INDOT
LOCAL PUBLIC AGENCY PROGRAM

Pavement Asset Management for Local Public Agency Roadways

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Approved

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PURPOSE

Due to the lack of funding sources and increasing demands and accountability from the general public, Local Public Agencies (LPA's) are under pressure to find better and the most cost effective way to maintain their existing roadway network. Development and implementation of a Pavement Asset Management Policy provides a local public agency a tool which can be used to identify their needs, prioritize their actions, and allocate available funds appropriately.

This *Pavement Asset Management for Local Public Agency Roadways* is intended to provide:

1. Assistance in understanding pavement asset management and preservation.

2. Guidance for Local Public Agencies (LPA's) Officials and employees in the planning, developing, programming and implementing of effective and cost efficient capital program including maintenance actions to preserve the roadways under their jurisdiction.

3. Information to aid local public agencies

    a. In understanding their local roadway system.

    b. In understanding the importance of roadway preservation and implementing a strategic, long term program of identifying, programming, budgeting, and completing roadway preservation projects to improve the statewide condition of these assets at the lowest possible cost to taxpayers.

    c. To support Call for Projects Application for Federal Funds.

PAVEMENT ASSET MANAGEMENT

Per Code of Federal Regulations, 23 CFR 500.106: *"An effective PMS* (Pavement Management System) *for Federal-aid highways is a systematic process that provides information for use in implementing cost-effective pavement reconstruction, rehabilitation, and preventative maintenance programs and that results in pavements designed to accommodate current and forecasted traffic in a safe, durable, and cost-effective manner. The PMS should be based on the "AASHTO Guidelines for Pavement Management Systems"."* An effective PMS should include, as a minimum, formal procedures for:

(a) Collecting, processing, and updating data;
(b) Predicting deterioration;
(c) Identifying alternative actions;
(d) Predicting costs;
(e) Determining optimal policies;

(f) Performing short- and long-term budget forecasting; and
(g) Recommending programs and schedules for implementation within policy and budget constraints.

The INDOT Pavement Management System (PMS) was initiated in 1989 based on the Federal Highway Administration (FHWA) requirements and subsequent regulations by Congress (ISTEA) and FHWA have further regulated the development and expansion of the PMS procedures. For an LPA, the process is administered through the INDOT Local Public Agency Program. The LPA must submit its Pavement Asset Management (PAM) Plan to the INDOT Pavement-Roadway Asset & Program Manager to obtain approval to ensure that the plan is in compliance with federal regulations. The LPA's PAM Plan is a living document and must be updated when work is completed on a road segment. The LPA's PAM Plan must be submitted for approval every two (2) years based on the biennial pavement condition data assessment.

In a PAM program which has a PAM Plan, the LPA should adopt a philosophy that supports its capital program by developing a mixture of activities which will maximize its funding sources. The LPA should determine the maintenance, repair, and rehabilitation needs for each and every individual roadway segment under their jurisdiction. By comparing the cost of implementing various pavement actions (pavement preservation, rehabilitation or reconstruction) based on the needs of each individual roadway segment versus deferring work needed, the LPA can determine which is the most cost effective use of its funding sources. Reconstruction of an individual roadway section may be warranted if reconstruction is the most cost-effective means to satisfy the existing structural or functional needs. Alternatively, if the physical condition of an individual roadway section has deteriorated to a point where the roadway section may be considered hazardous to the traveling public, reconstruction of said section may be determined to be the only feasible alternative. A sample Pavement Asset Management (PAM) Plan is included in Appendix A. The sample PAM Plan does not include the LPA's goals and objectives narrative, funding sources, recommendations and conclusions.

ROAD CONSTRUCTION AND PRESERVATION

Surface transportation programs established by the Federal government allow States to use federal funds to improve the condition of public highways (roads) which are functionally classified. As defined in Title 23 United State Code § 133 (c), *"Except as provided in subsection (b)(1), surface transportation program projects (other than those described in subsections (b)(3) and (4)) may not be undertaken on roads functionally classified as local or rural minor collectors, unless such roads are on a Federal-aid highway system on January 1, 1991, and except as approved by the Secretary."* LPA's are allowed to use federal funds on their public roadways when the functional classification is a major collector or higher (minor or major arterial). The LPA must have all roads (existing or proposed) functionally classified through INDOT and FHWA.

Indiana Design Manual (IDM), Chapter 304 has broken down road (pavement) projects into four categories:

1. New Alignment
2. Pavement Reconstruction
3. Pavement Rehabilitation
4. Preventative Maintenance

A project where the roadway is being built for the first time or an existing roadway centerline is being altered from its current centerline is considered New Alignment. New Alignment projects include pavement designs that include recommendations for preparation of the subgrade prior to placing the new pavement structure. New Alignment is considered (4R) work, resurfacing, restoration, rehabilitation and reconstruction.

Pavement Reconstruction is defined as the replacement or reestablishment of the original pavement structural capacity by the placement of the equivalent or increased pavement structure on the existing alignment. Pavement replacement projects include removal of the existing pavement structure, including subbase, and preparation of the foundation soil and subgrade prior to placing a new pavement structure. Pavement damaged due to structural deficiencies should be considered for replacement. Pavement reconstruction may utilize either new or recycled materials for the reconstruction of the complete pavement structure. Pavement reconstruction is (4R) work, resurfacing, restoration, rehabilitation, and reconstruction.

Pavement Rehabilitation project is defined as (3R) work, resurfacing, restoration, and rehabilitation, consisting of structural enhancements that extend the life of an existing pavement and/or improve its structural capacity. A widening component may be included with a rehabilitation or structural overlay project. Rehabilitation techniques include restoration treatments and/or structural overlays. A pavement that is currently structurally insufficient or will be insufficient based on future traffic is a candidate for a rehabilitation type project.

A Preventative Maintenance (PM) project is intended to preserve and extend the service life of an existing good pavement. A PM project shall be considered as cost effective treatment 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 increasing structural capacity. The proper time for a PM is before the pavement experiences severe distress, structural problems, and moisture or aging-related damage. Projects that address deficiencies in the pavement structure or increase the structural capacity of the facility are not considered preventative maintenance.

A systematic plan to preserve roadways must define a specific goal for the maintenance activities and describe what the systematic process is to be to achieve said goal. The FHWA defines a systemic process as "*a documented methodology regularly applied to repeatedly achieve a desired outcome or goal*." INDOT Treatment Guidelines for Pavement Preservation and IDM are valuable resources which the LPA can utilize for including preventative maintenance activities in its PAM Plan.

An effective pavement preservation program:

1. Employs long term network strategies and practices that are aimed to preserve and/or increase the condition of roads, extending their service life.

2. Has an adequate and future funding source.

3. Enhances pavement performance.

4. Ensures cost-effectiveness.

5. Reduces delays to the motoring public.

6. Provides improved safety and mobility.

7. Supports INDOT's mission statement: "INDOT will plan, build, maintain and operate a superior transportation system enhancing safety, mobility and economic growth."

8. Supports INDOT's *Open Roads* (Practical Design) Initiative by implementing low-cost project solutions that enhance the overall condition and function of roads without diminishing safety.

PLAN and DEVELOPMENT

The LPA is highly encouraged to develop a PAM Plan which includes preservation that maximizes the service life of roadways under its jurisdiction and optimizes available funding sources. The PAM Plan should include pavement reconstruction, pavement rehabilitation and pavement preservation which will improve the overall condition of its roadways at the lowest possible cost to taxpayers.

It is highly recommended that a LPA perform biennial pavement condition assessments of all roadways under their jurisdiction for assisting in the development of their five (5) year work program. The INDOT Local Public Agency Program in order to obtain continuity across the State of Indiana has adopted *"Pavement Surface Evaluation and Rating"* (PASER) as the uniform condition rating system to be utilized by LPA's when performing biennial pavement assessments. A LPA may use Pavement Condition Index (PCI) in accordance with ASTM D6433 *"Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys"* when performing biennial pavement assessments. If the LPA elects to use PCI, the numerical index must be converted to PASER equivalent to allow for uniformity across the State of Indiana.

PASER uses visual inspection to evaluate pavement surface conditions. The key to a useful evaluation is identifying different types of pavement distress and linking them to a cause.

Understanding the cause for current conditions is extremely important in selecting an appropriate maintenance, rehabilitation or reconstruction techniques. There are four major categories of common asphalt pavement surface distress:

1) Surface defects - raveling, flushing, polishing
2) Surface deformation - rutting, distortion—rippling and shoving, settling, frost heave
3) Cracks - transverse, reflection, slippage, longitudinal, block, and alligator cracks
4) Patches and potholes.

A complete description and pictorial of each category can be found in *Asphalt Roads PASER Manual.*

Once the LPA has an understanding of surface distress, they can evaluate and condition rate roadways under their jurisdiction. The PASER surface rating scale ranges from 10–excellent to 1-failed. The given surface condition rating will provide the LPA with a recommendation for needed maintenance or repairs. The following table shows surface rating conditions as related to needed maintenance or repairs.

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

Most pavement will deteriorate through the different phases listed in the following table.

Surface Rating	Visible Distress*	General condition / treatment measures
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 1⁄4")	Recent sealcoat or new cold mix Little or no maintenance required
7 Good	Very slight or no raveling, surface shows some traffic wear. Longitudinal cracks (open 1⁄4") due to reflection or paving joints Transverse cracks (open 1⁄4") 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 1⁄4"– 1⁄2") Transverse cracks (open 1⁄4"– 1⁄2"), 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 1⁄2" or more) 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 (1⁄2" 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 (greater than 1⁄2" but less than 2" deep).	Needs patching and repair prior to major overlay Milling and removal of deterioration extends the life of overlay
2 Poor	Alligator cracking (over 25% of surface) Severe rutting or distortions (2" or more 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.

After the LPA has performed their biennial pavement condition assessments, the LPA will have the data necessary to assess the overall condition of the roadways under its jurisdiction. The LPA then must determine what activities must be performed to best preserve the roadways under its jurisdiction. A properly developed PAM Plan usually includes a combination of activities ranging from pavement reconstruction, pavement rehabilitation and pavement preservation.

The developed PAM Plan should have short-term and long-term objectives. Long-term objectives address the need for sustained investment in the roadway system using a combination of preservation and replacement activities. Short-term objectives address the roadways that are currently in "fair to good" condition using preservation activities to extend the service life of the roadway.

LOCAL ROADWAY INVENTORY

Fuel taxes, vehicle surtaxes and license fees are collected by the State for distribution for road construction and maintenance. The State distributes to the LPA a portion of the amount collected through the Motor Vehicle Highway (MVH) Distribution and Local Road and Streets (LRS) Distribution. The formulas used for the MVH and LRS distribution have a certified road mileage component. With this in mind, the LPA must maintain and update a database consisting of all roadways under their jurisdiction. This database should have but not limited to:

1. Road Name and Identification
2. Beginning and Ending Point
3. Length (feet or miles) and Width (feet)
4. Functional Classification.

INDOT has a Roadway Inventory team that is responsible for managing, updating and reporting certified road mileage. The LPA is responsible for reporting any changes to their certified road mileage to the INDOT Roadway Inventory team. The LPA must keep in mind that the MVH and LRS distribution have a certified road mileage component which will affect the amount of funds being received.

PROJECTS and FUNDING

The LPA Program will consist of four types of projects: New Alignment, Pavement Reconstruction, Pavement Rehabilitation and Preventative Maintenance. To be eligible, the functional classification of the roadway must be a major collector, minor arterial or principal arterial. Specific eligibility criteria by project type are detailed in Appendix B.

Surface transportation programs established by the Federal government allow States to use federal funds to improve the condition of public highways (roads) which are functionally classified as a major collector, minor arterial or principal arterial. With this being stated, the LPA Program is open to all LPAs, however the selection of projects to receive federal-aid funding varies depending upon the location of the project. Road projects located outside the planning area of an MPO are selected thru the State's LPA project selection process. Road projects located inside the planning areas of an MPO are selected thru the MPO's project selection process.

An LPA is allowed to apply for funding for Preventative Maintenance projects as long as the LPA has an INDOT approved PAM Plan. The PAM Plan must at least meet the conditions outlined. The INDOT Pavement Engineering will review the LPA PAM Plan and issue a letter of acceptance. If an LPA does not have a INDOT approved PAM Plan in place, they will not be able to apply for or receive funds for Preventative Maintenance.

An LPA can still apply for funding for New Alignment, Pavement Reconstruction, and Pavement Rehabilitation projects during the call for Projects even if it does not have a PAM as long as it is in compliance with all federal and state rules and regulations and the project meets the eligibility criteria for New Alignment, Pavement Reconstruction, and Pavement Rehabilitation projects.

APPENDIX A
Sample Pavement Asset Management Plan

The submitted Pavement Asset Management Plan should at a minimum contain the following items:

1. List of all of the roads within the LPA's jurisdiction (must match certified road mileage on file with INDOT)

2. Road Name

3. From and To Points

4. Road Length and Width

5. Roadway Surface Type

6. PASER Rating,– current and historical (5 years if available)

7. Average Annual Daily Traffic (AADT) with year (optional)

8. Average Annual Daily Truck Traffic (AADTT) with year (optional)

9. Functional Classification

10. Right of Way Information

11. Drainage Information

12. List all of the planned work on the roads for the next five (5) years.

    a. The planned work should be summarized by year. The type of work can be obtained for the INDOT Treatment Guidelines for Pavement Preservation and IDM.

SAMPLE PAVEMENT ASSET MANAGEMENT PLAN

ROADWAY ASSET INVENTORY

Route ID	Roadway Name	Alternate Name	From	To	Length		Width	No. of Through Lanes	Roadway Surface Type	PASER										Average Annual Daily Traffic (AADT)		Average Annual Daily Truck Traffic (AADTT)		Functional Classification	Right of Way		Drainage		Work Type	Estimated Construction Cost	Year of Planned Work	Priority (H,M,L)	Note
			Roadway Name	Roadway Name	(feet)	(miles)	(feet)			Rating	Year	Rating	Year	Rating	Year	Rating	Year	Rating	Year	Year	(vpd)	Year	(vpd)	Year	Weighted Ave. Width (feet)	Document or Prescribed	Type	Comment					
30100000001000001	Division Road	IR 1	CR 1000 West	CR 900 West	5,280.00	1.00	24.00	2	1" Asphalt	7	2012	6	2013	6	2014	5	2015	5	2016	6,000	2014	300	2014	Major Collector Rural	40	Commissioner Minutes 11/1/1886	Open Ditch	Adequate - Needs cleaned			$ -		
30100000001000002	Division Road	IR 1	CR 900 West	CR 875 West	1,333.35	0.25	24.00	2	1" Asphalt	7	2012	6	2013	6	2014	5	2015	5	2016	5,820	2014	280	2014	Major Collector Rural	40	Commissioner Minutes 11/1/1886	None	Needs established			$ -		
30100000001000003	Division Road	IR 1	CR 875 West	CR 800 West	4,000.00	0.76	24.00	2	1" Asphalt	3	2012	3	2013	2	2014	9	2015	8	2016	10,000	2016	1,000	2016	Major Collector Rural	40	Recorded Instrument #14-215, 6/15/2014	Enclosed Ditch / Storm Sewer	Adequate			$ -		
30100000075000001	CR 125 West	IR 75	Divison Road	CR 200 North	9,985.00	1.89	18.75	2	8" Concrete	3	2012	2	2013	9	2014	8	2015	8	2016	4,200	2015	95	2015	Minor Collector Rural	35	Recorded Instrument #13-005, 1/19/2013	Curb and Gutter / Storm Sewer	Gutter lines need cleaned			$ -		
30100000215000001	CR 680 East	IR 215	South County Line	CR 900 South	640.00	0.12	16.00	2	1/2" Chip & Seal	7	2012	7	2013	7	2014	6	2015	6	2016	150	2009	2	2009	Local Rural	20	Prescribed	None	Needs established			$ -		
30100000200000001	CR 900 North	IR 200	CR 900 East	Dead End	300.00	0.06	14.00	1	4" #9 Stone											5	2012	0	2012	Local Rural	14	Prescribed	None	Needs established			$ -		

SAMPLE PAVEMENT ASSET MANAGEMENT PLAN
ROADWAY TREATMENT SUMMARY - Next 5 Years

2018

Year	*Rating*	*Treatment Used*	*Estimated Cost per Mile*	*Estimated Miles*	*Estimated Cost*
2017	1-2	Reconstruction	$250,000.00		
2017	3-5	Mill & 1½" Overlay	$100,000.00		
2017	3-5	Chip & Seal	$10,000.00		
2017	6-7	Patch Paving	$15,000.00		
2017	6-7	Patch Chip & Seal	$3,000.00		
2017	7	Crack Sealing	$1,000.00		
		TOTAL			

2019

Year	*Rating*	*Treatment Used*	*Estimated Cost per Mile*	*Estimated Miles*	*Estimated Cost*
2017	1-2	Reconstruction	$275,000.00		
2017	3-5	Mill & 1½" Overlay	$125,000.00		
2017	3-5	Chip & Seal	$15,000.00		
2017	6-7	Patch Paving	$20,000.00		
2017	6-7	Patch Chip & Seal	$5,000.00		
2017	7	Crack Sealing	$1,000.00		
		TOTAL			

2020

Year	*Rating*	*Treatment Used*	*Estimated Cost per Mile*	*Estimated Miles*	*Estimated Cost*
2017	1-2	Reconstruction	$300,000.00		
2017	3-5	Mill & 1½" Overlay	$150,000.00		
2017	3-5	Chip & Seal	$20,000.00		
2017	6-7	Patch Paving	$25,000.00		
2017	6-7	Patch Chip & Seal	$5,000.00		
2017	7	Crack Sealing	$1,000.00		
		TOTAL			

2021

Year	*Rating*	*Treatment Used*	*Estimated Cost per Mile*	*Estimated Miles*	*Estimated Cost*
2017	1-2	Reconstruction	$300,000.00		
2017	3-5	Mill & 1½" Overlay	$150,000.00		
2017	3-5	Chip & Seal	$20,000.00		
2017	6-7	Patch Paving	$25,000.00		
2017	6-7	Patch Chip & Seal	$5,000.00		
2017	7	Crack Sealing	$1,000.00		
		TOTAL			

2022

Year	*Rating*	*Treatment Used*	*Estimated Cost per Mile*	*Estimated Miles*	*Estimated Cost*
2017	1-2	Reconstruction	$300,000.00		
2017	3-5	Mill & 1½" Overlay	$150,000.00		
2017	3-5	Chip & Seal	$20,000.00		
2017	6-7	Patch Paving	$25,000.00		
2017	6-7	Patch Chip & Seal	$5,000.00		
2017	7	Crack Sealing	$1,000.00		
		TOTAL			

SAMPLE PAVEMENT ASSET MANAGEMENT PLAN
OBJECTIVES and MEASURES

1. Define the Agency performance Goals and expected level of service for pavement

2. Define the rating system used (PASER, PCI converter to PASER, or other converter to PASER)

3. Describe the process used to develop the work plan

4. Describe the monitoring program, plan for making updates and adjustments

APPENDIX B
CRITERIA FOR ELIGIBILITY

NEW ALIGNMENT

1. Road or thoroughfare such as a street, boulevard, or parkway, available to the public for use for travel or transportation

2. Functional classification of the roadway must be a major collector, minor arterial or principal arterial

PAVEMENT RECONSTRUCTION

1. Road or thoroughfare such as a street, boulevard, or parkway, available to the public for use for travel or transportation

2. Functional classification of the roadway must be a major collector, minor arterial or principal arterial

3. Current PASER rating 1, 2, or 3

4. Road CANNOT have been rehabilitated or reconstructed within the past ten (10) years regardless of funding source (i.e. local funds or federal funds)

5. Road CANNOT have been new within the past ten (10) years regardless of funding source (i.e. local funds or federal funds)

PAVEMENT REHABILITATION

1. Road or thoroughfare such as a street, boulevard, or parkway, available to the public for use for travel or transportation

2. Functional classification of the roadway must be a major collector, minor arterial or principal arterial

3. Current PASER rating 3, 4, or 5

4. Road CANNOT have been rehabilitated or reconstructed within the past five (5) years regardless of funding source (i.e. local funds or federal funds)

5. Road CANNOT have been new within the past ten (10) years regardless of funding source (i.e. local funds or federal funds)

PREVENTATIVE MAINTENANCE

1. Road or thoroughfare such as a street, boulevard, or parkway, available to the public for use for travel or transportation

2. Functional classification of the roadway must be a major collector, minor arterial or principal arterial

3. Current PASER rating 5, 6, 7 or 8

4. Road CANNOT have been new within the past five (5) years regardless of funding source (i.e. local funds or federal funds)

5. Preventative Maintenance Activities must be in compliance with the IDM and INDOT Treatment Guidelines for Pavement Preservation

SOURCES AND REFERENCES

The following sources and references were used in creating this document:

1. INDOT *Local Public Agency Project Development Process Guidance Document for Local Federal-Aid Projects*

2. FHWA/IN/JTRP 2010/01 *Treatment Guideline for Pavement Preservation*

3. *Indiana Design Manual*

4. INDOT *Open Roads* (Practical Design) Initiative

5. AASHTO *Guidelines for Pavement Management Systems*

6. Asphalt Roads PASER Manual

7. PASER Data Collection Best Practices Manual, Indiana LTAP PASER Training 2014

8. Code of Federal Regulations, 23 CFR 500

9. Title 23 United State Code § 133 (c)

10. ASTM D6433 *Standard Practice for Roads and Parking Lots Pavement Condition Index Surveys*