

Maintenance for Newly Designed Pavements Using the Maintenance Management Information System

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In recent years several states, including Illinois, have developed or revised their pavement design procedures and selection processes. These procedures and selection processes usually include an evaluation of the expected traffic and projected maintenance costs required for a given period of time. Since 1987 in Illinois, pavements have been designed, selected, and constructed using these procedures. One key to successful development and application of the pavement design procedures and selection processes is to compare and analyze field performance with expected results and make necessary adjustments. To do so requires a systematic data collection and reporting mechanism so the pavement sections are carefully monitored and all work performed is accurately reported. Illinois has established such a monitoring plan and a program of maintenance for newly designed pavement sections. The state expects to use the monitoring plan and to follow the program of maintenance for the 40-year design life of the selected pavement sections. Other states are likely to be concerned with the need to monitor pavement sections in order to check expected performance against actual performance and to summarize the maintenance activity and costs so predictive models can be evaluated. It is important that pavement maintenance models be realistic and accurate so that the economic analysis used in their selection produces correct results. Future pavement design models can be improved if complete information of past performance is available for evaluation. The procedures used by Illinois and its use of the Maintenance Management Information System to collect and produce the informational reports needed for long-term analysis are described.

In July 1990 the Illinois Department of Transportation, Division of Highways, began to develop a procedure for scheduling and financing the maintenance of newly designed pavement sections to ensure timely maintenance in accordance with pavement design models. The Bureau of Operations organized a technical task force with representatives from the executive office, the highway districts, and the Bureaus of Design and Environment, Construction, and Materials and Physical Research to develop a system for monitoring these pavement sections and including them in a program of maintenance corresponding to the prediction models for the first 40 years of pavement life.

In Illinois several miles of pavement sections had already been constructed using the new mechanistically based pavement design procedures and selection process by the time the monitoring project and program of maintenance were initiated in July 1990. Additional pavement sections have been constructed since that time. More will be constructed in the next few years. Industry, as well as the department, is very concerned with evaluating the new pavement design procedures and selection process. Therefore, it was necessary for the department to develop a rational and logical system to monitor, program, and report all maintenance performed on these pavement sections.

To meet these objectives, the task force determined the basic requirements:

- Logical selection criteria to decide which pavement sections to include and which to exclude from the monitoring;

- An accurate inventory of all pavement sections included;
- A means to identify the selected pavement sections to the operations personnel in the field who perform maintenance work activities;
- A way to ensure the performance of annual needs surveys and the inclusion of noted maintenance requirements in the annual district program for state highway maintenance;
- A mechanism to produce projected contract program funding requirements at least 5 years in the future from any point in time;
- A means to enter and report actual maintenance activity quantities and costs for each pavement section, whether by state forces or by contract;
- A means to compare the pavement selection model's projected work activities with actual maintenance work activities needed and performed; and
- An evaluation of the cost per mile to maintain the various types of pavements for comparison purposes.

After consideration of the requirements, reports were designed that the task force agreed would supply the necessary information. The task force decided the department's maintenance management information (MMI) system was the most suitable means to support the program of maintenance and produce all management reports. The MMI system was chosen primarily because terminals were readily available across the state to the source persons responsible for entering the data needed and the system already served the department as the "information highway" to provide reports on highway maintenance operations.

The MMI system consists of 252 terminals located in all highway maintenance team sections, traffic operations headquarters, the district offices, and the central bureaus. Dedicated lines are used to connect the terminals to the VAX cluster located in Springfield. The VAX cluster consists of two DEC 8700s and one 6510 central processing unit. Users anywhere on the network can access real-time data and produce reports from data base information. They can enter, change, and delete data within their area of responsibility. The MMI system has been operational in Illinois since July 1, 1987. At least 350 of the approximately 2,700 people on the operations staff are trained and already use the system frequently in reporting and managing their work.

SELECTION OF PAVEMENTS

One of the first goals of the task force was to select which pavement sections should be included in the monitoring plan and program of maintenance. The new design procedures had been and are applied not only to design new

pavement sections, but also for the design of additional lanes, intersections, ramps, and short relocations. Many believed that it would be difficult to monitor these isolated pavement sections and to ensure accurate reporting from field forces who more routinely report their work to longer pavement sections known as "subsections."

"Subsections" are the standard cost centers to which the operations field personnel report their work. To operations field personnel, a subsection is a pavement section that is contained within logical boundaries delineated by intersections, county lines, or city limits and that has a uniform cross section and number of lanes. A subsection may be any length. Most are 10 centerline mi in length or more. Since reporting is so important to the monitoring plan and program of maintenance, the task force recommended—and the department approved—the use of the following criteria to select pavement subsections:

- Only pavement sections greater than 3,000 yd² in surface area would be considered.
- Pavement sections must be at least 1 mi long, unless they are unique and require inclusion to ensure that a sample of that particular type of pavement is included in the monitoring plan and program of maintenance.
- Subsections must contain no more than one construction contract.

A subsection is designated for each pavement section selected.

Several bureaus are involved in selecting pavement sections based on the criteria. The Bureau of Design and Environment reviews each set of plans received for letting to select sections greater than 3,000 yd² in size. These sections are entered into a data base, which is monitored by the Bureau of Materials and Physical Research. The Bureau of Materials and Physical Research reviews each of the pavement sections selected by the Bureau of Design and Environment. It requests the Bureau of Operations to monitor and include in the program of maintenance those pavements at least 1 mi long or those meeting the "unique and required" criterion.

The Bureau of Operations reviews the request from the Bureau of Materials and Physical Research with the district. If the district agrees, the pavement section is made a subsection and is entered into the subsection inventory of the MMI system, and the process begins. If the district disagrees with the selection, it can appeal with the Bureau of Operations to the Bureau of Materials and Physical Research and give reasons why the pavement section should not be included.

Districts sometimes appeal for the following reasons:

- A pavement section is part of a larger pavement section already being reported,

- A section is not all-inclusive (for example, it includes a northbound lane with the new design and the southbound lane as an overlay), or
- A section has termini that are not easily delineated in the field.

SUBSECTION INVENTORY

The MMI system includes a subsection inventory of physical features that require maintenance within its limits. Each subsection is denoted by a three-digit number and "from and to" descriptive limits. Subsections are entered into the MMI system by the district office and field personnel. Maps are kept that signify the stationing, construction sections, and construction contract involved with each subsection. If a section of new pavement design is to be monitored and become part of the maintenance program, the information is entered into the MMI system's subsection inventory and printed as the subsection inventory report (see Figure 1) with the following fields unique to the new pavement design sections: new design monitored pavement (yes or no), pavement type (code), pavement thickness (in.), shoulder type (code), contract number, letting date, maintenance date (date maintenance of the pavement became the responsibility of the district), and old subsection. This information is entered only for those pavement sections noted as monitored pavements. It is used to identify these subsections to the field personnel and serves as a basis for the subsequent reports for the new pavement designs. In some instances, highway maintenance field forces have erected signs at the ends of these subsections to assist in identification and to ensure the integrity of data collection.

INSPECTION NOTIFICATION

At their option, districts may collect and store information from the needs survey for any or all subsections. The needs survey is a "windshield survey" of each subsection. It collects estimated quantities of maintenance work as it exists just before the new budget year, which begins on July 1. Pavement, shoulder, and drainage work are of primary concern. The information is entered into the MMI system and is integrated into and serves as a basis for the program/budget spreadsheet and work planning process.

The needs survey contains work quantities for the work activities (e.g., pothole patching, culvert cleaning, and curb repair), which state highway maintenance forces normally handle. Survey takers indicate the work priority as they take the survey. Priority 1 must be accomplished within the next year by state forces. Priority 2 must be accomplished by state forces, but is not Priority 1. Priority 3 work is recommended to be contracted (e.g., permanent patching and resurfacing).

The Priority 1 and 2 work information is passed directly into the highway maintenance program/budget and work planning process. Information for Priority 3 work is provided when requested to those who are responsible for pavement management and contract development.

The maintenance needs survey information cannot be used for the pavement condition rating survey, which is taken by others and used for other purposes.

One of the important requirements of the monitoring plan and program of maintenance is to ensure that the pavement sections are reviewed each year for maintenance needs. The MMI system provides the means to collect and store the necessary information from annual maintenance needs surveys.

To ensure that needs surveys are conducted for all of the monitored subsections whether or not the district is performing them for other subsections, an additional report was developed. The annual inspection notification report (see Figure 2) ensures that highway maintenance staff in the field, who may not be directly involved in the administration of new pavement design sections, are notified of the requirements for monitored subsections. A report creation process reviews the subsection inventory and needs surveys on file. On request, the system produces the annual inspection notification report, which lists each subsection in the monitoring plan and program of maintenance, the from-and-to limits, the pavement description, and the last needs survey date. Team section personnel, including field engineers and technicians, are responsible for performing the fiscal year inspections and entering the information. All can request and run the report. As each needs survey or inspection is accomplished and entered into the system, the annual inspection notification report is automatically updated.

In addition, an inspection report by fiscal year (see Figure 3) can be requested and printed for each of the subsections. This report shows the subsection involved and lists only those maintenance work activities involved in the pavement selection process. The report lists predicted future needs based on the model, the previous year's needs survey quantities, the previous year's accomplishments, and any current year or program needs entered into the system. The report information enables managers to compare work that has been noted before or that should be of special concern during the upcoming fiscal year, according to the models. The report draws information from the subsection inventory, the needs survey of the current and prior year, the programmed needs, and the predicted future needs according to the models. Last, a needs survey report may be requested and produced to show the summary of the information collected by field engineers and field technicians. If there are no needs for the pavement section in terms of these pavement and shoulder work activities, the report indicates that the survey was taken and that no needs were found.

**** LOCATION INFORMATION ****
LAST CHANGE DATE: 08/18/94

TEAM SECTION: 231 SUBSECTION: 726 FROM: 596+50 TO: 791+00 COUNTY: OGLE CITY: ROUTE: S026
HIGHWAY CLASS: R M/R: R FIELD ENGINEER: 20
ROUTE NAME: IL 26

**** PAVEMENT INFORMATION ****
LAST CHANGE DATE: 11/18/92

AVG. R.O.W. WIDTH	A.D.T. IN 100S	SURF. TYPE	TOTAL PAVT. WIDTH	CENT. LINE MILES	PAVEMENT LANE MILES								FRONT ROAD		ACC. CTL.	COMMITTS	MONITOR PAVE
					0 FT	1 FT	2 FT	3 FT	4 FT	5 FT	VAR	MI	MI				
70	21	4	24	2.2	0.0	0.0	0.0	0.0	4.4	0.0	0.0	0.0	0.0	0.0	N		Y

**** SHOULDER INFORMATION ****
LAST CHANGE DATE: 11/18/92

**** DRAINAGE INFORMATION ****
LAST CHANGE DATE: 08/10/92

--- SURFACED ---				STORM SEWERS (100 FT.)										--DITCHES--			
HIGH MI.	LOW MI.	AGGREG. MI.	TURF MI.	BARRIER MILES	OTHER MILES	CURBS & GUTTERS 100 FT.	NO. OF DRAIN STRUCT	NO. OF MAIN DRAIN TO 36" D.	NO. OF 36" D. & OVER	LATERAL	EARTH MILES	OTHER 100 FT	NO. OF CROSS ROAD	NO. OF MISC	NO. OF ENT. & SIDE APP		
4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0		

**** ROADSIDE INFORMATION ****
LAST CHANGE DATE: 08/10/92

**** SAFETY INFORMATION ****
LAST CHANGE DATE: 08/10/92

										--GUARDRAIL--				
NO. OF LANDSCAPING FEATURES	NO. OF FLUSH	NO. OF REST PIT	NO. OF REST MINOR	TOTAL MOWABLE ACRES	MOWING POLICY ACRES	R.O.W. FENCE MILES	NO. OF WEIGH STATIONS	NO. OF PUMP HOUSES	NO. OF HIST. MARKERS	SLOPE WALLS, CRIBBING, & RIP-RAP FT.	BARRIER WALL MILES	LINEAR STEEL PLATE	FEET OTHER	NO. OF IMPACT ATTEN.
0	0	0	0	0	0	0.0	0	0	0	0	0.0	0	0	0

**** MONITORED PAVEMENT INFORMATION ****
LAST CHANGE DATE: 06/30/94

PAVEMENT TYPE	THICKNESS (INCHES)	SHOULDER TYPE	CONTRACT NUMBER	LETTING DATE	MAINTENANCE DATE	OLD SUBSEC
10	11.8	B1	B4199	03/13/90	12/01/91	026

**** SUBSECTION BRIDGE INFORMATION ****

LINEAR FEET	NO. UNDER 100 FT.	NO. 100 FT. & OVER
0	0	0

**** SUBSECTION STATUS ****
DEACTIVATE DATE / /

SUB SECTION REMARKS: TWO LOCATIONS STA 596+50 TO 651+00 AND STA. 713+00 TO 791+00 11.75" F.D. BIT.

*** END OF REPORT ***

FIGURE 1 Subsection inventory report for a monitored pavement section.

FISCAL YEAR: 95 TEAM SECTION: ALL

TS	SEC	CONTRACT NUMBER	ROUTE NO.	FROM	TO	PAVEMENT DESCRIPTION
611	120	92038	U03600	ADAMS CO. LINE (STA. 999+99.8)	ILL. 96 (STA.1395+00)	CONT. REINFORCED CONCRETE-CRCP
611	127	92230&231	U03600	STATION 442+50	BARRY (STA. 18+50)	ASPH-TF LT 15.0 (R)
611	128	922290000	U03600	FA-408 @ TRUMPET INTCHGE	1.5 MILES SOUTH OF TRUMPET	ASPH-TF LT 15.0 (R)
611	122	921090000	U03600	IL 100	ILLINOIS RIVER BRIDGES	ASPH-TF LT 15.0 (R)
611	124	921100000	U03600	ILL RIVER BRIDGES	IL 107	ASPH-TF LT 15.0 (R)
611	126	921770000	U03600	BARRY	IL 96 (STA.1395+00)	ASPH-TF LT 15.0 (R)
611	125	92232&231	U03600	STATION 245+00	STATION 442+50	ASPH-TF LT 15.0 (R)
622	141	921080000	101550	JUST N. OF I-55	2 MILES S. OF US-136	ASPH-TF LT 15.0 (R)
622	142	922280000	101550	LOGAN/TAZWELL CO. LINE	2MILES SO. US 136	ASPH-TF LT 15.0 (R)
624	990	923280000	000000	W. OF WILLIAMSVILLE OVHD	TWELVE MILE HOUSE	ASPH-TF LT 15.0 (R)

*** END OF REPORT ***

FIGURE 2 Annual inspection notification report for upcoming fiscal year with subsection, contract number, route number limits, and pavement description.

**** LOCATION INFORMATION ****

TEAM SECTION: 231 SUBSECTION: 726 FROM: IL 26 - FORRESTON TO IL 72(W.) COUNTY: OGLE CITY:
TO: MECHANISTICALLY DESIGNED PVT. ROUTE: S026 ROUTE NAME: IL 26
CONTRACT NUMBER: B4199 HIGHWAY CLASS: R M/R: R FIELD ENGINEER: 20
LAST SURVEY DATE: 03/17/94 PAVEMENT TYPE: 10 ASPH-TF LT 15.0 (R)
LETTING DATE: 03/13/90 PAVEMENT THICKNESS (INCHES): 11.8
MAINTENANCE DATE: 12/01/91 LANE MILES: 4.4 PROJECT AGE: 4

WRK ACT	DESCRIPTION	UNIT MEAS	DESIGN PROJECTED			FY 95 CONTRACT NEEDS
			FY 94 NEEDS	FY 94 ACCOMP.	FY 95 NEEDS	
411	PART DEPTH PATCHES	SQYD				
412	FULL DEPTH PATCHES	SQYD				
413	BITUMINOUS OVERLAY	SQYD				
416	CRK&JT SEAL-HD POR	GALS				
515	PAVEMENT MILLING	SQYD				
516	CRK&JT ROUTING	L FT				35600
517	CRK&JT CLEAN&SEAL	L FT				35600
919	OTHER PAVEMENT	HRS				
420	PATCH&REPAIR SHLDR	TONS				
929	OTHER SHOULDER	HRS				

FIGURE 3 Inspection report by fiscal year with design projected needs, previous year's needs, previous year's accomplishments, and current year's needs (by state forces and contract) for each work activity.

MMIS3066 HMIQ3354 MMIR358
05/11/94 115513

ILLINOIS DEPARTMENT OF TRANSPORTATION
BUREAU OF MAINTENANCE
MONITORED PAVEMENT
PROPOSED BUDGET BY SUB SECTION
DISTRICT 2 FY 95

PAGE: 2

**** LOCATION INFORMATION ****

TEAM SECTION: 231 SUBSECTION: 726 FROM: IL 26 - FORRESTON TO IL 72(W.) COUNTY: OGLE CITY:
TO: MECHANISTICALLY DESIGNED PVT. ROUTE: S026 ROUTE NAME: IL 26
CONTRACT NUMBER: 84199 HIGHWAY CLASS: R M/R: R FIELD ENGINEER: 20
LAST SURVEY DATE: 03/17/94 PAVEMENT TYPE: 10 ASPH-TF LT 15.0 (R)
LETTING DATE: 03/13/90 PAVEMENT THICKNESS (INCHES): 11.8
MAINTENANCE DATE: 12/01/91 LANE MILES: 4.4 PROJECT AGE: 4

WRK ACT	DESCRIPTION	UNIT MEAS	** FY95 MAINTENANCE PROGRAM **			** FY95 CONTRACT PROGRAM **		
			NEEDS QUANTITY	UNIT COST	TOTAL COST	NEEDS QUANTITY	UNIT COST	TOTAL COST
411	PART DEPTH PATCHES	SQYD						
412	FULL DEPTH PATCHES	SQYD						
413	BITUMINOUS OVERLAY	SQYD						
416	CRK&JT SEAL-HD POR	GALS						
515	PAVEMENT MILLING	SQYD						
516	CRK&JT ROUTING	L FT				35,600	.90	\$ 32,040
517	CRK&JT CLEAN&SEAL	L FT				35,600		\$
919	OTHER PAVEMENT	HRS						
420	PATCH&REPAIR SHLDR	TONS						
929	OTHER SHOULDER	HRS						
SUB SECTION TOTAL:					\$			\$ 32,040
MAINTENANCE PROGRAM TOTAL:					\$			
CONTRACT PROGRAM TOTAL:					\$ 32,040			
REPORT TOTAL:					\$ 32,040			

*** END OF REPORT ***

FIGURE 4 Proposed budget report by location (subsection) with quantities and cost of projected maintenance by state and contract forces.

BUDGET REPORTS

The first report in the budget series is the proposed budget report (see Figure 4), which lists each subsection, the needs quantity, the unit cost, and the estimated total cost of the maintenance or repair. When they conduct the annual needs survey, the field engineers and field technicians indicate which maintenance needs they recommend be met by state forces and which should be contracted to outside forces. A second version of the report shows the total of all maintenance and repair by work activity and the corresponding unit price and total cost.

Districts use this information to develop contracts and direct the following year's work for each activity on the selected pavement sections. The department plans to fund all contracts for work needed on these pavement sections.

The department also prepares a multiyear road program for future maintenance and repairs. The 5-year budget report (see Figure 5) provides the information needed for the multiyear road program. It shows the cost to maintain these pavements on the basis of the needs survey data and the design models. The report contains information for the current year and for the upcoming 4 years on the basis of predicted future needs. The user can insert an inflation factor if desired. The report can also be requested and printed to show the projected costs for the current and next 4 years by project age and by work activity. Finally, users can request the report on a location (subsection) basis.

Another version of the budget report is a statewide report that shows the pavement types and the projected maintenance cost for each type by district (see Figure 6).

TEAM SECTION OREGON
SUBSECTION 726

COUNTY OGLE
FROM IL 26 - FORRESTON TO IL 72(W.) HIGHWAY CLASS R M/R R
TO MECHANISTICALLY DESIGNED PVT. ROUTE NAME IL 26

WORK ACTIVITY	UNIT MEASURE	UNIT COST	***** FY95 COST *****	***** FY96 COST *****	***** FY97 COST *****	***** FY98 COST *****	***** FY99 COST *****
			SURVEY	MODEL			
412 FULL DEPTH PATCHES	SQUARE YD	75.00	\$ 0	\$ 0	\$ 12,012	\$ 0	\$ 0
516 CRK&JT ROUTING	LIN FEET	.90	\$ 32,040	\$ 0	\$ 0	\$ 2,261	\$ 0
517 CRK&JT CLEAN&SEAL	LIN FEET	.00	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0
SUBSECTION 726 TOTAL			\$ 32,040	\$ 0	\$ 12,012	\$ 2,261	\$ 0
TEAM SECTION 231 TOTAL			\$ 32,040	\$ 0	\$ 12,012	\$ 2,261	\$ 0

TEAM SECTION MT CARROLL
SUBSECTION 773

COUNTY CARROLL
FROM LAHARK TO IL 72
HIGHWAY CLASS R M/R R
TO MECHANISTICALLY DESIGNED PAVT. ROUTE NAME ILL 73

WORK ACTIVITY	UNIT MEASURE	UNIT COST	***** FY95 COST *****	***** FY96 COST *****	***** FY97 COST *****	***** FY98 COST *****	***** FY99 COST *****
			SURVEY	MODEL			
412 FULL DEPTH PATCHES	SQUARE YD	75.00	\$ 0	\$ 2,362	\$ 0	\$ 0	\$ 0
516 CRK&JT ROUTING	LIN FEET	.90	\$ 0	\$ 0	\$ 444	\$ 0	\$ 0
517 CRK&JT CLEAN&SEAL	LIN FEET	.00	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0
SUBSECTION 773 TOTAL			\$ 0	\$ 2,362	\$ 444	\$ 0	\$ 0
TEAM SECTION 241 TOTAL			\$ 0	\$ 2,362	\$ 444	\$ 0	\$ 0

TEAM SECTION STOCKTON
SUBSECTION 720

COUNTY JO DAVIESS
FROM US 20 - ELIZABETH TO BECKER RD HIGHWAY CLASS R M/R R
TO MECHANISTICALLY DESIGNED PAVT. ROUTE NAME US 20

WORK ACTIVITY	UNIT MEASURE	UNIT COST	***** FY95 COST *****	***** FY96 COST *****	***** FY97 COST *****	***** FY98 COST *****	***** FY99 COST *****
			SURVEY	MODEL			
412 FULL DEPTH PATCHES	SQUARE YD	75.00	\$ 0	\$ 0	\$ 0	\$ 6,814	\$ 0
516 CRK&JT ROUTING	LIN FEET	.90	\$ 0	\$ 17,448	\$ 0	\$ 0	\$ 1,282
517 CRK&JT CLEAN&SEAL	LIN FEET	.00	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0
SUBSECTION 720 TOTAL			\$ 0	\$ 17,448	\$ 0	\$ 6,814	\$ 1,282
TEAM SECTION 242 TOTAL			\$ 0	\$ 17,448	\$ 0	\$ 6,814	\$ 1,282
DISTRICT 2 TOTAL			\$ 32,040	\$ 19,810	\$ 12,456	\$ 9,075	\$ 1,282

FIGURE 5 Five-year budget report by work activity with projected costs for the current and next 4 fiscal years.

CATEGORY TYPE: FLEXIBLE

DIST	LANE MILES	***** FY95 *****		FY 96	FY 97	FY 98	FY 99
		SURVEY	MODEL				
1	27	\$ 25,020	\$ 0	\$ 133,248	\$ 12,766	\$ 21,355	\$ 6,892
2	7	\$ 32,040	\$ 19,810	\$ 12,456	\$ 9,075	\$ 1,282	\$ 0
3	2	\$ 0	\$ 0	\$ 6,188	\$ 1,370	\$ 0	\$ 0
4	48	\$ 0	\$ 339,463	\$ 19,971	\$ 158,936	\$ 24,468	\$ 0
5	25	\$ 0	\$ 133,771	\$ 9,631	\$ 182,879	\$ 9,834	\$ 32,026
6	193	\$ 0	\$ 395,165	\$ 296,321	\$ 103,781	\$ 10,779	\$ 689,210
7	2	\$ 120	\$ 0	\$ 8,064	\$ 1,781	\$ 0	\$ 0
8	21	\$ 44	\$ 0	\$ 59,647	\$ 129,310	\$ 32,143	\$ 74,064
9	11	\$ 1,020	\$ 0	\$ 47,247	\$ 8,086	\$ 0	\$ 0
SUBTOTAL:	341	\$ 58,244	\$ 888,212	\$ 592,756	\$ 607,968	\$ 99,865	\$ 822,194

CATEGORY TYPE: RIGID

DIST	LANE MILES	***** FY95 *****		FY 96	FY 97	FY 98	FY 99
		SURVEY	MODEL				
1	13	\$ 530,073	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0
3	268	\$ 0	\$ 0	\$ 42,387	\$ 0	\$ 35,135	\$ 363,470
4	6	\$ 0	\$ 0	\$ 0	\$ 11,754	\$ 0	\$ 0
6	29	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0	\$ 0
SUBTOTAL:	317	\$ 530,073	\$ 0	\$ 42,387	\$ 11,754	\$ 35,135	\$ 363,470

STATEWIDE TOTAL: 659 \$ 588,317 \$ 888,212 \$ 635,144 \$ 619,722 \$ 135,001 \$ 1,185,664

*** END OF REPORT ***

FIGURE 6 Proposed 5-year budget report summarized by district with projected costs for the current and next 4 fiscal years.

MONITORED PAVEMENT
CONTRACT/DAY LABOR INFORMATION

ACTION IND: (Add, Inquiry, Change, Delete)
TEAM SEC: SUBSEC: FY: CONTRACT (C) OR DAY LABOR (D):

S = SELECT	WORK ACT.	CONTRACT QUANTITY	CONTRACT COST	REMARKS
.	.	.	\$.	.
.	.	.	\$.	.
.	.	.	\$.	.
.	.	.	\$.	.
.	.	.	\$.	.
.	.	.	\$.	.
.	.	.	\$.	.
.	.	.	\$.	.
.	.	.	\$.	.
.	.	.	\$.	.

(ENTER PF1 THEN 'E' TO EXIT) *** MESSAGES *** (ENTER PF1 THEN 'C' TO CLEAR)

FIGURE 7 Contract/day labor information screen to enter quantities and costs by location (subsection) and work activity.

MMIS323/MMITA319/MMIFF321 04/21/94 16:24:30
 DAILY FIELD WORK ACCOMPLISHMENT CREW REPORTING PAGE 3 OF 3
 1=LBR,2=EQ,3=MATL
 ACTION IND: I (Add,Inquiry,Change,Delete) PAGE REQUEST: 3
 WORK DATE (MM/DD/YY): 04/19/94
 ORG. TEAM SEC: 731 WORK ACT CODE: 410 PERF IND: LEAD WORKER NBR: 32
 WORK LOCATION> SEC: 731 SUB: 370 SPCL DSG: BRIDGE: - -
 WORK ACCOMPLIS

S= MAT
 SEL CD MATE

 14 BITUMI

(ENTER PF1 T
 INQUIRY SUCCES-
 PRESS THE RETU

MMIS323/MMITA319/MMIFF320 04/21/94 16:24:49
 DAILY FIELD WORK ACCOMPLISHMENT CREW REPORTING PAGE 2 OF 3
 1=LBR,2=EQ,3=MATL
 ACTION IND: I (Add,Inquiry,Change,Delete) PAGE REQUEST: 2
 WORK DATE (MM/DD/YY): 04/19/94
 ORG. TEAM SEC: 731 WORK ACT CODE: 410 PERF IND: LEAD WORKER NBR: 32
 WORK LOCATION> SEC: 731 SUB: 370 SPCL DSG: BRIDGE: - -
 WORK ACCOMPLISHED QTY: 1.0 SPCL PROJ NO: EQUIPMENT

S=SELECT I
 R=REPEAT N

 T

(ENTER PF
 INQUIRY SUC
 PRESS THE R

MMIS323/MMITA319/MMIFF319 04/21/94 16:25:02
 DAILY FIELD WORK ACCOMPLISHMENT CREW REPORTING PAGE 1 OF 3
 1=LBR,2=EQ,3=MATL
 ACTION IND: I (Add,Inquiry,Change,Delete) PAGE REQUEST: 1
 WORK DATE (MM/DD/YY): 04/19/94
 ORG. TEAM SEC: 731 WORK ACT CODE: 410 PERF IND: LEAD WORKER NBR: 32
 WORK LOCATION> SEC: 731 SUB: 370 SPCL DSG: BRIDGE: - -
 WORK ACCOMPLISHED QTY: 1.0 SPCL PROJ NO: WAGE
 ----- OVERTIME ----- PREM TEMP
 S=SEL EMP BORRWD START AM STOP AM WORK REG. STGT TIME & DOUBLE CODE ASG COM-
 R=REP ID EMP TS TIME PM TIME PM HR/MN HR/MN TIME A HALF TIME BCPT ID MUTE

 JEN 7:30 A 4:00 P 8/00 8/00 / / / .
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 : : / / / / / .
 : : / / / / / .
 (ENTER PF1 THEN 'E' TO EXIT) *** MESSAGES *** (ENTER PF1 THEN 'C' TO CLEAR)
 INQUIRY SUCCESSFUL - NO MORE LABOR RECORDS FOUND FOR THIS ACCOMPLISHMENT RECORD
 PRESS THE RETURN KEY TO INQUIRE ON ADDITIONAL ACCOMP RECORDS WITH THE SAME KEY

FIGURE 8 Daily field reporting of labor (page 1), equipment used (page 2), and material (page 3).

MMIS366/MMITA343/MMIFF364

04/25/94 09:42:20

PAVEMENT TYPE TABLE

ACTION IND: I (Add, Inquiry, Change, Delete)

S = SELECT	PAVEMENT TYPE CODE	PAVEMENT TYPE DESCRIPTION	PAVEMENT CATEGORY CODE
	10	ASPH-TF LT 15.0 (R)	F
	11	ASPH-TF LT 10.0 (U)	F
	20	ASPH-TF GT 15.0 & LT 24.5 (R)	F
	21	ASPH-TF GT 10.0 & LT 16.3 (U)	F
	30	ASPH-TF GT 24.5 & LT 34.0 (R)	F
	31	ASPH-TF GT 16.3 & LT 22.7 (U)	F
	40	ASPH-TF GT 34.0 (R)	F
	41	ASPH-TF GT 22.7 (U)	F
	50	HINGE-JOINTED CONCRETE	R
	60	CONT. REINFORCED CONCRETE-CRCP	R

(ENTER PF1 THEN 'E' TO EXIT) *** MESSAGES *** (ENTER PF1 THEN 'C' TO CLEAR)

INQUIRY SUCCESSFUL - TO CONTINUE IN THE INQUIRY MODE, PRESS THE RETURN KEY

FIGURE 10 Pavement type table with pavement type description and pavement category code.

Districts and state budget and program planners also make use of this information in developing the funding requirements for the multiyear program.

PERFORMANCE AND COST ENTRY

The contract information screen enables district personnel to enter the work activities that have been contracted, as-built contract quantities, and final contract costs (see Figure 7). Correspondingly, the work by state maintenance forces is entered through the normal MMI system procedure of daily field reporting of work accomplishments (see Figure 8). This reporting includes the work accomplished and calculated cost for labor, equipment, and materials consumed. These entry screens support the remaining reports.

PERFORMANCE, COST, AND ADHERENCE REPORTS

An important facet of the program of maintenance for these pavement sections is to ensure that maintenance and repair are performed as required and according to the predicted needs. The department's policy is to perform maintenance of these pavement sections when needed. A special contract maintenance fund has been established to support the policy.

The performance, cost, and adherence report (see Figure 9) provides information concerning the quantities of maintenance projected by the models or collected by the needs surveys to compare with actual accomplishments either performed by contract, the state's day labor forces, or district maintenance forces. It also includes a comparison of the cost of the work and the projected or estimated cost of the work. This is a feedback report to district managers, field engineers, and field technicians to help them determine which maintenance tasks have been performed and which remain.

A second report in the series, the maintenance cost/mile/year summary report, shows the overall cost per mile to maintain these pavements by year. Using this report, department executives can compare the long-term cost of maintenance for each of the various types of pavements.

TABLES

Several tables and entry screens are required to support the system. The first is the pavement type table (see Figure 10). In Illinois, six pavement types are included in the monitoring plan and the program of maintenance. The pavement type table contains the pavement type code, the description, and the pavement category code. A monitored pavement cost analysis schedule table (see Figure 11) is included for each pavement type. This table contains the design model information: pavement age at which the

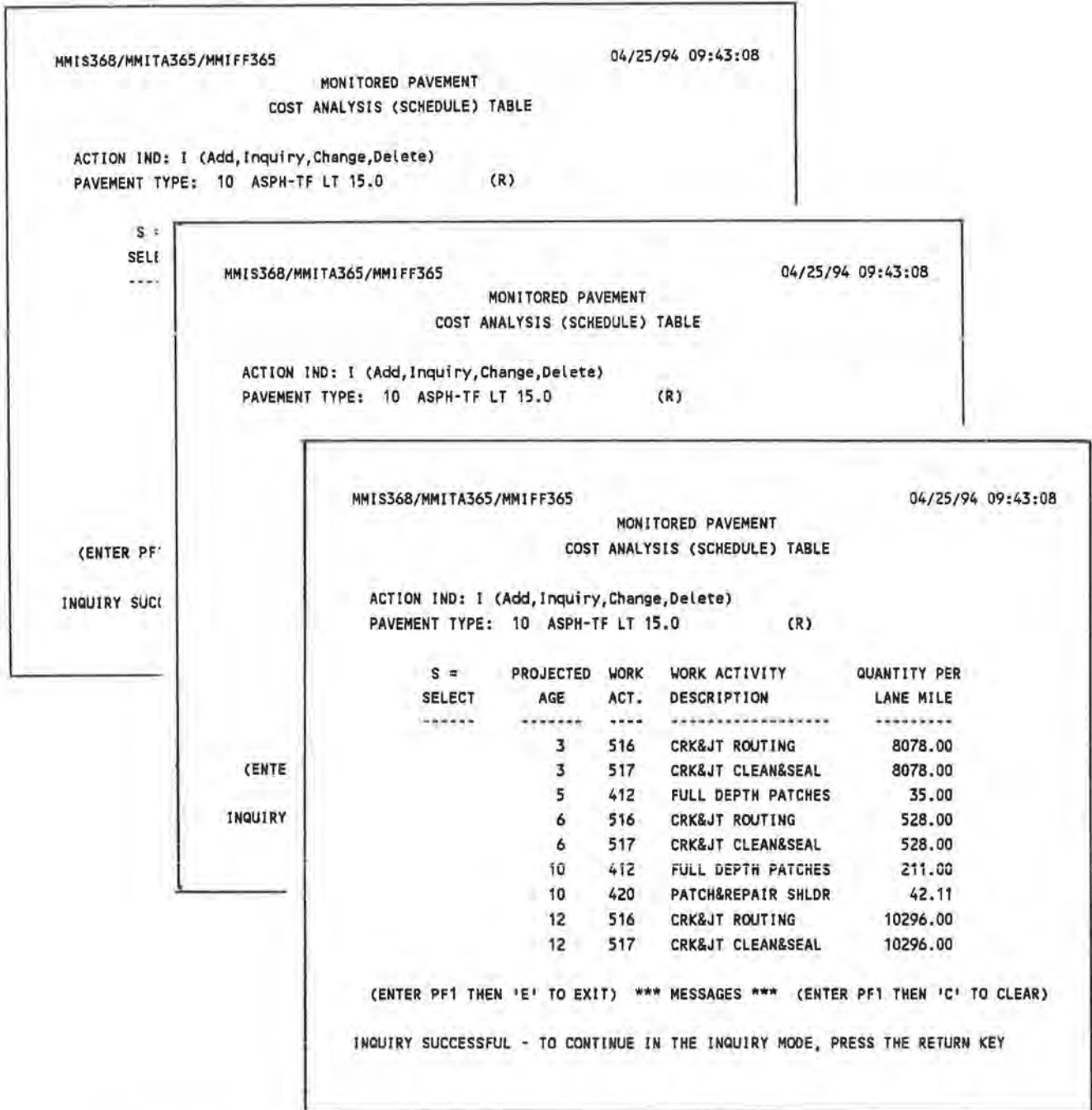


FIGURE 11 Monitored pavement cost analysis (schedule) table with projected age for the work activity and quantity per lane mile.

MMIS374/MMITA366/MMIFF366		04/25/94 15:56:59	
MONITORED PAVEMENT UNIT COST TABLE			
ACTION IND: I (Add,Inquiry,Change,Delete)			
DISTRICT: 2 FY: 95 PAVEMENT CATEGORY: R RIGID			
S = SELECT -----			
MMIS374/MMITA366/MMIFF366		04/25/94 09:47:29	
MONITORED PAVEMENT UNIT COST TABLE			
ACTION IND: I (Add,Inquiry,Change,Delete)			
DISTRICT: 2 FY: 95 PAVEMENT CATEGORY: F FLEXIBLE			
S = SELECT -----	WORK ACT.	WORK ACTIVITY DESCRIPTION	UNIT COST
	412	FULL DEPTH PATCHES	\$ 75.00
	413	BITUMINOUS OVERLAY	\$ 116.26
	420	PATCH&REPAIR SHLDR	\$ 26.88
	515	PAVEMENT MILLING	\$.75
	516	CRK&JT ROUTING	\$.90
			\$.
			\$.
			\$.
			\$.
(ENTER PF1 THEN 'E' TO EXIT) *** MESSAGES *** (ENTER PF1 THEN 'C' TO CLEAR)			
INQUIRY SUCCESSFUL - END OF DATABASE HAS BEEN REACHED			

FIGURE 12 Unit cost tables by district, pavement category, and work activity.

maintenance or repair is expected, work activity to be performed, and the projected quantity per lane mile to be accomplished. The unit cost table (see Figure 12) contains the work activity codes and their unit costs for each pavement type. These tables apply statewide. Therefore, they can be altered or changed only by engineers in the central bureau.

CONCLUSION

The Illinois Department of Transportation has embarked on a procedure to monitor and include in a program of maintenance selected newly designed pavement sections

built by the state. Pavements included are those meeting certain criteria. The monitoring plan and the program of maintenance are to collect data for 40 years on each of these pavement sections. The department now has an up-to-date inventory of the pavement sections included. The pavement sections are inspected each year, and maintenance needs are noted and entered into the MMI system. As maintenance is performed by contract or state forces, the department is assured that quantities and actual costs are recorded and compared with projected or estimated quantities and cost. The department has reports readily available that enable department managers at all levels to review projections of needs for the current and the next 4 years for budget planning and program develop-

ment. In the field the pavements are maintained properly and according to standard engineering practice. None are neglected.

Through use of the data collected and stored by the MMI system, the department has the information to ensure (a) that department managers, including field technicians, field engineers, and the bureau chiefs in the districts and central bureaus receive data useful for making decisions and carrying out the required maintenance on these pavement sections and (b) that the predicted needs models can be evaluated against actual performance so changes can be made as needed.

The pavement sections in the program of maintenance are in the early years of their design life. Maintenance and repair needs have been minimal so far. More pavement sections will be added to the program of maintenance as required. The department is prepared for the time when maintenance and repair of these pavements sections are needed. As a result, the department will have information available to enhance their design, alter maintenance models, improve pavement selection, and build even better pavements in the future.