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16. Abstract

The computerized bridge project selection program for Texas is a State and District level closed-loop process for the proper selection of bridge rehabilitation and replacement projects. The process described addresses a need for the consistent and effective evaluation of over 47,000 disparate inventoried structures. The State level of the process is driven by two computer programs and the proposed District level of the process is driven by a third. The one State-level program applies existing Federal Highway Administration (FHWA) criteria to the complete bridge inventory while the other program applies tighter State Department of Highways and Public Transportation criteria to those projects passing the FHWA screening. Statistical evaluations are used for the prioritization of projects within the system. The District level of the process evaluates the automated selections and feeds back the results to the State-level computer programs. The input for the State-level programs can then be adjusted to better reflect the concerns of the District Engineers. Variables for use in the State-level prioritization program are developed to complement existing evaluators. The Service Indices developed consider separately cost-effective, essential, and functional services of each proposed project. Elements of the process have recently been used for the determination of budget distributions for the 1987-1991 Off-State System Highway Bridge Replacement and Rehabilitation Program. The procedure implemented to calculate these distributions and its results are presented. Conclusions and recommendations regarding the overall process and the elements which comprise it complete the document.

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BRIDGE PROJECT SELECTION FOR TEXAS

by

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Research Report 439-3

Research Project 3-5-86-439
Strategies for Bridge Replacement

conducted for

Texas State Department of Highways and Public Transportation

in cooperation with the

U.S. Department of Transportation
Federal Highway Administration

by the

CENTER FOR TRANSPORTATION RESEARCH
Bureau of Engineering Research
THE UNIVERSITY OF TEXAS AT AUSTIN

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The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

PREFACE

The recent work completed through Center for Transportation Research (CTR) Research Project 3-5-86-439, "Strategies for Bridge Replacement," is presented here. To date, a two-level closed–loop selection process has been developed, tested, evaluated, refined, and implemented. The methodology is practical yet scientifically based. Background material, as well as new research, is given here. This report, however, must be considered in the context of the two CTR reports which preceded it.

The authors are grateful to all those who have helped with the development of this research. The project coordinator, Mr. Ralph Banks, and the other members of the Technical Advisory Committee, Messrs. Bobby Evans, Fred Herber, Billy Rogers, LeRoy Surtees, and Paul Ysaguirre have been particularly helpful. The authors would also like to acknowledge the assistance of the staff of the Center for Transportation Research. Finally, the authors would like to express appreciation to The University of Texas Department of Civil Engineering for generously providing computer time and supplies.

LIST OF REPORTS

Report No. 439-1, "Improvements in On-System Bridge Project Prioritization," by Chris Boyce, W. R. Hudson, and Ned H. Burns, presents a computerized procedure for prioritizing bridge replacements and rehabilitations. Background information and directions for further research are included.

Report No. 439-2, "Improved Safety Indices for Prioritizing Bridge Projects," by Chris Boyce, W. R. Hudson, and Ned H. Burns, presents two indices useful in bridge project prioritization procedures. A Structural Safety Index and a Geometric Safety Index are documented. Background information on the nature of bridge project prioritization procedures is presented, as is a chronological history of federal legislation concerning federal funding of bridge projects. A discussion of current prioritization procedures, including the federal Sufficiency Rating, is included.

Report No. 439-3, " Bridge Project Selection for Texas," by Tony Tascione, W. R. Hudson, Ned H. Burns, and Rob Harrison, presents a two-level closed-loop process for the selection of bridge rehabilitation and replacement projects. The process uses a computerized statistical evaluation to prioritize projects at the network level. Three indices which quantify the service projects provide are also developed to complement the safety indices previously defined.

ABSTRACT

The computerized bridge project selection program for Texas is a State and District level closed-loop process for the proper selection of bridge rehabilitation and replacement projects. The process described addresses a need for the consistent and effective evaluation of over 47,000 disparate inventoried structures. The State-level of the process is driven by two computer programs and the proposed District-level of the process is driven by a third. The one State-level program applies existing Federal Highway Administration (FHWA) criteria to the complete bridge inventory while the other program applies tighter State Department of Highways and Public Transportation criteria to those projects passing the FHWA screening. Statistical evaluations are used for the prioritization of projects within the system. The District-level of the process evaluates the automated selections and feeds back the results to the State-level computer programs. The input for the State-level programs can then be adjusted to better reflect the concerns of the District Engineers. Variables for use in the State-level prioritization program are developed to complement existing evaluators. The Service Indices developed consider separately cost-effective, essential, and functional services of each proposed project. Elements of the process have recently been used for the determination of budget distributions for the 1987-1991 Off-State System Highway Bridge Replacement and Rehabilitation Program. The procedure implemented to calculate these distributions and its results are presented. Conclusions and recommendations regarding the overall process and the elements which comprise it complete the document.

SUMMARY

A profile of the complete bridge inventory is presented first in this report. The profile consists of descriptive statistics such as number of structures statewide, type, number and lengths of spans, main member types, estimated remaining life of structures, year built, and average daily traffic over structures. The profile is presented as an introduction to the magnitude of the problem of rehabilitation and replacement project selection. The ongoing effort at The University of Texas at Austin to address this problem is next explained.

A proposed closed-loop two-level process for the proper selection of bridge replacement and rehabilitation projects in Texas is presented in the second chapter. The State level of this process consists primarily of two computer programs which would sort the entire state bridge inventory into three subsets. The District-level is guided by a reporting program whose input is from the State-level programs. Districts will provide additional information about each of the projects forwarded to them, and they are given the opportunity to add projects from their districts not output by the State-level computer programs. The updated district reports, returned to the State-level in this closed-loop system, are evaluated, first to determine if the input criteria for the State-level programs should be revised and second, along with the summaries provided by the State-level programs, to make final project selections.

The two State-level programs apply existing FHWA criteria and proposed SDHPT criteria to subset the entire bridge inventory. There are two methods for sorting projects in the program which applies SDHPT criteria: Automatic Qualification and Scoring. Automatic Qualification is a process in which the value of certain individual variables for each project are checked against critical levels for these variables input by the program user. Scoring is a process developed to prioritize projects based on the weighted combination of variable values, rather than on the value of any single attribute. The Percentile Scoring process, developed near the end of Chapter 2, uses descriptive statistics to evaluate project priority.

In Chapter 3, variables proposed for use in the prioritization program of the process are presented. Safety Indices, defined in an earlier report are briefly described and results of their recent automation are given. Service Indices are presented next. They quantify separately cost-effective, essential, and functional services of the proposed projects. These indices have an integer range of zero to nine and are formulated as uniformly distributed variables. The Service Indices are multivariate frequency distribution evaluators. The algorithms for these indices have been programmed, and the results of these programs are summarized with frequency distributions.

In Chapter 4, a recent implementation of elements of the selection process including a sensitivity analysis is described. The prioritization model developed for the State-level of the process was used to assess the condition of the off-system structures throughout the state. The results of this program were summarized by district and then used to formulate distribution factors for a $70.5 million 1987-1991 Off-System Highway Bridge Replacement and Rehabilitation Program. Later the program amount was raised to $90 million and an 87-91 program was developed using the results of this study. The process and its results, for the $70.5 million budget, are described. The sensitivity analysis is based on substantial variations in attribute weights for a veriety of paired methods in TEBS3. Results are presented and the impact on program comparison given a fixed budget is discussed.

Conclusions and recommendations are presented last in this report. The conclusions summarize the effectiveness of the overall process and also outline the responsibilities of the State and District-level users of the system. It is shown, that although much of the process is presently automated, the user input throughout the system is essential. The recommendations are presented as they relate to specific functions of the existing system and as they relate to the improvement of the overall process. How the work completed through this project should be implemented in a complete bridge management system is presented last.

IMPLEMENTATION STATEMENT

We recommend that the Texas Eligible Bridge Sorter Version 3 prioritization model be used to assist the allocation of District funds for the next On-State System Highway Bridge Replacement and Rehabilitation Program. The evaluation of the condition of structures in each district by the Texas Eligible Bridge Sorter is an appropriate starting point for the determination of district allocations.

The calculation of district allocation factors should be incorporated as an element within the framework of the Computerized Bridge Project Selection Program for Texas. This complete system should be implemented for the next Highway Bridge Replacement and Rehabilitation Program.

An additional bridge inventory item should be added to the present data base to facilitate the determination of projects funded through completed programs. As an alternative, the previously funded projects could be recorded in a new data base accessible to the Computerized Bridge Project Selection Program.

The Service Indices given in Chapter 3 should be incorporated into the evaluation process of the prioritization model. This will allow additional consideration of cost-effective, essential, and functional services that projects are providing.

Finally, the process described here should be complemented with a complete Bridge Management System for Texas. The work that has been accomplished suggests that it would make an attractive element or module of a Bridge Management System. In the meantime, the process should yield useful management information given the present structure of decision-making in SDHPT. The Computerized Bridge Project Selection Program should be linked to a central data base and used as the keystone of a statewide organization of processes to help system users make more cost-effective decisions regarding bridge planning, design, construction, maintenance, evaluation, and research.

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CHAPTER 1. BACKGROUND AND INTRODUCTION

INTRODUCTION AND OBJECTIVE

The Texas State Department of Highways and Public Transportation (SDHPT) maintains inventory records for approximately 47,000 bridges. These structures are generally divided into two classifications: On-System and Off-System. On-system refers to the approximately 31,000 structures on the state system of roadways, and Off-system refers to the nearly 16,000 structures off the state system of roadways and maintained by local governments. Projects for the rehabilitation and replacement of these structures are proposed and evaluated by the SDHPT. The objective of the research presented here is to improve the process by which the SDHPT makes rehabilitation and replacement project selections from its 47,000 inventoried structures.

There is a wide range of structure type and condition in the State Bridge Inventory. To make more cost-effective decisions, the SDHPT has begun to implement a computer-assisted process for the selection of bridge rehabilitation and replacement projects. This process is a practical method for the selection of either on or Off-system bridge projects in Texas. The process has been developed at The University of Texas at Austin Center for Transportation Research and is summarized further below, together with improvements to the existing overall process and additions to some specific elements of the process.

The research presented is given under several categories. Presented first is a profile of the bridges in the State of Texas to familiarize the reader with the magnitude of selection possibilities. This is followed by an explanation of the ongoing research at The University of Texas at Austin. With the size of the problem and the perspective of the research presented, the overall process is described. Explanations of recent improvements are included in this description. After this presentation of the overall system for selection, some additions to elements of the process are detailed. A recent application is related, and conclusions and recommendations are presented in the last chapter.

A PROFILE OF BRIDGES IN THE STATE OF TEXAS

A profile of the complete bridge inventory and other representative statistics about the bridges throughout the State of Texas are presented as an introduction to the state's bridge problem. Figures 1.1 to 1.3 and Tables 1.1 to 1.4, of this chapter, describe the State's bridges by number, general location, age, and operating status. Figures D.1 to D.12 and Tables D.1 to D.8, presented in Appendix D, further describe the State's bridge problem by characteristics and condition. When appropriate, the statistics are classified by SDHPT Districts and summarized statewide. The descriptive statistics presented were determined from the current State Bridge Inventory. The bridges are classified as belonging to the On-State or the Off-State System.

The age of structures, sufficiency, loading and operational status statistics imply that the condition of Off-system structures is worse than On-system. The number of structures and traffic indicate that the On-system structures are more vital to the State of Texas. Geographically, there is more of a problem in the higher populated and coastal Districts of the State. The information presented here indicates the magnitude of the problem. The SDHPT is responsible for the selection of bridge rehabilitation and replacement projects from a large number of structures in critical need. The complexity of selection is further compounded by

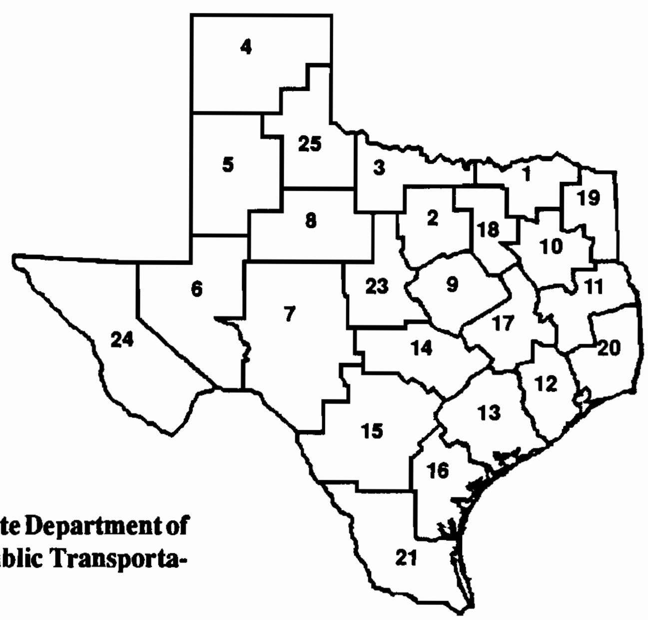


Fig 1.1. Texas State Department of Highways and Public Transportation Districts.

the diversity of structure size, type, age, and condition.

The On-system structures in each district (Table 1.1) total 31,330. The highly populated Districts 18, 12, 15, 2, and 13 have the largest percentage of structures. These On-system structures are again, maintained on the State system of roadways. Off the State system of roadways, structures in each District (Table 1.2) total 15,318. These structures are maintained by local governments such as cities and counties. Districts 12, 18, 13, 9, 2, and 1 have the largest percentages of these structures. Any structure is inventoried in these records only if it is 20 feet or longer. Those structures with lengths less than 20 feet typically are termed culverts. About 18 percent of the On-system structures, and more than 60 percent of the Off-system structures were classified as deficient by the Federal Highway Administration (FHWA) in 1986 (Ref 2). Deficiency may be either structural or functional, and is discussed in Chapter 2.

On-system construction has steadily declined from the late fifties and early sixties (see Fig 1.2). It had been increasing, until that period, since the 1920's, except for the period of war years in the mid-forties. Recently, we have fallen to a volume of construction similar to those levels of the late twenties. Peak construction during the fifties and sixties exceeded 1,000 projects per year, while currently, 200 to 300 On-system projects are being completed annually. Off-system, peak construction levels seem to predate

Fig 1.2. On-system structures year built histogram.

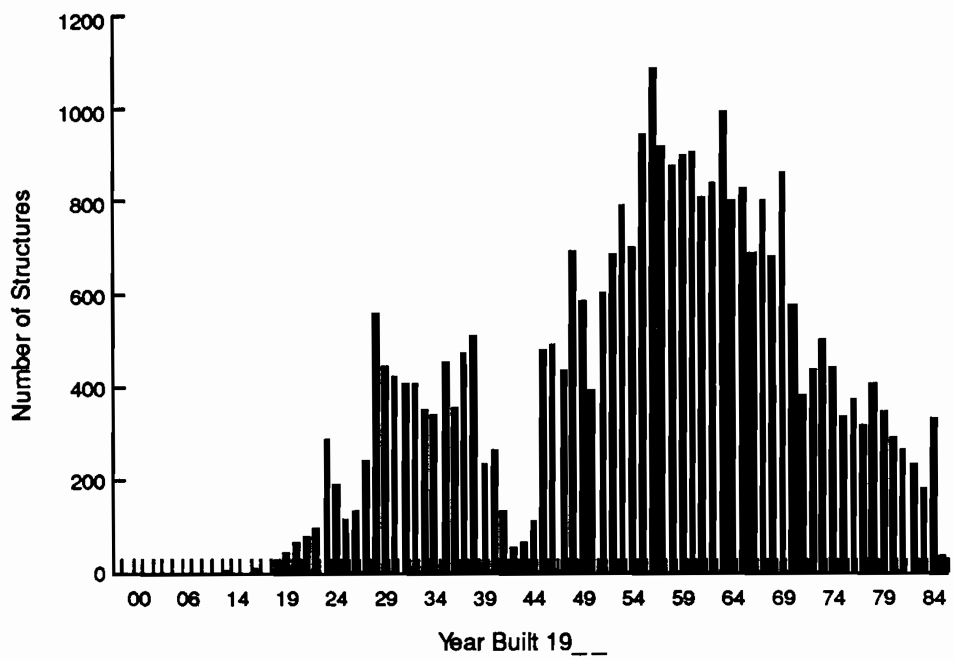
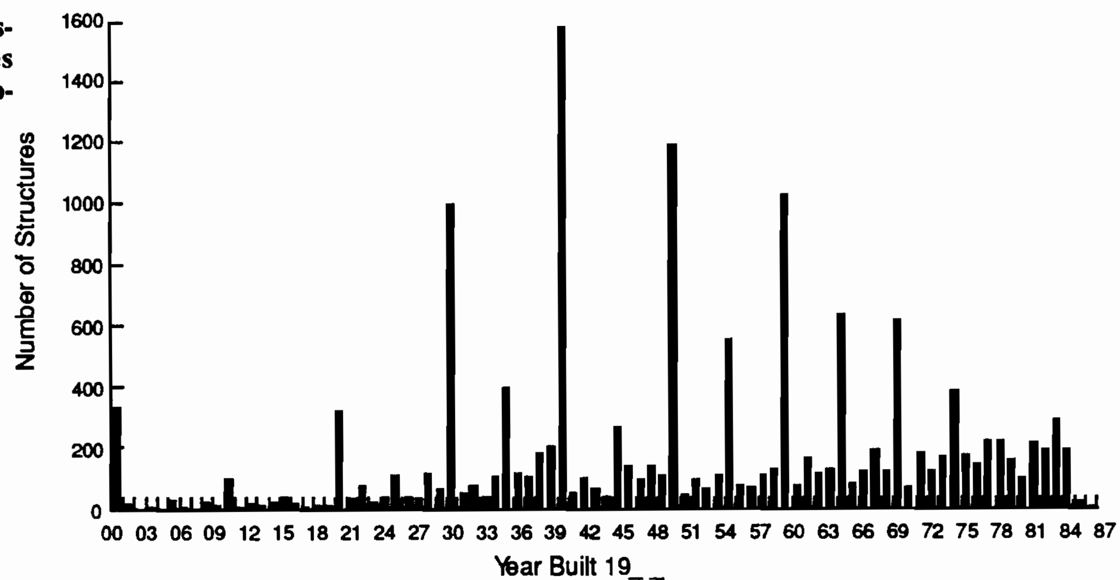


Fig 1.3. Off-system structures year built histogram.



the war, with a large number of structures even predating the turn of the century. Currently, Off-system projects number about the same annually as those On-system, but these projects typically are smaller efforts. The volume of construc-

TABLE 1.1. ON-SYSTEM STRUCTURES IN EACH DISTRICT

District	Frequency	Percent
1	1276	4.1
2	1922	6.1
3	1021	3.3
4	712	2.3
5	405	1.3
6	1012	3.2
7	1275	4.1
8	1355	4.3
9	1580	5.0
10	1142	3.6
11	772	2.5
12	1968	6.3
13	1607	5.1
14	1468	4.7
15	2593	8.3
16	1150	3.7
17	1102	3.5
18	3419	10.9
19	1068	3.4
20	1065	3.4
21	867	2.8
23	906	2.9
24	941	3.0
25	704	2.2

TABLE 1.2. OFF-SYSTEM STRUCTURES IN EACH DISTRICT

District	Frequency	Percent
1	1033	6.7
2	1100	7.2
3	486	3.2
4	144	0.9
5	39	0.3
6	33	0.2
7	144	0.9
8	373	2.4
9	1168	7.6
10	892	5.8
11	660	4.3
12	1901	12.4
13	1219	8.0
14	737	4.8
15	716	4.7
16	423	2.8
17	688	4.5
18	1514	9.9
19	352	2.3
20	500	3.3
21	354	2.3
23	437	2.9
24	164	1.1
25	241	1.6

TABLE 1.3. ON-SYSTEM STRUCTURES OPERATING STATUS

Operating Status	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Open	30323	97.5	30323	97.5
Closed	6	0.0	30329	97.5
Posted	768	2.5	31097	100.0

TABLE 1.4. OFF-SYSTEM STRUCTURES OPERATING STATUS

Operating Status	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Open	13166	86.4	13166	86.4
Closed	103	0.7	13269	87.1
Posted	1959	12.9	15228	100.0

tion Off-system has also been decreasing steadily since its secondary peak of the fifties and sixties.

Operating status was available for 31,097 On-system structures and 15,228 Off-system structures. These are summarized in Tables 1.3 and 1.4. A very small number of structures are closed On-system, and 2.5 percent of these total projects are posted or load restricted. Off-System, 13.6 percent of the inventoried structures are closed or posted. The percent figures presented for operating states may be a function of the policy of the agencies involved. The condition and characteristics of structures in the State of Texas can be further investigated in the tables and figures of Appendix D.

The remaining life of structures, and their sufficiency to remain in service, are presented in Figs D.1 to D.4. In Fig D.1, the estimated remaining life of On-system structures is presented. Approximately 1,000 structures have an estimated life of five or fewer years On-system, with the median of remaining life being near twenty years. In Fig D.2 the Off-system estimated remaining life of structures is summarized. There are more than 3,000 of these structures with estimated remaining lives of five or fewer years and the Off-system median appears to be nearer ten or eleven years. The sufficiency of a structure to remain in service is presented in Appendix D for On-system (Fig D.3) and Off-system (Fig D.4) structures. On-system, the complete inventory appears to be in much better condition to remain in service than the Off-system. The distribution presented in Fig D.3 is skewed significantly to the right (noncritical), while the distribution of Fig D.4 is bi-modal with one of those modes very low on the sufficiency rating scale. The Sufficiency Rating Index, presented in these figures for all the inventoried structures, is discussed in more detail in Chapter 2.

The average daily traffic over structures, length of spans, and length and width of structures are presented in Figs D.5 to D.12. On-system average daily traffic (Fig D.5) is much higher than Off-system (Fig D.6), and it is this attribute of the two classifications that complicates the bridge problem. Few On-system structures have an average daily traffic of 200 of fewer vehicles, while the majority of Off-system structures fall under this threshold. This disproportionate use of On-system structures requires special evaluation during the selection process.

Characteristics of On-system and Off-system structures, as they relate to physical dimensions of inventoried structures, are presented in Figs D.7 to D.12. Most structures, On-system (Fig D.7), or Off-system (Fig D.8), do not have significantly long span lengths. On-system (Fig D.9), most structures' overall lengths are less than 100 feet, and Off-system (Fig D.10) this dimension is usually less than 75 feet. Roadway widths of inventoried structures are presented in Figs D.11 and D.12. This dimension is much smaller Off-system (Fig D.11) than On-system (Fig D.12), with the lower bound of 20 feet On-system being about the median value for structures Off-system. As well as these inventory characteristics presented in figures, there are summary tables that further profile the bridges in the State of Texas.

Tables D.1 to D.14 present structure design loads, span types and number, and main member construction types. On-system (Table D.1), the majority of structures are designed for H20 and HS20 Live Loadings. Off-System (Table D.2) the design live loads for most structures are not known, while those available for summary are: H15, HS20, or H20 in that order of frequency. In addition to the design loads, tables for the Inventory Ratings for On and Off-systems are presented (Tables D.3 and D.4). Inventory rating of a bridge represents the heaviest loads that may safely use the bridge for an indefinite period of time. Consult Appendix B for an explanation of the numeric coding of the Inventory rating. For a very large number of structures main span types are simple or continuous span construction, see Tables D.5 and D.7. Table D.6 and D.8 present the On and Off-system culverts span type; the vast majority is composed of Multiple Box structures. The number of spans that comprise each of the inventoried bridges are provided in Tables D.9 and D.10 for the On-system and Off-system structures respectively. For both classifications, the majority of structures have fewer than four spans.

Main member types are summarized for the State's Bridge Inventory in Tables D.11 and D.13. Consult Appendix B for a plate which equates the Main Member Type Number, listed in the tables, with actual construction materials. For the On-system structures (Table D.11), 17 percent are steel I-beam, 41 percent are concrete slab, and 25 percent are prestressed concrete girder. Off-System (Table D.13), 24 percent are steel I-beam, 15 percent are concrete slab, and 37 percent are timber stringers. Tables for the On and Off-systems culverts material type are also included, see Tables D.12 and D.14. These tables of Main Member Types complete the profile of the State's Bridge Inventory presented here. This profile, again, is given as an introduction to the magnitude of selection possibilities.

For use in making consistent cost-effective evaluations of the inventory of projects, a computer assisted selection process has been defined. The primary automated evaluation of this process is a prioritization method based on statistical evaluations of the considered project inventory. This prioritization model determines the projects to be more carefully considered for funding at other levels of the system. A part of the selection process was defined in Ref 1. Modifications to the complete selection process presented here and these original developments are part of an ongoing effort at The University of Texas at Austin.

THE ONGOING EFFORT AT THE UNIVERSITY OF TEXAS

Modifications to the computerized bridge project selection program are included here. First, modifications to the overall selection process are presented and second, modifications to specific elements of the selection process are presented . Modifications to the overall process involve the addition of another level to the selection procedure, the incorporation of District Priority in the decision process, the introduction of secondary decision variables to the evaluation, and the development of feedback in the system. Modifications to the elements of the process involve minor changes to one automated process of the system and major revisions to the other automated process of the system. The elements of the system have also been improved by the incorporation of previously outlined work specifically developed for this selection process in Ref 2. In addition, new developments have been made and automated to complement the existing evaluations.

The material presented is the result of an ongoing effort at The University of Texas at Austin to develop a practical methodology for the effective selection of bridge rehabilitation and replacement projects. It should be emphasized that it does not constitute a Bridge Management System but rather a part, or module, of such a system. The focus of the work is towards addressing current selection and allocation problems facing decision makers in a practical and effective manner. To completely understand the application of the research, the reader should review Refs 1 and 2. The process developed in Chapter 2 and the indices developed in Chapter 3 are part of the systematically developed criteria for the proper selection of bridge rehabilitation and replacement projects. This process and these indices are the culmination of work previously completed at The University of Texas at Austin.

To help explain the development of the indices in Chapter 3, the overall selection process is first presented. Next, indices developed in Ref 2 are summarized and placed in relation to the indices developed in Chapter 3. The Safety Indices of Ref 2 were not automated in the selection process until now, and statistical evaluations of these indices are presented in Chapter 3 to extend the work previously published. This report does not reconsider the Safety and Service Indices reported earlier but the procedures are not dependent on these indices to be effective. New indices or variables needed by decision makers can be incorporated into the process. In summary then, the improvements to the overall system, and to the elements of the system presented are part of an ongoing effort to develop bridge replacement and rehabilitation strategies for the State of Texas. Work has been completed previously on the development of these strategies, and the material presented here should be considered in this overall context.

CHAPTER 2. THE COMPUTERIZED BRIDGE PROJECT SELECTION

INTRODUCTION

The proposed Computerized Bridge Project Selection Program for Texas is a two-level closed-loop system which may be used for the selection of bridge rehabilitation and replacement projects. The two levels of the process are the State-level and the District-level. These two levels were developed in order to consistently apply statewide criteria to the entire bridge inventory at one level and to take advantage of the District's familiarity with specific projects at another level. The proposed process has a closed-loop feature in order to incorporate the experience of the District evaluators into the computerized State-level prioritization programs. The incorporation of criteria consistently applied by experienced District Engineers and staff will allow the automated processes at the State-level to develop into even more efficient prioritization tools. The total process is presented as a diagram in Fig 2.1.

The State-level of the process is driven by two computer programs which use as input the complete bridge inventory for the State of Texas. These inventory records are maintained in a data base through the Bridge Inventory, Inspection and Appraisal Program (BRINSAP) administered by the Texas State Department of Highways and Public Transportation (SDHPT). BRINSAP is formulated to comply with the National Bridge Inspection and Appraisal Program. Coding of the data required for the administration of this program is maintained separately for On-system and Off-system structures.

THE BRIDGE INVENTORY, INSPECTION AND APPRAISAL PROGRAM

Through BRINSAP, the SDHPT maintains about 140 items of information for each of approximately 47,000 structures throughout the state. These items, which are listed in Ref 2, consist primarily of characteristic information, condition ratings, and appraisal ratings. The condition ratings and the appraisal ratings are updated every two years through the ongoing inspection programs of BRINSAP. Most characteristic information about the structure, such as location, span lengths, and construction materials, stays the same for each inspection. The other items used in the computerized bridge project selection program, coded on the BRINSAP tape, are the condition and appraisal ratings.

Specific condition and appraisal ratings are discussed later, but generally, they are subjective evaluations of the condition or subjective appraisals of the functional capacity of each existing structure's components. These ratings are made during the regular inspection of the structure by a registered engineer or bridge inspector with five years of inspection experience (Ref 3). The ratings are given as integer values ranging from zero to nine, with zero implying a critical condition or appraisal. These updated ratings and the characteristics are kept in separate bridge records for all 47,000 On-system and Off-system structures in the State of Texas. As mentioned, it is these inventory records that are used as input for the first program of the computerized bridge project selection process.

THE SUFFICIENCY RATING EVALUATOR PROGRAM

The first computer program of the selection process is the Sufficiency Rating Evaluator (SURE), as shown in the flow-diagram of Fig 2.2. This program applies well–defined Federal Highway Administration (FHWA) criteria to the entire bridge inventory to subset that inventory into projects eligible and ineligible for FHWA rehabilitation or replacement funds. This program is prepared in the SAS (Statistical Analysis Software) System and is operated through the selection process without input from the user of the selection process. The program criteria are described thoroughly in Ref 1. The criteria applied are largely based on the calculation of the structure's sufficiency rating.

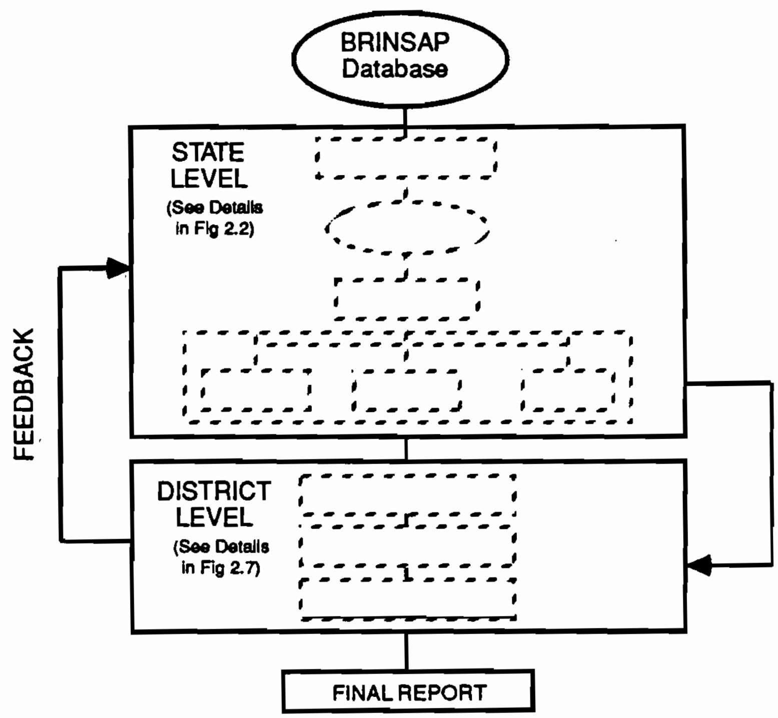


Fig 2.1. The Computerized Bridge Project Selection Program for Texas.

A structure's sufficiency rating is defined as its sufficiency to remain in service (Ref 3) and is calculated as a numeric index between zero and 100. A structure with a sufficiency rating of 100 is entirely sufficient to remain in service in its present condition and a structure with a sufficiency rating of zero is entirely insufficient to remain in service in its present condition. The sufficiency rating formula used to determine each structure's rating is long and combines up to 19 characteristics, condition ratings, and appraisal ratings to finally determine the numeric evaluation between zero and 100. This formula is reprinted and discussed in Ref 2. In addition to the sufficiency rating for a structure, the FHWA criteria consist of two other tests.

To be eligible for FHWA funds, a structure must be either functionally obsolete or structurally deficient. A structure is defined as functionally obsolete if the appraisal rating for its roadway geometry, underclearances, approach roadway alignment, structural condition, or waterway adequacy is 3 or less. A structure is defined as structurally deficient if the condition rating for its deck, superstructure, or substructure is 4 or less or if its structural condition appraisal rating or its waterway capacity appraisal rating is 2 or less. Typically, a structure determined as either structurally deficient or functionally obsolete is referred to only as deficient.

The complete FHWA criteria for eligibility require that a structure be functionally obsolete or structurally deficient and that the sufficiency rating for the structure be less than or equal to 80. If the sufficiency rating for the structure is less than or equal to 80, then the structure is specifically eligible for FHWA funds for rehabilitation. If the sufficiency rating for a structure is less than or equal to 50, and the structure is functionally obsolete or structurally deficient, then the structure is eligible for federal funds for replacement. This criteria is modeled and applied in the Computerized Bridge Project Selection Program for Texas in the computer program SURE.

The Sufficiency Rating Evaluator has been modified since the initial development as described in Ref 1. The second version of SURE was developed to facilitate its operation with later versions of the Texas Eligible Bridge Sorter. The program SURE Version 2 (SURE2) must be implemented as the first automated model of the computerized bridge project selection program if TEBS3 is to proceed. A listing of SURE2 is included in Appendix A of this report. The On-system and Off-system BRINSAP data tapes written August 3, 1987, include 11,800 structures eligible for FHWA funds for rehabilitation or replacement. These On-system and Off-system eligible project sets, as determined by the computer program SURE2, are the separate input for the next computer program of the selection process TEBS, as shown in the flow diagram of Fig 2.2. Figure 2.2 is enlarged and detailed from the complete selection process shown in Fig 2.1.

THE TEXAS ELIGIBLE BRIDGE SORTER

Introduction

The Texas Eligible Bridge Sorter (TEBS) is the next element of the computerized bridge project selection process (see Fig 2.2). The TEBS computer program is written in the SAS System and operates in the selection process with input from the process user. It calculates a prioritization index for each of the projects evaluated, and then subsets all the projects for output to the next element of the selection process. The inputs for TEBS, the processes available for use within the model, and the outputs are described. The position of TEBS in the complete selection processes is shown in Fig 2.2. The figure is enlarged and detailed from Fig 2.1 and is the State level of the complete selection process.

The project attributes used by TEBS for evaluation and comparison are termed variables. They were developed from three sources and are all summarized below. Automatic Qualification and Scoring are the processes of evaluation and comparison which use the TEBS variables. Scoring has been changed significantly since its development in the first version of TEBS and is summarized after a presentation of Automatic Qualification.

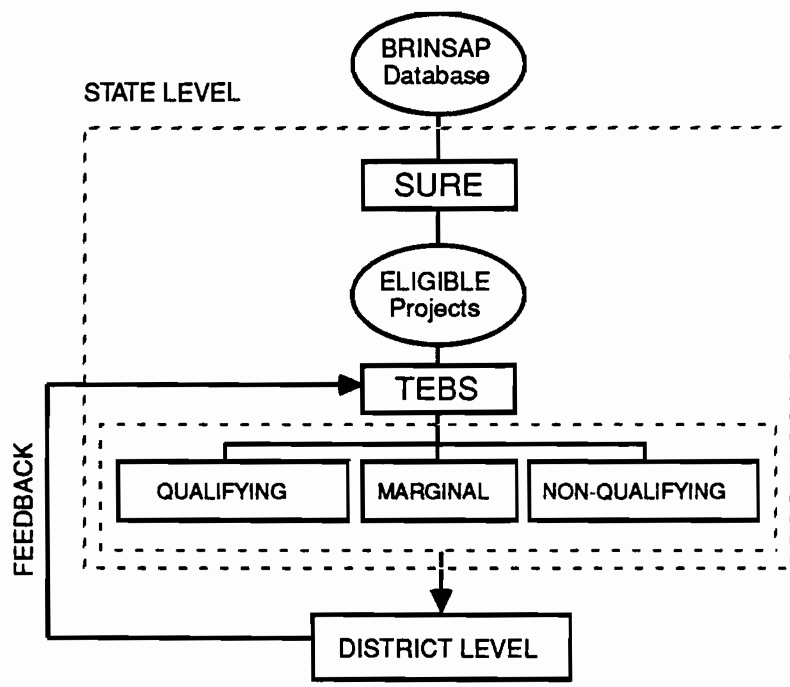


Fig 2.2. The State-level of the Computerized Bridge Project Selection Program for Texas.

Variables

TEBS uses as primary input the eligible projects output from the computer program SURE (see Fig 2.2). Its primary function in the selection process is to calculate a priority index for each of the eligible projects. To calculate this index TEBS uses a weighted combination of variable values for each project. The variables that may be used in TEBS were developed from three sources: (1) existing SDHPT prioritization procedures detailed in Ref 1; (2) research proposed in Ref 2; and (3) the work presented in Chapter 3. The SDHPT variables are

- CPV - Cost per Vehicle: Cost of Proposed Improvements divided by the Average Daily Traffic,
- ADT - Average Daily Traffic over the structure,
- SR - Sufficiency Rating, FHWA-developed 0-100 index that assesses the sufficiency of a structure to remain in service in its present condition; 100 represents a structure entirely sufficient to remain in service,
- DSS - The minimum of the deck, substructure, or superstructure condition ratings, which are 0-9 integer values given as ratings for each component of the structure during the BRINSAP inspections; 0 represents a critical condition, and 9 represents a new condition, and
- BWC - Bridge Width Condition, an evaluation of the comparison of bridge width to average daily traffic over the structure; 0 represents a critical condition of bridge width to ADT, and 1 represents a noncritical condition.

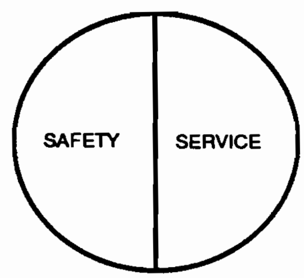
In addition to these variables, five other project attributes may be used by the prioritization model TEBS. Two of these attributes were presented in Ref 2, and three are described completely here in Chapter 3.

The five new variables proposed for use were systematically developed under two broad categories, service and safety (see Fig 2.3). Three variables were developed to quantify service, and two variables were developed to quantify safety. The variables that quantify safety evaluate separately the geometric and the structural safety of each project, and the variables that quantify service evaluate separately the cost-effective service, essential service, and functional service of each proposed project. The derivation of these variables is presented graphically in Fig 2.3. The variables are proposed as indices and they are labeled

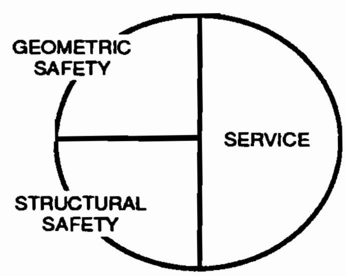
- SSI - Structural Safety Index,
- GSI - Geometric Safety Index,
- CSI - Cost-Effective Service Index,
- ESI - Essential Service Index, and
- FSI - Functional Service Index.

All of these indices may have an integer value between zero and nine, with zero indicating a critical condition. Further, the service variables are uniformly distributed variables with approximately 10 percent of all the structures each having variable values of 1, 2, 3, 4, 5, 6, 7, or 8 and approximately five percent of all the structures having variable values of zero and nine. These values of the Service Indices correspond to the percentiles of cumulative frequency of the variable value and are described completely in Chapter 3. The Safety Indices and the SDHPT variables are presented here only to demonstrate their use in TEBS.

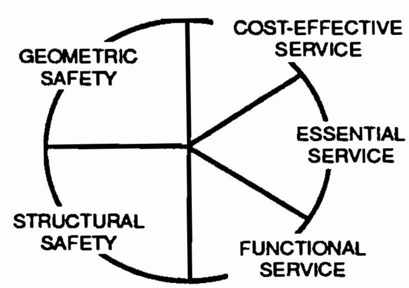
The SDHPT variables, the Service Indices, and the Safety Indices are determined from the coded information for each structure on the BRINSAP tape. They are calculated in the SURE or TEBS programs or taken directly from BRINSAP. Once they are determined for a structure they are considered in the evaluation processes used by the TEBS computer program. TEBS uses these methods of consideration to subdivide the eligible projects into three output subsets, as shown in Fig 2.2. The output sets of TEBS are the three subsets of eligible projects, Qualifying, Marginal, and Non-Qualifying. The Qualifying projects are those projects



Broad Categories of Consideration in TEBS3



Division of the Safety Category



Division of the Safety and Service Categories

Fig 2.3. The derivation of the safety and service indices.

in the most need of rehabilitation or replacement, and the Non-Qualifying projects are those in the least need of rehabilitation or replacement as evaluated by TEBS. The Marginal set of projects is formed to allow the user of the selection process to give individual consideration to a relatively short list of specific projects. The relative sizes of these subsets can be controlled by the user of the program, as described in Ref 1.

Automatic Qualification and Scoring

The evaluation processes TEBS uses to formulate subsets of eligible projects are Automatic Qualification and Scoring. Automatic Qualification is the individual consideration of each of the decision variables, and Scoring is the weighted and combined evaluation of all the project attributes. Automatic Qualification uses critical values input by the user of the process for each or any combination of the decision variables to check each project for possible automatic inclusion in the Qualifying set. Any of the variables may be used for Automatic Qualification of projects or none of the variables may be used. As an example, the user of the selection process may want to place into the Qualifying set all structures with SR's less than or equal to 20, or with DSS's less than or equal to 2. This would be accommodated through Automatic Qualification. The selection decision can also be based on the combined consideration of the values of decision variables through the TEBS Scoring process.

Scoring is a weighted combination method for the calculation of a priority index and gives a zero to 100 integer index indicating the priority of a structure for funding relative to all the other projects considered. 100 represents the highest priority a project can be given, and zero represents the lowest. TEBS scoring has been modified significantly from the first process developed. The latest versions of TEBS use a statistical evaluation of the decision variables to calculate the priority index for each project. This statistical evaluation is used for the individual assessment of the value of the decision variables, and is internal to the program. However, in order to consider these variables in combination, their relative importance must be provided by the user of the system.

The relative importance of the decision variables is represented in TEBS by variable weights. Variable weights may be input for any of the decision variables or a weight of zero may be input for a decision variable if it is intended that that variable be excluded from the prioritization process. The sum of the variable weights must equal 1.0. Clearly it is also possible to assign equal weights for the variables to be considered in the prioritization process, but the capability to emphasize those more critical attributes in the decision process is a feature of TEBS. It is also feasible to assign a weight of 1.0 to a single decision variable in the program and let the prioritization process be performed with consideration of only that single variable. The prioritization process in TEBS Version 3 is Percentile Scoring, as described below.

Percentile Scoring

The later versions of TEBS (TEBS2 and TEBS3) are formulated to consider the combination of the variable weights described through a statistical evaluation. Both of these versions of TEBS are listed in Appendix A. TEBS2 is formulated with the proposed Percentile Scoring and only the original Ref 1 variables. TEBS3 is formulated with Percentile Scoring but has available for this process the Refs 1 and 2 variables and the Service Indices developed in Chapter 3 of this report. The input file that allows the user of this selection process to select weights or relative importance of decision variables is thoroughly described in Ref 1. The input file for TEBS2 is exactly the same as that for TEBS1 except that line four described in Ref 1 is not required. In TEBS3, line four is not required, additional weights are required in line two, and additional Automatic Qualification levels are required in line three. These additional weights and levels are necessary since more variables are available in the latest version of TEBS. The order of the weights required in line two of the file TEBS3IC is

WTCPV, WTADT, WTSR, WTDSS, WTBWC, WTSSI, WTGSI, WTCSI, WTESI, WTFSI.

Similarly, the order for the Automatic Qualifying levels is:

AQCPV, AQADT, AQSR, AQDSS, AQBWC, AQSSI, AQGSI, AQCSI, AQESI, AQFSI.

The last letters of these variable names relate the weights (WT) and the automatically qualifying levels (AQ) to the SDHPT variables, Safety Indices, and Service Indices listed above. An example input file for each of the newer versions of TEBS is provided in Appendix A. These example files of inputs can be further investigated by referring to Ref 1. With this input, TEBS determines each project's prioritization index or score. The statistical evaluation the process uses to calculate project scores is based on the frequency distribution of the decision variable for the projects considered by TEBS.

Frequency distributions are data summaries. They may be formulated as tables or graphs. In the TEBS program the frequency tables used for each decision variable contain each of the occurring values of that variable, the frequency with which that value occurs in the eligible set of projects, and the accumulated percentage of frequency of occurrences for values, as they are tabulated. The frequency tables for the variables CPV, ADT, SR, and DSS as they occur in the Off-system eligible set of projects are shown in Tables 2.1 to 2.4. Similar, but complete, tables would be calculated in the TEBS program. The tables presented for the decision variables here have rounded values of CPV, ADT, and SR, while the tables used in TEBS Percentile Scoring contain all the occurring values of those variables.

TEBS uses the cumulative frequency percentage as the value goes from a noncritical condition to a critical condition (e.g., as SR=80 goes to SR=0 in Table 2.3) to proportion the variable weight to the TEBS Score. Projects with variable values completely noncritical (e.g., SR=80) would receive 0 percent of the SR weight, and projects with variable values completely critical (e.g., SR=2) would receive 100 percent of the SR weight. Projects with variable values between completely critical and completely noncritical receive percentages of the variable weight equal to the cumulative frequency percentage associated with each value of the variable tabulated. This calculation is performed for each of the decision variables, and the final score of the project is calculated as the sum of the results of each of these products.

The SR frequency table shown in Table 2.3 is presented as a histogram in Fig 2.4. If this histogram were presented with points for class marks (the count for each value) and lines connecting the points, the continuous plot would be the frequency polygon for SR. This is shown in Fig 2.5. Presented in Fig 2.6 is the graph of cumulative percentage for each of the values of SR as given in the last column of Table 2.3. This cumulative percentage is the percentage of area beneath the SR frequency polygon (Fig 2.5) to the left of the value of SR plotted. For example, the cumulative percentage value for SR=2 is 100 since 100 percent of the area beneath the SR polygon is to the left of, or less critical than, SR=2. The cumulative percentage value for SR=80 is zero since there is no area beneath the frequency polygon to the left of

TABLE 2.1. OFF-SYSTEM ELIGIBLE STRUCTURES COST PER VEHICLES FREQUENCY DISTRIBUTION

CPV	Frequency	Percent	Cumulative Frequency	Cumulative Percent	CPV	Frequency	Percent	Cumulative Frequency	Cumulative Percent
560000	3	0.0	3	0.0	800	408	4.2	2934	30.3
530000	1	0.0	4	0.0	700	452	4.7	3386	34.9
360000	1	0.0	5	0.1	600	611	6.3	3997	41.2
350000	1	0.0	6	0.1	500	738	7.6	4735	48.9
160000	1	0.0	7	0.1	400	933	9.6	5668	58.5
100000	2	0.0	9	0.1	300	1193	12.3	6861	70.8
90000	2	0.0	11	0.1	200	1152	11.9	8013	82.7
80000	1	0.0	12	0.1	100	563	5.8	8576	88.5
70000	3	0.0	15	0.2	90	102	1.1	8678	89.5
60000	3	0.0	18	0.2	80	116	1.2	8794	90.7
50000	2	0.0	20	0.2	70	100	1.0	8894	91.8
40000	6	0.1	26	0.3	60	105	1.1	8999	92.8
35000	7	0.1	33	0.3	50	64	0.7	9063	93.5
30000	8	0.1	41	0.4	45	44	0.5	9107	94.0
25000	10	0.1	51	0.5	40	53	0.5	9160	94.5
20000	23	0.2	74	0.8	35	64	0.7	9224	95.2
15000	35	0.4	109	1.1	30	49	0.5	9273	95.7
10000	29	0.3	138	1.4	25	59	0.6	9332	96.3
9000	20	0.2	158	1.6	20	48	0.5	9380	96.8
8000	25	0.3	183	1.9	15	62	0.6	9442	97.4
7000	42	0.4	225	2.3	10	44	0.5	9486	97.9
6000	57	0.6	282	2.9	9	26	0.3	9512	98.1
5000	72	0.7	354	3.7	8	15	0.2	9527	98.3
4500	53	0.5	407	4.2	7	19	0.2	9546	98.5
4000	58	0.6	465	4.8	6	23	0.2	9569	98.7
3500	75	0.8	540	5.6	5	21	0.2	9590	98.9
3000	131	1.4	671	6.9	4	34	0.4	9624	99.3
2500	160	1.7	831	8.6	3	30	0.3	9654	99.6
2000	284	2.9	1115	11.5	2	31	0.3	9685	99.9
1500	507	5.2	1622	16.7	1	5	0.1	9690	100.0
1000	643	6.6	2265	23.4	0	2	0.0	9692	100.0
900	261	2.7	2526	26.1					

SR=80. For SR=60, the cumulative percentage is 11 since 11 percent of the area under the frequency polygon is to the left of SR=60. The frequency polygon curve as shown in Fig 2.5 approximates the probability distribution function for a variable when a large number of classes (variable values) are plotted (Ref 5).

Using the cumulative frequency polygon shown in Fig 2.5 as a probability function to evaluate proper selection, it is clear that the probability of proper selection based only on SR is 1.0 if the only structures selected for funding are those with SR=2. It is also inferred that the probability of proper selection as evaluated by SR is equal to zero if the projects selected have SR=80. Furthermore, the probability of correct selection rises from zero to 1.0 along the cumulative percentage curve (Fig 2.6) as SR goes from the noncritical value of 80 to the critical value of 2. These probabilities of proper selection are determined for all the variables of each eligible project. Then these probabilities are multiplied by the variable weight and summed to produce the project's final score.

Since the variable BWC has only possible values of zero for critical and one for noncritical, the amount of weight summed to a project score based on BWC is always either zero or the entire weight. The following example illustrates the TEBS TEBS3 percentile scoring process. For this example only the Ref 1 variables have been used. The scores for each of the Off-system eligible projects given are calculated for the weight distribution shown.

Example 2.1

TEBS Version 3 percentile scores for each of the projects in Table 2.5 are computed using Off-system frequency distributions.

TABLE 2.2. OFF-SYSTEM ELIGIBLE STRUCTURES AVERAGE DAILY TRAFFIC FREQUENCY DISTRIBUTION

ADT	Frequency	Percent	Cumulative Frequency	Cumulative Percent	ADT	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Missing	15	0.0	0	0.0	275	37	0.4	8550	88.4
0	56	0.6	56	0.6	300	85	0.9	8635	89.2
5	65	0.7	121	1.3	325	30	0.3	8665	89.5
10	226	2.3	347	3.6	350	38	0.4	8703	89.9
15	141	1.5	488	5.0	375	15	0.2	8718	90.1
20	336	3.5	824	8.5	400	71	0.7	8789	90.8
25	1106	11.4	1930	19.9	425	25	0.3	8814	91.1
30	826	8.5	2756	28.5	450	31	0.3	8845	91.4
35	488	5.0	3244	33.5	475	21	0.2	8866	91.6
40	556	5.7	3800	39.3	500	65	0.7	8931	92.3
45	370	3.8	4170	43.1	600	88	0.9	9019	93.2
50	1001	10.3	5171	53.4	700	47	0.5	9066	93.7
55	284	2.9	5455	56.4	800	38	0.4	9104	94.1
60	364	3.8	5819	60.1	900	27	0.3	9131	94.4
65	203	2.1	6022	62.2	1000	133	1.4	9264	95.7
70	300	3.1	6322	65.3	2000	90	0.9	9354	96.7
75	173	1.8	6495	67.1	3000	66	0.7	9420	97.3
80	181	1.9	6676	69.0	4000	51	0.5	9471	97.9
85	131	1.4	6807	70.3	5000	39	0.4	9510	98.3
90	145	1.5	6952	71.8	6000	20	0.2	9530	98.5
95	99	1.0	7051	72.9	7000	24	0.2	9554	98.7
100	373	3.9	7424	76.7	8000	10	0.1	9564	98.8
125	341	3.5	7765	80.2	9000	14	0.1	9578	99.0
150	253	2.6	8018	82.9	10000	34	0.4	9612	99.3
175	152	1.6	8170	84.4	15000	43	0.4	9655	99.8
200	132	1.4	8302	85.8	20000	13	0.1	9668	99.9
225	111	1.1	8413	86.9	25000	8	0.1	9676	100.0
250	100	1.0	8513	88.0					

Score Calculation:

Project A Score = 10 x (0.349) + 10 x (0.085) + 35 x (0.705) + 35 x (0.941) + 10 x (0.0) = 62

Project B Score = 10 x (0.885) + 10 x (0.908) + 35 x (0.418) + 35 x (0.700) + 10 x (1.0) = 67

The value percentiles were determined from the frequency distribution tables for the variables shown in Tables 2.1 to

TABLE 2.3. OFF-SYSTEM ELIGIBLE STRUCTURES SUFFICIENCY RATING FREQUENCY DISTRIBUTION

SR	Frequency	Percent	Cumulative Frequency	Cumulative Percent	SR	Frequency	Percent	Cumulative Frequency	Cumulative Percent
80	29	0.3	29	0.3	40	164	1.7	3888	40.1
79	48	0.5	77	0.8	39	164	1.7	4052	41.8
78	61	0.6	138	1.4	38	222	2.3	4274	44.1
77	64	0.7	202	2.1	37	199	2.1	4473	46.2
76	48	0.5	250	2.6	36	174	1.8	4647	47.9
75	58	0.6	308	3.2	35	215	2.2	4862	50.2
74	55	0.6	363	3.7	34	247	2.5	5109	52.7
73	39	0.4	402	4.1	33	163	1.7	5272	54.4
72	58	0.6	460	4.7	32	299	3.1	5571	57.5
71	40	0.4	500	5.2	31	224	2.3	5795	59.8
70	57	0.6	557	5.7	30	226	2.3	6021	62.1
69	41	0.4	598	6.2	29	156	1.6	6177	63.7
68	46	0.5	644	6.6	28	210	2.2	6387	65.9
67	35	0.4	679	7.0	27	278	2.9	6665	68.8
66	39	0.4	718	7.4	26	164	1.7	6829	70.5
65	39	0.4	757	7.8	25	233	2.4	7062	72.9
64	70	0.7	827	8.5	24	360	3.7	7422	76.6
63	66	0.7	893	9.2	23	281	2.9	7703	79.5
62	75	0.8	968	10.0	22	236	2.4	7939	81.9
61	84	0.9	1052	10.9	21	195	2.0	8134	83.9
60	52	0.5	1104	11.4	20	265	2.7	8399	86.7
59	81	0.8	1185	12.2	19	260	2.7	8659	89.3
58	69	0.7	1254	12.9	18	215	2.2	8874	91.6
57	89	0.9	1343	13.9	17	371	3.8	9245	95.4
56	63	0.7	1406	14.5	16	228	2.4	9473	97.7
55	93	1.0	1499	15.5	15	78	0.8	9551	98.5
54	84	0.9	1583	16.3	14	32	0.3	9583	98.9
53	91	0.9	1674	17.3	13	18	0.2	9601	99.1
52	104	1.1	1778	18.3	12	19	0.2	9620	99.3
51	108	1.1	1886	19.5	11	10	0.1	9630	99.4
50	156	1.6	2042	21.1	10	4	0.0	9634	99.4
49	301	3.1	2343	24.2	9	14	0.1	9648	99.5
48	240	2.5	2583	26.7	8	7	0.1	9655	99.6
47	163	1.7	2746	28.3	7	9	0.1	9664	99.7
46	163	1.7	2909	30.0	6	8	0.1	9672	99.8
45	174	1.8	3083	31.8	5	7	0.1	9679	99.9
44	143	1.5	3226	33.3	4	4	0.0	9683	99.9
43	176	1.8	3402	35.1	3	3	0.0	9686	99.9
42	157	1.6	3559	36.7	2	6	0.1	9692	100.0
41	165	1.7	3724	38.4					

2.4, these cumulative percentage columns would plot along curves similar to that shown in Fig 2.6.

The procedure described and demonstrated is a weighted evaluation of project attributes. It uses a statistical evaluation of the variable values to assign a percentage of each variable weight to a final priority index. Because the frequency distributions are used to determine this percentage of weight, the final score is a true prioritization index. A project with a prioritization index, or score of 100, would be the most critical project being evaluated, based on the variables considered and the weights assigned. Similarly, a project with a score of 0 would be the least critical project being evaluated, based on the decision variables used and weights considered. TEBS3 Percentile Scores are relative priorities for the project set being considered. The values of project scores ranging between 0 and 100 represent the importance of the particular project relative to all the other projects considered.

TABLE 2.4. OFF-SYSTEM ELIGIBLE STRUCTURES DSS FREQUENCY DISTRIBUTION

DSS	Frequency	Percent	Cumulative Frequency	Cumulative Percent
9	4	0.0	4	0.0
8	1025	10.6	1029	10.6
7	2425	25.0	3454	35.6
6	2405	24.8	5859	60.5
5	925	9.5	6784	70.0
4	1299	13.4	8083	83.4
3	1040	10.7	9123	94.1
2	425	4.4	9548	98.5
1	72	0.7	9620	99.3
0	72	0.7	9692	100.0

TABLE 2.5. PROJECT PERCENTILE SCORES

Attribute	User Provided Weights	Attribute Value		Value Percentile	
		Project A	Project B	Project A	Project B
CPV	10	700	100	34.9	88.5
ADT	10	20	400	8.5	90.8
SR	35	26	39	70.5	41.8
DSS	35	3	5	94.1	70.0
BWC	10	1	0	0.0	100.0

Fig 2.4. Off-system eligible structures sufficiency rating histogram.

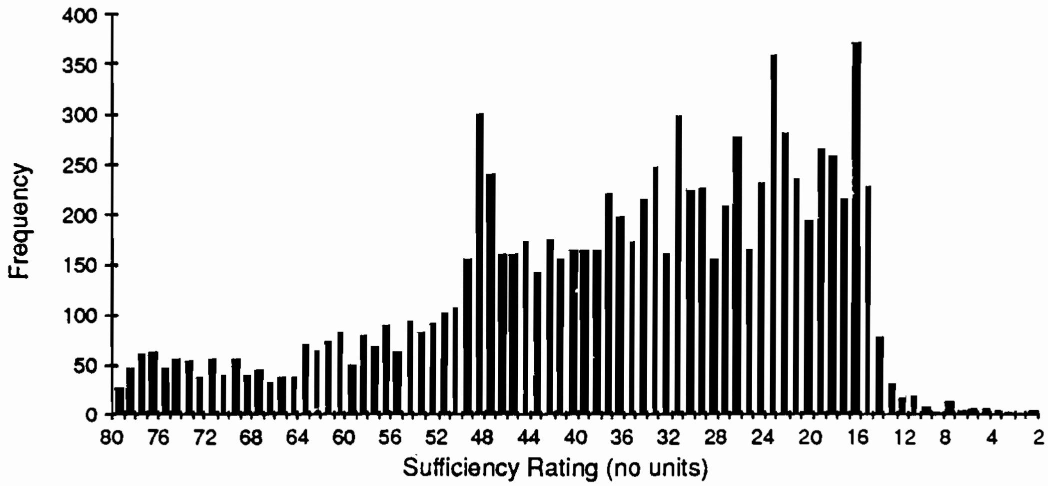


Fig 2.5. Off-system eligible structures sufficiency rating frequency polygon.

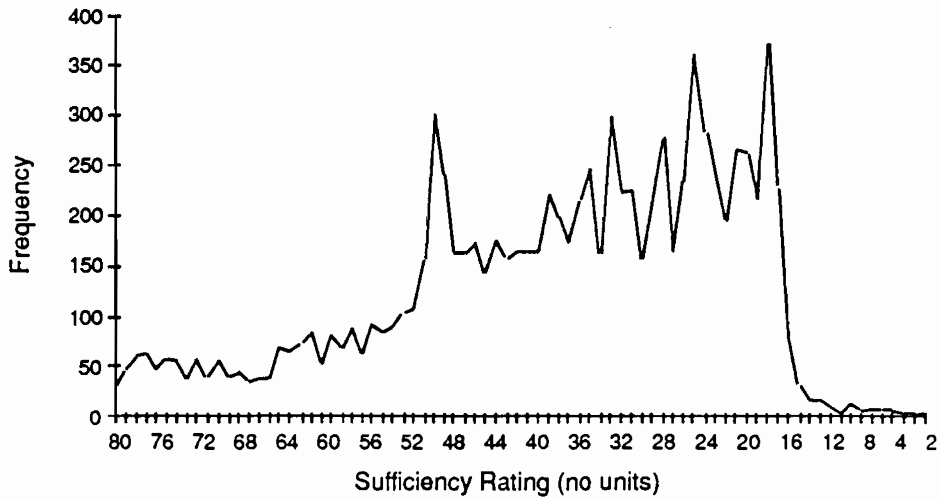
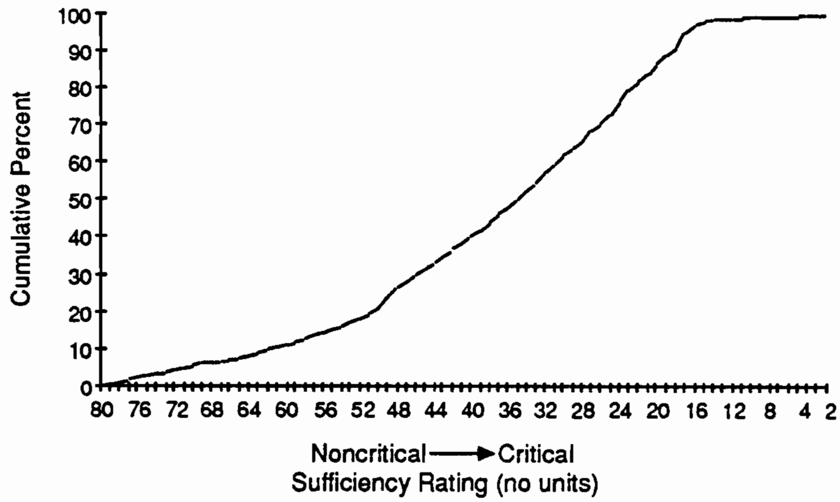


Fig 2.6. Off-system eligible structures sufficiency rating cumulative percentage curve.



TEBS uses the scores for all the projects and user inputted thresholds to finally subdivide projects into output sets. This process and the flexibility it adds to the complete selection program are presented completely in Ref 1. To summarize, however, the three output sets from TEBS are termed Qualifying, Marginal, and Non-Qualifying. The Qualifying set consists of those projects, based on the values of their scores, that are confidently to be funded. The Non-Qualifying set consists of those projects, based on their scores, that are confidently not to be funded. The Marginal set consists of projects that are to be evaluated further by the users of the process to determine if they should or should not be funded. The Qualifying set, incidentally, may contain projects which have been automatically qualified for funding. For these projects scores are calculated but not necessarily used to move the project into the Qualifying Set. It is the extremely critical value of only one specified decision variable that mandates the placement of Automatically Qualifying projects.

A sample of TEBS3 output listing is reprinted in Appendix C. TEBS2 output is different from TEBS1 only in that TEBS2 listings do not have Passing Levels. TEBS1 listings are presented in Ref 1. The TEBS3 listing is first a presentation of projects and project information that comprise the three TEBS output sets: Qualifying, Marginal, and Non-Qualifying. The information presented in TEBS3 project lists is the same for each project as that of TEBS1 and TEBS2 except that the Safety and Service Indices are presented, as well as all the previous project information. The projects are listed in order of descending TEBS scores. In addition to the project listings, TEBS3 presents summary tables of the frequency distributions for each of the decision variables. The summary tables are usually rounded to the nearest tenth percentile. These tables are presented for user review as well as for estimating or checking project scores.

In the computerized bridge project selection program proposed here, the Qualifying and the Marginal sets of projects would then be sorted by District and forwarded to the appropriate District Engineer for final confirmation or further evaluation. This procedure would be driven by a P/C Reporting Program which would work interactively with the District evaluator. This begins the District-level of the computerized selection process as it is shown in Fig 2.1 and detailed in Fig 2.7. The sorted projects would be output to diskettes, and sent to the District Engineer along with the reporting program. The evaluator at the district level could run the P/C reporting program and provide evaluation of the projects forwarded and add any projects that he feels should have been output by TEBS. The updated project reports would then be returned to the State-level evaluator for final project selection.

THE DISTRICT-LEVEL REPORTING PROGRAM

There are two objectives of the reporting program. First, it should aid the District evaluator's effective review of projects forwarded, and second, it should provide feedback to the State level of the selection process. The input for the reporting program will be an output file from the TEBS computer model. The output from the reporting program will be the final report of projects selected for funding. This final report should be a listing of selected projects as well as a summary of the selection criteria implemented for that program.

The first objective of the reporting program is to provide the District Evaluator with the necessary information and capacity to assign District priority to projects identified by TEBS as either Qualifying or Marginal. The information necessary for this is to be forwarded from the State level of the process for each Qualifying and Marginal project in the District. This information should include, at least, Project District, County, Control-Section-Structure Number, CPV, ADT, SR, DSS, BWC, SSI, GSI, CSI, ESI, FSI, Cost of Proposed Improvements, Roadway Width, Type of Work, TEBS Score and Subset, and any secondary decision criteria defined for that particular selection program. The reporting program should also facilitate the preparation of reports of

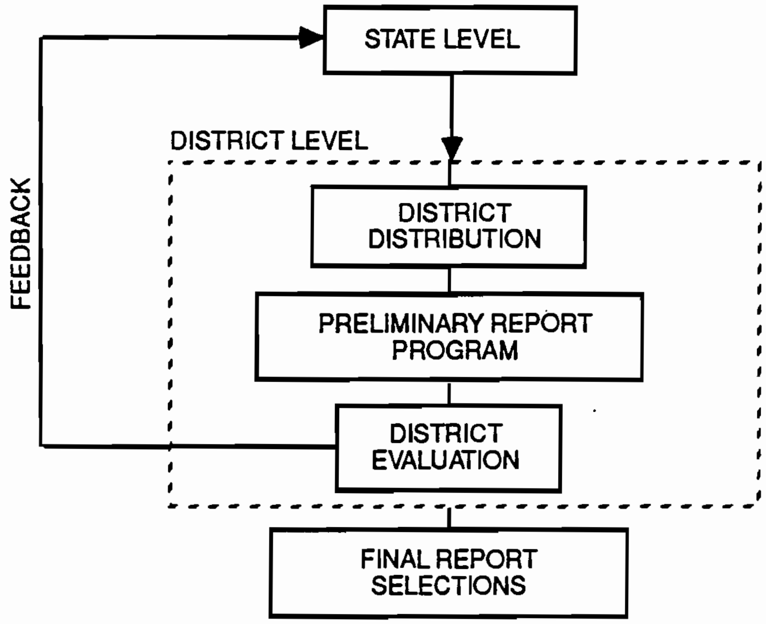


Fig 2.7. The District-level of the Computerized Bridge Project Selection Pro-

projects received with certain values of variables. This sorting of subsets should be available for single variables or for combinations. It should facilitate the sorting of projects with variables less than or greater than a given value. For example, the District Evaluator should be able to subset with the reporting program all the projects he has been forwarded with SR's less than 20 and DSS's less than or equal to two.

As well as sorting, the reporting program should allow the District Evaluator to add comments about each project forwarded and to input District priority for each project. The program should also allow the District Evaluator to add projects for State-level consideration that were not output by the program TEBS. Most importantly, the reporting program must feedback to the State-level of the selection process.

At the State-level of the selection process the reporting program would be used to make final program selections and produce the final program listing. The State-level Evaluator must be able to review each project and the comments provided by the District-level Evaluator and input the final selection decision. The State-level Evaluator should also be able to record his own comments and have easy access to the accumulated costs of selected projects. The reporting program should also output the selected projects in existing SDHPT format. Most importantly, the reporting program must provide feedback from the District-level of the process to the State-level. This feedback would originate from each district and should be their evaluation of the important decision variables and variable weights. This type of feedback, if it is consistent throughout the State, could be used directly to update TEBS input criteria.

As the State-level Evaluator reviews the reports from the District level he would also be evaluating the variables used in TEBS and the weights assigned to those variables. If District Evaluators are giving high priorities to projects not given high priorities by the TEBS program, the inputs for TEBS might be revised to better reflect the consistent concerns of the District Evaluators. Through this feedback process, the TEBS program could evolve into an efficient automated priority evaluator.

SUMMARY

The computerized bridge project selection program for Texas is a two-level closed-loop process developed for the proper selection of bridge rehabilitation and replacement projects. The process can be used for either the On-system or Off-system project classifications. The State-level of the process is composed primarily of the two automated models SURE and TEBS. TEBS has recently been improved with a statistical evaluation process described as Percentile Scoring. The District-level of the process is driven by a P/C reporting program and provides feedback to the State-level automated models. The TEBS computer model has been improved beyond the Percentile Scoring process, however. After a brief explanation of the Ref 2 variables, the new service indices developed for TEBS3 are discussed in Chapter 3.

CHAPTER 3. THE SAFETY AND SERVICE INDICES

The evaluation of individual projects involves the combined consideration of several attributes of each project, as demonstrated by the scoring example in Chapter 2. The decision can be formulated as a categorization of characteristics or attributes. This methodology has been used for the systematic development of decision criteria available within the automated prioritization program TEBS. The decision methodology has been formulated as the consideration of characteristics quantifying the service and the safety of bridge rehabilitation and replacement projects.

Indices that can be used to evaluate safety in the TEBS computer program are described in Ref 2. The indices developed there combine individual ratings given for various parts of an existing structure to formulate a new index which can be implemented in the decision made by TEBS. These indices quantify the broad consideration of safety under two different divisions. The Safety Indices were developed to separately consider the geometric and structural safety requirements of each proposed project. These indices have been automated in the TEBS3 program only recently, and the coding for that program is provided in Appendix A. The derivation of these indices is diagrammed in Fig 2.3.

STRUCTURAL SAFETY INDEX

The Structural Safety Index combines six ratings to produce a single integer from zero to nine which can be used within the TEBS computer model. In Ref 2 it was proposed that the Structural Safety Index have values only of 0, 3, 6, or 9. This limiting of values is consistent with the expected accuracy of the subjective ratings to be combined. The six ratings which have been proposed for combination are

- SUBCO - Substructure Condition Rating,
- SSCO - Superstructure Condition Rating,
- DECO - Deck Condition Rating,
- CPCO - Channel and Channel Protection Condition Rating,
- ARCO - Approach Condition Rating, and
- RWCO - Retaining Wall Condition Rating.

In order to properly consider these indices in combination their relative importance must be assigned.

One method for quantifying the relative importance of project attributes is index weighting. A series of weights for the condition ratings to be combined was developed in Ref 2 and they will not be discussed here. It is these weights that were used in the TEBS3 computer program to code the calculation of the Structural Safety Index. These weights will vary in value in the computer program if one or more of the condition ratings is not applicable to a project. While the present coding of weights follows the Ref 2 formulation, it could be altered to accommodate different evaluations of the importance of the ratings to be combined. The formulation could also be modified to exclude any of the ratings from the determination of the Structural Safety Index. This combined consideration of condition ratings, however, is more appropriate to an automated prioritization process than the consideration of only minimum values of ratings, such as is done with the variable DSS. The variable DSS, is more appropriate to the process of Automatic Qualification. Both the SSI and the DSS are programmed and available for use in the decisions to be made in TEBS3.

Since programming the Structural Safety Index, it was determined that the frequency distribution for the limited range of only four values was heavily skewed. This frequency distribution is shown for Off-system eligible structures in Fig 3.1. It is suggested, therefore, either the process of rating structures be modified to an integer scale of zero to four, or that the Structural Safety Index be formulated to range in integer values between zero and nine. This zero to nine range for the index would match the existing method of appraising and rating the condition of structures in BRINSAP.

GEOMETRIC SAFETY INDEX

The other aspect of safety quantified in the decision model TEBS and explained in Ref 2 is geometric safety. Geometric safety is evaluated as a combination of two appraisal ratings, an evaluation of existing guardrails and an evaluation of existing bridge width and approach roadway width. The variables combined to produce the Geometric Safety Index are

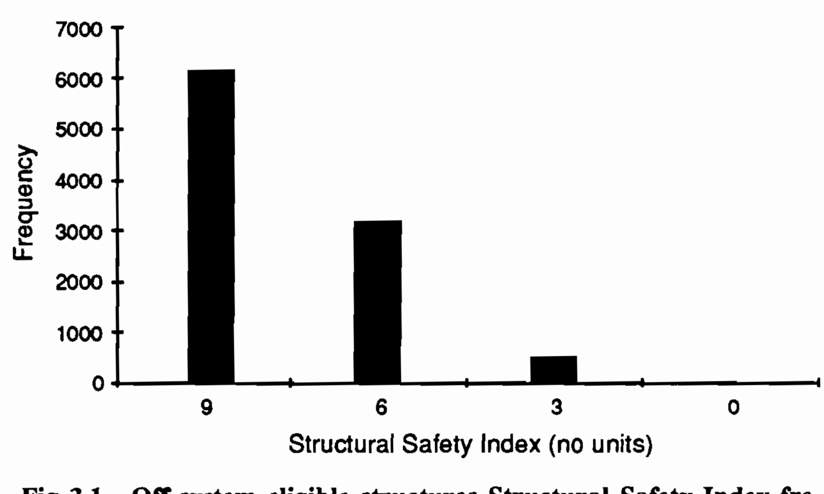


Fig 3.1. Off-system eligible structures Structural Safety Index frequency histogram.

DGAR - Deck Geometry Appraisal Rating,
AGAR - Approach Geometry Appraisal Rating,
TGR - Transformed Guardrail Rating, and
WD - Width Differential.

These variables are weighted, similarly to the Structural Safety Index, and are combined to produce an integer value between zero and nine. A zero would represent a critical condition of geometric safety, while a nine would represent a noncritical condition of geometric safety. The Geometric Safety Index is completely described in Ref 2. Here again, one weighting scheme for the ratings to be combined is described in that reference but could be altered by the user of the selection process. The formulation of the GSI described in Ref 2 has been coded in TEBS3 and the frequency distributions for the Off-system eligible project GSI's as calculated by TEBS3 are shown in Fig 3.2.

In summary the broad classification of safety has been subdivided into geometric and structural components for separate quantification. These indices, alone however, do not constitute a complete set of decision criteria. In addition to considering the safety a proposed project will provide, the proper evaluation of projects requires a consideration of service. This category of consideration has also been subdivided to more efficiently assess projects. The components of this division are presented as the Service Indices in the following section.

SERVICE INDICES

Together, the Geometric and the Structural Safety Indices complete one category of the decision made in TEBS. This decision may be demonstrated with the diagram in Fig 3.3. In this chart, the considerations of TEBS are first subdivided into the broad categories of safety and service; next the category of safety is divided into its structural and geometric components. The structural and the geometric considerations can then be divided into the ratings that are combined to formulate the indices that quantify them. Re-

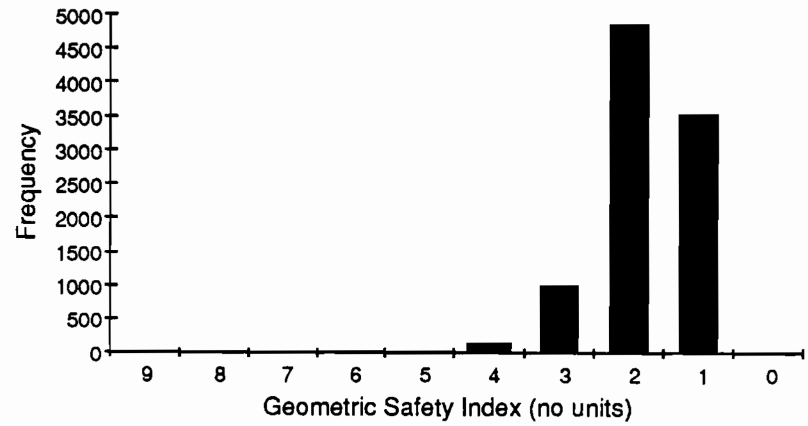


Fig 3.2. Off-system eligible structures Geometric Safety Index frequency histogram.

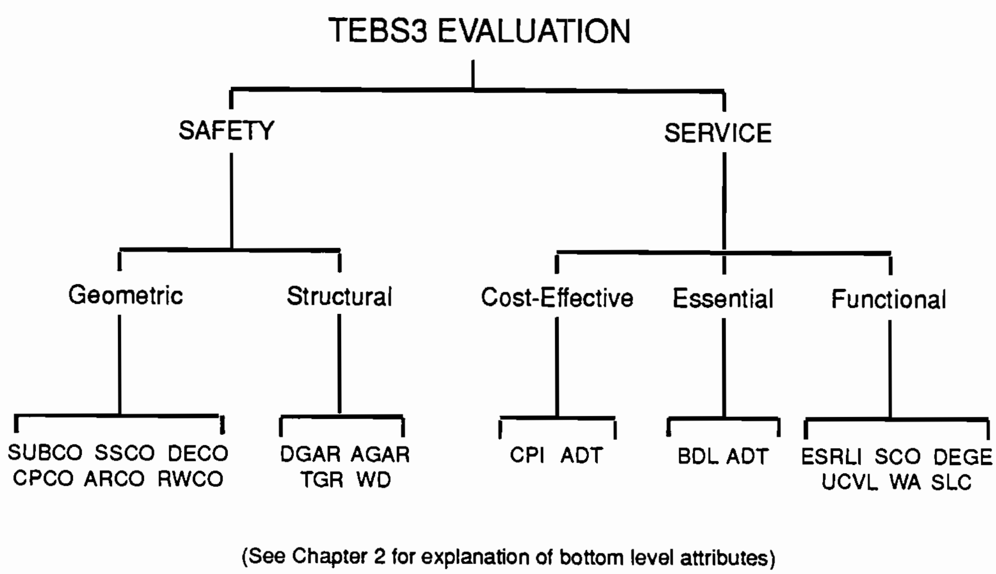


Fig 3.3. TEBS3 Safety/Service Indices evaluation composition.

maining to be systematically developed, however, is the broad category of service.

Like the category of safety, indices were developed to evaluate the service of each of the projects considered in the TEBS program. These indices evaluate separately cost-effective, essential, and functional service levels to determine the relative importance of rehabilitation and replacement structures input to the program TEBS. The development of these indices is similar to the statistical evaluation process presented as Percentile Scoring. All the Service Indices have a range of integer values between zero and nine, and they are uniformly distributed variables. While they do have some characteristics in common, they will each be presented separately. Immediately below is the evaluation of cost-effectiveness followed by the essential service evaluation and presented finally is the evaluation of functional service.

Cost-Effective Service Index

Cost-effective service is quantified by the Cost-Effective Service Index (CSI). CSI is formulated as a function of two variables:

- CPI - The cost of proposed improvements for each structure, and
- ADT - The average daily traffic over the structure.

CPI is normally recorded on the BRINSAP tape for each project eligible for FHWA funds for replacement or rehabilitation. It is recorded in units of 1000 dollars under the variable name COPRI and is the total cost of improvements. This total cost of improvements includes at least preliminary engineering costs, demolition costs and substructure and superstructure construction costs. In cases of replacement, the cost of proposed improvements may also include the price of required approach work (Ref 3). In the computer program TEBS, cost of proposed improvements may be estimated if no value for COPRI is recorded. The estimation of the variable CPI is made as follows:

$$CPI = LOI*PRW*CFRH,$$

or

$$CPI = LOI*PRW*CFRP,$$

where

- CPI - cost of improvements,
- LOI - length of improvements,
- PRW - proposed roadway width,
- CFRH - cost for rehabilitation as input by the user of TEBS, and
- CFRP - cost for replacement as input by the user of TEBS.

If square footage costs are not input by the TEBS user, the program uses values of $25/square foot for rehabilitation and $35/square foot for replacement. If the measurement of length or width is missing, as well as COPRI, the program assigns cost of improvements (CPI) a value of $20,000. As with most variables used in the TEBS decision model, if any value used in the calculation of the variable is assumed by the program, that variable is flagged with an asterisk. Few projects have cost of improvements estimated by TEBS for either the On-system or the Off-system BRINSAP tapes. The frequency distributions for rounded values of the variable CPI, as determined for the Off-system eligible projects, are shown in Table 3.1. While the table is composed of rounded values, the tables used for the determination of the CSI within TEBS3 are complete listings of all the values of CPI.

To determine the Cost-Effective Service Index for each project, the project's Average Daily Traffic and its Cost of Improvements are evaluated. The Average Daily Traffic for for Off-system projects ranges from 25,000 to 0 vehicles per day. The frequency distributions for rounded values of this attribute for the Off-system eligible projects are shown in Table 2.2. Again it should be noted, that, while the tables printed here are for rounded values of ADT, the tables used within TEBS for the calculation of CSI are longer complete listings of all the values of ADT being considered.

The Cost-Effective Service Index is an indicator of the project's cost-effectiveness as quantified by its Average Daily Traffic and Cost of Improvements. It is an integer variable that ranges in value between zero and nine. Very cost-effective projects will have low CSI's and projects not cost-effective will have higher CSI's. Further, the calculation of CSI is such that its value is an indicator of the particular project's critical condition relative to all the other projects considered.

The calculation of the variable CSI for each project considered by TEBS first requires the determination of the frequency distributions for the variables CPI and ADT. The frequency distributions should be ordered from noncritical value to critical value as listed in Tables 2.2 and 3.1 for the variables considered. For the variable CPI the noncritical value is the most expensive project considered by TEBS. In the frequency table for Off-system projects (Table 3.1) it is $9,400,000. The most critical value for CPI is the least expensive project considered, $1000 for the the Off-system projects, again as shown in Table 3.1. All the other values for CPI as they are distributed throughout the set of considered projects are tabulated in a frequency distribution similar to those shown in these tables.

With this distribution determined for the set of projects considered, the next step is to calculate cumulative percents for each of the values of the variables CPI and ADT. This number is shown in the last column of the frequency tables for these variables in Tables 3.1 and 2.2. This value ranges from zero to 100, and it is the cumulative frequency divided by the total number of projects considered. For each project evaluated by TEBS, the next step is to add together the cumulative percents of that project for its values of CPI and

TABLE 3.1. OFF-SYSTEM ELIGIBLE STRUCTURES COST OF PROPOSED IMPROVEMENTS FREQUENCY DISTRIBUTION

CPI	Frequency	Percent	Cumulative Frequency	Cumulative Percent
$9,400,000	1	0.0	3	0.0
$9,100,000	1	0.0	4	0.0
$3,300,000	1	0.0	5	0.1
$2,000,000	1	0.0	6	0.1
$1,400,000	1	0.0	7	0.1
$1,300,000	2	0.0	9	0.1
$1,200,000	2	0.0	11	0.1
$1,100,000	2	0.0	13	0.1
$1,000,000	5	0.1	18	0.2
$900,000	3	0.0	21	0.2
$800,000	1	0.0	22	0.2
$750,000	4	0.0	26	0.3
$700,000	3	0.0	29	0.3
$650,000	9	0.1	38	0.4
$600,000	4	0.0	42	0.4
$550,000	10	0.1	52	0.5
$500,000	16	0.2	68	0.7
$450,000	12	0.1	80	0.8
$400,000	15	0.2	95	1.0
$375,000	21	0.2	116	1.2
$350,000	15	0.2	131	1.4
$325,000	22	0.2	153	1.6
$300,000	18	0.2	171	1.8
$275,000	33	0.3	204	2.1
$250,000	46	0.5	250	2.6
$225,000	42	0.4	292	3.0
$200,000	69	0.7	361	3.7
$175,000	77	0.8	438	4.5
$150,000	83	0.9	521	5.4
$140,000	56	0.6	577	6.0
$130,000	89	0.9	666	6.9
$120,000	91	0.9	757	7.8
$110,000	85	0.9	842	8.7
$100,000	89	0.9	931	9.6
$95,000	47	0.5	978	10.1
$90,000	85	0.9	1063	11.0
$85,000	81	0.8	1144	11.8
$80,000	95	1.0	1239	12.8
$75,000	100	1.0	1339	13.8
$70,000	95	1.0	1434	14.8
$65,000	144	1.5	1578	16.3
$60,000	134	1.4	1712	17.7
$55,000	175	1.8	1887	19.5
$50,000	276	2.8	2163	22.3
$45,000	296	3.1	2459	25.4
$40,000	168	1.7	2627	27.1
$39,000	111	1.1	2738	28.3
$38,000	83	0.9	2821	29.1
$37,000	106	1.1	2927	30.2
$36,000	82	0.8	3009	31.0
$35,000	87	0.9	3096	31.9
$34,000	164	1.7	3260	33.6
$33,000	89	0.9	3349	34.6
$32,000	99	1.0	3448	35.6
$31,000	68	0.7	3516	36.3
$30,000	155	1.6	3671	37.9
$29,000	234	2.4	3905	40.3
$28,000	113	1.2	4018	41.5
$27,000	129	1.3	4147	42.8
$26,000	132	1.4	4279	44.1
$25,000	343	3.5	4622	47.7
$24,000	195	2.0	4817	49.7
$23,000	160	1.7	4977	51.4
$22,000	221	2.3	5198	53.6
$21,000	160	1.7	5358	55.3
$20,000	534	5.5	5892	60.8
$19,000	273	2.8	6165	63.6
$18,000	258	2.7	6423	66.3
$17,000	274	2.8	6697	69.1
$16,000	259	2.7	6956	71.8
$15,000	619	6.4	7575	78.2
$14,000	448	4.6	8023	82.8
$13,000	395	4.1	8418	86.9
$12,000	355	3.7	8773	90.5
$11,000	326	3.4	9099	93.9
$10,000	229	2.4	9328	96.2
$9,000	66	0.7	9394	96.9
$8,000	140	1.4	9534	98.4
$7,000	84	0.9	9618	99.2
$6,000	62	0.6	9680	99.9
$5,000	1	0.0	9681	99.9
$4,000	2	0.0	9683	99.9
$3,000	2	0.0	9685	99.9
$2,000	2	0.0	9687	99.9
$1,000	5	0.1	9692	100.0

ADT.

The summation of these two percentiles is termed CRSUMC and its frequency distribution is summarized and related to CSI in Table 3.2 for Off-system eligible structures. This variable has a possible range of zero to 200. If a project had a value of CPI that was the lowest of all those considered by TEBS, and also had an ADT that was the highest of all those considered by TEBS, then that project would have a CRSUMC of 200. Similarly, if a project had the highest cost and the lowest average daily traffic of any of those projects considered by TEBS, then that project would have a CRSUMC of zero. The variable value CRSUMC directly implies the value of the Cost-Effective Service Index for a project.

TABLE 3.2. OFF-SYSTEM ELIGIBLE STRUCTURES CRSUMC RANGES FOR COST-EFFECTIVE SERVICE INDICES

	CRSUMC			
CSI	Max	Min	Number	Percent
0	198	160	522	5
1	159	140	1054	11
2	139	126	1109	11
3	125	115	1044	11
4	114	105	1028	11
5	104	95	1152	12
6	94	84	996	10
7	83	69	1102	11
8	68	43	1125	12
9	42	0	560	6

The Cost-Effective Service Index is calculated as a uniformly distributed variable from CRSUMC. The value ranges from zero to nine, with the most critical five percent of projects receiving CSI values of zero, and the least critical five percent of projects receiving CSI values of nine. The remaining 90 percent of the projects considered by TEBS would receive CSI values of one to eight, with about ten percent of the total number of projects each receiving CSI's of 1, 2, 3, 4, 5, 6, 7, or 8. This sort of distribution is termed uniform. A frequency table for the variable CSI is shown in Table 3.3 and a graph of the frequency histogram for the variable is shown in Fig 3.4.

The broad category of service is also quantified, in part, by a consideration of the essential service a project may provide. The variable developed to quantify this aspect of service is termed the Essential Service Index (ESI). Like the Cost-Effective Service Index this index has a range in value of zero to nine. It can take the value of any integer within that range and it is also a uniformly distributed variable. The Essential Service Index is proposed for the partial evaluation of service made by the automated prioritization model TEBS. It would be used in conjunction with the other Safety and Service Indices to determine the relative priority of bridge rehabilitation and replacement projects considered in the Computerized Bridge Project Selection Program for Texas.

TABLE 3.3. OFF-SYSTEM ELIGIBLE STRUCTURES COST-EFFECTIVE SERVICE INDEX FREQUENCY DISTRIBUTION DISTRIBUTION

CSI	Frequency	Percent	Cumulative Frequency	Cumulative Percent
9	560	5.8	560	5.8
8	1125	11.6	1685	17.4
7	1102	11.4	2787	28.8
6	996	10.3	3783	39.0
5	1152	11.9	4935	50.9
4	1028	10.6	5963	61.5
3	1044	10.8	7007	72.3
2	1109	11.4	8116	83.7
1	1054	10.9	9170	94.6
0	522	5.4	9692	100.0

Essential Service Index

The Essential Service Index (ESI) is formulated as a function of the Average Daily Traffic (ADT) over a considered structure and the Bypass Detour Length (BDL) around a considered structure. Both of these variables, ADT and

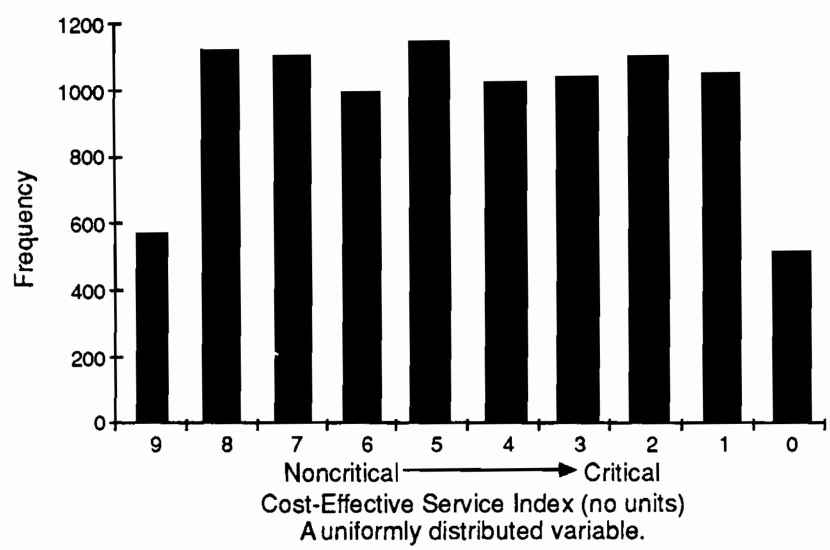


Fig 3.4. Off-system structures Cost-Effective Service Index frequency histogram.

BDL, are coded on the BRINSAP record for projects considered in the computerized bridge project selection program. The Bypass Detour Length is defined in Ref 3 as the

> shortest feasible detour measured to the nearest mile. The detour may include any On-System or Off-System route so long as the bridges and the roadways are adequate to carry the detoured traffic. The detour length represents the total additional travel for a vehicle which would result if the bridge were closed or if the vehicle were unable to pass over or under the bridge due to restricted clearances or load restrictions.

The frequency distribution for BDL for the Off-system structures eligible for federal funding is shown in Table 3.4.

The consideration of ADT and BDL in the formulation of ESI is consistent with the formulation of all the Service Indices. This formulation is a multivariate frequency distribution analysis which relates a single index value to combinations of values of other variables. In this case the values of variables considered by frequency distribution are ADT and BDL, and the index produced is termed ESI.

The first step in the determination of the Essential Service Index is the calculation of frequency distribution tables for the variables ADT and BDL. These distribution are shown for ADT in Table 2.2 and for BDL in Table 3.4 for the Off-system eligible structures considered in the computerized selection process. After determination of the frequency distribution for the two variables, the cumulative percentages for the variable values must be determined as the frequency tables are ordered from noncritical values to critical values. The ADT frequency distribution table is ordered from zero vehicles per day to 25,000 vehicles per day for these same projects. The BDL tables are ordered from zero detour miles to 99 detour miles for Off-system structures. The cumulative frequency of values divided by the total number of projects considered is cumulative percent, and it is shown in the last column of these tables.

These cumulative percentiles quantify the relative criti-

TABLE 3.4. OFF-SYSTEM ELIGIBLE STRUCTURES BYPASS DETOUR LENGTH FREQUENCY DISTRIBUTION

BDL	Frequency	Percent	Cumulative Frequency	Cumulative Percent	BDL	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	558	5.8	558	5.8	27	12	0.1	9302	96.1
1	938	9.7	1496	15.5	28	8	0.1	9310	96.2
2	638	6.6	2134	22.0	29	2	0.0	9312	96.2
3	913	9.4	3047	31.5	30	23	0.2	9335	96.4
4	1158	12.0	4205	43.4	31	6	0.1	9341	96.5
5	1105	11.4	5310	54.8	32	5	0.1	9346	96.5
6	960	9.9	6270	64.8	33	4	0.0	9350	96.6
7	664	6.9	6934	71.6	34	1	0.0	9351	96.6
8	637	6.6	7571	78.2	35	1	0.0	9352	96.6
9	386	4.0	7957	82.2	36	2	0.0	9354	96.6
10	299	3.1	8256	85.3	38	2	0.0	9356	96.6
11	203	2.1	8459	87.4	39	1	0.0	9357	96.6
12	183	1.9	8642	89.3	40	6	0.1	9363	96.7
13	107	1.1	8749	90.4	41	1	0.0	9364	96.7
14	114	1.2	8863	91.5	42	1	0.0	9365	96.7
15	121	1.2	8984	92.8	44	1	0.0	9366	96.7
16	69	0.7	9053	93.5	45	2	0.0	9368	96.8
17	46	0.5	9099	94.0	50	5	0.1	9373	96.8
18	37	0.4	9136	94.4	53	1	0.0	9374	96.8
19	22	0.2	9158	94.6	55	1	0.0	9375	96.8
20	47	0.5	9205	95.1	61	1	0.0	9376	96.8
21	13	0.1	9218	95.2	66	3	0.0	9379	96.9
22	27	0.3	9245	95.5	70	7	0.1	9386	96.9
23	13	0.1	9258	95.6	83	1	0.0	9387	97.0
24	9	0.1	9267	95.7	86	3	0.0	9390	97.0
25	20	0.2	9287	95.9	93	1	0.0	9391	97.0
26	3	0.0	9290	96.0	99	291	3.0	9682	100.0

calness of the different values of ADT and BDL. It should be noted that values of ADT On-system and values of ADT Off-system have different degrees of criticalness, depending on the classification they are in. This consideration by TEBS3 is consistent with the objective a prioritization model. If an Off-system structure has an ADT of 1200 vehicles per day it is given a much higher cumulative percent than an On-system structure with an ADT of 1200 vehicles per day. This is because Off-system structures do not typically have high values of ADT and On-system structures do. TEBS3 is adaptive to the set it is prioritizing.

With the cumulative percentiles calculated for each of the values of the variables ADT and BDL, the next step is to combine them. Similar to the combination used for the determination of CSI, the ADT and BDL percentiles are summed for each project considered by the TEBS computer model. This sum is labeled CRSUME. The frequency distribution for the variable CRSUME for the Off-system eligible structures considered is summarized in Table 3.5. The maximum possible value for CRSUME, is 200 and the minimum value that it could have is zero. This variable is an indicator of the critical value of the combined consideration of the variables ADT and BDL. It is used to calculate directly the Essential Service Index.

To calculate the Essential Service Index the cumulative frequency distribution is determined for the variable CRSUME as shown in Table 3.5. The cumulative percentage is calculated for each of the values of CRSUME as the frequency table is ordered from critical values to noncritical values (200 to 0). Finally, these values are equated to the integer range of ESI. Like CSI, ESI is a uniformly distributed index having integer values between zero and nine. Projects with ESI values of zero comprise approximately the most critical five percent of all projects with regard to ADT and BDL. These projects have higher ADT's and longer BDL's than the other projects considered by TEBS. Projects with ESI's of nine have the least critical values of ADT and BDL. Further, because ESI is of a known frequency distribution, the set of structures with ESI's of six comprise the least critical 35 to 40 percent of all structures considered. Similar information can be inferred from the other possible values of ESI since about ten percent of all the structures considered will have ESI values of like integers. The frequency distribution table for the Off-system ESI's is given in Table 3.6.

Functional Service Index

The final consideration in the TEBS computer model under the category of service is the the project's functional service. This consideration, like the other two Service Indices, CSI and ESI, is quantified by a uniformly distributed integer variable. The range of this integer variable is also zero to nine. Similarly, the method of consideration is a multivariate distribution analysis of related variables. The multivariate analysis is then related to the integers zero to nine in a uniform distribution as with the other two Service Indices. The difference between the methodology for the development of the Functional Service Index and the methodology for the development of the Cost-Effective and the Essential Service Indices is the number of variable distributions considered.

In the first two Service Indices, the analysis was bivariate only. For the CSI the variable ADT was considered in combination with the variable CPI to produce the final index. For the ESI the variable ADT was considered in combination with the variable BDL to produce the final index. These combinations are more straightforward than the combination to be used for the FSI. These bivariate frequency analyses also lend themselves to array summaries such as those shown in Fig 3.5 for the Off-system CSI's and those shown in Fig 3.6 for the Off-system ESI's. In these arrays, the Indices are shown as the result of various occurrences of ADT, CPI, and BDL percentiles. The percentiles of these tables have been rounded to the nearest tenth, but they show that projects with index values of nine have the

TABLE 3.5. OFF-SYSTEM ELIGIBLE STRUCTURES CRSUME RANGES FOR ESSENTIAL SERVICE INDICES

CSI	CRSUMC Max	CRSUMC Min	Number	Percent
0	196	160	503	5
1	159	137	1065	11
2	136	120	1102	11
3	119	109	1004	10
4	108	101	1064	11
5	100	92	1115	12
6	91	76	1118	12
7	75	60	1018	11
8	59	35	1125	12
9	34	0	578	6

TABLE 3.6. OFF-SYSTEM ELIGIBLE STRUCTURES ESSENTIAL SERVICE INDEX FREQUENCY DISTRIBUTION

ESI	Frequency	Percent	Cumulatlve Frequency	Cumulative Percent
9	578	6.0	578	6.0
8	1125	11.6	1703	17.6
7	1018	10.5	2721	28.1
6	1118	11.5	3839	39.6
5	1115	11.5	4954	51.1
4	1064	11.0	6018	62.1
3	1004	10.4	7022	72.5
2	1102	11.4	8124	83.8
1	1065	11.0	9189	94.8
0	503	5.2	9692	100.0

least critical combination of percentiles, and projects with index values of zero have the most critical combination of percentiles. Further, the integer values between zero and nine are uniformly distributed, as explained above. Unlike the CSI and the ESI, the FSI is a consideration of more than just two variables; therefore, it can not be easily summarized in an array. Its determination is similar in method, however, and is presented.

The Functional Service Index is the last Service Index to be developed. It is formulated to provide consideration to the important remaining aspects of service that can be taken from the BRINSAP tape and manipulated in the TEBS automated model. The variables used in the multivariate frequency determination of the FSI are

- ESRLI - Estimated Remaining Life in years,
- SCO - Appraisal of Structural Condition,
- DEGE - Appraisal of Roadway Geometry,
- UCVL - Appraisal of Vertical and Lateral Underclearance,
- WA - Appraisal of Waterway Adequacy, and
- SLC - Safe Load Capacity.

These variables are all recorded directly on the BRINSAP tapes for On-system and Off-system projects, and they have the following definitions.

ESRLI - "The remaining life of the bridge is estimated based on all appropriate factors such as material, traffic volume, age and condition. The estimate, which should be made using the best judgement of a knowledgeable individual, reflects the number of years the bridge can continue to carry traffic without major reconstruction" (Ref 3).

SCO - The appraisal of the structural condition "applies to all bridges, and its rating takes into account any major structural deficiencies. This rating is based partially on the Roadway, Superstructure, and Substructure condition ratings, and on the load carrying capacity" (Ref 3). A table for the proper determination of this rating is provided in Appendix B.

DEGE - The appraisal of roadway geometry "represents the overall adequacy of the roadway width and the vertical clearance over the roadway" (Ref 3). There is a table for the proper determination of this appraisal rating in Appendix B.

UCVL - This appraisal rating "represents the adequacy of the vertical and lateral underclearances" (Ref 3). A table which provides the criteria for the determination of this rating is provided in Appendix B.

WA - The waterway adequacy appraisal rating "represents the adequacy of the waterway to carry peak water flows" (Ref 3).

SLC - The Safe Load Capacity rating "represents the adequacy to carry the State legal load" (Ref 3). The criteria for this rating are provided in Appendix B as well.

All these ratings are developed during the regular inventory inspections under the guidelines of the BRINSAP

	ADTPTL										
	0 CSI 0 TO 9	10 CSI 0 TO 9	20 CSI 0 TO 9	30 CSI 0 TO9	40 CSI 0 TO 9	50 CSI 0 TO 9	60 CSI 0 TO 9	70 CSI 0 TO 9	80 CSI 0 TO 9	90 CSI 0 TO 9	100 CSI 0 TO 9
CPIPTL											
0	9	9	9	9	8	8	8	7	6	5	5
10	9	9	9	8	8	8	7	6	5	4	4
20	9	9	8	8	8	7	6	5	4	3	3
30	9	8	8	8	7	6	5	4	3	2	2
40	8	8	8	7	6	5	4	3	2	2	1
50	8	8	7	6	5	4	3	2	2	1	1
60	8	7	6	5	4	3	2	2	1	1	0
70	7	7	6	4	3	3	2	1	1	0	0
80	6	6	5	3	2	2	1	1	0	0	0
90	5	5	4	2	2	1	1	0	0	0	0
100	5	4	3	2	1	1	0	0	0	0	0

Fig 3.5. Off-system eligible structures cost-effective service index array. CSI vs. average daily traffic and cost of proposed improvements percentiles.

	ADTPTL										
	0 ESI 0 TO 9	10 ESI 0 TO 9	20 ESI 0 TO 9	30 ESI 0 TO9	40 ESI 0 TO 9	50 ESI 0 TO 9	60 ESI 0 TO 9	70 ESI 0 TO 9	80 ESI 0 TO 9	90 ESI 0 TO 9	100 ESI 0 TO 9
BDLPTL											
0	9	9	9	9	9	8	8	7	6	5	5
10	9	9	9	9	8	8	8	6	6	5	4
20	9	9	8	8	8	7	7	5	4	3	2
30	8	8	8	8	7	7	6	4	3	2	2
40	8	8	7	7	6	6	5	3	2	1	1
60	8	7	7	7	6	5	4	2	1	1	1
70	7	6	5	5	4	3	2	1	1	0	0
80	6	6	4	4	3	2	2	1	0	0	0
90	5	4	3	3	2	1	1	0	0	0	0
100	4	4	3	3	2	1	1	0	0	0	0

Fig 3.6. Off-system eligible structures essential service index array. ESI vs. average daily traffic and bypass detour length percentiles.

Manual of Procedures. They may range in value from zero to nine, with zero being the most critical condition. The guidelines from the BRINSAP Manual for the assignment of these indices when appropriate, are included in Appendix B. These ratings are summarized with frequency distribution tables for the Off-system eligible structures in Tables 3.7 to 3.12.

With these determinations of frequency distribution, the first step in the calculation of the Functional Service Index can begin. The cumulative percentiles associated with each of the values of the variables in Tables 3.7 to 3.12 are calculated, as the frequency table is ordered from critical value to noncritical value. These cumulative percents represent the relative importance of that value to all the other values of that variable. Further, the value of a variable is relative to the set it occurs in. For structures On-system the SCO value of six means that that structure is in less critical condition with regard to SCO than 21.1 percent of all the structures considered. However, for the Off-system frequency distribution, we see that an SCO value of six is worse than only 2.2 percent of all those structures considered. This use of the frequency distribution of decision variables is most appropriate for the determination of project priority within a given set.

Similar to what is done for the other Service Indices, a variable is next set up to accumulate the cumulative percentiles associated with the value of variables for each project considered. For the Functional Service Indices, the summing variable is labeled CRSUMF. This variable, since it is a summation of six cumulative percents, may have a maximum value of 600 and a minimum value of zero. These limits are less likely to occur in this multivariate consideration than they are to occur in the bivariate indices described. The frequency distribution for the variable CRSUMF is summarized in Table 3.13 for the Off-system eligible structures. The projects with the highest CRSUMF's have the consistently highest values of cumulative percents for the six variables analyzed. If the variable WA or UCVL is coded invalid or missing, the cumulative percent for that variable is appropriately taken as zero.

With the determination of the summation of cumulative percents for all the projects to be considered, the frequency table of that summation is used to determine directly the Functional Service Index. Like the other Service Indices, the Functional Service Index is a uniformly distributed variable. Its distribution is also of the same form as the other Service Indices. The approximately worst five percent of all the projects evaluated have an FSI of zero, and the approximately least critical five percent of projects considered have an FSI of nine. The other integer values between zero and nine each represent about ten percent of the all the projects considered by the TEBS computer model.

The frequency distribution table for the variable FSI is provided in Table 3.14 for the Off-system structures considered. The uniform distribution described for FSI is shown in the frequency percent column of this table. This method of

TABLE 3.7. OFF-SYSTEM ELIGIBLE STRUCTURES ESTIMATED REMAINING LIFE FREQUENCY DISTRIBUTION

ESRLI	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Missing	1382	0.0	0	0.0
87	3	0.0	3	0.0
81	1	0.0	4	0.0
78	1	0.0	5	0.1
77	1	0.0	6	0.1
70	6	0.1	12	0.1
55	1	0.0	13	0.2
51	5	0.1	18	0.2
50	22	0.3	40	0.5
47	2	0.0	42	0.5
46	2	0.0	44	0.5
45	5	0.1	49	0.6
44	2	0.0	51	0.6
43	1	0.0	52	0.6
42	3	0.0	55	0.7
41	3	0.0	58	0.7
40	44	0.5	102	1.2
39	1	0.0	103	1.2
36	1	0.0	104	1.3
35	34	0.4	138	1.7
33	2	0.0	140	1.7
32	1	0.0	141	1.7
31	4	0.0	145	1.7
30	92	1.1	237	2.9
29	1	0.0	238	2.9
28	2	0.0	240	2.9
27	2	0.0	242	2.9
26	4	0.0	246	3.0
25	151	1.8	397	4.8
23	4	0.0	401	4.8
22	4	0.0	405	4.9
21	4	0.0	409	4.9
20	589	7.1	998	12.0
19	9	0.1	1007	12.1
18	44	0.5	1051	12.6
17	6	0.1	1057	12.7
16	31	0.4	1088	13.1
15	1025	12.3	2113	25.4
14	37	0.4	2150	25.9
13	12	0.1	2162	26.0
12	69	0.8	2231	26.8
11	22	0.3	2253	27.1
10	1149	13.8	3402	40.9
9	37	0.4	3439	41.4
8	117	1.4	3556	42.8
7	49	0.6	3605	43.4
6	82	1.0	3687	44.4
5	1310	15.8	4997	60.1
4	558	6.7	5555	66.8
3	837	10.1	6392	76.9
2	537	6.5	6929	83.4
1	303	3.6	7232	87.0
0	1078	13.0	8310	100.0

TABLE 3.8. OFF-SYSTEM ELIGIBLE STRUCTURES APPRAISAL OF STRUCTURAL CONDITION FREQUENCY DISTRIBUTION

SCO	Frequency	Percent	Cumulative Frequency	Cumulative Percent
9	5	0.1	5	0.1
8	70	0.7	75	0.8
7	51	0.5	126	1.3
6	89	0.9	215	2.2
5	525	5.4	740	7.6
4	960	9.9	1700	17.5
3	3877	40	5577	57.5
2	3090	31.9	8667	89.4
1	624	6.4	9291	95.9
0	400	4.1	9691	100.0

TABLE 3.9. OFF-SYSTEM ELIGIBLE STRUCTURES APPRAISAL OF ROADWAY GEOMETRY FREQUENCY DISTRIBUTION

DEGE	Frequency	Percent	Cumulative Frequency	Cumulative Percent
9	3	0.0	3	0.0
8	88	0.9	91	0.9
7	71	0.7	162	1.7
6	235	2.4	397	4.1
5	819	8.5	1216	12.6
4	2164	22.4	3380	34.9
3	4333	44.8	7713	79.7
2	1893	19.6	9606	99.2
1	51	0.5	9657	99.7
0	25	0.3	9682	100.0

analysis of many variables by frequency distributions seems most appropriate to the prioritization objective of TEBS. Calculation of the multivariate frequency distribution indices CSI, ESI, and FSI is demonstrated in Example 3.1.

Example 3.1

Calculation of the Cost-Effective, Essential, and Functional Service Indices for typical Off-system projects. Reference Tables 3.1, 2.2, 3.4, and 3.7 to 3.12.

TABLE 3.10. OFF-SYSTEM ELIGIBLE STRUCTURES APPRAISAL OF VERTICAL AND LATERAL UNDERCLEARANCES FREQUENCY DISTRIBUTION

UCVL	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Missing	13	0.0	0	0.0
Invalid	9518	0.0	0	0.0
9	2	1.2	2	1.2
8	11	6.8	13	8.1
7	2	1.2	15	9.3
6	4	2.5	19	11.8
5	7	4.3	26	16.1
4	20	12.4	46	28.6
3	24	14.9	70	43.5
2	3	1.9	73	45.3
1	2	1.2	75	46.6
0	86	53.4	161	100.0

TABLE 3.11.. OFF-SYSTEM ELIGIBLE STRUCTURES APPRAISAL OF WATERWAY ADEQUACY FREQUENCY DISTRIBUTION

WA	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Invalid	43	0.0	0	0.0
9	2	0.0	2	0.0
8	1651	17.1	1653	17.1
7	502	5.2	2155	22.3
6	1230	12.7	3385	35.1
5	1286	13.3	4671	48.4
4	2820	29.2	7491	77.6
3	1914	19.8	9405	97.5
2	215	2.2	9620	99.7
1	13	0.1	9633	99.8
0	16	0.2	9649	100.0

Attribute	Attribute Value: Project A	Attribute Value: Project B	Value Percentile: Project A	Value Percentile: Project B
CPI	$90,000	$75,000	11.0	13.8
ADT	200	50	85.8	53.4
BDL	5	20	54.8	95.1
ESRLI	5	10	60.1	40.9
SCO	3	4	57.5	17.5
DEGE	3	5	79.7	12.6
UCVL	N/A	6	0.0	11.8
WA	3	N/A	97.5	0.0
SLC	5	3	13.5	62.0

Percentile Combination (PTL Implies Value Percentile)

CRSUMC = CPIPTL + ADTPTL

Project A CRSUMC = 11.0 + 85.8 = 96.8

Project B CRSUMC = 13.8 + 53.4 = 67.2

CRSUME = ADTPTL + BDLPTL

Project A CRSUME = 85.8 + 54.8 = 140.6

Project B CRSUME = 53.4 + 95.1 = 148.5

CRSUMF = ESRLIPTL + SCOPTL + DEGEPTL + UCVLPTL + WAPTL + SLCPTL

Project A CRSUMF = 60.1 + 57.5 + 79.7 + 0.0 + 97.5 + 13.5 = 308.3

Project B CRSUMF = 40.9 + 17.5 + 12.6 + 11.8 + 0.0 + 62.0 = 144.8

Index Determination (Reference Tables 3.2, 3.5, and 3.13)

	CRSUMC	CSI	CRSUME	ESI	CRSUME	FSI
Project A	97	5	141	1	308	8
Project B	67	8	149	1	145	9

With the preceding explanation of the determination of the multivariate index FSI, the service category of the proposed TEBS decision is complete. This service portion of the decision is composed of evaluations of project cost-effectiveness, essentiality, and function as shown in Fig 3.3. It is quantified by combining the three uniformly distributed indices CSI, ESI, and FSI, by the procedure described. These indices are products of multivariate frequency distribution considerations of project attributes coded through BRINSAP for each of the projects evaluated by TEBS3. The values of the indices are output by TEBS, as shown in the listings of Appendix C for each project. They may be considered in the calculation of project scores by assigning variable weights as described in the Percentile Scoring process presented in Chapter 2. Together with the Safety Indices developed in Ref 2 the Service Indices compose a set of complete selection criteria that may be implemented by TEBS in the Computerized Bridge Project Selection Program for Texas (see Fig 3.3). With the overall program described and the Service Indices presented above, a recent implementation of elements of the Computerized Bridge Project Selection Program for Texas will be given next.

TABLE 3.12. OFF-SYSTEM ELIGIBLE STRUCTURES APPRAISAL OF SAFE LOAD CAPACITY FREQUENCY DISTRIBUTION

SLC	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Missing	556	0.0	0	0.0
Invalid	5	0.0	0	0.0
9	15	0.2	15	0.2
8	115	1.3	130	1.4
7	170	1.9	300	3.3
6	406	4.4	706	7.7
5	530	5.8	1236	13.5
4	1158	12.7	2394	26.2
3	3271	35.8	5665	62.0
2	2062	22.6	7727	84.6
1	1045	11.4	8772	96.1
0	359	3.9	9131	100.0

TABLE 3.13. OFF-SYSTEM ELIGIBLE STRUCTURES CRSUMF RANGES FOR FUNCTIONAL SERVICES INDICES

	CRSUMC			
CSI	Max	Min	Number	Percent
0	600	552	536	6
1	551	500	1065	11
2	499	472	1075	11
3	471	442	1046	11
4	441	418	1087	11
5	417	392	1066	11
6	391	362	995	10
7	361	323	1182	12
8	322	267	1100	11
9	266	124	540	6

TABLE 3.14. OFF-SYSTEM ELIGIBLE STRUCTURES FUNCTIONAL SERVICE INDEX FREQUENCY DISTRIBUTION

FSI	Frequency	Percent	Cumulative Frequency	Cumulative Percent
9	540	5.6	540	5.6
8	1100	11.3	1640	16.9
7	1182	12.2	2822	29.1
6	995	10.3	3817	39.4
5	1066	11.0	4883	50.4
4	1087	11.2	5970	61.6
3	1046	10.8	7016	72.4
2	1075	11.1	8091	83.5
1	1065	11.0	9156	94.5
0	536	5.5	9692	100.0

CHAPTER 4. IMPLEMENTATION AND SENSITIVITY IN ELEMENTS OF THE COMPUTERIZED BRIDGE PROJECT SELECTION PROGRAM FOR TEXAS

IMPLEMENTATION

Recently, the prioritization indices for Off-system eligible projects, as calculated by the Texas Eligible Bridge Sorter Version 3 (TEBS3), were used to determine a distribution of a known construction program budget. The evaluation determined percentages of the program budget to be allotted to each SDHPT District for replacement and rehabilitation of Off-system structures. The process used for the determination is given below, together with charts summarizing the results of the program. This application of one element of the complete selection process should be modelled in the framework of the final selection system. The results of this procedure are a practical summary of the variable weights used.

The determination of District Distribution Factors started with the complete Off-system bridge inventory. A total of 15,866 Off-system records were transferred to the Center for Transportation Research on magnetic tape. The tape was mounted and the computer program SURE2 described above, was run using this Off-system BRINSAP data as input. SURE2 applies well defined existing FHWA criteria to determine projects eligible for federal funds for rehabilitation or replacement. Approximately 9700, or roughly 60 percent, of all the inventoried structures were determined as eligible.

The eligible set of projects was then checked against the set of projects previously funded through the 1985-1986 Off-System Highway Bridge Replacement and Rehabilitation Program (Ref 6). Approximately 100 projects previously funded but not yet updated on the BRINSAP tape were removed from the eligible set formed by SURE2. A total of 9600 eligible projects remained to be prioritized with the TEBS3 program. Two projects out of the 15,866 recorded were removed from the eligible set because of miscoded data.

The two processes of TEBS3 subsetting, Automatic Qualification and Percentile Scoring, were each implemented for the determination of the Off-system distribution factors. Automatic Qualification occurred for projects with DSS values equal to or less than two. The weights used in the scoring process of TEBS3 varied, as shown in Table 4.1, for the seven times that TEBS3 was used for the evaluation of eligible projects. The use of TEBS is an iterative process, as described in Ref 1. The weights were systematically varied from completely equal for all variables to a heavier weighted scheme for variables which quantify safety aspects. The variables used in the actual calculation of TEBS3 Scores were the original SDHPT variables CPV, ADT, SR, DSS, and BWC. In the use of these variables, CPV and ADT were considered to quantify the service of the proposed projects while the variables SR, DSS, and BWC were considered to quantify safety aspects.

TEBS3 was run with the seven weighting combinations described in Table 4.1. In each case, projects were output in the order of descending scores but the Automatically Qualifying projects were placed at the top of the order regardless of their calculated priority. The only projects, in fact, which can be considered to comprise the Qualifying Set (Ref 1) are the Automatically Qualifying projects. An accumulated cost of approximately $20 million was necessary to fund all the Automatically Qualifying projects. The list of prioritized projects was then cut at the point of an accumulated cost of $50.5 million. These projects can be considered to comprise the Marginal Set (Ref 1).

A list of projects, totaling $70.5 million, was subtotaled by District and the subtotals were divided by the program budget to derive District distribution factors. This process was completed for the seven weighting combinations described above and the results for each weighting combination are shown by District in Table 4.2. The results are presented graphically in Fig 4.1. Square footages of bridge deck are also shown in the table and figure presented. The square footages of bridge deck in each District should correspond with the distribution factors.

The curves follow practically the same pattern regardless of the weighting scheme employed. Further, the range of values, or the band width for each District is not unreasonablely wide. A decision maker needs to employ a system responsive to the changes in weighting values (to reflect his specific needs) yet it should not be extremely sensitive unless weights can be determined with high precision. The curves behavior seem consistent with this general objective.

TABLE 4.1. TEBS3 VARIABLES AND WEIGHTS IMPLEMENTED IN METHODS 1 TO 7

Method	CPV	ADT	SR	DSS	BWC
1	20	20	20	20	20
2	20	15	25	20	20
3	15	15	25	25	20
4	15	10	25	25	25
5	10	10	30	25	25
6	10	5	30	30	25
7	5	5	30	30	30

CPV - Cost Per Vehicle
ADT - Average Daily Traffic
SR - Sufficiency Rating
DSS - Minimum of Condition Ratings
BWC - Bridge Width vs. ADT

TABLE 4.2. BUDGET DISTRIBUTION FACTORS BASED ON TEBS3 SCORING WITH VARIABLES AND WEIGHTS GIVEN IN

Budget Distribution Factors (Percent)								
		Method						
District	SqFt	1	2	3	4	5	6	7
1	4.38	10.39	10.61	11.53	11.28	12.14	13.02	12.75
2	7.18	6.69	6.74	6.42	6.41	6.37	5.45	4.66
3	1.91	0.43	0.43	0.76	0.76	0.79	0.79	0.77
4	1.42	0.62	0.62	0.62	0.62	0.62	0.62	0.62
5	0.38	0.02	0.02	0.02	0.03	0.03	0.16	0.16
6	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	1.05	1.02	0.21	0.21	0.22	0.17	0.23	0.30
8	2.28	0.64	0.73	1.01	1.12	1.01	1.87	3.03
9	6.43	3.64	3.58	3.68	3.84	4.17	4.24	4.12
10	2.99	1.88	2.22	2.11	2.06	1.98	1.91	1.66
11	2.29	2.86	3.00	3.04	3.16	2.76	3.06	2.58
12	20.44	29.96	29.62	27.07	26.58	25.92	25.29	24.99
13	5.65	4.51	4.60	4.98	5.04	5.02	5.45	6.79
14	4.97	1.36	1.72	2.76	2.53	3.71	3.30	4.70
15	6.94	6.91	6.50	6.4	6.38	6.32	6.29	6.43
16	3.16	2.71	2.71	2.68	2.68	2.47	2.19	1.62
17	2.88	2.02	2.32	2.5	2.87	3.10	3.39	3.52
18	12.56	12.53	12.6	12.3	12.37	11.56	11.02	10.03
19	1.80	3.55	3.74	3.58	3.65	3.41	3.48	3.08
20	3.67	4.45	4.58	4.89	4.74	4.58	4.32	4.12
21	2.35	0.98	0.64	0.62	.062	0.62	0.59	0.59
23	1.86	1.77	1.82	1.84	2.00	2.14	2.30	2.31
24	1.69	0.30	0.30	0.30	0.30	0.26	0.26	0.26
25	1.47	0.70	0.70	0.70	0.74	0.73	0.76	0.93

SqFt = Percentage of Off-System bridge deck area each district is responsible for.

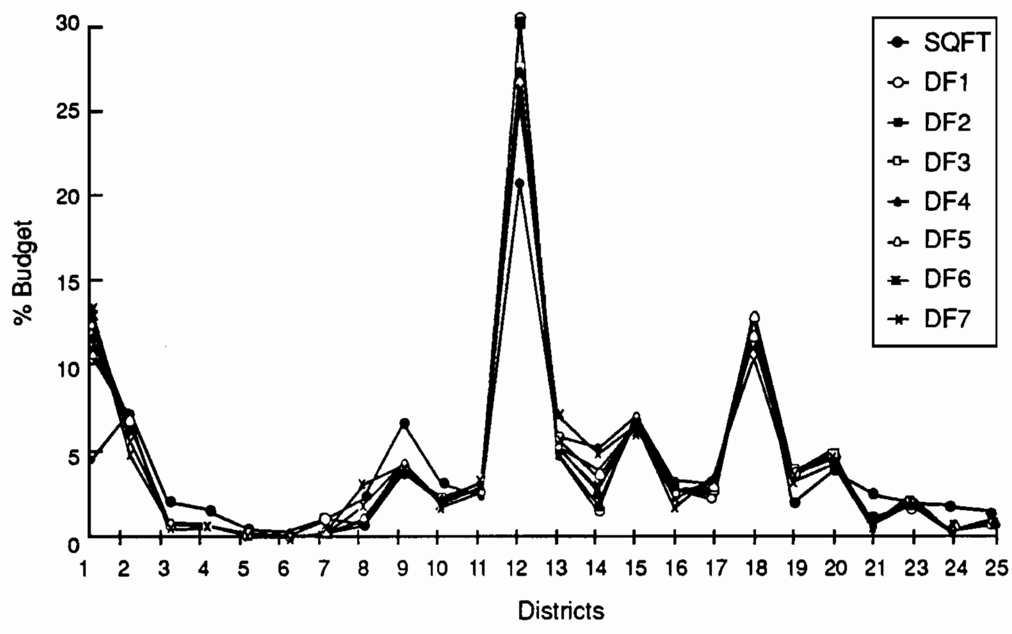


Fig 4.1. Budget distribution based on TEBS3 scoring for variables and weights given in Table 4.1.

The square footages of bridge deck that Districts are responsible for also follow a similar line. Bridges located in Districts 1, 12, 19, and 20 appear to be in worse condition, as assessed by TEBS3, than as assessed by the square footages of deck. The smaller Districts, 3, 4, 9, 10, 21, 24, and 25, appear to be in better condition, as assessed by TEBS3, than the square footages of bridge deck would imply. The remaining 14 Districts match closely the TEBS3 evaluation and the square footage evaluation.

The results of this automated analysis were used as the starting point for the distribution of a $70.5 million Off-State System Highway Bridge Replacement and Rehabilitation Program budget. As with any systematic process, the results generated by the mathematical models of the process were tested and evaluated before implementation. The experienced decision maker can take into account more variables than those quantifiable in TEBS3 when making final decisions.

The entire distribution determination process was also completed for the new Safety and Service Indices developed here and in Ref 2. Automatic Qualification of projects with a DSS of less than or equal to two still took place. The variables used and the seven weighting schemes implemented for this analysis are provided in Table 4.3. The weight distribution, again, went from an equal importance of variables to a heavier importance on safety aspects than service aspects of projects. The results of this process are given in Table 4.4 and presented graphically in Fig 4.2.

The bandwidths are even smaller for the evaluations by the new indices. Meaningful fluctuations occur only in Districts 9, 12, 13, and 14. As is shown in the comparison of results from the two methods in Fig 4.3, the pattern of results generally matches the typical pattern of the SDHPT variable analysis. Significant variations occur only in Districts 9, 12, 13, 14, and 18. It is easier for a decision maker to evaluate more closely these few separated Districts.

While the percentage of a budget a District might receive as analyzed by TEBS3, is not affected by the variables or weights used, the *priority* of projects is. This may be because most of the Districts are in the same relative condition with regard to the analysis variables. Therefore, the variation of variables or weights, consistently applied, does not affect the relation of district condition. Individual project priority, however, is significantly affected by the variation of weights and variables.

TABLE 4.3. TEBS3 VARIABLES AND WEIGHTS IMPLEMENTED IN METHODS 8 TO 14

Method	CSI	ESI	FSI	SSI	GSI
8	20	20	20	20	20
9	20	15	25	20	20
10	15	15	25	25	20
11	15	10	25	25	25
12	10	10	30	25	25
13	10	5	30	30	25
14	5	5	30	30	30

CSI - Cost Effective Service Index
ESI - Essectial Service Index
FSI - Functional Safety Index
SSI - Structural Safety Index
GSI - Geometric Safety Index

TABLE 4.4. BUDGET DISTRIBUTION FACTORS BASED ON TEBS3 SCORING WITH VARIABLES AND WEIGHTS GIVEN IN TABLE 4.3

	Budget Distribution Factors (Percent)						
	Method						
District	8	9	10	11	12	13	14
1	9.24	9.47	10	9.61	9.33	9.81	9.53
2	5.83	5.59	5.14	4.99	4.54	4.63	4.4
3	0.91	0.95	0.95	1.18	1.26	1.51	1.51
4	0.67	0.63	0.63	0.62	0.62	0.62	0.62
5	0.02	0.02	0.02	1.02	0.02	0.02	0.02
6	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	0.17	0.17	0.17	0.17	0.17	0.17	0.17
8	1.74	1.82	1.82	1.92	1.91	2.14	2.95
9	9.11	9.98	9.15	9.32	9.05	8.08	7.85
10	2.15	1.76	1.64	1.53	1.42	1.60	1.39
11	1.56	1.47	1.53	1.32	1.31	1.31	1.23
12	22.26	21.81	22.01	20.63	21.12	20.33	20.1
13	8.35	9.68	9.49	11.13	11.87	12.24	12.28
14	3.72	3.53	4.39	5.64	6.31	6.46	6.90
15	8.25	8.31	8.17	7.53	7.65	6.93	7.22
16	2.16	2.22	2.2	2.26	2.23	2.27	2.25
17	3.73	3.44	3.37	3.56	3.38	3.58	3.54
18	6.13	6.16	5.88	5.48	5.42	5.38	5.20
19	5.52	5.36	5.4	5.29	4.95	5.06	4.88
20	5.35	4.5	4.79	4.42	4.16	4.22	4.29
21	0.59	0.59	0.59	0.59	0.59	0.68	0.68
23	1.68	1.68	1.74	1.8	1.77	1.98	1.98
24	0.15	0.15	0.15	0.19	0.13	0.13	0.13
25	0.74	0.76	0.76	0.8	0.79	0.84	0.88

SENSITIVITY ANALYSIS

This section presents a sensitivity analysis of the TEBS3 scores, based on a substantial variation in attribute weights, for all the projects contained in the eligible Off-system set of structures.

Initially scores were calculated for all the eligible Off-system structures based on the weighting schemes presented in Tables 4.1 and 4.2. The weighting and scoring scheme presented on Table 4.1 covers methods 1 to 7 and employs the original SDHPT attributes CPV, ADT, SR, DSS, and BWC, as detailed in Ref 1. The weighting and scoring scheme presented on Table 4.2 covers methods 8 through 14. These later employ the new Safety and Service Indices, developed in this report from work established in Ref 2 and comprising CSI, ESI, FSI, SSI, and GSI. For each group of attributes within methods 1 to 14, scores were calculated on around 9600 Federally eligible projects. For each individual project in the set of procedure gives 14 scores, divided in two subsets. Scores 1 to 7 are calculated applying the SDHPT attributes, and scores 8 to 14 are calculated applying the Safety and Service Indices.

A bandwidth termed Delta percent and defined as the percentile deviation between the maximum and the mini-

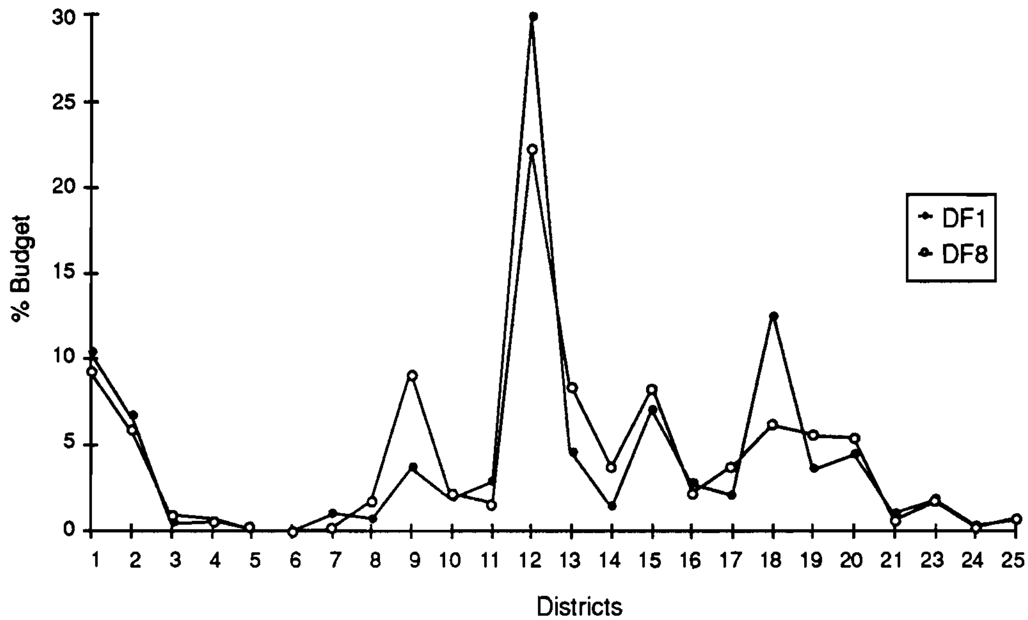


Fig 4.2. Budget distribution factors based on TEBS3 scoring with variables and weights given in Table 4.3.

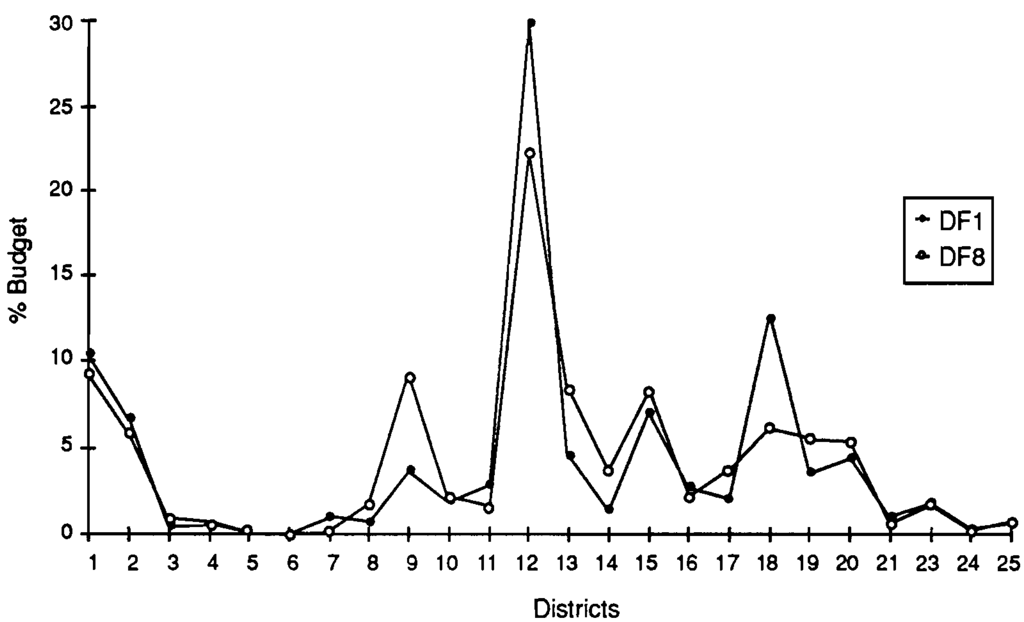


Fig 4.3. Comparison of Figs 4.1 and 4.2.

mum values for Scores 1 to 7 was calculated for each of the 9600 projects in the Federal eligible set. This can be expressed as

Delta percent=[max(score1, ..., score7) - min (score1, ..., score7) * 100 / [min (score1, ..., score7)]

The same process was then repeated for scores derived from methods 8 to 14. Again this can be conveniently expressed as

Delta percent=[(max(score8, ..., score14) - min (score8, ..., score14) * 100] / [min (score8, ..., score14)]

The sensitivity evaluation tests whether the scoring schemes are affected by weight selection. If they are completely unaffected then the frequency distributions of the bandwidths would be skewed towards Delta percent = 0.

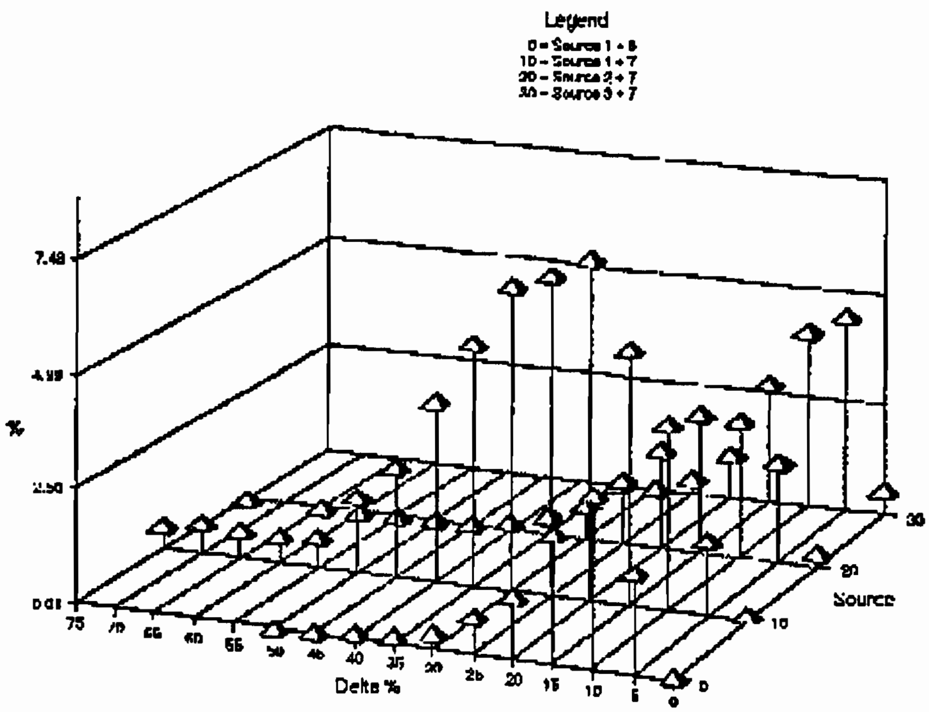


Fig 4.4. Frequency distribution Delta X source.

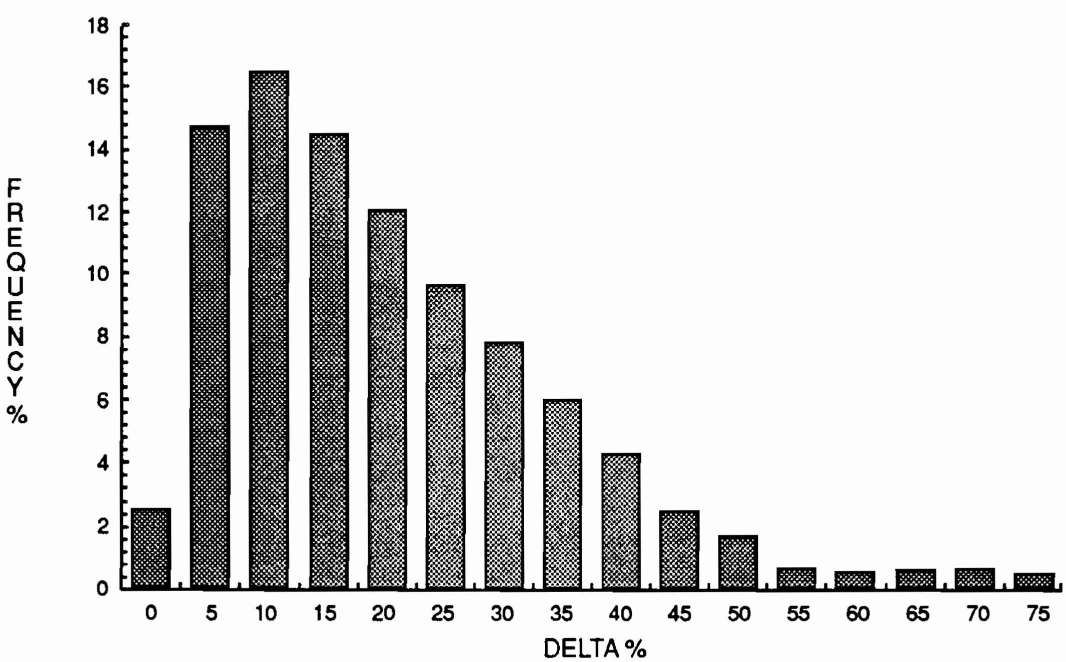


Fig 4.5. Frequency distribution of Delta percent SDHPT attributes Off-system.

Stated more formally, the null hypothesis to be tested is that most Delta percent bandwidths from the 9600 projects will be close or equal to zero. This would indicate little or no impact on the calculated scores from any of the 14 different scoring methods.

The computer tabulations of source data used to compare pairs of scored attributes are fairly large and have therefore been reported as Appendix items. Appendix Table E.1 incorporates the SDHPT attributes and shows the frequency distribution of Delta percent (rounded to 5 percent), in addition to indicating the pairing of the maximum and minimum scores utilized for the calculations. Referring to this table, source 1 and 7 means that scores 1 or 7 were utilized as either maximum or minimum values in the calcu-

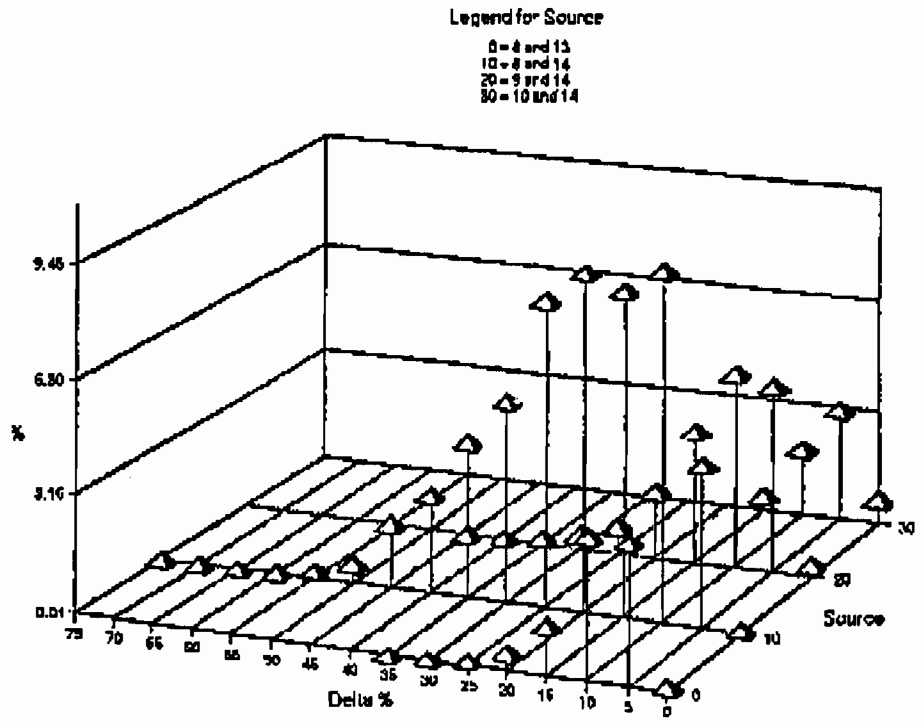


Fig 4.6. Frequency distribution Delta X sources safety and service indices Off-system.

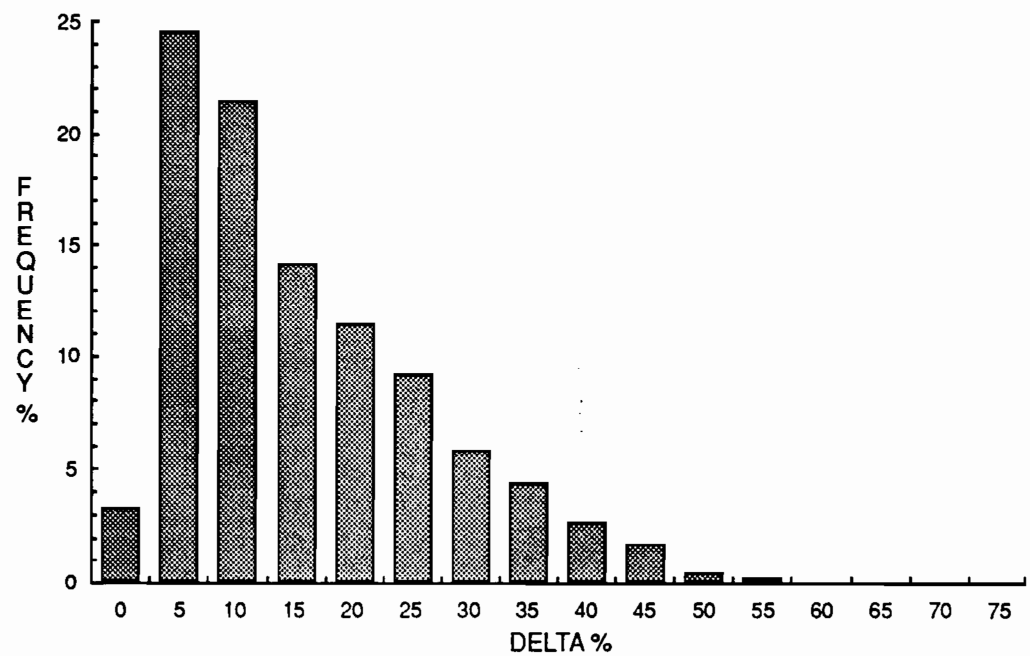


Fig 4.7. Frequency distribution of Delta percent safety and services indices Off-system.

lation of Delta percent. Figures 4.4 and 4.5 display the data given in Table E.1. Figure 4.5 depicts the frequency distribution of Delta percent independent of the source. The data that generated Fig 4.5 can be found in the final column in Table E.1 where each Delta percent total is reported. Figure 4.4 depicts the histogram for Table E.1, giving both Delta percent and source. Analysis of both Figs 4.4 and 4.5, and Table E.1 indicate that the distribution of Delta percent is not skewed toward zero, but is concentrated within the 5 percent to 45 percent range. Most of the variation comes from methods 1 and 7 and 2 and 7.

The same procedure was used to generate Table E.2 and Figs 4.6 and 4.7 for the Project 439 Safety and Service Indices. Again it is observed that Delta percent distributions are not skewed towards zero and, like the SDHPT variables tested above, the Delta percent is concentrated within the 5 percent to 45 percent range. The main source of variations come from methods 8 and 14 and 9 and 14.

This leads to the general conclusion that the null hypothesis is rejected and that TEBS3 scoring methods are sensitive to the variation of weights.

The above exercise is useful in determining both levels and composition of bridge programs using different weighting schemes. As an example of the effect of the weighting procedure on a budget allocation, a figure of $70.5 million was chosen and a wide range of paired weighting methods, for Example 1 and 7 for SDHPT attributes together with 8 and 14 for the safety and services indices - were adopted. For the purposes of this exercise, the number of selected structures making up the budget allocation given in Figs 4.1 and 4.2 were corrected to include only projects ranked by the scoring process. The automatic qualifying feature was not used for this exercise since the objective is to study the impact only of the weighting schemes on the allocation factors.

Comparing methods 1 and 7 as defined on Table 4.1, the following program information is obtained. The number of structures that take up an allocated $70.5 million budget for method 1 would be 1671. Adopting method 7 drops the number to 1508 for the same budget total, of which 954 are common to both methods. This latter figure indicates that around 37 percent of the projects for method 7 are new, that is they enter as a result of the weighting changes.

Comparing methods 8 and 14 as defined in Table 4.3, provides the following information. There would be 2116 structures funded from a $70.5 million budget using method 8. A similar budget used in conjunction with method 14 would result in 1559 structures being selected, of which 1100 would be common to method 8.

A number of interesting observations can be made from this sensitivity exercise.

(1) TEBS3 methods are sensitive to weights given to the elements of each method. Therefore, bridge program decision makers can feel reassured that biases they wish to be reflected in the selection process will have an impact on the calculation.

(2) It should be emphasized that TEBS3 scores cannot be compared between different sets of attributes. Their importance lies in the ability to rank projects within an attribute scale. For example, a score derived from methods 1 through 7 cannot be compared with a score (with, say, the same value) for methods 8 through 14. The score measures the relative position of each project within the selected method.

(3) Alternative indices considered desirable by specific groups of decision makers can be substituted and there is every likelihood that they will be found to be sensitive to changes in weights, and therefore useful for management purposes.

(4) Figure 4.3 compares the differences in District percentage budget allocations for the two groups of methods. In addition to the between variations which are clearly illustrated, there are the within variations which are not shown. What the sensitivity analysis reveals is that the variation in weights results in different combinations of projects being selected.

(5) The allocated budgets do not wildly fluctuate between different variables and weights, as can be seen from Table 4.1, which is a desirable feature for management purposes. However, there is movement of budget levels within which the composition of projects changes with the selected program. This is also desirable since it indicates that the procedure is both robust and sensitive and should reassure decision makers that it is worthy of further development.

CONCLUSIONS

This calculation of district distributions has been the most useful statistic for the system users. It is not formally a part of the process framework as yet. But, since program budgets can be predicted, this analysis should be automated and incorporated into the final selection process. As the frequency distribution tables summarize the eligible project set in the output of TEBS3, this analysis provides useful statistics about the results of the prioritization statewide. The budget allocations, however, are not the complete selection process and it is that complete system that should ultimately be employed.

Later the program amount was raised to $90 million, and an 87-91 program was developed.

CHAPTER 5. CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

The computerized bridge project selection program described above as a two-level closed-loop system for the proper selection of rehabilitation and replacement projects in the State of Texas is partly automated. The process allows, however, the user of the system to input important decision criteria and to evaluate projects individually in the light of the program's prioritization index. The process also has specific allowance for the District's considerations. This District input may be secondary decision criteria, such as whether the proposed project is on a mail or school bus route, unique comments about a particular project, or the addition of different projects not output by the State-level computer models. Specifically, the process uses the computer to help make the easy decisions regarding definitely qualified and definitely not qualified projects. It is flexible in order to recognize that the proper selection of projects can be assisted by automated tools, but not always entirely made by them.

The District evaluation within the process described above facilitates proper selection. It is the District Evaluator who is most familiar with the projects in need of repair in his locale. Furthermore, it is the District Evaluator who can best coordinate bridge projects with adjacent work, for which he is also responsible. While coordinations such as these may in the future be automated processes, practically, and presently, they may be considered by a District Evaluator. The District Evaluators are responsible for a significantly smaller set of projects than the complete bridge inventory and their familiarity with these projects is beneficial to the task of proper selection.

The State-level of the process applies consistent statewide criteria to the complete bridge inventory. This type of evaluation lends itself to automated processes. However, the State Evaluator must provide selection criteria for the automated tools, evaluate the results of the automated model, and, most importantly, manage the District selections.

The management of the District selections involves the incorporation of feedback into the selection process and the determination of Final Program Selections. Feedback should be requested directly from the District Evaluators with regard to the selection criteria used in the TEBS computer model. The District Evaluators would review the results of these criteria as they assign District priority to the projects forwarded to them. If they are not giving consistently high priority to the projects scored highly by TEBS, then they should suggest that the criteria be changed for the next program to better reflect their concerns. If the same criteria changes are being suggested by several Districts, the State-level Evaluator would then consider altering the variable weights to address the concerns of the Districts. The State-level Evaluator, through the proposed process, would finally evaluate the District's priorities, comments, and program budget to assemble the Final Program Selections.

In addition to improvements to the overall process, improvements to specific elements of the process have also been proposed. The decision made by the prioritization model has been formulated as the consideration of the two broad categories of safety and service. The evaluation of service, as detailed in Chapter 3, is further divided into considerations of cost-effective, essential, and functional services. These considerations have been formulated as uniformly distributed indices which have an integer range between zero and nine. Specifically, these indices are multivariate frequency distribution considerations of project attributes. They combine into a single index cumulative percentile evaluations of related project characteristics.

The attributes chosen for combination in the determination of the service indices are available in the existing bridge inventory. They were chosen to evaluate the service a proposed project would provide its owner and users. In this respect they are proxy Evaluators of user and agency costs. This allows for the consideration of the primary determining factors of such costs in the prioritization process but does not preclude the further analysis of project or network life cycle costs. A statistical process similar to that used for the formulation of the Service Indices was also proposed for TEBS Scoring.

Percentile Scoring, as described in Chapter 2, is a weighted combination method to calculate the priority index for each of the eligible bridge rehabilitation and replacement projects. Percentile Scoring is used to properly distribute the weight assigned for each variable considered in the decision. It is appropriate to prioritization processes since it uses the curves of the cumulative frequency distributions of the decision variables to apportion the variable weight. This method of weight distribution is adaptive to the set being considered. Percentile scoring properly determines the portion of variable weight a project score should receive. This portion is based on the critical condition of the project as assessed by the value of its decision variables relative to the other projects' decision variable values. The relative importance of the variables to be considered in Percentile Scoring is determined by the variable weights. The operational efficiency of percentile scoring as it is formulated in TEBS3 can be improved as outlined below.

RECOMMENDATIONS

It is recommended that the existing TEBS3 program be split in two to allow for the more efficient operation of the Computerized Bridge Project Selection Program for Texas. The determination of frequency distributions should be removed from the existing TEBS3 program and implemented by a new program located between SURE and TEBS. Alternately, the determination of frequency distributions could be completed by SURE and percentiles could be transferred to TEBS. By removing the calculation of frequency distributions from TEBS the program could be run iteratively more efficiently since frequency distributions for the variables do not change while user-provided variable weights are intended to change. By this division the calculation of the frequency distributions for the set of projects being considered is performed only once while the investigation of different variable weighting can continue more efficiently still using Percentile Scoring.

It is also recommended that the Safety Indices, SSI, be formulated to have the full integer range of values between zero and nine rather than the limited range of values: zero, three, six and nine. Another variable that should be improved is BWC. It has been proposed that this variable be formulated as a ratio of existing bridge width to standard bridge width for the given ADT over the structure. The ratio should be limited to the value 1.0. Further, this formulation should be implemented in the percentile scoring process developed above. It has been proposed that the new variable be termed Bridge Width Ratio or BWR.

The selection process described above can be improved by coordinating bridge and pavement investments where system integrity is important and by ensuring that funded projects are removed from the evaluation process early. Scheduled pavement rehabilitation work should be evaluated for its proximity to proposed bridge projects. The existing prioritization model could then consider this proximity of work in calculating the prioritization index or in the process of Automatic Qualification. Possibly the District Evaluator could consider the proximity and extent of scheduled pavement projects in his determination of District priority. To ensure that previously funded projects are not considered in the next implementation of the Computerized Bridge Project Selection Program a small data base of previously funded projects should be assembled. This data base would be checked before projects are forwarded from BRINSAP to the computer model SURE. Both of these considerations would allow the selection process to operate more efficiently.

It is also recommended that TEBS be improved by, first, the systematic determination of the relative importance of the decision variables it has available for use and, second, by its being made more readily available to the District Evaluators for the determination of their District priority of projects. The general process of the determination of the relative importance of the decision variables is a type of expert system, with the District Engineers the most likely source of opinion.

The overall process may be augmented by including a predictive model. Historical bridge data could be assembled and analyzed with the existing prioritization models. The results could then be subjected to regression analysis and the predicting curves could be used to assess the future condition of structures. Further, the predictive models might be implemented to quantify the performance of structures, that is, the deterioration of service with respect to time. This evaluation of performance could lead to the proper determination and timing of structure maintenance, rehabilitation, or replacement.

The proxy evaluators of agency and user costs developed as Service Indices are appropriate for use in the TEBS computer model. It is recommended that a new automated model be developed to more effectively evaluate the life cycle costs associated with some of the proposed projects. The main obstacle to the development of this model is the lack of a data base of alternative bridge maintenance and rehabilitation strategies. This data base might be assembled for the Marginal projects output by the prioritization model by the District Evaluator. Available then to the District and State-level Evaluators could be several economic evaluators for projects which are not confidently qualified or not qualified for selection.

Finally, a need exists in Texas to unify the complex activities associated with bridge management. A systematic method should be developed to provide statewide organization of bridge planning, design, construction, maintenance, evaluation, and research. The Computerized Bridge Project Selection Program for Texas is an evaluation process. This process could be linked to a central data base with the other processes described above to begin to compose a Bridge Management System. This system could help the SDHPT be more cost-effective with regard to all those aspects of bridge management. There is adequate emerging technology which addresses these tasks effectively but individually. It is proposed that the technology which coordinates them be developed.

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2. Boyce, C., W. R. Hudson, and N. H. Burns, "Improved Safety Indices for Prioritizing Bridge Projects," Research Report 439-2, Center for Transportation Research, The University of Texas at Austin, January 1987.
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6. SDHPT 1985-1986 Federal-Aid Bridge Replacement and Rehabilitation Program Statewide Listing for On and Off-systems," unpublished internal Texas State Department of Highways and Public Transportation document, July 1985.

APPENDIX A. STATE-LEVEL COMPUTER PROGRAM LISTINGS AND INPUT FILES

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S U R E 2

SUFFICIENCY RATING EVALUATOR PROGRAM

VERSION 2.0

WRITTEN BY:
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AUSTIN, TEXAS 78712

ON: MAY 1986
LAST UPDATED: OCTOBER 1987

SURE2 IS THE FIRST PROGRAM IN A TWO PART SERIES OF SAS PROGRAMS DEVELOPED AND WRITTEN TO COMPUTERIZE THE TEXAS SDHPT BRIDGE PROJECT SELECTION PROCESS. THIS PROGRAM WAS DEVELOPED UNDER CTR RESEARCH PROJECT 439. FOR MORE INFORMATION ABOUT THIS PROGRAM OR THE OTHER IN THE SERIES, REFER TO CTR REPORT 439-1.

SURE2 IS AN SAS PROGRAM TO CHECK FOR DEFICIENCY/OBSOLECENCE, CALCULATE SUFFICIENCY RATING SCORES AND DETERMINE ELIGIBILITY ON THE SDHPT- FORMATTED ON-SYSTEM BRINSAP (BRIDGE INVENTORY INSPECTION AND APPRAISAL PROGRAM) DATA TAPE. ALL THE ALGORITHMS IN THIS PROGRAM ARE BASED ON THE SDHPT BRINSAP MANUAL OF PROCEDURES.

DEVELOPED AND WRITTEN IN SAS (STATISTICAL ANALYSIS SYSTEM) VERSION 5 (RELEASE 5.08) FOR THE IBM 3081-D RUNNING UNDER VM/SP.

A NOTE ON MISSING OR ILLEGAL DATA:

THIS PROGRAM WILL ESTIMATE THE SUFFICIENCY RATING (SR) VALUE WHEN ANY VALUE INVOLVED IN THE SR CALCULATION IS MISSING OR ILLEGAL. THE SPECIFIC COMPONENT OR SUBINDEX REQUIRING THE MISSING OR ILLEGAL DATA IS MADE AS LARGE AS POSSIBLE IN ORDER TO GENERATE A CONSERVATIVE SR VALUE.

INPUT AND OUTPUT:

INPUT: BRINSAP ON-SYSTEM DATA TAPE IN SDHPT FORMAT. FOR SDHPT FORMAT REFER TO CTR REPORT 439-1 OR TO THE SDHPT BRIDGE DIVISION.
TAPE SPECIFICATIONS: 9-TRACK, 1600 BPI, UNLABELED, EBCDIC, 510 CHARACTERS/RECORD, 5100 RECORDS/BLOCK, FIXED BLOCK LENGTH.
NOTE: IF TAPE SPECS ARE CHANGED, THEN THE SYSTEM FILE DEFINITIONS MUST BE CHANGED TO BE CONSISTENT WITH THE TAP SPECS.

OUTPUT: THE PROGRAM PRODUCES TWO OUTPUTS: A REPORT OUTPUT FILE AND (SURE2 LISTING) AND THE ELIGIBLE DATA SET OUTPUT FILE (ELIGIBLE BRINSAP). THE REPORT FILE CONTAINS A LIST OF ALL THE DATA ITEMS FOR THOSE BRIDGE RECORDS CONTAINING MISSING OR ILLEGAL DATA. THE ELIGIBLE DATA SET OUTPUT FILE IS A PERMANENT SAS DATA SET CONTAINING ALL THE BRIDGES

ELIGIBLE FOR FEDERAL FUNDING. THE ELIGIBLE FILE IS IN SAS FORMAT AND CAN ONLY BE READ BY SAS.

THE SECOND VERSION OF SURE

IN THE SECOND VERSION OF SURE THE INPUTS TAKEN FROM THE BRINSAP TAPES HAVE BEEN INCREASED. THIS INCREASE OF VARIABLES IS REQUIRED TO COMPLETE THE TWO-LEVEL CLOSED-LOOP SELECTION PROCESS PROPOSED IN CTR RESEARCH REPORT 439-3. THAT SELECTION PROCESS REQUIRES ADDITIONAL VARIABLES TO CALCULATE NEW INDICES AND TO FACILITATE USE OF A REPORTING PROGRAM.

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                                          */
/*******************************************************************************************************************/
/*  CMS SYSTEM COMMANDS:  INPUT/OUTPUT FILE DEFINITIONS          */
/*******************************************************************************************************************/

CMS FI INF TAP1 SL 1 (RECFM FB LRECL 510 BLOCK 5100;
CMS FI BRINSAP DISK ELIGOF87 BRINSAP C;
/*******************************************************************************************************************/

OPTIONS REPLACE CENTER INVALIDDATA=I MISSING=M;

DATA SRDATA;

/*  DROP ALL TEMPORARY VARIABLES  */
 DROP TS2 A B C D E F G H I J K AI AIT GH AB COUNT DIG1 DIG2 X Y;

/*LENGTH EST $ 1;*/
 MISSING M;
 LABEL DIST='DISTRICT' STRUCT='STRUCTURE'
    RSTR='ROUTE:STRUCT.:FUNCT.' SR='SUFF.:RATING'
    DODRSN='DOD ROAD:SECTION NO.' BDL='BYPASS:DETOUR:LENGTH'
    LOS='LANES:OVER:STRUCT.' LUS='LANES:UNDER:STRUCT.'
    AWIDTH='APPROACH:WIDTH' TS='TYPE:SERVICE' MST='MAIN:SPAN:TYPE'
    ROWI='ROADWAY:WIDTH' VCO='VERT.:CLEAR.:OVER'
    DECO='DECK:COND.' SSCO='SUPER-:STRUCT.:COND.'
    SUBCO='SUB-:STRUCT.:COND.' INVRA='INV.:RATING'
    SCO='STRUCT.:COND.' DEGE='DECK:GEOM.'
    UCVL='UNDER:CLEAR.:VERT.& LAT.'
    WA='WATER:ADEQ.' AR='APPR.:ROADWAY' TYWO='TYPE:WORK'
    PRW='PROP.:ROADWAY:WIDTH' PNL='PROP.:NO. OF:LANES'
    COPRI='COST OF:PROP.:IMPROV.' TRASA='TRAFFIC:SAFETY'
    ORBDL='OR:BYPASS:LENGTH' ORADT='OR:ADT'
    W_ADT='ADT'  W_BDL='BYPASS:DETOUR:LENGTH'
    FX='BRIDGE LOCATION' RNUM='HWY NO.' BPI='BRIDGE PRIORITY INDEX'
    CPCO='CHANNEL COND. RATING' ARCO='APPR. RDWY. COND. RATING'
    RWCO='RETAINING WALL COND. RATING'
    ESRLI='ESTIMATED REMAINING LIFE' SLC='SAFE LOAD CONDITION';

 INFILE INF ;
 INPUT DIST 1-2 COUNTY $ 3-5 CONTROL $ 6-9 SECTION $ 10-11
    STRUCT $ 17-19 CITY 26-29 RNUM $ 34-38 RSTR 40 FX $ 41-83
    SURA $ 160-163 DODRSN $ 164-168
    BDL 191-192 LOS 220-221 LUS 222-223 ADT 224-229
    AWIDTH 233-235 TS 251-252 MST 253-256 CULVERT 265-266
    STRLEN 297-302
    ROWI 309-312 .1 VCO 317-320 DECO 343 SSCO 344 SUBCO 345
    CPCO 346 ARCO 353 RWCO 347 ESRLI 348-349
    INVRA 354-356  SCO 357 DEGE 358 UCVL 359 SLC 360 WA 361
    AR 362 TYWO 366-368 LOI 369-374 PRW 376-379 PNL 380-381
    COPRI 393-397 TRASA $ 398-401 ORBDL 453-454 ORADT 460-465
```

```
    BPI $ 491-494;
/*  CREATE UNIQUE BRIDGE ID NUMBER   */

 BRID = TRIM(LEFT(COUNTY)) || TRIM(LEFT(CONTROL)) ||
      TRIM(LEFT(SECTION)) || TRIM(LEFT(STRUCT));


/*******************************************************************************************/
/*   CHECK FOR MISSING AND ILLEGAL DATA                       */
/*******************************************************************************************/

 SR_EST = ' ';

/*  CHECK FOR MISSING AND ILLEGAL VALUES IN NUMERIC VARIABLES   */

 IF (RSTR<=.Z) OR (LOS<=.Z) OR (LUS<=.Z) OR (TS<=.Z) OR (ROWI<=.Z) OR
   (VCO<=.Z) OR (INVRA<=.Z) OR (CULVERT=.I) OR (AWIDTH=.I) OR
   (MST=.I) OR (DECO<=.I) OR (SSCO<=.I) OR (SUBCO<=.I) OR (SCO<=.I) OR
   (DEGE<=.I) OR (UCVL<=.I) OR (WA<=.I) OR (AR<=.I)
 THEN SR_EST = '*';

/*  SET WORKING ADT AND BDL VARIABLES (W_ADT AND W_BDL) DEPENDING ON WHICH IS THE INVENTORY
    ROUTE                        */

 IF (RSTR = 3) OR (RSTR = 4)
  THEN DO;
     IF (ORADT<=.Z) OR (ORBDL<=.Z) THEN SR_EST = '*';
     W_ADT = ORADT;
     W_BDL = ORBDL;
     END;
  ELSE DO;
     IF (ADT<=.Z) OR (BDL<=.Z) THEN SR_EST = '*';
     W_ADT = ADT;
     W_BDL = BDL;
     END;

/*  CHECK FOR MISSING VALUES IN CHARACTER VARIABLES   */

 IF (DODRSN='    ') OR (TRASA='    ') THEN SR_EST = '*';



/*******************************************************************************************/
/*  CHECK FOR "STRUCTURAL DEFICIENCY" (DEF=1) OR              */
/*  "FUNCTIONAL OBSOLESCENCE" (OBS=1)                         */
/*******************************************************************************************/


 /*  INITIALIZE DO & SPCL   */

 DEF = 0;  OBS = 0;  SPCL = 0;

/*  EXTRACT LAST (SECOND) DIGIT OF TS VARIABLE   */

 TS2 = TS - INT(TS/10)*10;

/*  STRUCTURALLY DEFICIENT   */

 IF (0 <= DECO <= 4) OR (0 <= SSCO <= 4) OR (0 <= SUBCO <= 4) OR
   (0 <= SCO <= 2)
```

```
  THEN DEF = 1;
  ELSE IF ((TS2 = 0) OR (5 <= TS2 <= 9)) AND (0 <= WA <= 2)
      THEN DEF = 1;


/* FUNCTIONALLY OBSOLETE */

 IF (0 <= DEGE <= 3) THEN
  IF  (( 0 <= W_ADT <=  250)  AND (ROWI < 20)) OR
      (( 250 < W_ADT <=  750)  AND (ROWI < 22)) OR
      (( 750 < W_ADT <=  2700)  AND (ROWI < 24)) OR
      ((2700 < W_ADT <=  5000)  AND (ROWI < 30)) OR
      ((5000 < W_ADT <=  9000)  AND (ROWI < 44)) OR
      ((9000 < W_ADT <= 35000)  AND (ROWI < 56))
  THEN OBS = 1;
  ELSE IF W_ADT > 35000 THEN SPCL = 1;
      ELSE;
 ELSE IF ((0 <= UCVL <= 3) AND
       (TS2=0 OR TS2=1 OR TS2=2 OR TS2=4 OR TS2=6 OR TS2=7 OR TS2=8))
      OR (0 <= AR <= 3)
    THEN OBS = 1;
    ELSE IF ((WA = 3) AND ((TS2 = 0) OR (5 <= TS2 <= 9))) OR (SCO = 3)
       THEN OBS = 1;


/******************************************************************************************************************/
/* CALCULATE S1 - STRUCTURAL ADEQUACY AND SAFETY                  */
/******************************************************************************************************************/

 S1 = 0;  /*  INITIALIZE S1  */


/*** CALCULATE  A  -  REDUCTION FOR DETERIORATION ***/

 IF (0 <= SSCO <= 2) OR (0 <= SUBCO <= 2) THEN A = 55;
 ELSE IF (SSCO = 3) OR (SUBCO = 3) THEN A = 40;
    ELSE IF (SSCO = 4) OR (SUBCO = 4) THEN A = 25;
       ELSE IF (SSCO = 5) OR (SUBCO = 5) THEN A = 10;
          ELSE IF (SSCO >= 6) THEN A = 0;
             ELSE A = 0;

/*** CALCULATE  I  -  REDUCTION FOR LOAD CAPACITY ***/

/* CALCULATE AIT -  ADJUSTED INVENTORY TONNAGE  */

/* EXTRACT FIRST DIGIT (TYPE OF LOADING) FROM VARIABLE INVRA  */

  DIG1 = INT(INVRA/100);
  IF DIG1 = 1 THEN AIT = (INVRA-100)*1.56;
  ELSE IF DIG1 = 2 THEN AIT = (INVRA-200)*1.00;
     ELSE IF DIG1 = 3 THEN AIT = (INVRA-300)*1.56;
        ELSE IF DIG1 = 4 THEN AIT = (INVRA-400)*1.00;
           ELSE IF DIG1 = 5 THEN AIT = (INVRA-500)*1.21;
              ELSE IF DIG1 = 6 THEN AIT = (INVRA-600)*1.21;
              ELSE IF DIG1 = 9 THEN AIT = (INVRA-900)*1.0;
                 ELSE IF (DIG1 = 7) OR (DIG1 = 8)
                     THEN DO; SR=999.9; GOTO SKIP; END;
                      ELSE DO; AIT = 36; SR_EST = '*'; END;
```

```
 IF (36 - AIT) > 0 THEN I = (36 - AIT)**1.5 * 0.2778;
              ELSE I = 0;
 AI = A + I;
 IF (AI > 55) THEN AI = 55;

/* CALCULATE S1 */

 S1 = 55 - AI;


/******************************************************************************************************************/
/* CALCULATE S2 - SERVICEABILITY AND FUNCTIONAL OBSOLESCENCE        */
/******************************************************************************************************************/

 /* INITIALIZE S2 AND TEMPORARY VARIABLES */

 S2 = 0;
 A = .; I = .;


/*** CALCULATE J - RATING REDUCTIONS ***/

/* CALCULATE A */

 IF (0 <= DECO <= 3) THEN A = 5;
 ELSE IF DECO = 4 THEN A = 3;
    ELSE IF DECO = 5 THEN A = 1;
       ELSE IF (DECO >= 6) THEN A = 0;
          ELSE A = 0;

/* CALCULATE B */

 IF (0 <= SCO <= 3) THEN B = 4;
 ELSE IF SCO = 4 THEN B = 2;
    ELSE IF SCO = 5 THEN B = 1;
       ELSE IF (SCO >= 6) THEN B = 0;
          ELSE B = 0;

/* CALCULATE C */

 IF (0 <= DEGE <= 3) THEN C = 4;
 ELSE IF DEGE = 4 THEN C = 2;
    ELSE IF DEGE = 5 THEN C = 1;
       ELSE IF (DEGE >= 6) THEN C = 0;
          ELSE C = 0;

/* CALCULATE D */

 IF (0 <= UCVL <= 3) THEN D = 4;
 ELSE IF UCVL = 4 THEN D = 2;
    ELSE IF UCVL = 5 THEN D = 1;
       ELSE IF (UCVL >= 6) THEN D = 0;
          ELSE D = 0;

/* CALCULATE E */

 IF (0 <= WA <= 3) THEN E = 4;
 ELSE IF WA = 4 THEN E = 2;
    ELSE IF WA = 5 THEN E = 1;
```

```
        ELSE IF (WA >= 6) THEN E = 0;
           ELSE E = 0;

/*  CALCULATE  F  */

 IF (0 <= AR <= 3) THEN F = 4;
 ELSE IF AR = 4 THEN F = 2;
    ELSE IF AR = 5 THEN F = 1;
        ELSE IF (AR >= 6) THEN F = 0;
           ELSE F = 0;

 J = A + B + C + D + E + F;
 IF J > 13 THEN J = 13;

/*** CALCULATE  G & H  -  "WIDTH OF ROADWAY" INSUFFICIENCY ***/

/*  CALCULATE  X  */

 IF (RSTR NE 1) AND (RSTR NE 2) AND (RSTR NE 3) AND (RSTR NE 4) AND
   (RSTR NE 8)
  THEN DO; SR=999.9; GOTO SKIP; END;  /*   BRIDGE N/A   */
  ELSE IF LOS > 0 THEN X = W_ADT/LOS;
             ELSE X = 0;

/*  IF ADT OR ORADT ARE MISSING THEN X = 0   */
 IF X < 0 THEN X = 0;


/*  CALCULATE  G  */

 IF (CULVERT = 0) OR (CULVERT=.) THEN
  IF (ROWI > 0) AND (AWIDTH > 0) THEN
   IF (ROWI+2) < AWIDTH  THEN G = 5;
   ELSE  G = 0;
  ELSE G = 0;
 ELSE G = 0;

/*  CALCULATE  H  */

 IF (ROWI > 0) AND (LOS > 0) THEN Y = ROWI/LOS;
                       ELSE Y = 0;

 IF (LOS = 1)
  THEN IF (0 < Y < 14)  THEN H = 15;
      ELSE IF (14 <= Y < 18) THEN H = ((18-Y)*15)/4;
          ELSE H = 0;


/*  NOTE:  IF ONE OF THE FOLLOWING FOUR CONDITIONS ARE MET, NO LANE WIDTH REDUCTIONS ARE
   ALLOWED.                          */

  ELSE IF ((LOS = 2) AND (Y >= 16)) OR
       ((LOS = 3) AND (Y >= 15)) OR
       ((LOS = 4) AND (Y >= 14)) OR
       ((LOS >= 5) AND (Y >= 12))
      THEN H = 0;
      ELSE IF (0 <= X <= 50)
           THEN IF (0 < Y < 9) THEN H = 7.5;
              ELSE H'= 0;
           ELSE IF (50 < X <= 125)
                THEN IF (0 < Y < 10) THEN H = 15;
```

```
            ELSE IF (10 <= Y < 13) THEN H = (15*(13-Y))/3;
               ELSE H = 0;
           ELSE IF (125 < X <= 375)
               THEN IF (0 < Y < 11) THEN H = 15;
                  ELSE IF (11 <= Y < 14)
                      THEN H = (15*(14-Y))/3;
                      ELSE H = 0;
               ELSE IF (375 < X <= 1350)
                   THEN IF (0 < Y < 12) THEN H = 15;
                      ELSE IF (12 <= Y < 16)
                          THEN H=(15*(16-Y))/4;
                          ELSE H = 0;
                   ELSE IF (X > 1350)
                       THEN IF (0 <= Y < 15)
                          THEN H = 15;
                          ELSE IF (15 <= Y < 16)
                              THEN H=15*(16-Y);
                              ELSE H = 0;
                       ELSE H = 0;

 GH = G + H;
 IF GH > 15 THEN GH = 15;


/*** CALCULATE  I  -  "VERTICAL CLEARANCE" INSUFFICIENCY ***/

 IF (DODRSN = '00000') THEN
  IF (VCO >= 1400)
   THEN I = 0;
   ELSE I = 2;
 ELSE IF (DODRSN NE '     ')
     THEN IF (VCO >= 1600)   /*  DEFENSE ROAD  */
         THEN I = 0;
         ELSE I = 2;
     ELSE I = 0;

 IF VCO < 0 THEN I = 0;  /*  IF VCO IS MISSING THEN I = 0  */

/*  CALCULATE S2  */

 S2 = 30 - (J + GH + I);


/*************************************************************************************************************/
/*  CALCULATE S3 - ESSENTIALITY                                */
/*************************************************************************************************************/


 /*  INITIALIZE S3  AND TEMPORARY VARIABLES  */

 S3 = 0;
 A = .;  B = .;


/*** CALCULATE  A  -  PUBLIC USE ***/

 K = (S1 + S2) / 85;

 IF (RSTR NE 1) AND (RSTR NE 2) AND (RSTR NE 3) AND (RSTR NE 4) AND
```

```
   (RSTR NE 8)
  THEN DO; SR=999.9; GOTO SKIP; END; /*  BRIDGE N/A  */
  ELSE IF K > 0
       THEN A = (W_ADT*W_BDL*15)/(200000*K);
       ELSE IF K = 0 THEN A = 15;
                 ELSE A = 0;

/*  IF ADT OR BDL ARE MISSING THEN A = 0  */
 IF A < 0 THEN A = 0;

/*** CALCULATE  B  -  MILITARY USE ***/

 IF (DODRSN = '00000')
  THEN B = 0;
  ELSE IF (DODRSN NE '     ')
       THEN B = 2;
       ELSE B = 0;

/*  CALCULATE  S3  */

 AB = A + B;
 IF AB > 15 THEN AB = 15;
 S3 = 15 - AB;


/*****************************************************************************************************************************/
/*  CALCULATE S4 - SPECIAL REDUCTIONS                          */
/*****************************************************************************************************************************/


/*  INITIALIZE S4 AND TEMPORARY VARIABLES  */

 S4 = 0;
 A = .;  B = .;  C = .;  DIG1 = .;


/*  NOTE:  CALCULATE S4 ONLY IF (S1+S2+S3) >= 50  */

 IF (S1 + S2 + S3) < 50
  THEN DO;
      S4 = 0;
      GOTO SKIPS4;
      END;


/*** CALCULATE  A  -  "DETOUR LENGTH" REDUCTION ***/

 IF (RSTR NE 1) AND (RSTR NE 2) AND (RSTR NE 3) AND (RSTR NE 4) AND
   (RSTR NE 8)
  THEN DO; SR=999.9; GOTO SKIP; END; /*  BRIDGE N/A  */
  ELSE A = (W_BDL**4) * 5.205 * (10**(-8));

 IF A < 0 THEN A = 0;  /* IF BDL OR ORBDL ARE MISSING THEN A = 0  */
       ELSE IF A > 5 THEN A = 5;     /*  SET MAX TO 5  */

/*** CALCULATE  B  -  "STRUCTURE TYPE" REDUCTION ***/

/*  EXTRACT FIRST AND SECOND DIGITS OF VARIABLE MST  */

 DIG1 = INT(MST/1000);
```

```
 DIG2 = INT(MST/100) - DIG1*10;

 IF (DIG1 = 7) OR (DIG1 = 8) OR (2 <= DIG2 <= 7)
  THEN B = 5;
  ELSE B = 0;

/*** CALCULATE  C  -  "HIGHWAY SAFETY" REDUCTION ***/

/*  COUNT THE NUMBER OF 0'S IN THE VARIABLE TRASA   */

 COUNT = 0;
 DO I=1 TO 4;
  IF SUBSTR(TRASA,I,1)='0' THEN COUNT=COUNT + 1;
 END;
 IF COUNT = 2 THEN C = 1;
 ELSE IF COUNT = 3 THEN C = 2;
    ELSE IF COUNT = 4 THEN C = 3;
       ELSE C = 0;

/*  CALCULATE S4   */

 S4 = A + B + C;

 SKIPS4: ;

/***************************************************************************************************************/
/*  CALCULATE SUFFICIENCY RATING                                   */
/***************************************************************************************************************/

 IF (SR NE 999.9) THEN SR = S1 + S2 + S3 - S4;
 IF (SR < 0) THEN SR = 888.8;
 SR=ROUND(SR,.1);


 SKIP:  RUN;     /*  END OF SRDATA DATA STEP   */

/***************************************************************************************************************/
/*  DETERMINE ELIGIBILITY                                  */
/***************************************************************************************************************/

DATA ELIGIBLE;
 SET SRDATA;

/*  INITIALIZE ELIG AND WT VARIABLES   */

   ELIG = 0;
   WT = ' ';

/*  SCREEN BRIDGES TO SELECT THOSE WHICH ARE ELIGIBLE FOR  FOR REPLACEMENT (WT='RP') OR REHA
    BILITATION (WT='RH').

   DEF=1 --> BRIDGE IS DEFICIENT;  OBS=1 --> BRIDGE IS OBSOLETE    */

  IF (DEF = 1)  OR  (OBS = 1)  THEN
   IF (SR <= 80)  AND  (SR >= 50)
    THEN DO;
       ELIG = 1;
       WT = 'RH';
       END;
    ELSE IF (SR < 50)
        THEN DO;
```

```
            ELIG = 1;
            WT = 'RP';
            END;

/* SELECT ONLY THOSE BRIDGES WHICH ARE ELIGIBLE  */

  IF ELIG = 0   THEN DELETE;

RUN;

/*****************************************************************************************************************************/
/* PRINT LIST OF ELIGIBLE BRIDGES                               */
/*****************************************************************************************************************************/

PROC SORT DATA=ELIGIBLE OUT=BRINSAP.ELIGOF87;
 BY DIST ;

TITLE1 'SUFFICIENCY RATING EVALUATION PROGRAM - VERSION 1.0';
TITLE2 '  ';
TITLE3 'ELIGIBLE BRIDGES';
TITLE4 'SORTED BY DISTRICT';
TITLE5 ' ';
TITLE6 'M - MISSING  DATA     I -ILLEGAL DATA';
TITLE5 ' ';

PROC PRINT DATA=BRINSAP.ELIGOF87;


/*****************************************************************************************************************************/
/* GENERATE AND PRINT LIST OF BRIDGES WITH MISSING OR ILLEGAL DATA  */
/*****************************************************************************************************************************/

DATA MISSILL;
 SET SRDATA;
 IF SR_EST = '*';
RUN;

TITLE1 'SUFFICIENCY RATING EVALUATION PROGRAM - VERSION 1.0';
TITLE2 ' ';
TITLE3 'BRIDGE RECORDS WITH MISSING OR ILLEGAL DATA';
TITLE4 'SORTED BY DISTRICT';
TITLE5 ' ';
TITLE6 'M - MISSING DATA     I - ILLEGAL DATA';
TITLE7 ' ';

PROC PRINT;
 VAR DIST COUNTY CONTROL SECTION STRUCT RSTR W_ADT DECO SSCO SUBCO ROWI
    SCO WA DEGE UCVL AR TS TYWO INVRA LOS LUS CULVERT AWIDTH PNL
    PRW W_BDL DODRSN VCO MST TRASA SR;
 BY DIST NOTSORTED;
 PAGEBY DIST;
/**********************************************END OF SURE2 PROGRAM LISTING**********************************************/
```

TEBS2

TEXAS ELIGIBLE BRIDGE SORTER

VERSION 2.0

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ON: MAY 1986
LAST UPDATED: OCTOBER 1987

TEBS IS THE SECOND PROGRAM IN A TWO PART SERIES OF SAS PROGRAMS DEVELOPED TO COMPUTERIZE THE TEXAS SDHPT BRIDGE PROJECT SELECTION PROCESS. THIS PROGRAM WAS DEVELOPED UNDER CTR RESEARCH PROJECT 439. FOR MORE INFORMATION ABOUT THIS PROGRAM OR THE OTHER IN THE SERIES, REFER TO CTR REPORT 439-1.

THE TEBS PROGRAM CLASSIFIES BRIDGES THAT ARE ELIGIBLE FOR FEDERAL FUNDING INTO THE THREE CATEGORIES DESCRIBED BELOW:

(1) QUALIFYING: BRIDGE PROJECTS THAT DEFINITELY MEET SDHPT CRITERIA FOR STATE FUNDING FOR REPLACEMENT OR REHABILITATION.
(2) MARGINAL: BRIDGE PROJECTS THAT MEET MOST OF SDHPT CRITERIA AND MAY BE FUNDED BY THE STATE FOR REPLACEMENT OR REHABILITATION UNDER CERTAIN CONDITIONS.
(3) NON-QUALIFYING: BRIDGE PROJECTS THAT DEFINITELY DO NOT MEET SDHPT CRITERIA FOR STATE FUNDING FOR REPLACEMENT OR REHABILITATION.

TEBS UTILIZES A WEIGHTED SCREENING METHOD TO SORT BRIDGES INTO QUALIFYING, MARGINAL AND NON-QUALIFYING GROUPS.

DEVELOPED AND WRITTEN IN SAS (STATISTICAL ANALYSIS SYSTEM) LANGUAGE, VERSION 5 (RELEASE 5.08) FOR THE IBM 3081-D RUNNING UNDER THE VM/SP OPERATING SYSTEM.

INPUT AND OUTPUT:

ELIGIBLE INPUT FILE:

THIS FILE CONTAINS ALL THE BRINSAP BRIDGES WHICH ARE ELIGIBLE FOR FEDERAL (FHWA) FUNDING. IT IS A SAS DATA SET FILE CREATED BY THE SURE1 SAS PROGRAM. IT CONTAINS IDENTIFICATION DATA FOR EACH ELIGIBLE BRIDGE, ALL THE DATA USED BY THE SURE1 PROGRAM AND THE DATA ITEMS THAT WILL BE USED BY TEBS1.

TEBSIC INPUT FILE:

THIS FILE PROVIDES TEBS1 WITH THE SDHPT QUALIFYING CRITERIA INFORMATION. THIS FILE IS IN FREE FORMAT. ALL REAL VALUES ARE TYPED WITH A DECIMAL POINT AS PART OF THE VALUE.
NOTE: DUE TO THE FREE FORMAT OF THE DATA FILE, NO FIELD MAY BE LEFT BLANK OR THE DATA WILL

BE MISINTERPRETED BY THE PROGRAM. TYPE "N" IN THOSE FIELDS TO BE LEFT BLANK, AND TYPE "D" TO USE THE FIELD'S DEFAULT VALUE.

```
LINE  VARIABLE
NO.   NAME      VARIABLE DESCRIPTION
----  --------  ----------------------------------------------------------
1     CFRH      REHABILITATION COST, IN DOLLARS/SQ. FT.  DEFAULT IS 25.
                USED TO ESTIMATE THE BRIDGE PROJECT COST IF MISSING.
      CFRP      REPLACEMENT COST, IN DOLLARS/SQ. FT.  DEFAULT IS 35.
                USED TO ESTIMATE THE BRIDGE PROJECT COST IF MISSING.
2     WCPV      WEIGHT FOR CPV.  DEFAULT IS 0.10 FOR 10%.  REAL.
      WADT      WEIGHT FOR ADT.  DEFAULT IS 0.10 FOR 10%.  REAL.
      WSR       WEIGHT FOR SR.  DEFAULT IS 0.25 FOR 25%.  REAL.
      WDSS      WEIGHT FOR DSS.  DEFAULT IS 0.35 FOR 35%.  REAL.
      WBWC      WEIGHT FOR BWC.  DEFAULT IS 0.20 FOR 20%.  REAL.
3     AQCPV     AUTOMATIC QUALIFYING LEVEL FOR CPV IN $.  DEFAULT IS N.
      AQADT     AUTOMATIC QUALIFYING LEVEL FOR ADT.  DEFAULT IS N.
      AQSR      AUTOMATIC QUALIFYING LEVEL FOR SR.  DEFAULT IS N.
      AQDSS     AUTOMATIC QUALIFYING LEVEL FOR DSS.  DEFAULT IS 2.
      AQBWC     AUTOMATIC QUALIFYING LEVEL FOR BWC.  DEFAULT IS N.
4     PLCPV     PASSING LEVEL FOR CPV IN DOLLARS.  DEFAULT IS 70.
      PLADT     PASSING LEVEL FOR ADT.  DEFAULT IS 1700.
      PLSR      PASSING LEVEL FOR SR.  DEFAULT IS 63.
      PLDSS     PASSING LEVEL FOR DSS.  DEFAULT IS 6.
      PLBWC     PASSING LEVEL FOR BWC.  DEFAULT IS 0.
5     TQ        THRESHOLD FOR QUALIFYING.  DEFAULT IS 75.
      TM        THRESHOLD FOR MARGINAL.  DEFAULT IS 65.
```

TEBS REPORT OUTPUT FILE:

THE OUTPUT OF TEBS CONSISTS OF A REPORT FILE CONTAINING THE ELIGIBLE BRIDGES CLASSIFIED IN THREE GROUPS: QUALIFYING, MARGINAL AND NON-QUALIFYING. THE BRIDGES ARE RANKED BY COST PER VEHICLE ON A STATEWIDE BASIS AND THEN SORTED BY COST PER VEHICLE WITHIN EACH CATEGORY.

THE SECOND VERSION OF TEBS:

THIS VERSION OF THE PROGRAM CONTAINS SEVERAL DIFFERENT PROCESSES FOR THE EVALUATION OF THE SCORE FOR THE ELIGIBLE BRIDGES. THE FIRST VERSION OF TEBS SUMMED THE WEIGHT OF A VARIABLE TO THE SCORE ONLY IF THE VALUE OF THE VARIABLE COMPARED FAVORABLY TO THE PASSING LEVEL OFTHE VARIABLE. VERSION 2 ALLOWS FOR A FRACTION OF THE WEIGHT TO BE SUMMED TO THE SCORE EVEN IF THE VALUE DOES NOT COMPARE FAVORABLY TO THE PASSING LEVEL.

```
                                        */
/*******************************************************************************************************/
/*  CMS SYSTEM COMMANDS:  I/O FILE DEFINITIONS                  */

CMS FI BRINSAP  DISK ELIGIBLE BRINSAP C;
CMS FI INF DISK TEBS2IC DATA C;

/*  SAS OPTIONS CHOSEN  */
OPTIONS REPLACE CENTER MISSING='M' INVALIDDATA=I;

/*******************************************************************************************************/
/*  START QUALIFICATION PROCESS USING WEIGHTED SCREENING METHOD     */
/*******************************************************************************************************/

DATA QDATA;
 LENGTH GROUP $ 2;
```

```
 MISSING N D;

/* INPUT SDHPT QUALIFYING CRITERIA */

 INFILE INF;
 INPUT #1 CFRH CFRP
     #2 WCPV WADT WSR WDSS WBWC
     #3 AQCPV AQADT AQSR AQDSS AQBWC
     #4 TQ TM;


/* CHECK REHABILITATION AND REPLACEMENT COST FACTORS AND ASSIGN DEFAULTS IF MISSING OR IF
   INDICATED BY THE USER */

 IF CFRH<=.Z THEN CFRH = 25;
 IF CFRP<=.Z THEN CFRP = 35;

/* CHECK WEIGHTS AND ASSIGN DEFAULTS IF MISSING, OR INDICATED BY THE USER, OR THE SUM OF
   WEIGHTS IS GREATER THAN ONE */

 SUMW = WCPV + WADT + WSR + WDSS + WBWC;
 IF (WCPV<=.Z) OR (SUMW > 1) THEN WCPV = 0.10;
 IF (WADT<=.Z) OR (SUMW > 1) THEN WADT = 0.10;
 IF (WSR<=.Z) OR (SUMW > 1) THEN WSR = 0.25;
 IF (WDSS<=.Z) OR (SUMW > 1) THEN WDSS = 0.35;
 IF (WBWC<=.Z) OR (SUMW > 1) THEN WBWC = 0.20;

/* CHECK AUTO QUALIFYING LEVELS AND ASSIGN DEFAULTS IF MISSING OR INDICATED BY THE USER
  */

 IF AQCPV<=.I THEN AQCPV = .N;
 IF AQADT<=.I THEN AQADT = 999999;
 IF AQSR<=.I THEN AQSR = .N;
 IF AQDSS<=.I THEN AQDSS = 2;
 IF AQBWC<=.I THEN AQBWC = .N;

/* CHECK PASSING LEVELS AND ASSIGN DEFAULTS IF MISSING OR
   INDICATED BY THE USER */
/*
 IF PLCPV<=.Z THEN PLCPV = 70;
 IF PLADT<=.Z THEN PLADT = 1700;
 IF PLSR<=.Z THEN PLSR = 63;
 IF PLDSS<=.Z THEN PLDSS = 6;
 IF PLBWC<=.Z THEN PLBWC = 0;
*/
/* CHECK THRESHOLDS AND ASSIGN DEFAULTS IF MISSING OR
   INDICATED BY THE USER */

 IF TQ<=.Z THEN TQ = 75;
 IF (TM<=.Z) OR (TM > TQ) THEN TM = 65;



/* LOOP THROUGH THE ELIGIBLE BRIDGE LIST */

 DO I=1 TO TOTOBS;
  SET BRINSAP.ELIGIBLE POINT=I NOBS=TOTOBS;

   KEEP TQ TM CFRP CFRH WCPV WADT WSR WDSS WBWC AQCPV AQADT AQSR AQDSS
     AQBWC CPI_EST SCR_EST DSS_EST SR_EST CSS CPV W_ADT SR DSS BWC
     SCORE DIST COUNTY WT ROWI CPI GROUP CPV_EST;
```

```
/* INITIALIZE ESTIMATE FLAGS AND SCORE */

   CPI_EST = ' '; CPV_EST = ' '; DSS_EST = ' '; SCORE = 0;
   AQ = ' ';      SCR_EST = ' ';

/* CHECK IF THE COST OF PROPOSED IMPROVEMENTS (COPRI) IS MISSING
   AND IF IT IS, ESTIMATE IT DEPENDING ON THE TYPE OF WORK OF THE
   BRIDGE PROJECT.                                    */

   IF (COPRI <= 0)
    THEN DO;
       CPI_EST = '*';
       CPV_EST = '*';
       IF TYWO = 371                   /* REHABILITATION */
        THEN IF (LOI > 0) AND (PRW > 0)
            THEN CPI = LOI * PRW * CFRH;
            ELSE CPI = 20000;
        ELSE IF (LOI > 0) AND (PRW > 0)  /* REPLACEMENT */
            THEN CPI = LOI * PRW * CFRP;
            ELSE CPI = 20000;
       END;
    ELSE CPI = COPRI * 1000;


/* GET CONTROL-SECTION-STRUCTURE NUMBER */

   IF (CONTROL = '    ') OR (SECTION = ' ') OR (STRUCT = '  ')
    THEN CSS = .N;
    ELSE CSS = (TRIM(LEFT(CONTROL)) || TRIM(LEFT(SECTION)) ||
           TRIM(LEFT(STRUCT)))*1;

/* CALCULATE COST PER VEHICLE */

   IF (W_ADT > 0) THEN CPV = CPI/W_ADT;
           ELSE DO; CPV_EST = '*'; CPV = CPI; END;


/* CALCULATE THE BRIDGE WIDTH CONDITION:
   BWC = 0 --> BRIDGE WIDTH IS CRITICAL
   BWC = 1 --> BRIDGE WIDTH IS NOT CRITICAL */

   IF ((W_ADT > 750) AND (0 < ROWI < 24)) OR
     ((750 >= W_ADT > 400) AND (0 < ROWI < 22)) OR
     ((W_ADT <= 400) AND (0 < ROWI < 20))
    THEN BWC = 0;
    ELSE BWC = 1;

/* CALCULATE MINIMUM OF DECK, SUBSTRUCTURE, SUPERSTRUCTURE CONDITION */

   IF (DECO<=.Z) OR (SSCO<=.Z) OR (SUBCO<=.Z) THEN DSS_EST='*';

   IF (DECO<=.Z) THEN W_DECO=0;
           ELSE W_DECO=DECO;
   IF (SSCO<=.Z) THEN W_SSCO=0;
           ELSE W_SSCO=SSCO;
   IF (SUBCO<=.Z) THEN W_SUBCO=0;
           ELSE W_SUBCO=SUBCO;
   DSS = MIN(W_DECO,W_SUBCO,W_SSCO);

OUTPUT;
```

```
END;

/* DETERMINE THE FREQUENCIES FOR THE ELIGIBLE SET */

PROC FREQ DATA=QDATA;
   TABLES CPV / OUT=CPVP NOPRINT;
   TABLES W_ADT /OUT=W_ADTP NOPRINT;
   TABLES SR / OUT=SRP NOPRINT;
   TABLES DSS / OUT=DSSP NOPRINT;

/* ASSIGN PERCENTILE VALUES TO THE FREQUENCIES */

DATA CPVP;
   SET CPVP;
   DROP COUNT PERCENT PERCTOT;
   PERCTOT + PERCENT;
   CPVPTL = 100 - INT(PERCTOT/10)*10;
   IF CPVPTL = 0 THEN CPVPTL = 10;
RETURN;

DATA W_ADTP;
   SET W_ADTP;
   DROP COUNT PERCENT PERCTOT;
   PERCTOT + PERCENT;
   ADTPTL = INT(PERCTOT/10)*10 + 10;
   IF ADTPTL = 110 THEN ADTPTL = 100;
RETURN;

DATA SRP;
   SET SRP;
   DROP COUNT PERCENT PERCTOT;
   PERCTOT + PERCENT;
   SRPTL = 100 - INT(PERCTOT/10)*10;
   IF SRPTL = 0 THEN SRPTL = 10;
RETURN;

DATA DSSP;
   SET DSSP;
   DROP COUNT PERCENT PERCTOT;
   PERCTOT + PERCENT;
   DSSPTL = 100 - INT(PERCTOT/10)*10;
   IF DSSPTL = 0 THEN DSSPTL = 10;
RETURN;

/* MERGE THE PERCENTILES FOR EACH OF THE VARIABLES INTO THE WORKING
   DATA SET.                                          */

PROC SORT DATA=QDATA;
   BY CPV;
DATA QDATA;
   MERGE QDATA CPVP;
   BY CPV;

PROC SORT DATA=QDATA;
   BY W_ADT;
DATA QDATA;
   MERGE QDATA W_ADTP;
   BY W_ADT;
```

```
PROC SORT DATA=QDATA;
   BY SR;
DATA QDATA;
   MERGE QDATA SRP;
   BY SR;

PROC SORT DATA=QDATA;
   BY DSS;
DATA QDATA;
   MERGE QDATA DSSP;
   BY DSS;
PROC TABULATE DATA=QDATA;
   CLASS CPVPTL ADTPTL SRPTL DSSPTL;
   VAR CPV W_ADT SR DSS;
   TABLE CPVPTL, CPV*(MAX MIN N PCTN);
   TABLE ADTPTL, W_ADT*(MAX MIN N PCTN);
   TABLE SRPTL, SR*(MAX MIN N PCTN);
   TABLE DSSPTL, DSS*(MAX MIN N PCTN);

/* DETERMINE SCORES FOR EACH OF THE BRIDGES BASED ON THE PERCENTILE
   GROUPING OF THE ELIGIBLE SET. FRACTIONAL AWARD OF THE WEIGHTS FOR
   EACH OF THE VARIABLES IS MADE TO EACH BRIDGE'S SCORE, BASED ON THE
   PERCENTILE THAT THAT BRIDGE'S VARIABLE VALUE FALLS INTO.        */

DATA QDATA;

  SET QDATA;

  KEEP TQ TM CFRP CFRH WCPV WADT WSR WDSS WBWC AQCPV AQADT AQSR AQDSS
     AQBWC CPI_EST AQ CPV_EST SCR_EST DSS_EST CSS CPV W_ADT SR DSS
     BWC SCORE DIST COUNTY WT ROWI CPI GROUP;

  IF BWC=0 THEN SCORE = SCORE + (WBWC*100);
  SCORE = SCORE + WCPV*CPVPTL
          + WADT*ADTPTL
          + WSR *SRPTL
          + WDSS*DSSPTL;


/* COMPARE BRIDGE DATA TO PASSING LEVELS AND DETERMINE SCORES BASED
   ON A PASS/FAIL AWARD OF THE WEIGHTS   */

/*
   IF (0 < CPV <= PLCPV) THEN SCORE = SCORE + (WCPV*100);
   IF (W_ADT >= PLADT) THEN SCORE = SCORE + (WADT*100);
   IF (0 <= SR <= PLSR) THEN SCORE = SCORE + (WSR*100);
   IF (0 <= DSS <= PLDSS) THEN SCORE = SCORE + (WDSS*100);
   IF (BWC <= PLBWC) THEN SCORE = SCORE + (WBWC*100);
*/

/* COMPARE BRIDGE DATA TO PASSING LEVELS AND DETERMINE SCORES BASED ON
   A TOTAL AWARD OF THE SCORE FOR BRIDGES THAT COMPARE FAVORABLY TO
   THE PASSING LEVEL AND, AWARD A PORTION OF THE WEIGHT TO BRIDGES
   WHICH DO NOT COMPARE FAVORABLY TO THE PASSING LEVEL OF THE VARIABLE.
   THE FRACTIONAL AWARD IS A FUNCTION OF THE PASSING LEVEL AND THE
   VALUE OF THE VARIABLE.                         */
/*
   IF (0< CPV <=PLCPV) THEN SCORE = SCORE + (WCPV*100);
     ELSE SCORE = SCORE + (PLCPV/CPV)*WCPV*100;
```

```
   IF (W_ADT>=PLADT) THEN SCORE = SCORE + (WADT*100);
     ELSE SCORE = SCORE + (W_ADT/PLADT)*WADT*100;

   IF (0<= SR <= PLSR) THEN SCORE = SCORE+(WSR*100);
     ELSE SCORE = SCORE + (PLSR/SR)*WSR*100;

   IF (0<= DSS <=PLDSS) THEN SCORE = SCORE + (WDSS*100);
     ELSE SCORE = SCORE + (PLDSS/DSS)*WDSS*100;

   IF (BWC <= PLBWC) THEN SCORE = SCORE + (WBWC*100);
*/



/*  COMPARE BRIDGE DATA TO AUTOMATIC QUALIFYING LEVELS  */

   IF (AQCPV > .Z) THEN
    IF (0 <= CPV <= AQCPV) THEN AQ = 'AQ';
   IF (AQADT > .Z) THEN
    IF (W_ADT >= AQADT) THEN AQ = 'AQ';
   IF (AQSR > .Z) THEN
    IF (0 <= SR <= AQSR) THEN AQ = 'AQ';
   IF (AQDSS > .Z) THEN
    IF (0 <= DSS <= AQDSS) THEN AQ = 'AQ';
   IF (AQBWC > .Z) THEN
    IF (BWC <= AQBWC) THEN AQ = 'AQ';

/*  FLAG THE SCORE AS ESTIMATED IF ANY OF THE CRITERIA USED HAS BEEN
    ESTIMATED OR IS MISSING                                  */

   IF (CPV_EST='*') OR (DSS_EST='*') OR (SR_EST='*') OR (W_ADT<=.Z)
    THEN SCR_EST='*';

/*  COMPARE SCORE TO QUALIFYING AND MARGINAL THRESHOLDS
    AND GROUP THEM IN QUALIFYING, MARGINAL AND NON-QUALIFYING LISTS  */

   IF (SCORE >= TQ) OR (AQ = 'AQ')
    THEN DO;
       GROUP = 'Q';
       END;
   ELSE IF (TQ > SCORE >= TM)
       THEN DO;
          GROUP = 'M';
          END;
      ELSE DO;
         GROUP = 'NQ';
         END;

         /*  OUTPUT THE BRIDGE TO THE DATA SET  */

      /*  OF DO LOOP  */


RUN;

/*  PERFORM A REGRESSION ANALYSIS ON THE SCORES CALCULATED WITH ALL THE
    VARIABLES OF THE PROCESS       */
/*
PROC REG DATA=QDATA;
  MODEL SCORE= CPV W_ADT SR DSS BWC;
```

```
DATA QDATA.OUT;
  SET QDATA;
RUN;
 */
/*  SORT BRIDGE RECORDS BY COST PER VEHICLE  */

PROC RANK TIES=HIGH DATA=QDATA OUT=RANKED;
 VAR CPV;
 RANKS CPV_RNK;

DATA QDATA2;
 SET RANKED;
 IF (CPV_RNK<=.Z) THEN CPV_RNK=9999;

PROC FORMAT;
 PICTURE CSSPIC 0-HIGH = '9999-99-999';
 PICTURE PC       0-1 = '009%' (MULT=100);
 PICTURE RK    0-9998 = '0009'
            OTHER  = 'NONE';
 PICTURE ACPV  0-HIGH = '0,009'
            LOW-<0 = 'NONE'   (PREFIX='$');
 PICTURE AADT 0-999998 = '000,009'
             OTHER = 'NONE';
 PICTURE ASR     0-100 = '09.9'
            LOW-<0 = 'NONE';
 PICTURE ADSS      0-9 = '9'
            LOW-<0 = 'NONE';
 PICTURE ABWC      0-1 = '9'
             OTHER = 'NONE';
 PICTURE PCPV  0-HIGH = '0000,009'    (PREFIX='<=');
 PICTURE PADT 0-999998 = '00000,009'  (PREFIX='>=');
 PICTURE PSR    0-100 = '00009.9'   (PREFIX='<=');
 PICTURE PDSS     0-9 = '009'       (PREFIX='<=');
 PICTURE PBWC    0-HIGH= '009'       (PREFIX='<=');
 VALUE $CNTY '001'='ANDERSON' '002'='ANDREWS' '003'='ANGELINA'
        '004'='ARANSAS' '005'='ARCHER' '006'='ARMSTRONG'
        '007'='ATASCOSA' '008'='AUSTIN' '009'='BAILEY'
        '010'='BANDERA' '011'='BASTROP' '012'='BAYLOR' '013'='BEE'
        '014'='BELL' '015'='BEXAR' '016'='BLANCO' '017'='BORDEN'
        '018'='BOSQUE' '019'='BOWIE' '020'='BRAZORIA'
        '021'='BRAZOS' '022'='BREWSTER' '023'='BRISCOE'
        '024'='BROOKS' '025'='BROWN' '026'='BURLESON'
        '027'='BURNET' '028'='CALDWELL' '029'='CALHOUN'
        '030'='CALLAHAN' '031'='CAMERON' '032'='CAMP'
        '033'='CARSON' '034'='CASS' '035'='CASTRO' '036'='CHAMBERS'
        '037'='CHEROKEE' '038'='CHILDRESS' '039'='CLAY'
        '040'='COCHRAN' '041'='COKE' '042'='COLEMAN' '043'='COLLIN'
        '044'='COLLINGSWORTH' '045'='COLORADO' '046'='COMAL'
        '047'='COMANCHE' '048'='CONCHO' '049'='COOKE'
        '050'='CORYELL' '051'='COTTLE' '052'='CRANE'
        '053'='CROCKETT' '054'='CROSBY' '055'='CULBERSON'
        '056'='DALLAM' '057'='DALLAS' '058'='DAWSON'
        '059'='DEAF SMITH' '060'='DELTA' '061'='DENTON'
        '062'='DEWITT' '063'='DICKENS' '064'='DIMMIT'
        '065'='DONLEY' '066'='KENEDY' '067'='DUVAL'
        '068'='EASTLAND' '069'='ECTOR' '070'='EDWARDS'
        '071'='ELLIS' '072'='EL PASO' '073'='ERATH' '074'='FALLS'
        '075'='FANNIN' '076'='FAYETTE' '077'='FISHER' '078'='FLOYD'
        '079'='FOARD' '080'='FORT BEND' '081'='FRANKLIN'
```

```
'082'='FREESTONE' '083'='FRIO' '084'='GAINES'
'085'='GALVESTON' '086'='GARZA' '087'='GILLESPIE'
'088'='GLASSCOCK' '089'='GOLIAD' '090'='GONZALES'
'091'='GRAY' '092'='GRAYSON' '093'='GREGG' '094'='GRIMES'
'095'='GUADALUPE' '096'='HALE' '097'='HALL'
'098'='HAMILTON' '099'='HANSFORD' '100'='HARDEMAN'
'101'='HARDIN' '102'='HARRIS' '103'='HARRISON'
'104'='HARTLEY' '105'='HASKELL' '106'='HAYS'
'107'='HEMPHILL' '108'='HENDERSON' '109'='HIDALGO'
'110'='HILL' '111'='HOCKLEY' '112'='HOOD'
'113'='HOPKINS' '114'='HOUSTON' '115'='HOWARD'
'116'='HUDSPETH' '117'='HUNT' '118'='HUTCHINSON'
'119'='IRION' '120'='JACK' '121'='JACKSON' '122'='JASPER'
'123'='JEFF DAVIS' '124'='JEFFERSON' '125'='JIM HOGG'
'126'='JIM WELLS' '127'='JOHNSON' '128'='JONES'
'129'='KARNES' '130'='KAUFMAN' '131'='KENDALL' '132'='KENT'
'133'='KERR' '134'='KIMBLE' '135'='KING' '136'='KINNEY'
'137'='KLEBERG' '138'='KNOX' '139'='LAMAR' '140'='LAMB'
'141'='LAMPASAS' '142'='LA SALLE' '143'='LAVACA'
'144'='LEE' '145'='LEON' '146'='LIBERTY' '147'='LIMESTONE'
'148'='LIPSCOMB' '149'='LIVE OAK' '150'='LLANO'
'151'='LOVING' '152'='LUBBOCK' '153'='LYNN' '154'='MADISON'
'155'='MARION' '156'='MARTIN' '157'='MASON'
'158'='MATAGORDA' '159'='MAVERICK' '160'='MCCULLOCH'
'161'='MCLENNAN' '162'='MCMULLEN' '163'='MEDINA'
'164'='MENARD' '165'='MIDLAND' '166'='MILAM' '167'='MILLS'
'168'='MITCHELL' '169'='MONTAGUE' '170'='MONTGOMERY'
'171'='MOORE' '172'='MORRIS' '173'='MOTLEY'
'174'='NACOGDOCHES' '175'='NAVARRO' '176'='NEWTON'
'177'='NOLAN' '178'='NUECES' '179'='OCHILTREE'
'180'='OLDHAM' '181'='ORANGE' '182'='PALO PINTO'
'183'='PANOLA' '184'='PARKER' '185'='PARMER' '186'='PECOS'
'187'='POLK' '188'='POTTER' '189'='PRESIDIO' '190'='RAINS'
'191'='RANDALL' '192'='REAGAN' '193'='REAL'
'194'='RED RIVER' '195'='REEVES' '196'='REFUGIO'
'197'='ROBERTS' '198'='ROBERTSON' '199'='ROCKWALL'
'200'='RUNNELS' '201'='RUSK' '202'='SABINE'
'203'='SAN AUGUSTINE' '204'='SAN JACINTO'
'205'='SAN PATRICIO' '206'='SAN SABA' '207'='SCHLEICHER'
'208'='SCURRY' '209'='SHACKELFORD' '210'='SHELBY'
'211'='SHERMAN' '212'='SMITH' '213'='SOMERVELL'
'214'='STARR' '215'='STEPHENS' '216'='STERLING'
'217'='STONEWALL' '218'='SUTTON' '219'='SWISHER'
'220'='TARRANT' '221'='TAYLOR' '222'='TERRELL'
'223'='TERRY' '224'='THROCKMORTON' '225'='TITUS'
'226'='TOM GREEN' '227'='TRAVIS' '228'='TRINITY'
'229'='TYLER' '230'='UPSHUR' '231'='UPTON' '232'='UVALDE'
'233'='VAL VERDE' '234'='VAN ZANDT' '235'='VICTORIA'
'236'='WALKER' '237'='WALLER' '238'='WARD'
'239'='WASHINGTON' '240'='WEBB' '241'='WHARTON'
'242'='WHEELER' '243'='WICHITA' '244'='WILBARGER'
'245'='WILLACY' '246'='WILLIAMSON' '247'='WILSON'
'248'='WINKLER' '249'='WISE' '250'='WOOD' '251'='YOAKUM'
'252'='YOUNG' '253'='ZAPATA' '254'='ZAVALA';

/*****************************************************************************/
/* SORT BRIDGES INTO THREE GROUPS: QUALIFYING, MARGINAL AND        */
/* NON-QUALIFYING                                       */
/*****************************************************************************/
```

```
DATA QB;
 SET QDATA2;
 IF GROUP = 'Q';

PROC SORT DATA=QB;
 BY CPV_RNK DIST;

DATA MB;
 SET QDATA2;
 IF GROUP ='M';

PROC SORT DATA=MB;
 BY CPV_RNK DIST;

DATA NQB;
 SET QDATA2;
 IF GROUP = 'NQ';

PROC SORT DATA=NQB;
 BY CPV_RNK DIST;

/*  PRINT QUALIFYING BRIDGES  */

 TITLE1 'T E X A S   B R I D G E   S O R T E R';
 TITLE2 ' ';
 TITLE3 'VERSION 2.0';
 TITLE4 ' ';
 TITLE5 'QUALIFYING BRIDGE PROJECTS';
 TITLE6 ' ';
 TITLE7 'DATA SET:  BRIDGES ELIGIBLE FOR FEDERAL FUNDING';
 TITLE8 ' ';

DATA _NULL_;
 SET QB END=EOF; BY CPV_RNK DIST;
 CPV_SB='<='; ADT_SB='>='; SR_SB='<='; DSS_SB='<='; BWC_SB='<=';
 IF AQCPV<=.Z THEN CPV_SB='  ';
 IF AQADT>=999999 THEN ADT_SB='  ';
 IF AQSR<=.Z THEN SR_SB='  ';
 IF AQDSS<=.Z THEN DSS_SB='  ';
 IF AQBWC<=.Z THEN BWC_SB='  ';
 RD4 = REPEAT('-',3);
 RD5 = REPEAT('-',4);
 RD6 = REPEAT('-',5);
 RD7 = REPEAT('-',6);
 RD9 = REPEAT('-',8);
 RD49 = REPEAT('-',48);
 RD131 = REPEAT('-',130);
 ATCOST + CPI;
 FILE PRINT HEADER=H LINESLEFT=L;
 IF L=3 THEN PUT _PAGE_@;
 PUT @3 DIST 2. @8 COUNTY $CNTY. @23 CSS CSSPIC. @38 WT $2.
    @43 CPV_RNK RK. CPV_EST $1. @50 SCORE 3. SCR_EST $1. @55 AQ $2.
    @60 CPV DOLLAR7. CPV_EST $1. @68 W_ADT COMMA9. @80 SR 5.1
    SR_EST $1. @90 DSS 1. DSS_EST $1. @97 BWC 1. @101 ROWI 5.1
    @108 CPI DOLLAR10. CPI_EST $1. @121 ATCOST DOLLAR12.;
 RETURN;
 H:PUT / @2 RD49 @54 'CRITERIA USED FOR SCREENING' @84 RD49
      / @5 'QUALIFYING:' @22 'SCORE >= ' @30 TQ 3.
        @106 'REHAB   COST = ' CFRH DOLLAR3. '/SQ FT'
      / @5 'MARGINAL:' @14 TM 3. @19 '<= SCORE <' @30 TQ 3.
```

```
        @106 'REPLACE COST = ' CFRP DOLLAR3. '/SQ FT'
      / @61 'CPV' @72 'ADT' @81 'SR' @89 'DSS' @96 'BWC'
      / @59 RD7   @68 RD9   @79 RD6  @87 RD6   @95 RD6
      / @31 'WEIGHTS:' @60 WCPV PC. @71 WADT PC. @80 WSR PC.
        @88 WDSS PC. @96 WBWC PC. @106 '* = ESTIMATED'
      / @31 'AUTO. QUALIFYING LEVELS:' @59 CPV_SB $2.  @61 AQCPV ACPV.
        @68 ADT_SB $2. @70 AQADT AADT. @79 SR_SB $2. @81 AQSR ASR.
        @87 DSS_SB $2. @89 AQDSS ADSS. @95 BWC_SB $2. @97 AQBWC ABWC.
        @106 'M = MISSING'
      / @31 'PASSING LEVELS ARE NOT NECESSARY IN TEBS VERSION 2.0'
      / @2 RD131
     // @37 'TYPE' @43 'CPV' @101 'RDWY' @112 'PROJECT'
        @121 'ACCUMULATIVE'
      / @2 'DIST' @8 'COUNTY' @23 'CONT-SEC-STR' @37 'WORK'
        @43 'RANK' @50 'SCORE' @61 'CPV' @72 'ADT' @82 'SR'
        @89 'DSS' @96 'BWC' @101 'WIDTH' @114 'COST'
        @121 'PROJECT COST' //;
  RETURN;
  RUN;

/* PRINT MARGINAL BRIDGES  */

  TITLE1 'T E X A S   B R I D G E   S O R T E R';
  TITLE2 ' ';
  TITLE3 'VERSION 2.0';
  TITLE4 ' ';
  TITLE5 'MARGINAL BRIDGE PROJECTS';
  TITLE6 ' ';
  TITLE7 'DATA SET:  BRIDGES ELIGIBLE FOR FEDERAL FUNDING';
  TITLE8 ' ';

DATA _NULL_;
  SET MB END=EOF;  BY CPV_RNK DIST;
  CPV_SB='<=';  ADT_SB='>=';  SR_SB='<=';  DSS_SB='<=';  BWC_SB='<=';
  IF AQCPV<=.Z THEN CPV_SB='  ';
  IF AQADT>=999999 THEN ADT_SB='  ';
  IF AQSR<=.Z THEN SR_SB='  ';
  IF AQDSS<=.Z THEN DSS_SB='  ';
  IF AQBWC<=.Z THEN BWC_SB='  ';
  RD4 = REPEAT('-',3);
  RD5 = REPEAT('-',4);
  RD6 = REPEAT('-',5);
  RD7 = REPEAT('-',6);
  RD9 = REPEAT('-',8);
  RD49 = REPEAT('-',48);
  RD131 = REPEAT('-',130);
  ATCOST + CPI;
  FILE PRINT HEADER=H LINESLEFT=L;
  IF L=3 THEN PUT _PAGE_@;
  PUT @3 DIST 2. @8 COUNTY $CNTY. @23 CSS CSSPIC. @38 WT $2.
     @43 CPV_RNK RK. CPV_EST $1. @50 SCORE 3. SCR_EST $1. @55 AQ $2.
     @60 CPV DOLLAR7. CPV_EST $1. @68 W_ADT COMMA9. @80 SR 5.1
     SR_EST $1. @90 DSS 1. DSS_EST $1. @97 BWC 1. @101 ROWI 5.1
     @108 CPI DOLLAR10. CPI_EST $1. @121 ATCOST DOLLAR12.;
  RETURN;
  H:PUT / @2 RD49 @54 'CRITERIA USED FOR SCREENING' @84 RD49
      / @5 'QUALIFYING:' @22 'SCORE >= ' @30 TQ 3.
        @106 'REHAB   COST = ' CFRH DOLLAR3. '/SQ FT'
      / @5 'MARGINAL:' @14 TM 3. @19 '<= SCORE <' @30 TQ 3.
        @106 'REPLACE COST = ' CFRP DOLLAR3. '/SQ FT'
```

```
     / @61 'CPV' @72 'ADT' @81 'SR' @89 'DSS' @96 'BWC'
     / @59 RD7   @68 RD9   @79 RD6  @87 RD6   @95 RD6
     / @31 'WEIGHTS:' @60 WCPV PC. @71 WADT PC. @80 WSR PC.
       @88 WDSS PC. @96 WBWC PC. @106 '* = ESTIMATED'
     / @31 'AUTO. QUALIFYING LEVELS:'  @59 CPV_SB $2. @61 AQCPV ACPV.
       @68 ADT_SB $2. @70 AQADT AADT.  @79 SR_SB $2. @81 AQSR ASR.
       @87 DSS_SB $2. @89 AQDSS ADSS.  @95 BWC_SB $2. @97 AQBWC ABWC.
       @106 'M = MISSING'
     / @31 'PASSING LEVELS ARE NOT NECESSARY IN TEBS VERSION 2.0'
     / @2 RD131
    // @37 'TYPE' @43 'CPV' @101 'RDWY' @112 'PROJECT'
       @121 'ACCUMULATIVE'
     / @2 'DIST' @8 'COUNTY' @23 'CONT-SEC-STR' @37 'WORK'
       @43 'RANK' @50 'SCORE' @61 'CPV' @72 'ADT' @82 'SR'
       @89 'DSS' @96 'BWC' @101 'WIDTH' @114 'COST'
       @121 'PROJECT COST' //;
 RETURN;
 RUN;


/*  PRINT NON-QUALIFYING BRIDGES  */

 TITLE1 'T E X A S   B R I D G E   S O R T E R';
 TITLE2 ' ';
 TITLE3 'VERSION 2.0';
 TITLE4 ' ';
 TITLE5 'NON-QUALIFYING BRIDGE PROJECTS';
 TITLE6 ' ';
 TITLE7 'DATA SET:  BRIDGES ELIGIBLE FOR FEDERAL FUNDING';
 TITLE8 ' ';

DATA _NULL_;
 SET NQB END=EOF;  BY CPV_RNK DIST;
 CPV_SB='<=';  ADT_SB='>=';  SR_SB='<=';  DSS_SB='<=';  BWC_SB='<=';
 IF AQCPV<=.Z THEN CPV_SB='  ';
 IF AQADT>=999999 THEN ADT_SB='  ';
 IF AQSR<=.Z THEN SR_SB='  ';
 IF AQDSS<=.Z THEN DSS_SB='  ';
 IF AQBWC<=.Z THEN BWC_SB='  ';
 RD4 = REPEAT('-',3);
 RD5 = REPEAT('-',4);
 RD6 = REPEAT('-',5);
 RD7 = REPEAT('-',6);
 RD9 = REPEAT('-',8);
 RD49 = REPEAT('-',48);
 RD131 = REPEAT('-',130);
 ATCOST + CPI;
 FILE PRINT HEADER=H LINESLEFT=L;
 IF L=3 THEN PUT _PAGE_@;
 PUT @3 DIST 2. @8 COUNTY $CNTY. @23 CSS CSSPIC. @38 WT $2.
   @43 CPV_RNK RK. CPV_EST $1. @50 SCORE 3. SCR_EST $1. @55 AQ $2.
   @60 CPV DOLLAR7. CPV_EST $1. @68 W_ADT COMMA9. @80 SR 5.1
   SR_EST $1. @90 DSS 1. DSS_EST $1. @97 BWC 1. @101 ROWI 5.1
   @108 CPI DOLLAR10. CPI_EST $1. @121 ATCOST DOLLAR12.;
 RETURN;
 H:PUT / @2 RD49 @54 'CRITERIA USED FOR SCREENING' @84 RD49
     / @5 'QUALIFYING:' @22 'SCORE >= ' @30 TQ 3.
       @106 'REHAB   COST = ' CFRH DOLLAR3. '/SQ FT'
     / @5 'MARGINAL:' @14 TM 3. @19 '<= SCORE <' @30 TQ 3.
       @106 'REPLACE COST = ' CFRP DOLLAR3. '/SQ FT'
```

```
      / @61 'CPV' @72 'ADT' @81 'SR' @89 'DSS' @96 'BWC'
      / @59 RD7   @68 RD9   @79 RD6  @87 RD6   @95 RD6
      / @31 'WEIGHTS:' @60 WCPV PC. @71 WADT PC. @80 WSR PC.
        @88 WDSS PC. @96 WBWC PC. @106 '* = ESTIMATED'
      / @31 'AUTO. QUALIFYING LEVELS:'  @59 CPV_SB $2. @61 AQCPV ACPV.
        @68 ADT_SB $2. @70 AQADT AADT.  @79 SR_SB $2. @81 AQSR ASR.
        @87 DSS_SB $2. @89 AQDSS ADSS.  @95 BWC_SB $2. @97 AQBWC ABWC.
        @106 'M = MISSING'
      / @31 'PASSING LEVELS ARE NOT NECESSARY IN TEBS VERSION 2.0'
      / @2 RD131
      // @37 'TYPE' @43 'CPV' @101 'RDWY' @112 'PROJECT'
        @121 'ACCUMULATIVE'
      / @2 'DIST' @8 'COUNTY' @23 'CONT-SEC-STR' @37 'WORK'
        @43 'RANK' @50 'SCORE' @61 'CPV' @72 'ADT' @82 'SR'
        @89 'DSS' @96 'BWC' @101 'WIDTH' @114 'COST'
        @121 'PROJECT COST' //;
   RETURN;
   RUN;
/*********************************************END OF TEBS2 PROGRAM LISTING*************************************************/
```

/*

TEBS3

TEXAS BRIDGE SORTER

VERSION 3.0

WRITTEN BY:
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ON: MAY 1986
LAST UPDATED: OCTOBER 1987

TEBS IS THE SECOND PROGRAM IN A TWO PART SERIES OF SAS PROGRAMS DEVELOPED TO COMPUTERIZE THE TEXAS SDHPT BRIDGE PROJECT SELECTION PROCESS. THIS PROGRAM WAS DEVELOPED UNDER CTR RESEARCH PROJECT 439. FOR MORE INFORMATION ABOUT THIS PROGRAM OR THE OTHER IN THE SERIES, REFER TO CTR REPORT 439-1.

THE TEBS PROGRAM CLASSIFIES BRIDGES THAT ARE ELIGIBLE FOR FEDERAL FUNDING INTO THE THREE CATEGORIES DESCRIBED BELOW:

(1) QUALIFYING: BRIDGE PROJECTS THAT DEFINITELY MEET SDHPT CRITERIA FOR STATE FUNDING FOR REPLACEMENT OR REHABILITATION.
(2) MARGINAL: BRIDGE PROJECTS THAT MEET MOST OF SDHPT CRITERIA AND MAY BE FUNDED BY THE STATE FOR REPLACEMENT OR REHABILITATION UNDER CERTAIN CONDITIONS.
(3) NON-QUALIFYING: BRIDGE PROJECTS THAT DEFINITELY DO NOT MEET SDHPT CRITERIA FOR STATE FUNDING FOR REPLACEMENT OR REHABILITATION.

TEBS USES TWO METHODS TO SORT BRIDGES INTO QUALIFYING, MARGINAL, AND NON-QUALIFYING GROUPS; AUTOMATIC QUALIFICATION AND SCORING.

DEVELOPED AND WRITTEN IN SAS (STATISTICAL ANALYSIS SYSTEM) LANGUAGE, VERSION 5 (RELEASE 5.08) FOR THE IBM 3081-D RUNNING UNDER THE VM/SP OPERATING SYSTEM.

INPUT AND OUTPUT:

ELIGIBLE INPUT FILE:

THIS FILE CONTAINS ALL THE BRINSAP BRIDGES WHICH ARE ELIGIBLE FOR FEDERAL (FHWA) FUNDING. IT IS A SAS DATA SET FILE CREATED BY THE SURE SAS PROGRAM. IT CONTAINS IDENTIFICATION DATA FOR EACH ELIGIBLE BRIDGE, ALL THE DATA USED BY THE SURE1 PROGRAM AND THE DATA ITEMS THAT WILL BE USED BY TEBS.

TEBSIC INPUT FILE:

THIS FILE PROVIDES TEBS WITH THE SDHPT QUALIFYING CRITERIAI NFORMATION. THIS FILE IS IN FREE FORMAT. ALL REAL VALUES ARE TYPED WITH A DECIMAL POINT AS PART OF THE VALUE.
NOTE: DUE TO THE FREE FORMAT OF THE DATA FILE, NO FIELD MAY BE LEFT BLANK OR THE DATA WILL BE MISINTERPRETED BY THE PROGRAM. TYPE "N" IN THOSE FIELDS TO BE LEFT BLANK, AND TYPE "D" TO USE THE FIELD'S DEFAULT VALUE.

LINE VARIABLE

```
NO.  NAME     VARIABLE DESCRIPTION
---  -------  -----------------------------------------------
1    CFRH     REHABILITATION COST, IN DOLLARS/SQ. FT.  DEFAULT IS 25.
              USED TO ESTIMATE THE BRIDGE PROJECT COST IF MISSING.
     CFRP     REPLACEMENT COST, IN DOLLARS/SQ. FT.  DEFAULT IS 35.
              USED TO ESTIMATE THE BRIDGE PROJECT COST IF MISSING.
2    WCPV     WEIGHT FOR CPV.  DEFAULT IS 0.10 FOR 10%.  REAL.
     WADT     WEIGHT FOR ADT.  DEFAULT IS 0.10 FOR 10%.  REAL.
     WSR      WEIGHT FOR SR.  DEFAULT IS 0.25 FOR 25%.  REAL.
     WDSS     WEIGHT FOR DSS.  DEFAULT IS 0.35 FOR 35%. REAL.
     WBWC     WEIGHT FOR BWC.  DEFAULT IS 0.20 FOR 20%.  REAL.
     WGSI     WEIGHT FOR GSI.  DEFAULT IS 0.00 FOR  0%. REAL.
     WSSI     WEIGHT FOR SSI.  DEFAULT IS 0.00 FOR  0%. REAL.
     WESI     WEIGHT FOR ESI.  DEFAULT IS 0.00 FOR  0%. REAL.
     WCSI     WEIGHT FOR CSI.  DEFAULT IS 0.00 FOR  0%. REAL.
     WFSI     WEIGHT FOR FSI.  DEFAULT IS 0.00 FOR  0%. REAL.
3    AQCPV    AUTOMATIC QUALIFYING LEVEL FOR CPV IN $.  DEFAULT IS N.
     AQADT    AUTOMATIC QUALIFYING LEVEL FOR ADT.  DEFAULT IS N.
     AQSR     AUTOMATIC QUALIFYING LEVEL FOR SR.  DEFAULT IS N.
     AQDSS    AUTOMATIC QUALIFYING LEVEL FOR DSS.  DEFAULT IS 2.
     AQBWC    AUTOMATIC QUALIFYING LEVEL FOR BWC.  DEFAULT IS N.
     AQGSI    AUTOMATIC QUALIFYING LEVEL FOR GSI.  DEFAULT IS N.
     AQSSI    AUTOMATIC QUALIFYING LEVEL FOR SSI.  DEFAULT IS N.
     AQESI    AUTOMATIC QUALIFYING LEVEL FOR ESI.  DEFAULT IS N.
     AQCSI    AUTOMATIC QUALIFYING LEVEL FOR CSI.  DEFAULT IS N.
     AQFSI    AUTOMATIC QUALIFYING LEVEL FOR FSI.  DEFAULT IS N.
4    TQ       THRESHOLD FOR QUALIFYING.  DEFAULT IS 75.
     TM       THRESHOLD FOR MARGINAL.  DEFAULT IS 65.

TEBS REPORT OUTPUT FILE:

   THE OUTPUT OF TEBS CONSISTS OF A REPORT FILE CONTAINING THE
ELIGIBLE BRIDGES CLASSIFIED IN THREE GROUPS:  QUALIFYING, MARGINAL AND
NON-QUALIFYING.  THE BRIDGES ARE RANKED BY COST PER VEHICLE ON A
STATEWIDE BASIS AND THEN SORTED BY COST PER VEHICLE WITHIN EACH CATEGORY.


THE SECOND VERSION OF TEBS:

   THIS VERSION OF THE PROGRAM CONTAINS SEVERAL DIFFERENT PROCESSES
FOR THE EVALUATION OF THE SCORE FOR THE ELIGIBLE BRIDGES. THE FIRST
VERSION OF TEBS SUMMED THE WEIGHT OF A VARIABLE TO THE SCORE ONLY IF
THE VALUE OF THE VARIABLE COMPARED FAVORABLY TO THE PASSING LEVEL OF
THE VARIABLE.  VERSION 2 ALLOWS FOR A FRACTION OF THE WEIGHT TO BE
SUMMED TO THE SCORE EVEN IF THE VALUE DOES NOT COMPARE FAVORABLY TO
THE PASSING LEVEL.

THE THIRD VERSION OF TEBS:

THIS VERSION OF TEBS HAS THE VARYING PERCENTILE SCORING PROCESS
DEVELOPED IN THE SECOND VERSION OF TEBS AND IT HAS FIVE NEW DECISION
VARIABLES.

THE NEW DECISION VARIABLES ARE SSI AND GSI DEVELOPED IN CTR RESEARCH
REPORT 439-2 AND CSI ESI AND FSI DEVELOPED IN CTR RESEARCH REPORT 439-3.
*/
/***********************************************************************************************************/
/*  CMS SYSTEM COMMANDS:  I/O FILE DEFINITIONS                *
```

```
CMS FI BRINSAP  DISK ELIGON87 BRINSAP D;
CMS FI INF DISK TEBS3IC DATA B;

/*  SAS OPTIONS CHOSEN   */

OPTIONS REPLACE CENTER MISSING='M' INVALIDDATA=I NOLABEL OBS=50;

/*******************************************************************************************************************/
/*  START QUALIFICATION PROCESS USING WEIGHTED SCREENING METHOD       */
/*******************************************************************************************************************/

DATA QDATA;
 LENGTH GROUP $ 2;
 MISSING N D;


/*  INPUT SDHPT QUALIFYING CRITERIA   */

 INFILE INF;
 INPUT #1 CFRH CFRP
     #2 WCPV WADT WSR WDSS WBWC WSSI WGSI WESI WCSI WFSI
     #3 AQCPV AQADT AQSR AQDSS AQBWC AQSSI AQGSI AQESI AQCSI AQFSI
     #4 TQ TM;


/*  CHECK REHABILITATION AND REPLACEMENT COST FACTORS AND ASSIGN
    DEFAULTS IF MISSING OR IF INDICATED BY THE USER                 */

 IF CFRH<=.Z THEN CFRH = 25;
 IF CFRP<=.Z THEN CFRP = 35;

/*  CHECK WEIGHTS AND ASSIGN DEFAULTS IF MISSING, OR INDICATED BY
    THE USER, OR THE SUM OF WEIGHTS IS GREATER THAN ONE            */

 SUMW = WCPV+WADT+WSR+WDSS+WBWC+WSSI+WGSI+WESI+WCSI+WFSI;
 IF (WCPV<=.Z) OR (SUMW > 1) THEN WCPV = 0.10;
 IF (WADT<=.Z) OR (SUMW > 1) THEN WADT = 0.10;
 IF (WSR<=.Z) OR (SUMW > 1) THEN WSR = 0.25;
 IF (WDSS<=.Z) OR (SUMW > 1) THEN WDSS = 0.35;
 IF (WBWC<=.Z) OR (SUMW > 1) THEN WBWC = 0.20;
 IF (WSSI<=.Z) OR (SUMW >1) THEN WSSI = 0.00;
 IF (WGSI<=.Z) OR (SUMW >1) THEN WGSI = 0.00;
 IF (WESI<=.Z) OR (SUMW >1) THEN WESI = 0.00;
 IF (WCSI<=.Z) OR (SUMW >1) THEN WCSI = 0.00;
 IF (WFSI<=.Z) OR (SUMW >1) THEN WFSI = 0.00;

/*  CHECK AUTO QUALIFYING LEVELS AND ASSIGN DEFAULTS IF MISSING OR
    INDICATED BY THE USER                              */

 IF AQCPV<=.I THEN AQCPV = .N;
 IF AQADT<=.I THEN AQADT = 999999;
 IF AQSR<=.I THEN AQSR = .N;
 IF AQDSS<=.I THEN AQDSS = 2;
 IF AQBWC<=.I THEN AQBWC = .N;
 IF AQSSI<=.I THEN AQSSI = .N;
 IF AQGSI<=.I THEN AQGSI = .N;
 IF AQESI<=.I THEN AQESI = .N;
 IF AQCSI<=.I THEN AQCSI = .N;
 IF AQFSI<=.I THEN AQFSI = .N;

/*  CHECK THRESHOLDS AND ASSIGN DEFAULTS IF MISSING OR
```

```
   INDICATED BY THE USER                          */

  IF TQ<=.Z THEN TQ = 75;
  IF (TM<=.Z) OR (TM > TQ) THEN TM = 65;


/*  LOOP THROUGH THE ELIGIBLE BRIDGE LIST  */

/*DO I=1 TO TOTOBS;*/
  DO I=1 TO NOBS;
   SET BRINSAP.ELIGON87  POINT=I NOBS=TOTOBS;

   KEEP TQ TM CFRP CFRH WCPV WADT WSR WDSS WBWC WSSI WGSI WCSI WESI WFSI
      AQCPV AQADT AQSR AQDSS AQBWC AQSSI AQGSI AQCSI AQESI AQFSI
      CPI_EST SCR_EST DSS_EST SR_EST    CPV W_ADT SR DSS BWC SSI GSI
      SCORE DIST COUNTY WT ROWI CPI GROUP CPV_EST W_BDL ESRLI DEGE
      UCVL WA SLC SCO CONTROL SECTION STRUCT;


/*  INITIALIZE ESTIMATE FLAGS AND SCORE  */

   CPI_EST = ' ';  CPV_EST = ' ';  DSS_EST = ' ';  SCORE = 0;
   AQ = ' ';      SCR_EST = ' ';

/*  CHECK IF THE COST OF PROPOSED IMPROVEMENTS (COPRI) IS MISSING
    AND IF IT IS, ESTIMATE IT DEPENDING ON THE TYPE OF WORK OF THE
    BRIDGE PROJECT.                              */

   IF (COPRI <= 0)
    THEN DO;
       CPI_EST = '*';
       CPV_EST = '*';
       IF TYWO = 371                   /*  REHABILITATION  */
        THEN IF (LOI > 0) AND (PRW > 0)
             THEN CPI = LOI * PRW * CFRH;
             ELSE CPI = 20000;
        ELSE IF (LOI > 0) AND (PRW > 0)    /*  REPLACEMENT  */
             THEN CPI = LOI * PRW * CFRP;
             ELSE CPI = 20000;
       END;
    ELSE CPI = COPRI * 1000;


/*  GET CONTROL-SECTION-STRUCTURE NUMBER

   IF (CONTROL = '    ') OR (SECTION = '  ') OR (STRUCT = '   ')
    THEN CSS = .N;
    ELSE CSS = (TRIM(LEFT(CONTROL)) || TRIM(LEFT(SECTION)) ||
           TRIM(LEFT(STRUCT)));      */

/*  CALCULATE COST PER VEHICLE  */

   IF (W_ADT > 0) THEN CPV = ROUND(CPI/W_ADT);
          ELSE DO; CPV_EST = '*'; CPV = CPI; END;


/*  CALCULATE THE BRIDGE WIDTH CONDITION:
   BWC = 0  --> BRIDGE WIDTH IS CRITICAL
   BWC = 1  --> BRIDGE WIDTH IS NOT CRITICAL  */
```

```
   IF ((W_ADT > 750) AND  (0 < ROWI < 24)) OR
     ((750 >= W_ADT > 400) AND  (0 < ROWI < 22)) OR
     ((W_ADT <= 400)  AND  (0 < ROWI < 20))
    THEN BWC = 0;
    ELSE BWC = 1;

/*  CALCULATE MINIMUM OF DECK, SUBSTRUCTURE, SUPERSTRUCTURE CONDITION */

   IF (DECO<=.Z) OR (SSCO<=.Z) OR (SUBCO<=.Z) OR (CPCO<=.Z)
    THEN  DSS_EST='*';

   IF (DECO<=.Z) THEN W_DECO=0;
            ELSE W_DECO=DECO;
   IF (SSCO<=.Z) THEN W_SSCO=0;
            ELSE W_SSCO=SSCO;
   IF (SUBCO<=.Z) THEN W_SUBCO=0;
             ELSE W_SUBCO=SUBCO;
   IF (CPCO<=.Z) THEN W_CPCO=9;
             ELSE W_CPCO=CPCO;
   DSS = MIN(W_DECO,W_SUBCO,W_SSCO,W_CPCO);

SR=ROUND(SR);

/*   CALCULATE STRUCTURAL SAFETY INDEX   */

IF SUBCO>.I THEN SUBWT=9; ELSE SUBWT=0;
IF SSCO>.I THEN SSWT=9; ELSE SSWT=0;
IF DECO>.I THEN DKWT=8; ELSE DKWT=0;
IF CPCO>.I THEN CPWT=5; ELSE CPWT=0;
IF ARCO>.I THEN ARWT=5; ELSE ARWT=0;
IF RWCO>.I THEN RWWT=4; ELSE RWWT=0;

SUMWT=SUBWT+SSWT+DKWT+CPWT+ARWT+RWWT;

SUBWT=SUBWT/SUMWT;
SSWT=SSWT/SUMWT;
DKWT=DKWT/SUMWT;
CPWT=CPWT/SUMWT;
ARWT=ARWT/SUMWT;
RWWT=RWWT/SUMWT;

IF SUBCO=9 OR SUBCO=8 OR SUBCO=7 THEN SUBCOM=3;
  ELSE IF SUBCO=6 OR SUBCO=5 THEN SUBCOM=2;
  ELSE IF SUBCO=4 OR SUBCO=3 THEN SUBCOM=1;
  ELSE SUBCOM=0;


IF SSCO=9 OR SSCO=8 OR SSCO=7 THEN SSCOM=3;
  ELSE IF SSCO=6 OR SSCO=5 THEN SSCOM=2;
  ELSE IF SSCO=4 OR SSCO=3 THEN SSCOM=1;
  ELSE SSCOM=0;


IF DECO=9 OR DECO=8 OR DECO=7 THEN DECOM=3;
  ELSE IF DECO=6 OR DECO=5 THEN DECOM=2;
  ELSE IF DECO=4 OR DECO=3 THEN DECOM=1;
  ELSE DECOM=0;
```

```
IF CPCO=9 OR CPCO=8 OR CPCO=7 THEN CPCOM=3;
  ELSE IF CPCO=6 OR CPCO=5 THEN CPCOM=2;
  ELSE IF CPCO=4 OR CPCO=3 THEN CPCOM=1;
  ELSE CPCOM=0;


IF ARCO=9 OR ARCO=8 OR ARCO=7 THEN ARCOM=3;
  ELSE IF ARCO=6 OR ARCO=5 THEN ARCOM=2;
  ELSE IF ARCO=4 OR ARCO=3 THEN ARCOM=1;
  ELSE ARCOM=0;


IF RWCO=9 OR RWCO=8 OR RWCO=7 THEN RWCOM=3;
  ELSE IF RWCO=6 OR RWCO=5 THEN RWCOM=2;
  ELSE IF RWCO=4 OR RWCO=3 THEN RWCOM=1;
  ELSE RWCOM=0;


SSI=ROUND(SUBWT*SUBCOM + SSWT*SSCOM + DKWT*DECOM + CPWT*CPCOM +
       ARWT*ARCOM + RWWT*RWCOM)*3;


/* CALCULATE THE GEOMETRIC SAFETY INDEX */

IF TRASA<=.I THEN TRGR=1;
  ELSE DO;
   D1=INT(TRASA/1000);
   D2=INT((TRASA-(1000*D1))/100);
   D3=INT((TRASA-(1000*D1)-(100*D2))/10);
   D4=INT(TRASA-(1000*D1)-(100*D2)-(10*D3));

    TRGR=(D1+D2+D3+D4)*9/4;
  END;

ROWI=ROUND(ROWI);

IF ROWI>=AWIDTH THEN TRWD=9;
  ELSE TRWD=0;

GSI=ROUND(0.375*DEGE + 0.0475*AR + 0.5475*TRGR + 0.0475*TRWD);

OUTPUT;

END;


/*  DETERMINE THE FREQUENCIES FOR THE ELIGIBLE SET  */

PROC FREQ DATA=QDATA;
    TABLES CPV / OUT=CPVP NOPRINT;
    TABLES W_ADT /OUT=W_ADTP NOPRINT;
    TABLES SR  / OUT=SRP NOPRINT;
    TABLES DSS / OUT=DSSP NOPRINT;
    TABLES SSI / OUT=SSIP NOPRINT;
    TABLES GSI / OUT=GSIP NOPRINT;
    TABLES W_BDL / OUT=BDLP NOPRINT;
    TABLES CPI / OUT=CPIP NOPRINT;
    TABLES SCO / OUT=SCOP NOPRINT;
    TABLES DEGE / OUT=DEGEP NOPRINT;
    TABLES SLC / OUT=SLCP NOPRINT;
    TABLES WA / OUT=WAP NOPRINT;
```

```
   TABLES UCVL / OUT=UCVLP NOPRINT;
   TABLES ESRLI / OUT=ESRLIP NOPRINT;


/* ASSIGN PERCENTILE VALUES TO THE FREQUENCIES      */

DATA CPVP;
   SET CPVP;
   DROP COUNT PERCENT PERCTOT;
   CPVPTL=ROUND(100-PERCTOT);
   PERCTOT + PERCENT;
RETURN;

DATA W_ADTP;
   SET W_ADTP;
   DROP COUNT PERCENT PERCTOT;
   PERCTOT + PERCENT;
   ADTPTL=ROUND(PERCTOT);
RETURN;

DATA SRP;
   SET SRP;
   DROP COUNT PERCENT PERCTOT;
   SRPTL=ROUND(100-PERCTOT);
   PERCTOT + PERCENT;
RETURN;

DATA DSSP;
   SET DSSP;
   DROP COUNT PERCENT PERCTOT;
   DSSPTL=ROUND(100-PERCTOT);
   PERCTOT + PERCENT;
RETURN;

DATA SSIP;
   SET SSIP;
   DROP COUNT PERCENT PERCTOT;
   SSIPTL=ROUND(100-PERCTOT);
   PERCTOT + PERCENT;
RETURN;

DATA GSIP;
   SET GSIP;
   DROP COUNT PERCENT PERCTOT;
   GSIPTL=ROUND(100-PERCTOT);
   PERCTOT + PERCENT;
RETURN;

DATA BDLP;
   SET BDLP;
   DROP COUNT PERCENT PERCTOT;
   BDLPTL=ROUND(PERCTOT);
   PERCTOT + PERCENT;
RETURN;

DATA CPIP;
   SET CPIP;
   DROP COUNT PERCENT PERCTOT;
   CPIPTL=ROUND(100-PERCTOT);
   PERCTOT + PERCENT;
```

```
RETURN;

DATA SCOP;
   SET SCOP;
   DROP COUNT PERCENT PERCTOT;
   SCOPTL=ROUND(100-PERCTOT);
   PERCTOT + PERCENT;
RETURN;

DATA DEGEP;
   SET DEGEP;
   DROP COUNT PERCENT PERCTOT;
   DEGEPTL=ROUND(100-PERCTOT);
   PERCTOT + PERCENT;
RETURN;

DATA UCVLP;
   SET UCVLP;
   DROP COUNT PERCENT PERCTOT;
   UCVLPTL=ROUND(100-PERCTOT);
   IF UCVL<=.Z THEN UCVLPTL=0;
   PERCTOT + PERCENT;
RETURN;

DATA SLCP;
   SET SLCP;
   DROP COUNT PERCENT PERCTOT;
   SLCPTL=ROUND(100-PERCTOT);
   PERCTOT + PERCENT;
RETURN;

DATA WAP;
   SET WAP;
   DROP COUNT PERCENT PERCTOT;
   WAPTL=ROUND(100-PERCTOT);
    IF WA<=.Z THEN WAPTL = 0;
   PERCTOT + PERCENT;
RETURN;

DATA ESRLIP;
   SET ESRLIP;
   DROP COUNT PERCENT PERCTOT;
 ESRLIPTL=ROUND(100-PERCTOT);
   PERCTOT + PERCENT;
RETURN;

/* MERGE THE PERCENTILES FOR EACH OF THE VARIABLES INTO THE WORKING
   DATA SET.                                          */

PROC SORT DATA=QDATA;
   BY CPV;
PROC SORT DATA=CPVP;
   BY CPV;
DATA QDATA;
   MERGE QDATA CPVP;
   BY CPV;

PROC SORT DATA=QDATA;
   BY W_ADT;
PROC SORT DATA=W_ADTP;
```

```
   BY W_ADT;
DATA QDATA;
   MERGE QDATA W_ADTP;
   BY W_ADT;

PROC SORT DATA=QDATA;
   BY SR;
PROC SORT DATA=SRP;
   BY SR;
DATA QDATA;
   MERGE QDATA SRP;
   BY SR;

PROC SORT DATA=QDATA;
   BY DSS;
PROC SORT DATA=DSSP;
   BY DSS;
DATA QDATA;
   MERGE QDATA DSSP;
   BY DSS;

PROC SORT DATA=QDATA;
   BY SSI;
PROC SORT DATA=SSIP;
   BY SSI;
DATA QDATA;
   MERGE QDATA SSIP;
   BY SSI;

PROC SORT DATA=QDATA;
   BY GSI;
PROC SORT DATA=GSIP;
   BY GSI;
DATA QDATA;
   MERGE QDATA GSIP;
   BY GSI;

PROC SORT DATA=QDATA;
   BY W_BDL;
PROC SORT DATA=BDLP;
   BY W_BDL;
DATA QDATA;
   MERGE QDATA BDLP;
   BY W_BDL;

PROC SORT DATA=QDATA;
   BY CPI;
PROC SORT DATA=CPIP;
   BY CPI;
DATA QDATA;
   MERGE QDATA CPIP;
   BY CPI;

PROC SORT DATA=QDATA;
   BY SCO;
PROC SORT DATA=SCOP;
   BY SCO;
DATA QDATA;
   MERGE QDATA SCOP;
   BY SCO;
```

```
PROC SORT DATA=QDATA;
   BY DEGE;
PROC SORT DATA=DEGEP;
   BY DEGE;
DATA QDATA;
   MERGE QDATA DEGEP;
   BY DEGE;

PROC SORT DATA=QDATA;
   BY UCVL;
PROC SORT DATA=UCVLP;
   BY UCVL;
DATA QDATA;
   MERGE QDATA UCVLP;
   BY UCVL;

PROC SORT DATA=QDATA;
   BY SLC;
PROC SORT DATA=SLCP;
   BY SLC;
DATA QDATA;
   MERGE QDATA SLCP;
   BY SLC;

PROC SORT DATA=QDATA;
   BY WA;
PROC SORT DATA=WAP;
   BY WA;
DATA QDATA;
   MERGE QDATA WAP;
   BY WA;

PROC SORT DATA=QDATA;
   BY ESRLI;
PROC SORT DATA=ESRLIP;
   BY ESRLI;
DATA QDATA;
   MERGE QDATA ESRLIP;
   BY ESRLI;


/*  CALCULATE SERVICE INDICES  ESSENTIAL SERVICE, COST-EFFECTIVE
   SERVICE, AND FUNCTIONAL SERVICE.  */

DATA QDATA;
   SET QDATA;
   CRSUME=ADTPTL+BDLPTL;
   CRSUMC=ADTPTL+CPIPTL;
   CRSUMF=SCOPTL+DEGEPTL+UCVLPTL+SLCPTL+WAPTL+ESRLIPTL;
RETURN;

PROC FREQ DATA=QDATA;
   TABLES CRSUME / OUT=ESIP NOPRINT;
   TABLES CRSUMC / OUT=CSIP NOPRINT;
   TABLES CRSUMF / OUT=FSIP NOPRINT;

DATA ESIP;
   SET ESIP;
   KEEP ESI CRSUME;
```

```
   ESI=ROUND(9*(100-PERCTOT)/100,1);
   PERCTOT + PERCENT;
RETURN;

DATA CSIP;
   SET CSIP;
   KEEP CSI CRSUMC;
   CSI=ROUND(9*(100-PERCTOT)/100,1);
   PERCTOT + PERCENT;
RETURN;

DATA FSIP;
   SET FSIP;
   KEEP FSI CRSUMF;
   FSI=ROUND(9*(100-PERCTOT)/100,1);
   PERCTOT + PERCENT;
RETURN;

PROC SORT DATA=ESIP;
   BY CRSUME;
PROC SORT DATA=QDATA;
   BY CRSUME;
DATA QDATA;
   MERGE QDATA ESIP;
   BY CRSUME;

PROC SORT DATA=CSIP;
   BY CRSUMC;
PROC SORT DATA=QDATA;
   BY CRSUMC;
DATA QDATA;
   MERGE QDATA CSIP;
   BY CRSUMC;


PROC SORT DATA=FSIP;
   BY CRSUMF;
PROC SORT DATA=QDATA;
   BY CRSUMF;
DATA QDATA;
   MERGE QDATA FSIP;
   BY CRSUMF;
RETURN;

PROC FREQ DATA=QDATA;
   TABLES ESI / OUT=ESIP2 NOPRINT;

PROC FREQ DATA=QDATA;
   TABLES CSI / OUT=CSIP2 NOPRINT;

PROC FREQ DATA=QDATA;
   TABLES FSI / OUT=FSIP2 NOPRINT;

DATA ESIP2;
   SET ESIP2;
   KEEP ESI ESIPTL;
   ESIPTL=ROUND(100-PERCTOT);
   PERCTOT + PERCENT;
RETURN;
```

```
DATA CSIP2;
   SET CSIP2;
   KEEP CSI CSIPTL;
   CSIPTL=ROUND(100-PERCTOT);
   PERCTOT + PERCENT;
RETURN;

DATA FSIP2;
   SET FSIP2;
   KEEP FSI FSIPTL;
   FSIPTL=ROUND(100-PERCTOT);
   PERCTOT + PERCENT;
RETURN;

PROC SORT DATA=ESIP2;
   BY ESI;
PROC SORT DATA=QDATA;
   BY ESI;
DATA QDATA;
   MERGE QDATA ESIP2;
   BY ESI;

PROC SORT DATA=CSIP2;
   BY CSI;
PROC SORT DATA=QDATA;
   BY CSI;
DATA QDATA;
   MERGE QDATA CSIP2;
   BY CSI;


PROC SORT DATA=FSIP2;
   BY FSI;
PROC SORT DATA=QDATA;
   BY FSI;
DATA QDATA;
   MERGE QDATA FSIP2;
   BY FSI;
RETURN;

/* ROUND THE PERCENTILES TO THE NEAREST TENTH FOR TABULATIONS OF THE
   LESS DISCRETE VARIABLES. */

DATA TEMP;
   SET QDATA;
   CPVPTL=ROUND(CPVPTL,10);
   ADTPTL=ROUND(ADTPTL,10);
   SRPTL=ROUND(SRPTL,10);
   BDLPTL=ROUND(BDLPTL,10);
   CPIPTL=ROUND(CPIPTL,10);
RETURN;

PROC TABULATE DATA=TEMP;
   CLASS CPVPTL ADTPTL SRPTL DSSPTL SSIPTL GSIPTL ESIPTL CSIPTL
            BDLPTL CPIPTL FSIPTL;
   VAR CPV W_ADT SR DSS SSI GSI ESI CSI FSI W_BDL CPI;
   TABLE CPVPTL, CPV*F=COMMA10.*(MAX MIN N PCTN) / RTS=15 CONDENSE;
   TABLE ADTPTL, W_ADT*F=COMMA10.*(MAX MIN N PCTN)/RTS=15 CONDENSE;
   TABLE SRPTL, SR*F=10.*(MAX MIN N PCTN) / RTS=15 CONDENSE;
   TABLE DSSPTL, DSS*F=10.*(MAX MIN N PCTN) / RTS=15 CONDENSE;
```

```
    TABLE SSIPTL, SSI*F=10.*(MAX MIN N PCTN) / RTS=15 CONDENSE;
    TABLE GSIPTL, GSI*F=10.*(MAX MIN N PCTN) / RTS=15 CONDENSE;
    TABLE ESIPTL, ESI*F=10.*(MAX MIN N PCTN) / RTS=15 CONDENSE;
    TABLE FSIPTL, FSI*F=10.*(MAX MIN N PCTN) / RTS=15 CONDENSE;
    TABLE CSIPTL, CSI*F=10.*(MAX MIN N PCTN) / RTS=15 CONDENSE;
    TABLE BDLPTL, W_BDL*F=10.*(MAX MIN N PCTN) / RTS=15 CONDENSE;
    TABLE CPIPTL, CPI*F=COMMA12.*(MAX MIN N PCTN) / RTS=15 CONDENSE;

PROC TABULATE DATA=TEMP;
    CLASS CSI ESI FSI;
    VAR CRSUMC CRSUME CRSUMF;
    TABLE CSI, CRSUMC*F=10.*(MAX MIN N PCTN) / RTS=15 CONDENSE;
    TABLE ESI, CRSUME*F=10.*(MAX MIN N PCTN) / RTS=15 CONDENSE;
    TABLE FSI, CRSUMF*F=10.*(MAX MIN N PCTN) / RTS=15 CONDENSE;



PROC TABULATE DATA=TEMP;
    CLASS BDLPTL ADTPTL CPIPTL;
    VAR ESI CSI;
    TABLE BDLPTL,ADTPTL*ESI*F=9.*MIN / RTS=15 MISSTEXT='NO OCCUR.';
    TABLE CPIPTL,ADTPTL*CSI*F=9.*MIN / RTS=15 MISSTEXT='NO OCCUR.';
    KEYLABEL MIN='0 TO 9';

/* DETERMINE SCORES FOR EACH OF THE BRIDGES BASED ON THE PERCENTILE
    GROUPING OF THE ELIGIBLE SET. FRACTIONAL AWARD OF THE WEIGHTS FOR
    EACH OF THE VARIABLES IS MADE TO EACH BRIDGE'S SCORE, BASED ON THE
    PERCENTILE THAT THAT BRIDGE'S VARIABLE VALUE FALLS INTO.         */

DATA QDATA;
  SET QDATA;

   KEEP TQ TM CFRP CFRH WCPV WADT WSR WDSS WBWC WSSI WGSI WCSI WESI WFSI
       AQCPV AQADT AQSR AQDSS AQBWC AQSSI AQGSI AQCSI AQESI AQFSI
       CPI_EST SCR_EST DSS_EST SR_EST    CPV W_ADT SR DSS BWC SSI GSI
       CSI ESI FSI SCORE AQ DIST COUNTY WT ROWI CPI GROUP CPV_EST
       CONTROL SECTION STRUCT;

  IF BWC=0 THEN SCORE = SCORE + (WBWC*100);
  SCORE = SCORE + WCPV*CPVPTL
          + WADT*ADTPTL
          + WSR *SRPTL
          + WDSS*DSSPTL
          + WSSI*SSIPTL
          + WGSI*GSIPTL
          + WESI*ESIPTL
          + WCSI*CSIPTL
          + WFSI*FSIPTL;
  SCORE=ROUND(SCORE,1);


/* COMPARE BRIDGE DATA TO AUTOMATIC QUALIFYING LEVELS */

   IF (AQCPV > .Z) THEN
    IF (0 <= CPV <= AQCPV) THEN AQ = 'AQ';
   IF (AQADT > .Z) THEN
    IF (W_ADT >= AQADT) THEN AQ = 'AQ';
   IF (AQSR > .Z) THEN
    IF (0 <= SR <= AQSR) THEN AQ = 'AQ';
   IF (AQDSS > .Z) THEN
```

```
    IF (0 <= DSS <= AQDSS) THEN AQ = 'AQ';
   IF (AQBWC > .Z) THEN
    IF (BWC <= AQBWC) THEN AQ = 'AQ';

/*  FLAG THE SCORE AS ESTIMATED IF ANY OF THE CRITERIA USED HAS BEEN
    ESTIMATED OR IS MISSING                                    */

   IF (CPV_EST='*') OR (DSS_EST='*') OR (SR_EST='*') OR (W_ADT<=.Z)
    THEN SCR_EST='*';

/*  COMPARE SCORE TO QUALIFYING AND MARGINAL THRESHOLDS
    AND GROUP THEM IN QUALIFYING, MARGINAL AND NON-QUALIFYING LISTS  */

   IF (SCORE >= TQ) OR (AQ = 'AQ')
    THEN DO;
       GROUP = 'Q';
       END;
   ELSE IF (TQ > SCORE >= TM)
       THEN DO;
          GROUP = 'M';
          END;
      ELSE DO;
         GROUP = 'NQ';
         END;

          /*  OUTPUT THE BRIDGE TO THE DATA SET  */

      /* OF DO LOOP */


RUN;


/*  SORT BRIDGE RECORDS BY COST PER VEHICLE  */

PROC RANK TIES=HIGH DATA=QDATA OUT=RANKED;
 VAR CPV;
 RANKS CPV_RNK;

DATA QDATA2;
 SET RANKED;
 IF (CPV_RNK<=.Z) THEN CPV_RNK=9999;

PROC FORMAT;
 PICTURE CSSPIC 0-HIGH = '9999-99-999';
 PICTURE PC      0-1 = '009%' (MULT=100);
 PICTURE RK     0-9998 = '0009'
           OTHER  = 'NONE';
 PICTURE ACPV   0-HIGH = '0,009'
           LOW-<0 = 'NONE'   (PREFIX='$');
 PICTURE AADT 0-999998 = '000,009'
            OTHER = 'NONE';
 PICTURE ASR     0-100 = '09.9'
           LOW-<0 = 'NONE';
 PICTURE ADSS      0-9 = '9'
           LOW-<0 = 'NONE';
 PICTURE ABWC      0-1 = '9'
            OTHER = 'NONE';
 PICTURE PCPV   0-HIGH = '0000,009'    (PREFIX='<=');
```

```
PICTURE PADT 0-999998 = '00000,009' (PREFIX='>=');
PICTURE PSR   0-100 = '00009.9'  (PREFIX='<=');
PICTURE PDSS    0-9 = '009'      (PREFIX='<=');
PICTURE PBWC  0-HIGH= '009'      (PREFIX='<=');
VALUE $CNTY '001'='ANDERSON' '002'='ANDREWS' '003'='ANGELINA'
      '004'='ARANSAS' '005'='ARCHER' '006'='ARMSTRONG'
      '007'='ATASCOSA' '008'='AUSTIN' '009'='BAILEY'
      '010'='BANDERA' '011'='BASTROP' '012'='BAYLOR' '013'='BEE'
      '014'='BELL' '015'='BEXAR' '016'='BLANCO' '017'='BORDEN'
      '018'='BOSQUE' '019'='BOWIE' '020'='BRAZORIA'
      '021'='BRAZOS' '022'='BREWSTER' '023'='BRISCOE'
      '024'='BROOKS' '025'='BROWN' '026'='BURLESON'
      '027'='BURNET' '028'='CALDWELL' '029'='CALHOUN'
      '030'='CALLAHAN' '031'='CAMERON' '032'='CAMP'
      '033'='CARSON' '034'='CASS' '035'='CASTRO' '036'='CHAMBERS'
      '037'='CHEROKEE' '038'='CHILDRESS' '039'='CLAY'
      '040'='COCHRAN' '041'='COKE' '042'='COLEMAN' '043'='COLLIN'
      '044'='COLLINGSWORTH' '045'='COLORADO' '046'='COMAL'
      '047'='COMANCHE' '048'='CONCHO' '049'='COOKE'
      '050'='CORYELL' '051'='COTTLE' '052'='CRANE'
      '053'='CROCKETT' '054'='CROSBY' '055'='CULBERSON'
      '056'='DALLAM' '057'='DALLAS' '058'='DAWSON'
      '059'='DEAF SMITH' '060'='DELTA' '061'='DENTON'
      '062'='DEWITT' '063'='DICKENS' '064'='DIMMIT'
      '065'='DONLEY' '066'='KENEDY' '067'='DUVAL'
      '068'='EASTLAND' '069'='ECTOR' '070'='EDWARDS'
      '071'='ELLIS' '072'='EL PASO' '073'='ERATH' '074'='FALLS'
      '075'='FANNIN' '076'='FAYETTE' '077'='FISHER' '078'='FLOYD'
      '079'='FOARD' '080'='FORT BEND' '081'='FRANKLIN'
      '082'='FREESTONE' '083'='FRIO' '084'='GAINES'
      '085'='GALVESTON' '086'='GARZA' '087'='GILLESPIE'
      '088'='GLASSCOCK' '089'='GOLIAD' '090'='GONZALES'
      '091'='GRAY' '092'='GRAYSON' '093'='GREGG' '094'='GRIMES'
      '095'='GUADALUPE' '096'='HALE' '097'='HALL'
      '098'='HAMILTON' '099'='HANSFORD' '100'='HARDEMAN'
      '101'='HARDIN' '102'='HARRIS' '103'='HARRISON'
      '104'='HARTLEY' '105'='HASKELL' '106'='HAYS'
      '107'='HEMPHILL' '108'='HENDERSON' '109'='HIDALGO'
      '110'='HILL' '111'='HOCKLEY' '112'='HOOD'
      '113'='HOPKINS' '114'='HOUSTON' '115'='HOWARD'
      '116'='HUDSPETH' '117'='HUNT' '118'='HUTCHINSON'
      '119'='IRION' '120'='JACK' '121'='JACKSON' '122'='JASPER'
      '123'='JEFF DAVIS' '124'='JEFFERSON' '125'='JIM HOGG'
      '126'='JIM WELLS' '127'='JOHNSON' '128'='JONES'
      '129'='KARNES' '130'='KAUFMAN' '131'='KENDALL' '132'='KENT'
      '133'='KERR' '134'='KIMBLE' '135'='KING' '136'='KINNEY'
      '137'='KLEBERG' '138'='KNOX' '139'='LAMAR' '140'='LAMB'
      '141'='LAMPASAS' '142'='LA SALLE' '143'='LAVACA'
      '144'='LEE' '145'='LEON' '146'='LIBERTY' '147'='LIMESTONE'
      '148'='LIPSCOMB' '149'='LIVE OAK' '150'='LLANO'
      '151'='LOVING' '152'='LUBBOCK' '153'='LYNN' '154'='MADISON'
      '155'='MARION' '156'='MARTIN' '157'='MASON'
      '158'='MATAGORDA' '159'='MAVERICK' '160'='MCCULLOCH'
      '161'='MCLENNAN' '162'='MCMULLEN' '163'='MEDINA'
      '164'='MENARD' '165'='MIDLAND' '166'='MILAM' '167'='MILLS'
      '168'='MITCHELL' '169'='MONTAGUE' '170'='MONTGOMERY'
      '171'='MOORE' '172'='MORRIS' '173'='MOTLEY'
      '174'='NACOGDOCHES' '175'='NAVARRO' '176'='NEWTON'
      '177'='NOLAN' '178'='NUECES' '179'='OCHILTREE'
      '180'='OLDHAM' '181'='ORANGE' '182'='PALO PINTO'
```

```
        '183'='PANOLA' '184'='PARKER' '185'='PARMER' '186'='PECOS'
        '187'='POLK' '188'='POTTER' '189'='PRESIDIO' '190'='RAINS'
        '191'='RANDALL' '192'='REAGAN' '193'='REAL'
        '194'='RED RIVER' '195'='REEVES' '196'='REFUGIO'
        '197'='ROBERTS' '198'='ROBERTSON' '199'='ROCKWALL'
        '200'='RUNNELS' '201'='RUSK' '202'='SABINE'
        '203'='SAN AUGUSTINE' '204'='SAN JACINTO'
        '205'='SAN PATRICIO' '206'='SAN SABA' '207'='SCHLEICHER'
        '208'='SCURRY' '209'='SHACKELFORD' '210'='SHELBY'
        '211'='SHERMAN' '212'='SMITH' '213'='SOMERVELL'
        '214'='STARR' '215'='STEPHENS' '216'='STERLING'
        '217'='STONEWALL' '218'='SUTTON' '219'='SWISHER'
        '220'='TARRANT' '221'='TAYLOR' '222'='TERRELL'
        '223'='TERRY' '224'='THROCKMORTON' '225'='TITUS'
        '226'='TOM GREEN' '227'='TRAVIS' '228'='TRINITY'
        '229'='TYLER' '230'='UPSHUR' '231'='UPTON' '232'='UVALDE'
        '233'='VAL VERDE' '234'='VAN ZANDT' '235'='VICTORIA'
        '236'='WALKER' '237'='WALLER' '238'='WARD'
        '239'='WASHINGTON' '240'='WEBB' '241'='WHARTON'
        '242'='WHEELER' '243'='WICHITA' '244'='WILBARGER'
        '245'='WILLACY' '246'='WILLIAMSON' '247'='WILSON'
        '248'='WINKLER' '249'='WISE' '250'='WOOD' '251'='YOAKUM'
        '252'='YOUNG' '253'='ZAPATA' '254'='ZAVALA';

/************************************************************************************************************/
/*  SORT BRIDGES INTO THREE GROUPS:  QUALIFYING, MARGINAL AND       */
/*  NON-QUALIFYING                                     */
/************************************************************************************************************/

DATA QB;
 SET QDATA;
 IF GROUP = 'Q';

PROC SORT DATA=QB;
 BY DESCENDING SCORE DIST;

DATA MB;
 SET QDATA;
 IF GROUP ='M';

PROC SORT DATA=MB;
 BY DESCENDING SCORE DIST;

DATA NQB;
 SET QDATA;
 IF GROUP = 'NQ';
RUN;

PROC SORT DATA=NQB;
 BY DESCENDING SCORE DIST;

/*  PRINT QUALIFYING BRIDGES  */

 TITLE1 'T E X A S   B R I D G E   S O R T E R';
 TITLE2 ' ';
 TITLE3 'VERSION 3.0';
 TITLE4 ' ';
 TITLE5 'QUALIFYING BRIDGE PROJECTS';
 TITLE6 ' ';
 TITLE7 'DATA SET:  BRIDGES ELIGIBLE FOR FEDERAL FUNDING';
```

```
 TITLE8 ' ';

DATA _NULL_;
 SET QB END=EOF; BY DESCENDING SCORE  DIST;
 CPV_SB='<='; ADT_SB='>='; SR_SB='<='; DSS_SB='<='; BWC_SB='<=';
 IF AQCPV<=.Z THEN CPV_SB=' ';
 IF AQADT>=999999 THEN ADT_SB=' ';
 IF AQSR<=.Z THEN SR_SB=' ';
 IF AQDSS<=.Z THEN DSS_SB=' ';
 IF AQBWC<=.Z THEN BWC_SB=' ';
 RD4 = REPEAT('-',3);
 RD5 = REPEAT('-',4);
 RD6 = REPEAT('-',5);
 RD7 = REPEAT('-',6);
 RD9 = REPEAT('-',8);
 RD49 = REPEAT('-',48);
 RD131 = REPEAT('-',130);
 ATCOST + CPI;
 FILE PRINT HEADER=H LINESLEFT=L;
 IF L=3 THEN PUT _PAGE_@;
 PUT @3 DIST 2. @8 COUNTY $CNTY. @24 CONTROL $4. @28 '-' @29 SECTION $2.
   @31 '-' @32 STRUCT 3. @38 WT $2.
   @43 CPV_RNK RK. CPV_EST $1. @49 SCORE 3. SCR_EST $1. @54 AQ $2.
   @58 CSI 1. @59 '/' @60 FSI 1. @61 '/'
   @62 CPV : DOLLAR7. CPV_EST $1. @71 ESI 1. @72 '/'
   @73 W_ADT : COMMA9. @80 SR 5.1
   SR_EST $1. @88 SSI 1. @89 '/' @90 DSS 1. DSS_EST $1. @95 GSI 1.
   @96 '/' @97 BWC 1. @101 ROWI 5.1
   @108 CPI DOLLAR10. CPI_EST $1. @121 ATCOST DOLLAR12.;
 RETURN;
 H:PUT / @2 RD49 @54 'CRITERIA USED FOR SCREENING' @84 RD49
     / @5 'QUALIFYING:' @22 'SCORE >= ' @30 TQ 3.
      @106 'REHAB   COST = ' CFRH DOLLAR3. '/SQ FT'
     / @5 'MARGINAL:' @14 TM 3. @19 '<= SCORE <' @30 TQ 3.
      @106 'REPLACE COST = ' CFRP DOLLAR3. '/SQ FT'
     / @55 'CSI/FSI/CPV  ESI/ADT   SR   SSI/DSS  GSI/BWC'
     / @55 RD5 @60 RD6 @67 RD9 @77 RD6 @84 RD9 @94 RD9
     / @31 'WEIGHTS:' @54 WCSI PC. @58 '/' @59 WFSI:PC. @62 '/'
      @63 WCPV : PC.
      @67 WESI PC. @71 '/' @72 WADT : PC. @78 WSR PC.
      @84 WSSI PC. @88 '/' @89 WDSS : PC. @94 WGSI PC.
      @98 '/'     @99 WBWC : PC. @106 '* = ESTIMATED'
     / @31 'AUTO. QUALIFYING LEVELS:' @58 AQCSI 1. @59 '/'
      @60 AQFSI 1. @61 '/' @62 AQCPV : DOLLAR4.
      @70 AQESI 1. @71 '/' @72 AQADT  : COMMA5.
      @79 AQSR 2. @87 AQSSI 1. @88 '/' @89 AQDSS 1.
      @97 AQGSI 1. @98 '/' @99 AQBWC 1.
      @106 'M = MISSING'
     / @31 'PASSING LEVELS ARE NOT NECESSARY IN TEBS VERSION 3.0'
     / @2 RD131
     / @60 'CSI/'
     / @37 'TYPE' @43 'CPV' @60 'FSI/' @72 'ESI/' @88 'SSI/' @95 'GSI/'
      @102 'RDWY' @112 'PROJECT'
      @121 'ACCUMULATIVE'
     / @2 'DIST' @8 'COUNTY' @23 'CONT-SEC-STR' @37 'WORK'
      @43 'RANK' @50 'SCORE' @60 'CPV' @72 'ADT' @82 'SR'
      @88 'DSS' @95 'BWC' @102 'WIDTH' @114 'COST'
      @121 'PROJECT COST' //;
 RETURN;
 RUN;
```

```
/* PRINT MARGINAL BRIDGES */

 TITLE1 'T E X A S   B R I D G E   S O R T E R';
 TITLE2 ' ';
 TITLE3 'VERSION 3.0';
 TITLE4 ' ';
 TITLE5 'MARGINAL BRIDGE PROJECTS';
 TITLE6 ' ';
 TITLE7 'DATA SET:  BRIDGES ELIGIBLE FOR FEDERAL FUNDING';
 TITLE8 ' ';

DATA _NULL_;
 SET MB END=EOF; BY DESCENDING SCORE   DIST;
 CPV_SB='<='; ADT_SB='>='; SR_SB='<='; DSS_SB='<='; BWC_SB='<=';
 IF AQCPV<=.Z THEN CPV_SB=' ';
 IF AQADT>=999999 THEN ADT_SB=' ';
 IF AQSR<=.Z THEN SR_SB=' ';
 IF AQDSS<=.Z THEN DSS_SB=' ';
 IF AQBWC<=.Z THEN BWC_SB=' ';
 RD4 = REPEAT('-',3);
 RD5 = REPEAT('-',4);
 RD6 = REPEAT('-',5);
 RD7 = REPEAT('-',6);
 RD9 = REPEAT('-',8);
 RD49 = REPEAT('-',48);
 RD131 = REPEAT('-',130);
 ATCOST + CPI;
 FILE PRINT HEADER=H LINESLEFT=L;
 IF L=3 THEN PUT _PAGE_@;
 PUT @3 DIST 2. @8 COUNTY $CNTY. @24 CONTROL $4. @28 '-' @29 SECTION $2.
   @31 '-' @32 STRUCT 3. @38 WT $2.
   @43 CPV_RNK RK. CPV_EST $1. @49 SCORE 3. SCR_EST $1. @54 AQ $2.
   @58 CSI 1. @59 '/' @60 FSI 1. @61 '/'
   @62 CPV : DOLLAR7. CPV_EST $1. @71 ESI 1. @72 '/'
   @73 W_ADT : COMMA9. @80 SR 5.1
   SR_EST $1. @88 SSI 1. @89 '/' @90 DSS 1. DSS_EST $1 @95 GSI 1.
   @96 '/' @97 BWC 1. @101 ROWI 5.1
   @108 CPI DOLLAR10. CPI_EST $1. @121 ATCOST DOLLAR12.;
 RETURN;
 H:PUT / @2 RD49 @54 'CRITERIA USED FOR SCREENING' @84 RD49
     / @5 'QUALIFYING:' @22 'SCORE >= ' @30 TQ 3.
      @106 'REHAB   COST = ' CFRH DOLLAR3. '/SQ FT'
     / @5 'MARGINAL:' @14 TM 3. @19 '<= SCORE <' @30 TQ 3.
      @106 'REPLACE COST = ' CFRP DOLLAR3. '/SQ FT'
     / @55 'CSI/FSI/CPV  ESI/ADT    SR    SSI/DSS   GSI/BWC'
     / @55 RD5 @60 RD6    @67 RD9   @77 RD6  @84 RD9   @94 RD9
     / @31 'WEIGHTS:' @54 WCSI PC. @58 '/' @59 WFSI:PC. @62 '/'
      @63 WCPV : PC.
      @67 WESI PC. @71 '/' @72 WADT : PC. @78 WSR PC.
      @84 WSSI PC. @88 '/' @89 WDSS : PC. @94 WGSI PC. @98 '/'
      @99 WBWC : PC. @106 '* = ESTIMATED'
     / @31 'AUTO. QUALIFYING LEVELS:'  @58 AQCSI 1. @59 '/'
      @60 AQFSI 1. @61 '/' @62 AQCPV : DOLLAR4.
      @70 AQESI 1. @71 '/' @72 AQADT : COMMA5.
      @79 AQSR 2. @87 AQSSI 1. @88 '/' @89 AQDSS 1.
      @97 AQGSI 1. @98 '/' @99 AQBWC 1.
      @106 'M = MISSING'
     / @31 'PASSING LEVELS ARE NOT NECESSARY IN TEBS VERSION 3.0'
     / @2 RD131
```

```
      / @60 'CSI/'
      / @37 'TYPE' @43 'CPV' @60 'FSI/' @72 'ESI/' @88 'SSI/' @95 'GSI/'
        @102 'RDWY' @112 'PROJECT'
        @121 'ACCUMULATIVE'
      / @2 'DIST' @8 'COUNTY' @23 'CONT-SEC-STR' @37 'WORK'
        @43 'RANK' @50 'SCORE' @60 'CPV' @72 'ADT' @82 'SR'
        @88 'DSS' @95 'BWC' @102 'WIDTH' @114 'COST'
        @121 'PROJECT COST' //;
  RETURN;
  RUN;


/*  PRINT NON-QUALIFYING BRIDGES   */

  TITLE1 'T E X A S   B R I D G E   S O R T E R';
  TITLE2 ' ';
  TITLE3 'VERSION 3.0';
  TITLE4 ' ';
  TITLE5 'NON-QUALIFYING BRIDGE PROJECTS';
  TITLE6 ' ';
  TITLE7 'DATA SET:  BRIDGES ELIGIBLE FOR FEDERAL FUNDING';
  TITLE8 ' ';

DATA _NULL_;
  SET NQB END=EOF;  BY DESCENDING SCORE   DIST;
  CPV_SB='<=';  ADT_SB='>=';  SR_SB='<=';  DSS_SB='<=';  BWC_SB='<=';
  IF AQCPV<=.Z THEN CPV_SB='  ';
  IF AQADT>=999999 THEN ADT_SB='  ';
  IF AQSR<=.Z THEN SR_SB='  ';
  IF AQDSS<=.Z THEN DSS_SB='  ';
  IF AQBWC<=.Z THEN BWC_SB='  ';
  RD4 = REPEAT('-',3);
  RD5 = REPEAT('-',4);
  RD6 = REPEAT('-',5);
  RD7 = REPEAT('-',6);
  RD9 = REPEAT('-',8);
  RD49 = REPEAT('-',48);
  RD131 = REPEAT('-',130);
  ATCOST + CPI;
  FILE PRINT HEADER=H LINESLEFT=L;
  IF L=3 THEN PUT _PAGE_@;
  PUT @3 DIST 2. @8 COUNTY $CNTY. @24 CONTROL $4. @28 '-' @29 SECTION $2.
     @31 '-' @32 STRUCT 3. @38 WT $2.
     @43 CPV_RNK RK. CPV_EST $1. @49 SCORE 3. SCR_EST $1. @54 AQ $2.
     @58 CSI 1. @59 '/' @60 FSI 1. @61 '/'
     @62 CPV : DOLLAR7. CPV_EST $1. @71 ESI 1. @72 '/'
     @73 W_ADT : COMMA9. @80 SR 5.1
     SR_EST $1. @88 SSI 1. @89 '/' @90 DSS 1. DSS_EST $1. @95 GSI 1.
     @96 '/' @97 BWC 1. @101 ROWI 5.1
     @108 CPI DOLLAR10. CPI_EST $1. @121 ATCOST DOLLAR12.;
  RETURN;
  H:PUT / @2 RD49 @54 'CRITERIA USED FOR SCREENING' @84 RD49
      / @5 'QUALIFYING:' @22 'SCORE >= ' @30 TQ 3.
        @106 'REHAB   COST = ' CFRH DOLLAR3. '/SQ FT'
      / @5 'MARGINAL:' @14 TM 3. @19 '<= SCORE <' @30 TQ 3.
        @106 'REPLACE COST = ' CFRP DOLLAR3. '/SQ FT'
      / @55 'CSI/FSI/CPV  ESI/ADT    SR    SSI/DSS   GSI/BWC'
      / @55 RD5 @60 RD6    @67 RD9   @77 RD6  @84 RD9   @94 RD9
      / @31 'WEIGHTS:' @54 WCSI PC. @58 '/' @59 WFSI:PC. @62 '/'
        @63 WCPV : PC.
```

```
        @67 WESI PC. @71 '/' @72 WADT : PC. @78 WSR PC.
        @84 WSSI PC. @88 '/' @89 WDSS : PC. @94 WGSI PC.
        @98 '/' @99 WBWC : PC. @106 '* = ESTIMATED'
      / @31 'AUTO. QUALIFYING LEVELS:'  @58 AQCSI 1. @59 '/'
        @60 AQFSI 1. @61 '/' @62 AQCPV : DOLLAR4.
        @70 AQESI 1. @71 '/' @72 AQADT : COMMA5.
        @79 AQSR 2. @87 AQSSI 1. @88 '/' @89 AQDSS 1.
        @97 AQGSI 1. @98 '/' @99 AQBWC 1.
        @106 'M = MISSING'
      / @31 'PASSING LEVELS ARE NOT NECESSARY IN TEBS VERSION 3.0'
      / @2 RD131
      / @60 'CSI/'
      / @37 'TYPE' @43 'CPV' @60 'FSI/' @72 'ESI/' @88 'SSI/' @95 'GSI/'
        @101 'RDWY' @112 'PROJECT'
        @121 'ACCUMULATIVE'
      / @2 'DIST' @8 'COUNTY' @23 'CONT-SEC-STR' @37 'WORK'
        @43 'RANK' @50 'SCORE' @60 'CPV' @72 'ADT' @82 'SR'
        @88 'DSS' @95 'BWC' @101 'WIDTH' @114 'COST'
        @121 'PROJECT COST' //;
  RETURN;
  RUN;
/*********************************************END OF TEBS3 PROGRAM LISTING*********************************************/
```

```
/********************************************************TEBS2IC INPUT FILE********************************************************/
25 35                              /*COSTS FOR ESTIMATING*/
0.10 0.10 0.25 0.35 0.20           /*ATTRIBUTE WEIGHTS*/
N N N 2 N                  /*AUTOMATIC QUALIFYING LEVELS**/
75 65                              /*THRESHOLDS*/
/**************************************************END OF TEBS2IC INPUT FILE**************************************************/
```

```
/********************************************************TEBS3IC INPUT FILE********************************************************/
25 35                                        /*COSTS FOR ESTIMATING*/
0.20 0.20 0.20 0.20 0.20 0.00 0.00 0.00 0.00 0.00  /*ATTRIBUTE WEIGHTS*/
N N N 2 N N N N N N                /*AUTOMATIC QUALIFYING LEVELS**/
75 65                                        /*THRESHOLDS*/
/**************************************************END OF TEBS3IC INPUT FILE**************************************************/
```

APPENDIX B. BRIDGE INVENTORY, INSPECTION, AND APPRAISAL PROGRAM CODING INFORMATION

Rev. 10-85

APPRAISAL RATING FOR STRUCTURAL CONDITION

(Item 67)

RATING	DESCRIPTION	ADT ≥ 400	ADT < 400
9	Structural condition exceeds presents desirable criteria	IR > H2O	IR > H2O
8	Structural condition equals present desirable criteria	IR = H2O	IR = H2O
7	Structural condition exceeds present minimum criteria	N/A	H20 > IR > H15
6	Structural condition equals presents minimum criteria	N/A	IR = H15
5	Structural condition is somewhat better than minimum tolerable limit	H2O > IR > H15	H15 > IR > H10
4	Structural condition meets minimum tolerable limit	IR = H15	IR = H10
3	Intolerable condition requiring high priority of repair	H15 > IR ≥ H3	H10 > IR ≥ H3
2	Intolerable condition requiring high priority of replacement		
1	Immediate repair necessary to keep the bridge in service	H3 > IR	H3 > IR
0	Immediate replacement necessary to keep the bridge in service		

IR = Inventory Rating
ADT = Average Daily Traffic (vehicles per day)

PLATE III-5

APPRAISAL RATING FOR BRIDGE ROADWAY WIDTHS

(Item 68)

A. CONTROLLED ACCESS HIGHWAY MAIN LANES

FACILITY	LEFT CLEAR.	LANES	RIGHT CLEAR.	PRES. DESR. (8)	PRES. MIN. (6)	MIN. ADEQ. (5)	MIN. TOL. (4)
2-Lane,	4'	24'	10'	38'			
1-Way	4	24	10		38'		
	3	24	6			33'	
	2	24	4				30'
3-Lane,	4	36	10	50			
1-Way	4	36	10		50		
Depressed	3	36	6			45	
Median	2	36	4				42
3-Lane,	10	36	10	56			
1-Way	10	36	10		56		
Flush or	8	36	8			52	
Raised	4	36	4				44
Median							
4-Lane,	10	N × 12'	10	12N + 20'			
or More,	10	N × 12'	10		12N + 20'		
1-Way	8	N × 12'	8			12N + 16'	
	4	N × 12'	4				12N + 8'

NOTES:

PRES. DESR.	= Present Desirable	(Appraisal Rating of 8)
PRES. MIN.	= Present Minimum	(Appraisal Rating of 6)
MIN. ADEQ.	= Minimum Adequate	(Appraisal Rating of 5)
MIN. TOL.	= Minimum Tolerable	(Appraisal Rating of 4)
N	= Number of Lanes	

B. RAMPS, DIRECT CONNECTIONS, ONE-WAY FRONTAGE ROADS, AND BUSWAYS

FACILITY	LEFT CLEAR.	LANES	RIGHT CLEAR.	PRES. DESR. (8)	PRES. MIN. (6)	MIN. ADEQ. (5)	MIN. TOL. (4)
1-Way	4'	N × 12'	4'	12N + 8'			
Frontage	2	N × 12'	2		12N + 4'		
Roads	1	N × 11'	1			11N + 2'	
	1	N × 10'	1				10N + 2'
1-Lane	4	14	8	26'			
Direct	4	14	8		26'		
Connection	3	14	6			23'	
	2	14	4				20'
2-Lane	4	24	8	36			
Direct	4	24	8		36		
Connection	3	24	6			33	
	2	24	4				30
Ramps	4	14	8	26			
	4	14	6		24		
	3	14	4			21	
	2	14	3				19
Busways	10	13	10	33			
	8	12	8		28		
	6	12	6			24	
	4	12	4				20

PLATE III-6 (cont.)

C. MULTILANE[1] FACILITIES WITHOUT ACCESS CONTROL

FACILITY	LEFT CLEAR.	LANES	RIGHT CLEAR.	PRES. DESR. (8)	PRES. MIN. (6)	MIN. ADEQ. (5)	MIN. TOL. (4)
2-Way Traffic	10'	N × 12'	10'	12N + 20'			
On 1 Bridge	8	N × 12'	8		12N + 16'		
ADT ≤ 7500	6	N × 12'	6			12N + 12'	
	4	N × 12'	4				12N + 8'
2-Way Traffic	10	N × 12' + 16'	10	12N + 36'			
On 1 Bridge	8	N × 12' + 4'	8		12N + 20'		
ADT ≥ 7500	6	N × 12' + 4'	6			12N + 16'	
	4	N × 12' + 4'	4				12N + 12'
2-Way Traffic	4	N × 12'	10	12N + 14'			
on Divided	4	N × 12'	8		12N + 12'		
Facility[2]	3	N × 12'	6			12N + 9'	
	2	N × 12'	4				12N + 6'
Urban Streets	2	N × 12'	2	12N + 4'			
(Multi-lane	2	N × 11'	2		11N + 4'		
Curbed Road-	1	N × 11'	1			11N + 2'	
way)[3,4]	1	N × 10'	1				10N + 2'

1. Multi-lane refers to roadways with three or more lanes of traffic.

2. On facilities with four or more lanes, when the two directions of traffic are carried on separate bridges or on one bridge with a median barrier, each direction is considered as a separate roadway and the bridge roadway width is measured from the face of the inside barrier (median barrier or bridge rail) to the face of the outside barrier (bridge rail or curb).

3. If the approach roadway provides parking lanes, sidewalks or a median, the present minimum criterion is to maintain the same curbed cross-section across the bridge. If the bridge is narrower than the approach roadway including existing parking lanes, sidewalks and median, then the minimum tolerable criterion is to provide a gradual curbed or delineated transition to the reduced cross-section.

4. Uncurbed, multi-lane urban streets should be evaluated using the appropriate multi-lane category above. Uncurbed, one-way urban streets should be evaluated as for two-way traffic on a divided facility.

D. TWO-LANE, TWO-WAY FACILITIES (PRIMARY AND SECONDARY HIGHWAYS, CITY STREETS, COUNTY ROADS AND FRONTAGE ROADS)

FACILITY	LEFT CLEAR.	LANES	RIGHT CLEAR.	PRES. DESR. (8)	PRES. MIN. (6)	MIN. ADEQ. (5)	MIN. TOL. (4)
0-250	4'	22'	4'	30'			
ADT	4	20	4		28'		
	2	18	2			22'	
	1	18	1				20'
250-400	4	24	4	32			
ADT	4	22	4		30		
	2	20	2			24	
	1	20	1				22
400-750	6	24	6	36			
ADT	6	22	6		34		
	4	22	4			30	
	2	20	2				24
750+2200	8	24	8	40			
ADT	4	24	4		32		
	4	22	4			30	
	2	22	2				26
2200+	10	24	10	44			
ADT	8	24	8		40		
	6	22	6			34	
	4	22	4				30

PLATE III-6 (cont.)

APPRAISAL RATING FOR VERTICAL CLEARANCES

(Item 68 and 69)

FACILITY	PRES. DESR. (8)	PRES. MIN. (6)	MIN. ADEQ. (5)	MIN. TOL. (4)
Interstate Highway and Other Freeway Main Lanes	16'-6"	16'-6"	15'-6"	14'-6"
Other Systems	16'-6"	16'-6"	15'-0"	14'-6"
Pedestrian and Utility	17'-6"	17'-6"	16'-6"	15'-6"
Railroad Overpasses	23'-0"	23'-0"	22'-6"	22'-6"

NOTES:

PRES. DESR. = Present Desirable (Appraisal Rating of 8)

PRES. MIN. = Present Minimum (Appraisal Rating of 6)

MIN. ADEQ. = Minimum Adequate (Appraisal Rating of 5)

MIN. TOL. = Minimum Tolerable (Appraisal Rating of 4)

APPRAISAL RATING FOR UNDERPASS LATERAL CLEARANCE

(ITEM 69)

FACILITY	PRES. DESR. (8)	PRES. MIN. (6)	MIN. ADEQ. (5)	MIN. TOL. (4)
A. INTERSTATE HIGHWAY AND OTHER FREEWAYS (Passing Underneath)				
RURAL				
Left Clearance	30'	30'	8' *	6' *
Right Clearance	30	30	16	12 *
URBAN				
Left Clearance	30	30	16	4
Right Clearance	30	30	12	10
URBAN FRONTAGE ROADS	15	15	10	6
B. PRIMARY AND SECONDARY HIGHWAYS (Passing Underneath)				
Left or Right Clearance				
ADT Less than 750	16'	16'	12'	7'
ADT 750 - 1500	30	30	16	7
ADT More than 1500	30	30	16	7
C. FM, RM, RECREATION AND RURAL FRONTAGE ROADS (Passing Underneath)				
Left or Right Clearance				
ADT Less than 750	7'	7'	4'	2'
ADT 750 - 1500	16	16	7	4
ADT More than 1500	30	30	16	7
D. RAILROAD PASSING UNDERNEATH				
Left or Right Clearance (As measured from centerline of railroad track to face of pier)	25'	25'	12' **	8'-5" **

NOTES: * Guard fence required when clearance on divided highway is less than 16'.

** Crash walls are also required for clearances less than 25'.

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APPRAISAL RATING FOR SAFE LOAD CAPACITY

(Item 70)

RATING	DESCRIPTION	LOAD CAPACITY
9	Safe load capacity is greater than present desirable criteria	IR ≥ H20
8	Safe load capacity is equal to present desirable criteria	IR = H20
7	Safe load capacity is somewhat greater than present minimum criteria	H20 > IR > H15 (1)
6	Safe load capacity is equal to present minimum criteria	IR = H15 (1)
5	Safe load capacity is somewhat greater than minimum tolerable criteria	H15 > IR > H10 (1)
4	Safe load capacity meets present minimum tolerable criteria	AL ≥ 15,000 (2)
3	Safe load capacity is less than minimum tolerable criteria. High priority for repair or reconstruction is recommended	15,000 > AL ≥ 5,000 (2)
2	Safe load capacity is less than minimum tolerable criteria. High priority for replacement is recommended	
1	Bridge should be closed to traffic. Repair or reconstruction is recommended to reopen the bridge to traffic	AL < 5,000 (3)
0	Bridge should be closed to traffic. Replacement of the bridge is recommended	

IR = Inventory Rating
AL = Posted Load Restriction, Single or Tandem Axle Load (lbs.)

1. If the operating rating is less than H20 or if the bridge is posted for load restriction, the appraisal rating shall be "4" or less as indicated in the table.
2. If the operating rating is less than H20, the bridge should be posted for load restriction. The recommendation for load posting is based on the National Bridge Inspection Standards as established by Title 23, United States Code (23 USC § 650.303c). See Plate III-13 for calculation of posting loads if the bridge should have a posted load restriction but does not currently have one.
3. The recommendation for bridge closing is based on the AASHTO Manual for Maintenance Inspection of Bridges, Article 4.7.2.

APPRAISAL RATING
FOR
WATERWAY ADEQUACY

(Item 71)

FACILITY	DESIGN FREQUENCY OR FREQUENCY OF OVER-FLOODING (IN YEARS) PRES. DESR. (8)	PRES. MIN. (6)	MIN. ADEQ. (5)	MIN. TOL. (4)
Controlled Access Highway Main Lanes	50	50	30	20
Other Highways and Frontage Roads	50	50	30	10

NOTES:

PRES. DESR. = Present Desirable (Appraisal Rating of 8)

PRES. MIN. = Present Minimum (Appraisal Rating of 6)

MIN. ADEQ. = Minimum Adequate (Appraisal Rating of 5)

MIN. TOL. = Minimum Tolerable (Appraisal Rating of 4)

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APPRAISAL RATING FOR APPROACH ROADWAY ALIGNMENT

(Item 72)

FACILITY	ADVISORY SPEED LIMIT (MPH)*			
	PRES. DESR. (8)	PRES. MIN. (6)	MIN. ADEQ. (5)	MIN. TOL. (4)
Primary Highways (IH, US & SH Routes)	70	55	50	45
Secondary Highways (FM, RM, RR & Other On-System Routes)	65	50	45	40
Other Paved Roads - High Speed (Posted Speed Limit ≥ 45 MPH)	55	45	40	35
Other Paved Roads - Low Speed (Posted Speed Limit ≤ 40 MPH)	45	40	35	30
Unpaved Roads	40	35	30	25

NOTES:

PRES. DESR. = Present Desirable (Appraisal Rating of 8)

PRES. MIN. = Present Minumum (Appraisal Rating of 6)

MIN. ADEQ. = Minimum Adequate (Appraisal Rating of 5)

MIN. TOL. = Minimum Tolerable (Appraisal Rating of 4)

* The advisory speed limit may be assumed to equal the posted advisory speed if one exists. Otherwise, determine as discussed in Section 3.206.

Item 43.1—Structure Type, Main Spans Field Length = 4

Coding for this Item is derived from the following Tables. For those cases where a bridge structure has been widened, the type describing the original structure is coded. If not applicable, as for a culvert, tunnel or ferry, all four digits are left blank.

1st digit—SPAN TYPE

1 Simple Span
2 Continuous
3 Cantilever
4 Cantilever with Suspended Span
5 Arch
6 Rigid Frame
7 Movable
8 Suspension or Stayed
9 Other

2nd digit—ROADWAY TYPE

1 Deck
2 Through
3 Part Through
*4 Combination 1 & 2
*5 Combination 1 & 3
*6 Combination 2 & 3
*7 Combination 1,2 & 3
*9 Other

*Not normally applicable to Span Type 1

3rd & 4th digits—MAIN MEMBER TYPE

01 Weathering Steel (WS) I-Beam
02 WS Plate Girder—Multiple
03 WS Plate Girder, Var. Depth—Multiple
04 WS Plate Girder with Floor System
05 WS Box Girder—Multiple
06 WS Box Girder—Single or Spread
08 WS Orthotropic Plate Girder
09 WS Other

11 Steel I-Beam
12 Plate Girder—Multiple
13 Plate Girder, Var. Depth—Multiple
14 Plate Girder with Floor System
15 Steel Box Girder—Multiple
16 Steel Box Girder—Single or Spread
18 Steel Orthotropic Plate Girder
19 Other Steel

21 Concrete Girder—Tee Beam
22 Concrete Girder, Var. Depth—Tee Beam
23 Concrete Box Girder—Multiple
24 Concrete Box Girder—Single or Spread
25 Concrete Slab & Girder—Pan Formed
26 Concrete Slab, Flat
27 Concrete Slab—Variable Depth
28 Concrete Arch, Open Spandrel
29 Other Concrete

31 PS Concrete Girder—Multiple
32 PS Concrete Girder with Floor System
33 PS Concrete Box Girder—Multiple
34 PS Concrete Box Girder—Single or Spread
35 PS Concrete Slab & Girder—Pan Formed
36 PS Concrete Slab—Full Depth
37 PS Concrete Slab—Partial Depth
39 Other Prestressed Concrete

41 Timber Stringers—Multiple
42 Timber Girder with Floor System
43 Timber Truss
49 Other Timber

51 Metal Arch
52 Other Metal
53 Masonry Arch
54 Movable, Vertical Lift
55 Movable, Bascule
56 Movable, Horizontal Swing
57 Movable, Other
59 Other Than Metal Truss or Other Metal

61 Pratt Truss, Parallel Chord
62 Pratt Truss, Half-Hip, Parallel Chord
63 Warren Truss, Parallel Chord
64 Warren Quadrangular Truss, Parallel Chord
65 Baltimore Truss, Parallel Chord
66 K Truss, Parallel Chord
67 Whipple Truss, Parallel Chord
68 Bedstead Truss, Parallel Chord
71 Parker Truss, Polygonal Top Chord
72 Camelback Truss, Polygonal Top Chord
73 Pennsylvania Truss, Polygonal Top Chord
74 K Truss, Polygonal Top Chord
75 Warren Truss, Polygonal Top Chord
76 Bowstring Truss, Polygonal Top Chord
77 Lenticular Truss, Polygonal Top Chord
78 Whipple Truss, Polygonal Top Chord
79 Pegram Truss, Polygonal Top Chord
81 Howe Truss, Parallel Chord
82 Post Truss, Parallel Chord
83 King Post or Waddell "A" Truss
84 Queen Post Truss, Parallel Chord
85 Bollman Truss, Parallel Chord
86 Fink Truss, Parallel Chord
87 Fink-Stearns Truss, Parallel Chord
88 Kellog Truss, Parallel Chord
89 Pratt-Greiner Truss, Parallel Chord
91 Continuous Truss
92 Wichert Continuous Truss
93 Vierendeel Truss
97 Other Truss, Parallel Chord
98 Other Truss, Polygonal Top Chord

Item 66—Inventory Rating Field Length = 3

This Item contains the Inventory Rating referred to in Section 4.1 of the AASHTO Manual and discussed in Section 3.401 of this Manual. The first digit indicates the type of loading as follows:

1 H Truck
2 HS Truck
3 Alternate Interstate Loading
4 Gross or Other Loading
5 Load Restricted to Tandem Axle
6 Load Restricted to Single or Tandem Axle*
7 Railroad Loading
8 Pedestrian or Special Loading (but bridge not load restricted)
9 Load Restricted to Gross Load

*Should be code 5 if load restriction is greater than 20,000 lb.

If a bridge is load restricted, codes 5, 6 or 9 govern over codes 1, 2, 3 or 4. Code 9 governs over codes 5 or 6 where a bridge has both axle and gross load restrictions. For codes 1, 2, 3, 4 and 9 the second and third digits give the gross loading in tons. For codes 5 and 6 the second and third digits give the single or tandem axle loading in tons. For railroad loading, the second and third digits will give Cooper Class or equivalent. Where the railroad loading is unknown, no attempt is made to calculate the loading and this Item is coded 700. Pedestrian and other special loadings are coded 800.

For a bridge shored up or repaired on a temporary basis both the inventory and operating ratings are coded as if the temporary repairs or shoring were not in place. Where the load calculates out to a fraction of a ton, the figure is rounded downward to the next whole ton.

Examples:	**Rating**	**Code**
	H5.6	105
	H10	110
	H15	115
	H20.5	120
	HS15(H15-S12)	227
	HS20(H20-S16)	236
	HS27(H27-S22)	249
	28,000 LB Tandem Axle	514
	15,000 LB Axle or Tandem	607
	Cooper E60 Railroad Load	760
	Unknown Railroad Load	700
	Pedestrian Loading	700
	58,420 LB Gross	929

Item 67—Appraisal of Structural Condition Field Length = 1
Item 68—Appraisal of Roadway Geometry Field Length = 1
Item 69—Appraisal of Vertical and Lateral Underclearance Field Length = 1
Item 70—Appraisal of Safe Load Capacity Field Length = 1

APPENDIX C. TEBS3 OUTPUT

T E X A S B R I D G E S O R T E R

VERSION 3.0

QUALIFYING BRIDGE PROJECTS

DATA SET: BRIDGES ELIGIBLE FOR FEDERAL FUNDING

CRITERIA USED FOR SCREENING

QUALIFYING: SCORE >= 75
MARGINAL: 65 <= SCORE < 75

REHAB COST = $25/SQ FT
REPLACE COST = $35/SQ FT

	CSI/FSI/CPV	ESI/ADT	SR	SSI/DSS	GSI/BWC
WEIGHTS:	0%/0% /20%	0%/20%	20%	0%/20%	0%/20%
AUTO. QUALIFYING LEVELS:	N/N/N	N/N	N	N/2	N/N

PASSING LEVELS ARE NOT NECESSARY IN TEDS VERSION 3.0

* = ESTIMATED
M = MISSING

DIST	COUNTY	CONT-SEC-STR	TYPE WORK	CPV RANK	SCORE	CSI/ FSI/ CPV	ESI/ ADT	SR	SSI/ DSS	GSI/ BWC	RDWY WIDTH	PROJECT COST	ACCUMULATIVE PROJECT COST
18	COLLIN	AA01-11-003	RP	N/A	99*	0/7/$1	1/17,585	8.0*	6/3	7/0	19.0	$20,000	$20,000
1	RED RIVER	AA01-32-002	RP	N/A	97* AQ	0/0/$24	2/507	9.0*	6/2	1/0	12.0	$12,000	$32,000
9	MCLENNAN	A053-11-001	RP	N/A	97*	2/3/$27	4/1,120	13.0*	6/3	1/0	22.0	$30,000	$62,000
12	HARRIS	AA22-31-001	RP	N/A	97*	5/4/$47	3/3,100	12.0*	6/3	2/0	22.0	$147,000	$209,000
12	HARRIS	AA49-55-002	RP	N/A	97*	2/1/$12	5/2,392	17.0*	6/3	1/0	20.0	$34,000	$243,000
18	ELLIS	AA02-99-001	RP	N/A	97*	2/5/$23	3/1,275	14.0*	6/3	2/0	15.0	$29,000	$272,000
18	ELLIS	AA02-99-002	RP	N/A	97* AQ	4/2/$66	0/1,275	11.0*	3/2	2/0	15.0	$84,000	$356,000
1	GRAYSON	C046-10-001	RP	N/A	96*	4/0/$68	4/1,310	13.0*	3/3*	1/0	22.0	$89,000	$445,000
12	HARRIS	AA43-53-001	RP	N/A	96*	1/8/$5	0/3,945	9.0*	6/4	4/0	20.0	$20,000	$465,000
12	BRAZORIA	AA03-41-001	RP	N/A	96*	2/4/$45	0/685	15.0*	6/3	2/0	20.0	$31,000	$496,000
12	HARRIS	AA50-14-001	RP	N/A	96*	2/2/$36	5/941	17.0*	6/3	1/0	20.0	$34,000	$530,000
12	BRAZORIA	AA05-65-001	RP	N/A	96*	4/1/$48	1/1,150	13.0*	6/3	1/0	24.0	$55,000	$585,000
12	GALVESTON	F004-30-046	RP	N/A	96* AQ	2/1/$27	3/1,000	19.0*	3/2	1/0	20.0	$27,000	$612,000
15	KENDALL	AA01-34-001	RP	N/A	96* AQ	0/1/$51	1/235	11.0*	6/2	1/0	15.0	$12,000	$624,000
18	ELLIS	AA06-13-001	RP	N/A	96*	1/3/$44	2/435	12.0*	6/3	2/0	13.0	$19,000	$643,000
18	ELLIS	F990-05-001	RP	N/A	96* AQ	2/2/$34	0/308	7.0*	3/2	2/0	15.0	$26,000	$669,000
18	DENTON	C008-37-001	RP	N/A	96*	0/1/$32	4/500	14.0*	6/3	2/0	13.0	$16,000	$685,000
12	HARRIS	AA49-60-003	RP	N/A	95*	2/4/$8	5/3,766	21.0*	6/3	2/0	23.0	$29,000	$714,000
12	BRAZORIA	AA06-52-002	RP	N/A	95*	3/3/$28	0/1,515	6.0*	6/4	2/0	20.0	$43,000	$757,000
12	HARRIS	AA33-30-002	RP	N/A	95*	2/3/$12	0/2,430	10.0*	6/4	2/0	23.0	$30,000	$787,000
12	MONTGOMERY	AA13-05-001	RP	N/A	95* AQ	5/3/$163	0/870	7.0*	6/2	2/0	20.0	$142,000	$929,000
12	HARRIS	0025-05-001	RP	N/A	95*	5/3/$67	2/8,400	7.0*	6/4	2/0	24.0	$561,000	$1,490,000
12	HARRIS	AA37-74-002	RP	N/A	95*	4/1/$96	2/679	6.0*	3/3	2/0	19.0	$65,000	$1,555,000
18	DALLAS	0020-40-001	RP	N/A	95*	3/0/$19	1/2,070	14.0*	6/4	1/0	16.0	$39,000	$1,594,000
24	EL PASO	0673-00-001	RP	N/A	95* AQ	2/2/$26	4/1,251	21.0*	6/1	5/0	15.0	$33,000	$1,627,000
2	TARRANT	ZH12-00-001	RP	N/A	94*	5/6/$60	1/6,200	12.0*	6/4	2/0	20.0	$373,000	$2,000,000
9	MCLENNAN	Y000-95-001	RP	N/A	94* AQ	1/0/$103	6/175	16.0*	6/1	1/0	15.0	$18,000	$2,018,000
12	HARRIS	AA06-10-001	RP	N/A	94*	5/6/$62	3/1,771	16.0*	6/4	3/0	20.0	$110,000	$2,128,000
12	HARRIS	AA57-75-002	RP	N/A	94*	5/3/$83	1/4,439	6.0*	6/4	2/0	20.0	$367,000	$2,495,000
12	GALVESTON	AA04-72-002	RP	N/A	94* AQ	2/2/$68	0/400	19.0*	6/2	2/0	19.0	$27,000	$2,522,000
12	GALVESTON	F008-90-020	RP	N/A	94* AQ	2/2/$63	5/400	20.0*	3/2	2/0	19.0	$25,000	$2,547,000
18	ELLIS	AA06-50-001	RP	N/A	94*	0/5/$50	4/200	16.0*	6/3	2/0	12.0	$10,000	$2,557,000
18	DALLAS	9002-50-001	RP	N/A	94*	3/4/$21	3/2,360	21.0*	6/3	2/0	20.0	$50,000	$2,607,000
18	COLLIN	AA04-34-001	RP	N/A	94*	2/3/$70	1/460	17.0*	6/3	2/0	14.0	$32,000	$2,639,000

T E X A S B R I D G E S O R T E R

VERSION 3.0

QUALIFYING BRIDGE PROJECTS

DATA SET: BRIDGES ELIGIBLE FOR FEDERAL FUNDING

CRITERIA USED FOR SCREENING

QUALIFYING: SCORE >= 75
MARGINAL: 65 <= SCORE < 75

REHAB COST = $25/SQ FT
REPLACE COST = $35/SQ FT

	CSI/FSI/CPV	ESI/ADT	SR	SSI/DSS	GSI/BWC
WEIGHTS:	0%/C% /20%	0%/20%	20%	0%/20%	0%/20%
AUTO. QUALIFYING LEVELS:	N/N/N	N/N	N	N/2	N/N

PASSING LEVELS ARE NOT NECESSARY IN TEBS VERSION 3.0

* = ESTIMATED
M = MISSING

DIST	COUNTY	CONT-SEC-STR	TYPE WORK	CPV RANK	SCORE	CSI/ FSI/ CPV	ESI/ ADT	SR	SSI/ DSS	GSI/ BWC	RDWY WIDTH	PROJECT COST	ACCUMULATIVE PROJECT COST
13	DENTON	AA05-78-001	RP	N/A	94* AQ	3/1/$144	1/270	12.0*	0/0	2/0	12.0	$39,000	$2,678,000
13	COLLIN	AA03-67-001	RP	N/A	94* AQ	1/1/$95	3/200	15.0*	3/2	2/0	14.0	$19,000	$2,697,000
1	GRAYSON	AA02-45-002	RP	N/A	93*	0/2/$9	3/120	18.0*	6/3	2/0	2.0	$1,000	$2,698,000
1	LAMAR	E000-50-001	RP	N/A	93* AQ	2/0/$40	5/650	23.0*	6/2	1/0	15.0	$26,000	$2,724,000
1	LAMAR	AA02-52-001	RP	N/A	93* AQ	0/0/$112	4/125	16.0*	6/2	1/0	14.0	$14,000	$2,738,000
2	HOOD	AA05-38-002	RP	N/A	93*	2/3/$16	1/2,200	7.0*	6/5	2/0	22.0	$35,000	$2,773,000
11	POLK	AA04-21-001	RP	N/A	93* AQ	1/0/$103	6/145	17.0*	6/2	2/0	11.0	$15,000	$2,788,000
12	GALVESTON	AA01-77-001	RP	N/A	93* AG	2/4/$33	3/400	21.0*	6/2	2/0	20.0	$33,000	$2,821,000
12	GALVESTON	L030-10-007	RP	N/A	93*	2/1/$55	4/510	20.0*	6/3	2/0	20.0	$28,000	$2,849,000
14	TRAVIS	AA14-70-001	RP	N/A	93*	5/5/$82	3/2,068	17.0*	6/4	2/0	21.0	$170,000	$3,019,000
15	MAVERICK	AA01-56-011	RP	N/A	93*	1/2/$40	5/525	21.0*	6/3	2/0	15.0	$21,000	$3,040,000
17	WALKER	AA02-54-001	RP	N/A	93*	1/7/$60	0/400	10.0*	9/4	1/0	14.0	$24,000	$3,064,000
17	ROBERTSON	AA01-04-001	RP	N/A	93*	3/1/$69	3/635	19.0*	6/3	1/0	16.0	$44,000	$3,108,000
17	LEON	F000-05-001	RP	N/A	93*	0/0/$83	6/180	16.0*	6/3	1/0	13.0	$15,000	$3,123,000
13	ELLIS	M007-50-001	RP	N/A	93*	0/5/$53	0/300	5.0*	6/4	2/0	14.0	$16,000	$3,139,000
18	ELLIS	AA01-42-001	RP	N/A	93* AQ	1/4/$91	3/230	19.0*	3/2	2/0	14.0	$21,000	$3,160,000
13	DENTON	KK00-05-001	RP	N/A	93*	4/3/$69	1/970	17.0*	6/4	2/0	18.0	$67,000	$3,227,000
13	ELLIS	AA06-21-001	RP	N/A	93*	0/2/$52	0/250	18.0*	6/3	2/0	13.0	$13,000	$3,240,000
13	DALLAS	N009-60-001	RP	N/A	93* AQ	4/2/$122	4/500	19.0*	3/0	2/0	20.0	$61,000	$3,301,000
13	DALLAS	AA02-66-001	RP	N/A	93*	4/1/$140	2/550	17.0*	6/3	1/0	14.0	$77,000	$3,378,000
1	GRAYSON	AA01-03-001	RP	N/A	92* AQ	0/0/$60	3/250	22.0*	0/2*	2/0	16.0	$15,000	$3,393,000
2	WISE	AA01-05-001	RP	N/A	92*	1/0/$83	0/216	5.0*	6/4	1/0	12.0	$18,000	$3,411,000
9	LIMESTONE	E000-30-001	RP	N/A	92*	0/0/$75	5/200	20.0*	6/3	1/0	15.0	$15,000	$3,426,000
12	HARRIS	AA49-60-002	RP	N/A	92*	1/7/$5	5/3,766	23.0*	9/4	2/0	23.0	$20,000	$3,446,000
12	HARRIS	AA52-09-001	RP	N/A	92*	0/7/$7	5/2,760	21.0*	6/4	2/0	23.0	$19,000	$3,465,000
12	HARRIS	0569-17-372	RP	N/A	92*	4/5/$20	4/3,375	22.0*	6/4	2/0	20.0	$67,000	$3,532,000
12	HARRIS	AA35-50-001	RP	N/A	92*	4/3/$149	0/477	8.0*	6/4	2/0	16.0	$71,000	$3,603,000
12	HARRIS	AA35-04-001	RP	N/A	92*	1/3/$26	2/770	19.0*	6/4	2/0	17.0	$20,000	$3,623,000
12	MONTGOMERY	AA10-12-001	RP	N/A	92*	5/0/$254	0/705	4.0*	6/3	2/0	15.0	$179,000	$3,802,000
15	KENDALL	AA01-34-002	RP	N/A	92*	1/1/$77	1/235	11.0*	6/4	1/0	11.0	$18,000	$3,820,000
13	ELLIS	AA05-21-002	RP	N/A	92*	1/7/$58	2/330	21.0*	6/3	3/0	13.0	$19,000	$3,839,000
13	ELLIS	AA03-33-002	RP	N/A	92*	1/5/$110	3/200	18.0*	6/3	2/0	13.0	$22,000	$3,861,000
13	ELLIS	AA04-51-001	RP	N/A	92*	1/4/$40	2/470	22.0*	6/3	3/0	13.0	$19,000	$3,880,000
13	DENTON	NN00-65-001	RP	N/A	92*	2/3/$96	1/240	19.0*	6/3	2/0	15.0	$23,000	$3,903,000

TEXAS BRIDGE SORTER

VERSION 3.0

QUALIFYING BRIDGE PROJECTS

DATA SET: BRIDGES ELIGIBLE FOR FEDERAL FUNDING

CRITERIA USED FOR SCREENING

QUALIFYING: SCORE >= 75
MARGINAL: 65 <= SCORE < 75

REHAB COST = $25/SQ FT
REPLACE COST = $35/SQ FT

	CSI/FSI/CPV	ESI/ADT	SR	SSI/DSS	GSI/BWC
WEIGHTS:	0%/0% /20%	0%/20%	20%	0%/20%	0%/20%
AUTO. QUALIFYING LEVELS:	N/N/N	N/N	N	N/2	N/N

PASSING LEVELS ARE NOT NECESSARY IN TEBS VERSION 3.0

* = ESTIMATED
M = MISSING

DIST	COUNTY	CONT-SEC-STR	TYPE WORK	CPV RANK	SCORE	CSI/ FSI/ CPV	ESI/ ADT	SR	SSI/ DSS	GSI/ BWC	RDWY WIDTH	PROJECT COST	ACCUMULATIVE PROJECT COST
18	ELLIS	AA06-21-003	RP	N/A	92*	1/3/$61	2/330	21.0*	6/3	2/0	12.0	$20,000	$3,923,000
19	HARRISON	AA03-63-001	RP	N/A	92*	0/3/$93	1/150	17.0*	6/3	1/0	15.0	$14,000	$3,937,000
20	HARDIN	AA02-40-002	RP	N/A	92*	1/5/$65	3/260	21.0*	6/3	1/0	16.0	$17,000	$3,954,000
1	GRAYSON	AA05-13-001	RP	N/A	91* AQ	0/4/$122	5/115	18.0*	3/2	2/0	14.0	$14,000	$3,968,000
1	GRAYSON	AA02-30-001	RP	N/A	91*	2/4/$120	2/200	20.0*	3/3	2/0	15.0	$24,000	$3,992,000
2	WISE	AA01-94-001	RP	N/A	91* AQ	4/1/$208	1/250	18.0*	6/2	2/0	12.0	$52,000	$4,044,000
2	PARKER	AA03-70-001	RP	N/A	91*	3/0/$50	1/720	3.0*	9/5	1/0	12.0	$36,000	$4,080,000
2	WISE	B001-55-001	RP	N/A	91*	4/0/$147	5/504	15.0*	6/4	1/0	12.0	$74,000	$4,154,000
9	CORYELL	C001-75-001	RP	N/A	91*	5/0/$233	5/365	16.0*	6/3	1/0	15.0	$85,000	$4,239,000
11	SHELBY	AA01-33-004	RP	N/A	91*	0/4/$122	2/115	15.0*	6/3	2/0	14.0	$14,000	$4,253,000
12	BRAZORIA	AA04-33-001	RP	N/A	91*	3/6/$100	0/400	18.0*	6/4	1/0	13.0	$40,000	$4,293,000
12	BRAZORIA	M007-55-001	RP	N/A	91*	3/6/$30	0/1,425	17.0*	9/5	2/0	23.0	$43,000	$4,336,000
12	BRAZORIA	AA01-35-001	RP	N/A	91*	4/5/$140	0/315	16.0*	6/4	2/0	19.0	$44,000	$4,380,000
12	HARRIS	AA33-53-002	RP	N/A	91*	1/5/$18	3/1,185	22.0*	6/4	5/0	23.0	$21,000	$4,401,000
12	GALVESTON	F008-50-023	RP	N/A	91*	4/4/$128	5/400	16.0*	6/4	2/0	19.0	$51,000	$4,452,000
12	BRAZORIA	AA08-13-001	RP	N/A	91*	5/4/$153	0/580	14.0*	6/4	2/0	22.0	$89,000	$4,541,000
12	HARRIS	AA34-02-003	RP	N/A	91*	3/4/$64	5/575	24.0*	6/3	2/0	20.0	$37,000	$4,578,000
12	GALVESTON	E003-70-037	RP	N/A	91* AQ	2/0/$185	0/130	2.0*	6/2	1/0	18.0	$24,000	$4,602,000
13	MATAGORDA	AA03-09-001	RP	N/A	91*	2/8/$70	6/400	19.0*	6/4	1/0	15.0	$28,000	$4,630,000
16	NUECES	D000-75-001	RP	N/A	91* AQ	3/0/$95	5/400	24.0*	6/1	1/0	17.0	$38,000	$4,668,000
17	WASHINGTON	AA01-95-003	RP	N/A	91*	0/0/$109	1/110	14.0*	9/3	1/0	14.0	$12,000	$4,680,000
18	ELLIS	AA03-83-001	RP	N/A	91*	2/5/$115	3/200	19.0*	6/3	2/0	11.0	$23,000	$4,703,000
18	ELLIS	AA01-42-002	RP	N/A	91* AQ	2/4/$109	3/230	21.0*	3/2	2/0	15.0	$25,000	$4,728,000
18	ELLIS	AA01-42-004	RP	N/A	91* AQ	0/4/$37	1/350	25.0*	3/2	2/0	16.0	$13,000	$4,741,000
18	ELLIS	AA04-36-001	RP	N/A	91* AQ	0/4/$96	1/115	19.0*	3/2	3/0	14.0	$11,000	$4,752,000
18	DALLAS	C016-40-001	RP	N/A	91*	4/1/$153	3/300	19.0*	6/3	2/0	18.0	$46,000	$4,798,000
18	COLLIN	AA03-87-005	RP	N/A	91*	0/1/$28	2/460	25.0*	6/3	2/0	16.0	$13,000	$4,811,000
20	ORANGE	C024-80-001	RP	N/A	91*	2/5/$115	6/200	19.0*	6/3	2/0	12.0	$23,000	$4,834,000
20	HARDIN	AA02-40-001	RP	N/A	91*	3/5/$92	3/370	22.0*	6/3	1/0	16.0	$34,000	$4,868,000
1	GRAYSON	L000-10-001	RP	N/A	90*	3/4/$219	5/155	16.0*	3/3	2/0	14.0	$34,000	$4,902,000
1	GRAYSON	AA05-11-002	RP	N/A	90*	2/3/$179	4/140	16.0*	3/3	2/0	12.0	$25,000	$4,927,000
1	GRAYSON	AA04-75-002	RP	N/A	90* AQ	2/2/$217	2/115	15.0*	3/2	2/0	12.0	$25,000	$4,952,000
2	TARRANT	ZP71-70-002	RP	N/A	90*	5/6/$133	0/3,000	4.0*	6/5	2/0	20.0	$399,000	$5,351,000
2	JOHNSON	AA04-82-003	RP	N/A	90*	4/1/$220	1/200	17.0*	6/3	2/0	15.0	$44,000	$5,395,000

T E X A S   B R I D G E   S O R T E R

VERSION 3.0

QUALIFYING BRIDGE PROJECTS

DATA SET: BRIDGES ELIGIBLE FOR FEDERAL FUNDING

QUALIFYING: SCORE >= 75
MARGINAL: 65 <= SCORE < 75

CRITERIA USED FOR SCREENING

	CSI/FSI/CPV	ESI/ADT	SR	SSI/DSS	GSI/BVC
WEIGHTS:	08/08 /20%	0%/20%	20%	0%/20%	0%/20%
AUTO. QUALIFYING LEVELS:	N/N/N	N/N	N	N/2	N/N

PASSING LEVELS ARE NOT NECESSARY IN TEBS VERSION 3.0

REHAB COST = $25/SQ FT
REPLACE COST = $35/SQ FT

* = ESTIMATED
M = MISSING

DIST	COUNTY	CONT-SEC-STR	TYPE WORK	CPV RANK	SCORE	CSI/ FSI/ CPV	ESI/ ADT	SR	SSI/ DSS	GSI/ BWC	RDWY WIDTH	PROJECT COST	ACCUMULATIVE PROJECT COST
11	SHELBY	AA04-97-001	RP	N/A	90*	0/6/$90	1/155	21.0*	3/3	2/0	14.0	$14,000	$5,409,000
11	SHELBY	AA02-34-001	RP	N/A	90* AQ	0/4/$137	4/95	18.0*	3/0	3/0	14.0	$13,000	$5,422,000
12	BRAZORIA	AA05-46-001	RP	N/A	90*	3/4/$102	0/325	18.0*	6/4	2/0	19.0	$33,000	$5,455,000
12	GALVESTON	F006-70-029	RP	N/A	90* AQ	3/2/$175	5/200	20.0*	6/2	2/0	19.0	$35,000	$5,490,000
12	MONTGOMERY	AA11-64-047	RP	N/A	90*	5/1/$80	0/1,905	23.0*	6/4	2/0	19.0	$152,000	$5,642,000
13	LAVACA	C000-30-001	RP	N/A	90* AQ	3/1/$36	4/545	26.0*	6/2	1/0	16.0	$47,000	$5,689,000
13	JACKSON	AA01-10-001	RP	N/A	90* AQ	1/0/$180	0/100	12.0*	6/2	1/0	12.0	$18,000	$5,707,000
17	ROBERTSON	AA03-23-001	RP	N/A	90*	1/1/$110	5/155	20.0*	9/3	1/0	16.0	$17,000	$5,724,000
17	MILAM	AA05-14-001	RP	N/A	90*	1/1/$107	0/150	12.0*	6/4	1/0	15.0	$16,000	$5,740,000
17	BRAZOS	AA01-84-001	RP	N/A	90*	5/1/$251	0/255	6.0*	6/3	1/0	12.0	$64,000	$5,804,000
18	ELLIS	E001-90-002	RP	N/A	90*	2/7/$90	5/290	24.0*	6/3	2/0	20.0	$26,000	$5,830,000
18	ELLIS	AA06-20-001	RP	N/A	90*	1/6/$127	3/150	19.0*	3/3	3/0	13.0	$19,000	$5,849,000
18	ELLIS	AA04-49-001	RP	N/A	90*	0/5/$42	4/165	19.0*	6/4	2/0	14.0	$7,000	$5,856,000
18	ELLIS	AA03-44-001	RP	N/A	90*	3/5/$157	0/230	16.0*	6/4	2/0	13.0	$36,000	$5,892,000
18	ELLIS	AA04-80-001	RP	N/A	90*	2/5/$118	2/220	21.0*	6/3	2/0	13.0	$26,000	$5,918,000
18	DENTON	B051-90-001	RP	N/A	90* AQ	0/3/$67	4/210	25.0*	3/0	2/0	14.0	$14,000	$5,932,000
18	ELLIS	AA03-59-001	RP	N/A	90* AQ	2/2/$200	2/100	15.0*	3/2	2/0	12.0	$20,000	$5,952,000
19	HARRISON	AA04-43-001	RP	N/A	90*	1/3/$140	3/100	17.0*	6/3	1/0	14.0	$14,000	$5,966,000
19	HARRISON	AA02-84-001	RP	N/A	90*	0/2/$122	1/90	15.0*	3/3	1/0	15.0	$11,000	$5,977,000
19	BOWIE	AA06-14-005	RP	N/A	90*	0/2/$92	4/120	20.0*	6/3	2/0	12.0	$11,000	$5,988,000
19	BOWIE	AA06-14-001	RP	N/A	90*	2/2/$192	4/120	16.0*	6/3	2/0	13.0	$23,000	$6,011,000
19	TITUS	AA01-41-002	RP	N/A	90*	5/2/$222	1/508	7.0*	6/4	1/0	15.0	$113,000	$6,124,000
24	BREWSTER	AA01-48-001	RP	N/A	90*	3/4/$133	6/255	21.0*	6/3	1/0	12.0	$34,000	$6,158,000
1	LAMAR	AA03-31-001	RP	N/A	89*	1/5/$121	1/165	21.0*	9/3	2/0	15.0	$20,000	$6,178,000
1	GRAYSON	AA01-09-003	RP	N/A	39*	0/4/$56	4/180	20.0*	6/4	2/0	14.0	$10,000	$6,188,000
1	GRAYSON	AA05-92-001	RP	N/A	87*	3/3/$73	2/400	26.0*	6/3*	3/0	15.0	$39,000	$6,227,000
1	GRAYSON	AA05-82-001	RP	N/A	89*	1/3/$45	4/550	28.0*	6/3	3/0	16.0	$25,000	$6,252,000
1	HUNT	AA02-80-001	RP	N/A	89*	0/2/$122	5/115	16.0*	6/4	1/0	12.0	$14,000	$6,266,000
1	GRAYSON	AA04-95-001	RP	N/A	89* AQ	1/2/$97	6/165	24.0*	3/2	2/0	16.0	$16,000	$6,282,000
2	WISE	AA02-27-004	RP	N/A	39*	1/7/$102	1/216	23.0*	6/3	3/0	12.0	$22,000	$6,304,000
2	WISE	AA02-38-001	RP	N/A	89*	1/7/$83	1/216	21.0*	6/4	2/0	12.0	$18,000	$6,322,000
2	WISE	AA02-23-001	RP	N/A	89*	3/2/$54	1/864	13.0*	9/6	2/0	12.0	$47,000	$6,369,000
9	BELL	D000-65-001	RP	N/A	39*	5/1/$226	5/500	20.0*	6/3	1/0	15.0	$113,000	$6,482,000
9	MCLENNAN	K004-77-001	RP	N/A	89* AQ	4/0/$190	0/300	23.0*	3/0	1/0	16.0	$57,000	$6,539,000

SKIP IN LISTING

T E X A S   B R I D G E   S O R T E R

VERSION 3.0

QUALIFYING BRIDGE PROJECTS

DATA SET: BRIDGES ELIGIBLE FOR FEDERAL FUNDING

CRITERIA USED FOR SCREENING

QUALIFYING: SCORE >= 75
MARGINAL: 65 <= SCORE < 75

REHAB COST = $25/SQ FT
REPLACE COST = $35/SQ FT

	CSI/FSI/CPV	ESI/ADT	SR	SSI/DSS	GSI/BWC
WEIGHTS:	0%/0% /20%	0%/20%	20%	0%/20%	0%/20%
AUTO. QUALIFYING LEVELS:	N/N/N	N/N	N	N/2	N/N

PASSING LEVELS ARE NOT NECESSARY IN TEBS VERSION 3.0

* = ESTIMATED
M = MISSING

DIST	COUNTY	CONT-SEC-STR	TYPE WORK	CPV RANK	SCORE	CSI/ FSI/ CPV	ESI/ ADT	SR	SSI/ DSS	GSI/ BWC	RDWY WIDTH	PROJECT COST	ACCUMULATIVE PROJECT COST
25	FOARD	AA01-20-002	RP	N/A	32* AQ	8/2/$4,000	5/5	32.0*	3/2	1/1	M	$20,000	$80,018,000
1	DELTA	AA01-30-001	RP	N/A	31* AQ	8/5/$20,000	*9/M	32.0*	3/2	3/1	M	$20,000*	$80,038,000
2	PARKER	CU99-99-001	RP	N/A	31* AQ	8/1/$27,000	*9/0	32.0*	6/1	2/1	20.0	$27,000	$80,065,000
2	TARRANT	MU02-70-001	RP	N/A	31* AQ	9/0/$74,000	*8/0	32.0*	3/0	0/1	20.0	$74,000	$80,139,000
10	RUSK	AA03-02-001	RP	N/A	31* AQ	9/2/$55,000	*9/0	32.0*	6/1	0/1	22.0	$55,000	$80,194,000
15	BEXAR	0156-65-001	RP	N/A	31* AQ	9/1/1010000	*9/0	32.0*	3/1*	2/1	23.0	$1,010,000	$81,204,000
18	KAUFMAN	AA03-54-002	RP	N/A	31* AQ	8/C/$18,000	*6/0	32.0*	3/1	1/1	M	$18,000	$81,222,000

T E X A S   B R I D G E   S O R T E R

VERSION 3.0

MARGINAL BRIDGE PROJECTS

DATA SET: BRIDGES ELIGIBLE FOR FEDERAL FUNDING

CRITERIA USED FOR SCREENING

QUALIFYING: SCORE >= 75
MARGINAL: 65 <= SCORE < 75

	CSI/FSI/CPV	ESI/ADT	SR	SSI/DSS	GSI/BWC
WEIGHTS:	0%/0% /20%	0%/20%	20%	0%/20%	0%/20%
AUTO. QUALIFYING LEVELS:	N/N/N	N/N	N	N/2	N/N

PASSING LEVELS ARE NOT NECESSARY IN TEBS VERSION 3.0

REHAB COST = $25/SQ FT
REPLACE COST = $35/SQ FT

* = ESTIMATED
M = MISSING

	DIST	COUNTY	CONT-SEC-STR	TYPE WORK	CPV RANK	SCORE	CSI/ FSI/ CPV	ESI/ ADT	SR	SSI/ DSS	GSI/ BWC	RDWY WIDTH	PROJECT COST	ACCUMULATIVE PROJECT COST
	1	GRAYSON	AA01-61-001	RP	N/A	74*	3/7/$309	6/55	27.0*	3/4	2/0	16.0	$17,000	$17,000
	1	FANNIN	AA01-15-001	RP	N/A	74*	2/7/$286	6/35	20.0*	6/4	2/0	14.0	$10,000	$27,000
	1	LAMAR	AA03-45-001	RP	N/A	74*	4/5/$420	4/50	27.0*	9/3	2/0	16.0	$21,000	$48,000
	1	GRAYSON	AA01-49-002	RP	N/A	74*	4/5/$425	7/40	20.0*	3/3	2/0	15.0	$17,000	$65,000
	1	GRAYSON	AA01-39-003	RP	N/A	74*	4/5/$450	7/40	20.0*	6/3	2/0	14.0	$18,000	$83,000
	1	GRAYSON	AA05-54-001	RP	N/A	74*	4/4/$385	6/65	27.0*	6/4	2/0	16.0	$25,000	$108,000
	1	GRAYSON	AA04-22-001	RP	N/A	74*	7/4/$960	5/50	16.0*	6/3	2/0	14.0	$48,000	$156,000
	1	DELTA	AA01-70-003	RP	N/A	74*	4/3/$100	9/20	23.0*	6/3	3/0	15.0	$2,000	$158,000
	1	GRAYSON	AA03-23-001	RP	N/A	74*	2/3/$286	9/35	24.0*	6/3	2/0	16.0	$10,000	$168,000
	1	LAMAR	AA01-30-002	RP	N/A	74*	3/3/$280	5/25	16.0*	6/4	2/0	14.0	$7,000	$175,000
	1	HUNT	AA02-71-001	RP	N/A	74*	1/2/$147	2/95	24.0*	9/7	1/0	15.0	$14,000	$189,000
	1	GRAYSON	AA04-73-001	RP	N/A	74*	7/2/$2,271	1/140	20.0*	3/3	2/0	15.0	$318,000	$507,000
*	1	HUNT	AA05-64-001	RP	N/A	74*	7/2/$644	7/45	16.0*	3/3	2/0	12.0	$29,000	$536,000
*	1	HUNT	AA01-33-001	RP	N/A	74*	2/1/$255	5/55	22.0*	6/6	2/0	14.0	$14,000	$550,000
*	1	HUNT	AA02-62-001	RP	N/A	74*	1/1/$69	6/290	24.0*	9/8	2/0	15.0	$20,000	$570,000
	1	LAMAR	AA01-61-001	RP	N/A	74*	6/1/$550	3/40	17.0*	6/3	1/0	14.0	$22,000	$592,000
	1	LAMAR	AA05-84-002	RP	N/A	74*	2/1/$267	8/45	28.0*	6/3	2/0	17.0	$12,000	$604,000
*	1	RED RIVER	B000-05-001	RP	N/A	74*	4/1/$378	6/90	32.0*	3/4	2/0	18.0	$34,000	$638,000
	1	LAMAR	AA03-58-001	RP	N/A	74*	7/1/$667	6/45	16.0*	6/3	1/0	11.0	$30,000	$668,000
*	1	HUNT	AA02-50-001	RP	N/A	74*	2/0/$325	7/40	19.0*	6/4	1/0	12.0	$13,000	$681,000
	2	WISE	AA01-13-003	RP	N/A	74*	1/9/$200	3/65	35.0*	9/4	3/0	14.0	$13,000	$694,000
	2	PARKER	AA03-74-001	RH	N/A	74*	1/8/$47	3/360	55.0*	6/5	2/0	16.0	$17,000	$711,000
	2	WISE	AA03-05-002	RP	N/A	74*	1/6/$111	1/144	39.0*	9/6	3/0	14.0	$16,000	$727,000
	2	PARKER	AA03-75-001	RP	N/A	74*	2/5/$76	0/432	47.0*	9/6	3/0	20.0	$33,000	$760,000
	2	ERATH	AA03-44-001	RP	N/A	74*	3/5/$333	1/60	23.0*	9/5	1/0	12.0	$20,000	$780,000
	2	ERATH	AA01-19-001	RP	N/A	74*	7/3/$783	1/60	15.0*	6/4	1/0	12.0	$47,000	$827,000
	2	ERATH	AA03-55-001	RP	N/A	74*	4/3/$337	1/98	24.0*	6/6	1/0	12.0	$33,000	$860,000
	2	PARKER	AA05-86-001	RP	N/A	74*	4/2/$400	8/50	18.0*	6/5	2/0	11.0	$20,000	$880,000
	2	WISE	AA03-52-001	RP	N/A	74*	1/2/$260	5/50	23.0*	9/5	2/0	14.0	$13,000	$893,000
	2	PARKER	AA04-31-001	RP	N/A	74*	4/1/$347	2/72	24.0*	6/5	2/0	16.0	$25,000	$918,000
	4	HEMPHILL	AA01-81-002	RP	N/A	74*	0/2/$129	0/85	34.0*	9/6	2/0	16.0	$11,000	$929,000
	3	NOLAN	AA02-21-002	RP	N/A	74*	2/8/$311	2/45	25.0*	6/3	1/0	16.0	$14,000	$943,000
	8	TAYLOR	0242-75-002	RP	N/A	74*	1/6/$27	5/930	39.0*	9/7	2/0	23.0	$25,000	$968,000
-	8	JONES	0034-25-001	RP	N/A	74*	6/5/$765	5/170	20.0*	6/5	1/0	16.0	$130,000	$1,098,000

T E X A S   B R I D G E   S O R T E R

VERSION 3.0

MARGINAL BRIDGE PROJECTS

DATA SET: BRIDGES ELIGIBLE FOR FEDERAL FUNDING

QUALIFYING: SCORE >= 75
MARGINAL: 65 <= SCORE < 75

CRITERIA USED FOR SCREENING

REHAB COST = $25/SQ FT
REPLACE COST = $35/SQ FT

	CSI/FSI/CPV	ESI/ADT	SR	SSI/DSS	GSI/BWC
WEIGHTS:	03/0% /20%	0%/20%	20%	0%/20%	0%/20%
AUTO. QUALIFYING LEVELS:	N/N/N	N/N	N	N/2	N/N

PASSING LEVELS ARE NOT NECESSARY IN TEBS VERSION 3.0

* = ESTIMATED
M = MISSING

DIST	COUNTY	CONT-SEC-STR	TYPE WORK	CPV RANK	SCORE	CSI/ FSI/ CPV	ESI/ ADT	SR	SSI/ DSS	GSI/ BWC	RDWY WIDTH	PROJECT COST	ACCUMULATIVE PROJECT COST
8	MITCHELL	AA01-51-002	RP	N/A	74*	7/3/$943	7/70	20.0*	6/3	1/0	16.0	$66,000	$1,164,000
8	CALLAHAN	AA01-52-002	RP	N/A	74*	7/2/$644	2/45	16.0*	6/3	1/0	12.0	$29,000	$1,193,000
8	TAYLOR	AA04-12-001	RP	N/A	74*	5/2/$413	1/50	32.0*	3/3	1/0	18.0	$33,000	$1,226,000
8	MITCHELL	AA02-87-002	RP	N/A	74*	7/1/$336	2/55	18.0*	6/3	1/0	16.0	$46,000	$1,272,000
9	LIMESTONE	AA04-53-001	RP	N/A	74*	4/5/$400	5/45	24.0*	6/3	2/0	16.0	$18,000	$1,290,000
9	FALLS	AA03-85-001	RP	N/A	74*	3/2/$257	4/105	33.0*	9/5	2/0	19.0	$27,000	$1,317,000
9	MCLENNAN	AA05-81-002	RP	N/A	74*	3/2/$171	1/170	37.0*	9/6	1/0	12.0	$29,000	$1,346,000
9	HILL	AA03-73-003	RP	N/A	74*	1/2/$143	3/140	38.0*	9/6	1/0	16.0	$20,000	$1,366,000
9	LIMESTONE	AA02-10-003	RP	N/A	74*	0/2/$91	0/165	41.0*	9/6	1/0	16.0	$15,000	$1,381,000
9	MCLENNAN	AA01-52-001	RP	N/A	74*	3/1/$275	3/80	29.0*	9/5	1/0	16.0	$22,000	$1,403,000
9	HILL	AA01-40-005	RP	N/A	74*	0/1/$122	3/115	37.0*	9/6	1/0	16.0	$14,000	$1,417,000
9	MCLENNAN	AA02-43-001	RP	N/A	74*	6/1/$538	2/65	25.0*	6/3	2/0	16.0	$35,000	$1,452,000
9	MCLENNAN	AA08-20-002	RP	N/A	74*	4/1/$262	3/210	23.0*	9/7	2/0	20.0	$55,000	$1,507,000
9	HILL	AA01-55-001	RP	N/A	74*	1/1/$160	1/100	34.0*	9/6	2/0	16.0	$16,000	$1,523,000
9	MCLENNAN	AA07-12-001	RP	N/A	74*	1/1/$178	4/90	31.0*	9/6	1/0	16.0	$16,000	$1,539,000
9	MCLENNAN	AA04-56-001	RP	N/A	74*	0/0/$138	2/80	32.0*	9/6	2/0	18.0	$11,000	$1,550,000
10	VAN ZANDT	AA02-28-001	RP	N/A	74*	2/9/$135	3/200	47.0*	9/5	2/0	19.0	$27,000	$1,577,000
10	RUSK	AA06-74-001	RP	N/A	74*	2/6/$280	6/50	27.0*	6/4	2/0	16.0	$14,000	$1,591,000
10	CHEROKEE	AA04-12-001	RP	N/A	74*	2/5/$129	2/170	46.0*	9/5	2/0	17.0	$22,000	$1,613,000
10	RUSK	AA05-52-003	RP	N/A	74*	1/5/$200	5/50	23.0*	6/6	2/0	14.0	$10,000	$1,623,000
10	SMITH	AA01-34-002	RP	N/A	74*	5/5/$491	3/235	24.0*	9/6	2/0	20.0	$113,000	$1,736,000
10	RUSK	AA04-73-002	RP	N/A	74*	1/5/$260	2/50	23.0*	6/5	2/0	12.0	$13,000	$1,749,000
10	SMITH	AA02-35-001	RP	N/A	74*	1/4/$77	3/209	44.0*	9/6	2/0	15.0	$16,000	$1,765,000
10	SMITH	AA02-32-001	RP	N/A	74*	0/4/$76	1/157	43.0*	9/6	2/0	13.0	$12,000	$1,777,000
10	SMITH	AA01-70-001	RP	N/A	74*	0/4/$87	1/150	40.0*	9/6	2/0	14.0	$13,000	$1,790,000
10	RUSK	AA06-62-002	RP	N/A	74*	7/4/$900	1/50	15.0*	3/3	2/0	14.0	$45,000	$1,835,000
10	SMITH	AA02-20-001	RP	N/A	74*	2/3/$283	7/46	23.0*	6/4	2/0	16.0	$13,000	$1,848,000
10	SMITH	AA02-37-001	RP	N/A	74*	1/3/$153	2/85	32.0*	9/6	2/0	16.0	$13,000	$1,861,000
10	RUSK	AA07-26-001	RP	N/A	74*	2/3/$300	2/50	21.0*	6/5	2/0	14.0	$15,000	$1,876,000
10	RUSK	AA03-41-001	RP	N/A	74*	2/2/$250	3/60	24.0*	6/6	2/0	14.0	$15,000	$1,891,000
10	RUSK	AA02-75-002	RP	N/A	74*	1/1/$260	2/50	28.0*	6/4	2/0	17.0	$13,000	$1,904,000
11	ANGELINA	AA01-45-001	RP	N/A	74*	2/8/$190	6/105	44.0*	6/4	3/0	16.0	$20,000	$1,924,000
11	SHELBY	AA04-56-001	RP	N/A	74*	1/7/$236	3/55	26.0*	6/5	3/0	14.0	$13,000	$1,937,000
11	SHELBY	AA02-09-002	RP	N/A	74*	2/7/$311	4/45	25.0*	6/3	2/0	14.0	$14,000	$1,951,000

T E X A S   B R I D G E   S O R T E R

VERSION 3.0

MARGINAL BRIDGE PROJECTS

DATA SET: BRIDGES ELIGIBLE FOR FEDERAL FUNDING

CRITERIA USED FOR SCREENING

QUALIFYING: SCORE >= 75
MARGINAL: 55 <= SCORE < 75

REHAB COST = $25/SQ FT
REPLACE COST = $35/SQ FT

	CSI/FSI/CPV	ESI/ADT	SR	SSI/DSS	GSI/BWC
WEIGHTS:	0%/0% /20%	0%/20%	20%	0%/20%	0%/20%
AUTO. QUALIFYING LEVELS:	N/N/N	N/N	N	N/2	N/N

PASSING LEVELS ARE NOT NECESSARY IN TEDS VERSION 3.0

* = ESTIMATED
M = MISSING

DIST	COUNTY	CONT-SEC-STR	TYPE WORK	CPV RANK	SCORE	CSI/ FSI/ CPV	ESI/ ADT	SR	SSI/ DSS	GSI/ BWC	RDWY WIDTH	PROJECT COST	ACCUMULATIVE PROJECT COST
11	SABINE	AA03-69-003	RP	N/A	74*	3/7/$273	0/110	39.0*	6/6	2/0	16.0	$30,000	$1,981,000
11	SHELBY	AA04-42-001	RP	N/A	74*	2/7/$267	7/60	27.0*	9/5	2/0	14.0	$16,000	$1,997,000
11	SHELBY	AA02-37-003	RP	N/A	74*	2/5/$300	2/50	27.0*	3/6	2/0	16.0	$15,000	$2,012,000
11	ANGELINA	AA02-12-003	RP	N/A	74*	2/5/$111	1/235	30.0*	9/7	3/0	16.0	$26,000	$2,038,000
11	SHELBY	AA04-91-001	RP	N/A	74*	4/5/$417	3/60	25.0*	6/6	3/0	14.0	$25,000	$2,063,000
11	SHELBY	AA01-23-001	RP	N/A	74*	6/5/$618	2/55	22.0*	6/3	2/0	14.0	$34,000	$2,097,000
11	SABINE	AA02-01-001	RP	N/A	74*	3/5/$333	5/45	22.0*	6/6	2/0	13.0	$15,000	$2,112,000
11	SABINE	AA02-51-001	RP	N/A	74*	4/4/$400	8/50	23.0*	6/4	2/0	14.0	$20,000	$2,132,000
11	SAN JACINTO	AA01-49-001	RP	N/A	74*	1/4/$150	5/100	24.0*	9/7	2/0	13.0	$15,000	$2,147,000
11	SAN JACINTO	AA01-49-002	RP	N/A	74*	0/2/$120	5/100	25.0*	9/7	2/0	13.0	$12,000	$2,159,000
12	HARRIS	AA43-39-001	RP	N/A	74*	4/9/$39	3/2,145	50.0*	6/6	2/0	23.0	$83,000	$2,242,000
12	HARRIS	AA07-56-001	RP	N/A	74*	5/9/$95	3/1,466	18.0*	9/3	3/1	24.0	$140,000	$2,382,000
12	HARRIS	AA59-01-001	RH	N/A	74*	1/8/$2	3/14,847	63.0*	9/6	1/0	22.0	$25,000	$2,407,000
12	HARRIS	AA06-21-001	RP	N/A	74*	3/8/$39	2/1,323	19.0*	6/3	3/1	25.0	$51,000	$2,458,000
12	BRAZORIA	W001-15-001	RP	N/A	74*	3/7/$40	0/1,035	50.0*	9/6	2/0	23.0	$41,000	$2,499,000
12	HARRIS	B546-01-725	RH	N/A	74*	0/7/$4	4/4,020	61.0*	9/6	2/0	22.0	$15,000	$2,514,000
12	BRAZORIA	W000-95-002	RH	N/A	74*	1/7/$20	0/1,240	51.0*	9/6	2/0	23.0	$25,000	$2,539,000
12	HARRIS	B590-61-235	RH	N/A	74*	3/7/$20	4/1,880	55.0*	9/6	3/0	20.0	$38,000	$2,577,000
12	BRAZORIA	AA06-90-005	RH	N/A	74*	3/7/$31	1/1,470	52.0*	9/6	1/0	23.0	$45,000	$2,622,000
12	BRAZORIA	AA07-39-001	RH	N/A	74*	0/7/$10	1/1,445	52.0*	6/6	2/0	24.0	$15,000	$2,637,000
12	HARRIS	B516-09-205	RP	N/A	74*	5/6/$13	4/14,160	18.0*	6/4	4/1	30.0	$181,000	$2,818,000
12	HARRIS	B175-69-123	RH	N/A	74*	0/6/$5	4/3,120	59.0*	6/6	2/0	22.0	$15,000	$2,833,000
12	BRAZORIA	B997-55-002	RH	N/A	74*	2/6/$22	0/1,425	54.0*	9/6	1/0	22.0	$32,000	$2,865,000
12	HARRIS	B600-41-013	RP	N/A	74*	2/5/$7	4/3,920	18.0*	6/4	2/1	25.0	$28,000	$2,893,000
12	HARRIS	B090-73-237	RH	N/A	74*	0/3/$17	5/365	52.0*	6/6	2/0	19.0	$15,000	$2,908,000
12	MONTGOMERY	AA10-11-001	RP	N/A	74*	5/0/$233	0/705	38.0*	9/6	1/0	18.0	$164,000	$3,072,000
13	WHARTON	AA03-17-006	RP	N/A	74*	1/3/$200	5/50	27.0*	9/5	1/0	15.0	$10,000	$3,082,000
13	LAVACA	AA03-40-001	RP	N/A	74*	5/2/$450	1/340	27.0*	6/6	1/0	11.0	$153,000	$3,235,000
13	LAVACA	AA01-21-001	RP	N/A	74*	6/2/$556	4/135	32.0*	6/3	3/0	18.0	$75,000	$3,310,000
13	GONZALES	AA02-66-001	RP	N/A	74*	6/1/$655	2/55	16.0*	6/4	1/0	15.0	$36,000	$3,346,000
13	FAYETTE	AA04-44-001	RP	N/A	74*	7/1/$986	2/70	15.0*	6/4	1/0	12.0	$69,000	$3,415,000
13	COLORADO	AA04-20-002	RP	N/A	74*	6/0/$600	1/65	19.0*	6/4	1/0	14.0	$39,000	$3,454,000
15	BANDERA	AA01-42-001	RH	N/A	74*	2/8/$54	0/555	56.0*	6/5	1/0	11.0	$30,000	$3,484,000
15	BEXAR	B002-75-001	RP	N/A	74*	4/4/$37	4/2,662	17.0*	9/4	1/1	26.0	$98,000	$3,582,000

SKIP IN LISTING

T E X A S   B R I D G E   S O R T E R

VERSION 3.0

MARGINAL BRIDGE PROJECTS

DATA SET: BRIDGES ELIGIBLE FOR FEDERAL FUNDING

CRITERIA USED FOR SCREENING

QUALIFYING: SCORE >= 75
MARGINAL: 65 <= SCORE < 75

REHAB COST = $25/SQ FT
REPLACE COST = $35/SQ FT

	CSI/FSI/CPV	ESI/ADT	SR	SSI/DSS	GSI/BWC
WEIGHTS:	0%/0% /20%	0%/20%	20%	0%/20%	0%/20%
AUTO. QUALIFYING LEVELS:	N/N/N	N/N	N	N/2	N/N

PASSING LEVELS ARE NOT NECESSARY IN TEBS VERSION 3.0

* = ESTIMATED
M = MISSING

DIST	COUNTY	CONT-SEC-STR	TYPE WORK	CPV RANK	SCORE	CSI/ FSI/ CPV	ESI/ ADT	SR	SSI/ DSS	GSI/ BWC	RDWY WIDTH	PROJECT COST	ACCUMULATIVE PROJECT COST
18	NAVARRO	AA05-16-001	RP	N/A	65*	4/1/$379	7/29	18.0*	9/6	2/0	14.0	$11,000	$112,310,580
18	NAVARRO	AA06-08-001	RP	N/A	65*	6/1/$600	6/35	18.0*	9/6	2/0	14.0	$21,000	$112,331,580
18	DALLAS	N000-60-001	RP	N/A	65*	7/1/$960	7/50	32.0*	6/3	2/0	19.0	$48,000	$112,379,580
19	HARRISON	AA03-40-001	RP	N/A	65*	1/6/$218	2/55	49.0*	6/5	1/0	19.0	$12,000	$112,391,580
19	PANOLA	AA04-33-004	RP	N/A	65*	0/6/$122	0/115	48.0*	9/7	2/0	17.0	$14,000	$112,405,580
19	BOWIE	AA07-12-001	RP	N/A	65*	6/4/$667	8/30	27.0*	6/3	2/0	12.0	$20,000	$112,425,580
19	PANOLA	AA02-64-001	RP	N/A	65*	6/3/$600	3/50	29.0*	6/5	2/0	16.0	$30,000	$112,455,580
19	UPSHUR	AA04-05-001	RP	N/A	65*	8/2/$2,975	3/40	20.0*	6/3	1/0	13.0	$119,000	$112,574,580
19	BOWIE	AA01-23-001	RP	N/A	65*	7/1/$900	2/30	19.0*	6/4	1/0	14.0	$27,000	$112,601,580
20	JEFFERSON	C016-45-001	RH	N/A	65*	5/9/$90	3/1,195	75.0*	9/7	2/0	22.0	$108,000	$112,709,580
20	HARDIN	AA03-34-001	RH	N/A	65*	5/9/$115	4/1,135	63.0*	9/7	2/0	20.0	$131,000	$112,840,580
20	NEWTON	AA03-80-002	RP	N/A	65*	7/5/$1,150	0/100	27.0*	9/6	1/0	15.0	$115,000	$112,955,580
20	JEFFERSON	H005-23-001	RP	N/A	65*	6/5/$659	6/120	34.0*	9/6	2/0	14.0	$79,000	$113,034,580
20	TYLER	AA02-36-001	RP	N/A	65*	6/5/$836	2/110	33.0*	6/5	1/0	12.0	$92,000	$113,126,580
20	TYLER	AA01-76-002	RP	N/A	65*	5/3/$471	7/35	26.0*	9/7	1/0	13.0	$40,000	$113,166,580
20	NEWTON	AA03-37-001	RP	N/A	65*	6/3/$554	7/65	31.0*	9/6	1/0	16.0	$36,000	$113,202,580
20	JASPER	AA01-19-001	RP	N/A	65*	8/3/$1,771	2/35	20.0*	6/3	1/0	16.0	$62,000	$113,264,580
20	TYLER	AA01-51-002	RP	N/A	65*	8/2/$1,200	6/30	20.0*	6/3	1/0	13.0	$36,000	$113,300,580
21	HIDALGO	AA03-23-002	RH	N/A	65*	3/8/$267	4/120	72.0*	6/5	2/0	17.0	$32,000	$113,332,580
21	WEBB	AA01-12-009	RP	N/A	65*	2/6/$263	8/57	30.0*	9/7	1/0	11.0	$15,000	$113,347,580
21	WEBB	AA01-12-002	RP	N/A	65*	2/6/$263	8/57	28.0*	9/7	4/0	11.0	$15,000	$113,362,580
21	WEBB	AA01-12-007	RP	N/A	65*	2/5/$263	8/57	30.0*	9/7	1/0	11.0	$15,000	$113,377,580
21	WEBB	AA01-16-001	RP	N/A	65*	2/4/$268	8/56	28.0*	9/7	1/0	11.0	$15,000	$113,392,580
21	WEBB	AA02-00-004	RP	N/A	65*	2/4/$268	8/56	28.0*	9/7	2/0	11.0	$15,000	$113,407,580
* 21	HIDALGO	AA05-09-001	RP	N/A	65*	4/4/$193	4/270	24.0*	6/4	2/1	20.0	$52,000	$113,459,580
21	WEBB	AA01-17-001	RP	N/A	65*	2/4/$268	8/56	39.0*	9/6	1/0	11.0	$15,000	$113,474,580
21	HIDALGO	AA06-70-001	RP	N/A	65*	6/1/$914	4/290	35.0*	9/6	2/0	18.0	$265,000	$113,739,580
23	COLEMAN	AA04-13-001	RP	N/A	65*	8/7/$1,114	6/35	18.0*	6/4	1/0	12.0	$39,000	$113,778,580
23	SAN SABA	AA01-37-003	RP	N/A	65*	7/6/$900	6/60	27.0*	6/5	1/0	16.0	$54,000	$113,832,580
23	SAN SABA	AA01-21-001	RP	N/A	65*	2/6/$280	7/50	38.0*	6/6	2/0	16.0	$14,000	$113,846,580
23	STEPHENS	AA01-02-001	RP	N/A	65*	2/5/$300	2/60	30.0*	9/7	1/0	16.0	$18,000	$113,864,580
23	COMANCHE	AA03-44-001	RP	N/A	65*	1/4/$200	7/80	27.0*	9/8	1/0	14.0	$16,000	$113,880,580
23	EASTLAND	AA04-54-002	RP	N/A	65*	8/1/$1,360	9/25	17.0*	6/3	1/0	12.0	$34,000	$113,914,580
25	CHILDRESS	AA02-55-001	RP	N/A	65*	7/3/$900	5/20	16.0*	3/3	2/0	14.0	$18,000	$113,932,580
25	HARDEMAN	AA01-54-001	RP	N/A	65*	8/2/$1,100	3/40	26.0*	6/3	2/0	15.0	$44,000	$113,976,580

TEXAS BRIDGE SORTER

VERSION 3.0

NON-QUALIFYING BRIDGE PROJECTS

DATA SET: BRIDGES ELIGIBLE FOR FEDERAL FUNDING

CRITERIA USED FOR SCREENING

QUALIFYING: SCORE >= 75
MARGINAL: 65 <= SCORE < 75

REHAB COST = $25/SQ FT
REPLACE COST = $35/SQ FT

	CSI/FSI/CPV	ESI/ADT	SR	SSI/DSS	GSI/BWC
WEIGHTS:	0%/0% /20%	0%/20%	20%	0%/20%	0%/20%
AUTO. QUALIFYING LEVELS:	N/N/N	N/N	N	N/2	N/N

PASSING LEVELS ARE NOT NECESSARY IN TEBS VERSION 3.0

* = ESTIMATED
M = MISSING

DIST	COUNTY	CONT-SEC-STR	TYPE WORK	CPV RANK	SCORE	CSI/ FSI/ CPV	ESI/ ADT	SR	SSI/ DSS	GSI/ BWC	RDWY WIDTH	PROJECT COST	ACCUMULATIVE PROJECT COST
1	GRAYSON	AA01-43-001	RP	N/A	64*	8/8/$2,055	5/55	31.0*	6/3	2/0	15.0	$113,000	$113,000
1	FANNIN	AA06-30-001	RP	N/A	64*	7/8/$800	9/20	20.0*	3/3	2/0	12.0	$16,000	$129,000
1	GRAYSON	AA09-56-001	RP	N/A	64*	4/7/$500	8/20	22.0*	6/4	2/0	14.0	$10,000	$139,000
1	FANNIN	AA05-24-001	RP	N/A	64*	5/7/$650	9/20	21.0*	6/3	3/0	13.0	$13,000	$152,000
1	FANNIN	AA01-22-001	RP	N/A	64*	4/7/$500	9/20	21.0*	6/4	2/0	14.0	$10,000	$162,000
1	DELTA	AA01-23-001	RP	N/A	64*	8/7/$1,080	7/25	21.0*	6/3	3/0	11.0	$27,000	$189,000
1	RAINS	AA01-01-001	RP	N/A	64*	1/7/$260	2/50	31.0*	9/7	2/0	14.0	$13,000	$202,000
1	RAINS	AA01-15-001	RP	N/A	64*	6/6/$600	5/30	18.0*	9/6	1/0	1.0	$18,000	$220,000
1	LAMAR	AA05-42-003	RP	N/A	64*	1/6/$187	3/75	40.0*	9/7	2/0	14.0	$14,000	$234,000
1	LAMAR	AA01-43-001	RP	N/A	64*	8/4/$1,200	5/25	20.0*	6/3	2/0	12.0	$30,000	$264,000
1	DELTA	AA01-06-003	RP	N/A	64*	8/4/$1,280	8/25	18.0*	6/3	3/0	14.0	$32,000	$296,000
1	HOPKINS	AA05-31-002	RP	N/A	64*	3/3/$433	8/30	23.0*	9/6	2/0	12.0	$13,000	$309,000
1	FANNIN	AA02-56-001	RP	N/A	64*	7/3/$800	8/25	24.0*	6/3*	3/0	12.0	$20,000	$329,000
1	LAMAR	AA03-31-001	RH	N/A	64*	0/3/$67	1/165	64.0*	9/7*	2/0	15.0	$11,000	$340,000
1	HUNT	AA11-89-001	RP	N/A	64*	6/2/$556	5/45	34.0*	6/4	1/0	15.0	$25,000	$365,000
1	HUNT	AA02-82-001	RP	N/A	64*	3/2/$333	7/45	23.0*	9/7	2/0	11.0	$15,000	$380,000
1	RED RIVER	AA01-05-001	RP	N/A	64*	5/2/$600	3/25	24.0*	6/4	1/0	10.0	$15,000	$395,000
1	HUNT	AA03-34-001	RP	N/A	64*	5/2/$496	7/35	22.0*	9/6*	2/0	12.0	$17,000	$412,000
1	LAMAR	AA02-00-001	RP	N/A	64*	4/1/$467	8/30	36.0*	6/3	2/0	16.0	$14,000	$426,000
1	HUNT	AA08-91-001	RP	N/A	64*	6/0/$760	7/25	20.0*	6/4	1/0	12.0	$19,000	$445,000
1	RED RIVER	AA02-42-001	RP	N/A	64*	8/0/$1,240	3/25	19.0*	6/3	1/0	11.0	$31,000	$476,000
2	ERATH	AA03-57-001	RH	N/A	64*	1/9/$173	1/75	59.0*	9/6	1/0	14.0	$13,000	$489,000
2	ERATH	AA04-07-001	RH	N/A	64*	1/9/$180	8/50	51.0*	9/5	2/0	12.0	$9,000	$498,000
2	PARKER	AA01-96-001	RH	N/A	64*	4/8/$361	2/72	53.0*	6/4	2/0	19.0	$26,000	$524,000
2	WISE	AA01-97-001	RP	N/A	64*	5/7/$527	2/55	31.0*	9/6	2/0	12.0	$29,000	$553,000
2	PARKER	AA04-41-001	RP	N/A	64*	2/6/$264	5/72	48.0*	6/6	2/0	17.0	$19,000	$572,000
2	ERATH	AA01-07-001	RP	N/A	64*	5/6/$500	1/50	29.0*	6/6	1/0	12.0	$25,000	$597,000
2	PALO PINTO	AA01-20-001	RP	N/A	64*	2/6/$167	0/150	50.0*	9/7	3/0	18.0	$25,000	$622,000
2	JOHNSON	MU05-64-001	RP	N/A	64*	1/6/$240	8/50	44.0*	9/6	2/0	14.0	$12,000	$634,000
2	ERATH	AA03-51-002	RP	N/A	64*	1/6/$240	6/50	44.0*	9/6	1/0	16.0	$12,000	$646,000
2	PARKER	AA03-33-002	RP	N/A	64*	4/5/$420	1/50	32.0*	6/6	1/0	14.0	$21,000	$667,000
2	PALO PINTO	AA01-20-002	RP	N/A	64*	5/5/$500	1/50	30.0*	6/6	1/0	12.0	$25,000	$692,000
2	JACK	AA01-81-002	RP	N/A	64*	2/5/$300	1/50	38.0*	9/6	1/0	16.0	$15,000	$707,000
2	WISE	AA04-40-002	RP	N/A	64*	5/4/$480	3/50	31.0*	9/6	1/0	12.0	$24,000	$731,000

TEXAS BRIDGE SORTER

VERSION 3.0

NON-QUALIFYING BRIDGE PROJECTS

DATA SET: BRIDGES ELIGIBLE FOR FEDERAL FUNDING

CRITERIA USED FOR SCREENING

QUALIFYING: SCORE >= 75
MARGINAL: 65 <= SCORE < 75

REHAB COST = $25/SQ FT
REPLACE COST = $35/SQ FT

	CSI/FSI/CPV	ESI/ADT	SR	SSI/DSS	GSI/BWC
WEIGHTS:	0%/C% /20%	0%/20%	20%	0%/20%	0%/20%
AUTO. QUALIFYING LEVELS:	N/N/N	N/N	N	N/2	N/N

PASSING LEVELS ARE NOT NECESSARY IN TEBS VERSION 3.0

* = ESTIMATED
M = MISSING

DIST	COUNTY	CONT-SEC-STR	TYPE WORK	CPV RANK	SCORE	CSI/ FSI/ CPV	ESI/ ADT	SR	SSI/ DSS	GSI/ BWC	RDWY WIDTH	PROJECT COST	ACCUMULATIVE PROJECT COST
2	JACK	AA01-45-001	RP	N/A	64*	2/4/$200	0/100	46.0*	9/7	1/0	16.0	$20,000	$751,000
2	JOHNSON	AA02-70-001	RP	N/A	64*	5/4/$483	2/120	43.0*	9/6	2/0	17.0	$58,000	$809,000
2	ERATH	AA02-70-001	RP	N/A	64*	7/3/$820	3/50	22.0*	6/6	1/0	13.0	$41,000	$850,000
2	PARKER	AA04-87-001	RP	N/A	64*	2/3/$300	1/50	38.0*	9/6	2/0	16.0	$15,000	$865,000
2	WISE	AA02-01-001	RP	N/A	64*	5/3/$500	8/50	20.0*	9/7	2/0	13.0	$25,000	$890,000
2	PARKER	AA03-86-001	RP	N/A	64*	7/2/$880	8/50	25.0*	9/5	2/0	15.0	$44,000	$934,000
2	JOHNSON	AA03-34-001	RP	N/A	64*	6/2/$1,765	0/235	30.0*	6/6	1/0	18.0	$503,000	$1,437,000
3	ARCHER	AA01-58-001	RP	N/A	64*	1/3/$220	4/50	43.0*	9/6	2/0	19.0	$11,000	$1,448,000
3	MONTAGUE	AA02-72-001	RP	N/A	64*	6/1/$582	2/55	29.0*	9/6	1/0	16.0	$32,000	$1,480,000
4	ROBERTS	B000-80-001	RH	N/A	64*	2/5/$200	6/100	66.0*	9/6	2/0	18.0	$20,000	$1,500,000
5	SWISHER	AA01-93-007	RP	N/A	64*	6/8/$625	3/40	30.0*	6/4	1/0	16.0	$25,000	$1,525,000
7	TOM GREEN	AA02-80-017	RH	N/A	64*	0/9/$68	4/220	65.0*	9/7	1/0	19.0	$15,000	$1,540,000
8	NOLAN	AA02-65-001	RH	N/A	64*	0/8/$129	2/70	63.0*	9/6	1/0	16.0	$9,000	$1,549,000
8	FISHER	AA01-33-001	RP	N/A	64*	7/5/$1,585	1/65	35.0*	6/3	2/0	19.0	$103,000	$1,652,000
8	MITCHELL	AA01-47-001	RP	N/A	64*	7/4/$1,271	1/70	23.0*	9/6	1/0	16.0	$89,000	$1,741,000
8	MITCHELL	AA02-65-002	RP	N/A	64*	7/4/$940	6/50	22.0*	9/6	1/0	16.0	$47,000	$1,788,000
8	NOLAN	AA02-60-001	RP	N/A	64*	4/4/$425	8/40	30.0*	9/5	2/0	20.0	$17,000	$1,805,000
8	MITCHELL	AA01-42-002	RP	N/A	64*	9/3/$13,867	9/30	17.0*	6/3	1/0	12.0	$416,000	$2,221,000
8	MITCHELL	AA02-23-001	RP	N/A	64*	9/1/$2,200	9/25	17.0*	6/3	1/0	12.0	$55,000	$2,276,000
9	LIMESTONE	AA03-95-001	RH	N/A	64*	1/5/$169	2/65	51.0*	9/6	1/0	16.0	$11,000	$2,287,000
9	BOSQUE	AA01-21-001	RP	N/A	64*	2/5/$250	2/40	39.0*	9/5	1/0	16.0	$10,000	$2,297,000
9	HILL	AA02-57-006	RP	N/A	64*	2/3/$250	2/60	48.0*	9/6	1/0	16.0	$15,000	$2,312,000
9	FALLS	AA02-54-005	RP	N/A	64*	7/2/$733	7/30	28.0*	6/3	2/0	17.0	$22,000	$2,334,000
9	FALLS	AA02-37-001	RP	N/A	64*	5/2/$486	1/70	39.0*	9/5	1/0	18.0	$34,000	$2,368,000
9	MCLENNAN	AA04-40-001	RP	N/A	64*	5/2/$514	4/70	35.0*	6/6	1/0	16.0	$36,000	$2,404,000
9	LIMESTONE	AA05-37-001	RP	N/A	64*	1/2/$200	2/50	34.0*	9/7	1/0	14.0	$10,000	$2,414,000
9	LIMESTONE	AA04-16-001	RP	N/A	64*	1/2/$185	3/65	37.0*	9/7	1/0	13.0	$12,000	$2,426,000
9	CORYELL	AA01-94-002	RP	N/A	64*	1/1/$214	4/70	38.0*	9/7	2/0	19.0	$15,000	$2,441,000
9	CORYELL	AA02-26-002	RP	N/A	64*	6/1/$580	1/50	27.0*	9/6	1/0	12.0	$29,000	$2,470,000
9	FALLS	AA04-14-001	RP	N/A	64*	5/1/$425	5/80	30.0*	9/7	1/0	16.0	$34,000	$2,504,000
9	HILL	AA01-91-001	RP	N/A	64*	8/0/$1,429	4/35	24.0*	6/3	1/0	16.0	$50,000	$2,554,000
9	HILL	AA01-33-001	RP	N/A	64*	7/0/$800	8/25	24.0*	6/3	2/0	16.0	$20,000	$2,574,000
9	FALLS	AA01-63-001	RP	N/A	64*	5/0/$489	3/45	26.0*	6/6	1/0	17.0	$22,000	$2,596,000
9	MCLENNAN	AA08-28-001	RP	N/A	64*	5/0/$600	7/25	28.0*	9/3	1/0	16.0	$15,000	$2,611,000

T E X A S   B R I D G E   S O R T E R

VERSION 3.0

NON-QUALIFYING BRIDGE PROJECTS

DATA SET: BRIDGES ELIGIBLE FOR FEDERAL FUNDING

QUALIFYING: SCORE >= 75
MARGINAL: 55 <= SCORE < 75

CRITERIA USED FOR SCREENING

	CSI/FSI/CPV	ESI/ADT	SR	SSI/DSS	GSI/BWC
WEIGHTS:	03/08 /20%	08/20%	20%	08/20%	08/20%
AUTO. QUALIFYING LEVELS:	N/N/N	N/N	N	N/2	N/N

PASSING LEVELS ARE NOT NECESSARY IN TEDS VERSION 3.0

REHAB COST = $25/SQ FT
REPLACE COST = $35/SQ FT

* = ESTIMATED
M = MISSING

DIST	COUNTY	CONT-SEC-STR	TYPE WORK	CPV RANK	SCORE	CSI/ FSI/ CPV	ESI/ ADT	SR	SSI/ DSS	GSI/ BWC	RDWY WIDTH	PROJECT COST	ACCUMULATIVE PROJECT COST
9	BELL	AA01-28-001	RP	N/A	64*	5/0/$450	6/60	35.0*	9/6	1/0	19.0	$27,000	$2,638,000
9	HAMILTON	AA02-34-001	RP	N/A	64*	9/0/$2,600	4/25	16.0*	6/3	1/0	12.0	$65,000	$2,703,000
9	HILL	AA03-79-001	RP	N/A	64*	6/0/$580	2/50	27.0*	9/6	1/0	16.0	$29,000	$2,732,000
10	SMITH	AA05-29-001	RP	N/A	64*	1/8/$217	6/60	48.0*	6/6	2/0	14.0	$13,000	$2,745,000
10	VAN ZANDT	AA01-15-002	RP	N/A	64*	4/8/$239	3/255	49.0*	9/7	1/0	19.0	$61,000	$2,806,000
10	CHEROKEE	AA01-57-001	RH	N/A	64*	0/8/$119	6/67	53.0*	9/6	1/0	17.0	$8,000	$2,814,000
10	RUSK	AA07-24-003	RP	N/A	64*	6/6/$700	1/50	39.0*	6/3	3/0	20.0	$35,000	$2,849,000
10	WOOD	AA01-70-002	RP	N/A	64*	3/6/$250	6/83	39.0*	9/7*	3/0	15.0	$22,000	$2,871,000
10	SMITH	AA05-15-001	RP	N/A	64*	3/5/$308	3/65	44.0*	9/6	2/0	16.0	$20,000	$2,891,000
10	GREGG	AA00-95-001	RP	N/A	64*	5/4/$390	6/100	45.0*	9/6	2/0	19.0	$39,000	$2,930,000
10	SMITH	AA04-75-002	RP	N/A	64*	3/4/$308	2/39	29.0*	9/6	2/0	16.0	$12,000	$2,942,000
10	ANDERSON	AA03-46-001	RP	N/A	64*	6/1/$700	8/20	17.0*	6/4	1/0	9.0	$14,000	$2,956,000
11	SABINE	AA02-21-002	RP	N/A	64*	3/8/$267	1/90	38.0*	9/7	2/0	14.0	$24,000	$2,980,000
11	ANGELINA	AA04-33-001	RP	N/A	64*	5/7/$480	4/50	36.0*	9/5	3/0	14.0	$24,000	$3,004,000
11	SHELBY	AA02-01-004	RP	N/A	64*	3/7/$263	1/95	38.0*	9/7	2/0	14.0	$25,000	$3,029,000
11	HOUSTON	AA03-02-002	RP	N/A	64*	3/7/$214	7/28	38.0*	9/4	2/0	14.0	$6,000	$3,035,000
11	NACOGDOCHES	AA03-55-001	RP	N/A	64*	3/7/$242	1/95	40.0*	9/7	3/0	16.0	$23,000	$3,058,000
11	HOUSTON	AA02-13-001	RP	N/A	64*	1/7/$175	1/80	42.0*	9/7	2/0	14.0	$14,000	$3,072,000
11	SHELBY	AA01-74-002	RP	N/A	64*	5/7/$560	8/25	24.0*	6/4	2/0	12.0	$14,000	$3,086,000
11	SHELBY	AA01-22-001	RP	N/A	64*	2/7/$300	7/40	37.0*	6/5	2/0	14.0	$12,000	$3,098,000
11	NACOGDOCHES	AA07-65-001	RP	N/A	64*	6/7/$525	8/40	26.0*	9/5	3/0	14.0	$21,000	$3,119,000
11	SABINE	AA01-78-001	RP	N/A	64*	4/6/$500	7/30	23.0*	9/5	2/0	12.0	$15,000	$3,134,000
11	HOUSTON	AA02-27-001	RP	N/A	64*	5/3/$650	6/20	22.0*	9/3	2/0	14.0	$13,000	$3,147,000
11	POLK	AA03-12-001	RP	N/A	64*	7/3/$767	8/30	18.0*	9/5	2/0	14.0	$23,000	$3,170,000
11	SAN JACINTO	AA01-04-001	RP	N/A	64*	3/3/$375	8/40	29.0*	6/6	2/0	15.0	$15,000	$3,185,000
11	SAN JACINTO	AA03-05-002	RP	N/A	64*	3/3/$400	3/30	24.0*	9/6	2/0	14.0	$12,000	$3,197,000
11	HOUSTON	AA01-54-001	RP	N/A	64*	8/2/$1,200	6/30	22.0*	9/3	2/0	14.0	$36,000	$3,233,000
11	SAN JACINTO	AA01-55-001	RP	N/A	64*	5/2/$500	6/50	21.0*	9/7	2/0	12.0	$25,000	$3,258,000
11	POLK	AA02-44-004	RP	N/A	64*	7/1/$800	6/20	16.0*	6/4	2/0	14.0	$16,000	$3,274,000
11	POLK	AA01-86-001	RP	N/A	64*	7/0/$800	9/20	20.0*	6/3	2/0	15.0	$16,000	$3,290,000
11	POLK	AA01-56-001	RP	N/A	64*	6/0/$750	6/20	19.0*	6/3	2/0	14.0	$15,000	$3,305,000
12	BRAZORIA	0000-30-001	RP	N/A	64*	5/8/$33	3/7,380	38.0*	6/4	3/1	27.0	$240,000	$3,545,000
12	HARRIS	C014-26-001	RP	N/A	64*	1/7/$25	5/805	31.0*	6/5	2/1	26.0	$20,000	$3,565,000

SKIP IN LISTING

TEXAS BRIDGE SORTER

VERSION 3.0

NON-QUALIFYING BRIDGE PROJECTS

DATA SET: BRIDGES ELIGIBLE FOR FEDERAL FUNDING

QUALIFYING: SCORE >= 75
MARGINAL: 65 <= SCORE < 75

CRITERIA USED FOR SCREENING

	CSI/FSI/CPV	ESI/ADT	SR	SSI/DSS	GSI/BWC
WEIGHTS:	0%/0% /20%	0%/20%	20%	0%/20%	0%/20%
AUTO. QUALIFYING LEVELS:	N/N/N	N/N	N	N/2	N/N

PASSING LEVELS ARE NOT NECESSARY IN TEBS VERSION 3.0

REHAB COST = $25/SQ FT
REPLACE COST = $35/SQ FT

* = ESTIMATED
M = MISSING

DIST	COUNTY	CONT-SEC-STR	TYPE WORK	CPV RANK	SCORE	CSI/ FSI/ CPV	ESI/ ADT	SR	SSI/ DSS	GSI/ BWC	RDWY WIDTH	PROJECT COST	ACCUMULATIVE PROJECT COST
13	COLLIN	U000-75-001	RH	N/A	14*	8/4/$22,000	*9/M	78.0*	6/5	3/1	24.0	$22,000	$355,570,510
25	HALL	AA02-41-001	RP	N/A	14*	9/7/$4,200	4/15	49.0*	9/7	2/1	M	$63,000	$355,633,510
9	HILL	AA01-92-002	RH	N/A	13*	3/8/$2,400	2/45	79.0*	9/8	3/1	24.0	$108,000	$355,741,510
14	TRAVIS	AA15-41-001	RH	N/A	13*	9/9/$4,840	8/25	70.0*	9/7	2/1	20.0	$121,000	$355,862,510
15	GOLIAD	AA01-57-001	RH	N/A	13*	9/5/$2,360	4/25	77.0*	9/7	2/1	23.0	$59,000	$355,921,510
21	HIDALGO	S001-05-001	RP	N/A	13*	9/2/$46,000	*9/0	34.0*	9/8	2/1	24.0	$46,000	$355,967,510
25	HALL	AA01-22-001	RP	N/A	13*	7/8/$1,267	8/15	43.0*	9/8	2/1	M	$19,000	$355,986,510
25	COLLINGSWORTH	AA01-06-001	RH	N/A	13*	5/7/$700	5/10	53.0*	9/8	2/1	M	$7,000	$355,993,510
25	WHEELER	AA02-82-001	RH	N/A	13*	7/6/$1,700	9/10	54.0*	9/7	2/1	M	$17,000	$356,010,510
1	HOPKINS	AA01-45-004	RP	N/A	12*	5/5/$1,100	8/10	49.0*	9/8*	2/1	M	$11,000	$356,021,510
9	BOSQUE	AA02-04-001	RH	N/A	12*	8/8/$1,675	6/40	80.0*	9/8	3/1	24.0	$67,000	$356,088,510
12	WALLER	AA01-39-001	RH	N/A	12*	8/6/$2,200	5/30	61.0*	9/8	4/1	26.0	$66,000	$356,154,510
14	GILLESPIE	AA01-85-001	RP	N/A	12*	9/7/$10,200	8/25	47.0*	9/8	2/1	22.0	$255,000	$356,409,510
16	KARNES	AA01-36-001	RH	N/A	12*	7/7/$800	6/25	79.0*	9/8	2/1	23.0	$20,000	$356,429,510
25	HALL	AA01-26-001	RP	N/A	11*	8/5/$1,667	8/15	47.0*	9/8	2/1	M	$25,000	$356,454,510
14	MASON	B003-20-001	RH	N/A	10*	9/7/$3,640	9/25	59.0*	9/8	1/1	24.0	$91,000	$356,545,510
14	MASON	B003-30-001	RH	N/A	10*	9/7/$3,720	9/25	56.0*	9/8	2/1	24.0	$93,000	$356,638,510
25	COLLINGSWORTH	AA02-07-001	RH	N/A	10*	7/9/$1,000	5/15	57.0*	9/8	2/1	21.0	$15,000	$356,653,510
25	FOARD	AA02-64-001	RH	N/A	10*	7/8/$1,000	7/15	59.0*	9/8	2/1	M	$15,000	$356,668,510
1	HOPKINS	AA01-10-002	RP	N/A	9*	5/4/$2,750	9/4	48.0*	9/8*	2/1	M	$11,000	$356,679,510
14	MASON	B002-95-002	RH	N/A	9*	9/7/$4,230	9/25	61.0*	9/8	2/1	24.0	$107,000	$356,786,510
4	DEAF SMITH	AA02-59-001	RH	N/A	8*	8/4/$1,150	4/20	75.0*	9/8	3/1	24.0	$23,000	$356,809,510
25	CHILDRESS	AA02-19-001	RH	N/A	7*	8/9/$2,400	9/10	59.0*	9/8	2/1	22.0	$24,000	$356,833,510
25	FOARD	AA01-87-001	RH	N/A	7*	7/9/$1,700	8/10	62.0*	9/8	2/1	20.0	$17,000	$356,850,510
25	CHILDRESS	AA01-34-001	RH	N/A	7*	8/9/$2,400	9/10	59.0*	9/8	2/1	22.0	$24,000	$356,874,510
25	CHILDRESS	AA01-34-002	RH	N/A	7*	7/9/$1,800	9/10	59.0*	9/8	2/1	22.0	$18,000	$356,892,510
25	CHILDRESS	AA01-72-002	RH	N/A	7*	8/8/$2,400	9/10	59.0*	9/8	2/1	22.0	$24,000	$356,916,510

	CPV			
	MAX	MIN	N	PCTN
CPVPTL				
0	2,037,000	3,975	436	4
10	3,950	1,403	965	10
20	1,400	903	967	10
30	900	658	966	10
40	657	507	899	9
50	500	395	1,048	11
60	394	301	815	8
70	300	218	1,117	12
80	217	134	961	10
90	133	39	974	10
100	38	0	544	6

	W_ADT			
	MAX	MIN	N	PCTN
ADTPTL				
0	13	0	348	4
10	24	15	550	6
20	29	25	1,079	11
30	39	30	1,289	13
40	48	40	913	9
50	54	50	996	10
60	71	55	1,058	11
70	99	72	824	9
80	189	100	1,114	12
90	955	190	968	10
100	854,034	960	538	6

	SR			
	MAX	MIN	N	PCTN
SRPTL				
0	80	73	402	4
10	72	57	941	10
20	56	49	1000	10
30	48	44	883	9
40	43	38	1048	11
50	37	33	998	10
60	32	29	905	9
70	28	25	885	9
80	24	21	1072	11
90	20	18	740	8
100	17	2	818	8

	DSS			
	MAX	MIN	N	PCTN
DSSPTL				
0	9	9	4	0
11	8	8	1025	11
36	7	7	2425	25
60	6	6	2405	25
70	5	5	925	10
83	4	4	1299	13
94	3	3	1040	11
99	2	1	497	5
100	0	0	72	1

	SSI			
	MAX	MIN	N	PCTN
SSIPTL				
63	9	9	6128	63
76	6	6	3132	32
100	3	0	432	4

	GSI			
	MAX	MIN	N	PCTN
GSIPTL				
0	9	5	46	0
2	4	4	146	2
13	3	3	1054	11
63	2	2	4869	50
100	1	0	3561	37

	CSI			
	MAX	MIN	N	PCTN
CSIPTL				
6	9	9	560	6
17	8	8	1125	12
29	7	7	1102	11
39	6	6	996	10
51	5	5	1152	12
62	4	4	1028	11
72	3	3	1044	11
84	2	2	1109	11
95	1	1	1054	11
100	0	0	522	5

	ESI			
	MAX	MIN	N	PCTN
ESIPTL				
6	9	9	578	6
18	8	8	1125	12
28	7	7	1018	11
40	6	6	1113	12
51	5	5	1115	12
62	4	4	1064	11
72	3	3	1004	10
84	2	2	1102	11
95	1	1	1065	11
100	0	0	503	5

	FSI			
	MAX	MIN	N	PCTN
FSIPTL				
6	9	9	540	6
17	8	8	1100	11
29	7	7	1182	12
39	6	6	995	10
50	5	5	1066	11
62	4	4	1087	11
72	3	3	1046	11
83	2	2	1075	11
94	1	1	1065	11
100	0	0	536	6

	CPI			
	MAX	MIN	N	PCTN
CPIPTL				
0	45,600,000	164,000	435	4
10	163,000	70,000	949	10
20	69,000	45,000	957	10
30	44,000	34,000	919	9
40	33,000	26,000	1,019	11
50	25,000	22,000	919	9
60	21,000	19,000	967	10
70	18,000	16,000	791	8
80	15,000	14,000	1,067	11
90	13,000	11,000	1,076	11
100	10,000	1,000	593	6

	W_HOL			
	MAX	MIN	N	PCTN
HOLPTL				
0	0	0	557	6
10	1	0	939	10
20	3	2	1551	16
30	4	4	1158	12
40	5	5	1105	11
50	6	6	960	10
70	8	7	1301	13
80	10	9	685	7
90	19	11	902	9
100	99	20	524	5

	CRSUMC			
	MAX	MIN	N	PCTN
CS1				
0	198	160	522	5
1	159	140	1054	11
2	139	126	1109	11
3	125	115	1044	11
4	114	105	1028	11
5	104	95	1152	12
6	94	84	996	10
7	83	69	1102	11
8	68	43	1125	12
9	42	0	560	6

CSI	CRSUMC MAX	CRSUMC MIN	CRSUMC N	CRSUMC PCTN
0	196	160	503	5
1	159	137	1065	11
2	136	120	1102	11
3	119	109	1004	10
4	108	101	1064	11
5	100	92	1115	12
6	91	76	1118	12
7	75	60	1018	11
8	59	35	1125	12
9	34	0	578	6

FSI	CRSUMF MAX	CRSUMF MIN	CRSUMF N	CRSUMF PCTN
0	600	552	536	6
1	551	500	1065	11
2	499	472	1075	11
3	471	442	1046	11
4	441	418	1087	11
5	417	392	1066	11
6	391	362	995	10
7	361	323	1182	12
8	322	267	1100	11
9	266	124	540	6

	ADTPTL										
	0	10	20	30	40	50	60	70	80	90	100
	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI	ESI
	0 TO 9	0 TO 9	0 TO 9	0 TO 9	0 TO 9	0 TO 9	0 TO 9	0 TO 9	0 TO 9	0 TO 9	0 TO 9
ADLPTL											
0	9	9	9	9	8	8	7	7	6	5	5
10	9	9	9	8	8	8	7	6	6	5	4
20	9	9	8	8	7	7	6	5	4	3	2
30	8	8	8	7	7	6	5	4	3	2	2
40	1	8	7	6	6	5	4	3	2	1	1
50	8	7	7	6	5	4	3	2	1	1	1
70	7	6	5	4	3	2	2	1	1	0	0
80	6	6	4	3	2	2	1	1	0	0	0
90	5	4	3	2	1	1	1	0	0	0	0
100	4	4	3	2	1	1	0	0	C	0	0

	ADTPTL										
	0	10	20	30	40	50	60	70	80	90	100
	CSI	CSI	CSI	CSI	CSI	CSI	CSI	CSI	CSI	CSI	CSI
	0 TO 9	0 TO 9	0 TO 9	0 TO 9	0 TO 9	0 TO 9	0 TO 9	0 TO 9	0 TO 9	0 TO 9	0 TO 9
CPIPTL											
0	9	9	9	9	8	8	8	7	6	5	5
10	9	9	9	8	8	8	7	6	5	4	4
20	9	9	8	8	8	7	6	5	4	3	3
30	9	8	8	8	7	6	5	4	3	2	2
40	8	8	8	7	6	5	4	3	2	2	1
50	8	8	7	6	5	4	3	2	2	1	1
60	8	7	6	5	4	3	2	2	1	1	0
70	7	7	6	4	3	3	2	1	1	0	0
80	6	6	5	3	2	2	1	1	0	0	0
90	5	5	4	2	2	1	1	0	0	0	0
100	5	4	3	2	1	1	0	0	0	0	0

APPENDIX D. A PROFILE OF THE STATE'S BRIDGE INVENTORY FIGURES AND TABLES

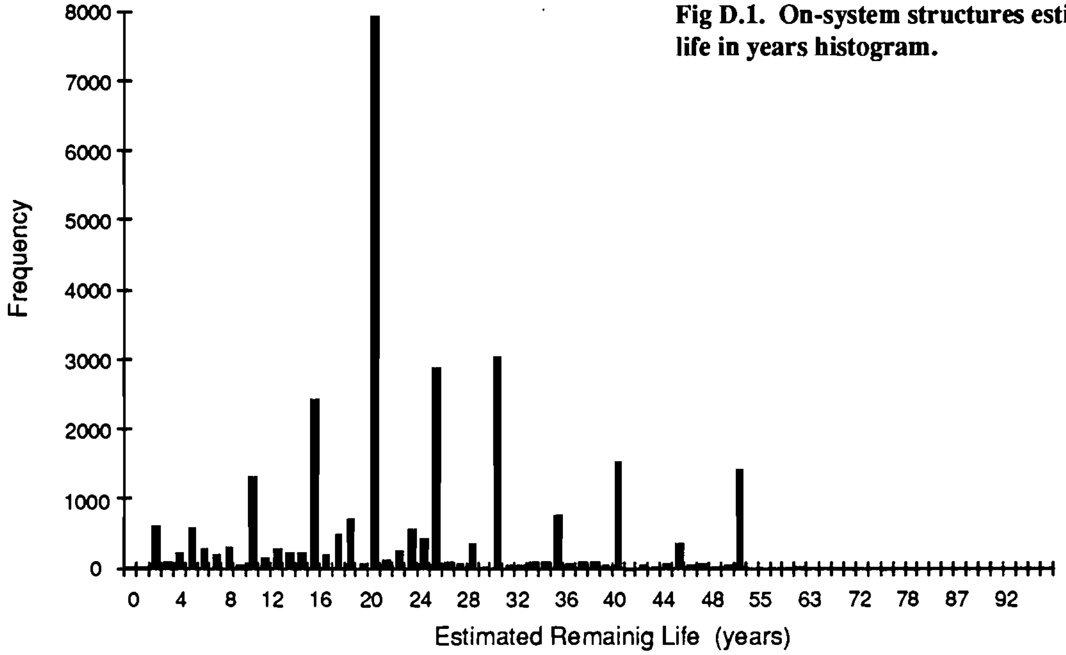


Fig D.1. On-system structures estimated remaining life in years histogram.

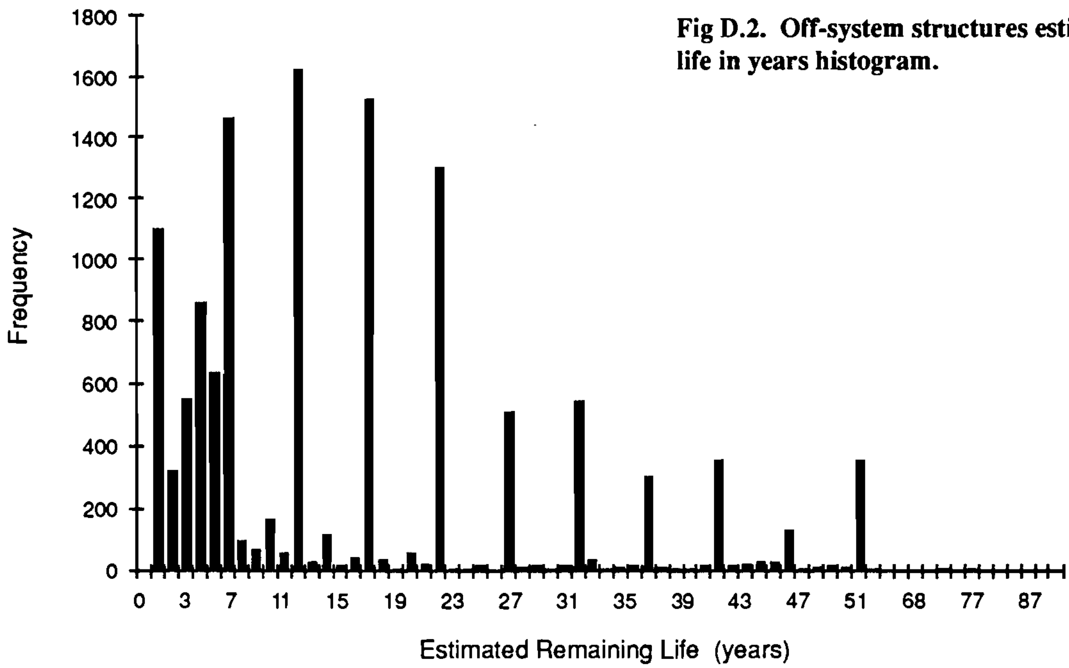


Fig D.2. Off-system structures estimated remaining life in years histogram.

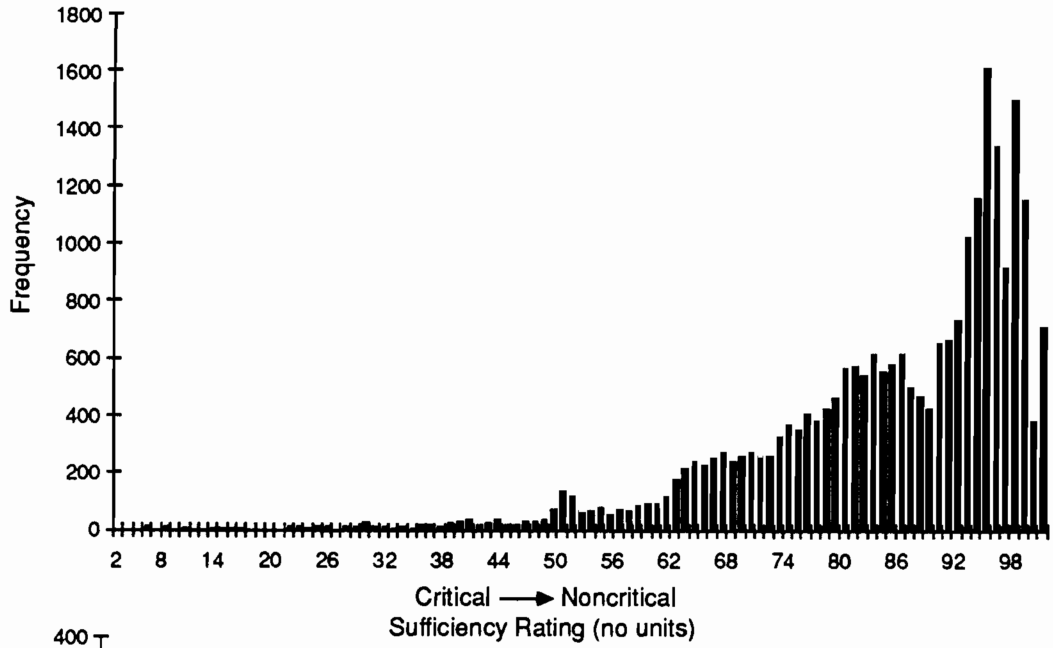


Fig D.3. On-system structures sufficiency ratings histogram.

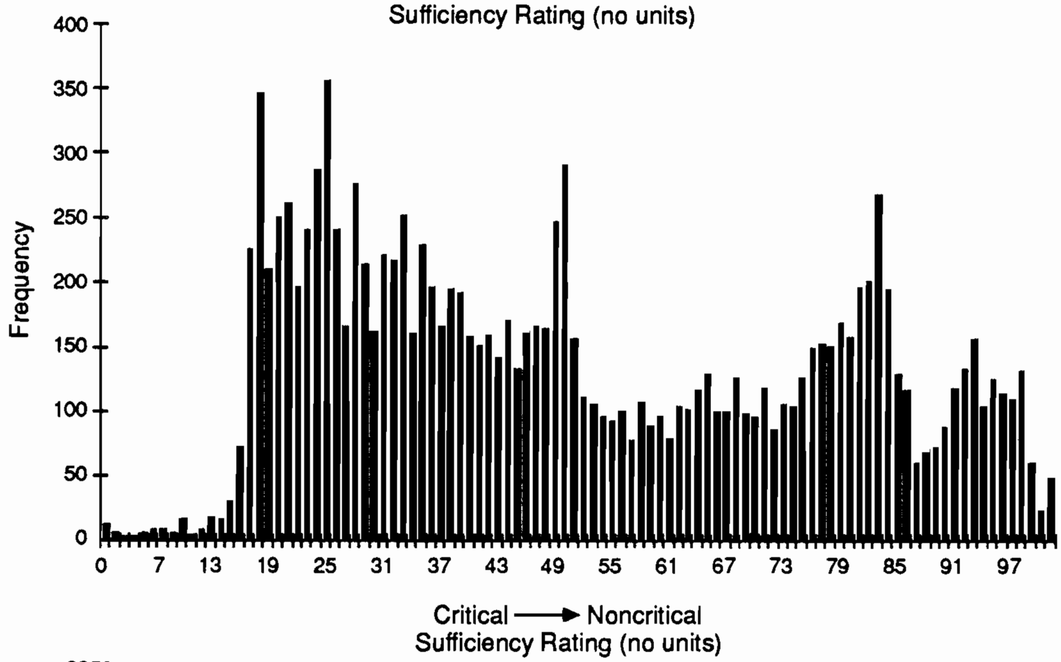


Fig D.4. Off-system structures sufficiency ratings histogram.

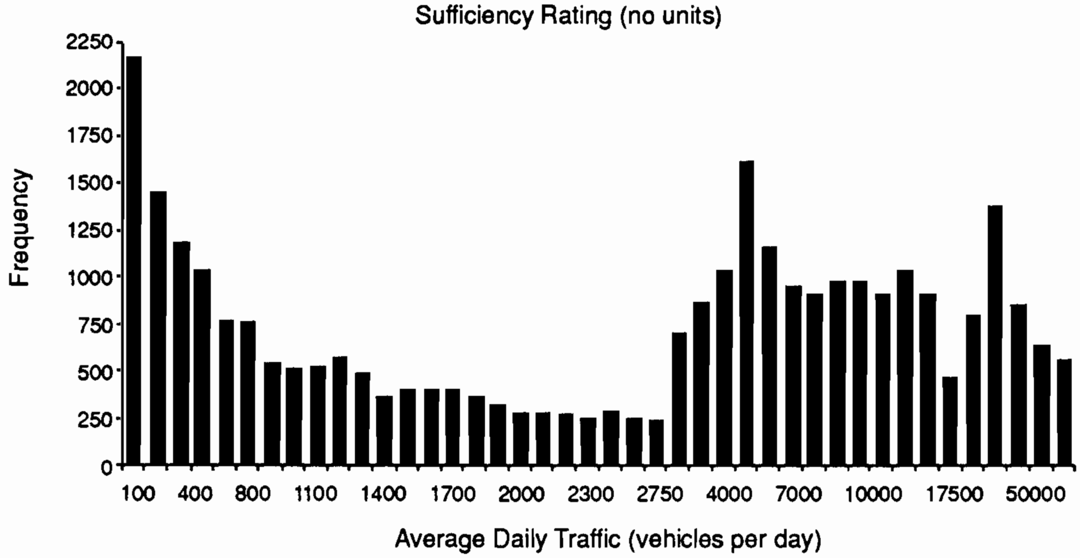


Fig D.5. On-system structures average daily traffic histogram.

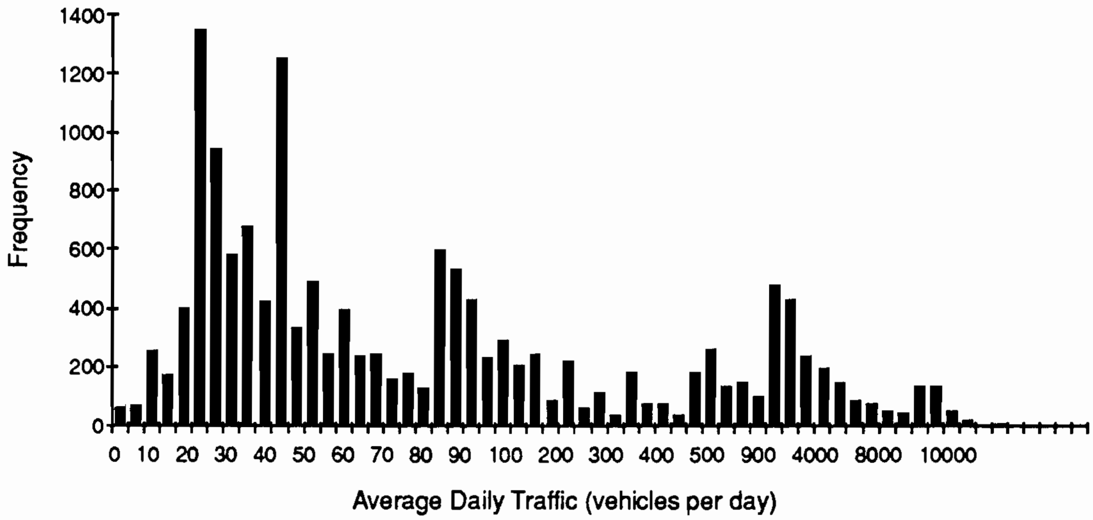


Fig D.6. Off-system structures average daily traffic histogram.

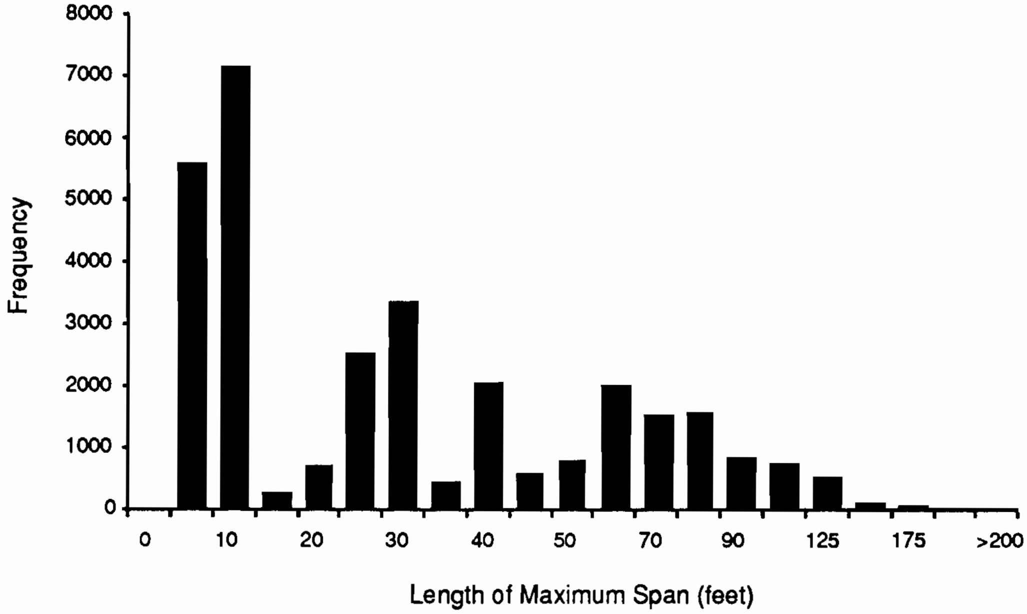


Fig D.7. On-system structures length of maximum span histogram.

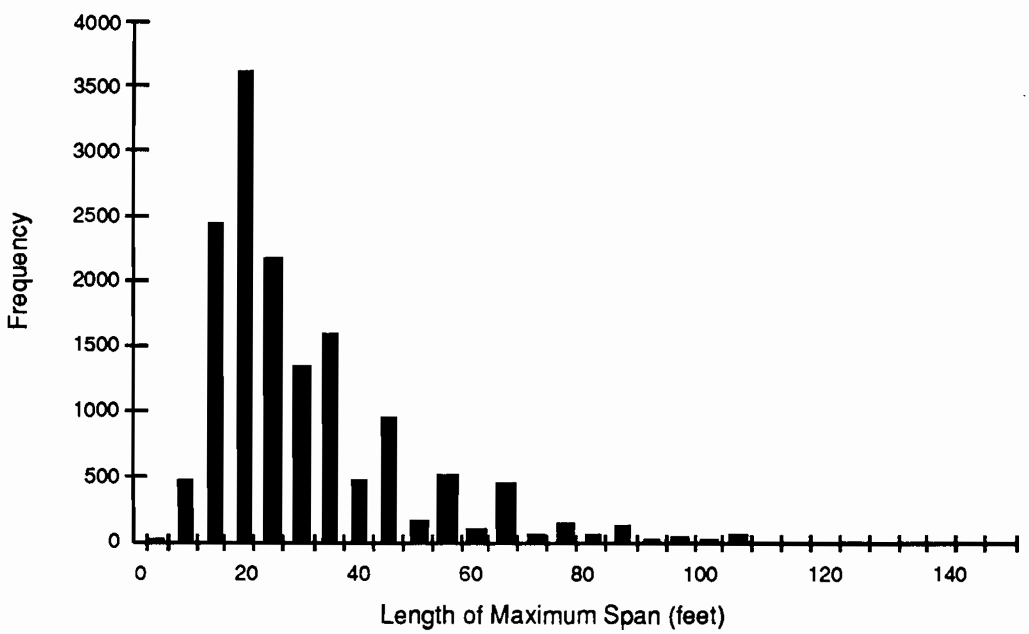


Fig D.8. Off-system structures length of maximum span histogram.

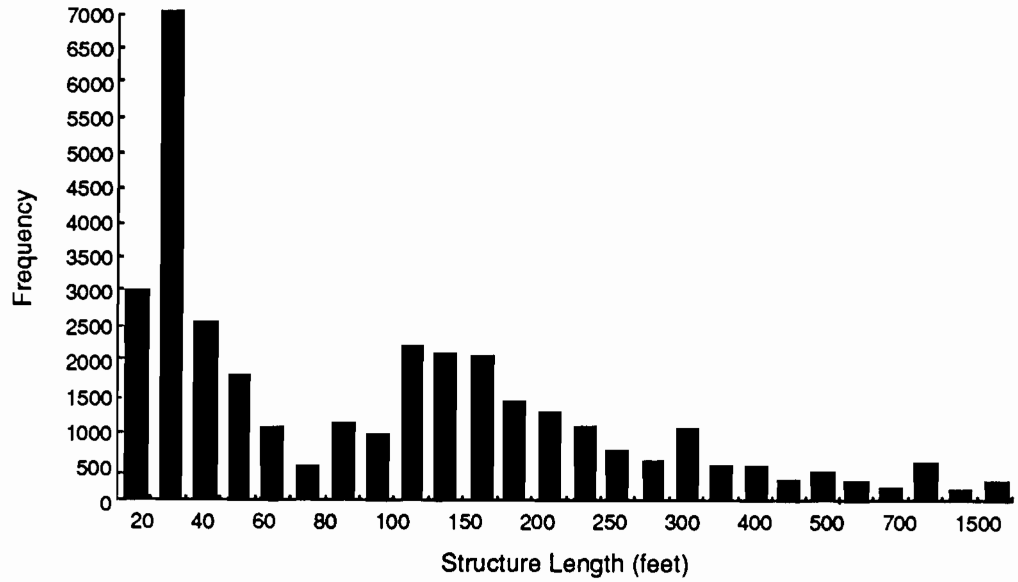


Fig D.9. On-system structures total length histogram.

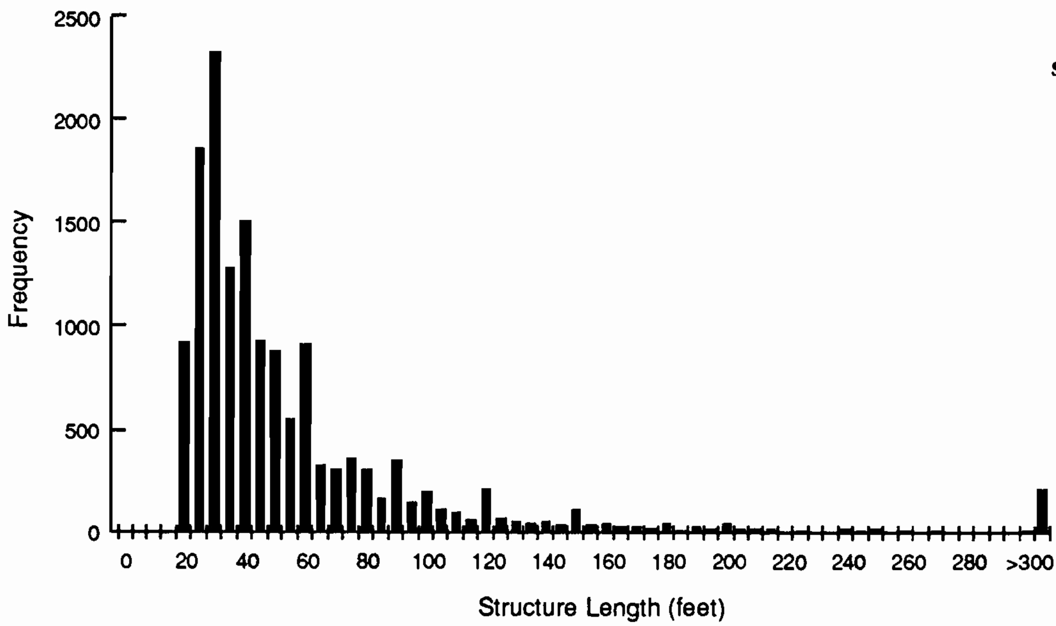
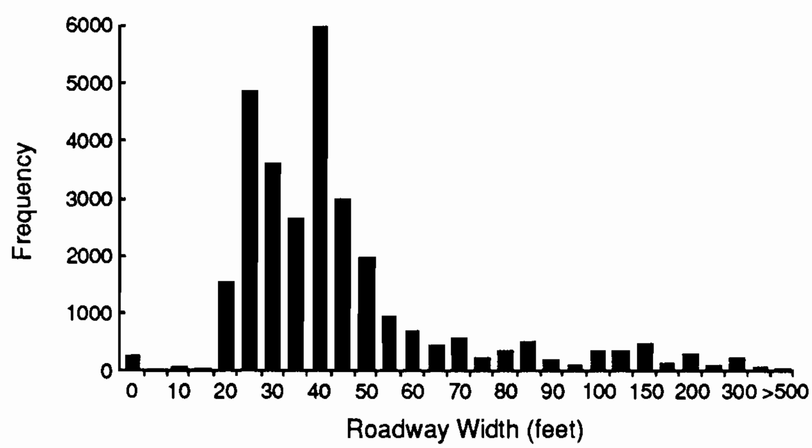


Fig D.10. Off-system structures total length histogram.

Fig D.11. On-system structures roadway width histogram.



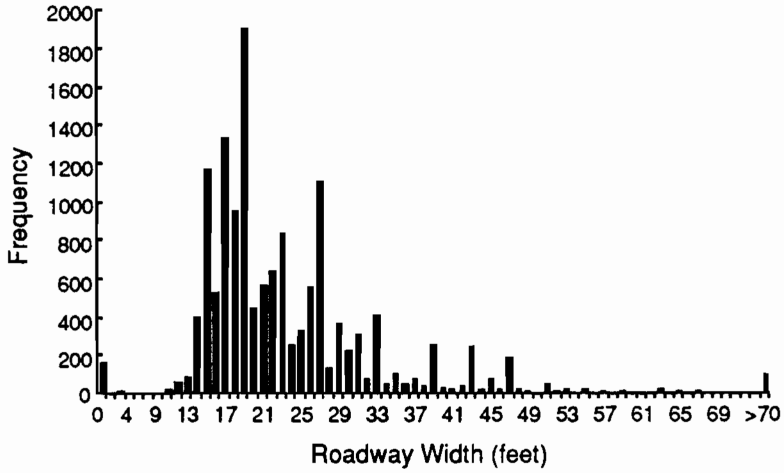


Fig D.12. Off-system structures roadway width histogram.

TABLE D.1. ON-SYSTEM STRUCTURES DESIGN LOAD

Design Load Class	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Unknown	92	0.3	92	0.3
H10	630	2.0	722	2.3
H15	6747	21.6	7469	24.0
HS15	20	0.1	7489	24.0
H20	12246	39.3	19735	63.3
HS20	10657	34.2	30392	97.5
HS20 + MOD	5	0.0	30397	97.5
Pedestrian	83	0.3	30480	97.8
Railroad	484	1.6	30964	99.3
Other	208	0.7	31172	100.0

TABLE D.2. OFF-SYSTEM STRUCTURES DESIGN LOAD

Design Load Class	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Unknown	11742	78.0	11472	78.0
H10	331	2.2	12073	80.2
H15	1274	8.5	13347	88.7
HS15	13	0.1	13360	88.7
H20	751	5.0	14111	93.7
HS20	745	4.9	14856	98.7
HS20 + MOD	4	0.0	14860	98.7
Pedestrian	14	0.1	14874	98.8
Railroad	142	0.9	15016	99.7
Other	38	0.3	15054	100.0

TABLE D.3. ON-SYSTEM STRUCTURES INVENTORY RATING

Inventory Rating	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Missing	313			
0	7	0.0	7	0.0
1	1	0.0	8	0.0
36	1	0.0	9	0.0
100	4	0.0	13	0.0
101	1	0.0	14	0.0
102	4	0.0	18	0.1
103	2	0.0	20	0.1
104	5	0.0	25	0.1
105	9	0.0	34	0.1
106	5	0.0	39	0.1
107	6	0.0	45	0.1
108	7	0.0	52	0.2
109	11	0.0	63	0.2
110	151	0.5	214	0.7
111	12	0.0	226	0.7
112	43	0.1	269	0.9
113	5	0.0	274	0.9
114	13	0.0	287	0.9
115	6624	21.4	6911	22.3
116	11	0.0	6922	22.3
117	7	0.0	6929	22.3
118	7	0.0	6936	22.4
119	8	0.0	6944	22.4
120	12169	39.2	19113	61.6
121	4	0.0	19117	61.6
122	3	0.0	19120	61.6
123	5	0.0	19125	61.7
124	4	0.0	19129	61.7
126	1	0.0	19130	61.7
127	6	0.0	19136	61.7
129	1	0.0	19137	61.7
131	2	0.0	19139	61.7
133	1	0.0	19140	61.7
134	1	0.0	19141	61.7
135	1	0.0	19142	61.7
136	2	0.0	19144	61.7
137	1	0.0	19145	61.7
139	1	0.0	19146	61.7
141	1	0.0	19147	61.7
144	1	0.0	19148	61.7
145	1	0.0	19149	61.7
148	1	0.0	19150	61.7
150	2	0.0	19152	61.7
151	4	0.0	19156	61.7
155	1	0.0	19157	61.8
156	2	0.0	19159	61.8
159	1	0.0	19160	61.8
163	1	0.0	19161	61.8
165	2	0.0	19163	61.8
180	1	0.0	19164	61.8
206	2	0.0	19166	61.8
207	1	0.0	19167	61.8
208	1	0.0	19168	61.8
209	2	0.0	19170	61.8
214	2	0.0	19172	61.8
218	3	0.0	19175	61.8
219	2	0.0	19177	61.8
220	110	0.4	19287	61.8
221	1	0.0	19288	61.8
222	1	0.0	19289	62.2
223	3	0.0	19292	62.2
225	2	0.0	19294	62.2
227	18	0.1	19312	62.3
228	3	0.0	19315	62.3
229	1	0.0	19316	62.3
230	2	0.0	19318	62.3
232	1	0.0	19319	62.3
234	4	0.0	19323	62.3
235	1	0.0	19324	62.3
236	10333	33.3	29657	95.6
237	3	0.0	29660	95.6
238	1	0.0	29661	95.6
246	2	0.0	29663	95.6
249	4	0.0	29667	95.6
254	1	0.0	29668	95.7
276	2	0.0	29670	95.7
336	5	0.0	29675	95.7
346	1	0.0	29676	95.7
416	1	0.0	29677	95.7
442	1	0.0	29678	95.7
445	1	0.0	29679	95.7
472	1	0.0	29680	95.7
507	45	0.1	29725	95.8
508	1	0.0	29726	95.8
510	40	0.1	29766	96.0
511	2	0.0	29768	96.0
512	18	0.1	29786	96.0
513	1	0.0	29787	96.0
514	481	1.6	30268	97.6
516	5	0.0	30273	97.6
602	1	0.0	30274	97.6
603	1	0.0	30275	97.6
606	7	0.0	30282	97.6
607	100	0.3	30382	98.0
608	9	0.0	30391	98.0
613	1	0.0	30392	98.0
700	55	0.2	30447	98.2
714	4	0.0	30451	98.2
715	5	0.0	30456	98.2
720	1	0.0	30457	98.2
722	1	0.0	30458	98.2
723	2	0.0	30460	98.2
736	12	0.0	30472	98.2
742	9	0.0	30481	98.2
750	6	0.0	30487	98.2
760	239	0.8	30726	98.2
762	4	0.0	30730	98.3

(Continued)

TABLE D.3. (CONTINUED)

Inventory Rating	Frequency	Percent	Cumulative Frequency	Cumulative Percent
872	1	0.0	30996	99.6
888	1	0.0	30997	99.9
905	4	0.0	31001	99.9
906	1	0.0	31002	100.0
910	2	0.0	31004	100.0
914	1	0.0	31005	100.0
915	1	0.0	31006	100.0
918	1	0.0	31007	100.0
924	4	0.0	31011	100.0
925	1	0.0	31012	100.0
929	5	0.0	31017	100.0

TABLE D.4. OFF-SYSTEM STRUCTURES INVENTORY RATING

Inventory Rating	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Missing	90			
0	14	0.1	14	0.1
2	1	0.0	15	0.1
3	1	0.0	16	0.1
5	1	0.0	17	0.1
7	1	0.0	18	0.1
8	3	0.0	21	0.1
9	2	0.0	23	0.2
10	2	0.0	25	0.2
13	3	0.0	28	0.3
15	12	0.1	40	0.3
20	1	0.0	41	0.3
33	2	0.0	43	0.3
47	1	0.0	44	0.3
53	2	0.0	46	0.3
54	1	0.0	47	0.3
55	1	0.0	48	0.3
57	1	0.0	49	0.3
58	1	0.0	50	0.3
63	1	0.0	51	0.3
70	1	0.0	52	0.3
72	1	0.0	53	0.3
78	1	0.0	54	0.4
82	1	0.0	55	0.4
83	1	0.0	56	0.4
85	1	0.0	57	0.4
87	1	0.0	58	0.4
100	735	4.8	793	5.2
101	443	2.9	1236	8.1
102	738	4.8	1974	13.0
103	1221	8.0	3195	21.0
104	877	5.8	4072	26.7
105	855	5.6	4927	32.4
106	785	5.2	5712	37.5
107	598	3.9	6310	41.4
108	579	3.8	6889	45.2
109	383	2.5	7272	47.8
110	508	3.3	7780	51.1
111	278	1.8	8058	52.9
112	233	1.5	8291	54.4
113	128	0.8	8419	55.3
114	112	0.7	8531	56.0
115	2343	15.4	10874	71.4
116	80	0.5	10954	71.9
117	90	0.6	11044	72.5
118	70	0.5	11114	73.0
119	60	0.4	11174	73.4
120	1439	9.4	12613	82.8
121	43	0.3	12656	83.1
122	14	0.1	12670	83.2
123	21	0.1	12691	83.3
124	13	0.1	12704	83.4
125	20	0.1	12724	83.6
126	8	0.1	12732	83.6
127	16	0.1	12748	83.7
128	5	0.0	12753	83.7
129	6	0.0	12759	83.8
133	3	0.0	12772	83.9
134	6	0.0	12778	83.9
135	5	0.0	12783	83.9
136	1	0.0	12784	84.0
137	2	0.0	12786	84.0
138	2	0.0	12788	84.0
139	1	0.0	12789	84.0
140	5	0.0	12794	84.0
141	5	0.0	12799	84.0
142	1	0.0	12800	84.1
144	2	0.0	12802	84.1
145	2	0.0	12804	84.1
146	5	0.0	12809	84.1
147	1	0.0	12810	84.1
148	3	0.0	12813	84.1
149	1	0.0	12814	84.1
150	1	0.0	12815	84.2
151	1	0.0	12816	84.2
152	2	0.0	12818	84.2
153	3	0.0	12821	84.2
154	3	0.0	12824	84.2
155	1	0.0	12825	84.2
156	1	0.0	12826	84.2
158	1	0.0	12827	84.2
160	1	0.0	12828	84.2
163	1	0.0	12829	84.2
166	3	0.0	12832	84.3
194	1	0.0	12833	84.3
195	1	0.0	12834	84.3
203	1	0.0	12835	84.3
204	2	0.0	12837	84.3
205	1	0.0	12838	84.3
208	1	0.0	12839	84.3
214	1	0.0	12840	84.3
215	4	0.0	12844	84.3
218	1	0.0	12845	84.4
220	29	0.2	12874	84.5
221	3	0.0	12877	84.6
222	1	0.0	12878	84.6
223	1	0.0	12879	84.6
225	1	0.0	12880	84.6
227	30	0.2	12910	84.8
230	1	0.0	12911	84.8
232	3	0.0	12914	84.8
234	1	0.0	12915	84.8
236	1057	6.9	13972	91.8
238	1	0.0	13973	91.8
239	1	0.0	13974	91.8
240	1	0.0	13975	91.8
243	1	0.0	13976	91.8
276	1	0.0	13977	91.8

(Continued)

TABLE D.4. (CONTINUED)

Inventory Rating	Frequency	Percent	Cumulative Frequency	Cumulative Percent
344	1	0.0	13978	91.8
365	1	0.0	13979	91.8
367	1	0.0	13980	91.8
368	1	0.0	13981	91.8
401	1	0.0	13982	91.8
402	1	0.0	13983	91.8
403	2	0.0	13985	91.8
404	2	0.0	13987	91.9
405	6	0.0	13993	91.9
406	3	0.0	13996	91.9
407	1	0.0	13997	91.9
408	1	0.0	13998	91.9
409	1	0.0	13999	91.9
416	1	0.0	14000	91.9
501	1	0.0	14001	91.9
502	1	0.0	14002	91.9
503	1	0.0	14003	92.0
504	2	0.0	14005	92.0
505	3	0.0	14008	92.0
506	1	0.0	14009	92.0
507	1	0.0	14010	92.0
510	21	0.1	14031	92.1
511	4	0.0	14035	92.2
512	5	0.0	14040	92.2
514	2	0.0	14042	92.2
516	2	0.0	14044	92.2
517	1	0.0	14045	92.2
519	1	0.0	14046	92.2
520	1	0.0	14047	92.2
534	1	0.0	14048	92.3
600	16	0.1	14064	92.4
601	11	0.1	14075	92.4
602	81	0.5	14156	93.0
603	80	0.5	14236	93.5
604	28	0.2	14264	93.7
605	91	0.6	14355	94.3
606	52	0.3	14407	94.6
607	61	0.0	14468	95.0
608	39	0.1	14507	95.3
609	5	0.0	14512	95.3
610	17	0.0	14529	95.4
611	16	0.0	14545	95.5
612	6	0.2	14551	95.6
613	1	0.0	14552	95.6

Inventory Rating	Frequency	Percent	Cumulative Frequency	Cumulative Percent
616	2	0.0	14554	95.6
617	1	0.0	14555	95.6
670	1	0.0	14556	95.6
700	175	1.1	14731	96.7
705	1	0.0	14732	96.7
710	2	0.0	14734	96.8
715	1	0.0	14735	96.8
736	1	6.9	14736	96.8
744	1	0.0	14737	96.8
750	3	0.0	14740	96.8
760	18	0.1	14758	96.9
765	2	0.0	14760	96.9
770	11	0.1	14771	97.0
772	9	0.1	14780	97.1
780	3	0.0	14783	97.1
800	19	0.1	14802	97.2
806	1	0.0	14803	97.2
811	1	0.0	14804	97.2
820	1	0.0	14805	97.2
860	1	0.0	14806	97.2
870	1	0.0	14807	97.2
900	20	0.1	14827	97.4
901	22	0.1	14849	97.5
902	43	0.3	14892	97.8
903	48	0.3	14940	98.1
904	99	0.7	15039	98.8
905	56	0.4	15095	99.1
906	24	0.2	15119	99.3
907	17	0.1	15136	99.4
908	13	0.1	15149	99.5
909	4	0.0	15153	99.5
910	41	0.3	15194	99.8
911	1	0.0	15195	99.8
912	4	0.0	15199	99.8
913	2	0.0	15201	99.8
914	3	0.0	15204	99.8
915	4	0.0	15208	99.9
916	3	0.0	15211	99.9
917	1	0.0	15212	99.9
918	4	0.0	15216	99.9
919	1	0.0	15217	99.9
920	8	0.1	15225	100.0
923	1	0.0	15226	100.0
929	2	0.0	15228	100.0

TABLE D.5. ON-SYSTEM STRUCTURES MAIN SPAN TYPE

Main Span Type	Frequency	Percent
Missing	165	0.0
Culverts	12836	0.0
Simple	14011	76.4
Continuous	4107	22.4
Cantilever	17	0.1
Cantilever with Suspended Span	49	0.3
Arch	55	0.3
Rigid Frame	78	0.4
Moveable	8	0.0
Suspension or Strayed	1	0.0
Other	3	0.0

TABLE D.6. ON-SYSTEM CULVERTS SPAN TYPE

Culvert Span	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Single Box	12	0.1	12	0.1
Multiple Box	12796	99.7	12808	99.8
Single Pipe	18	0.1	12826	99.9
Multiple Pipe	6	0.0	12832	100.0
Other	5	0.0	12837	100.0

TABLE D.7. OFF-SYSTEM STRUCTURES MAIN SPAN TYPE

Main Span Type	Frequency	Percent
Culverts	2316	0.0
Simple	11780	90.1
Continuous	1166	8.9
Cantilever	10	0.1
Cantilever with Suspended Span	1	0.0
Arch	48	0.4
Rigid Frame	22	0.2
Moveable	1	0.0
Suspension or Strayed	5	0.0
Other	9	0.1

TABLE D.9. ON-SYSTEM STRUCUTRES TOTAL NUMBER OF SPANS

Total Number of Spans	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Missing	197	0.0	0	0.0
0	6	0.0	6	0.0
1	767	2.5	773	2.5
2	3518	11.3	4291	13.8
3	8500	27.3	12791	41.1
4	7039	22.6	19830	63.7
5	3651	11.7	23481	75.4
6	2466	7.9	25947	83.3
7	1187	3.8	27134	87.2
8	828	2.7	27962	89.8
9	551	1.8	28513	91.6
10	484	1.6	28997	93.1
11	284	0.9	29281	94.1
12	278	0.9	29559	94.9
13	162	0.5	29721	95.5
14	152	0.5	29873	96.0
15	153	0.5	30026	96.4
16	102	0.3	30128	96.8
17	81	0.3	30209	97.0
18	80	0.3	30289	97.3
19	81	0.3	30370	97.5
20	86	0.3	30456	97.8
21	55	0.2	30511	98.0
22	54	0.2	30565	98.2
23	33	0.1	30598	98.3
24	43	0.1	30641	98.4
25	34	0.1	30675	98.5
>25	412	1.3	31133	100.0

TABLE D.8. OFF-SYSTEM CULVERTS SPAN TYPE

Culvert Span	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Single Box	20	0.9	20	0.9
Multiple Box	2187	94.4	2207	95.3
Single Pipe	11	0.5	2218	95.8
Multiple Pipe	9	0.4	2227	96.2
Other	89	3.9	2316	100.0

TABLE D.10. OFF-SYSTEM STRUCTURES TOTAL NUMBER OF SPANS

Total Number of Spans	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Missing	86	0.0	0	0.0
0	6	0.0	6	0.0
1	3598	23.6	3604	23.7
2	4242	27.9	7846	51.5
3	3955	26.0	11801	77.5
4	1471	9.7	13272	87.1
5	883	5.8	14155	92.9
6	409	2.7	14564	95.6
7	204	1.3	14768	97.0
8	131	0.9	14899	97.8
9	67	0.4	14966	98.3
10	67	0.4	15033	98.7
11	41	0.3	15074	99.0
12	29	0.2	15103	99.2
13	21	0.1	15124	99.3
14	22	0.1	15146	99.4
15	10	0.1	15156	99.5
16	10	0.1	15166	99.6
17	9	0.1	15175	99.7
18	4	0.0	15179	99.7
19	10	0.1	15189	99.8
20	5	0.0	15194	99.8
21	5	0.0	15199	99.8
23	3	0.0	15202	99.8
24	1	0.0	15203	99.8
25	3	0.0	15206	99.8
>25	23	0.2	15229	100.0

TABLE D.11. ON-SYSTEM STRUCTURES MAIN MEMBER TYPES

Main Member Type	Frequency	Percent
Missing	167	0.0
Culverts	12836	0.0
0	1	0.0
1	1	0.0
3	2	0.0
4	4	0.0
11	3139	17.1
12	460	2.5
13	77	0.4
14	98	0.5
15	8	0.0
16	3	0.0
17	34	0.2
18	1	0.0
19	5	0.0
21	1032	5.6
22	192	1.0
23	208	1.1
24	11	0.1
25	3708	20.2
26	3749	20.5
27	343	1.9
28	19	0.1
29	100	0.5
31	4573	25.0
32	8	0.0
33	223	1.2

Main Member Type	Frequency	Percent
34	23	0.1
35	19	0.1
36	12	0.1
37	32	0.2
39	40	0.2
41	89	0.5
49	3	0.0
51	11	0.1
52	1	0.0
53	10	0.1
54	3	0.0
56	6	0.0
57	2	0.0
59	1	0.0
61	5	0.0
62	2	0.0
63	16	0.1
71	32	0.2
72	7	0.0
73	2	0.0
74	1	0.0
91	7	0.0
97	3	0.0
98	1	0.0

See Appendix B for explanation of Main Member Types

TABLE D.12. ON-SYSTEM CULVERTS MATERIAL TYPE

Culvert Material	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Steel	13	0.01	13	0.1
OGM	9	0.01	22	0.2
Concrete	12765	99.4	12787	99.6
Timber	3	0.0	12790	99.7
Masonry	41	0.3	12831	100.0
Other	5	0.0	12836	100.0

TABLE D.13. OFF-SYSTEM STRUCTURES MAIN MEMBER TYPE

Main Member Type	Frequency	Percent
Culverts	2316	0.0
0	21	0.2
1	10	0.1
2	7	0.1
3	1	0.0
4	2	0.0
6	1	0.0
7	2	0.0
9	1	0.0
11	3134	24.0
12	37	0.3
13	9	0.1
14	45	0.3
15	9	0.1
16	2	0.0
17	258	2.0
18	1	0.0
19	254	1.9
21	189	1.4
22	34	0.3
23	81	0.6
24	6	0.0
25	641	4.9
26	1372	10.5
27	40	0.3
28	11	0.1
29	94	0.7
31	260	2.0
32	4	0.0
33	402	3.1
34	10	0.1
35	23	0.2
36	10	0.1
37	2	0.0
39	93	0.7
41	4862	37.2
42	8	0.1
43	2	0.0
46	1	0.0
49	27	0.2
51	10	0.1
52	9	0.1
53	6	0.0
54	2	0.0
56	1	0.0
59	4	0.0
61	183	1.4
62	28	0.2
63	687	5.3
64	3	0.0
67	4	0.0
68	12	0.1
71	13	0.1
72	8	0.1
73	3	0.0
75	44	0.3
76	7	0.1
77	6	0.0
81	6	0.0
84	1	0.0
85	1	0.0
91	2	0.0
97	13	0.1
98	1	0.0
99	55	0.4

See Appendix B for explanation of Main Member Types

TABLE D.14. OFF-SYSTEM CULVERTS MATERIAL TYPE

Culvert Material	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Steel	18	0.8	18	0.8
OGM	10	0.4	28	1.2
Concrete	2153	92.8	2181	94.0
Timber	4	0.2	2185	94.2
Masonry	50	2.2	2235	96.4
Other	84	3.6	2319	100.0

APPENDIX E. SOURCE DATA FOR SENSITIVITY ANALYSIS

TABLE E.1. SOURCE DATA FOR SDHPT ATTRIBUTES

DELTA SOURCE

FREQUENCY
PERCENT
ROW PCT
COL PCT

DELTA	1 & 5	1 & 6	1 & 7	2 & 3	2 & 6	2 & 7	3 & 4	3 & 5	TOTAL
0	1	8	15	0	3	30	0	0	239
	0.01	0.08	0.15	0.00	0.03	0.31	0.00	0.00	2.47
	0.42	3.35	6.28	0.00	1.26	12.55	0.00	0.00	
	5.00	0.72	0.29	0.00	3.66	2.21	0.00	0.00	
5	8	206	159	0	39	217	10	4	1431
	0.08	2.13	1.64	0.00	0.40	2.24	0.10	0.04	14.78
	0.56	14.40	11.11	0.00	2.73	15.16	0.70	0.28	
	40.00	18.64	3.06	0.00	47.56	16.01	20.83	66.67	
10	10	356	394	0	28	297	36	0	1598
	0.10	3.68	4.07	0.00	0.29	3.07	0.37	0.00	16.50
	0.63	22.28	24.66	0.00	1.75	18.59	2.25	0.00	
	50.00	32.22	7.58	0.00	34.15	21.92	75.00	0.00	
15	1	265	545	1	7	301	2	2	1406
	0.01	2.74	5.63	0.01	0.07	3.11	0.02	0.02	14.52
	0.07	18.85	38.76	0.07	0.50	21.41	0.14	0.14	
	5.00	23.98	10.49	100.00	8.54	22.21	4.17	33.33	
20	0	128	724	0	3	216	0	0	1170
	0.00	1.32	7.48	0.00	0.03	2.23	0.00	0.00	12.08
	0.00	10.94	61.88	0.00	0.26	18.46	0.00	0.00	
	0.00	11.58	13.93	0.00	3.66	15.94	0.00	0.00	
25	0	77	681	0	1	141	0	0	936
	0.00	0.80	7.03	0.00	0.01	1.46	0.00	0.00	9.67
	0.00	8.23	72.76	0.00	0.11	15.06	0.00	0.00	
	0.00	6.97	13.11	0.00	1.22	10.41	0.00	0.00	
30	0	32	648	0	0	75	0	0	759
	0.00	0.33	6.69	0.00	0.00	0.77	0.00	0.00	7.84
	0.00	4.22	85.38	0.00	0.00	9.88	0.00	0.00	
	0.00	2.90	12.47	0.00	0.00	5.54	0.00	0.00	
35	0	15	521	0	1	43	0	0	582
	0.00	0.15	5.38	0.00	0.01	0.44	0.00	0.00	6.01
	0.00	2.58	89.52	0.00	0.17	7.39	0.00	0.00	
	0.00	1.36	10.03	0.00	1.22	3.17	0.00	0.00	
TOTAL	20	1105	5196	1	82	1355	48	6	9683
	0.21	11.41	53.66	0.01	0.85	13.99	0.50	0.06	100.00

(continued)

TABLE E.1. (CONTINUED)

DELTA SOURCE

FREQUENCY / PERCENT / ROW PCT / COL PCT		1 & 5	1 & 6	1 & 7	2 & 3	2 & 6	2 & 7	3 & 4	3 & 5	TOTAL
40	FREQUENCY	0	13	390	0	0	18	0	0	421
	PERCENT	0.00	0.13	4.03	0.00	0.00	0.19	0.00	0.00	4.35
	ROW PCT	0.00	3.09	92.64	0.00	0.00	4.28	0.00	0.00	
	COL PCT	0.00	1.18	7.51	0.00	0.00	1.33	0.00	0.00	
45	FREQUENCY	0	4	237	0	0	5	0	0	246
	PERCENT	0.00	0.04	2.45	0.00	0.00	0.05	0.00	0.00	2.54
	ROW PCT	0.00	1.63	96.34	0.00	0.00	2.03	0.00	0.00	
	COL PCT	0.00	0.36	4.56	0.00	0.00	0.37	0.00	0.00	
50	FREQUENCY	0	1	164	0	0	4	0	0	169
	PERCENT	0.00	0.01	1.69	0.00	0.00	0.04	0.00	0.00	1.75
	ROW PCT	0.00	0.59	97.04	0.00	0.00	2.37	0.00	0.00	
	COL PCT	0.00	0.09	3.16	0.00	0.00	0.30	0.00	0.00	
55	FREQUENCY	0	0	67	0	0	3	0	0	70
	PERCENT	0.00	0.00	0.69	0.00	0.00	0.03	0.00	0.00	0.72
	ROW PCT	0.00	0.00	95.71	0.00	0.00	4.29	0.00	0.00	
	COL PCT	0.00	0.00	1.29	0.00	0.00	0.22	0.00	0.00	
60	FREQUENCY	0	0	59	0	0	1	0	0	60
	PERCENT	0.00	0.00	0.61	0.00	0.00	0.01	0.00	0.00	0.62
	ROW PCT	0.00	0.00	98.33	0.00	0.00	1.67	0.00	0.00	
	COL PCT	0.00	0.00	1.14	0.00	0.00	0.07	0.00	0.00	
65	FREQUENCY	0	0	62	0	0	2	0	0	64
	PERCENT	0.00	0.00	0.64	0.00	0.00	0.02	0.00	0.00	0.66
	ROW PCT	0.00	0.00	96.88	0.00	0.00	3.13	0.00	0.00	
	COL PCT	0.00	0.00	1.19	0.00	0.00	0.15	0.00	0.00	
70	FREQUENCY	0	0	71	0	0	0	0	0	71
	PERCENT	0.00	0.00	0.73	0.00	0.00	0.00	0.00	0.00	0.73
	ROW PCT	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	1.37	0.00	0.00	0.00	0.00	0.00	
75	FREQUENCY	0	0	53	0	0	1	0	0	54
	PERCENT	0.00	0.00	0.55	0.00	0.00	0.01	0.00	0.00	0.56
	ROW PCT	0.00	0.00	98.15	0.00	0.00	1.85	0.00	0.00	
	COL PCT	0.00	0.00	1.02	0.00	0.00	0.07	0.00	0.00	
TOTAL		20	1105	5196	1	82	1355	48	6	9683
		0.21	11.41	53.66	0.01	0.85	13.99	0.50	0.06	100.00

TABLE E.1. (CONTINUED)

DELTA SOURCE

DELTA	FREQUENCY / PERCENT / ROW PCT / COL PCT	1 & 5	1 & 6	1 & 7	2 & 3	2 & 6	2 & 7	3 & 4	3 & 5	TOTAL
80	FREQUENCY	0	0	53	0	0	0	0	0	53
	PERCENT	0.00	0.00	0.55	0.00	0.00	0.00	0.00	0.00	0.55
	ROW PCT	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	1.02	0.00	0.00	0.00	0.00	0.00	
85	FREQUENCY	0	0	24	0	0	1	0	0	25
	PERCENT	0.00	0.00	0.25	0.00	0.00	0.01	0.00	0.00	0.26
	ROW PCT	0.00	0.00	96.00	0.00	0.00	4.00	0.00	0.00	
	COL PCT	0.00	0.00	0.46	0.00	0.00	0.07	0.00	0.00	
90	FREQUENCY	0	0	27	0	0	0	0	0	27
	PERCENT	0.00	0.00	0.28	0.00	0.00	0.00	0.00	0.00	0.28
	ROW PCT	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.52	0.00	0.00	0.00	0.00	0.00	
95	FREQUENCY	0	0	24	0	0	0	0	0	24
	PERCENT	0.00	0.00	0.25	0.00	0.00	0.00	0.00	0.00	0.25
	ROW PCT	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.46	0.00	0.00	0.00	0.00	0.00	
100	FREQUENCY	0	0	28	0	0	0	0	0	28
	PERCENT	0.00	0.00	0.29	0.00	0.00	0.00	0.00	0.00	0.29
	ROW PCT	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.54	0.00	0.00	0.00	0.00	0.00	
105	FREQUENCY	0	0	20	0	0	0	0	0	20
	PERCENT	0.00	0.00	0.21	0.00	0.00	0.00	0.00	0.00	0.21
	ROW PCT	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.38	0.00	0.00	0.00	0.00	0.00	
110	FREQUENCY	0	0	33	0	0	0	0	0	33
	PERCENT	0.00	0.00	0.34	0.00	0.00	0.00	0.00	0.00	0.34
	ROW PCT	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.64	0.00	0.00	0.00	0.00	0.00	
115	FREQUENCY	0	0	27	0	0	0	0	0	27
	PERCENT	0.00	0.00	0.28	0.00	0.00	0.00	0.00	0.00	0.28
	ROW PCT	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.52	0.00	0.00	0.00	0.00	0.00	
TOTAL		20	1105	5196	1	82	1355	48	6	9683
		0.21	11.41	53.66	0.01	0.85	13.99	0.50	0.06	100.00

TABLE E.1. (CONTINUED)

DELTA SOURCE

FREQUENCY / PERCENT / ROW PCT / COL PCT	1 & 5	1 & 6	1 & 7	2 & 3	2 & 6	2 & 7	3 & 4	3 & 5	TOTAL
120	0	0	38	0	0	0	0	0	38
	0.00	0.00	0.39	0.00	0.00	0.00	0.00	0.00	0.39
	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.73	0.00	0.00	0.00	0.00	0.00	
125	0	0	19	0	0	0	0	0	19
	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.20
	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.37	0.00	0.00	0.00	0.00	0.00	
130	0	0	5	0	0	0	0	0	5
	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.05
	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	
135	0	0	6	0	0	0	0	0	6
	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.06
	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	
140	0	0	9	0	0	0	0	0	9
	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.09
	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	
145	0	0	7	0	0	0	0	0	7
	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.07
	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00	
150	0	0	5	0	0	0	0	0	5
	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.05
	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	
155	0	0	6	0	0	0	0	0	6
	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.06
	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	
TOTAL	20	1105	5196	1	82	1355	48	6	9683
	0.21	11.41	53.66	0.01	0.85	13.99	0.50	0.06	100.00

TABLE E.1. (CONTINUED)

DELTA SOURCE

FREQUENCY / PERCENT / ROW PCT / COL PCT

DELTA	1 & 5	1 & 6	1 & 7	2 & 3	2 & 6	2 & 7	3 & 4	3 & 5	TOTAL
160	0	0	4	0	0	0	0	0	4
	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.04
	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	
165	0	0	17	0	0	0	0	0	17
	0.00	0.00	0.18	0.00	0.00	0.00	0.00	0.00	0.18
	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.33	0.00	0.00	0.00	0.00	0.00	
170	0	0	5	0	0	0	0	0	5
	0.00	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.05
	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	
175	0	0	8	0	0	0	0	0	8
	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.08
	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	
180	0	0	10	0	0	0	0	0	10
	0.00	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.10
	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.19	0.00	0.00	0.00	0.00	0.00	
185	0	0	8	0	0	0	0	0	8
	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.08
	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	
190	0	0	6	0	0	0	0	0	6
	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.06
	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	
200	0	0	9	0	0	0	0	0	9
	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.09
	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.17	0.00	0.00	0.00	0.00	0.00	
TOTAL	20	1105	5196	1	82	1355	48	6	9683
	0.21	11.41	53.66	0.01	0.85	13.99	0.50	0.06	100.00

TABLE E.1. (CONTINUED)

DELTA SOURCE

DELTA	FREQUENCY / PERCENT / ROW PCT / COL PCT	1 & 5	1 & 6	1 & 7	2 & 3	2 & 6	2 & 7	3 & 4	3 & 5	TOTAL
205	FREQUENCY	0	0	1	0	0	0	0	0	1
	PERCENT	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01
	ROW PCT	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	
210	FREQUENCY	0	0	1	0	0	0	0	0	1
	PERCENT	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01
	ROW PCT	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	
215	FREQUENCY	0	0	1	0	0	0	0	0	1
	PERCENT	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01
	ROW PCT	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	
220	FREQUENCY	0	0	1	0	0	0	0	0	1
	PERCENT	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01
	ROW PCT	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	
225	FREQUENCY	0	0	2	0	0	0	0	0	2
	PERCENT	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.02
	ROW PCT	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	
265	FREQUENCY	0	0	1	0	0	0	0	0	1
	PERCENT	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01
	ROW PCT	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	
280	FREQUENCY	0	0	1	0	0	0	0	0	1
	PERCENT	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01
	ROW PCT	0.00	0.00	100.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	
TOTAL		20	1105	5196	1	82	1355	48	6	9683
		0.21	11.41	53.66	0.01	0.85	13.99	0.50	0.06	100.00

TABLE E.1. (CONTINUED)

DELTA SOURCE

DELTA	FREQUENCY / PERCENT / ROW PCT / COL PCT	3 & 7	4 & 5	4 & 6	4 & 7	5 & 6	5 & 7	6 & 7	TOTAL
0	FREQUENCY	56	4	4	20	6	24	68	239
	PERCENT	0.58	0.04	0.04	0.21	0.06	0.25	0.70	2.47
	ROW PCT	23.43	1.67	1.67	8.37	2.51	10.04	28.45	
	COL PCT	4.35	10.53	2.86	66.67	26.09	32.43	24.55	
5	FREQUENCY	433	28	110	5	13	45	154	1431
	PERCENT	4.47	0.29	1.14	0.05	0.13	0.46	1.59	14.78
	ROW PCT	30.26	1.96	7.69	0.35	0.91	3.14	10.76	
	COL PCT	33.62	73.68	78.57	16.67	56.52	60.81	55.60	
10	FREQUENCY	391	6	24	3	2	4	47	1598
	PERCENT	4.04	0.06	0.25	0.03	0.02	0.04	0.49	16.50
	ROW PCT	24.47	0.38	1.50	0.19	0.13	0.25	2.94	
	COL PCT	30.36	15.79	17.14	10.00	8.70	5.41	16.97	
15	FREQUENCY	269	0	2	1	2	1	7	1406
	PERCENT	2.78	0.00	0.02	0.01	0.02	0.01	0.07	14.52
	ROW PCT	19.13	0.00	0.14	0.07	0.14	0.07	0.50	
	COL PCT	20.89	0.00	1.43	3.33	8.70	1.35	2.53	
20	FREQUENCY	98	0	0	0	0	0	1	1170
	PERCENT	1.01	0.00	0.00	0.00	0.00	0.00	0.01	12.08
	ROW PCT	8.38	0.00	0.00	0.00	0.00	0.00	0.09	
	COL PCT	7.61	0.00	0.00	0.00	0.00	0.00	0.36	
25	FREQUENCY	35	0	0	1	0	0	0	936
	PERCENT	0.36	0.00	0.00	0.01	0.00	0.00	0.00	9.67
	ROW PCT	3.74	0.00	0.00	0.11	0.00	0.00	0.00	
	COL PCT	2.72	0.00	0.00	3.33	0.00	0.00	0.00	
30	FREQUENCY	4	0	0	0	0	0	0	759
	PERCENT	0.04	0.00	0.00	0.00	0.00	0.00	0.00	7.84
	ROW PCT	0.53	0.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.31	0.00	0.00	0.00	0.00	0.00	0.00	
35	FREQUENCY	2	0	0	0	0	0	0	582
	PERCENT	0.02	0.00	0.00	0.00	0.00	0.00	0.00	6.01
	ROW PCT	0.34	0.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.16	0.00	0.00	0.00	0.00	0.00	0.00	
TOTAL		1288	38	140	30	23	74	277	9683
		13.30	0.39	1.45	0.31	0.24	0.76	2.86	100.00

TABLE E.1. (CONTINUED)

DELTA SOURCE

FREQUENCY / PERCENT / ROW PCT / COL PCT	3 & 7	4 & 5	4 & 6	4 & 7	5 & 6	5 & 7	6 & 7	TOTAL
40	0	0	0	0	0	0	0	421
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.35
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
45	0	0	0	0	0	0	0	246
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.54
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
50	0	0	0	0	0	0	0	169
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.75
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
55	0	0	0	0	0	0	0	70
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.72
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
60	0	0	0	0	0	0	0	60
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.62
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
65	0	0	0	0	0	0	0	64
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.66
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
70	0	0	0	0	0	0	0	71
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.73
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
75	0	0	0	0	0	0	0	54
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.56
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
TOTAL	1288	38	140	30	23	74	277	9683
	13.30	0.39	1.45	0.31	0.24	0.76	2.86	100.00

TABLE E.1. (CONTINUED)

DELTA SOURCE

FREQUENCY PERCENT ROW PCT COL PCT	3 & 7	4 & 5	4 & 6	4 & 7	5 & 6	5 & 7	6 & 7	TOTAL
80	0	0	0	0	0	0	0	53
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.55
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
85	0	0	0	0	0	0	0	25
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.26
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
90	0	0	0	0	0	0	0	27
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
95	0	0	0	0	0	0	0	24
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
100	0	0	0	0	0	0	0	28
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
105	0	0	0	0	0	0	0	20
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
110	0	0	0	0	0	0	0	33
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.34
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
115	0	0	0	0	0	0	0	27
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
TOTAL	1288	38	140	30	23	74	277	9683
	13.30	0.39	1.45	0.31	0.24	0.76	2.86	100.00

TABLE E.1. (CONTINUED)

DELTA SOURCE

DELTA	FREQUENCY / PERCENT / ROW PCT / COL PCT	3 & 7	4 & 5	4 & 6	4 & 7	5 & 6	5 & 7	6 & 7	TOTAL
120	FREQUENCY	0	0	0	0	0	0	0	38
	PERCENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39
	ROW PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
125	FREQUENCY	0	0	0	0	0	0	0	19
	PERCENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20
	ROW PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
130	FREQUENCY	0	0	0	0	0	0	0	5
	PERCENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
	ROW PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
135	FREQUENCY	0	0	0	0	0	0	0	6
	PERCENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06
	ROW PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
140	FREQUENCY	0	0	0	0	0	0	0	9
	PERCENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09
	ROW PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
145	FREQUENCY	0	0	0	0	0	0	0	7
	PERCENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
	ROW PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
150	FREQUENCY	0	0	0	0	0	0	0	5
	PERCENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
	ROW PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
155	FREQUENCY	0	0	0	0	0	0	0	6
	PERCENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06
	ROW PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
TOTAL		1288	38	140	30	23	74	277	9683
		13.30	0.39	1.45	0.31	0.24	0.76	2.86	100.00

TABLE E.1. (CONTINUED)

DELTA SOURCE

DELTA	FREQUENCY / PERCENT / ROW PCT / COL PCT	3 & 7	4 & 5	4 & 6	4 & 7	5 & 6	5 & 7	6 & 7	TOTAL
160	FREQUENCY	0	0	0	0	0	0	0	4
	PERCENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
	ROW PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
165	FREQUENCY	0	0	0	0	0	0	0	17
	PERCENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18
	ROW PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
170	FREQUENCY	0	0	0	0	0	0	0	5
	PERCENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05
	ROW PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
175	FREQUENCY	0	0	0	0	0	0	0	8
	PERCENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08
	ROW PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
180	FREQUENCY	0	0	0	0	0	0	0	10
	PERCENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10
	ROW PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
185	FREQUENCY	0	0	0	0	0	0	0	8
	PERCENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08
	ROW PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
190	FREQUENCY	0	0	0	0	0	0	0	6
	PERCENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06
	ROW PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
200	FREQUENCY	0	0	0	0	0	0	0	9
	PERCENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09
	ROW PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
TOTAL		1288	38	140	30	23	74	277	9683
		13.30	0.39	1.45	0.31	0.24	0.76	2.86	100.00

TABLE E.1. (CONTINUED)

DELTA SOURCE

FREQUENCY / PERCENT / ROW PCT / COL PCT	3 & 7	4 & 5	4 & 6	4 & 7	5 & 6	5 & 7	6 & 7	TOTAL
205	0	0	0	0	0	0	0	1
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
210	0	0	0	0	0	0	0	1
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
215	0	0	0	0	0	0	0	1
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
220	0	0	0	0	0	0	0	1
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
225	0	0	0	0	0	0	0	2
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
265	0	0	0	0	0	0	0	1
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
280	0	0	0	0	0	0	0	1
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
TOTAL	1288	38	140	30	23	74	277	9683
	13.30	0.39	1.45	0.31	0.24	0.76	2.86	100.00

FREQUENCY MISSING = 9

TABLE E.2. SOURCE DATA FOR SAFETY AND SERVICE INDICES

DELTA SOURCE

DELTA	FREQUENCY / PERCENT / ROW PCT / COL PCT	10 & 11	10 & 12	10 & 13	10 & 14	11 & 12	11 & 13	11 & 14	12 & 13	12 & 14	TOTAL
0	FREQUENCY	3	1	0	64	2	2	44	3	31	309
	PERCENT	0.03	0.01	0.00	0.66	0.02	0.02	0.45	0.03	0.32	3.19
	ROW PCT	0.97	0.32	0.00	20.71	0.65	0.65	14.24	0.97	10.03	
	COL PCT	9.68	4.17	0.00	10.94	1.23	5.56	27.50	2.36	24.41	
5	FREQUENCY	23	20	23	303	149	34	110	112	95	2379
	PERCENT	0.24	0.21	0.24	3.13	1.54	0.35	1.14	1.16	0.98	24.57
	ROW PCT	0.97	0.84	0.97	12.74	6.26	1.43	4.62	4.71	3.99	
	COL PCT	74.19	83.33	100.00	51.79	91.41	94.44	68.75	88.19	74.80	
10	FREQUENCY	5	3	0	180	12	0	6	12	1	2085
	PERCENT	0.05	0.03	0.00	1.86	0.12	0.00	0.06	0.12	0.01	21.54
	ROW PCT	0.24	0.14	0.00	8.63	0.58	0.00	0.29	0.58	0.05	
	COL PCT	16.13	12.50	0.00	30.77	7.36	0.00	3.75	9.45	0.79	
15	FREQUENCY	0	0	0	38	0	0	0	0	0	1373
	PERCENT	0.00	0.00	0.00	0.39	0.00	0.00	0.00	0.00	0.00	14.18
	ROW PCT	0.00	0.00	0.00	2.77	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.00	6.50	0.00	0.00	0.00	0.00	0.00	
20	FREQUENCY	0	0	0	0	0	0	0	0	0	1119
	PERCENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	11.56
	ROW PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
25	FREQUENCY	0	0	0	0	0	0	0	0	0	897
	PERCENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.27
	ROW PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
30	FREQUENCY	0	0	0	0	0	0	0	0	0	571
	PERCENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.90
	ROW PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
35	FREQUENCY	0	0	0	0	0	0	0	0	0	430
	PERCENT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.44
	ROW PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
TOTAL		31	24	23	585	163	36	160	127	127	9681
		0.32	0.25	0.24	6.04	1.68	0.37	1.65	1.31	1.31	100.00

(continued)

TABLE E.2. (CONTINUED)

DELTA SOURCE

FREQUENCY / PERCENT / ROW PCT / COL PCT	10 & 11	10 & 12	10 & 13	10 & 14	11 & 12	11 & 13	11 & 14	12 & 13	12 & 14	TOTAL
40	0	0	0	0	0	0	0	0	0	264
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.73
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
45	0	0	0	0	0	0	0	0	0	172
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.78
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
50	0	0	0	0	0	0	0	0	0	51
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.53
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
55	0	0	0	0	0	0	0	0	0	23
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.24
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
60	0	0	0	0	0	0	0	0	0	4
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
65	0	0	0	0	0	0	0	0	0	2
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
70	0	0	0	0	0	0	0	0	0	1
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
75	0	0	0	0	0	0	0	0	0	1
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
TOTAL	31	24	23	585	163	36	160	127	127	9681
	0.32	0.25	0.24	6.04	1.68	0.37	1.65	1.31	1.31	100.00

TABLE E.2. (CONTINUED)

DELTA SOURCE

FREQUENCY / PERCENT / ROW PCT / COL PCT	13 & 14	8 & 12	8 & 13	8 & 14	8 & 9	9 & 10	9 & 13	9 & 14	TOTAL
0	105	0	15	7	0	0	0	32	309
	1.08	0.00	0.15	0.07	0.00	0.00	0.00	0.33	3.19
	33.98	0.00	4.85	2.27	0.00	0.00	0.00	10.36	
	38.46	0.00	1.60	0.13	0.00	0.00	0.00	1.87	
5	155	40	363	421	7	11	19	494	2379
	1.60	0.41	3.75	4.35	0.07	0.11	0.20	5.10	24.57
	6.52	1.68	15.26	17.70	0.29	0.46	0.80	20.77	
	56.78	57.97	38.78	7.88	87.50	91.67	38.00	28.86	
10	13	29	363	915	1	1	22	522	2085
	0.13	0.30	3.75	9.45	0.01	0.01	0.23	5.39	21.54
	0.62	1.39	17.41	43.88	0.05	0.05	1.06	25.04	
	4.76	42.03	38.78	17.12	12.50	8.33	44.00	30.49	
15	0	0	125	854	0	0	6	350	1373
	0.00	0.00	1.29	8.82	0.00	0.00	0.06	3.62	14.18
	0.00	0.00	9.10	62.20	0.00	0.00	0.44	25.49	
	0.00	0.00	13.35	15.98	0.00	0.00	12.00	20.44	
20	0	0	47	892	0	0	2	178	1119
	0.00	0.00	0.49	9.21	0.00	0.00	0.02	1.84	11.56
	0.00	0.00	4.20	79.71	0.00	0.00	0.18	15.91	
	0.00	0.00	5.02	16.69	0.00	0.00	4.00	10.40	
25	0	0	14	808	0	0	1	74	897
	0.00	0.00	0.14	8.35	0.00	0.00	0.01	0.76	9.27
	0.00	0.00	1.56	90.08	0.00	0.00	0.11	8.25	
	0.00	0.00	1.50	15.12	0.00	0.00	2.00	4.32	
30	0	0	5	528	0	0	0	38	571
	0.00	0.00	0.05	5.45	0.00	0.00	0.00	0.39	5.90
	0.00	0.00	0.88	92.47	0.00	0.00	0.00	6.65	
	0.00	0.00	0.53	9.88	0.00	0.00	0.00	2.22	
35	0	0	4	409	0	0	0	17	430
	0.00	0.00	0.04	4.22	0.00	0.00	0.00	0.18	4.44
	0.00	0.00	0.93	95.12	0.00	0.00	0.00	3.95	
	0.00	0.00	0.43	7.65	0.00	0.00	0.00	0.99	
TOTAL	273	69	936	5345	8	12	50	1712	9681
	2.82	0.71	9.67	55.21	0.08	0.12	0.52	17.68	100.00

TABLE E.2. (CONTINUED)

DELTA SOURCE

DELTA	FREQUENCY / PERCENT / ROW PCT / COL PCT	13 & 14	8 & 12	8 & 13	8 & 14	8 & 9	9 & 10	9 & 13	9 & 14	TOTAL
40	FREQUENCY	0	0	0	258	0	0	0	6	264
	PERCENT	0.00	0.00	0.00	2.67	0.00	0.00	0.00	0.06	2.73
	ROW PCT	0.00	0.00	0.00	97.73	0.00	0.00	0.00	2.27	
	COL PCT	0.00	0.00	0.00	4.83	0.00	0.00	0.00	0.35	
45	FREQUENCY	0	0	0	171	0	0	0	1	172
	PERCENT	0.00	0.00	0.00	1.77	0.00	0.00	0.00	0.01	1.78
	ROW PCT	0.00	0.00	0.00	99.42	0.00	0.00	0.00	0.58	
	COL PCT	0.00	0.00	0.00	3.20	0.00	0.00	0.00	0.06	
50	FREQUENCY	0	0	0	51	0	0	0	0	51
	PERCENT	0.00	0.00	0.00	0.53	0.00	0.00	0.00	0.00	0.53
	ROW PCT	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.00	0.95	0.00	0.00	0.00	0.00	
55	FREQUENCY	0	0	0	23	0	0	0	0	23
	PERCENT	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.24
	ROW PCT	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.00	0.43	0.00	0.00	0.00	0.00	
60	FREQUENCY	0	0	0	4	0	0	0	0	4
	PERCENT	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.04
	ROW PCT	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	
65	FREQUENCY	0	0	0	2	0	0	0	0	2
	PERCENT	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.02
	ROW PCT	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	
70	FREQUENCY	0	0	0	1	0	0	0	0	1
	PERCENT	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01
	ROW PCT	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	
75	FREQUENCY	0	0	0	1	0	0	0	0	1
	PERCENT	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.01
	ROW PCT	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	
	COL PCT	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	
TOTAL		273	69	936	5345	8	12	50	1712	9681
		2.82	0.71	9.67	55.21	0.08	0.12	0.52	17.68	100.00

FREQUENCY MISSING = 11