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CHAPTER FOUR

TRANSPORTATION MANAGEMENT

4-1.0 BACKGROUND

The *Intermodal Surface Transportation Efficiency Act of 1991* (ISTEA) requires the development and implementation by INDOT of six transportation management systems. The impetus for the mandate is the aging of the nation's highway and transit systems. Planning must therefore focus on how to use these systems more effectively and how to address the public's performance expectations.

Management systems are a key element in addressing these concerns and effectively managing existing transportation systems and resources. Therefore, Congress included the transportation management systems in ISTEA as follows:

1. Pavement Management System (PMS) Federal-aid highway only;
2. Bridge Management System (BMS);
3. Safety Management System (SMS);
4. Congestion Management System (CMS);
5. Public Transportation and Equipment Management System (PTMS); and
6. Intermodal Management System (IMS).

The FHWA/FTA regulations to implement ISTEA provide a common framework for all six management systems. Each management system should reflect a systematic process designed to assist decision makers in selecting cost-effective strategies and actions to improve the efficiency and safety of, and protect the investment in, the nation's transportation infrastructure. The results of the management systems should be incorporated into the Statewide and metropolitan planning processes and into the development of the State Transportation Improvement Program (STIP) and the metropolitan Transportation Improvement Program (TIP).

Each transportation management system should include the elements as follows:

1. identification of performance measures;
2. data collection and analysis;
3. determination of needs;
4. evaluation and selection of appropriate strategies and actions to address needs; and
5. evaluation of the effectiveness of the implemented strategies and actions.

The *National Highway System Designation Act of 1995* relaxed the requirements of ISTEA by making the management systems optional. However, INDOT has decided to develop and implement all six systems. A brief discussion of each system follows.

4-2.0 MANAGEMENT SYSTEMS

4-2.01 Pavement Management System

INDOT initiated the current Pavement Management System (PMS) in 1989 based on the Federal Highway Administration (FHWA) requirements. Subsequent regulation by Congress (ISTEA) and FHWA have further regulated the development and expansion of the PMS procedures.

The Planning Division's Roadway Inventory Team is responsible for the development of the PMS for use by INDOT. The Team is responsible for collecting pavement condition data for each State highway, generating information from the data for use in programming each preservation project, and monitoring the condition of each State highway. The information aids in informed decision-making for a programming project, pavement design, and pavement material selection.

A primary goal of the PMS is to provide the necessary engineering and economic tools to make decisions on preserving an INDOT pavement. One of these tools is gathering information to provide quantifiable pavement needs and data on other roadway items such as geometrics and roadside barriers. Cost-effective techniques are used to gather roughness, pavement condition, rutting, and video log data for each INDOT route in one pass for the PMS. At the same time, inventories have been constructed from the videos for other systems and INDOT divisions. These include speed limits, no-passing zones, guardrail and end treatments, limited GPS points and data on medians, shoulders, and geometrics.

The Roadway Reference System is another tool for INDOT developed and maintained by the Roadway Inventory Team. This system provides a unified-location reference system to link road location with road data. Each project location description must include the reference post start and end point on the plans and project description. Both printouts and live data base access are available from PMS to locate the correct reference post for a project.

The Roadway Reference System is used on each State highway. It consists of signposts placed at nominal 1 mi intervals. All PMS data is recorded by the reference-post-location method. The signpost numbering is continuous from the beginning of the route to the end. The zero point, or beginning, of the route is at its southern or western extremity, and the number increases in the northward or eastward direction. Each bridge is signed with its reference-post location. Each post is a benchmark for locating projects and features. The reference signs must be located for each construction project and be preserved in the end. A manual which explains the reference-post-location system is available from each district's Office of Design.

The Roadway Inventory Team can provide operations research analysis of pavement materials, building techniques, and overall pavement performance. This involves examining past and present performance information and projecting trends for the expected life of the pavement for various materials and techniques. This is part of a life-cycle cost analysis which can provide information on the effectiveness of pavement treatment. The Roadway Inventory Team provides this analysis for determining each project for programming. Contact the Roadway Inventory Team for details and additional information.

4-2.02 Bridge Management System

The Bridge Management System (BMS) will be used as a planning tool to identify each proposed project with a recommended action, cost, priority ranking, and optimized listing based on a set budget. Programming of a bridge project is based on recommended actions of the IBMS, district review and recommendations, and integration with other management systems.

The Planning Division is responsible for developing and maintaining the Bridge Management System in cooperation with Purdue University. An Indiana Bridge Management Advisory Committee (IBMAC), consisting of metropolitan planning organizations (MPOs), county engineers, county commissioners, the Indiana Local Technical Assistance Program (LTAP), Consulting Engineers of Indiana, and FHWA, was involved in preparing recommendations and developing processes for the IBMS. Currently, the BMS is in the development phase. The software will use data collected through the biennial National Bridge Inspection program as input data.

The Bridge Management System is a decision support tool that supplies analysis and summaries of data, uses mathematical models to make predictions and recommendations, and provides the means to efficiently evaluate alternative policies and programs. The System includes a database and an ongoing program for the collection and maintenance of the inventory, inspection, cost, and supplemental data needed to support it. The System also includes a rational and systematic procedure for applying network level analysis and optimization to the bridge inventory. The procedure has the capabilities as follows:

1. forecast a probable rate of deterioration of bridge elements;

2. identify feasible actions to improve bridge conditions, safety, and serviceability;

3. estimate the cost of recommended actions;

4. estimate expected user-cost savings for safety and serviceability improvements;

5. determine least-cost repair and rehabilitation strategies for bridge elements using life-cycle cost analysis;

6. perform multiperiod optimization; and

7. generate summaries and reports as needed for the planning and programming process.

4-2.03 Safety Management System

Since the passage of the *National Highway System Designation Act of 1995*, the Safety Management System (SMS) has been refocused to produce the tools that will select and prioritize Department projects and programs. This effort will aid in efficiently using Safety set-aside funds and aid in justifying other projects. SMS will also produce Statewide statistics for Highway Performance Monitoring System (HPMS) reporting and will help support and justify larger projects by predicting expected crash reductions due to proposed improvements.

The Safety Management System will continue to be based on the goal of reducing the number and severity of traffic accidents by ensuring that all opportunities to improve highway safety are identified, considered, implemented as appropriate, and evaluated in all phases of highway planning, design, construction, maintenance, and operation. The Department will continue the development of crash-reduction factors, improve the selection process for hazardous locations, and develop procedures for selecting and producing prioritized lists of safety projects and programs.

The primary responsibility of the Planning Division's Safety Team is to extract traffic crash data from Indiana State Police crash records, and compile summaries of traffic crash data on all State and local routes. This activity involves maintaining a road-name-to-pseudo-number listing. This listing is the basis for traffic crash locations within the State Police database.

The Safety Team provides, upon request, summaries of crash statistics for each intersection, or, Statewide, by route system. The summaries for each intersection are used to support the development of the SMS, and are used by Production Management Division's Office of Environmental Services for project scoping. The SMS uses the route-system summaries to determine high-hazard locations and to determine system-wide statistics used to support data requirements of the HPMS.

4-2.04 Congestion Management System

INDOT is developing a Statewide Congestion Management System (CMS). The CMS will identify present and future congestion levels. The CMS will also propose and evaluate congestion mitigation strategies and will provide recommendations for each project or program for consideration in the

development of Statewide and metropolitan transportation and improvement programs. In addition, each transportation management area (TMA), as part of its transportation planning process, is required to have an operational CMS. INDOT will continue supporting the TMAs in this effort.

A Statewide report that assesses the level of congestion for each State highway has been completed. Refinements to this assessment are continuing. The CMS recommends congestion management strategies and methods for their evaluation and selection. It includes a prototype on how to best simulate congested corridors to evaluate mitigation strategies. The CMS will also provide technical support for Indiana's involvement with building an Intelligent Transportation Infrastructure (ITI), which is the marriage of telecommunications, information, and computer technologies to relieve traffic congestion.

The CMS will be coordinated with the Public Transportation Management System (PTMS) and the Intermodal Management System (IMS), as discussed in the following Sections.

4-2.05 Public Transportation Management System

The Public Transportation Management System (PTMS) will serve as an informational tool to assist INDOT and the MPOs in making sound investment decisions on existing and future transit assets. The PTMS will establish a process for the collection of data on the age, condition, useful life, and replacement value of transit facilities and equipment to aid in the selection of the most cost-effective strategies for providing and maintaining transit assets. The overall intent of the PTMS is to facilitate an ongoing, Statewide assessment of the condition of transit assets to identify and prioritize investment needs.

The PTMS will function primarily as an asset management system, as opposed to other management systems that emphasize operational performance. It will be linked with the CMS and IMS. The PTMS will provide information on the condition and capacity of assets in a given region to support the evaluation of transit alternatives identified by the Congestion Management System. This portion of the Congestion Management System will then support the transit components of the Intermodal Management System.

The work elements for completion of the PTMS are as follows.

1. Definition of PTMS Elements. This task will determine which PTMS elements must be included to meet the needs of INDOT and the MPOs. Transit operators, INDOT, and the MPOs will assist in defining the PTMS elements.

2. Identification of Required Data. INDOT will work with the MPOs and transit operators to identify which types of data are readily available to support the defined elements of the PTMS.

3. Data Collection. INDOT will collect rolling stock data using the Annual Report Survey form. Facility and equipment information will be acquired through on-site visits with each transit system. INDOT already maintains operating and performance data for all transit systems.

4. Database Development. Separate databases will be structured and maintained for rolling stock and facilities/equipment. Each database will be compatible with all other management systems and with INDOT's Public Transit Annual Report database.

5. Condition Assessment Procedure. A consistent procedure for the assessment of the base-year condition of transit assets will be developed within the database. This procedure will follow a rating approach. This will enable the PTMS to identify current and future conditions of transit assets. Useful life, physical condition, and route-miles data will be part of this procedure.

6. Performance Assessment Procedure. A series of performance measures will also be built into the PTMS database. This process will identify deficiencies associated with the maintenance of transit assets, and prevent INDOT from investing in a project that resulted from poor maintenance practices.

7. Prioritization Procedure. A prioritization procedure will be established in cooperation with the MPOs and transit operators. The items that may be included are service maintenance performance, safety performance, financial performance, and compliance with regulatory and statutory requirements (e.g., ADA, Clean Air Act).

8. Modeling Framework of PTMS. This task will involve the integration of the PTMS database, condition assessment procedure, performance assessment procedure, and prioritization procedure to establish a functional management system. The modeling approach will allow these PTMS components to interact and generate output that identifies and prioritizes the capital needs associated with public transportation.

Operation of the PTMS will allow INDOT and transit operators to plan for transit capital investments in an integrated and cooperative manner. The PTMS will serve INDOT, MPOs, and transit operators with a valuable decision-making tool and, concurrently, provide an information resource for Statewide planning purposes. The net effect of a well-developed and properly-implemented PTMS will be improved public transportation performance. This improvement in public transportation will help reduce congestion in each urban area, improve travel safety, reduce travel costs to the tax-paying public, and improve service to the population with special mobility needs.

4-2.06 Intermodal Transportation System

4-2.06(01) Background

INDOT has developed an Intermodal Management System (IMS) to evaluate the performance of intermodal transportation investments as part of the Statewide transportation planning process. This planning process recognizes the shift from our historical emphasis on individual modes, to that of intermodalism as a means of increasing economic competitiveness by minimizing the cost of transportation.

The INDOT Intermodal Management System Report (October 1997) was developed in a cooperative effort with major transportation stakeholders. The Planning Division developed the IMS in conjunction with Freight and Passenger Advisory subcommittees. These subcommittees contained representatives of other INDOT divisions, Federal agencies, metropolitan development organizations, trade associations, facility managers, and individual mode operators and transportation providers.

4-2.06(02) Definition

The Intermodal Management System (IMS) is a systematic process that provides for the efficient, safe, and convenient movement of people and goods through the integration of transportation facilities and systems. The IMS improves the coordination in planning and implementation of air, water, and various land-based transportation facilities and systems. Intermodal transportation is viewed from the perspective of the total trip. The IMS planning process identifies transfers and interactions among modes. The IMS is a systematic process of the following.

1. identifying key linkages among one or more modes of transportation, where the performance of one mode will affect another;

2. defining strategies for improving the effectiveness of these modal interactions; and

3. evaluating and implementing these strategies to enhance the overall performance of the transportation system.

4-2.06(03) Identification of Key Linkages

The National Highway System (NHS) constituted the starting point for the development of the IMS. In 1995, INDOT worked with FHWA to identify intermodal passenger and freight facilities that qualified under Federal criteria for NHS access to define a network of NHS Intermodal Connectors. The intermodal facilities, NHS, and other State highways were analyzed in a geographic information

system (GIS). Seventeen major intermodal facilities of National Significance were identified in this effort. In the development of the IMS, an additional twenty-four major Intermodal Facilities of Statewide Significance were identified in a cooperative effort by the Freight and Passenger Subcommittees as shown in Figure 4-2A, Facilities with National/Statewide Significance, and in the Indiana Intermodal Facilities map.

4-2.06(04) Connecting Links Between the NHS and Major Intermodal Facilities

The IMS process developed access links connecting the Intermodal Facilities by working with local MPOs and facility managers/operators. Each connecting link may have a State-jurisdictional element and a local-jurisdictional element. The connecting links between the Intermodal Facilities of National Significance and the NHS may qualify for NHS funding. The connecting links between the NHS and Intermodal Facilities of National or Statewide Significance are awarded points in determining proposed project priority in the Office of Environmental Services Priority Setting Procedures. The connecting links for major intermodal facilities are shown in maps for the regions as follows:

a. Bloomington and Terre Haute;
b. Clark County;
c. Elkhart;
d. Evansville;
e. Gary;
f. Fort Wayne;
g. Indianapolis;
h. Kokomo and Anderson;
i. Lafayette and Remington;
j. Northwestern Indiana;
k. Portage;
k. South Bend; and
m. Waterloo/Garrett.

4-2.06(05) IMS Strategy Recommendations

The IMS analysis results conclude that the intermodal deficiencies in Indiana were less severe than in other states due to our well-developed transportation infrastructure. The major area of concern to the IMS Advisory Committee primarily addressed safety deficiencies. Based upon the analysis of the performance of the connecting linkage highways, safety action recommendations were made for four intermodal connectors and mobility action recommendations were made for five intermodal connectors. Other strategy recommendations included the need for INDOT to develop a multi-

modal and economic development focus in project identification and prioritization (see the October 1997 IMS Report for details).

		Facility Type	Name
National Significance	1	Airport (Pass./Freight)	Indianapolis International
	2	Airport (Passenger)	South Bend Michiana Regional
	3	Airports(Passenger)	Fort Wayne International
	4	Airport (Passenger)	Evansville Regional
	5	Airport (Freight)	Hulman Regional
	6	Intercity Bus	Tri-State Coach
	7	NICTD Station	Hammond
	8	NICTD Station	East Chicago
	9	NICTD Station	Gary Metro
	10	NICTD Station	Dune Park
	11	Rail/Truck Intermodal	Indianapolis Avon Yard
	12	Rail/Truck Intermodal	Fort Wayne Triple Crown
	13	Port	Burns International Harbor
	14	Port	Southwind Maritime Centre
	15	Port	Clark Maritime Centre
	16	Port	USX Steel
	17	Port	Mulzer Stone, Evansville
Statewide Significance	18	Airport (Passenger)	Purdue University – Lafayette
	19	Airport (Passenger)	Clark County
	20	Airport (Passenger)	Hulman Regional
	21	Airport (Passenger)	Eagle Creek Airpark
	22	Airport (Passenger)	Elkhart Municipal
	23	Airport (Passenger)	Monroe County
	24	Airport (Passenger)	Anderson Municipal
	25	Airport (Passenger)	Kokomo Municipal
	26	Amtrak Station	Indianapolis
	27	Amtrak Station	Hammond
	28	Amtrak Station	South Bend
	29	Amtrak Station	Elkhart
	30	Amtrak Station	Waterloo
	31	Amtrak Station	Lafayette
	32	Amtrak Station	Garrett
	33	Intercity Bus Station	Union Station, Indianapolis
	34	NICTD Station	South Bend
	35	Park N Ride	Indiana University, Bloomington
	36	Port	Inland Steel
	37	Port	LTV Steel
	38	Port	Mulzer Stone, Newburgh
	39	Rail/Truck Intermodal	Roanoke General Motors Facility
	40	Rail/Truck Intermodal	Evansville CSX
	41	Rail/Truck Intermodal	Hoosier Lift, Remington

FACILITIES WITH NATIONAL OR STATEWIDE SIGNIFICANCE

Figure 4-2A