Tennessee's Programing Study: First Year's Experience and Techniques for Updating

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● IN 1956 the Tennessee Department of Highways completed drawing up a 5-year program aimed at correcting the most serious deficiencies on the state highway system.[1] This program worked so well during the past year that the Department now has formulated the techniques and procedures for perpetuating the program and for always keeping it abreast of current demands and conditions in the future.

The criteria and methods used in determining deficiencies and priorities and in organizing the selected projects into the original 5-year program were described at the 36th Annual Meeting. The present paper is a sequel to that presentation. It reports the success that attended the first year's operation of the program; it attempts to explain why the operation has been so successful; and it goes on to describe how this experience has been utilized in devising a continuing process of record keeping, appraisal and programing by which the long-range development of the state highway system can be guided and achieved in an orderly and rational manner.

THE FIVE-YEAR PROGRAM EXPERIENCE

The adoption of the initial 5-year program marked an important milestone in the management of Tennessee's state highway system. Although it did not change the objective of highway administration—that has always been the steady improvement of the state's basic network—it did provide for the first time a consistent and technically sound method for deciding how improvement could best proceed.

That by itself was a significant step toward more efficient highway management, but it was only a first step. The really decisive achievement is that this program based on a thorough engineering analysis of the facts not only was adopted by the Department, but has been generally accepted by Tennessee people and their legislative representatives as a fair and efficient method of planning highway development.

It is an axiom that free government depends on popular approval and that, if its operations are to be successful and constructive, approval must be based on the intelligent and enlightened self-interest of the people. The fundamental theory of such a government is that the people are wise, or at least that they are able to choose between good and bad measures and methods. That ability is especially pertinent to the provision of public services like highways which are used by the whole population and which are essential to the functioning of the community.

Every citizen is keenly interested in highways and demands for himself the fullest possible benefit from their services. This interest and demand are by no means lessened by the fact that comparatively few individuals have any great knowledge of the engineering and financial problems involved in developing and operating a highway system. That is the reason that highway authorities usually are bombarded with constant demands for road improvements that may or may not be justified by conditions.

Very frequently highway officials themselves lack established means for weighing the relative merits of the demands and are forced to rely on their experience and judgment for the purpose. Even when criteria have been developed and are used, they sometimes are not of a character which is intelligible and convincing to the general public and its spokesmen. As a result, capable engineers with sound plans find themselves without effective evidence to support their programs against the weight of earnest, sincere, but ill-informed pressures.

In undertaking the studies which produced Tennessee's short-range program, a major purpose was to provide its highway authorities with a tool that would be useful under such circumstances.

HOW THE PROGRAM WAS LAUNCHED

The 5-year program began to influence the Department's decisions and activities before the program itself was either completed or formally adopted. The studies and analyses involved in the program project were performed by engineers from the Automotive Safety Foundation and the Tennessee Department of Highways. Engineers from all divisions of the Highway Department took an active part and interest in the programing work and were, therefore, completely familiar with the program when it had been completed.

While the program was in its final stage, but clearly marked for adoption, there were numerous inquiries as to how various projects were rated. The chief engineer obtained an advance preliminary copy for use in programing work for current lettings. The maintenance section found similar information useful to avoid planning heavy maintenance operations on roads soon to be rebuilt. Many legislators came in to see how their constituencies were affected.

When finally completed and adopted, the program was released and explained to the press by the state highway commissioner, the chief engineer and other key officials. Full information was given also to such interested organizations as the County Services Association, the Municipal League, the County Judges Association, and the Tennessee Road Builders.

The value the Department puts on the program is indicated by the fact that, although it was not adopted until November 1956, the state construction schedule for 1957 includes most of the projects given a first priority rating by the program studies. Also the coordination of location surveys, soil surveys, plans preparation and acquisition of rights-of-way has been greatly improved by the top level approval and use of the program. Contrary to the expectations of many, public acceptance of the program was good and the opinion was generally expressed that a step had been taken in the right direction.

REASONS FOR PUBLIC ACCEPTANCE

There are a number of solid reasons for the Department's confidence in the program, for the respectful attention given it by press and public, and for the degree to which they have accepted it as a trustworthy guide toward sound highway improvement. Adoption of the programing method won approval throughout the Department because of the general recognition of the need for such a method and because so many department engineers knew, through participation, what painstaking care had been used in devising it. The planning division could proceed only so far in evaluating the sections for improvement. Responsible engineers were informed of the methods used and their knowledge and experience was sought to appraise the reasonableness of the selected projects, and evaluate immeasurables not otherwise considered. These responsible engineers worked with the program until it became their program. Public acceptance came when the people became familiar with the fundamental reasonableness of the criteria and methods used.

To understand why these gratifying results were obtained, it will be necessary to review very briefly some of the facts presented at the January meeting of the Board. The paper referred to can be found in the Highway Research Board Bulletin 158 entitled "Priorities Determination and Programming in Tennessee."

BASES AND SCOPE OF THE PROGRAM STUDY

The studies for the 5-year program were an outgrowth of the Highway Needs Study conducted in Tennessee by the Automotive Safety Foundation with the cooperation of state, county and municipal highway agencies in 1954 and 1955. Major products of the needs study, as reported late in 1955, were listings of the state highway sections found to be deficient at that time and of those sections which would become deficient during succeeding 5-year periods.

The 5-year program studies were undertaken by the Department to devise means for correcting the existing deficiencies and to determine the priorities of their respec-

tive claims for attention. In the meantime, however, Congress appropriated funds for accelerated construction of the National System of Interstate and Defense Highways and accomplishment of that huge task will be programed separately from the remaining mileage. The 5-year program was limited, therefore, to remedying critical deficiencies on the remaining state mileage to the extent possible with available funds.

CHARACTER OF THE CRITERIA AND METHODS

Because there were a great number—about 1,600—highway sections which had been adjudged presently deficient by the Needs Study, it was necessary to break down this big backlog into groups of manageable proportions. This was done, first, by alloting the funds available for the program to the different classes of highway in each of the Department's four administrative divisions according to their proportion of total dollar needs and this includes both rural and urban needs over the entire period of time needed to bring all systems to adequacy; and, second, by determining the priorities for expenditure of the alloted funds among the deficient sections on each class of highway. The road systems included in this program are FAP rural, FAP urban and other state highways, rural and urban.

The distribution of improvements throughout the whole area of the state appealed to everyone as just and desirable, but perhaps what contributed most to public acceptance of the program were the means adopted for determining priorities.

Deciding which jobs should be done first is fundamentally important to good highway management, but it also is difficult. It deals with complex problems of structural design and condition and of traffic operation and accommodation. Criteria and procedures adopted for priority determination may become so involved in the details of these factors as to be understandable only to the engineers and statisticians who formulate them.

The studies for the 5-year plan did not bypass these complexities, but they did adopt certain directions of approach which brought details into focus in forms intelligible to the interested layman. The criteria selected to measure the relative priorities among deficient rural and urban sections are examples of the simple forms used to represent the end results of intricate analyses and computations.

After much study of and experiment with the data available for the several highway sections, three criteria were chosen as basically significant. These are dependability or structural condition, facility of movement, and safety.

While these criteria were selected as the best tests of adequacy for all roads and streets, differences of conditions, usage and the availability of data between rural and urban highways required one important change and some modification of application.

Highway dependability was based on appraisals of the surface, subgrade and drainage, but the combined effects of these factors could be presented as a single factor, rideability, which is the criterion by which people judge the physical condition of a road or street.

Facility of movement, to the popular ear, has a very vague meaning. In appraising the deficient rural sections, however, this factor was measured in terms of the "actual average speed" permitted by existing conditions of roadway design, alignment and traffic. Urban sections were appraised for facility of movement in terms of the degree of congestion imposed on existing traffic volumes by the conditions which affect street capacity. "Speed" and "congestion" are terms which the motorist readily understands and uses in describing the quality of travel service afforded by highways and streets.

Safety expressed in terms of traffic accidents per mile of roadway, is a simple and realistic measure of highway hazard and is easily intelligible to both engineers and laymen. This criterion was used for rural highways, but data regarding urban accidents was lacking at the time the studies for the 5-year program were made. For street appraisals, another factor representing route features which affect traffic accommodation as well as hazards, was used in place of an accident ratio.

A scoring system was used to register the appraised condition of each deficient section of rural and urban highway with regard to each of these three criteria. When all the deficient sections of one class of rural highway or of urban state routes in one of the Department's territorial divisions had been so appraised and scored, the scores

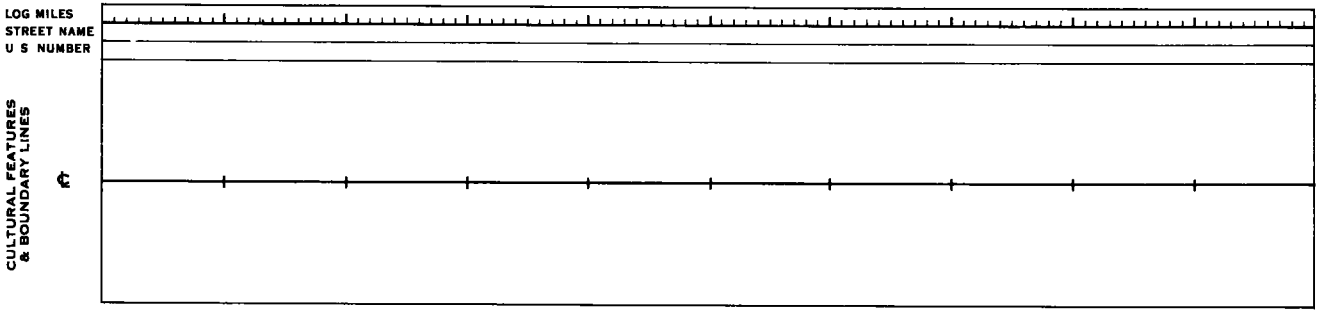
RURAL HIGHWAY PROGRAM CONTROL SHEET

STATE OF TENNESSEE
DEPT OF HWYS AND PUBLIC WORKS

HIGHWAY PLANNING
SURVEY DIVISION

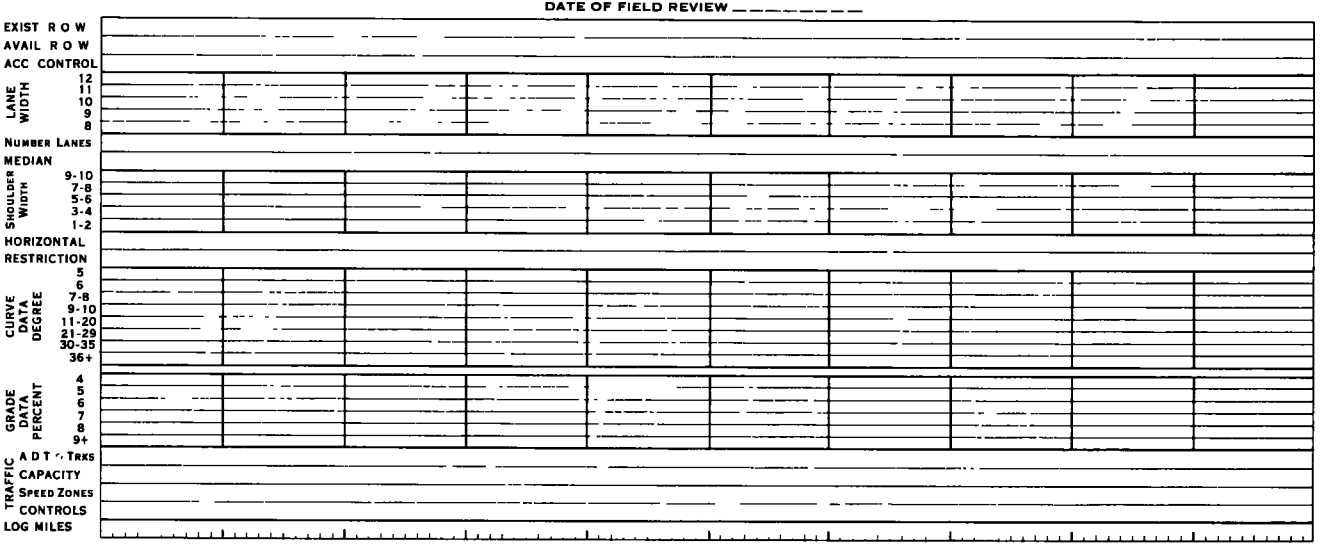
SECTION I — STRAIGHT LINE DIAGRAM

DATE OF FIELD REVIEW _____



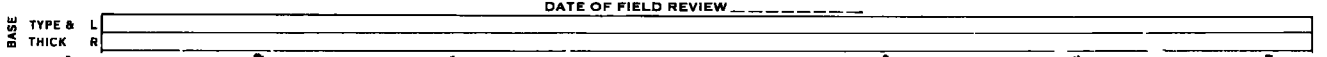
SECTION II - GEOMETRICS

DATE OF FIELD REVIEW _____



SECTION III - SURFACE LIFE AND DEPENDABILITY RATING

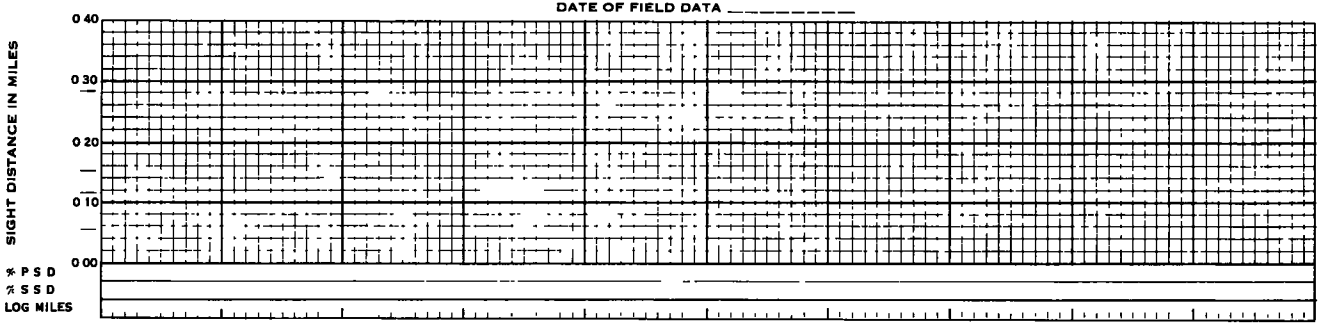
DATE OF FIELD REVIEW _____



PAVEMENT TYPE & THICK YR BUILT	L																																				
PAVEMENT TYPE & THICK YR BUILT	R																																				
PROBABLE RETIREMENT	L																																				
	R																																				
CONDITION		A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
SURFACE		0	10	40	50	0	10	40	50	0	10	40	50	0	10	40	50	0	10	40	50	0	10	40	50	0	10	40	50	0	10	40	50	0	10	40	50
BASE		0	6	24	30	0	6	24	30	0	6	24	30	0	6	24	30	0	6	24	30	0	6	24	30	0	6	24	30	0	6	24	30	0	6	24	30
SUBGRADE		0	2	8	10	0	2	8	10	0	2	8	10	0	2	8	10	0	2	8	10	0	2	8	10	0	2	8	10	0	2	8	10	0	2	8	10
DRAINAGE		0	2	8	10	0	2	8	10	0	2	8	10	0	2	8	10	0	2	8	10	0	2	8	10	0	2	8	10	0	2	8	10	0	2	8	10
EXCESS MTCE		S	LT	S	RT	S	LT	S	RT	S	LT	S	RT	S	LT	S	RT	S	LT	S	RT	S	LT	S	RT	S	LT	S	RT	S	LT	S	RT	S	LT	S	RT
POINT RATING PER MILE	L																																				
	R																																				

SECTION IV - SIGHT DISTANCE

DATE OF FIELD DATA _____



SECTION V - REPORTED ACCIDENTS

STARTING DATE OF ACCIDENT DATA _____

FISCAL YEAR										

SECTION VI - STRUCTURES

DATE OF FIELD REVIEW _____

STRUCT NUMBER	LOG MILES	TYPE SERVICE	TYPE & MATERIAL	LENGTH IN FEET	HOR CLEAR	VERT CLEAR	SAFE LOADING	SPECIAL DEFIC	STRUCT NUMBER	LOG MILES	TYPE SERVICE	TYPE & MATERIAL	LENGTH IN FEET	HOR CLEAR	VERT CLEAR	SAFE LOADING	SPECIAL DEFIC

SYSTEM

SECTION LOCATION· FROM _____

TO _____

SHEET NO _____ TERRAIN _____ MILES INC _____ MILES UNINC _____

LOG MILES BEGIN _____ END _____ SECTION LENGTH _____

ROUTE NO _____ CITY _____ CO _____ DIV _____

URGENCY RATING

SPECIAL WARRANT

TYPE OF WORK

PROJECT LOCATION FROM _____

TO _____

_____ COST PER VEH MI PER YR _____

MILES INC _____ MILES UNINC _____ TYPE SECTION _____

LOG MILES BEGIN _____ END _____ PROJECT LENGTH _____

PROGRAM YEAR

DEFICIENCY ANALYSIS AND PROGRAM STUDY

SECTION VII - TRUCK ADJUSTMENT FOR TERRAIN AND WEIGHTED A D T

PERCENT GRADE	GRADE LGTH IN MILES		TRUCK SPEED		SPEED MILES
		x		=	
		x		=	
		x		=	
		x		=	
		x		=	
		x		=	
		x		=	
		x		=	
		x		=	
		x		=	
		x		=	
		x		=	
		x		=	
		x		=	
		x		=	
		x		=	
		x		=	
		x		=	
		x		=	
		x		=	
		x		=	

TOTAL LGTH _____

_____ - _____ = _____ X 40 = _____

SECTION LGTH | TOT GRADE LGTH | FLAT TERRAIN | SPEED MILES

TOTAL SPEED MILES = _____

SPEED MILES _____ = _____

SECTION LGTH _____ AV TRUCK SPEED

1 TRUCK = _____ PASSENGER CARS (T IN FORMULA)

PERCENT OF TRUCKS = _____ (P IN FORMULA)

TERRAIN FACTOR FLAT-105 ROLLING-115 MTS-135

100 = _____ P + (_____ P X _____ T) = _____

TERRAIN FR _____ CORR FR

SECTION VIII - AVERAGE DESIGN SPEED

DEGREE	NUMBER CURVES		DESIGN SPEED FACTOR		WEIGHTED LENGTH (TIMES D S)
5°		X	9 00	=	
6°		X	8 25	=	
7°-8°		X	7 50	=	
9°-11°		X	6 45	=	
12°-20°		X	5 55	=	
21°-29°		X	4 50	=	
30°-35°		X	3 75	=	
36° +		X	3 00	=	

_____ X 0 15 = _____

NO CURVES | CURVE LENGTH

_____ - _____ = _____ X 65 = _____

SEC LGTH | CURVE LGTH | TAN LGTH | TAN WT'D LENGTH

TOTAL WT'D LENGTH X D S _____

_____ - _____ = _____

TOTAL WT'D LGTH X D S | SEC LGTH | AVERAGE DESIGN SPEED

SECTION IX - DEPENDABILITY ANALYSIS

	TOTAL POINTS		MILES		AV PER MILE
LT	_____	-	_____	=	_____
RT	_____	-	_____	=	_____

SECTION X - SPEED ANALYSIS

	DESIGN SPEED		OPER'G SPEED		INDEX
ST'D	_____	ST'D	_____	IND	_____
ACT	_____	ACT	_____	ADT	_____
DIF	_____	DIF	_____	W IND	_____

SECTION XI - ACCIDENT ANALYSIS

ACCIDENTS | MILES | YEARS | AV ANNUAL ACCIDENTS

_____ - _____ - _____ = _____

ANALYZED BY _____

DATE ANALYZED _____

DATE PROGRAMED _____

REMARKS _____

DEFICIENCIES RELIEVED BY STOP-GAP WORK _____

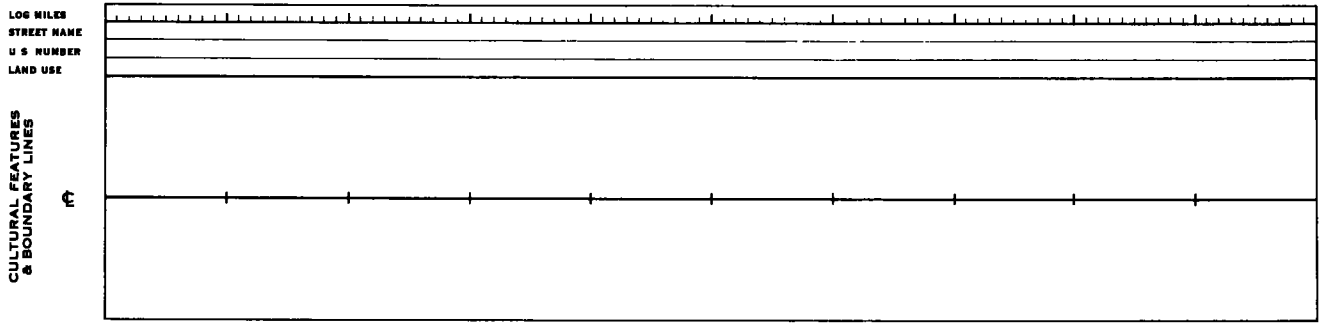
URBAN HIGHWAY PROGRAM CONTROL SHEET

STATE OF TENNESSEE
DEPT OF HWYS AND PUBLIC WORKS

HIGHWAY PLANNING
SURVEY DIVISION

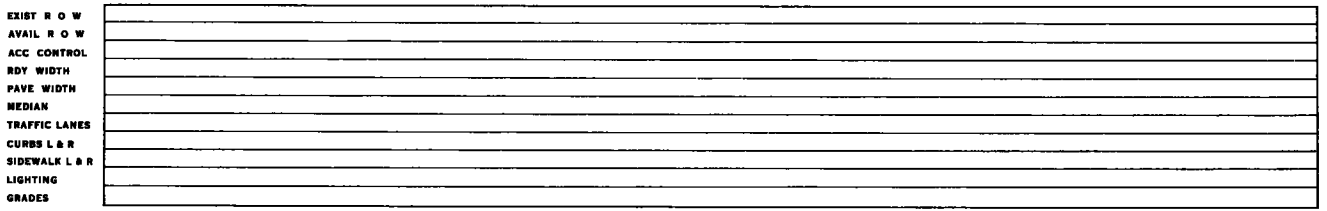
SECTION I — STRAIGHT LINE DIAGRAM

DATE OF FIELD REVIEW _____



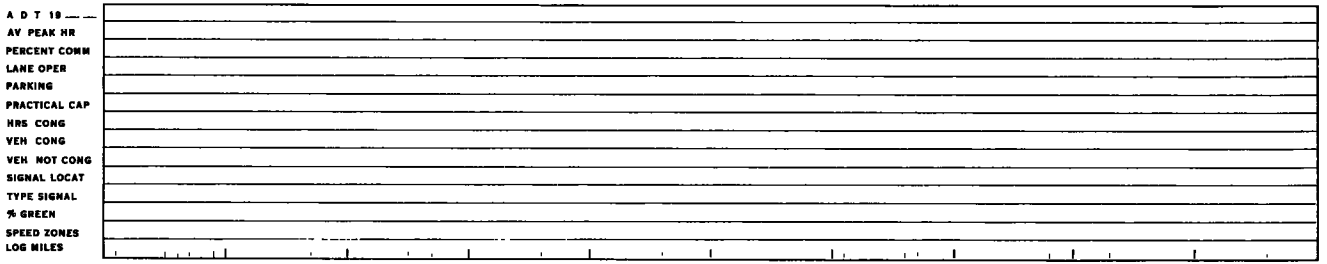
SECTION II - GEOMETRICS

DATE OF FIELD REVIEW _____



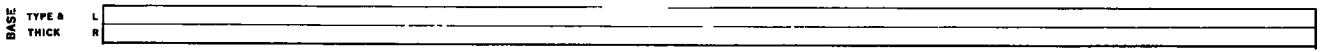
SECTION III - TRAFFIC & OPERATIONS

DATE OF FIELD REVIEW _____



SECTION IV - SURFACE LIFE AND RIDABILITY RATING

DATE OF FIELD REVIEW _____



CORR FR ____ X TABLE FR ____ X A D T ____ = WT'D A D T ____

SECTION XII - DEFICIENCIES

LT ROADWAY MINOR	LT ROADWAY MAJOR		RT ROADWAY MINOR	RT ROADWAY MAJOR
☐	☐	ACCESS CONTROL	☐	☐
☐	☐	LANE WIDTH	☐	☐
☐	☐	MEDIAN	☐	☐
☐	☐	SHOUL &/OR LAT CLEAR	☐	☐
☐	☐	CURVATURE	☐	☐
☐	☐	GRADES	☐	☐
☐	☐	CAPACITY (____%)	☐	☐
☐	☐	PAVEMENT TYPE	☐	☐
☐	☐	PAVEMENT CONDITION	☐	☐
☐	☐	BASE CONDITION	☐	☐
☐	☐	SUBGR &/OR DRAINAGE	☐	☐
☐	☐	PASSING OPPORTUNITY	☐	☐
☐	☐	STOP SIGHT DISTANCE	☐	☐
☐	☐	ACCIDENTS	☐	☐
☐	☐	INTERSECTION & X-ING	☐	☐
☐	☐	R R GRADE CROSSINGS	☐	☐
☐	☐	STRUCTURES	☐	☐
	☐	ADEQUATE NOW	☐	
	☐	WARRANTS IMPROV T	☐	
	☐	SPECIAL WARRANTS	☐	

SECTION XIII - RECOMMENDED IMPROVEMENT

DESIGN STANDARD NO ____

DESCRIPTION ____

____

____

____

____ EXPECTED A D T ____

SECTION XIV - URGENCY RATINGS

	LT	RT.
DEPENDABILITY	____	____
FACILITY OF MOVEMENT	____	____
SAFETY	____	____
SPECIAL WARRANTS	____	____
GROUP NUMBER	____	____
COLOR	____	____

SECTION XV - PROJECT DESCRIPTION AND COST ESTIMATE

TYPE AND EXTENT OF PROPOSED WORK

REQUIRED IMPROVEMENTS DESIGN STANDARD NO ____ TERRAIN ____ TYPE GRADING ____

DESCRIPTION ____

COST SUMMARY

DESCRIPTION OF URBAN TYPE CROSS SECTION

TRAFFIC LANES NO & WIDTH ____
MEDIAN TYPE & WIDTH ____
PARKING LANES NO & WIDTH ____
SIDEWALKS NO & WIDTH ____
CURB & GUTTER ____
STORM DRAINS ____

ITEM COST IN $1,000

TYPE OF WORK	LENGTH	ACCESS CONTROL	R O W	GRADE & DRAIN	BASE	SURF	STRS	TOTAL
RESURFACE								
WIDEN & RESURF								
RECONSTRUCTION								
NEW CONSTRUCTION								
TOTAL								

STRUCTURE SUMMARY
(COST INCLUDED IN ABOVE SUMMARY)

LOG MILE	TYPE STRUCTURE	TYPE WORK	LENGTH	COST	LOG MILE	TYPE STRUCTURE	TYPE WORK	LENGTH	COST

TRUCK CLIMBING LANES
(COST INCLUDED IN ABOVE SUMMARY)

LOCATION			ITEM COST		
BEGIN	END	LENGTH	G & D	B & S	TOTAL

RAMPS AND APPROACHES
(COST INCLUDED IN ABOVE SUMMARY)

LOCATION		ITEM COST		
LOG MILE	LENGTH	G & D	B & S	TOTAL

STOP-GAP WORK SUMMARY
(REQUIRED IF IMPROVEMENTS ARE POSTPONED)

TYPE OF WORK	BEGIN	END	LENGTH	COST

DESCRIPTION ____

COST ESTIMATE BASIS ____

DATE

PREPARED BY

APPROVED BY

PAVEMENT	TYPE & THICK YR BUILT	L								
	TYPE & THICK YR BUILT	R								
	PROBABLE RETIREMENT	L								
		R								
RIDABILITY	N	0								
	GOOD IC, C	10								
	ICaC	30								
	N	30								
	FAIR IC C	40								
	ICaC	60								
	N	60								
	POOR IC C	60								
	ICaC	100								
PT RATING PER 0.10 MILE SECTION		L								
		R								

SECTION V - REPORTED ACCIDENTS

STARTING DATE OF ACCIDENT DATA _____

FISCAL YEAR _____									

SECTION VI - RAILROAD GRADE CROSSINGS

DATE OF FIELD REVIEW _____

LOG MILE									
TYPE SERVICE									
NO TRACKS									
TRAINS DAILY									
NO STOPPING									
TYPE PROT									

SECTION VII - STRUCTURES

DATE OF FIELD REVIEW _____

STRUCTURE NO									
LOG MILE									
TYPE SERVICE									
SPANS & TYPE									
LGTH IN FEET									
HOR CLEAR									
VERT CLEAR									
SIDEWALKS									
SAFE LOAD									
SPECIAL DEF									

REMARKS _____

SYSTEM	SECTION LOCATION FROM _____ TO _____ SHEET NO _____ TERRAIN _____ MILES INC _____ MILES UNINC _____ LOG MILES BEGIN _____ END _____ SECTION LENGTH _____ ROUTE NO _____ CITY _____ CO _____ DIV _____	URGENCY RATING	SPECIAL WARRANT	TYPE OF WORK	PROJECT LOCATION FROM _____ TO _____ COST PER VEH MI PER YR _____ MILES INC _____ MILES UNINC _____ TYPE SECTION _____ LOG MILES BEGIN _____ END _____ PROJECT LENGTH _____	PROGRAM YEAR

DEFICIENCY ANALYSIS AND PROGRAM STUDY

SECTION VIII - TURNING DELAY

NUMBER TURNS	NUMBER VEHICLES	SEC DELAY	MOVING LANE FAC	ADJ DELAY
_____ X NC_____		X_____	X_____	=_____
_____ X C_____		X_____	X_____	=_____

TOTAL VEHICLE SECONDS DELAY = _____

MOVING LANE FACTORS

TWO LANE = 2 0 MULTIPLE LANE = 1 0

SECTION IX - PARKING DELAY

NO VEH UNDER CAP	SEC DELAY	MOVING LANE FAC	ADJUSTED DELAY
_____ x	_____ x	_____	= _____
_____ x	_____ x	_____	= _____
_____ x	_____ x	_____	= _____
_____ x	_____ x	_____	= _____
_____ x	_____ x	_____	= _____
_____ x	_____ x	_____	= _____
_____ x	_____ x	_____	= _____
_____ x	_____ x	_____	= _____
_____ x	_____ x	_____	= _____
_____ x	_____ x	_____	= _____

TOTAL VEHICLE SECONDS DELAY = _____

SECONDS OF DELAY FOR PARKING
PARALLEL = 2 0 SEC DIAGONAL = 4 0 SEC

SECTION X - SIGNAL DELAY

SIGNAL FACTORS

CONNECTED SIGNALS	_____ 0 5 OR 1 0
PEDESTRIAN SIGNALS	_____ 0 3
ACTUATED SIGNALS	_____ 0 7
FIXED TIME SIGNALS	_____ 1 0

SIGNAL LOCATION	AV DELAY	AV DAILY TRAFFIC	SIG FAC	ADJUSTED DELAY
_____	_____ X	_____ X	_____	=_____
_____	_____ X	_____ X	_____	=_____
_____	_____ X	_____ X	_____	=_____
_____	_____ X	_____ X	_____	=_____
_____	_____ X	_____ X	_____	=_____
_____	_____ X	_____ X	_____	=_____
_____	_____ X	_____ X	_____	=_____
_____	_____ X	_____ X	_____	=_____
_____	_____ X	_____ X	_____	=_____
_____	_____ X	_____ X	_____	=_____

SECTION XI - SPEED ZONE DELAY

DELAY FACTORS FROM FORMULA IN MANUAL

30 M P H SPEED LIMIT	= 1 71 AVERAGE DELAY
25 M P H SPEED LIMIT	= 4 12 AVERAGE DELAY
20 M P H SPEED LIMIT	= 7 72 AVERAGE DELAY
15 M P H SPEED LIMIT	= 13 71 AVERAGE DELAY
SPEED ZONE FACTOR	_____ 1 0
SCHOOL ZONE FACTOR	_____ 0 2

AV DELAY	AV DAILY TRAFFIC	ZONE FAC	NO SECTS	ADJUSTED DELAY
_____ x	_____ x	_____ x	_____	=_____
_____ x	_____ x	_____ x	_____	=_____
_____ x	_____ x	_____ x	_____	=_____

TOTAL VEHICLE SECONDS DELAY =_____

SECTION XII - RAILROAD X-ING DELAY

OPEN INTERSECTIONS

AV DAILY TRAFFIC	NO OF TRAINS	SECONDS DELAY	ADJUSTED DELAY
_____ X	_____ X	0 50	= _____

BLOCKED INTERSECTIONS

_____ X _____ X 1 00 = _____

TOTAL VEHICLE SECONDS DELAY = _____

SECTION XIII - RIDABILITY ANALYSIS

TOTAL POINTS	NO 0 1 MI SECTIONS	AV PER 0 1 MI
LT _____	- _____	= _____
RT _____	- _____	= _____

SECTION XIV - TIME DELAY ANALYSIS

TOTAL VEHICLE SECONDS DELAY	NO 0 1 MI SECTIONS	SEC DELAY PER 0 1 MI
_____	- _____	= _____

SECTION XV - ACCIDENT ANALYSIS

ACCIDENTS	NO 0 1 MI SECTIONS	YEARS	AV ANNUAL ACCIDENTS PER 0 1 MI
_____	- _____	- _____	= _____

ANALYZED BY _____

DATE ANALYZED _____

DATE PROGRAMED _____

REMARKS _____

DEFICIENCIES RELIEVED BY STOP-GAP WORK _____

TOTAL VEHICLE SECONDS DELAY = _____

SECTION XVI - DEFICIENCIES

LT RDY		RT RDY
☐	MINIMUM WIDTH	☐
☐	NOT PAVED FULL WIDTH	☐
☐	CURBS	☐
☐	SIDEWALKS	☐
☐	LIGHTING	☐
☐	GRADES	☐
☐	CONTINUITY OF DESIGN	☐
☐	PARKING	☐
☐	CAPACITY (_____ %)	☐
☐	SIGNALS	☐
☐	OTHER TRAFFIC CONTROLS	☐
☐	SURFACE TYPE	☐
☐	RIDABILITY	☐
☐	ACCIDENTS	☐
☐	R R GRADE CROSSINGS	☐
☐	STRUCTURES	☐

☐ ADEQUATE NOW ☐
☐ WARRANTS IMPROVEMENT ☐
☐ SPECIAL WARRANTS ☐

SECTION XVII - RECOMMENDED IMPROVEMENT

DESCRIPTION _____

_____

_____

_____

_____

_____ EXPECTED A D T _____

SECTION XVIII - URGENCY RATING

	LT	RT
RIDABILITY		
FACILITY OF MOVEMENT		
SAFETY		
SPECIAL WARRANTS		
GROUP NUMBER		
COLOR		

SECTION XIX - PROJECT DESCRIPTION AND COST ESTIMATE

REQUIRED IMPROVEMENT TYPE AND EXTENT OF PROPOSED WORK

SECTION TYPE NO _____
TRAFFIC LANES NO & WIDTH _____
MEDIAN TYPE & WIDTH _____
PARKING LANES NO & WIDTH _____
SIDEWALKS NO & WIDTH _____
PLANT STRIPS NO & WIDTH _____

DESCRIPTION _____

COST SUMMARY

ITEM COST IN $ 1 000

TYPE OF WORK	LENGTH	ACCESS CONTROL	R O W	GRADE & DRAIN	BASE	SURF	STRS	CURB & GUTTER	STORM DRAINS	SIDE WALKS	ILLUMI NATION	TRAFFIC CONTROLS	TOTAL
RESURFACE													
WIDEN & RESURFACE													
RECONSTRUCTION													
NEW CONSTRUCTION													
TOTAL													

STRUCTURE SUMMARY
(COST INCLUDED IN ABOVE SUMMARY)

LOG MILE	TYPE STRUCTURE	TYPE WORK	LENGTH	COST	LOG MILE	TYPE STRUCTURE	TYPE WORK	LENGTH	COST

RAMPS AND APPROACHES
(COST INCLUDED IN ABOVE SUMMARY)

LOG MILE	LENGTH	G & D	B & S	TOTAL	LOG MILE	LENGTH	G & D	B & S	TOTAL

STOP-GAP WORK SUMMARY
(REQUIRED IF IMPROVEMENTS ARE POSTPONED)

TYPE OF WORK	BEGIN	END	LENGTH	COST

DESCRIPTION _____

COST ESTIMATE BASIS _____

DATE _____

PREPARED BY _____

APPROVED BY _____

were compared. On the basis of this comparison the sections were arranged in the descending order of their critical deficiency.

Five-year programs for correcting the deficiencies on each class of highway in each division were formulated by drawing successive sections from the top of this priority list. The number of projects programed for each year was governed by the estimated cost of correction in relation to the amounts assigned to that group of highways in the original allotment of funds. When this had been done, the programs were taken into the field for checking by the division engineers. When revisions had been made to conform with current conditions, the program was complete.

While this method of priority determination and program building required handling an immense volume of data and making numerous computations, the process itself was fundamentally simple, direct and, as results proved, effective. As a matter of fact it was the basic simplicity and directness of the means used and the clear and generally acknowledged validity of the results obtained, which have won for the 5-year program the approval of highway officials, public authorities and most of the public. Neither the methods nor the program are perfect, but the engineers and the people alike have recognized that highway administration in Tennessee has turned an important corner and that the new direction should be followed.

KEEPING THE PROGRAM UP-TO-DATE

The original priority study rated rural highways as to structural condition, facility of movement and safety. Urban highways were rated as to structural condition, congestion, and route characteristics. In the continuing program procedure, the term "structural condition" has been superceded by "dependability" for rural sections and "rideability" for urban sections. The criteria used in the continuing program bring the rural and urban ratings closer together for comparative study.

Highway program control sheets for both rural and urban highways are prepared on an 11- by 17-in. card (see illustrations), folded and filed in a visible card filing cabinet. On the front of the card is a straight line diagram of the study section. On the back is the deficiency analysis and program data. A strip map of the same section is on the back of the preceding file pocket. A sample of each of the forms is presented.

The data card file is kept current and available for use at all times, not only for programing, but for a multiplicity of other uses by all engineers of the Department.

The 5-year program is revised each year by bringing into the program the projects with the highest priorities replacing projects which have been constructed in the previous year.

The same procedure of going to the four field divisions and carefully reviewing each project in the program is continued. This procedure gives the opportunity to pick up sections of road that have suddenly gone bad and necessarily need immediate attention, pick up sections that should be programed for continuity of development or for any other valid reason. When the field divisions have been visited, the program is submitted to the chief engineer and his headquarters staff for study and approval. When the program is approved, copies are given to all engineers who have the responsibility for execution of the program.