MICHIGAN

OFFICE OF THE AUDITOR GENERAL

# AUDIT REPORT

PERFORMANCE AUDIT
OF THE

## USE OF WARRANTIES

MICHIGAN DEPARTMENT OF TRANSPORTATION

April 2006

THOMAS H. MCTAVISH, C.P.A.
AUDITOR GENERAL

59-320-05

"...The auditor general shall conduct post audits of financial transactions and accounts of the state and of all branches, departments, offices, boards, commissions, agencies, authorities and institutions of the state established by this constitution or by law, and performance post audits thereof."

– Article IV, Section 53 of the Michigan Constitution

Audit report information may be accessed at:
*http://audgen.michigan.gov*

Michigan

*Office of the Auditor General*

# REPORT SUMMARY

*Performance Audit*

*Use of Warranties*

*Michigan Department of Transportation*

**Report Number:**
**59-320-05**

**Released:**
**April 2006**

*The Michigan Department of Transportation's (MDOT's) mission is to provide the highest quality integrated transportation services for economic benefit and improved quality of life. MDOT began using warranties on pavement projects in 1996. One of the objectives of MDOT's pavement warranty program is to get a longer life from its pavements and reduce pavement failures and maintenance costs. As of May 2005, MDOT had 435 active road construction warranties and 102 active bridge painting warranties. The length of warranties varies from two to five years.*

***Audit Objective:***
To assess the effectiveness of MDOT's efforts in evaluating whether warranties have improved the quality of pavement construction projects.

***Audit Conclusion:***
We concluded that MDOT's efforts were moderately effective in evaluating whether warranties have improved the quality of pavement construction projects.

***Reportable Condition:***
MDOT should continue its efforts to fully develop a continuous quality improvement (CQI) process for evaluating the effectiveness of its pavement warranty program (Finding 1).

~ ~ ~ ~ ~ ~ ~ ~ ~ ~

***Audit Objective:***
To assess the effectiveness of MDOT's efforts to ensure that warranty claims are made when appropriate.

***Audit Conclusion:***
We concluded that MDOT's efforts were moderately effective in ensuring that warranty claims are made when appropriate.

***Reportable Conditions:***
MDOT did not ensure that all warranted projects were entered into the Statewide Warranty Administrative Database (SWAD) and assigned an initial acceptance date (Finding 2).

MDOT did not maintain documentation to ensure that all warranty inspections were conducted or that contractors had performed corrective action on warranted projects (Finding 3).

~ ~ ~ ~ ~ ~ ~ ~ ~ ~

***Agency Response:***
Our audit report contains 3 findings and 3 corresponding recommendations. MDOT's preliminary response indicated that it concurs with all of our recommendations.

~ ~ ~ ~ ~ ~ ~ ~ ~ ~

A copy of the full report can be obtained by calling 517.334.8050 or by visiting our Web site at:
http://audgen.michigan.gov

Michigan Office of the Auditor General
201 N. Washington Square
Lansing, Michigan 48913

**Thomas H. McTavish, C.P.A.**
Auditor General

**Scott M. Strong, C.P.A., C.I.A.**
Deputy Auditor General

STATE OF MICHIGAN
OFFICE OF THE AUDITOR GENERAL
201 N. WASHINGTON SQUARE
LANSING, MICHIGAN 48913
(517) 334-8050
FAX (517) 334-8079

THOMAS H. MCTAVISH, C.P.A.
AUDITOR GENERAL

April 26, 2006

Mr. Ted B. Wahby, Chair
State Transportation Commission
and
Kirk T. Steudle, P.E., Director
Michigan Department of Transportation
Murray Van Wagoner Transportation Building
Lansing, Michigan

Dear Mr. Wahby and Mr. Steudle:

This is our report on the performance audit of the Use of Warranties, Michigan Department of Transportation.

This report contains our report summary; description of agency; audit objectives, scope, and methodology and agency responses; comments, findings, recommendations, and agency preliminary responses; and a glossary of acronyms and terms.

Our comments, findings, and recommendations are organized by audit objective. The agency preliminary responses were taken from the agency's responses subsequent to our audit fieldwork. The *Michigan Compiled Laws* and administrative procedures require that the audited agency develop a formal response within 60 days after release of the audit report.

We appreciate the courtesy and cooperation extended to us during this audit.

Sincerely,

Thomas H. McTavish, C.P.A.
Auditor General

This Page Left Intentionally Blank

# TABLE OF CONTENTS

## USE OF WARRANTIES
## MICHIGAN DEPARTMENT OF TRANSPORTATION


| | Page |
|---|---|
| **INTRODUCTION** | |
| Report Summary | 1 |
| Report Letter | 3 |
| Description of Agency | 6 |
| Audit Objectives, Scope, and Methodology and Agency Responses | 8 |
| **COMMENTS, FINDINGS, RECOMMENDATIONS, AND AGENCY PRELIMINARY RESPONSES** | |
| Effectiveness of Warranties on Construction Project Quality | 11 |
| 1. Warranty Program Evaluation | 11 |
| Effectiveness of Warranty Claims Processing | 14 |
| 2. Warranty Program Controls | 15 |
| 3. Warranty Program Documentation | 16 |
| **GLOSSARY** | |
| Glossary of Acronyms and Terms | 20 |

## Description of Agency

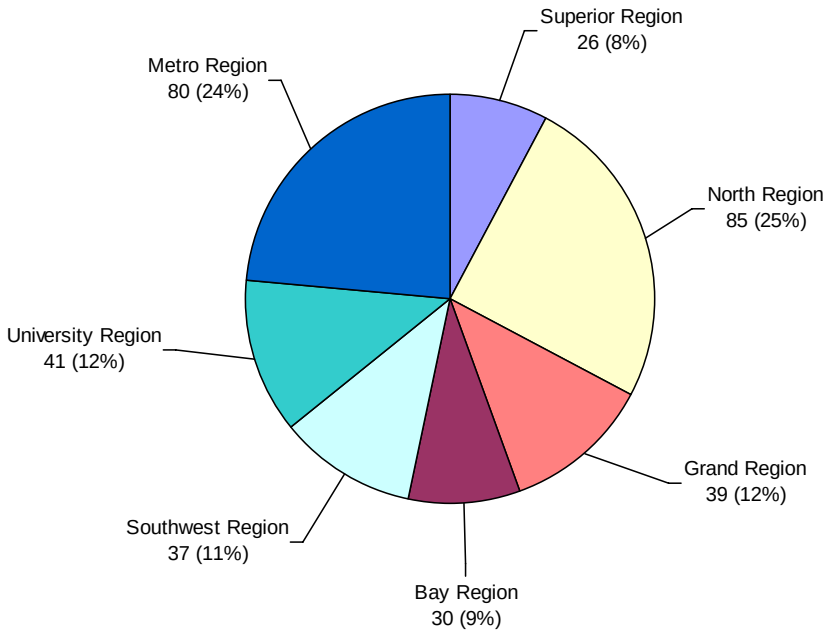
The Michigan Department of Transportation (MDOT) was organized under Sections 16.450 - 16.458 of the *Michigan Compiled Laws* (sections of the Executive Organization Act of 1965). MDOT is governed by the State Transportation Commission, which is made up of six members who are appointed by the Governor with the advice and consent of the Senate. The Commission is responsible for establishing policies. MDOT's director, who is appointed by the Governor, is responsible for administering MDOT and implementing the policies established by the Commission. MDOT's mission* is to provide the highest quality integrated transportation services for economic benefit and improved quality of life.

MDOT began using warranties on pavement projects in 1996. Act 79, P.A. 1997, provides that MDOT shall, where possible, secure full replacement warranties of not less than five years on State trunkline* projects. Subsequent appropriations acts have contained language directing MDOT to work with the road construction industry to develop performance warranties* and road construction warranties for construction projects. In response to these requirements, MDOT identified specific types of road and bridge maintenance, reconstruction*, and rehabilitation* projects that would have warranties on them. As of May 2005, MDOT had 435 active road construction warranties and 102 active bridge painting warranties. The length and type of warranties vary from two- to three-year performance warranties on bridge components and capital preventative maintenance* projects to five-year materials and workmanship warranties* on most reconstruction and rehabilitation projects. As of June 2005, 11 states, including Michigan, used warranties on road construction projects. MDOT informed us that since it started its warranty program in 1996, it has administered more than 1,000 warranty projects and, to date, less than 5% have required corrective action*.

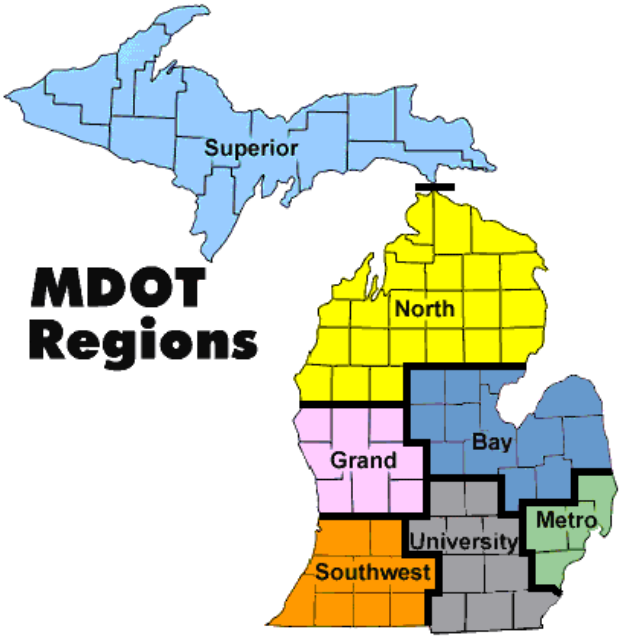
In November 2003, MDOT implemented the Statewide Warranty Administrative Database (SWAD) to provide tools for the monitoring of warranted construction projects. SWAD was designed to enable management to track warranties and to identify when warranties are due to expire to allow MDOT to schedule an inspection of the project. The cost to develop SWAD was approximately $1.4 million and annual maintenance costs are approximately $200,000.

* *See glossary at end of report for definition.*

During the period October 2002 through April 2005, MDOT awarded 1,008 construction contracts with a total cost of $2.031 billion. Of these contracts, 338 (34%) had warranties on them and cost $971 million (48%). The number of contracts with warranties awarded during the period October 2002 through April 2005, by region, was as follows:




The following map shows the seven MDOT regions:




Source: MDOT's Web site (http://www.michigan.gov/mdot).

## Audit Objectives, Scope, and Methodology and Agency Responses

### Audit Objectives

Our performance audit* of the Use of Warranties, Michigan Department of Transportation (MDOT), had the following objectives:

1. To assess the effectiveness* of MDOT's efforts in evaluating whether warranties have improved the quality of pavement construction projects.

2. To assess the effectiveness of MDOT's efforts to ensure that warranty claims are made when appropriate.

### Audit Scope

Our audit scope was to examine the program and other records associated with the Michigan Department of Transportation's use of warranties. Our audit was conducted in accordance with *Government Auditing Standards* issued by the Comptroller General of the United States and, accordingly, included such tests of the records and such other auditing procedures as we considered necessary in the circumstances.

### Audit Methodology

Our audit procedures, conducted from April through July 2005, included examination of warranty construction project records and activities primarily for the period October 1, 2002 through June 30, 2005.

We conducted a preliminary review of MDOT's warranty program to formulate a basis for defining the audit objectives and scope. Our review included interviewing MDOT management and staff to obtain an understanding of how MDOT uses warranties with its construction and maintenance projects. We reviewed applicable laws, procedures, processes, and reports generated by MDOT that were related to warranties.

We obtained access to MDOT's Statewide Warranty Administrative Database (SWAD) and MDOT's construction contract database to conduct tests to determine that MDOT required warranties on all applicable projects.

* *See glossary at end of report for definition.*

To assess the effectiveness of MDOT's efforts in evaluating whether warranties have improved the quality of pavement construction projects, we met with MDOT staff and reviewed reports to determine what efforts MDOT had made to evaluate the effect warranties had on construction project quality. We contacted other states that use warranties or require guarantees on road or bridge construction or maintenance projects to determine the methods they used to evaluate how warranties had affected their projects.

To assess the effectiveness of MDOT's efforts to ensure that warranty claims are made when appropriate, we selected a sample of projects with warranties and conducted tests to determine whether MDOT conducted inspections on a timely basis and documented the inspections in the project files. We also assessed whether MDOT required contractors to perform necessary corrective action work on warranty claims and whether performance of the corrective action work was documented in the project files. In addition, we compared documentation in the project files to inspection and warranty information contained in SWAD to verify the accuracy of the database.

Agency Responses

Our audit report contains 3 findings and 3 corresponding recommendations. MDOT's preliminary response indicated that it concurs with all of our recommendations.

The agency preliminary response that follows each recommendation in our report was taken from the agency's written comments and oral discussion subsequent to our audit fieldwork. Section 18.1462 of the *Michigan Compiled Laws* and Department of Management and Budget Administrative Guide procedure 1280.02 require MDOT to develop a formal response to our audit findings and recommendations within 60 days after release of the audit report.

# COMMENTS, FINDINGS, RECOMMENDATIONS, AND AGENCY PRELIMINARY RESPONSES

# EFFECTIVENESS OF WARRANTIES ON CONSTRUCTION PROJECT QUALITY

## COMMENT

**Audit Objective:** To assess the effectiveness of the Michigan Department of Transportation's (MDOT's) efforts in evaluating whether warranties have improved the quality of pavement construction projects.

**Conclusion: We concluded that MDOT's efforts were moderately effective in evaluating whether warranties have improved the quality of pavement construction projects.** We noted a reportable condition* related to warranty program evaluation (Finding 1).

## FINDING

1. Warranty Program Evaluation

MDOT should continue its efforts to fully develop a continuous quality improvement* (CQI) process for evaluating the effectiveness of its pavement warranty program. Without a fully developed CQI process, MDOT cannot ascertain that its warranty program has resulted in higher quality pavement construction or determine if the added cost of administering the warranty program is offset by reduced pavement construction and maintenance costs.

The Legislature and the Governor have required, in various appropriations acts and in Executive Directive No. 1996-1, that State programs use quality improvement processes to manage the use of limited State resources. Also, Executive Directive No. 2001-3, which rescinded Executive Directive No. 1996-1 effective June 8, 2001, stated that it was a goal to increase efforts toward continuous improvement and ensure the implementation of quality and customer service management techniques.

A CQI process should include: performance indicators* for measuring outputs* and outcomes*; performance goals that describe the desired level of outcomes based on management expectations, peer group performance, and/or historical data; a

* *See glossary at end of report for definition.*

performance measurement system* to gather actual output and outcome data; a comparison of the actual data with desired outputs and outcomes; a reporting of the comparison results to management; and proposals of program changes to improve effectiveness and efficiency.

MDOT has implemented partial components of a CQI process, but MDOT has not established formal performance goals to compare against actual pavement performance information. From 1996, when MDOT began using pavement warranties, through December 2004, MDOT administered 907 pavement warranties. One of the objectives of MDOT's pavement warranty program is to get a longer life from its pavements and reduce pavement failures and maintenance costs.

Our audit of MDOT's pavement warranty program disclosed:

a. MDOT annually accumulates road condition information in its pavement management system; however, without formal performance goals, MDOT cannot use this information to evaluate the effectiveness of its warranty program. MDOT informed us that it has not evaluated the warranty program because it believes that it is too early in the process to evaluate the long-term value of warranties. Although a comprehensive evaluation may not be possible until the roadway has exceeded its designed life, establishment of interim performance goals would allow MDOT to periodically evaluate the performance of its warranted pavements. We contacted 6 states that have used warranties on pavement construction projects and determined that 4 (67%) of the states did conduct performance analyses of their warranted projects. Of these 4 states, 2 (50%) concluded that no difference was noted in pavement quality and 2 (50%) concluded that warranted projects outperformed nonwarranted projects. We also determined that 2 of the 6 states were no longer using warranties on pavement construction projects.

* *See glossary at end of report for definition.*

b. MDOT did not determine if the benefits of warranties equaled or exceeded the costs associated with having them. Costs related to MDOT's administration of its warranty program included:

(1) Development costs of the Statewide Warranty Administrative Database (SWAD) of $1.4 million.

(2) Annual maintenance costs of SWAD of $200,000.

(3) Warranty inspection costs estimated at $800,000 for conducting inspections of warranted projects to verify conformance with warranty provisions.

(4) Warranty performance bond costs estimated at $1.5 million. Contractors must provide these bonds to insure the cost of corrective actions on a project if the contractor is unable to perform the work. However, MDOT has never had to use a performance bond for corrective action on a warranted project since inception of the warranty program.

We recognize that as a result of using warranties on capital preventative maintenance pavement projects, MDOT no longer performs quality control testing but rather relies on the contractor to perform these tests, which has reduced MDOT's testing costs.

MDOT needs to accumulate and analyze all benefits and costs associated with the pavement warranty program to determine if the benefits derived exceed the costs of the program.

## RECOMMENDATION

We recommend that MDOT continue its efforts to fully develop a CQI process for evaluating the effectiveness of its pavement warranty program.

## AGENCY PRELIMINARY RESPONSE

MDOT concurs with the recommendation. While formal performance goals for warranty projects have not been established, MDOT does have average historical performance data against which the performance of warranty projects can be compared. While warranty project quality could be compared with this average

data, MDOT feels that a more valid evaluation would involve warranted and nonwarranted comparable fixes that have been constructed during the same general time frame and, thus, under similar project specifications. MDOT intends to utilize warranted and nonwarranted comparable fix data to evaluate the projects when that data is complete and available as discussed in the next paragraph. Should MDOT find there is not enough warranted and nonwarranted data available, MDOT plans to utilize the historical data as necessary. In addition, MDOT does have formal pavement performance goals of 90% in good condition by 2007, which have been in place since 1997.

MDOT recognizes the need for a complete assessment of its warranty program, but only when all of the pertinent information is available. At this time, MDOT feels that it is premature to determine whether warranties have or have not improved pavement quality. Based on MDOT's engineering experience with pavement life cycles, the appropriate method of evaluation is to obtain and analyze the data on pavement performance for warranty and nonwarranty projects over the projected design life of the pavements. This analysis is typically referred to as projected pavement life curves and requires a minimum of three (preferably four) distinct data points to develop a curve. MDOT's system for collecting pavement condition data requires analysis of one-half of the Statewide system every year. Therefore, to collect the appropriate data points requires a minimum of six (preferably eight) years before appropriate projected life curves can be developed for warranty and nonwarranty projects.

MDOT will develop a process for evaluating the effectiveness of the pavement warranty program by September 30, 2006. However, an overall evaluation will not be completed until the pertinent data is available.

## EFFECTIVENESS OF WARRANTY CLAIMS PROCESSING

### COMMENT

**Audit Objective:** To assess the effectiveness of MDOT's efforts to ensure that warranty claims are made when appropriate.

**Conclusion: We concluded that MDOT's efforts were moderately effective in ensuring that warranty claims are made when appropriate.** We noted reportable conditions related to warranty program controls and warranty program documentation (Findings 2 and 3).

## FINDING

2. Warranty Program Controls

MDOT did not ensure that all warranted projects were entered into SWAD and assigned an initial acceptance date*. Without a complete database, MDOT cannot ensure that it conducted required inspections on all warranted projects or that contractors performed corrective action when necessary.

MDOT procedures require staff to enter project information into SWAD for each warranted construction project awarded. When the project is completed, staff inspect the work and, if it meets the contract requirements, accept the project, initiating the warranty period. Procedures also require staff to enter this initial acceptance date into SWAD, which it uses to notify staff of the need for future warranty inspections of the project. The purpose of these inspections is to determine if the project meets the warranty thresholds* or if the contractor needs to perform corrective action.

We reviewed warranted projects at 8 of MDOT's 26 transportation service centers (TSCs) to determine if MDOT accurately entered warranted project information into SWAD. We determined:

a. MDOT staff had not entered 5 (3%) of 150 warranted projects into SWAD at 4 TSCs. Although none of these warranties had expired at the time of our audit, MDOT was not aware of the required warranty inspections on these projects.

b. MDOT staff had not entered initial acceptance dates into SWAD for 31 (18%) of 173 warranted projects that had been completed and accepted at 7 TSCs from construction years 2003 and 2004. Although these projects were entered into SWAD when awarded, their acceptance was not recognized and, therefore, they were not flagged for inspections.

* *See glossary at end of report for definition.*

## RECOMMENDATION

We recommend that MDOT ensure that all warranted projects are entered into SWAD and assigned an initial acceptance date.

## AGENCY PRELIMINARY RESPONSE

MDOT concurs with the recommendation. MDOT noted that 97% of warranted projects reviewed were entered into SWAD and that this was accomplished even though SWAD is still a relatively new endeavor being implemented throughout MDOT across the State.

MDOT stated that as a result of placing warranties on projects in the 1990s, the number of projects entering and leaving warranty status increased and the task of administering the warranty program became more difficult. Recognizing the need for uniform administration of warranties, a Statewide Warranty Administration Team was formed in 2001. In 2002, SWAD was planned and, in November 2003, it was rolled out. Since that time, MDOT personnel have been entering warranty data and becoming familiar with SWAD. At the same time, a consultant has been retained to make enhancements as needed.

MDOT stated that it continues to work on improving accuracy and that system modifications are underway to notify users when a new project does not have an initial acceptance date entered. These modifications will be implemented by August 31, 2006. In addition, the November 2002 Guidelines for Administering Warranties on Road and Bridge Construction Contracts will be updated and distributed to applicable MDOT personnel. The updated guidelines will incorporate language to help ensure that all warranted projects are entered into SWAD and assigned an initial acceptance date. The guidelines will also include requirements to help ensure that warranty inspections and corrective action follow-up are conducted and documented on all warranted projects. These guidelines will be issued by March 31, 2007.

## FINDING

3. Warranty Program Documentation

MDOT did not maintain documentation to ensure that all warranty inspections were conducted or that contractors had performed corrective action on all warranted projects.

In November 2002, MDOT established guidelines for administering its road and bridge warranty contracts. These guidelines identified responsibilities for field staff and contained forms for staff to use to document activities on warranted projects, including forms for interim and final inspections. In addition, MDOT management issued an office memorandum stating that the inspection forms contained within the guidelines were to be used to document the inspections of warranted projects.

We reviewed files of 124 warranted projects at 8 of MDOT's 26 TSCs to determine if project inspections and corrective actions were conducted. We determined:

a. MDOT did not document 92 (47%) of 196 inspections of warranted projects. Without inspection documentation, MDOT could not ensure that inspections were conducted or support warranty claims for project defects and necessary corrective actions.

b. MDOT could not ensure that contractors performed repair work on 14 (54%) of 26 warranties requiring corrective action. Field staff indicated that they were not aware that project files should contain documentation that corrective actions were completed on warranted projects. Documentation of corrective action follow-up is necessary for MDOT to ensure that repair work on warranted projects is completed.

## RECOMMENDATION

We recommend that MDOT maintain documentation to ensure that all warranty inspections are conducted and that contractors have performed corrective action on all warranted projects.

## AGENCY PRELIMINARY RESPONSE

MDOT concurs with the recommendation. SWAD does have the capability to document inspections and corrective actions and MDOT will utilize the system to do so. MDOT informed us that a system modification has been implemented to notify users when a final inspection is due.

As cited in the response to the previous recommendation, the November 2002 Guidelines for Administering Warranties on Road and Bridge Construction Contracts will be updated and distributed to applicable MDOT personnel. The updated guidelines will incorporate language to help ensure that all warranted

projects are entered into SWAD and assigned an initial acceptance date. The guidelines will also include requirements to help ensure that warranty inspections and corrective action follow-up are conducted and documented on all warranted projects. These guidelines will be issued by March 31, 2007.

# GLOSSARY

| | |
|---|---|
| capital preventive maintenance | A planned strategy of cost-effective treatments to an existing roadway system and its appurtenances that preserves the system, retards future deterioration, and maintains or improves the functional condition of the system without substantially increasing structural capacity. |
| continuous quality improvement (CQI) | A process that aligns the vision and mission of an organization with the needs and expectations of internal and external customers. It normally includes a process to improve program effectiveness and efficiency by assessing performance indicators that measure outputs and outcomes related to the program vision, mission, goals, and objectives. |
| corrective action | Work that is required by the contractor when a project has been found to be in violation of the warranty. |
| effectiveness | Program success in achieving mission and goals. |
| initial acceptance date | The date when warranted work is complete and has been determined by MDOT to be in compliance with the contract specifications and is continuously open to traffic. This is also the start date of the warranty period. |
| materials and workmanship warranty | A warranty on pavement construction in which the contractor is responsible for correcting deficiencies in the pavement caused by materials and workmanship during the warranty period. The contractor assumes no responsibility for deficiencies that are design-related because MDOT is responsible for pavement design. |
| MDOT | Michigan Department of Transportation. |
| mission | The agency's main purpose or the reason that the agency was established. |

| | |
|---|---|
| outcomes | The actual impacts of the program. |
| outputs | The products or services produced by the program. |
| performance audit | An economy and efficiency audit or a program audit that is designed to provide an independent assessment of the performance of a governmental entity, program, activity, or function to improve public accountability and to facilitate decision making by parties responsible for overseeing or initiating corrective action. |
| performance indicators | Information of a quantitative or qualitative nature used to assess achievement of goals and/or objectives. |
| performance measurement system | A system for capturing and processing data to determine if the program is achieving its goals. |
| performance warranty | A warranty on pavement construction in which the contractor assumes full responsibility for pavement performance during the warranty period and is responsible for materials selection, workmanship, and certain aspects of design. The contractor is responsible for deficiencies under the contractor's control. |
| reconstruction | Fixes that typically remove and replace the entire pavement structure. Sometimes the sand subbase may be left in place and incorporated in the new pavement structure. Reconstruction fixes have a fix life of 20 years or more. Such fixes are typically applied to pavements with a remaining service life of 2 years or less. |
| rehabilitation | Fixes that include multiple course bituminous overlays, concrete patching and diamond grinding, crush and shape with bituminous overlay, and unbonded concrete overlays. Rehabilitation fixes have an estimated fix life of 10 to 20 years. Such fixes are typically applied to pavements with a remaining service life of 2 years or less. |

| | |
|---|---|
| reportable condition | A matter that, in the auditor's judgment, represents either an opportunity for improvement or a significant deficiency in management's ability to operate a program in an effective and efficient manner. |
| State trunkline | The 9,716 miles of highway made up of State ("M"), national ("US"), and interstate ("I") routes that are MDOT's responsibility. |
| SWAD | Statewide Warranty Administrative Database. |
| threshold | A specific distress level or condition causing a violation of a warranty. |
| TSC | transportation service center. |

This Page Left Intentionally Blank

This Page Left Intentionally Blank

This Page Left Intentionally Blank

STATE OF MICHIGAN

OFFICE of the AUDITOR GENERAL