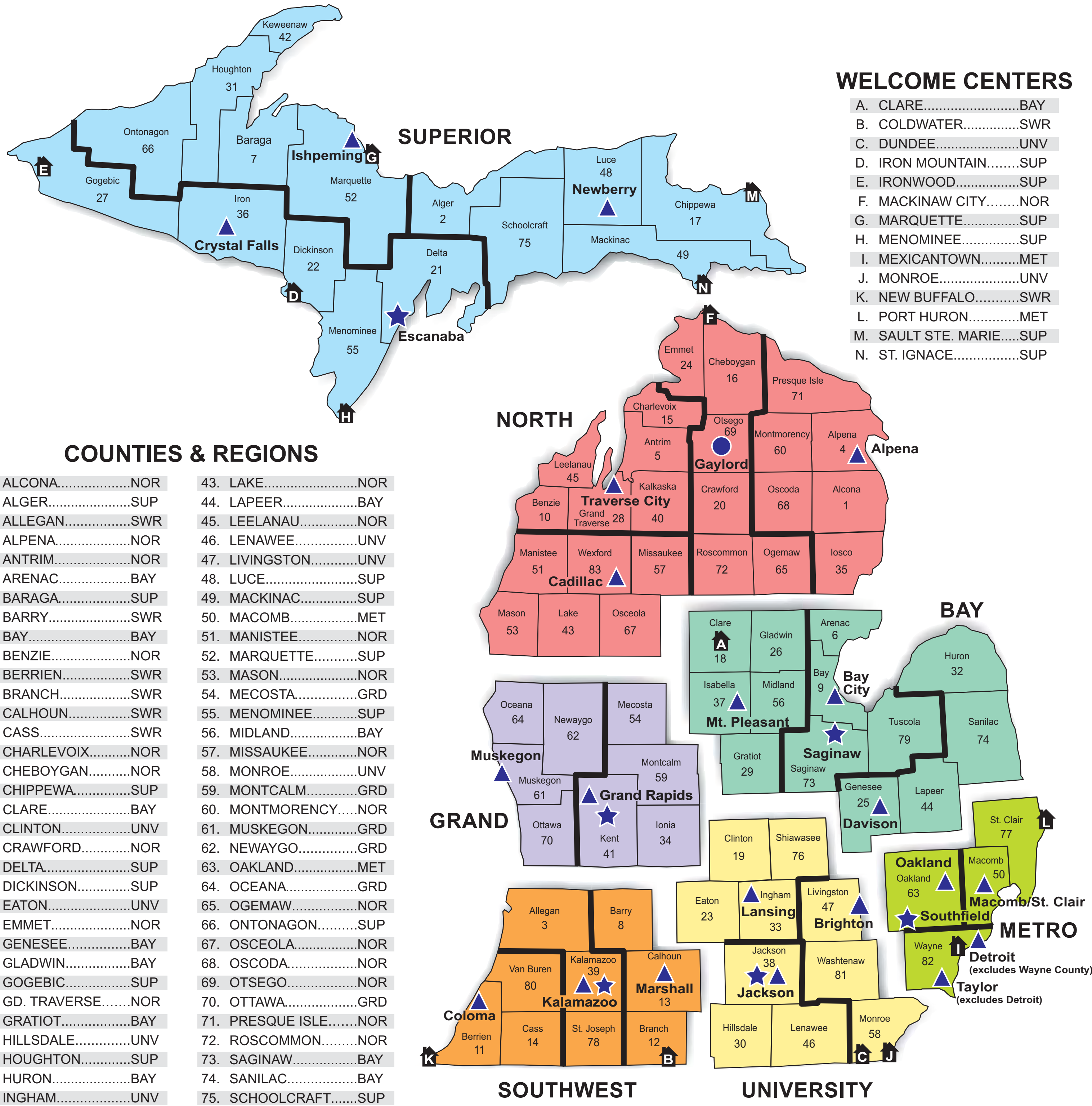
MDOT
Michigan Department of Transportation

Region Offices and Transportation Service Centers



WELCOME CENTERS

A. CLARE........................BAY
B. COLDWATER..............SWR
C. DUNDEE.....................UNV
D. IRON MOUNTAIN........SUP
E. IRONWOOD................SUP
F. MACKINAW CITY........NOR
G. MARQUETTE..............SUP
H. MENOMINEE...............SUP
I. MEXICANTOWN..........MET
J. MONROE....................UNV
K. NEW BUFFALO...........SWR
L. PORT HURON.............MET
M. SAULT STE. MARIE.....SUP
N. ST. IGNACE................SUP

COUNTIES & REGIONS

1. ALCONA..................NOR
2. ALGER.....................SUP
3. ALLEGAN................SWR
4. ALPENA..................NOR
5. ANTRIM..................NOR
6. ARENAC..................BAY
7. BARAGA..................SUP
8. BARRY.....................SWR
9. BAY.........................BAY
10. BENZIE....................NOR
11. BERRIEN................SWR
12. BRANCH..................SWR
13. CALHOUN...............SWR
14. CASS.......................SWR
15. CHARLEVOIX..........NOR
16. CHEBOYGAN...........NOR
17. CHIPPEWA.............SUP
18. CLARE.....................BAY
19. CLINTON.................UNV
20. CRAWFORD............NOR
21. DELTA......................SUP
22. DICKINSON.............SUP
23. EATON.....................UNV
24. EMMET....................NOR
25. GENESEE................BAY
26. GLADWIN................BAY
27. GOGEBIC................SUP
28. GD. TRAVERSE.......NOR
29. GRATIOT..................BAY
30. HILLSDALE.............UNV
31. HOUGHTON............SUP
32. HURON....................BAY
33. INGHAM..................UNV
34. IONIA.......................GRD
35. IOSCO.....................NOR
36. IRON........................SUP
37. ISABELLA................BAY
38. JACKSON................UNV
39. KALAMAZOO...........SWR
40. KALKASKA..............NOR
41. KENT.......................GRD
42. KEWEENAW............SUP
43. LAKE.......................NOR
44. LAPEER...................BAY
45. LEELANAU..............NOR
46. LENAWEE...............UNV
47. LIVINGSTON...........UNV
48. LUCE.......................SUP
49. MACKINAC..............SUP
50. MACOMB.................MET
51. MANISTEE..............NOR
52. MARQUETTE...........SUP
53. MASON...................NOR
54. MECOSTA...............GRD
55. MENOMINEE...........SUP
56. MIDLAND.................BAY
57. MISSAUKEE............NOR
58. MONROE.................UNV
59. MONTCALM............GRD
60. MONTMORENCY.....NOR
61. MUSKEGON............GRD
62. NEWAYGO...............GRD
63. OAKLAND................MET
64. OCEANA..................GRD
65. OGEMAW................NOR
66. ONTONAGON..........SUP
67. OSCEOLA................NOR
68. OSCODA.................NOR
69. OTSEGO.................NOR
70. OTTAWA..................GRD
71. PRESQUE ISLE.......NOR
72. ROSCOMMON.........NOR
73. SAGINAW................BAY
74. SANILAC.................BAY
75. SCHOOLCRAFT.......SUP
76. SHIAWASEE............UNV
77. ST. CLAIR................MET
78. ST. JOSEPH............SWR
79. TUSCOLA................BAY
80. VAN BUREN............SWR
81. WASHTENAW..........UNV
82. WAYNE....................MET
83. WEXFORD...............NOR

SUPERIOR	UNIVERSITY	TSC OFFICE
NORTH	BAY	REGION/TSC OFFICE
GRAND	METRO	TSC BOUNDARY
SOUTHWEST	REGION OFFICE	WELCOME CENTER

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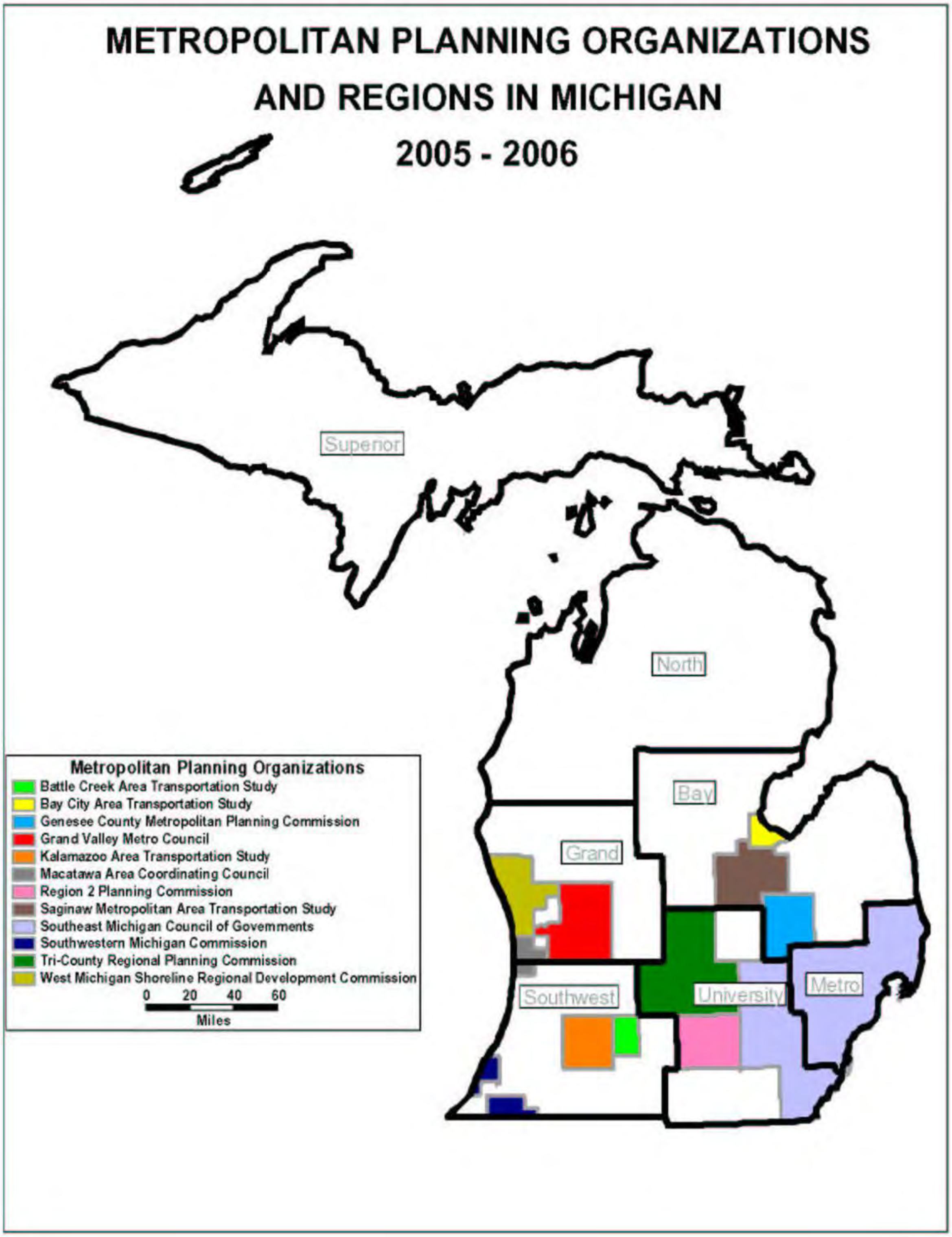
Metropolitan Planning Organizations (MPOs)

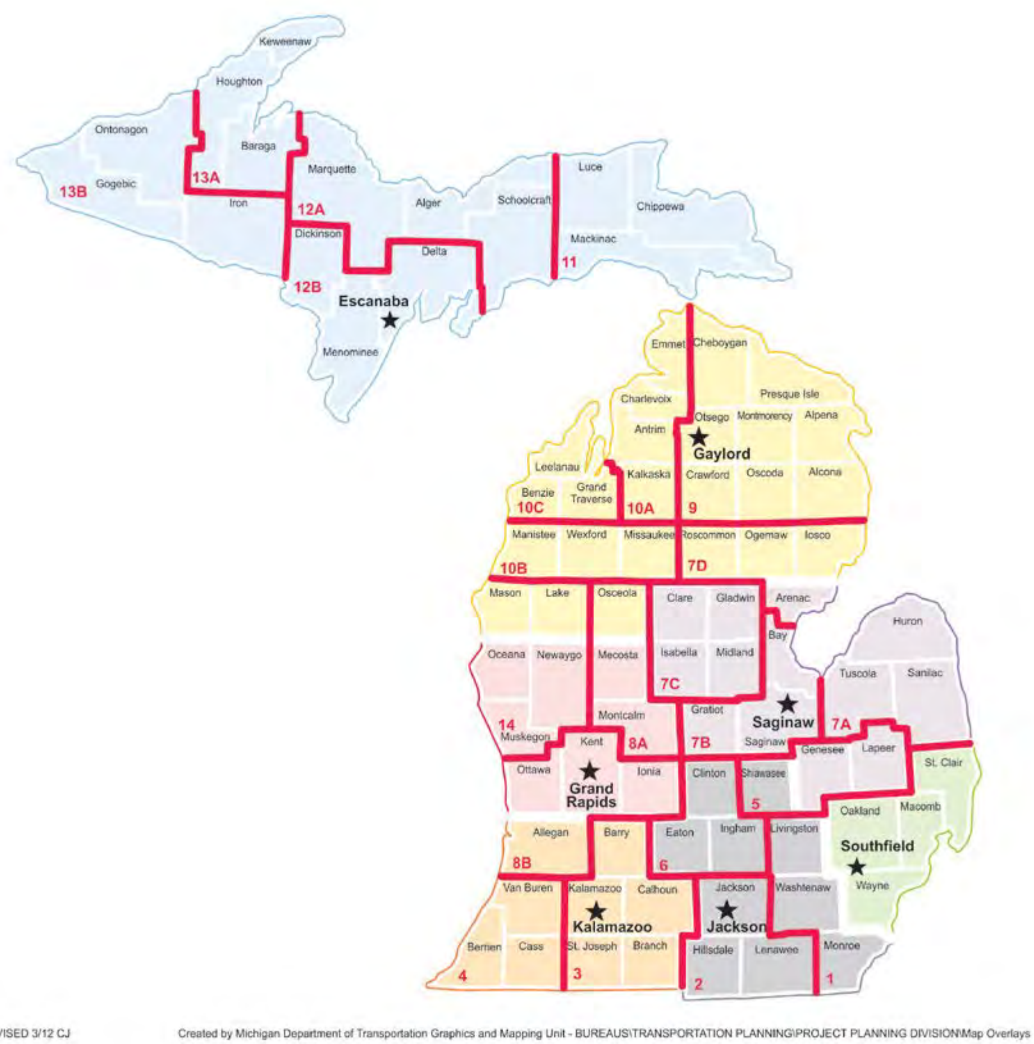
Metropolitan Planning Organization (MPO) consists of local government and transportation authorities, and makes transportation policy. In the United States, an MPO is required for any urbanized area with a population greater than 50,000; because it was felt that large urban areas required continuing, cooperative, and comprehensive transportation planning.
Under federal law, each MPO must establish an agreement among its members that explains how transportation will be organized and operated. Coordination with the local MPO may be one of the first steps when scoping a possible project, to find out local issues and concerns.


METROPOLITAN PLANNING ORGANIZATIONS
AND REGIONS IN MICHIGAN
2005 - 2006
Superior
North
Bay
Grand
Southwest
University
Metro
Metropolitan Planning Organizations
Battle Creek Area Transportation Study
Bay City Area Transportation Study
Genesee County Metropolitan Planning Commission
Grand Valley Metro Council
Kalamazoo Area Transportation Study
Macatawa Area Coordinating Council
Region 2 Planning Commission
Saginaw Metropolitan Area Transportation Study
Southeast Michigan Council of Governments
Southwestern Michigan Commission
Tri-County Regional Planning Commission
West Michigan Shoreline Regional Development Commission
0 20 40 60
Miles

Rural Task Forces (RTFs)

Rural task forces were mandated in December 1991 when the Intermodal Surface Transportation Efficient Act (ISTEA) was signed into law. The objective was to include transit operators and representatives of cities under 5000 people in all federally-funded transportation decisions. This mandate for stakeholder engagement was strengthened by Executive Order 2003-25 in December 2003, calling for MDOT to use context sensitive design.

As shown on the map below, one rural task force includes several counties.



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Financial Systems:
As of April, 2012

CODE	DESCRIPTION	STATUS * 0% Federal
5303	CTF METRO TRANSPORTATION PLANNING	Active *
5304	CTF STATEWIDE TRANSPORTATION PLANNING	Active *
5307	CTF URBANIZED FORMULA	Active *
5308	CTF CLEAN FULES PPROGRAM	Active
5309	CTF CAPITAL PROGRAM	Active *
5310	CTF ELDERLY AND DISABLED	Active *
5311	CTF NON URBAN FORMULA	Active *
5316	CTF JOB ACCESS REVERSE COMMUTE	Active *
5317	CTF NEW FREEDOM	Active *
5320	CFT ALTRENATIVE TRNSPR. PARKS & PUBLIC LAND	Active
5339	CTF ALTERNATIVE ANALYSIS	Active
A307	AMERICAN RECOVERY - CTF URBANIZED FORMULA	Active
A311	AMERICAN RECOVERY - CTF NON URBAN FORMULA	Active
AA	AERONAUTICS METRO STANDARD RATE	Active
AAS	AERONAUTICS AVIATION SERVICES	Active *
AB	AERONAUTICS FEDERAL BLOCK GRANTS	Active *
ABH	ADV CON BRIDGE REHAB FED SYSTEM PRIOR 1991	Inactive
ABHI	ADV CON BRIDGE REHAB INTERSTATE	Inactive
ABHN	ADV CON BRIDGE REHAB NATL HIGHWAY SYSTEM	Inactive
ABHT	ADV CON BRIDGE REHAB SURFACE TRANSPORTATION	Inactive
ABR	ADV CON BRIDGE REPLACEMENT FED SYS PRIOR 1991	Inactive
ABRI	ADV CON BRIDGE REPLACEMENT INTERSTATE	Inactive
ABRN	ADV CON BRIDGE REPLACEMENT NHS	Inactive
ABRT	ADV CON BRIDGE REPLACEMENT SURFACE TRANS	Inactive
ACFR	ADV CON CONSOLIDATED PRIMARY RURAL	Inactive
ACFU	ADV CON CONSOLIDATED PRIMARY URBAN	Inactive
ACI	ADV CON INTERSTATE	Inactive
ACIR	ADV CON INTERSTATE RECONSTRUCT	Inactive
ACM	ADV CON CONGESTION MITIGATION	Inactive
ADBE	AMERICAN RECOVERY - DBE OJT	Active
ADPO	ADV CON ISTEA DEMO 80% FEDERAL NOT CLASSIFIED	Inactive
AFBD	AMERICAN RECOVERY - FERRY BOATS	Active
AFFH	AMERICAN RECOVERY - FOREST HIGHWAYS	Active
AFLH	AMERICAN RECOVERY - NATIONAL PARK ROADS	Active
AFM	AERONAUTICS FEDERAL	Inactive
AFR	ADV CON CONSOLIDATED PRIMARY RURAL	Inactive
AFRI	ADV CON RECONSTRUCT ON FRI	Inactive
AFRR	ADV RECON CONSOLIDATED PRIMARY RURAL 4R	Inactive
AFU	ADV CON CONSOLIDATED PRIMARY URBAN	Inactive
AFUG	ADV RECON CONSOLIDATED PRI URBAN HWY 100% FED	Inactive
AFUR	ADV RECON CONSOLIDATED PRIMARY URBAN 4R	Inactive
AG	AERONAUTICS NOICE PROGRAM	Active
AH	AERONAUTICS 90% STATE 10% LOCAL	Active *
AIM	ADV CON RECONSTRUCT IM NO ADDED LANES	Inactive
AIMG	ADV CON RECONSTRUCT ON IMG	Inactive
AIR	ADV CON RECONSTRUCT ON IR	Inactive
AIRR	AMERICAN RECOVERY - INDIAN RESERVATION ROADS	Active

Financial Systems:
As of April, 2012

CODE	DESCRIPTION	STATUS * 0% Federal
AK	AERONAUTICS STANDARD AIP AIP 2004 & AFTER	Active
AL	AERONAUTICS STANDARD AIP PRE 2004	Active
AM	AERONAUTICS 50% STATE & 50% LOCAL	Active *
ANH	ADV CON RECONSTRUCT ON NH	Inactive
ANHG	ADV CON RECONSTRUCT NHF SAFETY 100% FEDERAL	Inactive
ANHI	ADV CON RECONSTRUCT ON NHI	Inactive
ANHS	ADV CON RECONSTRCT NHS MDOT SAFETY	Inactive
AR	AMERICAN RECOVERY - ANY AREA	Active
AR1	AMERICAN RECOVERY - 120 DAY OBLIGATION	Active
ARA	AMERICAN RECOVERY - AERONAUTICS	Active
ARE	AMERICAN RECOVERY - ENHANCEMENT	Active
ARE1	AMERICAN RECOVERY - ENHANCEMENT 120 DAY OBL	Active
ARL	AMERICAN RECOVERY - RURAL	Active
ARTG	ARRA TIGER GRANT	Active
ARU	AMERICAN RECOVERY - TMA	Active
ARUL	AMERICAN RECOVERY - SMALL MPO, SMALL URBAN	Active
AS	AERONAUTICS 100% STATE PROGRAM	Active *
AST	ADV CON RECONSTRUCT SFC TRANS ANY AREA	Inactive
ASTG	ADV CON RECONSTRUCT SFC TRANS SAFETY	Inactive
ASTH	ADV CON SURFACE TRANS SAFETY HAZARD ELIMIN	Inactive
ASTL	ADV CON SURFACE TRANSPORTATION LOCAL RURAL	Inactive
ASTT	ADV CON RECONSTRUCT SFC TRANSPORTATION	Inactive
ASTU	ADV CON SURFACE TRANS URBAN AREA > 200K POP	Inactive
AT	AERONAUTICS 95% STATE & 5% LOCAL	Active *
AW	AERONAUTICS 9/11 SECURITY REIMBURSEMENTS 2002	Active
BE01	BOND EDF LOCAL ROADS FOR FIRST ISSUE	Active *
BE02	BOND EDF LOCAL ROADS FOR SECOND ISSUE	Active *
BE03	BOND EDF LOCAL ROADS FOR THIRD ISSUE	Active *
BFU	BOND FUNDS CNSL PRI URBAN	Inactive
BG	BOND GARVEE	Active *
BGP	BICYCLE GRANT PROGRAM	Inactive *
BHES	BOND HAZARD ELIMINATION	Inactive
BHF	BRIDGE REHAB PRIOR 1991 BILL	Inactive
BHI	BRIDGE REHAB PRIOR 1991 BILL INTERSTATE	Active
BHM	BRIDGE REHAB PRIOR 1991 BILL URBAN SYSTEM	Inactive
BHN	BRIDGE REHAB NHS	Active
BHO	BRIDGE REHAB NOT CLASSIFIED OFF SYSTEM	Active
BHS	BRIDGE REHAB PRIOR 1991 BILL SECONDARY	Inactive
BHT	BRIDGE REHAB SURFACE TRANSPORTATION	Active
BI	BOND FUNDS INTRASTATE	Inactive
BI04	BOND ISSUE 2004	Active *
BI06	BOND ISSUE 2006	Active *
BI08	BOND ISSUE 2008	Active *
BI11	BOND ISSUE 2011	Active *
BI12	BOND ISSUE 2012	Active *
BI8M	BOND ISSUE 2008 MATCH	Active *

Financial Systems:
As of April, 2012

CODE	DESCRIPTION	STATUS * 0% Federal
BIA	BUREAU OF INDIAN AFFAIRS	Active
BIR	BOND INTERSTATE RECONSTRUCT 4R	Inactive
BIS	BOND INTERSTATE SAFETY	Inactive
BIU	BOND INTERSTATE URBAN	Inactive
BM	BOND STATE FUNDS MI BETTERMENT	Inactive *
BMU	BOND METRO URBAN FEDERAL	Inactive
BOWD	BUSINESS OPP & WORK FORCE DEVELOP CENTER	Active
BRF	BRIDGE REPLACEMENT FEDERAL SYS PRE 91 PR	Inactive
BRI	BRIDGE REPLACEMENT PL PRE 91 INTERSTATE	Active
BRM	BRIDGE REPLACEMENT METRO URBAN SYSTEM	Inactive
BRN	BRIDGE REPLACEMENT NATIONAL HIGHWAY SYSTEM	Active
BRO	BRIDGE REPLACEMENT NOT CLASSIFIED OFF SYSTEM	Active
BRS	BRIDGE REPLACEMENT SECONDARY	Inactive
BRT	BRIDGE REPLACEMENT SURFACE TRANSPORTATION	Active
BT01	BOND TRUNKLINE ROADS FIRST ISSUE	Active *
BT02	BOND TRUNKLINE ROADS SECOND ISSUE	Active *
BT03	BOND TRUNKLINE ROADS THIRD ISSUE	Active *
BWM	BIKEWAY/NON-MOTORIZED PATH	Inactive *
C	COUNTY	Inactive *
CAF	CNTRL ADVERTISING PRIMARY	Inactive
CAI	CNTRL ADVERTISING INTERSTATE	Inactive
CBCD	CORRIDOR & BORDER CROSSING DISCRETIONARY	Active
CBIP	CORRIDOR & BORDER INFRASTRUCTE SAFETEA-LU	Active
CJF	CNTRL JUNK YARD PRIMARY	Inactive
CJI	CNTRL JUNK YARD INTERSTATE	Inactive
CM	CONGESTION MITIGATION	Active
CMG	CONGESTION MITIGATION 100% FEDERAL	Active
CMX	CONGESTION MITIGATION 100% LOCAL	Active *
CS	COUNTY SECONDARY	Inactive
CSG	COUNTY SECONDARY 100% FEDERAL	Inactive
CSR	COUNTY SECONDARY 4R	Inactive
CSX	COUNTY SECONDARY 100% LOCAL	Inactive *
CTF	COMPREHENSIVE TRANSPORTATION FUND	Active *
DE	SPL 87 APPR 50% DEMO 30% DISCRETIONARY	Inactive
DFG	GENERAL FUND APPR 100% FEDERAL ANY	Inactive
DFUR	APPRP FROM GENERAL FUND PRIMARY FUNDS	Inactive
DIG	ISTEA DEMONSTRATION 100% FEDERAL INTERSTATE	Active
DIV	ISTEA DEMONSTRATION AUTH ACT FED INTLGNT VEHI	Inactive
DNG	ISTEA DEMONSTRATION 100% FEDERAL NHS	Active
DOG	ISTEA DEMONSTRATION 100% FEDERAL NOT CLSFD	Active
DP	DEMONSTRATION FEDERAL AID SYSTEM	Active
DPF	DEMONSTRATION FEDERAL AID SYS PRIMARY	Inactive
DPI	DEMONSTRATION FEDERAL AID SYS INTERSTATE	Active
DPM	DEMONSTRATION FEDERAL AID SYS URBAN SYSTEM	Inactive
DPN	ISTEA DEMONSTRATION 80% FEDERAL NHS	Active
DPO	ISTEA DEMONSTRATION 80% FEDERAL NOT CLSFD	Active
DPS	ISTEA DEMONSTRATION 80% FEDERAL STP	Active

Financial Systems:
As of April, 2012

CODE	DESCRIPTION	STATUS * 0% Federal
DPSA	DEMONSTRATION SECTION 112 DIVISION A	Active
DPU	DEMONSTRATION FEDERAL AID SYSTEM URBAN	Inactive
DPX	DEMONSTRATION 100% LOCAL	Active *
DST	DONOR BONUS SURFACE TRANSPORTATION	Inactive
DSTP	DEMONSTRATION SURFACE TRANSPORTATION PRIORITIE	Active
DSTS	DONOR BONUS SURFACE TRANS MDOT SAFETY	Inactive
DSTT	DONOR BONUS SURFACE TRANS RURAL TRUNKLINE	Inactive
DSTU	DONOR BONUS SURFACE TRANS URBAN OVER 200	Inactive
EBA	ECON DEVELOP CATEGORY A WITH BOND	Inactive *
EBAF	ECON DEVELOP CATEGORY A WITH BOND & FED	Inactive
EBAX	ECON DEVELOP CATEGORY A WITH BOND 100% LOCAL	Inactive *
EBB	ECON DEVELOP CATEGORY B WITH BOND	Inactive *
EBBF	ECON DEVELOP CATEGORY B WITH BOND & FED	Inactive
EBSL	EQUITY BONUS SAFETEA-LU	Active
EBX	ECON DEVELOPMENT 100% LOCAL	Inactive *
ECS	EMERGENCY COUNTY SECONDARY FEDERAL ER	Inactive
EDA	ECON DEVELOPMENT CATEGORY A	Active *
EDAF	ECON DEVELOPMENT CATEGORY A WITH FEDERAL	Active
EDAX	ECON DEVELOPMENT CATEGORY A 100% LOCAL	Active *
EDB	ECON DEVELOPMENT CATEGORY B	Inactive *
EDBF	ECON DEVELOPMENT CATEGORY B WITH FEDERAL	Inactive *
EDC	ECON DEVELOPMENT CATEGORY C	Active *
EDCF	ECON DEVELOPMENT CATEGORY C WITH FEDERAL	Active
EDD	ECON DEVELOPMENT CATEGORY D	Active *
EDDF	ECON DEVELOPMENT CATEGORY D WITH FEDERAL	Active
EDF	ECON DEVELOPMENT CATEGORY F	Active *
EDFF	ECON DEVELOPMENT CATEGORY F WITH FEDERAL	Active
EDX	ECON DEVELOPMENT 100% LOCAL	Active *
EMU	DELAYED FEDERAL AID FEDERAL ROADWAY USU	Inactive
ER	EMERGENCY RELIEF	Active
EXP	UNKNOWN	Inactive *
F	PRIMARY FUNDS	Inactive
FBD	FERRY BOAT & TERMINAL DISCRETIONARY	Active
FF	PRIORITY PRIMARY	Inactive
FFH	FEDERAL FOREST HIGHWAY	Active
FFHX	FEDERAL FOREST HIGHWAY 100% LOCAL	Inactive *
FFN	PRIORITY PRIMARYNON-MOTORIZED	Inactive
FG	RAIL ROAD GRADE CROSSINGS PRIMARY	Inactive
FI	PRIMARY ON INTERSTATE	Inactive
FIR	CONSOLIDATED PRIMARY	Inactive
FLH	FEDERAL LANDS HIGHWAYS PUBLIC LANDS	Active
FM	PRIMARY ROUTE M FUNDS	Inactive *
FNG	PRIMARY ROUTE NON-MOTORIZED 100% FEDERAL	Inactive
FNM	PRIMARY NON-MOTORIZED	Inactive
FR	CONSOLIDATED PRIMARY RURAL	Inactive
FRG	CONSOLIDATED PRIMARY RURAL RAIL HWY 100% FED	Inactive

Financial Systems:
As of April, 2012

CODE	DESCRIPTION	STATUS * 0% Federal
FRI	CONSOLIDATED PRIMARY RURAL ON INTERSTATE	Inactive
FRN	CONSOLIDATED PRIMARY RURAL NON-MOTORIZED	Inactive
FRR	CONSOLIDATED PRIMARY RURAL 4R	Inactive
FRRI	CONSOLIDATED PRIMARY RURAL 4R ON INTERSTATE	Inactive
FRRS	CONSOLIDATED PRIMARY RURAL 4R SAFETY	Inactive
FRS	CONSOLIDATED PRIMARY RURAL SAFETY	Inactive
FTA	FEDERAL TRANSIT ADMINISTRATION	Inactive
FU	CONSOLIDATED PRIMARY URBAN	Inactive
FUG	CONSOLIDATED PRIMARY URBAN RAIL HWY 100% FED	Inactive
FUI	CONSOLIDATED PRIMARY URBAN ON INTERSTATE	Inactive
FUN	CONSOLIDATED PRIMARY URBAN NON-MOTORIZED	Inactive
FUR	CONSOLIDATED PRIMARY URBAN 4R	Inactive
FURI	CONSOLIDATED PRIMARY URBAN 4R ON INTERSTATE	Inactive
GTF	GENERAL TRANSPORTATION FUND	Inactive *
HBOA	HIGHWAY BRIDGE OBLIGATION AUTHORITY	Active
HES	HAZARD ELIMINATION 90% FEDERAL	Inactive
HEX	HAZARD ELIMINATION 100% LOCAL	Inactive *
HFL	HIGHWAYS FOR LIFE	Active
HHS	HIGH HAZARD LOCATIONS 90% FEDERAL	Inactive
HIP	HIGHWAY INFRASTRUCTURE PROGRAM	Active
HPP	HIGH PRIORITY PROJECTS DEMONSTRATION	Active
HPR	HIGHWAY PLANNING RESEARCH	Inactive
HPRG	HIGHWAY PLANNING RESEARCH 100% FEDERAL	Inactive
HPSL	HIGH PRIORITY PROJECTS SAFETEA-LU	Active
HRRR	HIGH RISK RURAL ROADS HSIP SAFETEA-LU	Active
HSG	HIGH SPEED RAIL ROAD CROSSING 100%	Active
HSIP	HIGHWAY SAFETY IMPROVEMENT SAFETEA-LU	Active
I	INTERSTATE	Inactive
ID	INTERSTATE DISCRETIONARY	Inactive
IDR	INTERSTATE DISCRETIONARY PRIOR TO 1999 ISTEA	Inactive
IFU	INTERSTATE CONSOLIDATED PRIMARY URBAN	Inactive
IG	INTERSTATE 100% FEDERAL	Inactive
IM	INTERSTATE MAINTENANCE NO ADDED LANES	Active
IMD	INTERSTATE MAINTENANCE DISCRETIONARY	Active
IMG	INTERSTATE MAINTENANCE SAFETY 100% FEDERAL	Active
IMNH	INTERSTATE MAINTENANCE AND NATIONAL HIGHWAY	Inactive
IMS	INTERSTATE MAINTENANCE MDOT SAFETY	Inactive
INM	INTERSTATE NON MOTORIZED	Inactive
IR	INTERSTATE RECONSTRUCTION 4R	Inactive
IRG	INTERSTATE RECONSTRUCTION 100% FEDERAL	Inactive
IS	INTERSTATE SAFETY	Inactive
ITS	INTELLIGENT TRANSPORTATION SYSTEM	Active
IU	INTERSTATE URBAN	Inactive
IVH	INTELLIGENT VEHICLE HIGHWAY	Inactive
JCS	85% MINIMUM FLOOR COUNTY SECONDARY	Inactive
JCSR	85% MINIMUM FLOOR COUNTY SECONDARY 4R	Inactive
JFR	85% MINIMUM FLOOR CONSOLIDATED PRIMARY RURAL	Inactive
JFRI	85% MIN FLOOR CONSOLIDATED PRIMARY RURAL INT	Inactive
JFRR	85% MIN FLOOR CONSOLIDATED PRIMARY RURAL 4R	Inactive

Financial Systems:
As of April, 2012

CODE	DESCRIPTION	STATUS * 0% Federal
JFU	85% MINIMUM FLOOR CONSOLIDATED PRIMARY URBAN	Inactive
JFUG	85% MIN FLOOR CONSOLIDATED PRIMARY URBAN 100%	Inactive
JFUR	85% MIN FLOOR CONSOLIDATED PRIMARY URBAN 4R	Inactive
JHES	85% MINIMUM FLOOR HAZARD ELIMINATION	Inactive
JIR	85% MINIMUM FLOOR INTERSTATE 4R	Inactive
JMU	85% FEDERAL AID URBAN SYSTEM	Inactive
JMUG	85% FEDERAL AID URBAN SYSTEM 100% FEDERAL	Inactive
JMUR	85% FEDERAL AID URBAN SYSTEM 4R	Inactive
JRS	85% MINIMUM FLOOR RURAL SECONDARY	Inactive
JST	85% MINIMUM FLOOR SURFACE TRANSPORTATION	Inactive
JSTI	85% MINIMUM FLOOR SURFACE TRANS INTERSTATE	Inactive
JSTL	85% MINIMUM FLOOR SURFACE TRANS RURAL LOCAL	Inactive
JSTS	85% MINIMUM FLOOR SURFACE TRANS SAFETY	Inactive
JSTT	85% MINIMUM FLOOR SURFACE TRANS RURAL TRNKLN	Inactive
JSTU	85% MIN FLOOR SURFACE TRANS URBAN > 200K POP	Inactive
JSUT	85% MIN FLR SURF TRANS URBAN < 200K POP TRNKLN	Inactive
JT07	JOBS TODAY BOND ISSUE 2007 GARVEE	Active
JTM	JOBS TODAY BOND ISSUE 2007 GARVEE MATCH	Active *
LFA	LOCAL FEDERAL AID MATCH	Inactive
LFMP	LOCAL FUND MATCH PROGRAM	Active
LJTL	LOCAL JOBS TODAY LOAN	Inactive
LSF	LANDSCAPE ON PRIMARY	Inactive
LTA	LOCAL TECHNICAL ASSISTANCE	Active
M	MICHIGAN FUNDS MICHIGAN BETTERMENT	Active *
MB	MICHIGAN BITUMINOUS RESURFACING	Inactive *
MBD	MICHIGAN BRIDGE DECK	Inactive *
MBP	MICHIGAN BRIDGE PAINTING	Inactive *
MBR	MICHIGAN BITUMINOUS RECONSTRUCTION	Inactive *
MBS	MICHIGAN BUDGET STABILIZATION	Active *
MBWB	MICHIGAN BLUE WATER BRIDGE	Active
MC	MOTOR CARRIER	Inactive *
MCB	MICHIGAN CRITICAL BRIDGE	Inactive
MCP	MINOR CONSTRUCTION PROGRAM	Inactive *
MCS	MICHIGAN CRITICAL STRUCTURES	Active *
MDA	MICHIGAN DRAINAGE ASSESSMENT	Active *
MEC	MICHIGAN ENVIRONMENT CLEANUP	Inactive *
MER	MICHIGAN EMERGENCY	Active *
MFA	MICHIGAN FEDERAL AID MATCH	Inactive *
MG	MINIMUM GUARANTEE	Active
MIR	MICHIGAN INSTITUTIONAL ROADS	Active *
MJC	MICHIGAN JOBS COMMISSION	Inactive *
MJT	MICHIGAN JOINT REPAIR	Inactive *
MMR	MICHIGAN MINOR ROAD SIDE	Active *
MNM	MICHIGAN NON-MOTORIZED	Inactive *
MPB	MICHIGAN PEDESTRIAN OVERPASS	Inactive *

Financial Systems:
As of April, 2012

CODE	DESCRIPTION	STATUS * 0% Federal
MR	MICHIGAN ROAD PRESERVATION	Inactive *
MRG	METRO URBAN FUNDS 4R 100% FEDERAL	Inactive *
MRP	MICHIGAN ROADSIDE PARK PROGRAM	Inactive *
MRR	MICHIGAN RAILROAD	Active *
MRRF	MICHIGAN ADV ROW ACQUISION REVOLV REAL ESTATE	Active *
MS	MICHIGAN SAFETY PROGRAM	Active *
MSH	MICHIGAN SHOULDERS	Inactive *
MSS	MICHIGAN SAFETY FOR SIGNALS	Inactive *
MTB	MICHIGAN TURNBACK PROGRAM	Active *
MU	METRO URBAN FEDERAL URBAN SYSTEM	Inactive
MUG	METRO URBAN FEDERAL URBAN SYSTEM 100% FED	Inactive
MUI	METRO URBAN SYSTEM INTERSTATE	Inactive
MUN	METRO URBAN NON-MOTORIZED	Inactive
MUR	METRO URBAN 4R	Inactive
MURS	METRO URBAN 4R SAFETY	Inactive
MUX	METRO URBAN 100% LOCAL	Inactive
MX	NON STATE FUNDED 100% LOCAL	Active *
NCII	NATIONAL CORR INFRASTRUCTURE IMPR SAFETEA-LU	Active
NH	NATIONAL HIGHWAY SYSTEM	Active
NHG	NATIONAL HIGHWAY SAFETY100% FEDERAL	Active
NHI	NATIONAL HIGHWAY ON I (DOES NOT QUALIFY IM)	Inactive
NHIM	NATIONAL HIGHWAY ON I (QUALIFIES FOR IM)	Inactive
NHPG	NATIONAL COOP HIGH PLANNING 100% FEDERAL	Inactive
NHS	NATIONAL HIGHWAY SYSTEM MDOT SAFETY	Inactive
NHX	NATIONAL HIGHWAY SYSTEM 100% LOCAL	Active *
NRD	NATIONAL RIDESHARE DISCRETIONARY	Inactive
NRT	NATIONAL RECREATIONAL TRAILS	Active
OS	OFF SYSTEM	Inactive
PL	METRO PLANNING	Active
PMS	PAVEMENT MRKNG DEMO SEC.205-L973 ACT 90% FED	Inactive
PNRS	PROJECTS OF NATIONAL AND REGIONAL SIGNIFICANCE	Active
QF	ADVANCE ROW ACQUISITION ON PRIMARY	Inactive
QNH	ADVANCE ROW ACQUISITION ON NH	Inactive
RAD	RADAR ACCESS DEFENSE	Inactive
RF	RURAL PRIMARY	Inactive
ROS	ELIMINATION OF ROADSIDE OBSTACLES 90% FEDERAL	Inactive
RP	RESEARCH PROJECT	Active
RRO	RAIL HIGHWAY OFF SYSTEM 90% FEDERAL	Inactive
RRP	RAIL HWY XING SEC.203,L973 ACT PRTCV DEV 90% FED	Inactive
RRS	RAIL HIGHWAY CROSSING 90% FEDERAL	Inactive
RS	RURAL SECONDARY	Inactive
RSG	RURAL SECONDARY 100% FEDERAL	Inactive
RSR	RURAL SECONDARY 4R	Inactive
RTA	RURAL TECHNICAL ASSISTANCE	Inactive
SBD	SCENIC BYWAYS DISCRETIONARY	Active
SHG	SURFACE TRANS SAFETY 100% FED FOR STH-ITEMS	Inactive
SIB	STATE INFRASTRUCTURE BANK	Active

Financial Systems:
As of April, 2012

CODE	DESCRIPTION	STATUS * 0% Federal
SIBG	STATE INFRASTRUCTURE BANK 100%	Active
SLG	SURFACE TRANS SAFETY 100% FED FOR STL-ITEMS	Active
SOS	SAFER OFF SYSTEM ROUTES	Inactive
SPR	STATEWIDE PLANNING & RESEARCH	Active
SPRG	STATEWIDE PLANNING & RESEARCH 100% FEDERAL	Active
SRS	FEDERAL AID SAFER ROADS DEMO 90% FEDERAL	Inactive
SRSE	SAFE ROUTES TO SCHOOL EITHER SAFETEA-LU	Active
SRSI	SAFE ROUTES TO SCHOOL INFRASTRUCT SAFETEA-LU	Active
SRSN	SAFE ROUTES TO SCHOOL NON INFRAST SAFETEA-LU	Active
SS	SECONDARY FUNDS	Inactive
SST	SUPPORTIVE SERVICES TRAINING	Active
ST	SURFACE TRANSPORTATION ANY AREA	Active
STE	SURFACE TRANSPORTATION ENHANCEMENT	Active
STEI	SURFACE TRANS ENHANCEMENT ON INTERSTATE	Inactive
STG	SURFACE TRANS SAFETY 100% FED FOR ST-ITEMS	Active
STGI	SURFACE TRANS SAFETY 100% FED ON INTERSTATE	Inactive
STH	SURFACE TRANS SAFETY HAZARD ELIMINATION	Active
STI	SURFACE TRANS ON INTERSTATE 90%	Active
STL	SURFACE TRANS WAS COUNTY SECONDARY LOCAL	Active
STR	SURFACE TRANS SAFETY HWY XXING PROTECTION	Active
STRG	STP RAIL HWY SAFETY & INCENTIVE PAYMENT 100%	Active
STS	SURFACE TRANS ANY AREA MDOT SAFETY	Inactive
STSI	SURFACE TRANS ANY AREA MDOT SAFETY ON I	Inactive
STT	SURFACE TRANS WAS RURAL SECONDARY TRUNKLINE	Active
STTG	SURFACE TRANS SAFETY 100% FED FOR STT-ITEMS	Active
STTS	SURFACE TRANS SAFETY WAS RURAL SEC TRUNKLINE	Active
STU	SURFACE TRANS URBAN AREAS > 200K POP	Active
STUG	SURFACE TRANS URBAN AREAS < 200K POP 100% FED	Inactive
STUL	SURFACE TRANS URBAN AREAS < 200K POP LOCAL	Active
STUT	SURFACE TRANS URBAN AREAS < 200K POP TRUNKLN	Active
STUX	SURFACE TRANS URBAN AREAS > 200K POP 100% LOC	Active *
STX	SURFACE TRANS ANY AREA 100% LOCAL	Active *
SUG	SURFACE TRANS SAFETY 100% FED FOR STU-ITEMS	Active
T	TOPICS	Inactive
TBR	TIMBER BRIDGE	Inactive
TCD	TRAFFIC CONTROL DEMONSTRATION	Inactive
TCP	TAX COMPLIANCE PROGRAM	Inactive
TCSP	TRANS COMMUNITY AND SYSTEM PRESERVATION	Active
TG	TRANSPORTATION GRANT 100% FEDERAL	Inactive
TGR2	TIGER II DISCRETIONARY GRANTS	Active
TIP	TRANS IMPROVEMENT PROJECTS SAFETEA-LU	Active
TMI	UNKNOWN	Inactive
TMU	TOPICS FUNDS ON FEDERAL AID URBAN SYSTEM	Inactive
TNH	TRUE ADV CON SPECIAL CONVERSION PROCESS	Inactive
TPFD	TRUCK PARKING FACILITIES DISCRETIONARY	Active
TQF	TRANSITIONAL QUARTER ON PRIMARY	Inactive
TQM	TRANSITIONAL QUARTER ON URBAN SYSTEM	Inactive
TQMM	TRANSITIONAL QUARTER AND URBAN SYSTEM	Inactive
TQS	TRANSITIONAL QURATER ON SECONDARY	Inactive

Financial Systems:
As of April, 2012

CODE	DESCRIPTION	STATUS * 0% Federal
TSM	TRANSPORTATION SYSTEM MANAGEMENT	Inactive
U	URBAN FUNDS	Inactive *
UM	URBAN AREA (POPULATION URBANIZED AREA) 'M'	Inactive
UMT	URBAN MASS TRANSIT	Inactive
UNM	URBAN FUNDS NON-MOTORIZED	Inactive
US	URBAN TECHNICAL ASSISTANT	Inactive
UTA	URBAN TECHNICAL ASSISTANCE PROGRAM	Inactive

NOTE: Yellow highlight indicates inactive Funding Codes

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Glossary & Acronyms

Glossary & Acronyms

A

ABC	**Accelerated Bridge Construction (ABC)** is bridge construction that uses innovative planning, design, materials, and construction methods in a safe and cost-effective manner to reduce the on-site construction time that occurs when building new bridges or replacing and rehabilitation existing bridges.
	ACT51 – A system to collect county reporting data.
ACRS	**Administrative Customizable Reporting System** - MDOT application that allows MDOT employees to create their own reports that access data from the MAP database. Used to view job/phase information from the MAP database displayed in several pre-formatted reports.
	Administrative Directive – Work identified by leadership as a priority for implementation or special funding.
AERO	**Aeronautics**
	Aggregate - A substance composed of mineral crystals or mineral rock fragments, used in pavement.
	Alligator cracking (or fatigue cracking) - Cracks in an asphalt pavement surface forming a pattern that resembles an alligator's hide or chicken wire. Alligator cracking may begin with a single longitudinal crack in the wheel path. The cracks indicate failure of the surface layer generally caused by repeated traffic loadings.
AASHTO	**American Association of State Highway and Transportation Officials** - Association of state departments of transportation that work on common issues. Commonly prepares positions on federal legislation and policies.
ACEC	**American Council of Engineering Companies** – Is the voice of America's engineering industry. Council members number more than 5,500 firms throughout the country. The Council's mission is to contribute to America's prosperity and welfare by advancing the business interests of members firms.
ANSI	**American National Standards Institute**
ADA	**Americans with Disabilities Act**
	As Built – Common jargon for the official term: As Constructed Final Plans.

APAM	**Asphalt Pavement Association of Michigan** – Is a nonprofit trade association representing the Hot Mix Asphalt industry in Michigan.
ADD	**Assistant Deputy Director**
AG	**Attorney General**
AGCIP	**Automated Grade Crossing Inspection** – FoxPro database management system is used for the collection and management of program of data. This management system has 4 processing modules, Onsite Inspection Process, In-house Data Processing Notification Process and the Management Approval Process.
AADT	**Average Annual Daily Traffic** – The estimate of the typical daily traffic on a road segment for all days of the week, Sunday through Saturday, over a period of one year.
ADT	**Average Daily Traffic (or Average Daily Traffic Counts)** - The average number of vehicles using a roadway in one day.
AUP	**Average Unit Price**

B

BMP	**Beginning Mile Point** - Within a linear referencing system (e.g., Control Section, Physical Road), denotes the associated mile point at the beginning of a segment of road.
BLVD	**Boulevard** – A wide street with a landscaped center island running the length of the street. Boulevards are usually found in urbanized areas.
	Bridge –A structure, including supports, erected over a depression or obstruction, such as water, highway or railway, and having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the center of the roadway of more than 20 feet between undercroppings of abutments or springlines of arches, or extreme ends of openings for multiple boxes; it may also include pipes, where clear distance between openings is less than half of the smaller contiguous opening.
BCFS	**Bridge Condition Forecasting System** – Is an MS Excel program that forecasts bridge condition for up to three strategies given an annual budget (per year), average cost per deck area for replacement, rehabilitation, and preventive maintenance projects, and rate of inflation. BCFS uses Markov chains or transition probability to deteriorate the bridge network using the National Bridge Inspection (NBI) 0 to 9 rating scale. The number of bridges

and deck area for each of the NBI ratings is input at the beginning of the scenario modeling and BCFS adjusts the number of bridges and deck area in each condition state based upon the transition probabilities. The user can adjust what type of projects are chosen for each work category and the effectiveness of the work type, i.e. poor rated bridges (NBI 0-4) will be chosen for replacement projects making them good (NBI 9).

BIR **Bridge Inspection Report**

BMS **Bridge Management System** - Allows users to see current physical conditions and inspections data for bridges in Michigan, as well as their locations on the highway system. It consists of a database that can be accessed by an interface specific to Michigan and also by the Pontis system of the American Association of State Highway and Transportation Officials.

As one of the six components of the Transportation Management System (TMS), the Bridge Management System (BMS) is the decision-support tool responsible for managing the inspection, analysis and maintenance of the numerous components that make up a bridge. To make bridge asset management even more flexible, the American Association of State Highways and Transportation Officials (AASHTO) "Pontis" bridge management system is an integral part of the BMS.

BOH **Bureau of Highways**

BTP **Bureau of Transportation Planning** – Develop and implement a comprehensive transportation planning process which results in transportation investments that are consistent with financial, social, economic and environmental policies of the State Transportation Commission.

UPTRAN **Bureau of Urban and Public Transportation** – Administrators Michigan's public transportation and regulatory programs to provide a safe and balanced statewide network of public transportation services to meet the social, safety and economic well-being of the state.

BL **Business Loop** - A surface route that leads into a downtown business district and returns to the freeway at the other end. Frequently, the Business Loop is the alignment of the original highway before that highway was bypassed. (See Business Route.)

BR **Business Route** - A Business Route connects the freeway or through highway with the downtown and commercial areas of a city or town. Business Routes are primary arterials and begin and end on the interstate. Business Loops and Business Spurs are types of Business Routes. Business Loop implies that the Business Route will return to the parent route, while a Business Spur implies that the Business Route will only spur into the commercial area and not return to the parent route.

BS **Business Spur** - A Business Spur is a surface street route leading from the Interstate highway into the central commercial district. The spur route ends upon reaching a specified point within that urban area. (See Business Route.)

C

CFP **Call For Projects** - The process used to identify highway mode preservation projects for the Five Year Transportation Program. MDOT issues an annual internal Call for Projects in December, for the upcoming rolling Five Year Transportation Program.

CPM **Capital Preventive Maintenance** - "Preventive maintenance is a planned strategy of cost-effective treatments to an existing roadway system and its appurtenances that preserves, retards future deterioration and maintains or improves the functional condition of the system without (significantly) increasing structural capacity." Preventive maintenance is applied to pavements having a remaining service life of three years or greater. Examples of capital preventive maintenance include bituminous crack sealing, chip sealing, micro-surfacing, concrete joint resealing, concrete crack sealing, thin bituminous overlays, diamond grinding, full depth concrete repairs, and dowel bar retrofit.

CSM **Capital Scheduled Maintenance** - An MDOT program to preserve bridges in their current condition state for a longer period of time. CSM activities include bridge washing, vegetation control, drain cleaning, spot painting, joint repair, concrete coating, patching, and sealing, crack sealing, pavement relief joints, and pavement repair. For more information, see the CSM Manual in the Miscellaneous Documents chapter.

Change In Scope – A change in objectives, work plan, or schedule that results in a material difference from the terms of previously granted approval to proceed.

CRF **Change Request Form –** Users of MDOT databases can make requests for changes to a database (i.e. add users and/or grant privileges) by submitting this form. (Production-Client server; Development –Web based)

Chip seal - A surface treatment in which the pavement is sprayed with asphalt (generally emulsified) and then immediately covered with aggregate and rolled. Chip seals are used primarily to seal the surface of a pavement with non load-associated cracks and to improve surface friction. This is typically used to extend the life of the pavement surface by sealing out moisture, which can cause major damage to pavement, until major repairs are made.

Cold Mill - Removal of pavement material from the surface of the pavement either to prepare the surface to receive overlays (by removing rutting and surface irregularities) or to restore pavement to the correct specifications. This process is also used to remove oxidized asphalt concrete.

CAADT **Commercial Annual Average Daily Traffic** - The estimate of typical daily commercial traffic on a road segment for all days of the week, Sunday through Saturday, over the period of one year.

Comprehensive Project Plan – This plan consists of all the smaller plans, which includes the following: Schedule; Scope Statement; Budget Plans; Resource/Skill Plan (Includes Team Roster); Change Management Methods; Quality Plan (Includes Testing); Risk Response Plan; Procurement.

CADD **Computer Aided Drafting and Design**

CMAQ **Congestion Mitigation and Air Quality** - A federal program that funds projects designed to reduce vehicle congestion and improve air quality.

Constraint – Applicable restriction that will affect the performance of the project. Any factor that affects when an activity can be scheduled.

Constructability Review - a process that utilizes construction personnel with extensive construction knowledge *early in the design stages* of a project to ensure that the projects are buildable, cost-effective, biddable and maintainable.

C&T **Construction and Technology** - Construction and Technology Division is responsible for the development and distribution of construction specifications, quality control/quality assurance programs, field consultation standards and training in support of the region's delivery of the annual program.

Additionally, the administration of the annual Bridge and Capital Preventative Maintenance programs are located in the division. This includes the statewide bridge inspection program and the maintenance and operation of both the bridge management and pavement management systems.

The division provides specialized engineering expertise to the regions and other divisions and maintains AASHTO-accredited testing laboratories for all types of highway materials. The division's Testing and Research Section conducts applied research, technical and forensic investigations, as well as administering an extensive contract research program with Michigan's universities.

CE **Construction Engineering** - Construction Engineering is the management of a project during the construction phase. This includes, but is not limited to, specification and plan interpretation, cost control, contract payment, project documentation, material testing, and quality assurance.

CSS **Context Sensitive Solution –** This is “a collaborative, interdisciplinary approach involving stakeholders for the development of a transportation facility that fits its physical setting and preserves scenic, aesthetic, historic, cultural and environmental resources, while maintaining safety and mobility.” A program developed in 2003 that requires MDOT to solicit dialogue with local governments, road commissions, industry groups, land use advocates, and state agencies early in a project’s planning phase. This dialog helps to ensure that bridges, interchanges, bikepaths and other transportation projects “fit” into their communities. The CSS approach results in projects that respect a community’s scenic, aesthetic, historic, economic, and environmental character.

CATS **Contract Administration Tracking System –** This system is used to track and maintain information about UPTRAN Checklists, CS-138 forms, contracts, contract amendments, authorizations, authorization revisions, audits and vendors.

Contingencies – A provision in the project plan to mitigate cost and/or schedule risk.

Continuous traffic flow - A steady, unbroken stream of traffic.

Contractor – The successful bidder who is awarded a Contract.

CS **Control Section –** A referencing system represented by a number assigned by MDOT that uniquely identifies an area of operation or activity on the transportation system.

Controller - An electrical mechanism for controlling traffic signal operation which is mounted in a cabinet.

Corridor approach to project coordination - The effort to do all construction for an area at the same time, to minimize inconvenience to travelers.

CBA **Cost Benefit Analysis –** Provides information to make an informed decision about the cost and benefits, or value, of various economic choices concerning alternatives within the project.

Crack - A fracture of the pavement surface not necessarily extending through the entire thickness of the pavement. Cracks generally develop after initial construction of the pavement and may be caused by temperature changes, excess loadings, or excess deflections, which are movements in or under the pavement. (See **working crack**.)

Crack filling - Placing materials into non-working cracks to reduce the infiltration of water and other matter, while also reinforcing the adjacent pavement. Crack filling should be distinguished from crack sealing (see **crack sealing**.)

Crack sealing - Placing specialized materials into working cracks in unique configurations to keep water and other matter out of the crack and the underlying pavement layers. (See **working crack**.)

CRIS **Crash Report Information System** – This system migrates the Michigan State Police Crash related information to an Oracle Database, generates various kinds of reports, prepares the flat tile for external customers and archives the historical data.

Culvert – A structure, including supports, built over a depression, watercourse, highway, railroad or other obstruction, with a clear span of less than 20 feet measured along the center of the roadway. A structure designed hydraulically to take advantage of submergence to increase hydraulic capacity. Culverts, as distinguished from bridges, are usually covered with embankment and are composed of structural material around the entire perimeter, although some are supported on spread footings with the streambed serving as the bottom of the culvert.

Cure - A period of time following placement and finishing of a material such as concrete, during which desirable engineering properties (such as strength) develop. Improved properties may be achieved by controlling temperature or humidity during curing.

Curing - The maintenance of a satisfactory moisture content and temperature in concrete during its early stages so that desired properties may develop.

D

Data Collection – Gathering and recording of facts, changes and forecasts for status reporting and future planning.

Delineators - Road markers that define lanes and shoulders; safety measures intended to guide drivers.

Deliverable - Any measurable, tangible, verifiable outcome, result or item that must be produced to complete a project or part of a contract.

DEQ **Department of Environmental Quality**

Design Life - The anticipated life of the pavement section at the time of initial construction. Design life, as fix life, does not include any additional life estimates provided by anticipated future preventive maintenance. This term is also used to define the number of years for which design Equivalent Single Axle Loads are calculated as an input parameter for formal pavement design calculations.

Diamond grinding - A process that uses a series of diamond-tipped saw blades mounted on a shaft to shave the upper surface of a pavement to remove bumps, restore pavement rideability, and improve surface friction.

DI — **Distress Index** - An index that quantifies the level of distress that exists on a pavement section based on 1/10 mile increments. The scale starts at zero and increases numerically as distress level increases (pavement condition worsens).

DI-Proj — Name of an MDOT pavement management system software application which allows a user to define a specific pavement section (project) length and obtain both a calculated Distress Index value and a summary of the observed distress type/severity combinations upon which the value is based.

Dowel - A plain round steel bar which extends into two adjoining slabs of pavement at a joint. Dowels are used to keep concrete slabs from heaving up and down.

Dowel bar retrofits - A rehabilitation technique used to distribute the weight of vehicles across existing joined pavements by placing dowel bars across joints and/or cracks.

E

EPE — **Early Preliminary Engineering** - The Early Preliminary Engineering phase includes planning, environmental, and engineering analysis, prior to the formal Design or Preliminary Engineering (PE) phase. Specific activities include, but are not limited to, the following: Financial Analysis, Feasibility Studies, Access Management Studies, Alternative Analysis, Project Scoping, Traffic Operation and Crash Analysis, NEPA Environmental Clearance Activities (CE, EA, EIS), Contaminated Site Assessment, Soil and Material Testing, and Engineering Analysis necessary for completing previously noted and/or related activities.

Emerging Technologies – Treatments that are not Standard Capital Preventative Treatments that show promise, but do not have proven performance and cost effectiveness. These treatments will require monitoring and reporting of findings consistent with the "AASHTO Research Protocol for Pavement Preservation," adopted January 6, 2000 by Engineering Operations Committee (EOC).

EMP — **Ending Mile Point** - Within a linear referencing system (e.g., Control Section, Physical Road), denotes the associated mile point at the end of a segment of road.

EOC **Engineering Operations Committee** - MDOT's principal technical policy making body in the department on engineering, research, and related matters.

EA **Environmental Assessment** - As part of the environmental clearance process, public document that a federal/state agency prepares under the National Environmental Policy Act (NEPA) to provide sufficient evidence and analysis to determine whether a proposed agency action would require preparation of an environmental impact statement (EIS) or a finding of no significant impact (FONSI).

EIS **Environmental Impact Statement** - A detailed written statement required by the National Environmental Policy Act (NEPA) for a proposed major federal/state action significantly affecting the quality of the human environment. The statement includes information and discussions of the environmental impacts of the proposed action, all reasonable alternatives, and adverse environmental effects that cannot be avoided.

ESAL **Equivalent Single Axle Load** - A unit of measurement equating the amount of pavement consumption caused by an axle, based on the loaded weight of the axle group, to the consumption caused by a single axle weighing 18,000 lbs.

Estimate – An assessment of the likely quantitative result.

F

Feasibility Study – A formal document in the Initiation Phase that analyzes and discusses the technical feasibility of the project.

FAUB **Federal Aid Urban Boundary** - Federal aid urban boundaries are the adjusted census boundaries. FAUBs begin with census boundaries and are established for any area for which the census identifies an urban cluster boundary or urbanized area boundary. The census identifies urban cluster boundaries for areas with a population of at least 2,500. According to Title 23, the minimum threshold population for an urban area is 5,000. Thus, FAUBs are established for census urban clusters with a population 5,000 - 49,999. FAUBs are also established for census urbanized areas; the population threshold for an urbanized area is 50,000.

FHWA **Federal Highway Administration** - Part of the Department of Transportation and is headquartered in Washington, D.C. with field offices located across the United States. For Michigan, there is a division office located in Lansing, Michigan. <u>FHWA's Roles</u>: Leaders for National Mobility, Stewards for National Highway Programs, Innovators for a Better Future. <u>FHWA's Services</u>: Deliver the Federal Aid and Federal Lands Highway Program, Advance the State-of-the-Art in the Transportation System, Enhance Safety and Protect the Environment, and Customer and Partner Service.

FTA **Federal Transit Administration**

FY **Financial Year** - For MDOT, the financial year begins October 1 and goes through September 31. The financial year is named for the next year after that October. *Example*: A project begun in October '06 is called an '07 job, because the funding comes in 2007.

FONSI **Finding of No Significant Impact** - A determination by FHWA that the environmental impacts that will result from construction of a project will be minor. Also used to refer to the written document that presents the reasons why an action will not have a significant effect on the social, economic, and natural environment making it unnecessary to prepare an Environmental Impact Statement (EIS).

Five Year Plan - A report of five year Trunkline Road and Bridge Program submitted annually to the Governor and the State Transportation Commission for approval. To include: Trunkline road and bridge, transit, rail, aviation and non-motorized elements.

Fix Life - The anticipated pavement life provided by the fix, <u>excluding</u> any future preventive maintenance treatments.

FA **Force Account** – Construction Work Performed by Local Agencies.

Framework – MDOT application system

Frost Heave - A process in which the ground freezes and thaws, creating potholes.

G

GIS **Geographic Information System** – A term used to describe the creation, manipulation, analysis and storage of spatial data. This technology integrates common database operations such as query and statistical analysis with geographic data through visualization and maps.

GPS **Global Positioning System**

GR **Guardrail** – A protective rail placed along roadways for safety.

Guidelines – Used to define a collection of steps that are recommendations to be followed for meeting a stated policy.

H

HSIP — **Highway Safety Improvement Program** – The Federal Highway Administration currently administers two infrastructure-related highway safety improvement programs, the Highway-Rail Grade Crossing Program and the Hazard Elimination Program, as part of an overall effort to reduce human and economic losses on the nation's highway system. To optimize the implementation/execution of these programs, a formalized Highway Safety Improvement Program (HSIP) has been established. The current requirements for an HSIP are defined in the Code of Federal Regulations, Title 23, Part 924.

HSM — **Highway Safety Manual –** The ASHTO Highway Safety Manual.

HMA — **Hot mix asphalt** - A carefully controlled mixture of asphalt binder and well-graded, high quality aggregate thoroughly compacted into a uniform density. HMA pavements may also contain additives such as anti-stripping agents and polymers.

I

Impact Statement – A cause-and-effect report generated at the managerial level to show the impact that new projects will have on the current schedules and resources as they enter the work stream.

IT — **Information Technology** - A combination of electronic hardware, software, and procedures used to compile, manage, analyze, and report information or to otherwise facilitate business functions.

Initiation – Committing the organization to begin a project phase.

ITSOM — **Integrated Transportation Systems Operation and Management** – Integrated Transportation Systems have been defined as: the application of advanced sensor, computer, electronics and communication technologies and management strategies in an integrated manner to improve the safety and efficiency of the surface transportation system. This definition encompasses a broad array of systems and technologies.

ITS — **Intelligent Transportation System** - ITS, previously known as the Intelligent Vehicle Highway Systems (IVHS) program, was designed to promote the use of advanced technologies in multi-modal transportation. Still evolving with technology, ITS uses electronics, telecommunications, and information technology to improve safety and travel time in all modes of transportation.

Interchange - The junction of freeway and another road. Interchanges keep the traffic flowing on the freeway, but there may be some restrictions on the connecting routes. A complete interchange provides for movements in all directions; a partial interchange has some missing connections.

ISTEA **Intermodal Surface Transportation Efficiency Act** - A law established in 1991 to "maintain and expand the nation's transportation system; foster a sound financial base for transportation; keep the industry strong and competitive; promote safety; protect the environment and quality of life; and advance U.S. technology and expertise." ISTEA broadened the scope of eligibility for funding and required wider participation in the project selection process.

IRI **International Roughness Index** - A standardized mathematical function of a pavement section's longitudinal profile that is used, in part, to summarize surface roughness in relation to overall ride quality. As the IRI value increases (from zero), ride quality decreases (referenced from *The Little Book of Profiling*, UMTRI, 1998).

J

JIT **Just-in-Time**

K

L

Lane miles - The number of miles of pavement going in one direction on any given road. Miles of roadway x (times) the number of lanes = lane miles.

Letting Date – The date project quotes are opened and read to determine lowest bid. Links to plans and proposals on the Project Advertisement become inactive, or will be removed, on the Letting Date. There is a typically one Letting Date a month although there are sometimes special or invitational lettings.

LOS **Level of Service**

LCCA **Life Cycle Cost Analysis (LCCA)** – Calculates the cost of a system or product over its entire life span. This objective, nationally recognized method is used to quantify the cost effectiveness of various investment alternatives. Michigan law requires LCCA for each project for which total pavement cost exceed one million dollars. MDOT must design and award paving projects utilizing material having the lowest life cycle costs. The law also requires comparison of equivalent designs and use of Michigan's actual historic project maintenance, repair and resurfacing schedules, and costs, including estimates of user costs throughout the entire pavement life.

LA ROW **Limited Access Right of Way** - A highway or section of highway designed for travel by registered motor vehicles. Access is limited to intersections, and driveways are generally not allowed. Freeways are a common type of limited access highway.

Load Transfer - The ability to distribute the weight of vehicles across joined sections of pavement. This is a critical factor in extending pavement life.

LA **Local Agency**

LRP **Long Range Transportation Plans**

Longitudinal Profile - The set of perpendicular deviations of the pavement surface from an established horizontal reference plane taken along a travel lane.

M

MOT **Maintenance of Traffic** - Plan and/or method for keeping motorists moving. Typically associated with construction and permit activities.

MMS **MAP Management System** - A MDOT computer system linked to the MAP database, used to manage program template targets, transfers, and adjustments which align funding and work to accomplish approved goals and performance standards. It is used to tag jobs as Administrative Directives.

MPINS **MAP Project Information System** - A MDOT computer system linked to the MAP database, used to collect and tracks information about projects from scoping through design and builds documentation for projects. Coordinates project tasks between staff and transmits project changes for review and approval (for inclusion in the department's capital programs).

M&T **Materials and Technology** – see Construction and Technology

MFOS **MDOT Financial Obligation System** - A MDOT computer system linked to the MAP database, used to manage the financing of approved job phases. Includes coordination of federal fund obligation and disbursement; communication between Program Management, Program Control, Project Initiation, Project Accounting, and the Federal Highway Administration.

MPO **Metropolitan Planning Organization** - Represents the transportation planning process in urbanized areas (metropolitan areas with a population of 50,000 or greater).

MAP **Michigan Architecture Project (database)** - MDOT's Oracle database that stores information about capital program projects. This database supports the management of transportation projects and programs, and funding. Underlies many systems, including MPINS, MFOS, PPMS, etc.

MBIS **Michigan Bridge Inspection System** - MDOT application that allows bridge owners and inspectors to enter and retrieve bridge inspection information.

MBRS **Michigan Bridge Reporting System** - MDOT application that allows bridge owners and inspectors to retrieve bridge inspection information.

MDOT **Michigan Department of Transportation** - State department responsible for providing transportation facilities and services for the state of Michigan.

MGF **Michigan Geographic Framework**

MTF **Michigan Transportation Fund**

MITP **Michigan Transportation Plan**

Microsurfacing - A mixture of polymer-modified asphalt emulsion, mineral aggregate, mineral filler, water, and other additives, properly proportioned, mixed, and spread on a paved surface. Unlike slurry seal, microsurfacing can be used on high-volume roadways to correct wheel path rutting and provide a skid-resistant pavement surface.

MP **Mile Point** - Within a linear referencing system (e.g., Control Section, Physical Road), denotes the measuring system of the road. Distance between points is one mile.

Milling - Grinding off the top layer of pavement.

Mix of Fixes - A variety of methods for road construction or improvement. For example, mill and fill (where the road is milled over, then filled), new construction, grading, etc. Mix of fixes is considered a best practice because some fixes do not need to last as long as others, so different construction methods are appropriate at different times.

Movable Bridge - A movable bridge is a structure which has been designed to have two alternative positions and which can be moved back and forth between those positions in a controlled manner. The two primary purposes of movable bridges are to allow conflicting flows of traffic to pass through a crossing point or to move traffic across a waterway.

N

NBI	**National Bridge Inspection** - A compilation of data supplied by the states as required by the National Bridge Inspection Standards for bridges located on public roads. The database is maintained in a format prescribed by the Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges. The NBI information is available to FHWA's field offices through the National Bridge Inventory Information System.
NEPA	**National Environmental Policy Act** – The purposes of this Act are: To declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality.
NFC	**National Functional Class** - The process by which streets and highways are grouped into classes, or systems, according to the character of service they are intended to provide (Principal arterials, Minor arterial roads, Collector roads, Local roads).
NHI	**National Highway Institute**
NHS	**National Highway System** - Approximately 160,000 miles (256,000 kilometers) of roadway important to the nation's economy, defense, and mobility. This system includes local roads and state trunklines.
NFRP	**Non-Freeway Resurfacing Program** - Is a four-year program began by MDOT in FY (financial year) 2004 to focus about $40 million on low-volume, non-freeway roadways in poor condition. FY 2007 was the last year for the NFRP program.

O

OEC	**Omissions and Errors Check** - In the Plan Development QA Process, this is the last opportunity for the various disciplines to review the plan/proposal

package for completeness. Plans are to be 100% complete prior to scheduling this review.

Overbanding - Overfilling of a joint or crack reservoir so that a thin layer of crack or joint sealant is spread onto the pavement surface over the joint or crack.

P

Patch - Repair of a localized defect in the pavement surface.

PHD **Pavement Historical Data** – Historical database of the cross section and materials for all trunklines maintained by MDOT. Allows users the ability to research a trunkline's history, perform material trend analysis, query capability and quantification of materials used.

PaveMaPP **Pavement Management Process Plan** - A MDOT formal IT development project focused on creating a relational database environment with an integrated set of software tools to facilitate detailed pavement condition data processing, analysis, and accessibility.

PMS **Pavement Management System** - This is used to forecast pavement condition based on estimates of future annual types of repairs to pavements. Types of data collected include faulting, roadway curvature, pavement grade, cross slopes, rutting, and pavement distress. Data is used to calculate remaining service life.

Pavement Miles - The number of miles of pavement in both directions of a road/freeway.

P3 **Pavement Preservation Plan** - A MDOT tool to automatically track past projects from the MAP database and apply future fixes based on typical or user-defined deterioration rates for roadways on the state highway system. Information can be sorted by location, fix type, cost, or year and be used to help select projects for the annual Call for Projects. It will also help with planning and estimating future network needs by various sort criteria.

Pavement Reconstruction - Complete removal and replacement of the existing pavement structure; may include new and/or recycled materials.

Pavement Rehabilitation - Structural enhancements that extend the service life of an existing pavement and/or improve its load carrying capability. Rehabilitation techniques include restoration treatments and structural overlays.

	Pavement Service Life- The estimated number of years, from a specified date in time, until a pavement section reaches the threshold distress index. Also see **Remaining Service Life**.
PASER	**Pavement Surface Evaluation and Rating** - Method for rating and classifying roadways using windshield surveys.
PTR	**Permanent Traffic Recorder** - Permanent traffic recorders are permanently placed at specific locations throughout a region to record the distribution and variation of traffic flow by hours of the day, days of the week, and month of the year from year to year.
PR	**Physical Road –** A single segment of roadway identified by a Physical Road Number. Physical Roads are made as long as practical within the PR Referencing system. A Physical Road is a roadway path traveled by a vehicle with wheels (i.e., roadbeds, bike paths and rail) with the state of Michigan.
	Pontis - (Latin for bridge) is an AASHTOWare computer program and relational database designed to be a comprehensive bridge management system. Pontis stores element level bridge inventory and inspection data; formulates network-wide preservation and improvement policies for use in evaluating the needs of each bridge in a network; and makes recommendations for what projects to include in an agency's capital plan for deriving the maximum benefit from limited funds.
	Poor Pavement – A pavement that has an RSL of 0 to 2 years, and RQI greater than 70, or an IRI greater than 170 in/mi.
	Potholes - A hole in the pavement surface, commonly caused by moisture.
PBES	**Prefabricated Bridge Elements and Systems (PBES)** are structural components of a bridge that are built offsite, or near-site of a bridge and include features that reduce onsite construction time and the mobility impact time that occurs when the building of new bridges or rehabilitating or replacing existing bridges relative to conventional construction methods. Use of PBES is one strategy that can meet the objectives to Accelerate Bridge Construction while providing additional benefits beyond those with reducing on-site construction time.
PE	**Preliminary Engineering** - All design activities and plan preparation performed for the construction of a transportation project.
	Preserve - A project type involving rehabilitation of existing roadways; may include resurfacing or reconstruction of existing roads and bridges.
	Profilameter - A computer-aided device used to measure the smoothness of the road.

P/PMS **Program/Project Management System** - A MDOT tool to enable managers to plan, schedule, monitor, and control both long-term and short-term programs, projects, and resources within the highway program. The system standardizes the procedures involved in initiating, reviewing, and approving projects before they are actually programmed and scheduled.

P/PRB **Program/Project Review Board** - A MDOT committee that oversees statewide and region highway capital programs. The board has the decision-making authority for project budget increases over $3 million, schedule changes that move a letting outside of the Five Year Transportation Program, significant changes in project scope, and additions of projects or phases. The Program/Project Review Board consists of the Chief Deputy Director, Director of Highway Development, Director of Highway Delivery, Director of Transportation Planning, Chief Operations Officer (as chair and facilitator), and Chief Administrative Officer.

PLRS **Project Letting and Reporting System** - A MDOT computer program that queries reports from the MAP database for project letting information. It is used by program and project managers to monitor the preliminary engineering and construction engineering costs of projects.

PM **Project Manager** - The main person responsible for a job or group of jobs during plan development, including schedule, cost and quality.

Project Scope – The work that must be done to deliver a product with the specified features and functions.

Q

QA **Quality Assurance** – MDOT's (owner) assurance of a product through monitoring and acceptance testing.

QC **Quality Control** - A producer's process control through monitoring and testing.

R

Reconstruction - A fix that typically removes and replaces the entire pavement structure. Sometimes the sand subbase may be left in place and incorporated in the new pavement structure. Reconstruction fixes have a design or fix life of twenty years or more. This fix is typically applied to pavements with a remaining service life of two years or less.

ROD **Record of Decision** - This is the conclusion of the NEPA approval process for an Environmental Impact Statement (EIS). This public document identifies the basis for the decision and selected alternative summarizes mitigation action measures that will be incorporated into the projects and documents any 4 F approvals.

RM **Reactive Maintenance** - Reactive maintenance is an activity that must be done in response to events beyond the control of the Department. Reactive maintenance cannot be scheduled because events occur without warning and often must be immediately addressed. Examples of reactive maintenance activities include snow plowing, pothole patching, removing and patching pavement blowups, unplugging drainage facilities, replacing a regulatory sign knocked down by traffic, removing tree limbs and branches fallen on the pavement, cleaning and inspecting underdrains, and responding to a road closing because of flooding.

RTP **Regional Transportation Plan** - A forum consisting of counties, cities, villages, and townships. The forum for a cooperative transportation planning process for decision making.

Rehabilitation - A fix that has an estimated design or fix life of ten to twenty years. Rehabilitation fixes are typically applied to pavements with a remaining service life of two years or less. These fixes include: two or three course bituminous overlays, concrete patching & diamond grinding, crush & shape with bituminous overlay, rubblize & multiple course bituminous overlay, and unbonded concrete overlays.

R&R **Rehabilitation and Reconstruction –**

Rehabilitation is a pavement treatment that has an estimated design or fix life of 10 to 20 years. These fixes are generally applied to pavements with an RSL estimate of two years or less and typically include two or three course bituminous overlays, concrete patching and diamond grinding, crush and shape with bituminous overlay, rubblize and multiple course bituminous overlay, and unbonded concrete overlays.

Reconstruction is a pavement treatment that typically removes and replaces the entire pavement structure. Sometimes the sand subbase may be left in place and incorporated in the new pavement structure. Reconstruction fixes have a design or fix life of 20 years or more. This fix is typically applied to pavements with an RSL estimate of two years or less.

RSL **Remaining Service Life** - The estimated number of years, from a specified date in time, until a pavement section reaches the threshold distress index. RSL is a function of the distress level and rate of deterioration.

RFP **Request For Proposal** - A package of materials intended to accomplish exactly what the name implies. The most important part of an RFP is the

Scope of Services. The scope informs the vendor what MDOT wants them to do. The remainder of the RFP package covers instructions, information, and rules of the process.

RQI	**Ride Quality Index** - An index developed by Michigan that quantifies the user's perception of pavement ride quality. It is reported in tenth mile increments. The scale starts at zero and increases numerically as ride quality decreases.
ROW	**Right of Way** - A described area in which MDOT has legal rights for transportation related facilities. These rights range from fee (owned) easements, statutory, legally recorded rights, aerial rights and etc.
	Road Diet - This is a strategy employing a reduction in existing lanes or lane widths to accommodate evolved transportation needs within or along the roadway. These needs may include among other features, center turn lanes, bicycle lanes, sidewalks or to induce traffic speed reduction (traffic calming) within a corridor.
RDM	**Road Design Manual**
RQFS	**Road Quality Forecasting System** - A MDOT network-level pavement management tool where users can estimate the best combination of pavement treatment strategies (reconstruction, rehabilitation, and preventive maintenance) to utilize in order to maximize future overall pavement network condition within a restricted budget.
	Roughness - **T**he deviation of a surface from a true planar surface with characteristic dimensions that affect vehicle dynamics and ride quality. In this practice, the term roughness is the average of the two IRI statistics calculated from the longitudinal profile measurements, one in each pavement wheelpath.
	Roundabout - This should be considered as a potential intersection option within MDOT-sponsored or funded planning studies/design projects since they offer improved safety, cost savings, and enhanced traffic operations in many situations.
	Routine Maintenance - Routine maintenance is the day-to-day maintenance activities that are scheduled or whose timing is within the control of maintenance personnel. Examples of routine maintenance activities include mowing and cleaning roadsides, cleaning ditches, sealing cracks in the pavement, painting pavement markings and pruning trees.
	Rubblize - A process where concrete is broken up into uniform size pieces, rolled flat and covered with a new surface (usually asphalt).

RTF **Rural Task Force** - A group consisting of counties and associated cities, villages, and townships, working cooperatively to see priorities and oversee transportation investments for a region of the state.

S

SAFETEA-LU **Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users** - Legislation signed on August 10, 2005 by President George W. Bush that authorizes the Federal surface transportation programs for highways, highway safety, and transit for the 5-year period 2005-2009.

SR2S **Safe Route to School –** An international movement to make it safe, convenient and fun for children to bicycle and walk to school. The federal SR2S program was created by SAFETEA-LU. It allocated funding for infrastructure (sidewalks, traffic calming/diversion, etc.) and non-infrastructure (community outreach, traffic enforcement, etc.) projects.

Sand Seal - An application of asphalt binder, normally an emulsion, covered with a fine aggregate. It is used to improve the skid resistance of slippery pavements and to seal against air and water intrusion.

Sandblasting - A procedure in which compressed air is used to blow sand particles at a pavement surface to abrade and clean the surface. Sandblasting is a construction step in partial-depth patching and joint resealing.

Scope Creep – Any increase in the project scope (products and services described by the project) that happens incrementally and is subtle in recognition.

Scoping - The process of determining the type, extent, and cost of a proposed project.

Seal coats - See **surface treatment**.

Sealant - A material that has adhesive and cohesive properties to seal joints, cracks, or other various openings against the entrance or passage of water or other debris in pavements.

Sealing - The process of placing sealant material in prepared joints or cracks to minimize intrusion of water and incompressible materials. This term is also used to describe the application of pavement surface treatments.

Service Life (Analysis Period) - The anticipated life of a rehabilitation or new/reconstruction, including additional pavement life provided by anticipated future preventive maintenance. This term is used to describe the number of years from the initial new construction, reconstruction or rehabilitation of a pavement to a subsequent rehabilitation or reconstruction. A service life or analysis period equals the sum of the original design/fix life plus any additional pavement life provided by future anticipated preventive maintenance. Analysis period is the term typically used to describe the time used in a life cycle cost analysis.

Signal cycle - The time required for all phases of a signal to take place, from beginning of green to beginning of green.

SPUI **Single-Point Urban Interchange** - A variant on the standard diamond interchange, whereby all traffic meets at one single traffic signal in the center of a bridge over the freeway (or underneath the freeway). These interchanges can accommodate more traffic in smaller spaces, hence their appear in urban areas.

Signal warrants - A set of guidelines designed to determine the need for a stop-and-go traffic signal.

Slurry - Mixture of a liquid and fine solid particle that together are denser than water.

Slurry seal - A mixture of slow-setting emulsified asphalt, well-graded fine aggregate, mineral filler, and water. It is used to fill cracks and seal areas of old pavement, to restore a uniform surface texture, to seal the surface to prevent moisture and air intrusion into the pavement, and to improve skid resistance.

Sound wall - A structure built alongside a roadway to reduce vehicular noise in nearby neighborhoods. Also called noise wall.

SLRP **State Long Range Plan** - required by federal law in order to be eligible for federal funding. For MDOT, the SLRP is a policy document, covering a 25-year period which provides a vision for the future development of the transportation system, defines goals, objectives and strategies with different levels of specificity. Updated at least every five years, or more often as needed, to reflect changes in issues and Michigan's long range transportation goals and objectives for the ensuing 25 years.

SPR **State Planning and Research** - The State Planning and Research (SPR) Program is generally 80% federally funded, requiring a 20% state or local match (some Research categories are eligible for 100% federal aid). The apportionment is calculated using 2% of the state's portion of federal construction program funds (CMAQ, STP, Bridge, IM, NHS and Min Guarantee). Of the 2%, 25% MUST be used on Research. The annual SPR Planning Program is used to fund activities that support a federally required planning process. The activities can be completed through contractual services or through MDOT salaries, travel and other requests.
The SPR Part II Program is a multi-modal program addressing MDOT's research needs. The purpose of this program is to identify cutting edge research topics, conduct research, and implement results. Major research categories include: Congestion Management; Traffic and Safety;

Intelligent Transportation Systems (ITS); and Infrastructure (Bridges and Highways). Eligible SPR activities and projects are submitted and approved by the Federal Highway Administration each fiscal year.

STC **State Transportation Commission**

STF **State Trunkline Fund**

SPMAC **Statewide Pavement Management Advisory Committee** - A 14-member cross functional team with representation from regions, TSC's, and three Lansing bureaus. It was formed in 2005 to develop a comprehensive outline to identify how MDOT currently manages pavement and to implement change and/or make recommendations to management about resource adjustments, changes to organization/function, goals, performance measurements, and policies/guidelines.

STIP **Statewide Transportation Improvement Plan** – A staged, multi-year, statewide, intermodal program of transportation projects which is consistent with the statewide transportation plan and planning processes and metropolitan plans, TIPs and processes. This includes rural and urbanized area projects (example: MPO TIPs).

STDM **Statewide Travel Demand Manual** – MDOT's statewide passenger model used to forecast travel patterns under varying conditions. Travel demand modeling refers to the development and application of a series of interrelated mathematical equations and relationships specifically designed to simulate existing and forecasted travel patterns. The models are used to identify existing and future highway capacity deficiencies and analyze potential transportation improvements. These analyses are incorporated into Statewide and Urban Long-Range Transportation Plans, Sub Area Plans, and a continuous planning process which are prerequisites for receiving federal funds for project implementation.

SUTA **Statewide and Urban Travel Analysis** - within the Bureau of Transportation Planning at MDOT has responsibility for travel demand modeling for the department. SUTA is responsible for providing travel demand modeling analysis. Travel demand models (TDM) are developed, maintained, and updated for each of the urbanized areas population between 50,000 and 100,000 population. The five urban areas over 200,000 population are responsible for the development of their own travel demand models. The SUTA Section has a copy of those models in-house for project level analysis. The Statewide Model Unit is responsible for the statewide passenger and truck models, as well as freight and economic analysis.

SHSP **Strategic Highway Safety Plan**

Streetscape - Equipment, such as lights, plant material or benches placed off the street to improve or enhance the appearance and usability of a street.

Superstructure - A bridge.

Surface seal - See **surface treatment**.

Surface treatment - Any material applied to asphalt pavement to restore or protect the surface. Surface treatments are typically less than 25 millimeters thick. Also called **surface seal**

SS&SP **Supplemental Specification & Special Provisions**

T

Template Category – Represents the type of work activities, facilities or features that receive an allocation of financial resources to accomplish approved transportation improvement strategies.

Template Target – Is the annual estimated dollar amount required to finance a set of work activities to accomplish approved transportation improvement strategies for implementation of transportation system components or objectives.

Threshold Distress Index - A minimum pavement condition level where a rehabilitation or reconstruction project should be seriously considered. The threshold DI is equal to 50.
Threshold Ride Quality Index - The minimum threshold index for poor pavement ride quality is equal to 70 on the RQI scale (170 in/mi on the IRI scale).

Timing permit - A form indicating/authorizing how a traffic signal will operate; when it will flash, how much “green time” will be allotted to each leg of the intersection, how it will operate in relation to adjacent signals, and what special provisions will be made for high-volume, peak-hour traffic.

TOR **Time of Return**

Tine - To create grooves in the pavement for traction.

Traffic calming - A set of street designs and traffic rules that slow and reduce traffic while encouraging walkers and cyclists to share the street. Traffic calming measures include traffic circles, raised crosswalks, sidewalk extensions, speed humps, and medians.

Traffic circle - An intersection where traffic moves around a circular center island. Some traffic circles have traffic signals. Also called a Roundabout.

T&S **Traffic and Safety** - MDOT/Bureau of Highway Operations/Division of Operations (previously known as Traffic & Safety Division). The Traffic and

Safety Support Area participates in all phases of the Department's effort to reduce traffic crashes and injuries, vehicle delay, fuel consumption, pollution and operating costs. This can be done by increasing the safety, efficiency and capacity of the state highway trunkline system.

Traffic volume - The actual number of vehicles passing a given point.

TransCAD A software package that assists MDOT and the Metropolitan Planning Organizations in travel model development including Geographic Information System/mapping capabilities.

TEDF **Transportation Economic Development Fund** - A fund consisting of state and federal money that provides a means for state government, local agencies, and businesses to work together on highway, road, and street projects that support economic growth. It was enacted by the Michigan State Legislature in 1987.

TEDF-A **Transportation Economic Development Fund – Category A** - A TEDF fund for projects related to target industry development and redevelopment opportunities. Target industries include agriculture or food processing; tourism; forestry; high technology research; manufacturing; mining or office centers of not less than 50,000 square feet.

TEDF-B **Transportation Economic Development Fund – Category B** - A TEDF fund supporting conversion of local roads to state trunk lines. It was repealed in 1993.

TEDF-C **Transportation Economic Development Fund – Category C** - A TEDF fund for projects that relieve urban traffic congestion in developing areas.

TEDF-D **Transportation Economic Development Fund – Category D** - A TEDF fund intended to upgrade rural roads to all season standards.

TEDF-E **Transportation Economic Development Fund – Category E** - A TEDF fund to construct roads essential to the development of commercial forest in Michigan.

TEDF-F **Transportation Economic Development Fund – Category F** - A TEDF fund for road and street improvement in cities and rural counties.

TE **Transportation Engineer**

Transportation Enhancement Funds - Also known as the **Transportation Enhancement Activity Fund.** This federal fund sets aside a portion of **Surface Transportation Funds** (STF) specifically for landscaping and street improvements, bike and foot paths, mitigating highway runoff and the historic preservation of transportation-related structures.

TEP **Transportation Enhancement Program** – A competitive federal grant program that funds projects such as non-motorized paths, streetscapes, and historic preservation of transportation facilities, that enhance Michigan's transportation system and improve the quality of life for Michigan citizens.

TIP **Transportation Improvement Program** – A staged, multi-year, intermodal program of transportation projects which is consistent with the MPO transportation plan and planning processes. These are multiple urbanized areas within the state responsible for developing TIPs.

TMS **Transportation Management System** – MDOT's transportation asset inventory that contains attributes location and condition data over time. The overall framework which the PMS operates to include subsystems for pavements, bridges, public transit, congestion, safety and intermodal systems. Also includes output from PaveMaPP.

TSC **Transportation Service Center** – An MDOT office assigned to represent and service a designated geographic area regarding transportation needs.

TWA **Transportation Work Authorization**

TRNS*PRT **The State of Michigan transportation database**

U

UD10 - An accident report filed by the state police.

Urban area - As defined by the U.S. Bureau of the Census, an area located outside of an urbanized area, with a population over 5,000.

Urbanized area - An area containing a city or twin cities of 50,000 or more people surrounded by a closely settled incorporated area which also meets specified criteria of population and density.

V

VMT **Vehicle Miles of Travel** – Average Sunday through Saturday vehicle movement on a specific road segment, reported in the form of daily and annual vehicle miles of travel.

W

Weigh station - A set of scales located alongside a freeway that verifies that trucks and buses are within the legal weight limit.

WMS **Wetland Mitigation System** – Assists environment division in tracking sites created to mitigate wetlands which were destroyed by construction projects.

Working crack - A crack in a pavement that changes, becoming narrower or wider under different temperature conditions. A working crack develops through movement in or under the pavement; for example, when an old expansion joint fails.

WIRS **Work item Reporting System** - Provides project bid tab price and quantity reporting from the Trns*port database by individual item or by contract ID.

X

Y

Z