TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
TTI-1-18-76-525-1F		

4. Title and Subtitle	5. Report Date
SAFETY IMPROVEMENT PROGRAMMING FOR ROADSIDE OBSTACLES -- INSTRUCTOR'S MANUAL	September 1977
	6. Performing Organization Code
7. Author(s) Graeme D. Weaver, Donald R. Hatcher, Anton Huber, and Donald L. Woods (Contributions by W. R. Ratcliff, W. L. Crawford, A. R. Luedecke, Jr. (SDHPT)	8. Performing Organization Report No. Research Report No. 525-1F
9. Performing Organization Name and Address Texas Transportation Institute Texas A&M University College Station, Texas 77843	10. Work Unit No.
	11. Contract or Grant No. Study No. 1-18-76-525
	13. Type of Report and Period Covered Final - October 1976 to September 1977
12. Sponsoring Agency Name and Address Texas State Department of Highways and Public Transportation P.O. Box 5051, Austin, Texas 78763	14. Sponsoring Agency Code

15. Supplementary Notes
Research done in cooperation with DOT, FHWA (Contract No. DOT-FH-11-9185) (TTI Subcontract to Texas SDHPT)
Study Title: "Training Course on Highway Safety Improvement Programming"

16. Abstract

This Instructor's Manual includes specific instructional material relating to presentation of a one week training course entitled, "Safety Improvement Programming For Roadside Obstacles." The training course, developed by the Texas Transportation Institute (TTI) and the Texas State Department of Highways and Public Transportation (SDHPT), was administered at the Georgia Institute of Technology in Atlanta, Georgia under FHWA Contract DOT-FH-11-9185 by TTI and Texas SDHPT. This training course was developed and designed specifically to train state and federal personnel to implement the Texas SDHPT roadside safety improvement priority program developed by TTI. Therefore, emphasis is placed on technical methodology and "hands-on" application of the Texas procedure.

The Instructor's Manual is intended to supplement the Course Text as a guide to the instructor in preparing for a making class presentations. It includes instructional details relating to each Course Text chapter, chapter purpose, training objectives, and a print of each visual aid used with the corresponding lesson plan in outline form. Special instructions or training technique comments are also included.

The course includes approximately six hundred 35-mm slides. The visual aids provide complete and consistent coverage of the material in the Course Text. Thus, the visuals, through use of lists, diagrams, photographs and sequential case example illustrations, provide the skeletal framework for each presentation.

17. Key Words	18. Distribution Statement
Roadside Safety, Cost-Effectiveness, Safety Improvements	No restrictions. This document is available to the public through the National Technical Information Service, Springfield, Virginia 22161

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	198	

Form DOT F 1700.7 (8-69)

A Training Course

SAFETY IMPROVEMENT PROGRAMMING FOR ROADSIDE OBSTACLES

(INSTRUCTOR'S MANUAL)

Graeme D. Weaver, Donald R. Hatcher,
Anton Huber, and Donald L. Woods
TEXAS TRANSPORTATION INSTITUTE
Texas A&M University

With Contributions by

W. R. Ratcliff, W. L. Crawford, and A. R. Luedecke, Jr.
TEXAS STATE DEPARTMENT OF HIGHWAYS
AND PUBLIC TRANSPORTATION

Prepared for

FEDERAL HIGHWAY ADMINISTRATION
U. S. Department of Transportation
Washington, D.C. 20590

Contract DOT-FH-11-9185
(FCIP Study No. 1-18-76-525)
(TTI Study No. 2525)

Through the

TEXAS STATE DEPARTMENT OF HIGHWAYS
AND PUBLIC TRANSPORTATION
Austin, Texas

September 1977

STUDY DOCUMENTS

This report represents one of four documents prepared under Contract DOT-FH-11-9185 as listed below:

1. Safety Improvement Programming for Roadside Obstacles -- Course Text
2. Safety Improvement Programming for Roadside Obstacles -- Instructor's Manual
3. Safety Improvement Programming for Roadside Obstacles -- Project Report
4. Safety Improvement Programming for Roadside Obstacles -- Computer Documentation

The first three documents were prepared by the Texas Transportation Institute. The Texas State Department of Highways and Public Transportation prepared the computer documentation report.

NOTICE

ACKNOWLEDGMENTS

This Instructor's Manual was prepared by the Texas Transportation Institute (TTI) under subcontract to the Texas Department of Highways and Public Transportation (SDHPT) for the Federal Highway Administration (Contract DOT-FH-11-9185). The course Text, instructor's manual, and visual aids were produced as training materials used at a one-week training course conducted in Atlanta, Georgia cooperatively by staff from TTI and the Texas SDHPT.

TTI staff included Graeme D. Weaver, principal investigator, D. R. Hatcher, A. Huber, and D. L. Woods. Appreciation is expressed to Lorice Bush for typing the manuscript.

Texas SDHPT staff included W. R. Ratcliff, principal investigator, W. L. Crawford, and A. R. Luedecke, Jr. Appreciation is expressed to these individuals for preparing drafts of selected chapters and visual aids, and for assisting in the conduct of the training course.

Special acknowledgment is extended to W. Collins and R. A. Richter (FHWA, Washington) for their invaluable assistance in arranging the necessary facilities and equipment at Georgia Institute of Technology, and for their cooperation and advice throughout the research project.

PREFACE

This Instructor's Manual includes specific instructional material relating to presentation of a one week training course entitled, "Safety Improvement Programming For Roadside Obstacles." The training course, developed by the Texas Transportation Institute (TTI) and the Texas State Department of Highways and Public Transportation (SDHPT), was administered at the Georgia Institute of Technology in Atlanta, Georgia under FHWA Contract DOT-FH-11-9185 by TTI and the Texas SDHPT. This training course was developed and designed specifically to train state and federal personnel to implement the Texas SDHPT roadside safety improvement priority program developed by TTI. Emphasis was placed on technical methodology and "hands-on" application of the Texas field inventory process and computerized evaluation procedure. Where used elsewhere, simplifying modifications could be made to the training technique by using slide illustrations and prepared computer printouts to show inventory technique. It must be recognized, however that actual field instruction and computer application are considered essential to adequately prepare those who will be doing inventory work and who will implement the total methodology.

The Instructor's Manual is intended to supplement the Course Text as a guide to the instructor in preparing for and making class presentations. It includes instructional details relating to each Course Text chapter, chapter purpose, training objectives, and a print of each visual aid used with the corresponding lesson plan in outline form. Special instructions or training comments are also included.

The Course Text contains a very comprehensive presentation of the

subject material; therefore, the instructor should be thoroughly familiar with the text content. Also, he should be familiar with the computer program and other documents referenced through the Course Text. The Instructor's Manual and Course Text are organized similarly; therefore, the instructor may review or amplify a presentation by studying the appropriate chapter in the text and citing illustrative examples. Much of the material is highly technical and it is recommended that the instructor study each chapter carefully to thoroughly understand the various case examples, input data and format shown on case example slides, and computer formats shown in the visual aids.

Visual Aids and Lesson Plan

The course includes approximately six hundred 35-mm slides. The visual aids provide complete and consistent coverage of the material in the Course Text. Thus, the visuals, through use of lists, diagrams, photographs and sequential case example illustrations, provide the skeletal framework for each presentation. The instructor can then concentrate on presentation techniques and the selection of amplification and illustrative material to enhance the effectiveness of the class presentation.

The points to be emphasized for each visual aid are presented in outline form adjacent to the copy of each visual aid within a chapter. Suggestions for workshop conduct are presented in those sessions in which visual aids are not used.

Special Equipment

Two slides projectors and two large projection screens are used during the training course. Also, equipment such as adequate audio systems, a

pointer (preferably electric spot pointer), remote controller for each projector, writing materials, etc. are required for successful course conduct. A large room with tables is the preferable meeting facility.

When the course format includes the field inventory and computer demonstration, arrangements must be made to have available vehicles to transport participants to pre-selected highways for field workshop activities, and a computer facility capable of accommodating the computer software packages. The computer programs should be "on-line" prior to conduct of the training course. Other special equipment includes distance-measuring equipment installed in the workshop vehicles and slope steepness measuring devices (slopeometers).

Course Agenda

When presented as initially developed (with inclusion of the field inventory and participant computer demonstration) the arrangement of the course is controlled to a large degree by two logistical factors: (1) the number of participants and (2) the availability of computer keypunchers and computer "turn-around" time. Neither constraint is insurmountable; however, considerable preplanning is necessary to schedule the lectures and workshops. Where necessary, the class can be divided into sections to facilitate conduct of the field inventory trip. Lectures and workshops can be scheduled to facilitate keypunching and to obtain computer output so that printouts are available during certain workshops. The initial presentation in Atlanta was structured to accommodate both factors. The course schedule is shown in Exhibit 1.

EXHIBIT 1

COURSE AGENDA

(As Conducted in Atlanta, Georgia)

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
AM	1. Registration 2. Welcoming Remarks 3. Introduction and Concept of Cost-Effectiveness (Chapter 1 in Text) 4. NCHRP 148 Conceptual Model (Chapter 2 in Text) 5. Texas Cost-Effectiveness Analysis Procedure Development (Chapter 3 in Text)	1. Roadside Hazard Improvement Form (Chapter 6 in Text) 2. Workshop No. 1 -- Encoding of Case Examples (Chapter 7 in Text) 3. Organization of Field Teams	1. Building and Updating of Inventory Master File (Chapter 8 in Text) 2. Accident Data Incorporation (Chapter 9 in Text) 3. Procedure Adaptation For Individual States (Chapter 10 in Text) (See Note 1)	1. Workshop No. 3 -- Inspection of Computer Output and Correction of Errors 2. Development of Safety Program (Chapter 12 in Text) 3. Experience in Texas (Chapter 13 in Text)	1. Workshop No. 5 -- Team Presentation of Safety Program 2. Course Critique 3. Closing Remarks
PM	1. Application of Procedure (Chapter 4 in Text) 2. Roadside Hazard Inventory Form (Chapter 5 in Text)	1. Field Activity (Roadside Inventory on Selected nearby highways) (See Note 1)	1. Management Programs (Chapter 11 in Text) 2. Workshop No. 2 -- Preparation of Field Data For Computer Analysis	1. Workshop No, 4 -- Development of Safety Program by Participants	

Note (1) Field Activity was conducted in two parts -- half the class traveling to the field on Tuesday afternoc the other on Wednesday morning. The lectures listed on Wednesday morning were presented on both Tuesc afternoon and Wednesday morning to the half of the class that was not conducting the field inventory.

TITLE: INTRODUCTION AND CONCEPT OF COST-EFFECTIVENESS

PRESENTATION TIME: 30 Minutes REFERENCE IN COURSE TEXT: Chapter 1

PURPOSE OF PRESENTATION:

1. To summarize Safety Improvement Evaluation Techniques
2. To define elements of cost-effectiveness analysis
3. To identify application and benefits of cost-effectiveness analysis techniques to solving the roadside safety improvement problem

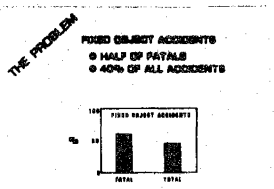
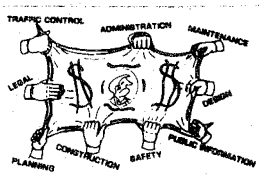
TRAINING OBJECTIVES:

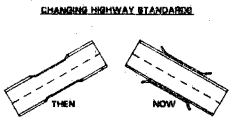
At the completion of the presentation the participant should be able to demonstrate his (her) understanding of the material by:

1. Stating the reasons (Federal, State, etc.) why roadside safety improvement prioritizing programs are necessary
2. Identifying and differentiating between evaluation methods that have been used and are proposed herein for implementing roadside safety programs
3. Defining and explaining the relationship between the elements of cost-effectiveness analysis and, in particular, of the cost-effectiveness model forming the basis of the Texas analysis model
4. Stating potential uses and benefits of application of cost-effectiveness analysis techniques to institute a roadside safety prioritizing program

SPECIAL INSTRUCTIONS AND COMMENTS:

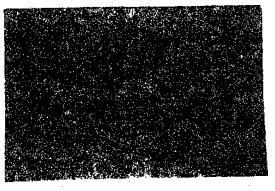
1. Presentation Format: Lecture/slide presentation
2. Allow participant/instructor interaction with questions and answers during presentation as time permits
3. One projector required

 1-1	1. Define chapter objectives. 2. This chapter provides the background of C/E analysis detailing the assumptions and basis of concept. 3. Emphasize that the overall goal is to obtain the greatest safety from the funds available.
 1-2	1. Traffic accidents involving roadside obstacles are a major problem. 2. About half of the total accidents and 40% of all accidents on freeways are associated with collision with roadside obstacles.
 1-3	1. Safety like all other aspects of highway engineering must compete for limited funds. 2. As the need for roadside safety improvements increase, the funds available are being reduced. 3. There is a need to obtain the maximum benefit from the available safety monies. 4. This fact was emphasized by the requirement that safety projects be ranked by priority.



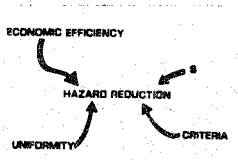
1-4

1. Highway development is a dynamic process.
2. From concept to completion is often 8-10 years and the life span may be 50 years or more.
3. Older facilities will not be up to modern safety standards.



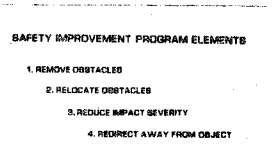
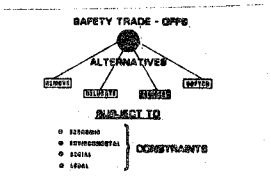
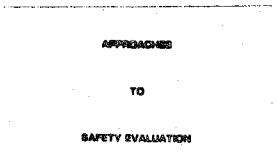
1-5

1. Economic considerations prohibit the complete rebuilding of these facilities.
2. There will always be a need to retrofit many older facilities to be consistent with the current level of technology.
3. The only viable solution appears to be judicious application of available safety monies to upgrade existing facilities to current standards.



1-6

1. Hazard reduction is the obvious goal of every safety program.
2. The constraints of funding, economic efficiency, and existing criteria coupled with ever present social pressures make the consideration of safety alternatives in a uniform and objective manner essential.

 1-7	1. The treatment priorities are: (a) Remove the obstacles (b) Relocate the obstacle in a less hazardous location (c) Reduce the severity of impacts (d) Redirect the errant vehicle away from the hazardous area 2. With unlimited funding a meaningful safety program would not be difficult. 3. Limited funding combined with a lack of uniformity in evaluation of safety alternatives greatly complicates the problem.
 1-8	1. Safety trade-offs associated with these four alternatives are subject to economic, environmental, social, and legal constraints.
 1-9	1. There are several basic approaches to safety evaluation: (a) Engineering judgment (b) Safety review team (c) Benefit cost analysis (d) Cost-effective analysis

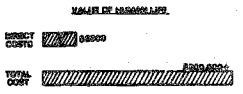
INDIVIDUAL ENGINEER SUBJECT TO PERSONAL BIAS LACK OF UNIFORMITY IN DECISION CRITERIA SUBJECT TO PUBLIC PRESSURE 1-10	1. Evaluation by a trained individual is valid but has some major short comings. (a) Bias (b) Lack of uniformity (c) Subject to public pressure
SAFETY REVIEW TEAM SEVERAL DISCIPLINES INCLUDED POSSIBLY LESS PERSONAL BIAS MORE UNIFORM DECISION CRITERIA 1-11	1. Combining the talents of several trained persons can reduce personal bias and provide a more uniform decision making criteria. 2. Teams still are subject to personal and agency bias when objective evaluation criteria are not established.
EVALUATION CRITERIA 1-12	1. The evaluation criteria are obviously the key to any safety priority program. 2. Poor or non-existent criteria reduce the probability of an objective program. 3. Both benefit-cost and cost-effectiveness analysis are used to provide consistency in decision making. 4. A brief review of these concepts is of importance.

BENEFIT - COST

- $ VALUE MUST BE ASSIGNED TO BENEFITS
- HUMAN LIFE BECOMES A DOMINANT FACTOR
- WELL SUITED TO SITES WITH ACCIDENT HISTORY

1-13

1. Benefit-cost analysis is the traditional engineering approach to establishing priorities for improvements.
2. This technique requires that a monetary value be assigned to all benefits. In such an analysis, the value of a human life dominates.
3. This technique is particularly well suited to locations with definable accident histories.



1-14

1. The value assumed for a human life is critical in the benefit-cost approach.
2. Recent studies suggest that any value between $5,000 and $300,000 can be justified.
3. The results within these limits vary widely as would be expected.

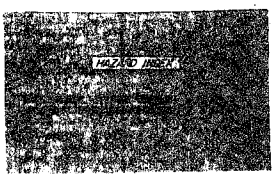
COST-EFFECTIVENESS ANALYSIS

- BASED ON ACCIDENT PROBABILITY
- C/E VALUE IS COST TO REDUCE ONE FATAL OR SERIOUS INJURY ACCIDENT
- DOES NOT INVOLVE ARBITRARY VALUE OF HUMAN LIFE
- PERMITS DIRECT COMPARISON OF ALTERNATIVES

1-15

1. Cost-effectiveness analysis is based on the reduction in hazard and the cost to achieve that reduction.
2. The C/E value reflects the cost to eliminate one serious injury or fatal accident and does not involve an arbitrary value of human life.
3. The measure of effectiveness is hazard reduction; therefore, a direct comparison of alternatives is possible.

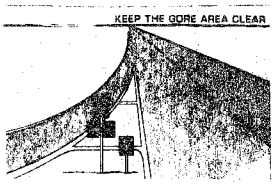
COST- EFFECTIVENESS = $\frac{\text{COST}}{\text{CHANGE IN HAZARD INDEX}}$ 1-16	1. Cost-effectiveness then is the total cost (initial and maintenance) divided by the change in hazard that is achieved by the modification.
C/E = $ PER FATAL OR SERIOUS INJURY ACCIDENT ELIMINATED COST = ANNUALIZED TOTAL COSTS 1-17	1. The C/E value represents the cost to eliminate one serious injury or fatal accident. 2. To place the cost data on the same basis in the accident prediction model, total annualized cost are used.
HAZARD REDUCTION = DIFFERENCE IN HAZARD INDEX BEFORE AND AFTER TREATMENT 1-18	1. The hazard reduction is the difference in the hazard indices before and after treatment. 2. Define "Hazard Index" using next slide.



1-19

1. The hazard index is the product of the probability of the vehicle leaving the roadway at that point, the probability that the vehicle will reach the obstacle and the severity of impact if the obstacle is struck.

2. Probability of a vehicle leaving the roadway is computed from roadside encroachment data that were based on empirical data concerning vehicles encroaching medians of alongside tangent roadways.



1-20

1. The exposure in gore areas such as exit ramps is greater than will be indicated by the analysis model.

2. Gore areas are areas of potentially high encroachment and should be kept clear of obstacles. Many spot improvement programs are directed toward this important roadside feature.

ANALYSIS ASSUMPTIONS

20 YEAR LIFE

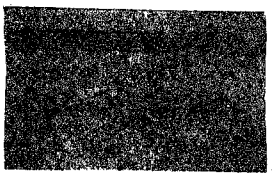
8% INTEREST

1-21

1. The basic assumptions of the C/E model are

   (a) a 20 year effect life
   (b) 8% interest rate

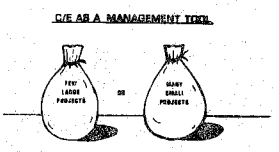
2. The 20 year life does not reflect a limited life of the highway facility but rather that a longer life has little or no effect on the analysis.



1-22

1. The analysis model is:

   (a) initial cost C_1, plus
   (b) the difference in the maintenance costs before and after treatment, plus
   (c) the difference in the accident repair costs before and after treatment
   (d) all divided by the difference in the hazard index before and after treatment.



1-23

1. The safety emphasis of recent years has expanded the array of alternatives to be evaluated.

2. A common question is "would a few large safety projects or many smaller projects result in the greatest benefit?"

3. C/E has been developed to assist in the decision which will yield the greatest safety benefits.

ADVANTAGES OF C/E ANALYSIS

SAFETY SCHEDULING

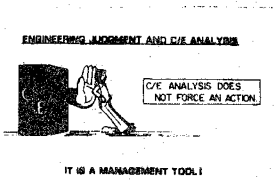
DESIGN DEFICIENCIES

COMPARISON OF DESIGN ALTERNATIVES

1-24

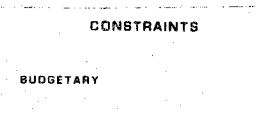
1. The C/E output based on an adequate data file can

   (a) be used to schedule safety projects
   (b) can assist in identifying design deficiencies
   (c) compare the relative safety of design alternatives.



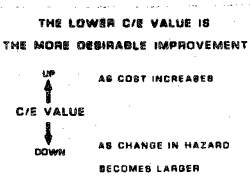
1-25

1. C/E does not force an action.
2. It is a management tool which can be used as one basis for a decision on safety programming.



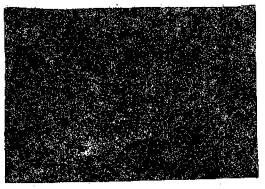
1-26

1. Other constraints must also be a part of the decision making process.
2. Cite examples such as "tree-planting" programs versus "tree-removal" safety alternatives.



1-27

1. The cost-effectiveness value is consistent in nature.
2. As the cost of treatment increases the C/E value increases.
3. As the change in hazard becomes larger, the C/E value is reduced.
4. Thus the lower C/E value is more desirable.
5. Negative values are even more desirable under certain conditions.

NEGATIVE COST-EFFECTIVENESS NUMERATOR NEGATIVE DUE TO MAINTENANCE COSTS → MEANINGFUL DENOMINATOR NEGATIVE $H_A > H_B$ → NOT MEANINGFUL 1-28	1. A negative C/E can occur in two ways; (a) the numerator can be negative indicating that the annual maintenance cost after improvement results in a net annual saving sufficient to offset the initial improvement cost. This is, of course, highly desirable. (b) The C/E can be negative if the hazard index after treatment is greater than before treatment. The safety benefits are nil and the negative C/E value is meaningless.
 1-29	1. The basic C/E analysis procedure is based on many assumptions. 2. The results must be interpreted with reason and judgment. 3. It is a valuable tool but not a panacea for all answers without engineering judgment input.

TITLE: NCHRP 148 CONCEPTUAL MODEL

PRESENTATION TIME: 30 Minutes REFERENCE IN COURSE TEXT: Chapter 2

PURPOSE OF PRESENTATION:

1. To define elements of NCHRP 148 cost-effectiveness analysis model
2. To identify assumptions and basis on which the model was developed

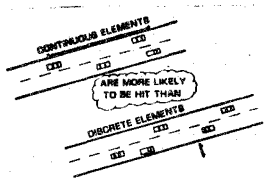
TRAINING OBJECTIVES:

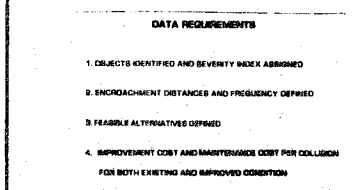
The participant should be able to:

1. Define the elements of the NCHRP 148 cost-effectiveness analysis model
2. State the several probability relationships that constitute the conceptual model
3. State in non-mathematical terminology, the influence of obstacle parameters on hazard index
4. State the sequential conceptual design involved in transforming the NCHRP 148 conceptual model to an implementation procedure in Texas including the information requirements to accomplish this

SPECIAL INSTRUCTIONS AND COMMENTS:

1. Presentation Format: Lecture/slide presentation
2. Allow participant/instructor interaction with questions and answers during presentation as time permits
3. One projector required

NCHRP 148 CONCEPTUAL MODEL FOR COST-EFFECTIVENESS ANALYSIS (CHAPTER 2) 2-1	Title Slide: NCHRP 148 Conceptual Model for Cost-Effectiveness Analysis 1. State chapter objectives and training technique. 2. Discuss background of NCHRP 148 work as basis for the Texas analysis model.
HAZARD IS A FUNCTION OF : 1. PROXIMITY TO THE ROADWAY 2. SEVERITY OF IMPACT IF STRUCK SEVERITY IS INDEPENDENT OF DISTANCE ENCROACHMENT FREQUENCY IS A FUNCTION OF : 1. VOLUME 2. ROADSIDE GEOMETRY 2-2	1. Discuss terms: (Ref. pg. 2-1, Text) (1) Hazard (2) Severity (3) Encroachment 2. Cite examples of distance, rigidity, and roadside encroachment to illustrate effect of each on above elements.
 2-3	1. Nature of roadside obstacle influences expected frequency of impact. 2. Discuss differences between expected impact on point obstacles and longitudinal (continuous) obstacles. 3. Cite examples of each for participant reference.

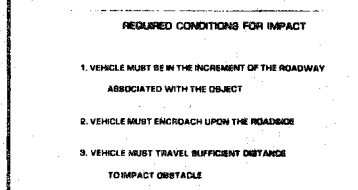


2-4

Data Requirements

1. Elements listed on slide are necessary for September analysis.

2. Discuss each element and its relationship to successful operation of NCHRP 148 conceptual model.



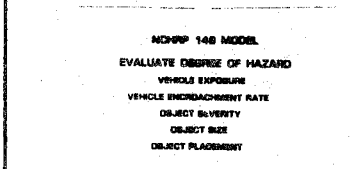
2-5

Required Conditions For Impact

1. NCHRP 148 model is based on the assumptions listed here.

2. The model is probabalistic in nature; therefore these parameters must be mathematically defined to determine probability of impact.

3. Discuss relationship of ADT, encroachment probability, and encroachment distance.



2-6

NCHRP 148 Model

1. NCHRP 148 conceptual model formulated considering:

   (a) vehicle exposure
   (b) vehicle encroachment rate
   (c) object severity
   (d) object size
   (e) object placement

2. Equation developed (see next slide)

$H = V[P(E)][P(C/E)][P(I/C)]$

H - HAZARD INDEX

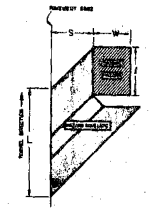
V - VEHICLE EXPOSURE

P( ) - PROBABILITY OF ENCROACHMENT, COLLISION, INJURY, ETC.

2-7

NCHRP 148 Hazard Equation

1. Define individual terms in equation.
2. Discuss basis for obtaining mathematical definition of probabilities shown.



VEHICLE - OBJECT COLLISION RELATIONSHIP

2-8

Vehicle-Object Collision Relationship

1. Discuss concept of "Hazard Envelope".
2. Breifly define major terms in diagram.
3. Emphasize:

   (1) L increases with S, W, and l.
   (2) d is vehicle width.

DEFINITIONS OF TERMS

HAZARD

SEVERITY

HAZARD INDEX

COST-EFFECTIVENESS

2-9

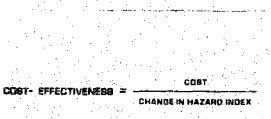
Definition of Terms

1. Four terms must be defined and clearly understood:
   (1) Hazard
   (2) Severity
   (3) Hazard Index
   (4) Cost-Effectiveness
2. Define first two with slide 2-9 on screen.
3. Define (3) and (4) with slides 2-10 and 2-11 respectively.

2-10

Hazard Index

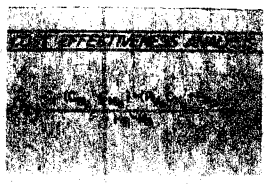
1. Define individual terms in mathematical expression.
2. Discuss sensitivity of each probability term.



2-11

Cost-Effectiveness General Equation

1. Define cost-effectiveness in general terms of "cost per change in hazard reduction".
2. Show slide 2-12 and re-define in specific cost terms.



2-12

Cost-Effectiveness Analysis

1. Cost-Effectiveness analysis composed of individual cost-elements divided by hazard index change.
2. Define each cost and probability term in expression.
3. Illustrate with cost examples.

ADAPTATION OF 148 CONCEPT
TO TEXAS

148 BASIC STARTING POINT FOR ANALYSIS
DEVELOP METHODOLOGY TO IMPLEMENT CONCEPT
FIT SDHPT POLICY & EQUIPMENT
COMPUTERIZED
OPERATE STATEWIDE - ALL ROADWAYS

2-13

Adaptation of 148 Concept of Texas

1. NCHRP 148 model provides a basic foundation for a structured method to evaluate safety improvements.

2. Basic model must be expanded to all types of roadways.

3. Implementation methodology must be developed for specific needs of Texas SDHPT.

TEXAS PROCEDURE

- APPLICABLE FOR CONTROLLED AND NON-CONTROLLED ACCESS HIGHWAYS
- BASIC RESULTS – NCHRP 148 EQUATIONS
- IMPLEMENTATION TECHNIQUE:
  - SKILLS FILE OF HAZARDS AND IMPROVEMENTS
  - DEVELOP DATA MANAGEMENT SYSTEM FOR SELECTIVE EVALUATION

2-14

Texas Procedure

1. Summarize conceptual design of Texas implementation procedure.

2. The remainder of the course will involve detailed discussion of "how" the basic concept is applied.

TITLE: TEXAS COST-EFFECTIVENESS ANALYSIS PROCEDURE DEVELOPMENT

PRESENTATION TIME: 45 Minutes REFERENCE IN COURSE TEXT: Chapter 3

PURPOSE OF PRESENTATION:

1. To summarize the assumptions and rationale upon which the Texas procedure is based.

TRAINING OBJECTIVES:

The participant should be able to:

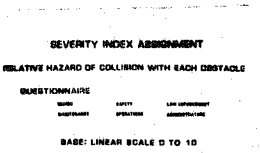
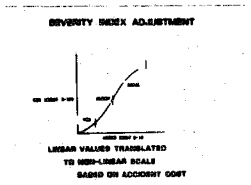
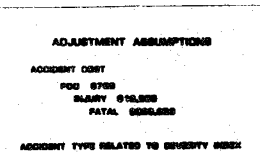
1. Describe methodology used to identify, quantify, and select roadside hazards, improvement alternatives, encroachment data, severity index data
2. Describe in mathematical termology the scalar limits of adjusted (non-linear) and base (linear) severity indices
3. Define terms such as hazard; classification, identification and descriptor codes; Hazard Inventory Form; Hazard Improvement Form; and other unique terms within chapter 3 (Course Text)
4. State the six steps in the General Procedure to apply the Texas Cost-Effectiveness Roadside Safety Improvement Program

SPECIAL INSTRUCTIONS AND COMMENTS:

1. Presentation Format: Lecture/slide presentation
2. Allow participant/instructor interaction with questions and answers during presentation as time permits
3. One projector required

CHAPTER 3 COST - EFFECTIVENESS ANALYSIS PROCEDURE DEVELOPMENT 3-1	Title Slide: Cost-Effectiveness Analysis Procedure Development 1. Summarize assumptions and rationale on which Texas procedure is based.
ANY OBJECT PROJECTING ABOVE OR DEPRESSED BELOW THE SURFACE WHICH CAN PRODUCE A CHANGE IN VEHICLE ACCELERATION IS A HAZARD 3-2	Definition of a Hazard 1. Decision to computerize dictated that all hazards be specifically identified. 2. Hazard connotes severity -- severity implies impact. 3. Cite examples -- 2 "curb to bridge pier and entire spectrum.
DEFINE HAZARDS 1. LIST ALL OBSTACLES 2. CATEGORIZE 3. FIELD TRIAL 4. REVISE 14 CATEGORIES AND SUB-CATEGORIES 3-3	Define Hazards 1. Discuss manner in which hazard list was developed. 2. Reference Table 3.1 in text.

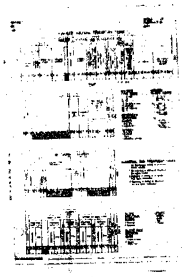
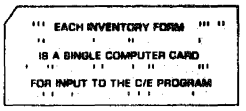
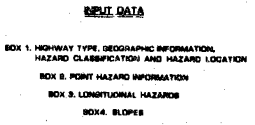
OBSTACLES WITH FULL SAFETY TREATMENT WERE EXCLUDED FROM THE INVENTORY. 3-4	1. Certain "hazards" have been designed such that impact severity is virtually negligible. Examples: breakaway supports 2. These obstacles were omitted from hazard list because there is no technology to improve safety (except removal).
SOME ROADSIDE HAZARDS ARE NECESSARY FOR TRAFFIC OPERATIONS •POST AND CABLE •MEDIAN BARRIERS •CHANNELIZING ISLANDS •RAILROAD SIGNALS 3-5	1. Certain other roadside obstacles were either omitted from list, or provided no improvement alternative because they were considered necessary for proper traffic separation. Example: post and cable median barriers 2. Others omitted: channelizing islands, R.R. signals, and urban facilities
HAZARD IDENTIFICATION CODING 14 CATEGORIES OF HAZARDS — 47 HAZARDS PRIMARY CATEGORY - IDENTIFICATION CODE SUB-CATEGORY - DESCRIPTOR CODE ALL HAZARDS CODED WITH 4-DIGIT CODE 3-6	Hazard Identification Coding 1. Hazards were grouped with subcategories. 2. For computer input - each must carry a unique code. 3. Classification system allows flexibility to add more codes. 4. Reference Table 3.1 with example shown.

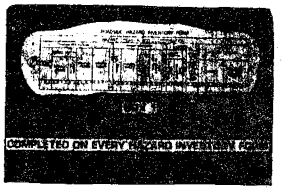
 3-7	Severity Index Assignment 1. Define severity index. 2. Questionnaire: 98-statement "agree/disagree" Rate 50 impacts, 0-10 scale Submitted throughout Texas (300-400 people) 3. Linear Scale: 0 - negligible injury, PDO 10 - assumed fatality 4. TTI crash test results also used.
 3-8	Severity Index Adjustment (Figure 3.1, Page 3-5) 1. Discuss translation scale from 0-10 linear to 0-100 non linear. 2. Reference Figure 3.1 in text. 3. Unit change in S.I. depends on position. 4. Linear Scale has disadvantages in C/E value.
 3-9	Adjustment Assumptions 1. Reference Table 3.2 in text. 2. Adjustment process essentially same as cost relationships between accident costs and severity. 3. U.S. DOT cost figures used.

SEVERITY INDICES FOR ALL HAZARDS BUILT INTO ANALYSIS PROGRAM 3-10	Decision was made early in the development state--to avoid personal bias toward particular hazard type, severity index would not be specified as individual input; instead a table of severity indices would be built into program for automatic call-up.
ENCROACHMENT CHARACTERISITICS VEHICLE ENCROACHMENT ASSUMPTIONS ●HUTCHINSON & KENNEDY'S RESEARCH - FREQUENCY & DISPLACEMENT ●EXIT ANGLE - 11° ●VEHICLE SPEED - 60 mph VEHICLE OPERATING CONDITIONS BUILT INTO PROGRAM 3-11	Encroachment Characteristics 1. Quantification of certain traffic operating characteristics is vital to usage of the NCHRP 148 analysis model. 2. Discuss each characteristic on slide. 3. Model dependent on single angle and speed -- 60 mph and 11 degrees selected.
APPROACHES TO OBTAINING HAZARD INFORMATION 1. FROM "AS-BUILT" PLANS 2. FROM PHOTO-LOGS 3. PHYSICAL ROADSIDE INVENTORY 3-12	Approaches to Obtaining Hazard Information 1. Hazard influenced by dimensions, location, etc. 2. Question: "What are possible ways to determine this information?" 3. Discuss each cited possibility and point out reasons for not using it.

BEST ALTERNATIVE FIELD INVENTORY WITH TEAM PERMITS ACCURATE LOCATION OF HAZARDS SHOWS INTERRELATIONSHIP BETWEEN HAZARDS PERMITS ON-SITE PERSPECTIVE OF HAZARD PERMITS ON-SITE EVALUATION OF TREATMENT 3-13	Best Alternative: Field Inventory with Team 1. This possibility offered many advantages (cite as shown on slide). 2. Selected by Texas as way to obtain hazard information for model input data.
HOW TO DO IT? WHO WOULD CONDUCT INVENTORY? OBSTACLE LOCATION TECHNIQUE? HOW TO RECORD HAZARD INFORMATION? WHAT IMPROVEMENT ALTERNATIVES? HOW TO RECORD IMPROVEMENT ALTERNATIVES? 3-14	1. Having selected field inventory as the way to obtain information, methodology had to be developed to accomplish it. 2. Several questions had to be answered (cite questions from slide).
WHO? INVENTORY TEAM @LOCATE EXISTING HAZARDS @RECOMMENDED SAFETY TREATMENTS ALL IN ONE PROCESS! 3-15	Who? 1. To alleviate the undesirable attributes of single-person evaluation, it was decided that the inventory data could best be obtained by an Inventory Team. 2. Team with proper membership could locate obstacles and recommend improvements <u>all in one process</u>.

LOCATING OBSTACLES USE OF VEHICLE ESSENTIAL ODOMETER WITH 1/1000 MILE ACCURACY REFERENCE HAZARDS TO KNOWN MILEPOST 3-16	Locating Roadside Obstacles 1. Since many miles of highway would require inventorying, use of a vehicle was essential. 2. Special DMI equipment referencing obstacle to mileposts eliminated standard survey techniques and would reduce inventory time.
DEFINING SAFETY ALTERNATIVES SAME TECHNIQUE USED AS FOR HAZARD LIST ALL FEASIBLE ALTERNATIVES LISTED •FIELD TRIED •REVISED 3-17	Defining Safety Alternatives 1. Discuss "brainstorming" techniques used to develop safety improvement list -- same principle as development of hazard. 2. Final list (Improvement Form) refined to include improvements to groups of hazards.
RECORDING INFORMATION POSSIBLE METHODS •FIELD PUNCH CARDS •PORTABLE ELECTRONIC RECORDING •MANUAL RECORDING ON FORMS •MANUAL RECORDING SELECTED DUE TO SIMPLICITY AND FLEXIBILITY. 3-18	Recording Information 1. Uniformity of data input is essential to computer application. 2. Many hazards necessitated systematic coding process. 3. Several possible methods of recording information (cite slide) 4. Manual forms selected.

 3-19 (Screen 2)	Hazard Inventory Form 1. One page form containing all information to describe existing hazard 2. Developed in several stages. 3. Repeated field trials and modifications. 4. Final form applicable for controlled and non-controlled access highways.
 3-20	1. Separate form used for each hazard. 2. Direct transfer to computer cards, 3. Only data within numbered columns are punched. 4. Each numbered column is a computer card column.
 3-21	Input Data 1. Form designed to record data within 4 categories. 2. Hazards classified in 3 categories: (1) Point hazard (2) Longitudinal hazard (3) Slopes 3. Box 1 - classification & location information

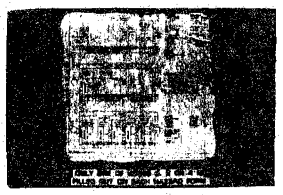


3-22

Box 1 -- completed on every hazard inventory form

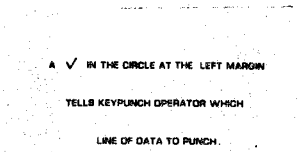
Emphasize the necessity of this:

1. Key
2. Pertinent data for location and hazard type (severity index assignment)



3-23

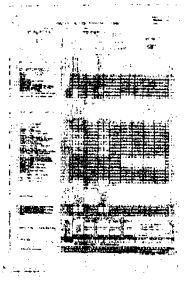
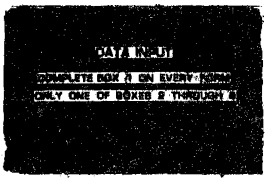
Discuss use of only one of Boxes 2, 3, or 4 for proper completion of form



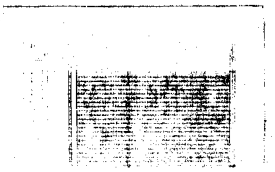
3-24

Check mark

1. Format simplified as much as possible to assist keypuncher.
2. All data are in rows.
3. Only applicable rows of data are keypunched.
4. Checkmark delineates row to be keypunched.

 3-25 (Screen 2)	Project Improvement Form on Screen 2 and leave for discussion purposes in subsequent slides on Screen 1.
RECORDING IMPROVEMENT INFORMATION FORMAT SIMILAR TO HAZARD FORM BOX 1: IDENTIFICATION & COSTS BOX 2: POINT HAZARD IMPROVEMENTS BOX 3: LONGITUDINAL HAZARD IMPROVEMENTS BOXES 4 & 5: SLOPE IMPROVEMENTS BOX 6: NO IMPROVEMENT RECOMMENDED 3-26	Recording Improvement Information 1. Mechanism had to be devised to record improvements. 2. Improvement form "after" condition 3. It was desirable to develop data input system compatible with hazard form. 4. Repeated field trials 5. Discuss format.
 3-27	Data Input 1. Emphasize that Box 1 and one other box must be completed on each form. 2. Emphasize that there must be an improvement for each hazard. 3. Example: 3 hazards, 2 improvements = 3 hazard forms, 6 improvement forms

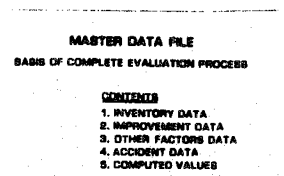
ANALYSIS MODEL COMPUTER NEEDED TO: CALCULATE COMPLEX EQUATIONS MINIMIZE INPUT REQUIREMENTS MAXIMIZE ALTERNATIVE SELECTIONS PROVIDE COMPREHENSIVE DATA FILE SYSTEM 3-28	Analysis Model 1. Calculations are cumbersome by hand -- easy for computer. 2. Discuss reasons and attributes of computer analysis model development. (Blank Screen 2)
COMPUTERIZATION ASSURES UNIFORMITY IN ANALYSIS WHILE REMOVING PERSONAL BIAS 3-29	1. Provides consistent base for selection of one alternative relative to another
SUMMARY OF GENERAL PROCEDURE 1. FIELD INVENTORY 2. DEFINE ACCIDENT EXPERIENCE 3. ANALYZE IMPROVEMENT ALTERNATIVES 4. ESTABLISH MASTER FILE 5. SELECT, SORT & REPORT WITH MANAGEMENT PROGRAM 6. PRIORITIZE IMPROVEMENT ALTERNATIVES 3-30	1. So far, we have discussed only the development of the field inventory procedure -- this is only one of the several phases of the procedure. 2. Summarize remainder of overall safety procedure. 3. Expand each element in subsequent slides.

INVENTORY PROCESS 1. LOCATE EACH HAZARD WITH ODOMETER 2. EVALUATE HAZARD & RECOMMEND IMPROVEMENTS 3. COMPLETE INVENTORY & IMPROVEMENT FORMS 4. IDENTIFY "OTHER FACTORS" INFLUENCING HAZARD 5. COMPLETE "OTHER FACTORS" FORM 3-31	Inventory Process 1. So far discussion has been limited to items 1-3 2. Desirable to develop a methodology to incorporate information concerning geometric factors, etc. 3. Other Factors Form developed to record this information
 3-32	Other Factors Form 1. Card Type 3 2. Discuss form format
ACCIDENT INFORMATION ACCIDENT EXPERIENCE IS ANOTHER DECISION-MAKING TOOL ASSISTS IN SELECTING BETWEEN IDENTICAL C/E VALUES 3-33	Accident Information 1. C/E is only one tool. 2. Accidents are symptoms of problems that are occurring. 3. Desirable to incorporate method to evaluate accident information. 4. Develop input data technique -- accident input form.

3-34

Accident Input Form

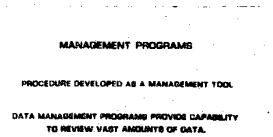
1. Card Type 4
2. Discuss briefly contents of form.
3. Accident input and analysis discussed in detail in Chapter 9.



3-35

Master Data File

1. Flexibility in data input and retrieval is mandatory to effective usage of the program.
2. Intent: build master file and file management system
3. Discussed in detail in Chapter 8



3-36

Management Programs

1. Procedure is primarily a management tool.
2. Intent: develop highly flexible data handling system to accommodate variety of data review and evaluations for managerial decision assistance

TITLE: APPLICATION OF PROCEDURE

PRESENTATION TIME: 45 Minutes **REFERENCE IN COURSE TEXT:** Chapter 4

PURPOSE OF PRESENTATION:

1. To illustrate the implementation of the Texas Cost-Effectiveness Roadside Safety Analysis Procedure

TRAINING OBJECTIVES:

The participant should be able to:

1. Identify special equipment used in the field inventory and describe the features and application of each
2. State the necessary measurements to record inventory and improvement data for all classes of obstacles and the procedures used to acquire these
3. Define (and explain the relationship to successful program implementation) the elements of the application process including data collection, file development and management program usage

SPECIAL INSTRUCTIONS AND COMMENTS:

1. Presentation Format: Lecture/slide presentation
2. Allow participant/instructor interaction with questions and answers during presentation as time permits
3. One projector required

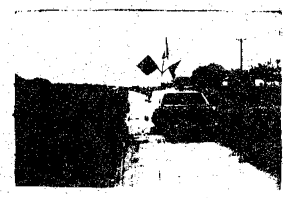
CHAPTER 4 APPLICATION PROCEDURE 4-1	Title Slide: Application Procedure 1. State session objectives and training technique. 2. Session Purpose: To illustrate the implementation of the Texas cost-effectiveness roadside safety improvement analysis procedure.
SCOPE OF INVENTORY All hazards within median and within 30 feet of pavement edge *EXCEPTIONS: Certain Steep Slopes 4-2	Scope of Inventory 1. Lateral boundaries for roadside safety treatment are administrative decision. Most programs consider 30-ft. treatment zone acceptable. 2. Discuss 30-ft. treatment zone in Texas procedure. 3. Exceptions: (a) critical slope (3.5:1 or steeper) (b) back-slope of ditch (c) total median width but not greater than 30-ft. from each side
INVENTORY VEHICLE VAN OR STATION WAGON MUST HAVE DOME-MOUNTED WARNING FLASHER AND ORANGE HAZARD FLAGS ODOMETER — 4-3	Special Equipment -- Inventory Vehicle Emphasize reasons for (a) need for vehicle usage (b) vehicle type -- space, carrying capacity (c) safety hardware -- dome flashers, flags, etc. -- slow moving vehicle (d) special distance measuring equipment with required characteristics

4-4

Interior of Station-Wagon with Table

The vehicle shown here was adapted for use by one of the teams in a district.

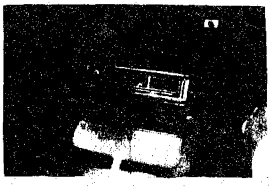
Note: large working area for coding many forms



4-5

View of Station-Wagon Safety Hardware

Inventory vehicle is slow moving, constantly stopping on roadside or shoulder and sometimes re-entering travel lane. It is a hazard itself. Therefore delineate with conspicuous hardware.

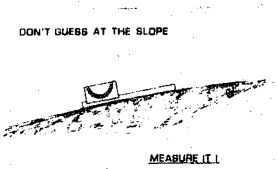


4-6

View of Distance-Measuring Equipment

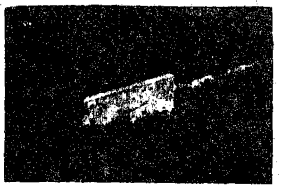
Attributes and desirable characteristics:

1. Digital readout to nearest 1/1000th mile
2. Re-zero easily
3. Negative or positive readout
4. Initial value can be set
5. Fairly inexpensive



4-7

1. Several methods may be used to measure slope steepness.
2. Slope steepness may be determined by "eye" only after considerable practice.
3. "Slope-ometer" developed to provide fast, easy way to measure slope steepness.



4-8

Close-up View of Slopeometer Scale

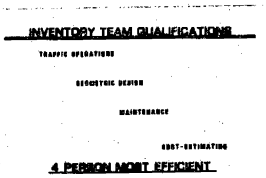
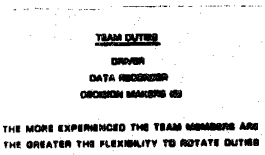
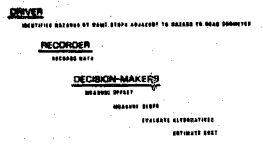
Discuss operation of slopeometer and direct-reading slope ratio scale.

4-9

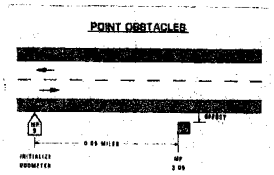
Slopemeter in Operation

Discuss field operation of Slopeometer.

1. Lay instrument on slope.
2. Allow ball to come to rest in groove.
3. Read slope ratio at low point.

 4-10	Inventory Team Qualifications Quality of analysis depends on quality of input inventory data. Since improvement recommendations govern results -- team should be selected to include as many as possible of disciplines listed.
 4-11	Team Duties 1. List team composition. 2. Emphasize: Team-work and flexibility.
 4-12	Team Duties (continued) Discuss each team member duty as shown on slide. (See next slide for important note)

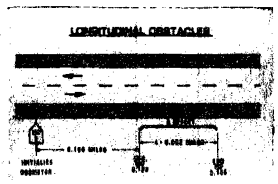
FEWER RECORDING ERRORS OCCUR WHEN DATA ARE RECORDED BY ONE PERSON RATHER THAN ROTATING DUTIES TO OTHER TEAM MEMBERS. 4-13	1. Practice improves efficiency. 2. It takes time to become familiar with form layout. 3. Use of one data recorder produces fewer data errors.
GOOD COST ESTIMATES REFLECT THE LOCAL ECONOMIC SITUATION 4-14	1. Costs vary among geographic areas and in localized areas. 2. Team members must be able to estimate improvement costs on an individual site basis. 3. The key to meaningful cost-effectiveness results is proper cost input data.
LOCATION OF OBSTACLES ROADSIDE OBSTACLES REFERENCED TO MILEPOST OR KNOWN MILEPOINT USING VEHICLE-MOUNTED DISTANCE MEASURING EQUIPMENT 4-15	Location of Obstacles 1. Use roadway mile-post markers if available, otherwise reference to known mile-points from road inventory plans (bridges, intersections, etc.) 2. Re-initialize DMI frequently to avoid cumulative error build-up.



4-16

Point Hazard Obstacle Location Procedure

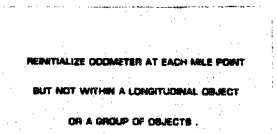
1. Set DMI to record positive or negative depending on inventory direction.
2. Initialize DMI at known mile post.
3. Travel to obstacle and stop adjacent to leading edge (beginning point).
4. Discuss obstacle dimensions and offset and DMI recording.



4-17

Longitudinal Hazard Obstacle Location

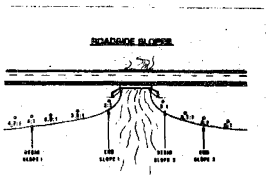
1. Same technique as above except
   (a) record DMI reading at <u>both</u> beginning and end points
   (b) analysis program computes length



4-18

Important Note:

Do not re-initialize DMI within length of longitudinal obstacle or "grouping" -- ending milepost must be recorded on same reference as beginning to produce correct length



4-19

Roadside Slope Boundary Location

1. Only slopes 4:1 or steeper are recorded as a hazard.
2. Beginning point is point at which slope becomes 4:1 - record milepost.
3. End point in example shown is bridgerail.
4. Slope longitudinal length computed by analysis program.

SLOPES WITH VARIABLE STEEPNESS

MODEL USES AVERAGE STEEPNESS

FOR SEVERE STEEPNESS CHANGES

INVENTORY SLOPE IN SECTIONS

ASSIGN NEW HAZARD NUMBERS

END ONE AND START NEXT AT SAME MILEPOST

4-20

Slopes with Variable Steepness

1. Particular care should be taken to determine slope boundaries.
2. Discuss technique (see slide) to inventory variable steepness slopes using example slope ratios to illustrate.

RUN SLOPE-OMETER ALONG SLOPE

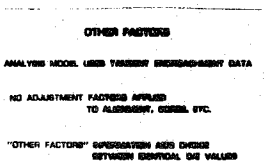
TO DETERMINE BEGINNING

AND END MILEPOST

OF A SLOPE

4-21

Discuss use of slopeometer at points along slope to determine beginning and end points of slope.

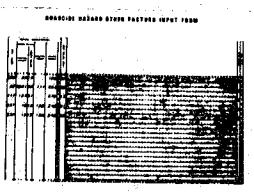


4-22

Other Factors

1. Discuss reasons for incorporation of "Other Factors" information.

2. Factors include: vertical curvature, horizontal curvature, intersections, super-elevation, gores, etc. - codes listed on reverse of "Other Factors" form

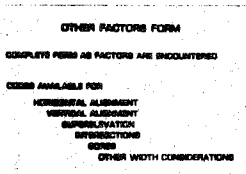


4-23
(Screen 2)

Other Factors Form

1. Discuss how completed (during inventory).

2. Other Factors information is for supplementary information only (not used in computations).



4-24

Other Factors Form

1. Card type 3

2. Form contains many codes, each code referenced by "key"

3. Form completed as hazards encountered

OTHER FACTORS

DATA INPUT ON TYPE 3 CARD

DURING INVENTORY PROCESS

4-25

Other Factors

1. Emphasize that other factors are input on a particular card type as they are encountered along the roadway.

2. Not all obstacles will have other factors data.

INVENTORY DATA FILE DEVELOPMENT

FIELD DATA CONSTITUTES BASIC DATA SOURCE

FOR COMPLETE EVALUATION PROCESS

AND PRIORITY LIST

4-26

Inventory Data File Development

1. Master file of all inventory data (including Other Factors) is established.

2. Forms nucleus of total procedure.

3. Each remaining element discussed briefly here and in detail later.

FILE ELEMENTS

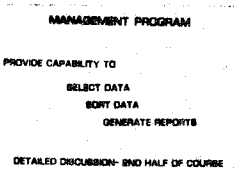
ALL INFORMATION FROM

- INVENTORY FORMS
- IMPROVEMENT FORMS
- OTHER FACTORS FORMS
- ACCIDENT INFORMATION (ADDED LATER)
- CALCULATIONS

4-27

File Elements

List data type and source for all information contained in Master File.



4-28

Management Program

1. Management programs provide capability to manage massive amounts of data in file.

2. Selection, sort, print capabilities

3. Detailed usage will be covered in Chapters 8 and 11.

TITLE: ROADSIDE HAZARD INVENTORY FORM

PRESENTATION TIME: 2 Hours

REFERENCE IN COURSE TEXT: Chapter 5

PURPOSE OF PRESENTATION:

1. To illustrate, using case examples, proper encoding of information on the hazard inventory form.

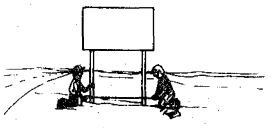
TRAINING OBJECTIVES:

The participant should be able to:

1. Define the elements and terminology on the Roadside Hazard Inventory Form
2. State which data entries are required for proper completion of the form and correctly decide which data are not needed for a particular hazard type
3. Define and illustrate proper data entry format and placement for any data entry space on the form

SPECIAL INSTRUCTIONS AND COMMENTS:

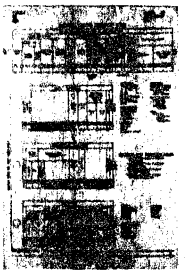
1. Presentation Format: Lecture/slide presentation with step-by-step illustration of correct data requirements and entry methodology
2. Instructor should permit and encourage questions from participants during and at the end of presentation
3. Equipment Required: Two projectors



5-1

Roadside Hazard Inventory (Title Slide)

1. State objectives and training technique.
2. Purpose: To instruct participants, using case examples, to properly encode information on the Hazard Improvement Form.

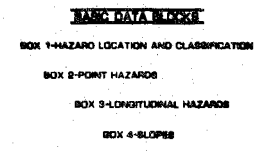


5-2
(Screen 2)

Hazard Inventory Form

1. Data describe existing obstacle
2. One form per obstacle
3. All entries are numeric.
4. All data right justified
5. Complete Box 1 and one other on each form.
6. Discuss form structure and format.
7. Emphasize:

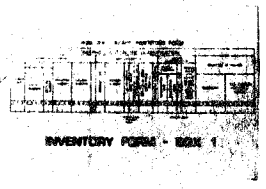
   (1) Entry spaces, numbers, check marks, etc.
   (2) Basic data boxes



5-3

Basic Data Blocks

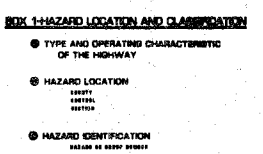
1. Four basic data blocks
2. Note circles on left side
3. Preprinted check mark in first circle
4. Box 1 always completed
5. Either Box 2, 3, or 4 completed
6. Place check mark in circle adjacent to box completed.
7. Check marks in circles indicate to keypuncher where data is located on form.



5-4
(Screen 2)

Inventory Form - Box 1

Note: This slide remains on screen 2 throughout discussion of slides 5-5 through 5-33



5-5

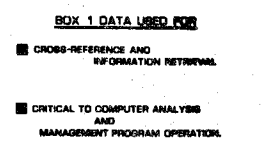
Box 1 - Hazard Location and Classification

1. Discuss four main sections of Box 1

   (1) Hazard identification
   (2) Highway description
   (3) Hazard description
   (4) Milepost at hazard

2. Identify sub-sections of the four main sections

3. Define terms uncommon to all states, i.e., control section, milepost, etc.



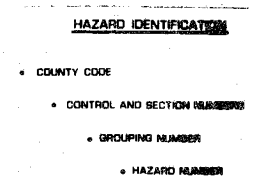
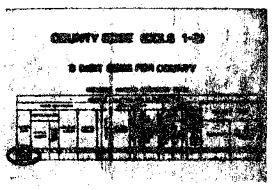
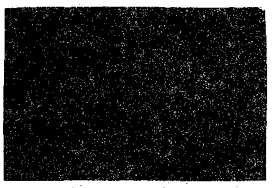
5-6

Box 1 - Data Used For

1. Describe which data are used for cross reference and computer operation (cite examples)

2. Data provide basic decision-making information critical to:

   (1) Computer operation
   (2) Management program

 5-7	Hazard Identification 1. Introductory slide to elements in this sub-section of Box 1 - use screen 2 to illustrate. 2. County code is numeric. 3. Define control and section. 4. Define grouping and grouping number. 5. Define hazard number. 6. Coding of each element is illustrated in subsequent slides.
 5-8	County Code 1. Example shown in County 17. 2. Code county in which inventory is being conducted. 3. Code is an alphabetical - numerical designation incorportate in model. 4. County code must be same for all hazards in a group. 5. The county number and/or name will appear on all output. 6. The county code can be used as a selection/sort field in management program.
 5-9	Control and Section Numbers 1. Example shown illustrates Control No. 1026 and Section No. 28 2. Must be same for all hazards in a group. 3. Used as a selection/sort field in management programs.

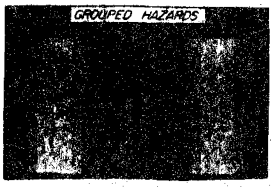
CONTROL AND SECTION NUMBERS ARE USED FOR COMPUTER SORTING AND DATA MANAGEMENT. OMISSION OF THESE DATA WILL RESULT IN A PROGRAM ERROR. 5-10	Emphasize importance of correct control and section numbers (1) Within group (2) Errors will occur if omitted or incorrect
GROUPING NUMBER (COLS 10-13) GROUP: TWO OR MORE CLOSELY SPACED HAZARDS SINGLE HAZARDS ASSIGNED A GROUP NUMBER OF ZERO 5-11	Grouping Number 1. Slide used for redefinition and redundancy 2. Redefine group and grouping number for emphasis (use examples). 3. Single hazard is assigned group number of zero (always). 4. All hazards in a group must carry same grouping number, unique hazard numbers.
THE GROUPING NUMBER IS THE ONLY REFERENCE THE PROGRAM HAS TO INDICATE THAT IT IS TO CONSIDER A SINGLE HAZARD OR A GROUP OF HAZARDS. 5-12	Emphasis Statement on Grouping Number 1. Grouping number provides only key to program to consider more than one hazard. 2. If improvement can affect any other hazard, include hazard in group. 3. Only hazard not part of a group is a single isolated hazard. 4. If grouping number omitted, program does not consider effect of improvements on related hazards.

GROUPING NUMBER LIMITATIONS ZERO VALID FOR SINGLE HAZARD ONLY SAME OFFSET CODE MUST BE USED FOR ALL HAZARDS IN A GROUP 5-13	Grouping Number Limitations 1. Zero grouping number valid only for single hazard 2. Offset code must be same for all hazards in group 3. Hazards on right and left side of highway- cannot be grouped together - make separate groups for each side 4. Hazards in group must be in same county, control section, etc.
• GUARDRAIL IN GROUP PROTECTS THE ENTIRE GROUP • IF GUARDRAIL LEFT IN PLACE, ALL HAZARDS BEHIND RAIL MUST HAVE " NO IMPROVEMENT " CODE 5-14	Grouping Rules (continued) 1. If guardrail included in group, assumed to protect all hazards in group 2. If hazard not protected by guardrail, do not include hazard in group 3. Not allowed by program to make improvements to hazards protected by guardrail if guardrail remains 4. If guardrail removed, improvements may be specified to hazards exposed
• HAZARDS IN THE MEDIAN MAY BE GROUPED REGARDLESS OF THEIR LOCATION ACROSS THE MEDIAN • THE GROUP NUMBER AND HAZARD NUMBER MUST NOT BE REPEATED WITHIN ONE CONTROL-SECTION. 5-15	Grouping Rules (continued) 1. Discuss each item on slide 2. Exception to item 1 is that in inventorying parallel bridges, separate group numbers are assigned for hazards on each side of the median

5-16

Bridge Piers in median

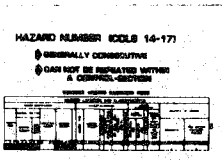
1. Closely spaced point hazards of same type may be grouped together, called one point hazard having dimensions of box around periphery.
2. Zero grouping number assigned.
3. Example-bridge piers (trees use judgment - keep groups small)
4. Assumed to act as single point hazard if vehicle cannot pass between any two hazards.



5-17

Grouped Hazards

1. Illustrate each of 5 hazards comprising group and point out to class.
2. Each cluster of trees considered as a single point hazard.
3. Each hazard in group is assigned a unique hazard number.
4. Same group number for all hazards in group



5-18

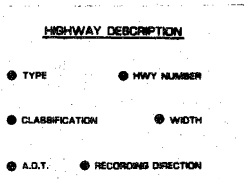
Hazard Number

1. Generally assigned consecutively throughout control-section
2. Do not repeat within a control-section
3. If hazards are added later, use unique numbers.
4. Hazard numbers do not need to be consecutive within a group or a control-section.
5. Example shown is Hazard No. 1 (single hazard) in County 136, Control Section 734-28

5-19

Column 18 is a Blank

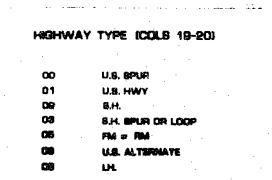
1. Space is shaded - therefore no entries allowed
2. First 17 columns of Hazard Inventory Form constitute the "key"
3. Discuss importance of "key" to cross reference and sorting operation



5-20

Highway Description

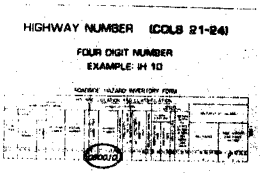
1. Introductory slide (second major division of Box 1)
2. Box sub-section contains data listed on slide.
3. Indicate on slide on Screen 2 where these data spaces are located.



5-21

Highway Types

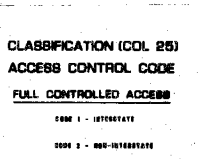
1. Each highway type assigned numeric code.
2. Codes are same as Texas Road Inventory codes.
3. Codes are printed on form to right of Box 2.
4. More codes may be added as needed.



5-22

Highway Number

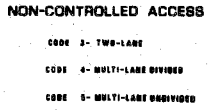
1. Four digits allowed (hwy number)
2. Right justified
3. Example shown is IH-10
   (1) IH- code 08
   (2) 10 - coded as 0010



5-23

Classification (Controlled Access)

1. Defines access control
   (1) Full control
   (2) Non-controlled
   (3) Frontage roads
2. Seven codes printed on form
3. Important to analysis model operation -- the program branches on this code to compute hazard index.



5-24

Classification (Non-Controlled Access)

1. Discuss individual codes

FRONTAGE ROAD CODES

CODE 6 - ONE-WAY FRONTAGE ROAD

CODE 7 - TWO-WAY FRONTAGE ROAD

5-25

Frontage Road Codes

1. Discuss each code.
2. Define types of frontage roads (service roads, etc.)

TOTAL WIDTH (COLS 26-27)

IF CLASSIFICATION CODE 3,5 OR 7 USED (WIDTHS REQUIRED)

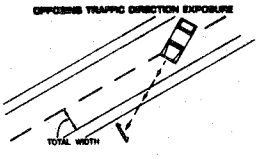
WIDTH FROM CENTERLINE TO SHOULDER MUST BE RECORDED.

5-26

Total Width

1. If classification code is 3, 5, 7 must record roadway width from centerline to shoulder on side of highway on which hazard is located to nearest foot
2. For classification codes 1, 2, 4, 6 leave Total Width blank

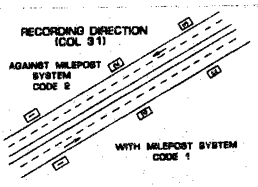
NEEDED TO INCLUDE OPPOSING TRAFFIC DIRECTION EXPOSURE

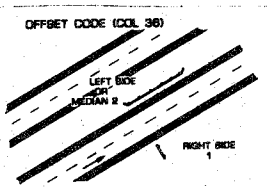
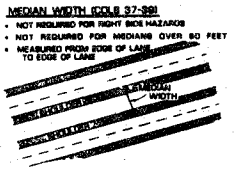


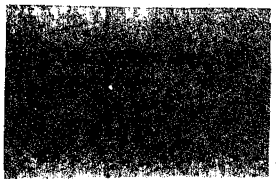
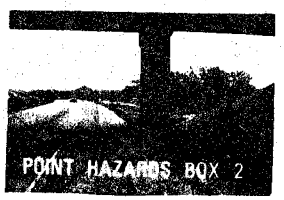
5-27

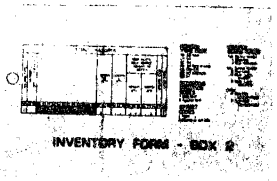
Total Width Illustration

1. Total Width may include more than one lane on undivided facilities.
2. Width is necessary for program to calculate additional hazard index for traffic in opposing direction for an obstacle located on right side or outside of roadway.
3. If width is not specified, program assumes "zero" width, and additional increment of hazard index would not be computed.

ADT (COLS 28-30) • MAIN LANES TOTAL DAILY TRAFFIC IN BOTH DIRECTIONS IN 1000's • FRONTAGE ROADS ONE WAY-TOTAL ADT FOR BOTH FRONTAGE ROADS TWO WAY- EACH FRONTAGE ROAD ADT RECORDED SEPARATELY 5-28	ADT (Columns 28-30) 1. Used by program to calculate probability of encroachment 2. Specify total ADT in 1000's for both directions. 3. Frontage roads (1) One-Way: Total ADT for both frontage roads (2) Two-Way: Total ADT for each frontage road
 5-29	Recording Direction (Column 31) 1. Direction in which inventory is being conducted 2. With or against increasing milepost 3. Directs program to proper operating routines 4. Codes printed on inventory form (1) Code 1 - with milepost (2) Code 2 - against milepost
HAZARD CLASSIFICATION (COLS 32-36) • IDENTIFICATION AND DESCRIPTOR CODE • OFFSET CODE • MEDIAN WIDTH • MILEPOST AT HAZARD 5-30	Hazard Classification (Introductory Slide) 1. Third section of Box 1 2. Contains information listed on slide 3. Each item will be discussed individually in next slides 4. Mile-post at Hazard is fourth section of Box 1 -- discussed later in presentation

HAZARD I.D. & DESCRIPTOR CODES (COLS 32-35) 4-DIGIT CODE FROM HAZARD LIST SEVERITY INDEX ASSIGNED FROM THIS CODE PROGRAM ANALYSIS PROGRAM BRANCHING 5-31	Hazard Identification and Descriptor Codes 1. Identifies type of hazard 2. Four digit code from Table 3.1, pages 3-2 & 3-3 3. Severity Index assigned from code 4. Analysis program branches on this code
 5-32	Offset Code (Column 36) 1. Defines position of hazard with respect to right or left side of travel lanes in inventory direction 2. Code One - right side 3. Code Two - left side of undivided facility median of divided facility
 5-33	Median Width (Columns 37-39) 1. Leave blank if offset code = 1 2. Directs program to consider hazard effect on opposing traffic 3. Must be recorded if: (1) Effects of opposing traffic are to be considered (2) Entire median inventoried concurrently with one set of travel lanes (3) Hazard on far side of median (adjacent to opposing traffic lanes) is inventoried from inventory side (4) Improvement is recommended for far side of median

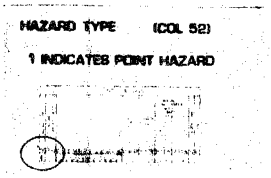
THE MEDIAN WIDTH IS USUALLY RECORDED TO INSURE THAT IT IS NOT OVERLOOKED IN A CRITICAL SITUATION 5-34	Median Width Statement 1. Median width is usually recorded although it may be left blank if hazard effect on opposing traffic is not desired. 2. Wide medians (over 60 feet) are inventoried as two separate 30 foot wide sections adjacent to each travel lane. 3. If in doubt, record median width.
 5-35	Milepost at hazard (Columns 40-51) 1. All hazards are located along highway by milepost. (1) To nearest one-thousandth of a mile (2) Point hazards - Beginning Milepost only (3) Longitudinal and slope hazards - both beginning and ending milepost (4) Note decimal point on form 2. Blank Screen 2
 5-36	Point Hazards - Box 2 Title Slide



5-37
(Screen 2)

Inventory Form - Box 2

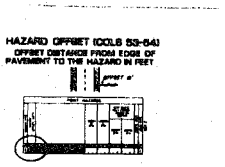
1. Project on Screen 2 and leave on until through discussion of slide 5-45.
2. Discuss Box contents briefly.
3. No entries allowed in shaded areas.



5-38

Hazard Type - Point Hazard

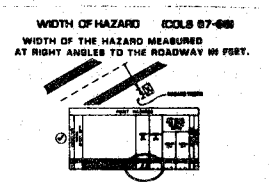
1. Code 1 - Column 52 - preprinted - must be keypunched.
2. Code designates point hazard.
3. Code keys program to specific analysis routines
4. Point hazards are circled in Table 3.1, text.



5-39

Hazard Offset (Columns 53-54)

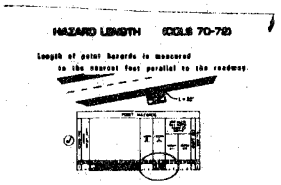
1. Measured to nearest foot from outer edge of travel lane to nearest surface of obstacle
2. Measured in horizontal plane (generally estimated)
3. Example shown: 18-ft offset to a point hazard



5-40

Width of Hazard (Columns 67-69)

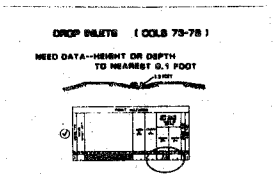
1. Measured to nearest foot at right angles to pavement edge
2. If hazard is skewed, measure width of "shadow"
3. Example shown: width of 11-ft
4. Width usually estimated



5-41

Hazard Length (Columns 70-72)

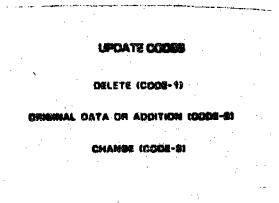
1. Measured (estimated) to nearest foot parallel to roadway.
2. Example shown: 32-ft length



5-42

Drop Inlets, Height, or Depth (Columns 73-78)

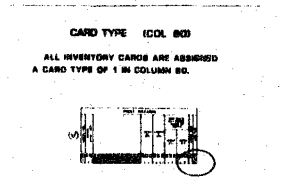
1. For all other point hazards, leave blank
2. Recorded to nearest one-tenth of a foot
3. Measured from natural ground adjacent to inlet
4. Data necessary to adjust severity indices for certain types of inlets



5-43

Update Codes, (Column 79)

1. Use will be explained in building and updating of Master File
2. Code 1 - delete
3. Code 2 - add - used for new data
4. Code 3 - change
5. Codes are printed on inventory form
6. Update code must be entered to direct computer to proper action with data



5-44

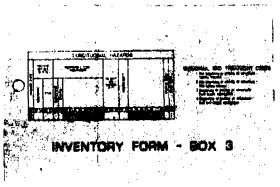
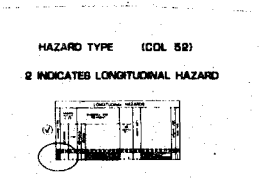
Card Type - Column 80

1. Inventory Form is Card Type 1
2. Must be keypunched
3. Necessary for computer program internal operation
4. Card type appears in Column 80 in Boxes 2, 3, and 4
5. Blank screen 2

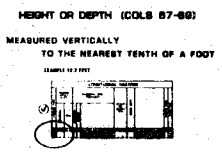
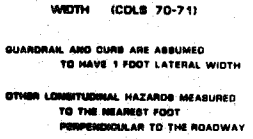
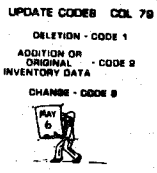
5-45

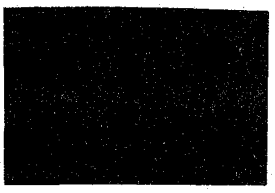
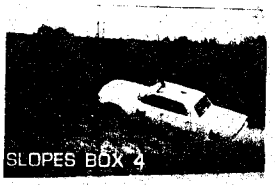
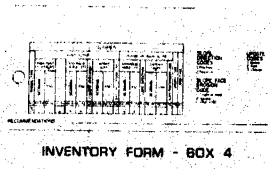
Longitudinal Hazards -- Box 3 Title Slide

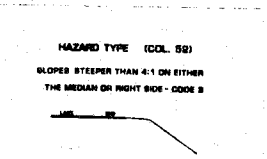
1. Project Slide 5-46 on Screen 2

 5-46 (Screen 2)	Inventory Form Box 3 1. Discuss general contents of Box 3 2. Applies only to longitudinal hazards 3. No entries allowed in shaded areas 4. Individual elements will be discussed in subsequent slides on Screen 1
 5-47	Hazard Type (Column 52) 1. Preprinted Code 2 designates longitudinal hazard. 2. Includes curbs, median barriers, guardrail, bridge rail, ditches, retaining walls 3. Curbs on entrance, exit ramps are longitudinal hazards 4. Length of gore curb is measured parallel to main lanes, beginning at nose of gore 5. If curb is continuous, use 150 foot length 6. If only exit region curbed, use actual length
5-47 (cont.)	7. Width of gore curb defined as width of gore 25-foot downstream from nose, not to exceed 10 feet wide 8. Examine existing guardrail installations critically to determine if hazards behind guardrail are protected.

HAZARD OFFSET (COLS 53-56) • DISTANCE FROM THE LANE EDGE TO POINT ON THE HAZARD NEAREST THE LANE COLS 53-54 BEGINNING POINT COLS 55-56 END POINT • DISTANCE RECORDED TO THE NEAREST FOOT 5-48	Hazard Offset (Columns 53-56) 1. Measured to nearest foot from outer edge of travel lane to nearest surface of obstacle at both upstream and downstream ends 2. Beginning offset - Columns 53-54 3. Ending offset - Columns 55-56 4. If hazard is parallel, both offsets will be same 5. Allows for hazards that are not parallel to travel lanes
GUARDRAIL END TREATMENT COLS 57-58) COL 57 - BEGINNING END TREATMENT COL 58 - TREATMENT AT END 5-49	Guardrail End Treatment Codes Columns 57-58 1. Primarily for guardrail, also median barriers 2. Identifies end conditions, safety treatments 3. Column 57 - beginning, upstream end 4. Column 58 - ending, downstream end 5. Treatment codes discussed in next slide
CODES 1 - END NOT AT STRUCTURE AND SAFETY TREATED 2 - NOT AT STRUCTURE AND NOT SAFETY TREATED 3 - AT STRUCTURE-FULL BEAM STRENGTH CONNECTION 4 - AT STRUCTURE-NOT FULL BEAM STRENGTH CONNECTION 5-50	Guardrail End Treatment Codes 1. Four codes, 16 combinations 2. Describes all possible guardrail installations 3. Codes are printed on form 4. Guardrail may be: (1) Isolated, not connected at either end to a bridge or other structure (2) Located at approach to structure 5. At a structure a "full beam connection" transmits continuous rail strength through eight bolt connections or other types. 6. "Not full beam connection" - one bolt, gap columns, etc.

 5-51	Height or Depth (Columns 67-69) 1. Note decimal point 2. Recorded to nearest one-tenth foot 3. Record height of guardrail, curbs, and depth of ditches 4. Example shown: 2.2-ft height (or depth)
 5-52	Width (Columns 70-71) 1. Measured (estimated) to nearest foot at right angle to pavement edge 2. If hazard is skewed, measure width of "shadow" 3. Guardrail, curbs, nominal width of one foot
 5-53	Update Code (Column 79) 1. Update code must be entered on each card type and appears in Column 79 in each Box

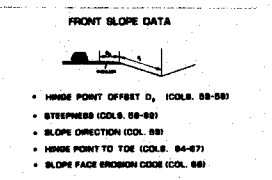
 5-54	Card Type (Column 80) 1. Card type 1 must be keypunched on all Inventory Cards in Column 80 2. Blank screen 2
 5-55	Slopes - Box 4 (Title Slide) 1. Introductory slide for subsequent discussion 2. Project Slide 5-56 on screen 2
 5-56	Inventory Form - Box 4 1. Discuss general content of Box 4 2. Project Slide 5-57 on Screen 1



5-57

Hazard Type - (Column 52)

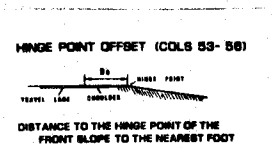
1. Code 3 - preprinted in Column 52
2. Inventory slopes 4:1 or steeper in median and alongside outer travel lanes



5-58

Front Slope Data (Columns 53-68)

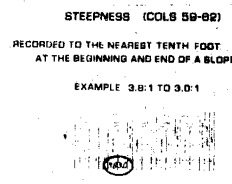
1. Define elements of front slope using slide 5-58 to illustrate elements and slide 5-56 on screen 2 to illustrate data entry space.



5-59

Hinge Point Offset - D_o (Columns 53-56)

1. Specified at beginning and ending of slope
2. D_o - distance from edge of travel lane to hinge point
3. D_o may be "zero".
4. D_o measured horizontally.



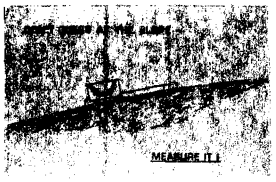
5-60

Steepness (Columns 59-62)

1. Recorded to nearest tenth foot (beginning - Columns 59-60; ending - Columns 61-62)
2. Define length of slope, where 4:1 begins, ends
3. Slope ending at structure, beginning point of bridgerail, end of slope Figure 4.3, page 4-5
4. Variable steepness example:

   4:1 - 2:1 - 4:1

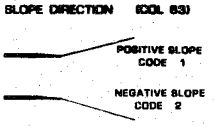
   (1) Inventory as two slopes
   (2) Program uses average of beginning and ending slopes
5. Example shown: Beginning Steepness 3.8:1
   Ending Steepness 3.0:1



5-61

Slope-ometer

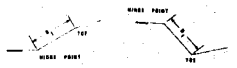
1. Explain that slopeometer should be used rather than estimating slope steepness

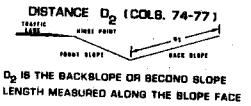


5-62

Slope Direction (Column 63)

1. Must be recorded
2. Keys program to various subroutines (slope direction same as used in roadway alignment)
3. Code 1 - upward - positive
4. Code 2 - downward - negative (referenced to plane of roadway)
5. Level terrain, coded as positive slope with steepness 9.9:1

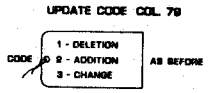
DISTANCE D_1 (COLS. 64-67) MEASURED TO NEAREST FOOT FROM HINGE POINT TO TOE ALONG SLOPE FACE  5-63	Distance D_1 (Columns 64-67) 1. Measured (estimated) at both ends of slope 2. Columns 64-65 - beginning of slope 3. Columns 66-67 - ending of slope 4. Measured along face of slope (not horizontally) fron hinge point to toe of slope
SLOPE FACE EROSION CODE (COL 68) CODE 1 SLIGHT OR NO EROSION CODE 2 SEVERE EROSION 5-64	Slope Face Erosion Code (Column 68) 1. Code used to describe roughness of slope surface 2. Code 1 - slight or none 3. Code 2-severe ruts 4. Code 2 produces a severity index increase within the program
SECOND SLOPE OR BACK SLOPE (COLS 69-78) • STEEPNESS (COLS 69-72) • SLOPE DIRECTION (COL 73) • DISTANCE D_2 (COLS 74-77) • SLOPE FACE EROSION CODE (COL 78) 5-65	Second Slope or Back Slope (Columns 69-78) 1. Similar information as for front slopes 2. Program compares front and back slopes, and assigns severity index from g-level change at toe of slope as vehicle passes through ditch 3. Back slope data must be recorded (even if flat) to permit severity index computation 4. Back slopes even beyond 30-ft must be recorded to compute severity index



5-66

Distance D_2 (Columns 74-77)

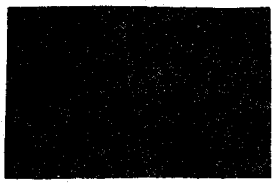
1. Define D_2 from slide
2. D_2 must be specified to compute severity index (if beyond 30-ft, insert nominal 10-ft for computational purposes only)



5-67

Update Code (Column 79)

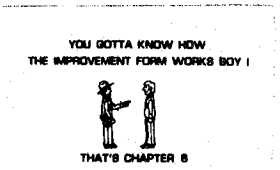
1. Same as in Boxes 2 or 3



5-68

Card Type (Column 80)

1. Same as previously discussed in Boxes 2 and 3

 5-69	Cartoon 1. The Hazard Inventory Form and Improvement Form constitute a pair of interrelated data sources. 2. The Improvement Form is discussed in Chapter 6

TITLE: ROADSIDE HAZARD IMPROVEMENT FORM

PRESENTATION TIME: 1 hour

REFERENCE IN COURSE TEXT: Chapter 6

PURPOSE OF PRESENTATION:

1. To illustrate, through use of case examples, the proper techniques to encode improvement alternatives for all classifications of applicable roadside hazards.

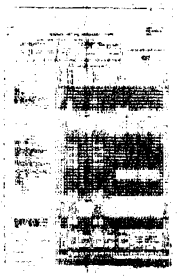
TRAINING OBJECTIVES:

The participant should be able to:

1. Define the elements and terminology on the Roadside Hazard Improvement Form
2. State which data entries are required for proper completion of the form and correctly decide which data are not needed for a particular hazard type
3. Define and illustrate proper data entry format and placement for any data entry space on the form

SPECIAL INSTRUCTIONS AND COMMENTS:

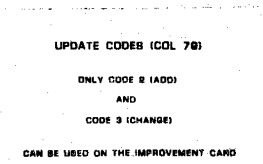
1. Presentation Format: Lecture/slide presentation with step-by-step illustration of correct data requirements and entry methodology
2. Instructor should permit and encourage questions from participants during and at the end of presentation
3. Equipment Required: Two projectors

CHAPTER 6 ROADSIDE HAZARD IMPROVEMENT FORM 6-1	Roadside Hazard Improvement Form (Title Slide) 1. State chapter purpose. 2. Chapter Purpose: To illustrate, through case examples, the proper technique to encode improvement alternatives for all classifications of applicable roadside hazards.
 6-2	Hazard Improvement Form 1. Leave on screen 2 through discussion of slide 6-4. 2. Mention that participants have a copy of this form in their handout. 3. Project slide 6-3 on screen 1
FORMAT SIMILAR TO HAZARD FORM FORMAT BOX 1 - REFERENCE AND COST INFORMATION BOX 2 - POINT HAZARD IMPROVEMENTS BOX 3 - LONGITUDINAL HAZARD IMPROVEMENTS BOXES 4 & 5 - SLOPE IMPROVEMENTS BOX 6 - NO IMPROVEMENT RECOMMENDED 6-3	Format 1. Use slide 6-2 (screen 2) to point out similarities between Inventory and Improvement Form format. 2. Discuss general contents of Boxes 1 through 5. 3. Box 6 will be discussed later. 4. Each Box will be discussed in detail separately.

FORM STRUCTURE SINGLE-LINE IMPROVEMENT CODING ⊘ AT THE FRONT OF EACH LINE INDICATES DATA TO BE PUNCHED NO DATA ENTRIES IN SHADED COLUMNS! 6-4	Form Structure 1. Improvement recommended for hazard requires only one line of data to be completed after Box 1. 2. Each line to be punched must have a check in the appropriate place so the keypuncher can be to see it more easily. 3. No data will be entered in any of the shaded columns. (Not always necessary to make entry in blank column)
BOX 1 MUST BE COMPLETED FOR EACH IMPROVEMENT COMPLETE ONE MORE LINE ENTER ZEROS IF NECESSARY 6-5	Box 1 Must be Completed 1. Advance screen 2 to slide 6-6 simultaneously. 2. This box must be completed for each improvement alternative. 3. Zeros are preferred as a check on data omission errors. 4. Each element of Box 1 will be discussed in detail.
 6-6 (Screen 2)	Improvement Form -- Box 1 1. Leave on screen 2 for reference through slide 6-13.

IMPROVEMENT IDENTIFICATION AND COST BOX 1 CROSS REFERENCED TO HAZARD (KEY) COLUMNS 1-16 MUST BE IDENTICAL TO 1-16 ON THE HAZARD INVENTORY FORM IMPROVEMENT COST ESTIMATES ARE IN COLUMNS 18-40 6-7	Improvement Identification and Cost -- Box 1 1. Reveiw importance of Key Field. (Only method of relating improvement to Hazard) 2. Columns 1-17 must be identified to Hazard it is improving. 3. Use screen 2 to identify costs that must be specified.
IMPROVEMENT ALTERNATIVE 4 IMPROVEMENT ALTERNATIVES PERMITTED CODE NUMERICALLY IN COLUMN 18 6-8	Improvement Alternative 1. Maximum of four alternative solutions are available for each hazard. 2. Since there must always be at least one improvement for each hazard, column 18 is never blank (numbering used in program). 3. Describe function of alternative numbering within program. 4. Try as many alternative improvements as possible to let program evaluate best one.
COST DATA (COLS 18-40) FIRST COST (COLS 18-24) REPAIR COST PER COLLISION HAZARD (COLS 25-28) IMPROVEMENT (COLS 29-32) NORMAL MAINTENANCE COST HAZARD (COLS 33-36) IMPROVEMENT (COLS 37-40) 6-9	Cost Data 1. All costs should be uniform throughout smallest geographic area (cite examples -- guardrail $6.00/ft, etc.). 2. Mention that technique is available to update costs in program. 3. Individual costs will be defined in next few slides.

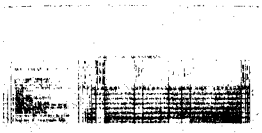
FIRST COST INITIAL LUMP SUM NET COST TO INCORPORATE IMPROVEMENT 6-10	First Cost 1. Define first cost. 2. Include all costs (example, include right-of-way if necessary). 3. Costs may be lost entry made to form after lengths, volumns, etc. are determined. 4. If cost is added last -- do not forget to code.
REPAIR COSTS EXCLUDE VEHICLE REPAIR AND INJURY COSTS ESTIMATE FOR HAZARD AND IMPROVEMENT MAY BE ZERO COST 6-11	Repair Cost 1. Define repair cost. 2. Repair costs may be estimated. 3. Costs may be zero for either hazard, improvement, or both. 4. Cite examples of zero costs.
MAINTENANCE COSTS NORMAL MAINTENANCE COSTS FOR EXISTING HAZARD AND IMPROVEMENT MAY BE ZERO COST 6-12	Maintenance Costs 1. Define maintenance costs. 2. Maintenance costs are based on experience. 3. Keep costs uniform in area. 4. Maintenance costs may be zero (example: tree, bridge pier, etc.).



6-13

Update Codes

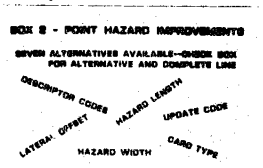
1. Code 1 cannot be used on Improvement Card (Type 2 Card).
2. Update Code 2 or 3 must be entered on Card.
3. Blank screen 2.



6-14

Improvement Form -- Box 2

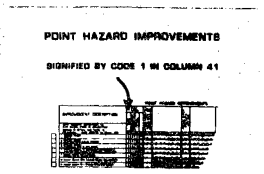
1. Leave on screen 2 throughout discussion of slide 6.
2. Project slide 6-15 on screen 1, simultaneously.



6-15

Box 2 -- Point Hazard Improvements

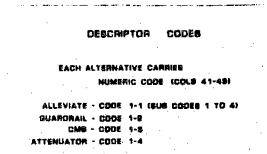
1. Introductory slide to identify sub-elements within Box 2
2. Each element will be discussed in detail in subsequent slides



6-16

Point Hazard Improvement -- Code 1

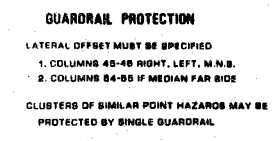
1. Point hazard improvement signified by Code 1 in column 41
2. Only additional data required is applicable offset data.



6-17

Descriptor Codes

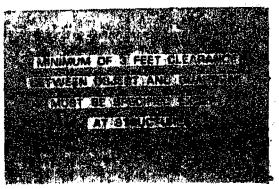
1. Define each code using screen 2 to illustrate data entry position.
2. Codes are preprinted in columns but must be keypunched.
3. Four subcodes for "remove" or "alleviate"



6-18

Guardrail Protection

1. Use of guardrail appears in other Boxes.
2. Used in this Box only for point hazards not on a slope (on slope, protects slope, not point hazard).
3. Describe median offsets, median widths, impact direction, etc.
4. Guardrail always part of a group.
5. Single point hazards in close proximity may be protected by a single guardrail.



6-19

3-ft. Clearance Statement

1. Minimum of 3-ft must be allowed between guardrail and obstacle to allow for rail deflection upon impact.
2. Exception -- guardrail connection at structure

PROTECTION WITH CMB

CMB MAY BE USED ON EITHER SIDE OF ROADWAY

CMB IN MEDIAN - OFFSET NOT NEEDED

CMB ON RIGHT - SPECIFY OFFSET (COLS. 45-48)

35' CMB ASSUMED IN PROGRAM AT EACH END OF HAZARD

6-20

Protection with Concrete Median Barrier

1. Discuss points on slide.
2. Dimensions of CMB relative to hazard are internally computed.
3. Offset in median internally computed from hazard location.
4. Right side offset must be stated.

ATTENUATOR

SPECIFY LENGTH, WIDTH, AND OFFSET

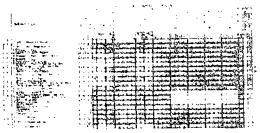
CODE ONLY ONE ATTENUATOR & SINGLE COSTS (PROGRAM CHECKS FOR OTHER DIRECTION)

IF TWO ARE NEEDED, DATA REFLECTS DOUBLE COSTS

6-21

Attenuator

1. No particular type specified -- all are assumed to reduce severity substantially.
2. Offset is to near side of system.
3. Explain computer check for opposite direction impact and cost reflection.
4. Blank screen 2



6-22
(Screen 2)

Box 3 -- Longitudinal Hazard Improvements

1. Project slide 6-23 on screen 1 simultaneously

2. Briefly reveiw contents and format of Box 2 using screen 2

LONGITUDINAL HAZARD
IMPROVEMENTS - BOX 3
(CODE 8 - COLUMN 41)

IMPROVEMENTS FOR FOUR TYPES OF
LONGITUDINAL HAZARDS

CURB - CODE 8-1 (8 SUB-CATEGORIES)
BRIDGERAIL - CODE 8-2 (6 SUB-CATEGORIES)
GUARDRAIL - CODE 8-3 (9 SUB-CATEGORIES)
DITCH - CODE 8-4 (6 SUB-CATEGORIES)

6-23

Longitudinal Hazard Improvements -- Box 3

1. Improvements offered for 4 types of longitudinal hazards

2. Each type pre-coded -- merely check box and enter other data

3. Each type has several subcategories

   (1) Use screen 2 to illustrate subcategories

"INSTALL GUARDRAIL" DATA
(COLUMNS 45-57)

PERTAINS ONLY TO INSTALLATION WHERE

NONE EXISTED BEFORE

6-24

"Install Guardrail" Data

1. This coding pertains only to installation of new guardrail where none existed before or where relocation is involved.

2. Upgrading of existing guardrail is accomplished differently.

CHANGES TO EXISTING GUARDRAIL
(COLUMNS 62-77)

PERTAINS ONLY TO CHANGES
TO EXISTING RAIL

6-25

Changes to Existing Guardrail

1. These data apply only to improvements made to an existing guardrail (which is in itself longitudinal hazard).

BRIDGERAIL IMPROVEMENTS

4 IMPROVEMENT ALTERNATIVES
FOR EACH TYPE
RIGID
SEMI-RIGID

FROM "UPGRADE TO FULL SAFETY STANDARDS"
TO "MOVE LATERALLY 6 DECK OPEN GAP"

COSTS REFLECT DIFFERENCES
OFFSETS MUST BE SPECIFIED ONLY
WHEN WIDENING

6-26

Bridgerail Improvements

1. Separate series of improvement alternatives
2. Separate codes for "rigid" and "semi-rigid"
3. "Upgrade to Fuel Safety Standards" includes everything from minor anchorage modifications to complete replacement.
4. Offsets are necessary for "widening" or "relocating".

GUARDRAIL IMPROVEMENTS

9 ALTERNATIVES AVAILABLE (CODES 1-9, COLUMN 45)
FOR EXISTING GUARDRAIL

CHANGES TO EXISTING GUARDRAIL (COLUMNS 62-77)

LENGTHEN OR SHORTEN EITHER END
OR BOTH ENDS

ALL COMBINATIONS AVAILABLE

6-27

Guardrail Improvements

1. Use screen 2 to illustrate six alternatives for improving existing guardrail.
2. Discuss how guardrail can be lengthened or shortened.

GUARDRAIL FACTS

GUARDRAIL : 1. ALWAYS PART OF A GROUP

2. INSTALLED ACCORDING TO TEXAS DOT STANDARDS (STRAIGHT 150 FT)

3. INSTALLED AT GRADES TO PROTECT SLOPE (NOT GRADE WALL ALIGNMENT)

4. NEW INSTALLATIONS IS TO HIGHEST STANDARDS

5. PROTECTS ALL HAZARDS IN GROUP

6-28

Guardrail Facts

1. Explain each item on slide using examples where necessary.

2. These are basic rules built into program logic.

3. Note: be careful in specifying guardrail removal to ensure that hazards behind it are adequately improved

APPROACH AND DEPARTING GUARDRAIL TO A BRIDGERAIL ARE CONSIDERED AS PROTECTION ON CRITICAL SLOPES

AND ARE INCLUDED UNDER SLOPE IMPROVEMENTS

6-29

Emphasis Statement

1. This is a program logic requirement and must be remembered.

2. Approach and/or departing guardrail is accommodated under slope improvements -- Guardrail (Box 4) and will be discussed later.

GUARDRAIL REMOVAL

DEFINITION- REMOVE TOTAL LENGTH

CODE 1 IN COLUMN 45

NO LENGTH DATA REQUIRED

6-30

Guardrail Removal

1. Total length of existing guardrail is assumed to be removed.

2. Removal of only portions is accomplished by shortening one of the ends or both ends.

UPGRADING TO FULL
SAFETY STANDARDS

BE CERTAIN TO MAKE NEEDED ADJUSTMENTS

IN LENGTH TO THE PROPER END !

6-31

Upgrading to Full Safety Standards

1. Used only for improvements (changes to existing guardrail) if applicable -- otherwise leave blank

GAP CLOSURE

WHEN DONE IN ADDITION TO UPGRADING

USE CODE 3 & INSERT "CHANGES"

6-32

Gap Closure

1. Two ways to accomplish
2. When done with upgrading - use code 2-3-3
3. When done alone - use code 2-3-4
4. Both require lengthening data

GUARDRAIL AT STRUCTURES

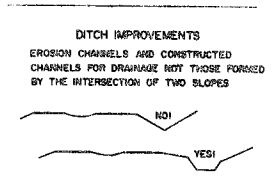
ANCHOR AT STRUCTURE- CODE 5

FREE END ONLY- CODE 6

6-33

Guardrail at Structures

1. When only specifying anchorage improvement at a bridge -- use code 2-3-5
2. Safety treating free end of guardrail (not at a structure -- use code 2-3-6).



6-34

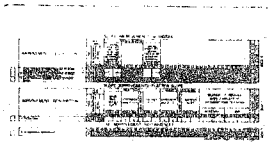
Ditch Improvements

1. Define "ditch" as shown on slide

2. Three ways to improve ditches

   (1) reshape (code 2-4-1)
   (2) replace with storm drain (code 2-4-2)
   (3) protect with guardrail (code 2-4-3)
   (offset required here)

3. Slope intersection "ditches" are improved as a "Slope Improvement".

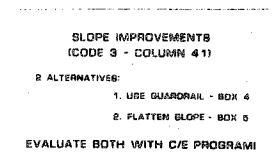


6-35
(Screen 2)

Boxes 4 and 5 -- Slope Improvements

1. Project slide 6-36 on screen 1 simultaneously

2. Leave slide 6-35 on screen 2 throughout subsequent slides



6-36

Slope Improvements

1. Two ways to improve slopes -- use slide 6-35 on screen 2 to illustrate data entry spaces

2. It is wise to use program to evaluate both alternatives.

3. Discuss Box 4 elements in next few slides

SLOPE IMPROVEMENTS - GUARDRAIL
(BOX 4)

ALTERNATIVES

INSTALL RAIL NOT AT A BRIDGE

INSTALL APPROACH OR DEPARTING BRIDGERAIL

INSTALL CONTINUOUS GUARDRAIL BETWEEN SUCCESSIVE BRIDGES

WATCH OUT FOR APPLICABLE OFFSET CODING

6-37

Slope Improvements - Guardrail (Box 4)

1. Identify 3 allowable guardrail improvements using Slide 6-35 on screen 2 to illustrate position
2. Lateral offsets are required for first two options.
3. Emphasize correct placement of data for columns 45-48 and 54-57

GUARDRAIL NOT AT BRIDGE
CODE 1, COLUMN 48

MAY BE USED FOR SLOPES WITH OR WITHOUT POINT HAZARDS

RAIL PROTECTS WHOLE GROUP

6-38

Guardrail Not Bridge

1. Used for installing guardrail to protect isolated slope only (not at bridge)
2. This code represents installation of new guardrail, therefore offsets must be specified.
3. Grouping may contain point hazards.

APPROACH OR DEPARTING GUARDRAIL

GUARDRAIL PROTECTS SLOPE!

SLOPE MUST BE INCLUDED IN GROUP

MAY NEED "DUMMY" SLOPE

6-39

Approach or Departing Guardrail

1. Code used only for installing new approach or departing guardrail
2. Point hazards may be existent in grouping.
3. Use proper offset code columns depending on whether guardrail is an approach or departing installation.

GUARDRAIL BETWEEN BRIDGES

USE CODE 9, COLUMN 42

EACH ROADSIDE TREATED AS SEPARATE GROUP

6-40

Guardrail Between Bridges

1. Special code to permit closure of slopes between closely spaced bridges
2. Improvement will also protect other hazards on slopes.
3. Treat each roadside separately.
4. This improvement may be particularly desirable on two-lane highways.

SLOPE IMPROVEMENTS - FLATTEN SLOPE
BOX 5

REQUIRES FULL DESCRIPTION OF

SLOPE CONFIGURATION AFTER IMPROVEMENT.

6-41

Slope Improvements -- Flatten Slope (Box 5)

1. Slope description is necessary to compute hazard indices.
2. Review definition of terms D_0, D_1, etc.
3. Briefly discuss elements of Box 5.

SLOPE IMPROVEMENT FACTS

FLAT BACKSLOPE IS CODED AS 9.9 : 1
STEEPNESS

D_1 AND D_2 MUST BE ESTIMATED

IF HINGE POINT IS MOVED, SPECIFY NEW OFFSET

SLOPE DIRECTION CODE MUST BE SPECIFIED

6-42

Slope Improvement Facts

1. Newly proposed slopes must be estimated because actual slope cross section is not known until designs are done.
2. Discuss other special rules as shown on slide.
3. All spaces in Box 5 must be completed.

IF ONLY A PORTION OF SLOPE IS TO BE FLATTENED - SPECIFY LENGTH OTHERWISE LEAVE MILEPOST BLANK 6-43	Partial Slope Flattening 1. Portions of a long slope with or without varying steepness may be flattened. 2. If so, mileposts of ends of charged slope must be specified, otherwise whole slope is assumed to be flattened. 3. Leave milepost blank if whole slope is flattened.
NO IMPROVEMENT RECOMMENDED - BOX 8 (CODE 4 - COLUMN 41) CODE 4 IS NOT "CATCH-ALL" CODE CODE 4 MUST BE USED FOR HAZARDS BEHIND GUARDRAIL WHEN GUARDRAIL NOT REMOVED CODE 4 MAY BE USED TO ENTER OBSTACLES IN FILE FOR INVENTORY 6-44	No Improvement Recommended 1. Code 4 should not be used merely because inventory personnel think alternative is not viable. 2. Must be used for hazards behind a guardrail that is not removed. 3. May be used to enter obstacles in file for recording purposes only.
CARD TYPE ALL IMPROVEMENT CARDS ARE TYPE 2 6-45	Card Type 1. Card Type 2 code must be entered in Column 80 of each applicable box 2. Update code must also be entered in column 79 on each improvement card

AT THIS POINT YOU HAVE LEARNED
HOW TO COMPLETE THE HAZARD
INVENTORY FORM AND THE HAZARD
IMPROVEMENT FORM !

COMING ATTRACTION : CASE EXAMPLES
YOU DO THE WORK - I GET TO LISTEN !

6-46

Final Slide

1. Participants have been shown how to use both the Inventory Form and Improvement Form.

2. They will demonstrate their understanding in the subsequent workshop by coding case examples.

TITLE: WORKSHOP NO. 1 -- ENCODING OF CASE EXAMPLES

WORKSHOP TIME: 1 hour, 30 minutes REFERENCE IN COURSE TEXT: Chapter 7

PURPOSE OF WORKSHOP:

To provide an opportunity, in a workshop environment, for participants to:

1. Demonstrate their ability to code Roadside Hazard Inventory and Improvement Forms for selected illustrative case examples.

2. Be presented illustration of properly encoded forms for the case examples so that they may correct their coding procedures.

3. Discuss general coding procedures and individual state practices in relation to improvement alternatives.

TRAINING OBJECTIVES:

Participants should be able to:

1. Code all required information on the Roadside Hazard Inventory Form and the Hazard Improvement Form to define an existing hazard and a recommended improvement for a point hazard, a longitudinal hazard, a slope hazard or groups of hazards for case examples presented.

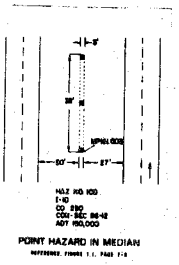
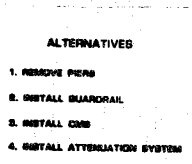
2. Estimate reasonable cost data for recommended improvements selected in the case examples.

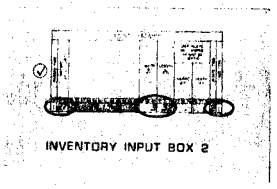
SPECIAL INSTRUCTIONS AND COMMENTS:

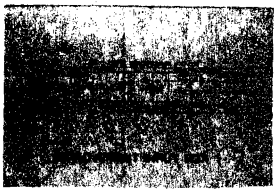
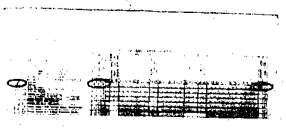
Presentation Format: Workshop in which Instructor presents case situations, participants encode Inventory and Improvement Forms, then Instructor presents correct coding in detailed form. Participants review and correct their forms.

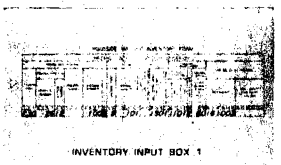
Note: Participants given sufficient copies of both forms as a hand-out prior to workshop.

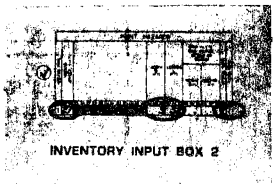
Equipment Required: Two projectors

CASE EXAMPLES (WORKSHOP ACTIVITY) 7-1	1. State Session objectives and training technique. 2. Session Purpose: To illustrate proper coding technique to complete Hazard Inventory Form and Hazard Improvement Form for selected case examples. Instructor will discuss in detail one case example. Participants will then complete Forms for remaining case examples. Instructor will review correct coding of each case after participants have completed case.
 7-2 (Screen 2)	1. Mention Reference Fig. 7.1, pg. 7-3 in Text. 2. Discuss hazard situation and geometric layout.
 7-3	Ref. Text, pp. 7-2 thru 7-8 Discuss 4 alternatives. Remove Piers - Actually a "design" application or complete bridge reconstruction. Instructor will go through Alternative No. 1 in detail -- Inventory Form and Improvement Form in next few slides

 IMPROVEMENT INPUT BOX 1 7-4	Describe each coded entry using Slide 7-2 on Screen 2 for reference: Emphasize: (1) Check mark (2) Key - state source of each entry (3) Group No - (zero) Blank because point hazard (4) Col. 26-27: not needed - blank (5) Col. 32-35: Code 11-01, Roadway Under Bridge structure, bridge pier (Table 3.1) (6) Col. 36: offset code 2, left or median (7) Col 46-51: not needed - point hazard
 INVENTORY INPUT BOX 2 7-5	Describe entries using slide 7-2 on Screen 2. Emphasize: (1) Check mark (2) All coded entries (3) Blanks in Col. 73-78 only for inlets
 INVENTORY INPUT 7-6	Emphasize: (1) Notes at bottom of form useful for reference later and clarification for other personnel in addition to structuring card completion.

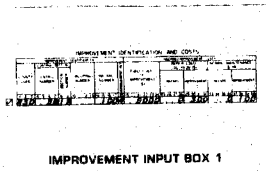
IMPROVEMENT REPLACE PIERS WITH SINGLE-SPAN BRIDGE 7-7	Type of improvement restated for emphasis and introduction to proper completion of Improvement Form in subsequent slides.
 7-8	Box 1 must always be completed on each Form. Discuss each coded entry and blanks in Box 1 using Slide 7-2 on Screen 2 for reference. Emphasize: (1) Check mark (2) Key (Blank Group No.), Alt. 1, Col. 18 (3) Col. 19-24: high cost of reconstructed bridge (4) Col. 75-28: Zero cost, no damage (5) Col. 29-32: Zero cost, piers removed (6) Col. 33-36: Zero cost, no maintenance to piers (7) Col. 37-40: Zero cost, piers removed
 IMPROVEMENT INPUT BOX 2 7-9	Improvement: Remove point hazard, use Box 2 Emphasize: (1) Check mark (2) Code 1-1-1, Col. 41-43 (preprinted) (3) Update Code 2, Col. 79 (4) Preprinted code 2, Col. 80 Stress simplicity of Form Completion.

ALTERNATIVES 1. REMOVE PIERS 2. INSTALL GUARDRAIL 3. INSTALL CMB 4. INSTALL ATTENUATION SYSTEM 7-10	1. Restate 4 alternatives that were presented before for emphasis. 2. Instructor has done Alternative 1. 3. Now participants will do Alternative 4 using Forms in hand-out.
ASSIGNMENT INSTALL ENERGY ATTENUATION SYSTEM (ALTERNATIVE NO. 4) 180 FT. SYSTEM, 10 FT. WIDE, CENTERED ON PIERS 1. CODE INVENTORY FORM 2. CODE IMPROVEMENT FORM 7-11	Describe participant assignment and conditions: (1) 50-ft attenuator at one end only (2) 10-ft wide system, centered on piers (3) Allow participants 5-10 minutes to complete Inventory Form and Improvement Form leaving Slide 7-11 on Screen 1 and Slide 7-2 on Screen 2.
 INVENTORY INPUT BOX 1 7-12	Instructor will illustrate proper coding of Case Example using Slide 7-2 on Screen 2 for reference. (1) Inventory Box 1 same as previous alternative (2) Briefly discuss coded entries and blanks. (3) Box 1 must be completed - but only once for each hazard regardless of number of improvement alternatives evaluated.



7-13

1. Box 2 -- Same as previously shown
2. Briefly discuss each coded entry and blank space to reiterate.
3. Hazard Forms would be completed only once regardless of number of improvement alternatives to be evaluated.
4. Remarks at bottom would include "install attenuator" or similar wording.

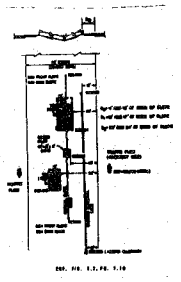


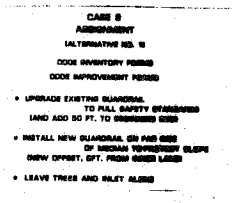
7-14

1. Since only one improvement alternative is being coded, only one Improvement Form is needed; however this was Alternative No. 4, therefore three others would be required to evaluate all 4 alternatives stated in Slide 7-3 and participant's Form should contain code 4 in column 18.
2. Discuss coded entries and blanks
3. Discuss costs (values and zero costs) and question participants on their choice of costs.

7-15

1. Must complete one other Box on Form in addition to Box 1 - Use Box 2 in this case because improvement is to a point hazard.
2. Discuss each coded entry
3. Emphasize:
   (1) Check mark
   (2) Offset 23 ft (Attenuator extends 3.5 ft on each side of piers, or 4 ft rounded to inventory side of piers)
   (3) Dimensions of attenuator (one only)
   (4) Update code 2 to add to file

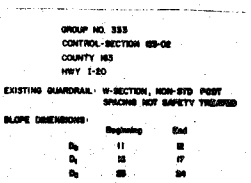
CASE 2 GROUP OF HAZARDS IN MEDIAN 7-16	Introductory title slide to coding a group of hazards in median of controlled access highway (Remove Slide 7-2 from Screen 2 and project Slide 7-17 on Screen 2 concurrently with Slide 7-16 on Screen 1)
 7-17 (Screen 2)	Reference: Figure 7.7, pg. 7-10 in Text. Discuss hazard grouping identifying each of the five hazards by name and type using Slide 7-17 on Screen 2 for reference. Emphasize: (1) 5 hazards, therefore 5 inventory forms needed (2) Improvement Form for each hazard for each improvement (3) Example: 2 Improvements would mean 5 Inventory Forms and 10 Improvement Forms
CASE 2 IMPROVEMENTS 1. UPGRADE EXISTING GUARDRAIL AND INSTALL GUARDRAIL ON FAR SIDE OF MEDIAN 2. REMOVE ALL HAZARDS EXCEPT SLOPE 7-18	Possible alternatives that might be evaluated include: (1) Upgrade existing guardrail to full safety standards and install new guardrail on far side of median, and (2) Remove all hazards except slopes. There are many more improvements that could be evaluated (Instructor cite various combinations).



7-19

Instructor state assignment for participants - code forms for the alternative shown here.

(1) Upgrade existing guardrail (add 50 ft to beginning end).
(2) Install new guardrail on far side of median at an 8-ft offset from far lane.
(3) Leave everything else alone (Code 4 -- No Improvement for other hazards in Group).
(4) Number Forms - 5 Inventory, 5 Improvement
(5) Project Slide 7-20 on Screen 1 with Slide 7-17 still on Screen 2.

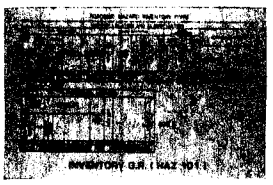


7-20

Reference: Text Figure 7.7, pg. 7-10.

1. Screens 1 and 2 present all necessary coding information for Inventory Forms - Instructor review briefly.

2. Participants complete Inventory Forms and Improvement Forms for assignment (allow 15 minutes) then Instructor illustrates proper coding with subsequent slides.



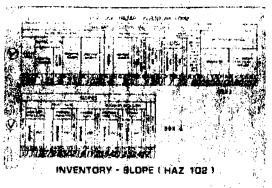
7-21

Inventory Form For Existing Guardrail

1. Instruct praticipants to use handout of Figure 7.7 for reference because slides must be removed from screen.

2. Discuss each coded entry and blanks.

3. Emphasize:
   (1) Key (with grouping number)
   (2) Selection of appropriate Boxes
   (3) Guardrail height and width
       (2.3 ft or 27 inches and 1 ft width)



7-22

Inventory Form For Slope (Hazard 102)

1. Discuss each coded entry and blanks.

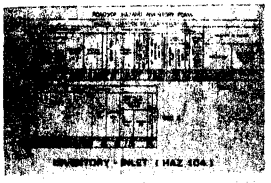
2. Emphasize:
   (1) Same grouping number but different hazard number
   (2) Col. 32-35: sod slope
   (3) Median width of 60' must be specified
   (4) Selection of appropriate Box 1 and Box 4
   (5) Check mark on Box 4

7-23

Inventory Form For Trees (Hazard 103)

1. Discuss each coded entry and blanks.

2. Emphasize:
   (1) Grouping number and hazard number
   (2) Col. 32-35: Tree (point hazard)
   (3) Boxes 1 and 2 must be completed
   (4) Check mark on Box 2

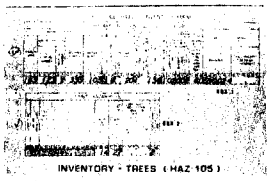


7-24

Inventory Form For Inlet (Hazard 104)

1. Discuss each coded entry and blanks.

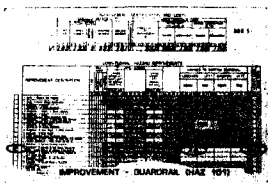
2. Emphasize:
   (1) "Key" elements
   (2) Col. 32-35: Code 10-01, Tabletop Inlet
   (3) Boxes 1 and 2 used, insert check mark
   (4) Complete inlet height only (Col. 73-75)



7-25

Inventory Form For Trees (Hazard 105)

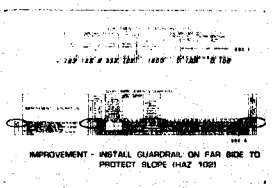
1. Discuss each coded entry and blanks.
2. Col. 32-35: Code 02-00, Tree (point hazard)
3. Use Boxes 1 and 2-insert check mark.



7-26

Improvement Form For Existing Guardrail (Hazard 101)

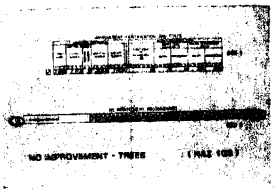
1. There must be one improvement form for each inventoried hazard even if the improvement alternative is a code 4--No Improvement.
2. Discuss each coded entry in Boxes 1 and 3.
3. Check appropriate line in Box 3 and insert 50 in column 62-65 to add 50 ft to beginning end of existing guardrail.
4. Emphasize "key" and update codes.



7-27

Improvement Form - Install Guardrail on Far Side (8 ft offset) to Protect Slope (Hazard 102)

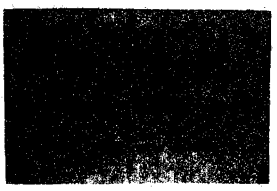
1. Discuss each coded entry and blanks in Boxes 1 and 4.
2. Col. 54-57: 8 ft offset from far side is 52 ft from inventory side.
3. Emphasize "key" and update code.



7-28

Improvement Form - Trees (Hazard 103)

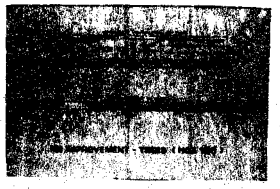
1. An improvement form is needed even though Code 4 -- No Improvement is recommended.
2. Discuss entries and blanks in Boxes 1 and 6.
3. Emphasize "key", check mark, and update code.
4. Box 1, including costs, must be completed even with No Improvement code to provide total costs for group cost-effectiveness value.



7-29

Improvement Form - Inlet (Hazard 104)

Same discussion points as Slide 7-28

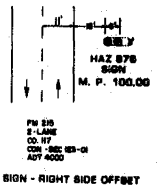


7-30

Improvement Form - Trees (Hazard 105)

Same discussion points as Slide 7-29

Emphasize need for Improvement Form for each hazard to balance number of Inventory Forms with corresponding improvements.



7-31
(Screen 2)

Ref: Text, Figure 7.47, pg. 7-53

Until now, we have been coding for controlled access highways. This case example illustrates the subtle differences in coding undivided highway roadside obstacles.

(Remove Slide 7-17 from Screen 2 and project Slide 7-31 on Screen 2 during introductory remarks.)

1. Discuss hazard layout.

2. Discuss hazard potential from both directions of travel on the 2-lane highway.

IMPROVEMENTS

1. REMOVE OR RELOCATE SIGN
2. INSTALL GUARDRAIL
3. INSTALL ATTENUATION SYSTEM

7-32

Title - possible improvements that may be evaluated.

Standard options available with analysis model.

ASSIGNMENT

PROTECT SIGN WITH GUARDRAIL

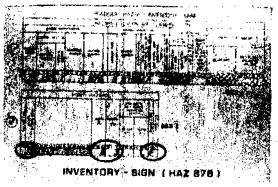
1. CODE INVENTORY FORM
2. CODE IMPROVEMENT FORM

7-33

Assignment - Alternative 2 from Slide 7-32.

"Install Guardrail at Sign"

Instructions: Code both Inventory and Improvement Form for this alternative (1 of each) (allow 10 minutes for participants to complete Forms)



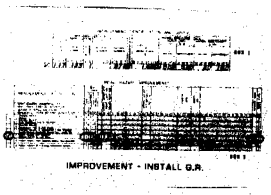
7-34

Inventory Form - Sign (Hazard 876)

Using Slide 7-31 on Screen 2 for reference, discuss entries and blanks in Boxes 1 and 2.

Emphasize:

(1) "Key" - zero grouping number
(2) Lane width in Col. 26-27
(3) No ending milepost needed for a point hazard
(4) Box 2 entries as discussed before



7-35

Improvement Form - Install Guardrail

Using Slide 7-31 on Screen 2 for reference, discuss entries and blanks in Boxes 1 and 2.

Emphasize:

(1) 12 ft offset (Col. 45-46) to allow 3 ft minimum clearance between new guardrail and sign
(2) Check mark and update code

CASE 4

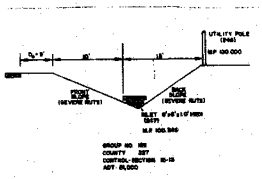
POINT HAZARD ON A ROADSIDE SLOPE

-- RIGHT SIDE OF CONTROLLED ACCESS ROADWAY

7-36

Case 4 -- Point Hazard on Slope

Coding point hazards on the right side of a controlled access highway is only slightly different than point hazards in a group in the median which was illustrated in case example 2. This example includes a 2-stage slope situation.

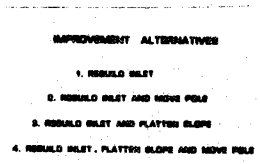


7-37
(Screen 2)

Profile View of Hazard Situation

Ref: Text, Figure 7.52, pg. 7-59

1. Discuss geometry of severely changing slope alongside roadway length (inventory as two hazards).
2. Assume inlet height of 1.0 ft.
3. Assume slopes are severely rutted.
4. Number of hazards = 4, therefore 4 Hazard Inventory Forms needed and 4 Improvement Forms needed for each alternative.

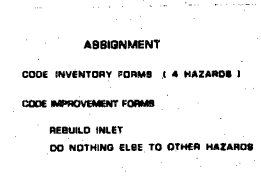


7-38

Possible Alternatives:

(1) State alternatives from slide.

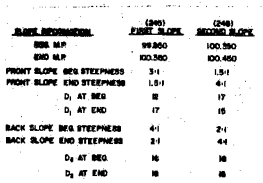
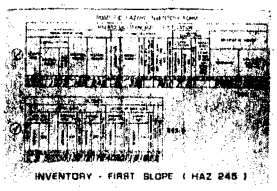
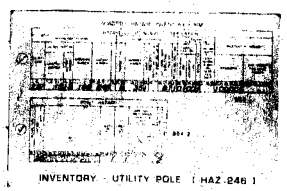
(2) More combinations may exist (double entry needed with unique hazard and grouping numbers because 4 improvement alternatives maximum).

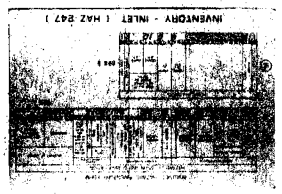


7-39

Assignment: Code Inventory Forms and Improvement Forms for all hazards for Improvement Alternative No. 1 - "Rebuild Inlet and Leave Other Hazards Alone." (4 Inventory Forms, 4 Improvement Forms)

(Project Slide 7-40 on Screen 1 to complete coding data. Slide 7-37 remains on Screen 2)

 7-40	Plan View of Case 4 Hazard Situation Ref: Text, Figure 7.52, pg. 7-59 This slide contains the remaining information to permit coding the Inventory and Improvement Forms for the assignment. Discuss geometric layout and other pertinent information. Allow 15 minutes for participants to complete Forms.
 7-41	Inventory Form - First Slope (Hazard 245) Using Slide 7-37 on Screen 2 and handout for reference, discuss coded entries and blanks in Boxes 1 and 4. Emphasize: (1) Elements of key (2) Beginning and end mileposts of first slope (3) Beginning and end offsets, steepness, and D_1 distances for front and back slopes. (Box 4)
 7-42	Inventory Form - Utility Pole (Hazard 246) Briefly discuss entries and blanks in Boxes 1 and 2 (covered previously in several cases). Emphasize: (1) Grouping number (2) Width and length of utility pole assumed to be 1 ft

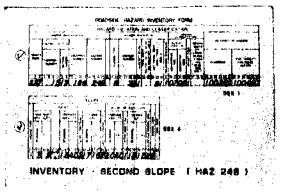


7-43

Inventory Form -- Inlet (Hazard 247)

1. Discuss coded entries and blanks in Boxes 1 and 2.

2. Emphasize need for height entry in Col. 73-75, Box 2 since this hazard is an inlet.



7-44

Inventory Form -- Second Slope (Hazard 248)

1. Emphasize beginning and ending mileposts
   - second slope begins at same milepost that slope 1 ended.

   Discuss coded entries and blanks in Boxes 1 and 4.

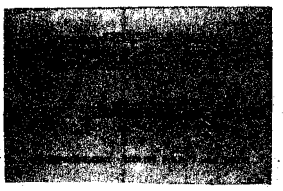
7-45

Improvement Form -- First Slope (Hazard 245)

Reiterate: There must be an Improvement Form for each Hazard Inventory Form.

Even though the improvement alternative here is to to do nothing, the form must be completed.

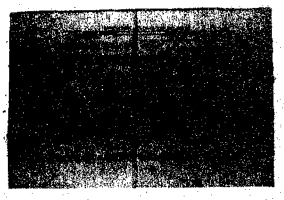
Discuss entries in Boxes 1 and 6.



7-46

Improvement Form -- Utility Pole (Hazard 246)

Same discussion as Slide 7-45

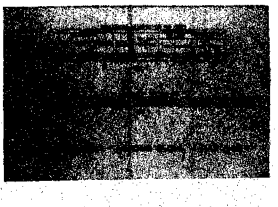


7-47

Improvement Form -- Inlet (Hazard 247)

The inlet is the only hazard in the 4-hazard group to which an improvement alternative other than "No Improvement" was recommended.

1. Discuss entries in Boxes 1 and 2.



7-48

Improvement Form -- Second Slope (Hazard 248)

Same discussion as Slide 7-46

TITLE: FIELD ACTIVITY -- ROADSIDE INVENTORY

FIELD ACTIVITY TIME: 4 hours

PURPOSE OF FIELD ACTIVITY:

To provide an opportunity for participants:

1. To obtain experience, under actual highway operating conditions, in assessing the roadside situation to identify and code point hazards, longitudinal hazards and slope hazards individually and in groupings.
2. To use the special equipment (distance measuring instrument, slopeometer, etc.) in a "real-world" environment.
3. To receive experience in identifying and solving some of the problems that might occur during an actual field inventory, and thus translate this knowledge to developing methods of avoiding similar problems when they conduct field inventories in their own state.

TRAINING OBJECTIVES:

The participant should be able to:

1. Recognize all applicable roadside obstacles and identify whether the hazards should be coded as a single hazard or as a hazard grouping.
2. Define each hazard location using the vehicle-mounted distance measuring instrument (DMI).
3. Measure a slope steepness using the slopeometer and define the beginning and ending mileposts of a slope by employing the methodology discussed in applicable lectures.
4. Encode the Inventory and Improvement Forms for all hazards and improvements recommended for the hazards encountered during the field activity.

SPECIAL INSTRUCTIONS AND COMMENTS:

1. The field inventory is basic to the entire roadside Safety Improvement Program. Therefore, it is essential that a field activity by provided for the purpose of training participants in identifying hazard types and groups within a "real-world" situation.
2. Roadways that will serve as field laboratories for this activity should be chosen in advance. Both controlled and non-controlled access roadways which have been inventoried by a knowledgable inventory team are necessary. The data collected by the inventory team will be used by the participants in Workshop No. 3.

TITLE: BUILDING AND UPDATING OF INVENTORY MASTER FILE

PRESENTATION TIME: 1 hour 45 minutes **REFERENCE IN COURSE TEXT:** Chapter 8

PURPOSE OF PRESENTATION:

1. To define pertinent operational requirements for the Master File usage
2. To illustrate techniques to manage the master file by adding, changing or deleting data within the base file

TRAINING OBJECTIVES:

The participants should be able to:

1. Describe in sequential order, the process to build an initial file, update process including defining the data card inputs to accomplish this
2. Determine which update process is required by identifying whether the data are <u>not</u> in the file or are in the file either correctly or incorrectly

SPECIAL INSTRUCTIONS AND COMMENTS:

1. Presentation Format: Lecture/slide presentation with illustrative case examples presented by instructor
2. Instructor should solicit and encourage participant questions during and at the end of presentation
3. Two projectors are required

BUILDING AND UPDATING

INVENTORY MASTERFILE

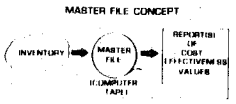
(CHAPTER 8)

8-1

Title Slide: Building and Updating Inventory Master File

1. State chapter objectives and training technique
2. Chapter Purpose:

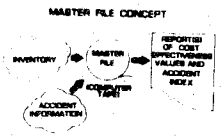
   To review some of the key points of coding the Hazard Inventory, Improvement Specification and Other Factors Input Forms and the proper use of the File Building and Updating program to build and maintain the Master file. The proper file maintenance techniques will be illustrated with case examples.
3. The discussion in text is written for non-computer personnel and may be summarized for experienced personnel.



8-2

Master File Concept

1. Card Types 1, 2 & 3 provide base file of information to compute Cost-Effectiveness values for improving roadside obstacles and developing and safety improvement program.



8-3

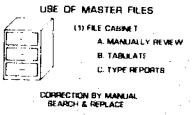
Master File Concept (continued)

1. The accident information which is not obtained during the inventory process provides the necessary information to compute the CE/Accident Index. The incorporation of the accident information will be discussed in Chapter 9.
2. After a segment of roadway is inventoried, the computer forms must be converted into a form usable by the manager. This will be discussed in this session, but first review in general terms the concept and use of a master file.

8-4

Master File Types

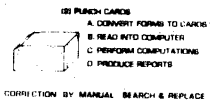
1. Four types of master files available
2. Types 1 and 2 are "back-up" to Type 3



8-5

Use of Master Files

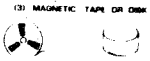
1. Discuss briefly standard file cabinet type of file.
2. Emphasize: all are familiar with this type and extraction of information and maintenance is manual.

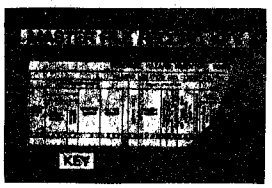


8-6

Punch Cards

1. Discuss difference between file cabinet and punched cards.
2. Computer can read and perform required computations.
3. Emphasize: Update and maintenance is still manual search and replace

(3) MAGNETIC TAPE OR DISK  A CONVERT FORMS TO CARDS B READ INTO COMPUTER C BUILD MASTER FILE D PRODUCE REPORTS ON REQUEST CORRECTION BY USE OF FILE MANAGEMENT PROGRAM 8-7	Magnetic Tape or Disc 1. Discuss storage of inventory on magnetic file - either tape or disk 2. Emphasize: (1) Reports can be run without re-calculating information (2) Manual updating not possible (3) Requires File Management Program (or File Building and Update Program) (4) More flexible and responsive than card file
ROADSIDE SAFETY IMPROVEMENT PROGRAM  FILE MANAGEMENT PROGRAM REPORT GENERATION PROGRAM 8-8	Roadside Safety Improvement Program 1. With a master file, a Report Generation Program is required in addition to File Management Program. 2. File Management Program will be discussed here except for brief overview of Report Generation Program.
ROADSIDE SAFETY IMPROVEMENT PROGRAM MASTER FILE CONTAINS (1) ROADSIDE HAZARD INVENTORY (2) IMPROVEMENT SPECIFICATION (3) OTHER FACTORS (4) ACCIDENT INFORMATION (5) COMPUTED INFORMATION (A) INDICES (B) C.E.VALUE (C) ACCIDENT INDEX 8-9	Roadside Safety Improvement Program Master File 1. Review contents of master file shown on slide 2. Emphasize: File contains all input + selected computed values 3. Mention: (1) Accident Information contains three years Run-off Road, collision with fixed object, and vehicle overturned (2) Indices are both Severity and Hazard for both existing Hazard and Improvement(s) (3) Some input optional



8-10

Master File Record Key

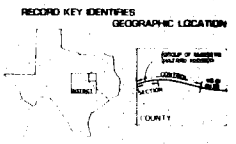
1. Review key with emphasis on need for proper file management and report generation. Review elements of key on slide.
2. Emphasize:
   (1) Key must be unique (no two alike).
   (2) Record key stored in file comes from Card Type 1 only. Key on other cards used to match with key in file
   (3) Key consists of first 17 columns of Card Type 1, 2, 3 and 4
   (4) Col. 18 used to identify various improvements of a hazard.

KEY INCLUDES

DISTRICT NUMBER

8-11

1. District number corresponding to the county number is automatically added by the system during transaction.
2. Key is hierarchical - that is - it has order
3. District is highest order to hierarchy for master file
4. Understanding hierarchy concept is important



8-12

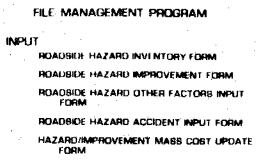
Record Key Identifies Geographic Location

1. Emphasize:
   (1) As discussed earlier, key relates to a particular geographic location
   (2) Program uses Texas I.D. system
   (3) The key defines a unique position of road
   (4) District is the highest order (25 in Texas)
   (5) County is next (Approx. 10/District in Texas)
   (6) Control provides historical reference to segment of road. Control number does not change while route designation might (i.e., U.S. route to I.H.). Control always changes at county line

(continued on next page)

8-12 (continued)	(7) Section is a smaller segment of route, usually corresponding to original major construction segment. (8) Grouping & hazard number define specific hazards or groups of hazards. May not be repeated in same section. (9) Key must be unique to one section of road and no other (10) Will discuss adaption to other states in Chapter 10. Refer to page 8-2 in text for discussion
BASE DECK PREPARATION 8-13	Base Deck Preparation 1. Preparation of base deck is normally handled by technicians and will not be discussed in detail. 2. Review key punching in general terms.
KEYPUNCH INSTRUCTIONS SHADED AREAS FIRST LINE ON CARD TYPES 1 & 2 REQUIRED ONE ADDITIONAL LINE MAXIMUM (CARD TYPES 1 & 2) INDICATED BY CHECK MARK KEY REQUIRED ON ALL CARD TYPES ALL ENTRIES NUMERIC (CARD TYPES 1-5) FIELDS MATCH THROUGH COLUMN 65 ON CARD TYPE 1 FIELDS MATCH THROUGH COLUMN 61 ON CARD TYPE 2 8-14	Keypunch Instructions 1. Reference Chapter 5 for detail discussion of each entry 2. Review items 1 thru 4 briefly 3. Last three are of specific interest to keypunch operators in preparation of "program cards" and last two items are of interest to user when using Management Program

DATA CARD ARRANGEMENT 8-15	Data Card Arrangement 1. Data Cards not required to be input in any particular order. They are sorted upon input in master file order (District, County, Control-Section, Group, Improvement Alternative No. and Hazard Number. 2. Probably expedient to keep forms in some logical order--probably inventory order--so if necessary a particular hazard input can be located in forms and/or deck 3. During inventory, Other Factors Forms would probably be kept separate from Card Types 1 & 2 since on a separate form allowing multiple entries - Not all hazards will have Other Factors recorded.
JOB CONTROL LANGUAGE (JCL) 8-16	Job Control Language (JCL) 1. Job Control Language (JCL) is computer control cards for IBM computers. They will vary with each state and computer. Each state will develop own when system installed. This is normally handled by a technician. 2. Mention: Both File Management and Report Generation Programs will have separate JCL
MASTER FILE "LINK BETWEEN PROGRAMS"  8-17	Master File -- "Link Between Programs" 1. Master File is "link" between two programs. 2. Discuss inputs and outputs in slide 8-18 (next).



8-18

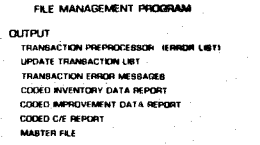
File Management Program Input

1. Prior to discussion of Flow Charts review input and output.

2. Discuss input sources as shown on slide.

3. Mention:

   (1) Accident Input will be discussed in Chapter 9
   (2) Mass Cost will be discussed at end of this chapter.



8-19

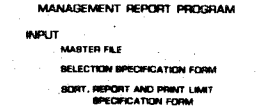
File Management Program Output

1. Discuss output of File Management Program.

2. Example reports will be shown later.

3. Identify Transaction Preprocessor as step which inputs District Number and checks for Invalid County Numbers

4. Emphasize: Master File is output.

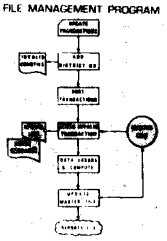


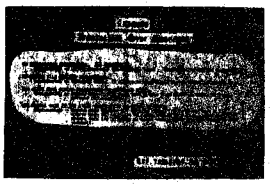
8-20

Management Report Program Input

1. Mention Input to Management Report Program. Detail will be discussed later.

2. Emphasize: Master File from File Management Program is only input, except for report specification cards.

MANAGEMENT REPORT PROGRAM OUTPUT REPORTING SPECIFICATIONS CODED INVENTORY DATA REPORT CODED IMPROVEMENT DATA REPORT CODED C/E REPORT MANAGEMENT REVIEW REPORT HAZARD LOCATION REPORT ERROR MESSAGES 8-21	Management Report Program Output 1. Reporting Specifications "echoes back" the selection & sorting parameters for reports printed. Identifies what information reports represent. 2. 3-coded reports are the same as those produced for File Management Program 3. Management Review and Hazard Location are de-coded abbreviated reports for administrator's review. 4. Error Messages are printed in reports and/or as special messages.
FILE MANAGEMENT PROGRAM  8-22	File Management Program Flow Chart Ref. Fig. 8-1, pg. 8-4 and Text Section 8.4 1. Discuss Data Flow of File Management Program 2. Discuss through "Check Invalid Transactions." (upper shaded portion) 3. Emphasize: (1) Use of Update List - complete list of all transactions except those rejected in Preprocessor (2) Error messages - list of transactions that <u>will not</u> be added to file
UPDATE CODES DELETE ADD CHANGE 8-23	Update Codes 1. Discuss Update Code - Delete Ref. Text, page 8-6, Section 8.4 3(a) 2. Discuss Update Code - Add Ref. Text, page 8-6, Section 8.4.3(b) 3. Discuss Update Code - Change Ref. Text, page 8-6, Section 8.4.3(c) 4. Detailed usage will be discussed in slides 8-33 through 8-35



8-24

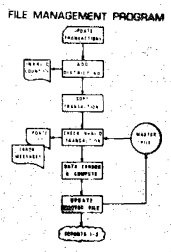
Example -- Transaction Error Message

1. Refer student to Table 8.1, List of Transaction Error Messages, for future reference (pages 8-9 thru 8-10)

2. Emphasize:

   (1) Three components on table

      (a) Error Messages
      (b) explanation
      (c) suggested correction



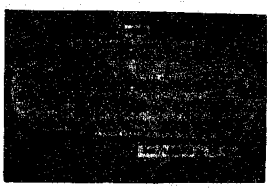
8-25

File Management Program Flow Chart

Ref. Text, page 8-8

1. Continue discussion of Data Flow of File Management Program

2. Emphasize difference between transaction error and data error. Use next slide if necessary to identify examples of data errors.



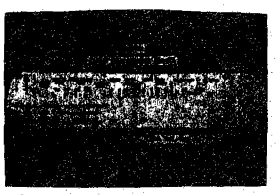
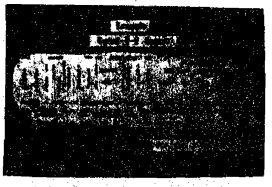
8-26

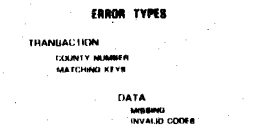
Examples -- List of Input Error Messages

1. Refer Student to Table 8.2, List of Input Error Messages, for future reference (page 8-13 thru 8-16).

2. Emphasize three components:

   (1) Error Messages
   (2) explanation
   (3) suggested correction

 8-27	Example -- Coded Inventory Data Report Ref. Figure 8-6, page 8-17 1. Contains all Input from Card Type 1. 2. Hazard Input may be printed up to 4 times (example Hazard No. 876) to allow matching Inventory with Improvement Report. 3. Emphasize: Student should study this example with Input Form to verify corresponding input with output. Figure 8.8 will assist in clarifying coded inventory report.
 8-28	Example -- Coded Improvement Data Report (Ref. Fig. 8.7, page 8-18) 1. Contains all input from Card Type 2 2. Error Messages printed on all reports (Reverse projector to slide 8-27 to show Error Message and back to 8-28 for comparison) 3. Emphasize: Student should study this example with Input Form to verify corresponding input with output. Figure 8.9 can assist in clarification.
 8-29	Example -- Coded C/E Report Ref. Fig. 8-10, page 8-21 1. Discuss: (1) Contents of Indices, Accident Information input on Card Type 4 (to be discussed in Chapter 9) and Other Factors input on Card Type 3. (2) C/E Value and CE/Accident Index Note (-) C/E Value, CE/Accident Index won't print unless Accident Data Input 2. Emphasize: Student should study this example and compare input on Card Type 3 & 4 with output.



8-30

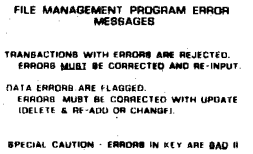
Error Types

1. Two types

   (1) Transaction Errors

   (2) Data Errors

2. Discuss where and why each type occurs.



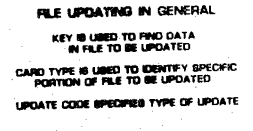
8-31

File Management Program Error Messages

1. Discuss in general how two types of Data Errors are corrected.

2. Emphasize:

   (1) Importance of reviewing Transaction Error list (A hazard & all improvements could be left out of group of hazard and CE value be incorrect)
   (2) Importance of accuracy in "key" (A hazard could be "moved" to another part of State by erroneous coding of county, for example County 10 instead of County 1.



8-32

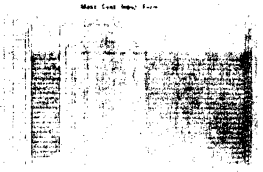
File Updating in General

Discuss file updating in General

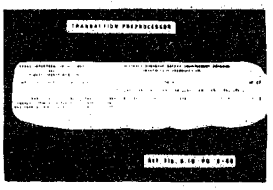
Ref. Text page 8-22, section 8.5.1

UPDATE CODE TYPE 2 - "ADD" • USED TO BUILD FILE • RECORD CAN BE ADDED WITH CARD TYPE 1 ONLY • KEY OF OTHER DATA INPUT MUST MATCH KEY OF AN EXISTING RECORD • ENTIRE DATA ON FORM ADDED 8-33	Update Code Type 2 -- Add Ref. text page 8-22, section 8.5.2 1. "Add" Update is not numbered 1 even though it is used first to "build" file 2. Update Code Numbering Sequence is: (1) DELETE (2) ADD (3) CHANGE 3. Sequence established to allow sorting into input order for logical performance of updates in run. Ref. text page 8-23, section 8.5.5
UPDATE CODE TYPE 1 - "DELETE" • DELETES INFORMATION INDIVIDUAL HAZARDS HAZARD GROUPINGS • IMPROVEMENT ALTERNATIVES CAN NOT BE DELETED BY THEMSELVES • OTHER FACTOR CODES AND ACCIDENT INFORMATION CAN NOT BE DELETED INDIVIDUALLY • KEY IDENTIFIES RECORDS TO BE DELETED 8-34	Update Code Type 1 -- Delete Ref. text page 8-23, section 8.5.3 1. Key, update Code and Card Type 1 are the only input required to delete information. 2. Discuss how a group is deleted and a single hazard is deleted.
UPDATE CODE TYPE 3 - "CHANGE" MODIFIES DATA IN FILE COMPLETE FORM MUST BE CODED TO MODIFY PART OF DATA ON FORM KEY IDENTIFIES SPECIFIC RECORD TO BE MODIFIED 8-35	Update Code Update Code Type 3 -- Change Ref. text page 8-23, section 8.5.4 1. Individual fields of information on form can not be changed by themselves. Complete data on any one form must be re-input to change any one field. 2. Key fields can not be changed (Columns 1-18). 3. Discuss individual points on slide.

RESULTS OF UPDATE PROCESS MODIFICATION OF THE MASTER FILE RECALCULATION OF ALL COMPUTED VALUES PRINTING OF CODED REPORTS (OF RECORDS UPDATED ONLY) 8-36	Results of Update Process Ref. text page 8-23, section 8.5.5 1. Only records that had transactions performed against them are printed during an update run. 2. Discuss individual points on slide.
MASS COST UPDATE PROVIDES FOR COST UPDATE FOR INFLATION SPECIAL METHOD OF FILE MODIFICATION 8-37	Mass Cost Update 1. Mass Cost Update is a special type of update allowing modification of costs in a geographic area.
COST UPDATE MAY BE FOR SPECIFIC HAZARD OR IMPROVEMENT TYPE IN GEOGRAPHIC AREA COUNTY CONTROL CONTROL-SECTION INCREASE OR DECREASE 8-38	Cost Update 1. Discuss key reference of Mass Cost Update and that % change in cost may be + or -. Ref. text page 8-24, section 8.5.7 2. Cost for specific type of hazard or for particular improvement type may be adjusted. 3. Percent may be positive or negative and must be coded.

 8-39 (Screen 2)	Mass Cost Input Form Ref. Figure 8.12, page 8-26 1. Lowest key element allowed to be updated with Mass Cost Update is control-section 2. Change other lower element costs with "change" 3. Always use update code 4, column 79
COST UPDATE AFFECTS: 5 COST VALUES ON IMPROVEMENT FORM • HAZARD REPAIR COST/COLLISION • HAZARD NORMAL MAINTENANCE COST • FIRST COST OF IMPROVEMENT • IMPROVEMENT REPAIR COST/COLLISION • IMPROVEMENT NORMAL MAINTENANCE COST 8-40	Cost Update Affects: 1. Discuss 5 cost values that may be updated (Ref. Slide 8-39 on screen 2) 2. Cost Values are all input on Improvement Form
MASS COST UPDATE RULES • MORE THAN ONE MASS COST UPDATE ALLOWED PER RUN • MAY NOT APPLY TO SAME GEOGRAPHIC AREA • CAN BE SAME TYPE HAZARD OR IMPROVEMENT 8-41	Mass Cost Update Rules Ref. page 8-24, section 8.5.7 1. Discuss rules shown on slide 2. More than one cost change cannot be made to same geographic area at one time 3. Hazard type does not have to match improvement type on same card

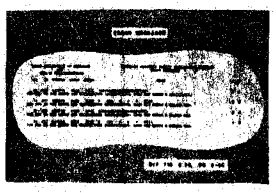
REVIEW: INVENTORY CAN BE THOUSANDS OF HAZARDS FILE MANAGEMENT & MANAGEMENT REPORT PROGRAMS ARE TOOLS EACH AGENCY WILL DEVELOP OWN TECHNIQUES FILE ADMINISTRATOR ACTIVITIES RECEIVE INVENTORY FORMS BUILD FILE MAINTAIN FILE PRODUCE REPORTS BUILD FILE IN REASONABLE SEGMENTS DEVELOP MASTER LISTING FOR REFERENCE 8-42	Review Ref. text page 8-24, section 8.5.8 1. Summarize and review chapter briefly using items on slide 2. Emphasize importance of designating a file administrator
CASE EXAMPLES 8-43	Case Examples Title slide to introduce case examples for illustration purposes.
TRANSACTION ERROR INVALID COUNTY NUMBER ON INVENTORY FORM (COUNTY NUMBER 999 INPUT) 255 IS LARGEST COUNTY NUMBER ALLOWABLE 8-44	Transaction Error 1. Example situation of coding an erroneous county number on the Inventory Form 2. Error will show in Transaction Preprocessor



8-45
(Screen 2)

Transaction Preprocessor Error Printout

1. Error shows that hazard was rejected
2. Hazard is not in the master file at this stage



8-46
(Screen 2)

Error Messages

1. Improvements to rejected hazard are also rejected in preprocessor check stage because there is no key to which the improvement can be matched

CORRECTION

1. CORRECT COUNTY NUMBER ON INVENTORY CARD
2. RESUBMIT HAZARD AND IMPROVEMENTS

(USE UPDATE CODE 2 - ADD)

8-47

Correction

1. Discuss correction procedure to re-submit corrected hazard and improvements
2. Use update code 2 - "add" because hazard was not in file, nor was improvement information

TRANSACTION ERROR

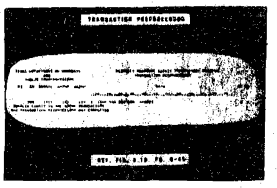
INVALID COUNTY NUMBER
ON IMPROVEMENT FORM

(COUNTY NUMBER 799 INPUT)

8-48

Transaction Error

1. Example situation of coding erroneous county number on Improvement Form
2. Error will show up on transaction preprocessor report
3. Hazard is in master file, but improvement data are not in file

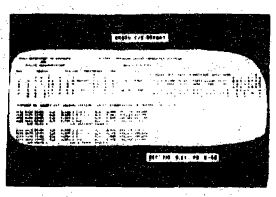


8-49
(Screen 2)

Transaction Preprocessor Printout

Ref. Figure 8.19, page 8-45 in text

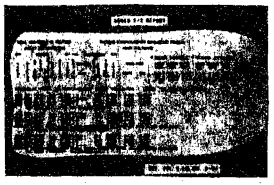
1. Rejected improvement data are shown



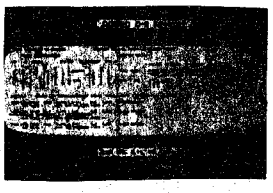
8-50
(Screen 2)

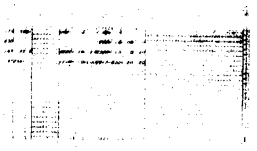
Coded C/E Report Printout

1. Type 4 improvement added to balance number of improvements for the group
2. Data are now in file with Type 4 improvement for that hazard
3. This error must be corrected in order to compute a correct C/E value

CORRECTION 1. CORRECT COUNTY NUMBER ON IMPROVEMENT CARD 2. RESUBMIT IMPROVEMENT (USE UPDATE CODE 3 - CHANGE) 8-51	Correction 1. County number must be corrected on new improvement card (card type 2) and resubmitted 2. Use Update Code 3 - "change" 3. Blank screen 2
FIELD DATA INPUT ERROR •HAZARD INVENTORIED AND IMPROVEMENTS SPECIFIED WHEN HAZARD IS LOCATED 40 FEET FROM ROADWAY •HAZARDS LOCATED GREATER THAN 30 FEET FROM ROADWAY SHOULD NOT BE INVENTORIED ERROR WILL SHOW UP INVENTORY REPORTS 8-52	Field Data Input Error Case Example 1. Describe situation: hazard greater than 30ft from roadway edge is erroneously inventoried 2. Error message will be generated in the coded C/E report and other coded reports 3. Two exceptions to the 30 ft limit are: (a) 3.5:1 or steeper slopes (b) hazard in median and median width specified
 8-53 (Screen 2)	Coded C/E Report Printout 1. Error message shown on printout 2. Error message will appear on all reports 3. Error must be corrected 4. Data are in file

CORRECTION 1. DELETE COMPLETE GROUP PUNCH KEY ON INVENTORY CARD WITH "DELETE" (CODE 1) 2. ADD BACK OTHER HAZARDS IN GROUP WITH THEIR IMPROVEMENTS (CODE 2) 8-54	Correction 1. Delete group 2. Add hazards within 30 ft but omit hazard beyond 30 ft 3. Blank screen 2
FIELD DATA INPUT ERROR IMPROVEMENT SPECIFIED TO HAZARD BEHIND GUARDRAIL (OTHER THAN IMP. CODE 4) HAZARDS LOCATED BEHIND EXISTING GUARDRAIL CANNOT BE IMPROVED CORRECTION INPUT IMPROVEMENT CARD WITH "NO IMPROVEMENT RECOMMENDED" USING "CHANGE" (CODE 3) 8-55	Field Data Input Error Case Example 1. Describe situation from slide 2. Guardrail in group is assumed by program to protect entire gorup 3. Improvements are not allowed to obstacles behind a guardrail 4. Correct by resubmitting an Improvement Card with Type 4 Improvement using an update code - change
 8-56 (Screen 2)	Coded Inventory Data Report Printout 1. Error message shown on report 2. Blank screen 2

EXAMPLE ADD "OTHER FACTORS" TO FILE 1 PUNCH "OTHER FACTORS" DATA 2 USE UPDATE CODE 2 (ADD) TO CARD TYPE 3 8-57	Example -- Add "Other Factors" to File 1. Other Factors for case examples in Chapter 7 are added to file using update code 2 -- Add and card type 3. 2. Completed Other Factors Form shown on next slide
 8-58 (Screen 2)	Other Factors Input Form 1. Five other factors codes are shown for the nine case examples in Chapter 7, text 2. Other Factors codes will show up on Coded C/E Report and on Management Reveiw Report
 8-59 (Screen 2)	Coded C/E Report Printout Ref. Figure 8.10, page 8-21, text 1. Other factors Codes are shown here for the five examples 2. Blank Screen 2

EXAMPLE MASS COST UPDATE 1 COST CHANGES TO CULVERT HEADWALLS IN CONTROL SECTION 59-01 2 COST CHANGES TO GUARDRAIL IMPROVEMENT THROUGHOUT COUNTY 230 3 COST CHANGES TO GUARDRAIL IN CONTROL SECTION 123-2 4 COST CHANGES TO BRIDGERAIL IN CONTROL 2561 8-60	Example -- Mass Cost Update 1. Mass Cost Update may be accomplished on a county, a control, a section 2. Project slide 8-61 on screen 2 simultaneously to illustrate situation shown in slide 8-60
 8-61	Mass Cost Update Form -- Example 1. Discuss each entry with slide 8-60 on screen 1

TITLE: ACCIDENT DATA INCORPORATION

PRESENTATION TIME: 30 minutes REFERENCE IN COURSE TEXT: Chapter 9

PURPOSE OF PRESENTATION:

1. To define the need for inclusion of accident information
2. To define applicable accident information
3. To demonstrate methodology for incorporating accident information in developing roadside safety programs

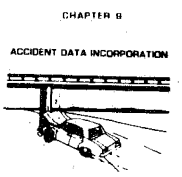
TRAINING OBJECTIVES:

Participants should be able to:

1. Define accident information needs for computer input and describe methodology to acquire these data
2. Define technical terms such as cost-effectiveness/accident index, mathematical term of equations, input parameters on form, etc.
3. Describe the decision-making processes that would be used to evaluate indices produced by the equation for use in prioritizing program

SPECIAL INSTRUCTIONS AND COMMENTS:

1. Presentation Format: Lecture/slide presentation
2. One projector required
3. Participant should be given handout of Roadside Hazard Accident Form at beginning of presentation



9-1

Accident Data Incorporation

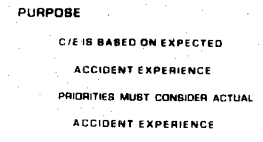
1. Accident experience is a basic indication of a malfunction of our system.

2. This section details a methodology to incorporate the influence of accident experience in the decision-making process for prioritizing safety improvements

9-2

When two improvement alternatives have the same C/E value:

The improvement alternative that has the high accident experience should have the highest priority.



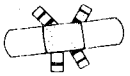
9-3

Purpose

Since C/E is based on expected accident experience, the management process must incorporate actual accident experience. In this session we consider how this has been accomplished.

SPOT IMPROVEMENT PROGRAMS

BANDAGE WHERE THE WOUND BLEEDS



9-4

Spot Improvement Programs

1. Are essential to identifying problem locations
2. Should not be replaced with C/E ... the two programs are complimentary

Note: Spot Improvement Programs are a bandage on the open wound

C/E IS PREVENTIVE MEDICINE

TO PREVENT UNNECESSARY BLEEDING

9-5

C/E is Preventive Medicine

C/E is preventive medicine to identify and eliminate a hazard before it generates an accident history.

THAT DOES NOT MEAN WE NEGLECT

AN OPEN WOUND!

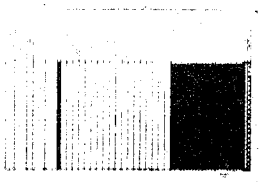
9-6

Strongly Emphasize:

1. High accident locations are not ignored
2. C/E and spot improvement programs are complimentary systems.

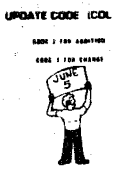
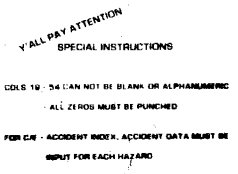
C/E ACCIDENT INDEX $I = C_1 \left[\frac{C/E + C_2}{GACC + C_3}\right]$ 9-7	C/E Accident Index The C/E-Accident Index is the ratio of the C/E value to the gross accident costs with the resulting relationship adjusted to reflect the nature of the C/E and GACC values.
THE CONSTANTS C_1 - TO KEEP I BETWEEN 0 & 1000 C_2 - TO KEEP NUMERATOR POSITIVE (I.E. C/E MAY BE NEGATIVE) C_3 - TO KEEP DENOMINATOR POSITIVE 9-8	The Contraints: 1. C_1 - C_1 scale the value of I to keep it between 0 and 1000 2. C_2 - The value of C_2 should be large enough to insure that the numerator is not negative 3. C_3 - Should just insure that attempt to divide by zero does not result
THE VALUE OF THE CONSTANTS C_1 - 0.032 C_2 - 1001 C_3 - 1 9-9	The Value of the Constants To achieve these constraints the value are: $C_1 = 0.032$ $C_2 = 1001$ $C_3 = 1$

THE BASIC EQUATION $I = 1 + 0.032 \left[\frac{C/E + 1001}{GACC + 1} \right]$ I IS DIMENSIONLESS THE LOWER THE VALUE THE MORE EFFECTIVE IT IS 9-10	The Basic Equation The Equation shown is the C/E-Accident Index Equation. The lower the value of I, the more desirable the alternative
WHICH ACCIDENTS ? COLLISIONS INVOLVING ROADSIDE FIXED OBJECTS RAN - OFF - THE - ROAD ACCIDENTS VEHICLE - OVERTURNED ACCIDENTS 9-11	Which Accidents? Accidents that are included in the Gross Accident Cost (GACC) are: 1. Accidents involving roadside fixed objects 2. Ran-off-the-Road Accidents 3. Vehicle overturned accidents
ACCIDENT FILE HAZARD ACCIDENTS - VEHICLE STRUCK AN INVENTORIED FIXED OBJECT RELATED ACCIDENTS - ACCIDENTS IN IMMEDIATE VICINITY (WITHIN 0.1 - MILE DISTANCE) 9-12	Accident File The master accident data file includes two classes of accidents: 1. Hazard Accidents (those accidents involving inventoried obstacles) 2. Related Accidents (Accidents of the run-off-the road and vehicle overturned types in the immediate vacinity of the inventoried obstacle)

ACCIDENT LOCATION MILEPOINT SYSTEM LOCATION RELATED TO ROAD INVENTORY FILE BY MILEPOINT INVENTORY DATA MILEPOST SYSTEM 9-13	Accident Location Milepoint System: 1. Accident location is related to inventory file by milepoint 2. Location of Accidents by milepoint permits cross referencing with inventory file
ACCIDENT INFORMATION INPUT USE "ADD" UPDATE CODE (CODE 2) USE ROADSIDE HAZARD ACCIDENT INPUT FORM (CARD TYPE 4) 9-14	Accident Information Input To input accident data, use: 1. Roadside Hazard Accident Input Form (Card Type 4) 2. "Add" Update Code (Code 2)
 9-15	Roadside Hazard Accident Input Form 1. Discuss elements of form 2. Define terms in headings 3. Cite examples of usage

HAZARD IDENTIFICATION KEY (COLS 1-17) IDENTIFICATION OF HAZARD IN INVENTORY FILE COUNTY CONTROL NUMBER SECTION NUMBER GROUP NUMBER HAZARD NUMBER 9-16	Hazard Identification Key 1. The Hazard Identification Key for the Data Input Form is the same as for all other forms 2. Identification of hazard in inventory file by: (1) County (2) Control Number (3) Section Number (4) Group Number (5) Hazard Number
ROADSIDE ACCIDENT HAZARD FORM — INPUTS 3 YEARS DATA 1. HAZARD IDENTIFICATION KEY (COLS 1-17) 2. ACCIDENTS INVOLVING HAZARDS (COLS 18-36) A. FATALITIES B. INJURIES C. P.D.O. 9-17	Note: 1. The basic input data on accident history involves the last three years experience 2. The data is stratified by fatalities, injuries and property damage only accidents Inputs: 1. Hazard Identification key 2. Accidents involving hazards
INPUTS (CONT'D) 3. RELATED ACCIDENTS (COLS 37-54) 4. UPDATE CODE (COL 78) 5. CARD TYPE (COL 80) 9-18	Inputs Continued: 3. Related Accidents (1) Fatalities - Code 2 (2) Injury - Code 4 4. Update Code 5. Card Type

ACCIDENTS INVOLVING HAZARDS FATALS INJURED PDO YEARLY COLUMNS NAMED ON FORM I 9-19	Accidents Involving Hazards The accident data are entered onto the the form as illustrated in this scale
THE 3RD YEAR IS THE MOST CURRENT YEAR'S DATA I  9-20	The 3rd Year is the Most Current Year's Data 1. The 3rd year's data is the most current year's data 2. The order does not affect the computation but is an orderly entry of data facilitating updating of the accident data
RELATED ACCIDENTS SAME FORMAT AS ACCIDENTS INVOLVING HAZARDS I 9-21	Related Accidents Note: Same Format as accidents involving hazards

 9-22	Update Code (Column 79) 1. Code 2 for addition 2. Code 3 for change
 9-23	Card Type (Column 80) All roadside accident cards have a Code 4
 9-24	Special Instructions 1. Columns 19-34 must not be blank. These columns can contain any numeric data including zero 2. Accident data must be input for each obstacle. If no data are input, the C/E-Accident Index can not be computed

SPECIAL INSTRUCTIONS (CONT'D) IF NO UPDATE FOR A HAZARD, CE/ACCIDENT INDEX WILL BE BLANK. AN * APPEARS IF CE/ACCIDENT INDEX IS GREATER THAN 1000 A ZERO IS PRINTED IF CE/ACCIDENT INDEX IS LESS THAN 0.001 9-25	Special Instructions (Continued) 1. If I exceeds 999.999 an * will be printed. 2. If I is less than 0.001 a zero will be printed.
SPECIAL INSTRUCTIONS (CONT'D) MANAGEMENT REPORT PROGRAM CODED CE REPORT PRINTS OUT ALL ACCIDENT DATA 9-26	Special Instructions (Continued) The Report Type 03 (coded CE report) prints out the accident data input in column 19-54.
C/E ACCIDENT INDEX IS USED TO DECIDE BETWEEN TWO SIMILAR C/E VALUES ANOTHER TOOL  9-27	Emphasize: The C/E-Accident Index does not substitute for C/E but rather is a complementary tool to assist in prioritizing alternatives with relatively equal C/E values.

TITLE: PROCEDURE ADAPTATION FOR INDIVIDUAL STATES

PRESENTATION TIME: 30 minutes REFERENCE IN COURSE TEXT: Chapter 10

PURPOSE OF PRESENTATION:

1. To identify procedural elements that may require modification for application in other states

TRAINING OBJECTIVES:

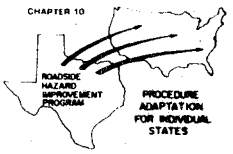
The participant should be able to:

1. Define the elements of the Texas procedure that would require modification prior to implementation of the process in another state

2. Describe methods to accomplish the necessary modifications (modifying the program or modifying state policies and practice to fit the program needs.)

SPECIAL INSTRUCTIONS AND COMMENTS:

1. Presentation Format: Lecture/slide presentation
2. One projector required
3. The instructor should allow considerable time to answer participants questions during and at the end of this presentation. Questions can be expected to be very specific "how" questions regarding individual state practices. (Therefore knowledge of the computer program logic is essential)



10-1

Title Slide: Procedure Adaptation for Individual States

Purpose: (1) To define procedural elements that may require modification for application in other states

(2) To define potential modifications

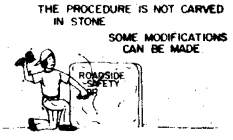
ORIGINAL PROCEDURE DEVELOPED FOR TEXAS BY TEXAS TRANSPORTATION INSTITUTE TEXAS STATE DEPARTMENT OF HIGHWAYS AND PUBLIC TRANSPORTATION

10-2

Emphasize:

(1) NCHRP intent was that each state adapt the concept to its own needs and policy structure.

(2) This procedure was developed specifically for Texas; therefore certain features are unique to Texas and may not fit other states exactly.



10-3

Procedure is <u>not</u> carved in stone!

Emphasize:

(1) Certain modifications can be made to existing program easily; others may involve complex internal changes.

(2) User must decide what modifications must be made.

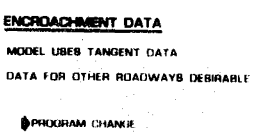
10-4

Possible Modifications

Basically there are two methods to modify the implementation:

(1) Change procedure to fit individual states precisely

(2) Change state's files or data to fit program needs

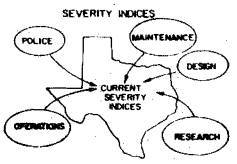


10-5

Encroachment Data

One basic change that may be desirable is to incorporate encroachment data for all types of roadsides - this would entail program change by addition of data tableaus.

(These data are not currently available.)

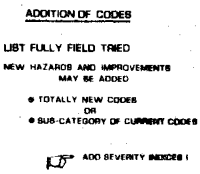


10-6

Severity Indices

(1) Severity indices incorporated in Texas program were based on comprehensive data from field disciplines on slide.

(2) Severity indices may be changed; however, care should be taken to assure completeness.



10-7

Addition of Codes

(1) List of hazards was fully field tried in Texas; however other states may wish to add new codes or additional sub-categories.

(2) A severity index must be added for any hazard added.

(3) This is a relatively simple change.

(4) Improvement alternative must be specified.

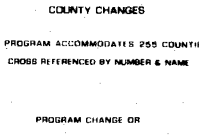
10-8

Changing the Key

Emphasize:

(1) First 17 columns must contain unique data so that transactions can be keyed to a particular (and only one) location in master file.

(2) Following slides present ways to modify elements of the "key".



10-9

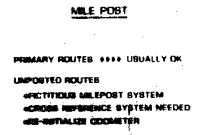
County Changes

(1) Current program accommodates 255 counties cross-referenced for Texas county names.

(2) Other states may change county list to fit their county names.

(3) Small program change if more than 255 counties used

CONTROL SECTION WAYS AROUND IT 1. "DUMMY" CONTROL-SECTION 2. HIGHWAY ROUTE AND CLASS ANYTHING THAT IS ABSOLUTELY UNIQUE 10-10	Control Section (1) For states not using "control-section" designation, a set of "dummy" control sections may be established. (2) State mileage may be designated or a separate numbering designation using highway route and class may be used. (3) Whatever is used, it must be unique.
GROUPING NUMBER NO TWO GROUPING NUMBERS CAN BE THE SAME ! 10-11	Grouping Number (1) The grouping number must not be duplicated within the smallest sorting element (in the current program, this is the control-section). (2) Numbering order need not be sequential.
HAZARD NUMBER NO TWO HAZARD NUMBERS CAN BE THE SAME ! 10-12	Hazard Number (1) Hazard number must not be duplicated within the smallest sorting element (control-section). (2) Hazard numbers need not be sequential.

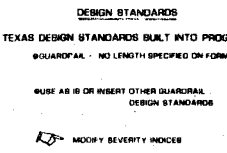


10-13

Mile Post

(1) If routes do not contain "in-field" milepost markers, a "dummy" milepost system must be devised and cross referenced to known fixed locations in the field.

(2) Known points should be fairly closely spaced so that the odometer can be re-initialized frequently.

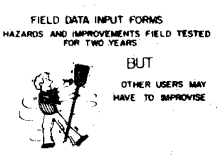


10-14

Design Standards

(1) Program includes Texas design standards for guardrail.

(2) Other states may incorporate own guardrail specifications; however "safety treated" with one treatment is essentially same as another treatment and severity indices would probably be very similar.



10-15

Field Data Input Forms

(1) Both data input forms are structured for management program operation.

(2) Care should be taken in modifying forms to assure that sorting capabilities are not affected.

(3) Many times it is better to improvise or "trick" the computer by coding a slightly different hazard using an existing code.

10-16

Caution -- Beware of Computer Analysis Program Changes

(1) The analysis program is extremely complex and interrelated with extensive internal branching on certain input codes.

(2) Changes should be made only after detailed study and thorough understanding of the total program.

10-17

Management Programs

(1) The management programs are developed using fairly standard selection/sorting techniques and probably will not require much changing.

(2) Hiearchy of select and/or sort should be well understood prior to making modifications.

TITLE: MANAGEMENT PROGRAMS

PRESENTATION TIME: 2 hours

REFERENCE IN COURSE TEXT: Chapter 11

PURPOSE OF PRESENTATION:

1. To define the uses, capabilities, and limitations of the Management Report Program
2. To demonstrate, through case examples, the application of the Management Report Program toward developing a safety priority program

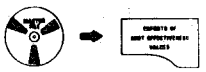
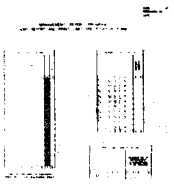
TRAINING OBJECTIVES:

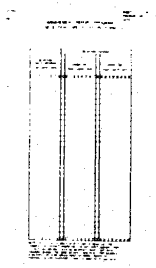
The participant should be able to:

1. Define technical terminology presented during the session
2. Identify the types of reports that can be generated, select the reports that will provide specific information for program needs
3. Code appropriate input forms to generate reports to present information required

SPECIAL INSTRUCTIONS AND COMMENTS:

1. Presentation Format: Lecture/slide presentation in which Instructor illustrates detailed input requirements to generate specific types of reports (case examples)
2. Two projectors required
3. The material presented is extremely technical and Instructor should encourage participant questions to ensure understanding of input requirements.

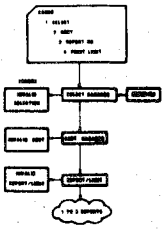
MANAGEMENT REPORT PROGRAM (CHAPTER 11) 11-1	Management Report Program (Title Slide) 1. State session objectives and training technique 2. Session objectives: To train the subject in the uses, capabilities and limitations of the Management Report Program. To illustrate, through case examples, the proper application of the Management Report Program toward developing a safety priority program.
MANAGEMENT REPORT PROGRAM CONCEPT  11-2	Management Report Program Concept 1. Briefly review concept of Management Report Program presented in Chapter 8. 2. Reiterate (1) Input to Management Report Program is master file and report specifications. (2) Output is 3 coded and 2 de-coded reports + reporting specifications.
 11-3	Sort, Report and Print Limit Specification Form 1. Two Forms (4 card types) are used to provide Reporting Specifications. 2. The card types will be discussed in the order used and the Sort, Report and Print Limit Specifications will be discussed after Selection Specifications Form shown on screen 2.



11-4
(Screen 2)

Selection Specification Form

1. Describe general contents of form
2. Use to discuss flow chart on slide 11-5 (next) on screen 1



11-5

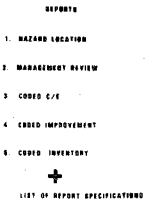
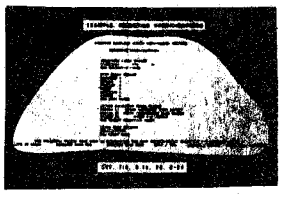
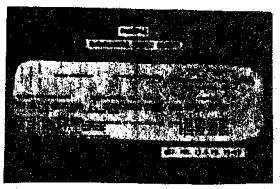
Flow Chart

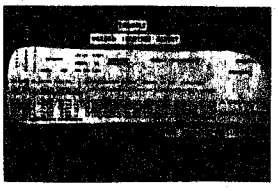
1. Discuss General Process of Management Report Program (Ref. Text page 11-1, Section 11.1.1)
2. Advise student that examples of error messages produced when errors are detected in report parameter cards are on page: 11-21, Fig 11.6 through 11.8. Examples will not be shown.
3. Change screen 2 to slide 11-6 when beginning discussion of Sort of Hazards
4. Emphasize: Management Report Program does not modify Master File (refer to direction of Arrow from Master file)
5. Change to slide 11-7 (screen 1) and slide 11-8 (screen 2) to discuss reports

11-6
(Screen 2)

Sort, Report and Print Limit Specification Form

1. Use to refer to in discussion of General Process of Management Report Program on slide 11-5 beginning with discussion of sorting

 11-7	Reports 1. Mention 5 reports produced by Management Report Program by name. Nos. 3-5 on slide (coded reports) previously discussed and examples shown in Chapter 8 (reiterate briefly) 2. Two new decoded reports for Managers (Nos 1 & 2) will be reviewed before discussing program in detail 3. Slide 11-8 on Screen 2 is example of Report Specifications Listing Note: Reports are not listed on slide in report number order .
 11-8 (Screen 2)	Example: Reporting Specifications 1. Review report using slide to illustrate location 2. Points to discuss: (1) "Echo" of input (2) Provides the only definition to selection criteria of Reports produced in that run (3) Values shown printed at bottom of the report provide record of cost values, interest and life used in program to produce C/E and C/E accident Index values.
 11-9	Example: Management Review Report 1. Review Report (Ref. Fig. 11.4, page 11-19 in Text) 2. Points to discuss: (1) It is a decoded report (2) Same print rules apply for de-coded reports as coded reports (i.e., error messages appear on all reports, CE/Accident Index will not print unless Accident data in file, etc.) (3) Review items on Report and advise students to study text example to be certain they can relate output to input.



11-10

Example: Hazard Location Report

1. Review Report

   (Ref. Fig. 11.5 page 11-20 in Text)

2. Points to discuss:

   (1) Same as Slide 11-9

EXAMPLE USES OF REPORT CAPABILITY:

11-11

Example Uses of Report Capability

1. Discuss briefly example uses of report capability

   (Ref. page 11-5, first paragraph in text)

2. Cite examples for each point on slide

3. Details of "how" will be discussed later in course.

INFORMATION SELECTION

11-12

Information Selection

1. Brief discussion of Information Selection factors

2. Add to list - User Needs and imagination

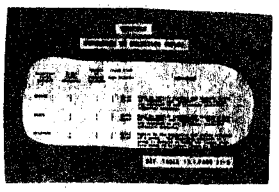
   (Ref. page 11-5 second paragraph in text.)

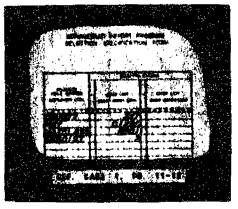
3. Use slide 11-8 on Screen 2 to illustrate example selection. (Discuss each selection card and arrangement)

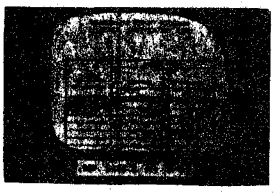
INFORMATION SORTING : • ALLOWS ARRANGEMENT IN SPECIFIC ORDER FOR PRINTING • ALLOWS SORTING BY 15 FIELDS (EXCEPT HAZARD NUMBER AND OFFSET ORDER) • SOME SORT FIELDS REQUIRED 11-13	Information Sorting 1. Brief discussion of Information Sorting (Ref. page 11-5 thrid paragraph in text.) 2. Give examples from text Use Slide 11-8 on Screen 2 for one example to illustrate 3. "How" will be discussed later in session in case examples
INFORMATION REPORTING: ALLOWS SELECTION OF ANY OF 6 REPORTS PARTICULAR REQUIREMENTS WILL DEFINE REPORTS NEEDED SOMETIMES MANAGEMENT LEVEL REPORTS WILL BE SUFFICIENT OTHER TIMES ONE OR MORE OF OTHER REPORTS WILL BE REQUIRED CAN BE EXPANDED 11-14	Information Reporting 1. Brief discussion of Information Reporting (Ref. page 11-5 third paragraph in text) 2. Give example from text of need for different reports for varied information 3. "How" will be discussed later in session in case examples
PRINT LIMIT CAPABILITY LIMITS IMPROVEMENT ALTERNATIVES TO BE PRINTED 11-15	Print Limit Capability 1. Brief discussion of Print Limit Capability (Ref. page 22-5 fourth paragraph in text). 2. Give example from text of limiting alternatives printed because of limit of money. 3. "How" is simple and can be explained here or later - slide illustrating input shown later in session.

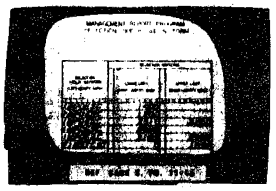
SELECTION CRITERIA 11-16	Selection Criteria 1. Define Selection Capability: "The selection capability allows examination of a field of related information and comparison of limits input on Selection Specification Form" (Screen 2 slide 11-17) 2. Mention Key word & define (discussed on Slide 11-22) 3. Indicate on form (Screen 2) where limits are input.
 11-17 (Screen 2)	Selection Specification Form 1. Use to discuss Selection capability (1) Redefine column headings (2) Define limits -- upper and lower (3) Cite examples where limits would apply
SELECTION PROCESS RULES (1) ALL VALUES BASED ON NUMERIC COMPARISON (2) ALL COMPARISONS BASED ON ABSOLUTE VALUES (SIGNS ARE CONSIDERED) (3) LIMITS INPUT ON SELECTION SPECIFICATION FORM MUST CORRESPOND EXACTLY WITH VALUES IN MASTER FILE 11-18	Selection Process Rules (Ref. page 11-6 Section 11.2.2 items 1-3 in text) 1. Discuss each point on slide 2. Example: Milepost 2.324 is reviewed by computer merely as 2324, decimals are not contained in file 3. Emphasize point (3) on slide

SELECTION RULES (CONT'D) (4) DATA FOR COMPLETE GROUP PRINTED (A) IF HAZARD INFORMATION SELECTED - ALL IMPROVEMENTS PRINTED (B) IF IMPROVEMENT INFORMATION SELECTED - ONLY IMPROVEMENT ALTERNATIVE PRINTED 11-19	Continue discussion of Selection Process Rules: (Ref. page 11-6 Section 11.2.2 Items 4-6 in text) 1. All information to support C/E value is printed 2. All hazards for a group are printed but only improvement alternative is selected
SELECTION RULES (CONT'D) (5) SELECTION FIELDS REPRESENTING A RANGE OF VALUES REQUIRE SPECIAL HANDLING 11-20	Selection Process Rules (continued) (Ref. page 11-6 Section 11.2.2 Item 7 in text) 1. Cite example of selection fields representing a range of values Example: Beginning and ending lateral offset (1) Lowest value is placed in beginning (2) Highest value is placed in ending for selection process only (does not affect master file position) (3) Allows determination of closest hazard to roadway edge
MULTIPLE SELECTION CARDS / REQUEST: 11-21	Multiple Selection Cards/Request (Ref. page 11-7 Section 11.2.2.1 in text) 1. "OR" Rule 2. "AND" Rule 3. Rules 1 & 2 apply Note: Maximum Selection cards with Duplicate Keywords/run = 20 is arbitrary limit and can be changed.

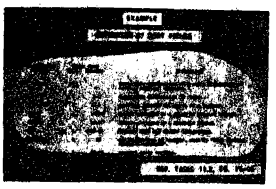
SELECTION FIELD - KEYWORD DESCRIPTIVE ABBREVIATIONS MAXIMUM OF 8 CHARACTERS ENTERED LEFT - JUSTIFIED MUST BE SPELLED EXACTLY AS SHOWN IN TEXT 11-22	Selection Field - Keyword (Ref. page 11-7 Section 11.2.2.2 in text) 1. Discuss rules on slide 2. Use Slide 11-7 (Screen 2) to define where Keyword is input (Columns 1-8) 3. Emphasize: (1) Input left-justified (define) (2) Spell exactly as in Table 11.1 page 11-8 thru 11-11 in text Example: Definition of Selection Fields
 11-23	1. Review Definition of Selection Fields table (Ref. Table 11.1 page 11-8 thru 11-11 in text) 2. Points to discuss: (1) Keyword (2) Field width (discussed under selection limits) (3) Number of Implied decimals (discussed under "Limits") (4) Input type - card type where information in field comes from (5) Input columns - card columns information is input in. (Items 4 & 5 allow cross-reference with card input to see if selection on field is provided) (6) Definition of terms
SELECTION LIMITS: LOWER LIMIT INPUT IN COLUMNS 10-17 WITH SIGN IN COLUMN 9 UPPER LIMIT INPUT IN COLUMNS 19-26 WITH SIGN IN COLUMN 18 RANGE OF VALUES ENTER RIGHT JUSTIFIED MUST HONOR TRAILING ZEROES IMPLIED DECIMALS 11-24	Selection Limits 1. Discuss rules of Selection Limits on slide (Ref. page 11-7 Section 11.2.2.3 in text) 2. Emphasize: Importance of trailing zeroes and implied decimals 3. Give examples from text

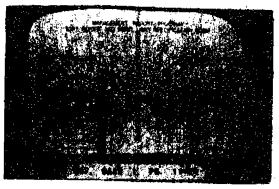
MULTIPLE DEFINED FIELDS : EXAMPLE 1 - IMPTYPE - CARD TYPE 2- COLUMN 41 IMPDESC - CARD TYPE 2- COLUMNS 41-64 EXAMPLE 2- DIST1BEG - CARD TYPE 2 - COLUMNS 45-46 DIST1END - CARD TYPE 2 - COLUMNS 47-48 DIST2BEG - CARD TYPE 2 - COLUMNS 54-55 DIST2END - CARD TYPE 2 - COLUMNS 56-57 DISTANCE - DIST1BEG, DIST1END, DIST2BEG & DIST2END 11-25	Multiple Defined Fields 1. Define terms (Ref. page 11.12 Section 11.2.2.4 in text) 2. Review examples on slide and discuss 3. Define what is meant by related information (i.e. offset distance for point hazard and slope hazard) Instructional Note: (When this slide in advanced, Screen 2 should be advanced to a blank)
CASE EXAMPLE 1 SELECT ALL GROUPS OF HAZARDS CONTAINING CULVERT HEADWALLS WITHIN 3 FOOT OF ROADWAY. ON US 290. IN TRAVIS COUNTY (NUMBER 227) 11-26	Case Example 1 (Ref. page 11-12 Case Example 1 in text) 1. Define case situation 2. When problem is defined advance Screen 2 to slide 11-27 3. Leave 11-26 on Screen 1
 11-27 (Screen 2)	Selection Specification Form - Case 1 1. Review input required to select hazards required using this slide 2. Point out: 1. Hwy 01290 = US 290 2. No upper limit required 3. When complete, both screens should be advanced and screen 2 should be blank

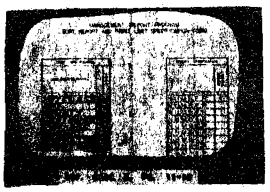
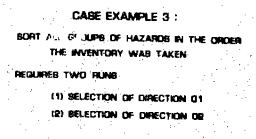
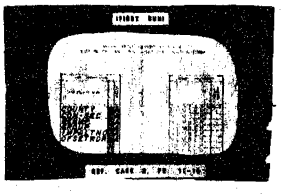
CASE EXAMPLE 2 SELECT ALL GROUPS OF HAZARDS ON CONTROLLED ACCESS HIGHWAYS WITH 10 OR MORE FATALITIES IN THE PAST 3 YEARS 11-28	Case Example 2 (Ref. page 11-13 Case Example 2 in text) 1. Discuss case example When problem is defined advance Screen 2 to slide 11-29 leaving slide 11-28 on Screen 1
 11-29 (Screen 2)	Selection Specification Form - Case 2 1. Review input required to select hazards required using this slide 2. Point out: 1. Use of upper limit 2. Upper limit of 999 total fatalities When complete both screens should be advanced and screen 2 should be blank
CASE EXAMPLE 3 SELECT ALL GROUPS OF HAZARDS WITH GUARDRAIL & ATTENUATOR IMPROVEMENTS SPECIFIED WITH FIRST COST OF IMPROVEMENT OF LESS THAN $2000 DO NOT INCLUDE GUARDRAIL IMPROVEMENTS ON THE FACE OF BRIDGERAILS 11-30	Case Example 3 (Ref. page 11-13 Case Example 3 in text) 1. Discuss selection situation When problem is defined advance Screen 2 to slide 11-31 leaving 11-30 on Screen 1

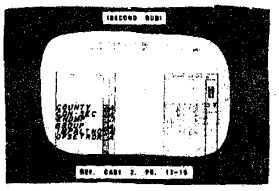
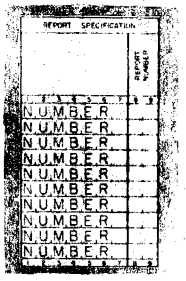
 11-31 (Screen 2)	Selection Specification Form - Case 3 1. Review input required to select hazards required using this slide 2. Point out: (1) Bridge rail Improvements (Desc. Codes 2120-2224 are not included) When complete, both screens should be advanced
 11-32	Information Sorting (Title Slide) 1. Introductory slide for subsequent slides
 11-33 (Screen 2)	Sort, Report and Print Limit Specification Form 1. Use slide for discussion of information sorting--illustrating where specific input is coded.

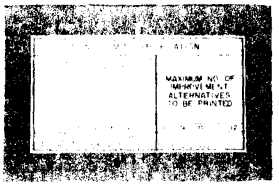
SEQUENCE OF SORT PROCESS (1) CARDS ACCEPTED IN INPUT ORDER (2) ORDER OF SORT OF FIRST CARD DETERMINED (ASCENDING OR DESCENDING) (3) RECORDS SORTED UNTIL DUPLICATE DETECTED (4) ORDER OF SORT OF SECOND CARD DETERMINED (5) RECORDS WITH DUPLICATE VALUES SORTED UNTIL ANOTHER DUPLICATE DETECTED 11-34	Sequence of Sort Process 1. Discuss process used by utility sort to arrange data in specified order (Ref. page 11-13 section 11.3.1 in text) 2. Discuss illustration of sort-example: County, Control-Section & C/E Value 3. Emphasize: Next sort specification in sequence is not used until duplicate value is found in field being sorted.
NORMALLY NOT ADVISABLE TO SORT FIRST BY FIELD WITH FEW DUPLICATE VALUES 11-35	Sorting Cautionary Statement 1. If a field with few duplicate values is specified to be sorted first, the remaining sort specifications will have little effect on the order of report.
SORT FIELD SPECIFICATIONS KEYWORDS • MAXIMUM OF 8 CHARACTERS • MUST COINCIDE WITH SELECTION FIELD KEYWORDS • KEYWORDS MUST BE SPELLED EXACTLY AS GIVEN IN TEXT • INPUT LEFT-JUSTIFIED IN COLUMNS 1-8 OF SORT SPECIFICATION CARD SORT ORDER • "A" OR "D" INPUT IN COLUMN 10 FOR ASCENDING OR DESCENDING SORT 11-36	Sort Field Specifications 1. Review Sort Field Specifications rules on slide 2. Discuss keyword rules and then sort order 3. Use slide 11-33 on Screen 2 to discuss card column locations and rules

 11-37	Example: Definition of Sort Fields 1. Review Definition of Sort Fields Table (Ref. Table 11.2 page 11-16 in text) 2. Points to discuss: (1) Keyword (2) Input card type and columns (Allows cross-reference with card input to see if sort on field is provided) (3) Definition
SOME KEYWORDS ARE DIFFERENT FOR SORT AND SELECT PROCESS : (1) BEGMP (2) ENDMP (3) OFSETRDR 11-38	1. Discuss Sort Fields that are different than Selection (Ref. page 11-14 Section 11.3.2 in text) 2. Define Offset Order (first time mentioned) (1) BEGMP - Lowest (2) ENDMP - milepost in selection (3) OFSETDR - not in selection
REQUIRED SORT INPUT (1) CON-SEC (2) GROUP (3) IMPALTNO (4) HAZARD OR OFSETRDR 11-39	Required Sort Input 1. Discuss required sort input. Explain why sort is set up in this way (Ref. page 11-14 section 11.3.2.1) 2. Emphasize: These sort specifications are required to insure that a group will not be printed out of order

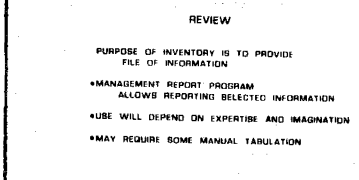
CASE EXAMPLE 1: SORT ALL GROUPS OF HAZARDS IN ORDER BY CONTROL-SECTION C/E - VALUE 11-40	Case Example 1 (Ref. page 11-14 Case Example 1 in text) (1) Discuss case situation When problem is defined advance screen 2
 11-41	Sort, Report and Print LImit -- Case 1 1. Review input required to sort hazards in order specified on slide 11-40 2. Point out: Inclusion of GROUP, IMPALTNO, AND HAZARD as required When complete both screens should be advanced and Screen 2 should be blank
CASE EXAMPLE 2 : SORT ALL GROUPS OF HAZARDS IN ORDER BY HIGHWAY CLASSIFICATION HIGHWAY DESIGNATION COUNTY C/E - ACCIDENT INDEX 11-42	Case Example 2 (Ref. page 11-15 case example 2 in text) 1. Describe sort situation When problem is defined, advance screen 2.

 11-43 (Screen 2)	Sort, Report and Print Limit -- Case 2 1. Review input required to sort hazards in order specified using this slide to illustrate coding 2. Emphasize: (1) Inclusion of required sort parameters (2) Use of Offset order instead of Hazard When complete, both screens should be advanced and screen 2 should be blank
 11-44	Case Example 3 (Ref. page 11-15 Case Example 3 in text) 1. Describe sort requirements When problem is defined, advance Screen 2
 11-45 (Screen 2)	Sort Report and Print Limit -- Case 3 (Run 1) 1. Review input required to sort hazards in ascending order by milepost. Note: Selection on Direction - 01 not shown but required. 2. Point out: (1) Selection on direction 01 required to select hazards inventoried in direction of mileposts. (2) Sorting on Beginning Milepost (BEGMP) with "A" sort. When complete advance screen 2 to review other runs input

 11-46 (Screen 2)	Case 2 -- Second Run 1. Review input required to sort hazards in descending order by milepost. 2. Point out: (1) Selection on direction 02 required to select hazards inventoried in opposite direction to mileposts (2) Sorting on Ending Milepost (ENDMP) with "D" sort. When complete advance both screens - screen 2 should be blank
MANAGEMENT REPORT PURPOSE •ALLOWS SELECTION OF REQUIRED REPORT •RESTRICT OUTPUT IF REQUIRED 11-47	Title Slide for Management Report Capability
 11-48 (Screen 2)	Report Specification Portion of Form 1. Use slide to discuss Management Report Capability 2. Explain input & give rules (Ref. page 11-15 Section 11.4.2 in text) 3. More lines of input are provided on form than currently needed to allow for anticipated expansion on number of reports.

REPORTS PRODUCED BY MANAGEMENT REPORT PROGRAM (1) CODED INVENTORY DATA REPORT (2) CODED IMPROVEMENT DATA REPORT (3) CODED C/E REPORT (4) MANAGEMENT REVIEW REPORT (5) HAZARD LOCATION REPORT 11-49	Reports Produced by Management Report Program 1. Review briefly reports available - Use Slide 11-48 on Screen 2 for most discussion. 2. Little discussion of this capability should be required after prior discussions Advance Screen 2
 11-50	Print Limit Specification 1. Discuss Print Limit Capability using slide of form with input for printing all records selected. 2. Explain difference between selection capability and Print Limit 3. Define input rules (Ref. page 11-17 first full paragraph in text) Advance both screens - Screen 2 should be blank
KEYPUNCH INSTRUCTIONS : ALL FIELDS ARE ALPHANUMERIC EXCEPT COLUMNS 10-17 & 19-26 ON SELECTION SPECIFICATION CARD COLUMNS 6 & 8 ON REPORT SPECIFICATION CARD COLUMNS 9-10 ON PRINT LIMIT SPECIFICATION CARD 11-51	Keypunch Instructions (Ref. page 11-17 Section 11.5.1 & 2 in text) 1. This will be a review of previous discussions 2. Review briefly

KEYPUNCH INSTRUCTIONS (CONT'D) NO ENTRIES ALLOWED IN SHADED AREAS ALL PRE-CODED ENTRIES MUST BE PUNCHED SELECTION SPECIFICATION CARDS ONLY "+" OR "-" ALLOWED IN COLS. 6 & 10 ("+" IS ASSUMED IF LEFT BLANK) SORT SPECIFICATION CARD ONLY "A" OR "D" ALLOWED IN COL. 10 11-52	Keypunch Instructions (continued) (Ref. page 11-17 Section 11.5. 1 & 2 in text) 1. Review points on slide briefly
DATA CARD ARRANGEMENT SELECTION SPECIFICATION CARDS • NO REQUIRED ORDER • ORDER IS TABLE - "DEFINITION OF SELECTION FIELDS" WILL RESULT IN SOME COMPUTER EFFICIENCY SORT SPECIFICATION CARDS • INPUT IN ORDER OF SORT HIERARCHY 11-53	Data Card Arrangement 1. Discuss Data Card Arrangement - use slide as outline (Ref. page 11-17 Sections 11.5.3 & 4 in text) 2. Review that JCL will have to be developed for each State implementing and will not be discussed here 3. Emphasize difference between order of input for Selection and Sort cards - Selection, no required order - sort, order determines arrangement of hazards in printout
DATA CARD ARRANGEMENT (CONT'D) REPORT SPECIFICATION CARDS NO REQUIRED ORDER PRINT LIMIT SPECIFICATION CARD 1 CARD 11-54	Data Card Arrangement (continued) (Ref. page 11-17 sections 11.5.3 & 4 in text) 1. Complete discussion of points regarding report specification cards and print-limit specification cards

<table>
<tr>
<td> 

11-55</td>
<td>Give brief review of Chapter using points on slide 11-55

(Ref. text page 11-17 & 18 Section 11.6)

1. Emphasize: Purpose of Management Report Program is to provide Administrators flexibility in analyzing proposed improvements to develop a Roadside Safety Improvement Program. If inventory team does not provide alternative improvements, all inventory reflects is teams bias. This takes away the administrators prerogatives to establish a safety program of worthy projects, lumping like work together even though the alternative may not be the most cost effective for that location when only</td>
</tr>
<tr>
<td></td>
<td>that hazard is considered (i.e. widening all culverts on a stretch of road even though guardrail may be more cost-effective for some individual cases)

2. Solicit questions from participants</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</table>

TITLE: WORKSHOP NO. 2 -- PREPARATION OF FIELD DATA FOR COMPUTER ANALYSIS

PRESENTATION TIME: 1 hour

PURPOSE OF WORKSHOP:

To provide an opportunity, in a workshop environment, for participants:

1. To inspect the keypunched field data collected during the roadside inventory (Field Activity).

2. To receive individual instruction and assistance from instructor regarding indentification of possible errors, and clarification or correction of data.

3. To receive "hands-on" experience in personally reviewing data input in card format, arranging cards in correct order (where necessary) and preparing the card deck for computer input.

TRAINING OBJECTIVES:

The participants should be able to:

1. Identify possible errors or omissions in keypunched data cards.

2. Define corrective treatment to rectify errors.

3. Submit a correctly prepared card deck for computer input.

SPECIAL INSTRUCTIONS AND COMMENTS:

1. No slides used.

2. Participant's keypunched card deck from field activity must be available for this workshop.

TITLE: WORKSHOP NO. 3 -- INSPECTION OF COMPUTER OUTPUT AND CORRECTION OF ERRORS

WORKSHOP TIME: 1 hour

PURPOSE OF WORKSHOP:

To provide an opportunity, in a workshop environment, for participants:

1. To inspect and study computer output data resulting from the field data they collected and input in Workshop No. 2.

2. To receive individual instruction and assistance from the instructors to interpret computer output, identify errors (if any), and to apply Management Program techniques in updating the data file for a subsequent computer run.

3. To be made vividly aware of the results of encoding or inputting data in an incorrect manner through the experience of so doing.

TRAINING OBJECTIVES:

The participants should be able to:

1. Interpret computer output content and error messages by correctly identifying sources of error.

2. Code proper update input to correct the errors.

SPECIAL INSTRUCTIONS AND COMMENTS:

No Slides Used.

TITLE: DEVELOPMENT OF SAFETY PROGRAM

PRESENTATION TIME: 1 hour

REFERENCE IN COURSE TEXT: Chapter 12

PURPOSE OF PRESENTATION:

1. To demonstrate, using case examples, the process of developing a safety priority program.

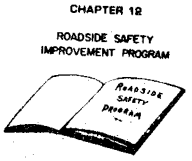
TRAINING OBJECTIVES:

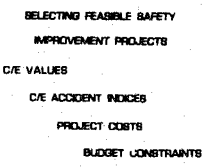
The participant should be able to:

1. Identify and Describe input requirements to select and sort data file information to generate reports that will provide the maximum amount of information with which to evaluate safety alternatives for parameters chosen

SPECIAL INSTRUCTIONS AND COMMENTS:

1. Presentation Format: Lecture/slide presentation in which Instructor describes input requirements for selected case examples illustrating several ways to extract data file information to develop alternative priority programs
2. One projector required

 12-1	Roadside Safety Improvement Program (Title Slide) 1. State presentation purposes 2. Purpose: (1) To demonstrate, using case examples, the process of developing a safety priority program
 12-2	Initial Steps Review Program Purpose: 1. Conduct inventory to identify and locate each roadside hazard. 2. Recommend improvement alternatives for each hazard and groups of hazards.
IMPROVEMENT ALTERNATIVES REMOVAL RELOCATION IMPACT ATTENUATION VEHICLE REDIRECTION 12-3	Improvements may be: 1. Removal 2. Relocation 3. Reduce impact severity by: (1) Installing breakaway devices (2) Guardrail end treatment (3) Flatten roadside slopes 4. Protect driver from obstacles that cannot be removed by using: (1) Impact attenuation devices (2) Vehicle redirection devices 5. Other types of improvements such as geometrics or delineation are not considered in program.

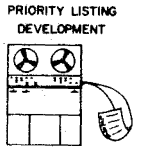


12-4

Selecting Feasible Safety Improvement Projects

Evaluate improvements using computerized C/E model by:

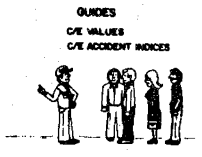
1. Building and maintaining masterfile of inventory and improvement data
2. Using capabilities of management report program to produce lists of projects considering:
   (1) C/E Values
   (2) C/E-Accident Indices
   (3) Cost of projects
   (4) Budget constraints
   (5) Combination of above



12-5

Priority Listing Development

1. Priority listing of projects may be produced by ranking improvements in order of ascending C/E Values
2. If accident data is available, rank by ascending C/E-Accident Indices
3. Other ways are possible

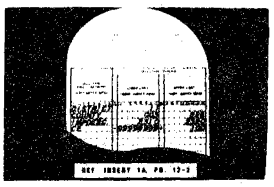


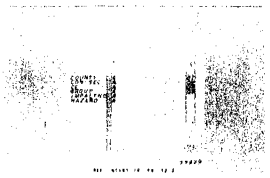
12-6

Guides

1. Remember that C/E Values and C/E-Accident Indices:
   (1) Are relative values
   (2) Used as guides to help establish priorities
   (3) Should never override engineering judgement

TYPES OF PROJECTS STATE FORCES CONTRACT 12-7	Types of Projects 1. By using select and sort capabilities of management program, select two types of projects for safety program: (1) State forces (2) Contract 2. Definition presented in next slides
STATE FORCE PROJECTS USUALLY OF SMALL SCALE EFFECTIVELY INTEGRATED INTO ROUTINE MAINTENANCE 12-8	State Force Projects 1. Relatively small in scale and cost 2. Integrated into routine maintenance 3. Example projects: (1) Removal of unneeded guardrail, storage in maintenance yard, reinstallation where needed, repair of damaged sections, upgrade end treatments (2) Use "waste" material from construction or maintenance to flatten slopes
CONTRACT PROJECTS COMMON OR SIMILAR HAZARDS SO THAT [illegible] OF SCALE APPLY PROJECTS TO BE INCLUDED WITH CONCURRENT CONSTRUCTION 12-9	Contract Projects 1. Combine similar types of improvements which: (1) Are cost effective (2) Are adjacent to each other so that economies of scale are realized (3) Can be let as one contract for similar hazard improvements 2. Select similar types of improvements which: (1) Are not numerous or large enough for separate contract (2) Are adjacent to proposed construction project (3) Can be included with concurrent construction contract

CASE EXAMPLES 12-10	Case Examples (Title Slide) Title slide presented to introduce case examples that will be covered in subsequent slides
CASE 1 - GUARDRAIL SELECT GUARDRAIL SECTIONS FOR WHICH REMOVAL IS COST-EFFECTIVE CRITERIA IMPROVEMENTS IN CLOSE PROXIMITY LIMITED TO GUARDRAIL IMPROVEMENTS C/E VALUE BELOW 100 12-11	Case 1 - Guardrail Discuss situation: Select guardrail removal improvements which are: 1. Cost effective, C/E Value ≦ 100 2. In close proximity to each other 3. May be done by State Forces
 12-12	Selection Specification Form 1. Discuss Elements and usage of form 2. Note entries on this example: (Describe selection specification) (1) Only District 11 data (2) Counties 003 through 228 (3) IMPDESC: 2-3-1-0-Remove Existing Guardrail, 2-3-2-0-Upgrade Existing Guardrail to full safety standards (4) C/E Values from -99,999,999 to + 100 (5) Note: IMDESC 2-3-2-0 may select guardrail to be added Eliminate manually from output



12-13

Sort, Report and Print Limit Specification Form

1. Discuss elements and usage of form
2. Discuss example entries
3. Describe Sort specification sorted by:

   County
   Con-sec
   C/E Value
   Required sort

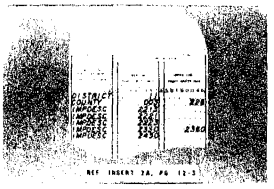
4. Reports: No. 03(Coded C/E Report) not requested
5. Print Limit: All data in file will be printed

INSTALL GUARDRAIL
- COUNTY
- CONTROL-SECTION

12-14

Install Guardrail

1. Generate report which lists guardrail to be installed
2. Sorted by county and control-section
3. Same order as report listing guardrail to be removed



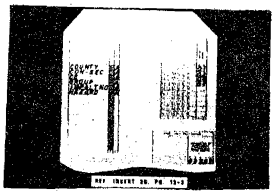
12-15

Selection Specification Form

Describe selection specification:

Note:

1. Only District 11 data selected
2. Counties 003 through 228 selected
3. IMPDESC: 2-2-1-3
   2-2-2-1
   2-2-2-3
   2-3-3-0 through 2-3-6-0
   2-4-3-0



12-16

Sort, Report and Print Limit Specification Form

1. Define example entries

2. Sort, report and print limit specifications same as previous report for guardrail removal

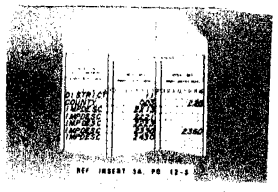
INSTALL GUARDRAIL
- COUNTY
- C/E VALUE

12-17

Install Guardrail

1. Generate report which list guardrail to be installed

2. Sorted by: County
   C/E Value

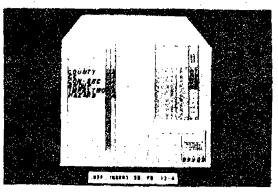


12-18

Selection Specification Form

1. Define example entries

2. Selection specification same as for previous report for guardrail to be installed



12-19

Sort, Report and Print Limit Specification Form

1. Sort Specification by County
2. C/E Value
   (required sort)
3. Report, Print Limit Specifications same as discussed before

CASE 2 — SLOPE FLATTENING

THE MANAGEMENT REPORT IDENTIFIES LOCATIONS WHERE FLATTENING SLOPES IS COST-EFFECTIVE.

LARGE QUANTITIES OF EARTH ARE RECOVERED IN NORMAL MAINTENANCE OPERATIONS.

12-20

Case 2 - Slope Flattening

1. Inventory indentifies steep, unsafe slopes
2. Desirable to alleviate slope hazards by utilizing "waste" dirt from construction or maintenance activities
3. Management Report Program list slopes where "waste" may be used to flatten slopes
4. State forces project

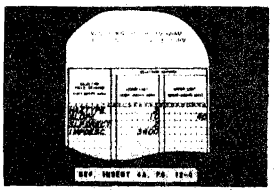
ONE ALTERNATIVE :

SELECT SLOPES TO WHICH "FLATTEN SLOPE" IMPROVEMENT WAS RECOMMENDED.

12-21

One Alternative (statement)

One alternative would be to select all slopes to which a "flatten slope" improvement was recommended.

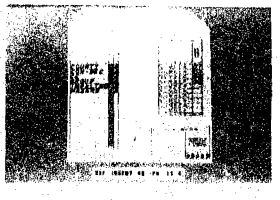


12-22

Selection Specification Form

Define example entries:

1. HAZTYPE-3-slopes (redundant)
2. SLOPE-1.0 to 4.0 (all slopes from 1-4:1 steepness)
3. SLPDIRECT-2-negative front slope (only negative slopes)
4. IMPDESC-3-4-flatten slope (only flatten slope improvements)



12-23

Sort, Report, Print Limit Specification Form

Note:

1. Sorted by ascending C/E Values within Control-Section
2. Required sorts
3. Reports-no coded C/E Report
4. IMPALTS - all

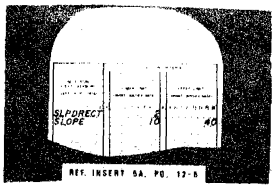
ANOTHER ALTERNATIVE :

SELECT ALL FILL SLOPES.

12-24

Another Alternative

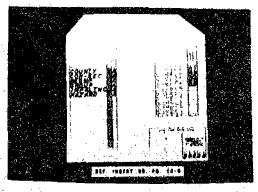
1. Previous selection specification retrieves only slopes that were recommended to be flattened
2. Guardrail improvement and "No Improvement Recommended" were not selected
3. Many negative front slopes can be flattened



12-25

Selection Specification Form

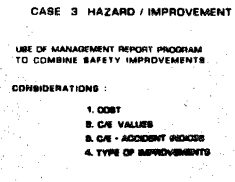
1. This selection specification retrieves all negative front slopes with steepness from 1.0 to 4.0 regardless of improvement recommended.
2. Update inventory as slopes are alleviated
3. Suggest a color coded map as a means of showing location of slopes



12-26

Sort, Report, and Print Limit Specification Form

1. This sort specification list groups by ascending BEGMP within each con-sec
2. Required sort
3. Reports, IMPALTS same as previous examples



12-27

Case 3 Hazard/Improvement

Case 3 is an example of letting a contract with which roadside obstacle removal projects are combined and consider:

1. Cost
2. C/E Values
3. C/E-Accident Indices
4. Type of improvements

COMBINING SIMILAR IMPROVEMENTS MAY PRODUCE DESIRABLE ECONOMIES OF SCALE. 12-28	Note: 1. First Cost on improvement form is based upon removing or alleviating hazard on an individual basis. 2. Combining similar improvements which are adjacent to each other produces lower unit cost. 3. Use update program to compute new C/E Values from the lower unit cost.
RANGE OF C/E VALUE MUST ALSO BE CONSIDERED EXAMPLE FIVE CULVERT HEADWALLS IN A TWO MILE SECTION WITH A WIDE RANGE OF C/E VALUES MIGHT BE INCLUDED IN A SINGLE CONTRACT 12-29	Range of C/E Values Must Also Be Considered 1. Group together projects with range of C/E Values, similar type, adjacent to each other 2. Example of five culvert headwalls along two mile section 3. Might be better to extend all headwalls under on contract 4. C/E Values average or balance out 5. Lower unit cost may be obtained by letting five culverts to contract rather than just one or two culvert improvements
C/E - ACCIDENT INDEX MAY INDICATE A NEED FOR IMPROVEMENT EVEN WHEN C/E VALUE IS HIGH. 12-30	Emphasize: 1. Similar comments for Slide 11-29 apply to C/E-Accident Index 2. Accidents tend to "overpower" C/E Values to rank higher in the priority list than those with no accidents

CASE 4

COMBINING ROADSIDE SAFETY TREATMENT WITH OTHER PROJECTS

APPLY ENGINEERING JUDGMENT WHEN COMBINING ROADSIDE HAZARDS WITH CONCURRENT CONSTRUCTION PROJECTS.

12-31

Case 4

1. Combining roadside safety treatments with concurrent construction projects
2. Comments for Case 3 apply here also
3. Removal projects should be adjacent to each other and the construction contract project

CULVERT EXTENSIONS

COULD

BE COMBINED WITH A CONCURRENT CONCRETE STRUCTURE OR PAVING JOB.

PROBABLY SHOULD NOT

BE COMBINED WITH ASPHALT OVERLAY JOB.

12-32

Culvert Extensions

1. Roadside safety improvements should be compatible with construction projects

   Example: Culvert extensions combined with construction project which has same or similar types of concrete work

2. Probably should not be combined with an asphalt project

SUMMARY

ROADSIDE HAZARD INVENTORY PROGRAM PRODUCES A DATA FILE OF:

- ALL ROADSIDE HAZARDS
- PROPOSED IMPROVEMENTS
- C/E OF IMPROVEMENT ALTERNATIVES
- C/E ACCIDENT INDICES
- OTHER PERTINENT INFORMATION

12-33

Summary

Roadside Hazard Inventory Program produces an inventory of all roadside hazards, improvements, and the following information:

1. C/E values of improvements
2. C/E-Accident Indices
3. Other factors

SUMMARY (CONT'D) MANAGEMENT PROGRAM PROVIDES FLEXIBILITY TO EXTRACT DATA TO MEET MANAGER'S NEEDS THE MORE COMPLETE THE DATA FILE THE BETTER THE SAFETY DECISIONS WILL BE ! 12-34	Summary 1. Management program provides capability to select and sort the data from the file 2. Program is flexible, to be able to meet managers' needs 3. Good data, including all hazards inventoried with several improvements for each hazard, will enhance manager's capability to make decisions when developing safety programs.
SUMMARY (CONT'D) USES OF THE ROADSIDE SAFETY IMPROVEMENT PROGRAM ARE LIMITED ONLY BY: • USER'S IMAGINATION • KNOWLEDGE OF THE PROGRAM • DEDICATION TO ROADSIDE SAFETY IMPROVEMENT 12-35	Summary Uses of program is limited only by: 1. User's imagination 2. Knowledge of program 3. Dedication to roadside safety improvements

TITLE: EXPERIENCE IN TEXAS

PRESENTATION TIME: 45 minutes

REFERENCE IN COURSE TEXT: Chapter 13

PURPOSE OF PRESENTATION:

1. To report Texas Experience in implementing the Roadside Safety Program to provide the participants the opportunity to benefit from that experience

TRAINING OBJECTIVES:

The participant should be able to:

1. Describe operational methodology employed by Texas to select roadways to be inventoried, field inventory procedures, to determine cost information, etc.

SPECIAL INSTRUCTIONS AND COMMENTS:

1. Presentation Format: Lecture/slide presentation in which Instructor illustrates procedure with case examples

2. One projector required

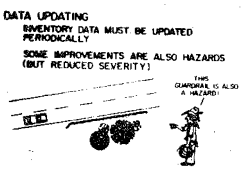
CHAPTER 13  13-1	1. Define session objectives. 2. Emphasize the fact that this session is provided so that the participants can benefit from discussion of some of the "working" changes or daily operations application techniques that Texas Districts employ to expedite field implementation.
ROADSIDE HAZARD IMPROVEMENT PROGRAM IMPLEMENTED THROUGHOUT TEXAS FOR TWO YEARS 13-2	History of Roadside Safety Improvement Program 1. Program has been underway in Texas for 2 years by SDHPT. 2. Procedure developed as a cooperative effort of SDHPT and TTI. 3. Program was designed to meet the policies and needs of the Texas SDHPT.
ALL 26 S.D.H.P.T. DISTRICTS HAVE INVENTORIED MANY MILES OF ROADWAY 13-3	Extent of Implementation of Program in Texas 1. All 26 districts have inventoried many miles of roadway in Texas. 2. All mileage in some of the districts has been complelely inventoried. 3. Some districts have inventoried only some roadway mileage.

EXPERIENCE TO DATE HAS CONCERNED DEVELOPMENT OF THE DATA FILE -- THE MANAGEMENT PROGRAMS WERE DEVELOPED ON THIS PROJECT. 13-4	1. Experience to date in Texas has been with development of the data file . . . . roadway inventory 2. Programs for data management and safety improvement were developed as part of this contract and have not been implemented state-wide. 3. One district has thoroughly checked management programs during development.
A COMPREHENSIVE TRAINING PROGRAM WAS USED TO PREPARE DISTRICT PERSONNEL IN THE USE OF THE TECHNIQUE. 13-5	1. A comprehensive training program was developed to prepare district personnel. 2. The program stressed: (1) "Sales Promotion" to management personnel (2) Advantages of safety programming (3) Funding sources (4) Importance of safety prioritizing system from standpoint of Tort Claims defense
EMPHASIS OF TRAINING COURSE BENEFITS OF THE PROGRAM "HANDS - ON" EXPERIENCE IN INVENTORYING SECTIONS OF ROADWAY INVENTORY WITHOUT INSTRUCTOR GUIDANCE GROSS ERRORS ! 13-6	Emphasize: (1) The training course provides an opportunity for the participants to gain experience in inventorying roadways. (2) Inventorying roadway without proper guidance and instruction will result in numerous errors.

TRAINING NEW TEAM MEMBERS VITAL TO SUCCESS OF INVENTORY TRAINING PROGRAM PROGRAM ORIENTATION FIELD OBSERVATION TEAM MEMBER WITH SUPERVISION 13-7	1. Training course attendance should consist of personnel that will comprise inventory teams, personnel that will be responsible for program implementation, and personnel who are responsible for roadway safety.
SURVEY CREW SIZE OPTIMUM 1. TWO - MAN TEAM FOR RURAL LOCATIONS 2. THREE - MAN TEAM FOR URBAN LOCATIONS 13-8	Inventory Team Size 1. High volume urban areas: 3 member crew was optimum with one member from design, one from maintenance, and one from traffic 2. Rural areas: 2 member team was satisfactory for rural areas
TRAINING COURSE ATTENDEES ROADSIDE HAZARD INVENTORY TEAM DISTRICT SAFETY REVIEW TEAM ASST. DISTRICT ENGINEER DISTRICT DESIGN ENGINEER DISTRICT CONSTRUCTION ENGINEER DISTRICT MAINTENANCE ENGINEER DISTRICT TRAFFIC ENGINEER 13-9	1. Personnel changes require: (1) Program orientation (2) Field observation (3) Supervision 2. Thorough training is considered vital to continuity and accuracy of data.

WHEN A DELAY OCCURS BETWEEN TRAINING AND INVENTORY, RETRAINING IS REQUIRED ! 13-10	Due to the complexity of the program, a break occurring between the training period and the actual start of the inventory will necessitate a retraining program.
INVENTORY PRIORITY 1. NON-INTERSTATE CONTROLLED ACCESS ROADWAYS 2. NON-CONTROLLED ACCESS ROADWAYS 3. INTERSTATE HIGHWAYS IN EACH CASE, PRIORITY IS FROM HIGHEST TO LOWEST ADT 13-11	1. Inventory Priority (Texas) (1) Non-Interstate controlled access roadways (2) Non-controlled access roadways (3) Interstate highways 2. Note: (1) Priority is from highest to lowest ADT in all cases. (2) Interstates are inventoried last because they are built with higher safety standards.
NO ROADWAY WITH AN ADT BELOW 1000 WAS INVENTORIED 13-12	1. Roadways with ADTs of less than 1000 were not inventoried in Texas. Individual states may alter this policy based on funds available. 2. The analysis model is highly dependent on ADT, and ADT's less than 1000 produced high cost-effectiveness indices.

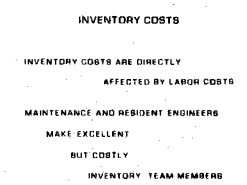
NO PRIORITIES PLACED ON HAZARD TYPE. INVENTORY ALL HAZARDS 13-13	Emphasize: Inventory all hazards . . . . to build master file. Note: Instructor should mention that a master file has other uses . . . maintenance, budgeting, etc.
SURVEY CREW SAFETY INVENTORY VEHICLE A HAZARD GUIDELINES STAY ON SHOULDER IF POSSIBLE USE ROTATING ROOF-LIGHTS AND CAUTION FLAGS INVENTORY DURING OFF-PEAK PERIOD STRESS SAFETY-CONSCIOUSNESS ON PART OF TEAM MEMBERS 13-14	1. Stress the importance of crew safety. 2. Mention the following as guidelines: (1) Stay on shoulder - never stop. (2) The inventory vehicle should be visible to oncoming traffic-use rotating roof lights and caution flags. (3) Inventory during off-peak when traffic volumes are low. (4) Crew safety is dependent on the attitude and awareness of the driving public and the crew members.
EXPEDIENCY TECHNIQUES PREPARE INVENTORY AND IMPROVEMENT FORMS DURING UNFAVORABLE WEATHER COORDINATE INVENTORY AND KEYPUNCH TASKS 13-15	Ways of decreasing inventory time: 1. Prepare inventory and improvement forms before the actual inventory is started -- much of the information in Box 1 can be filled in by inventory personnel on days when inclement weather hampers field work. 2. Coordinate inventory and keypunch tasks to reduce errors and speed up process.



13-16

Data Updating

1. Periodic update helpful
2. <u>But</u> whether or not this is done, all hazards corrected must be indicated in inventory.
3. Many hazards will be removed from the inventory.
4. Others will be only modified - guardrail is an example



13-17

Inventory Costs

1. Inventory is a labor-intensive process.
2. Use the highest level of subprofessional personnel available. . . Texas uses engineering technicians.
3. Maintenance foreman and resident engineers are ideal for inventory but were considered too costly.
4. Texas Districts are now averaging approximately $21.25 per lane-mile for inventory.

TITLE: WORKSHOP NO. 4 -- DEVELOPMENT OF SAFETY PROGRAM BY PARTICIPANTS

WORKSHOP TIME: 4 hours

PURPOSE OF WORKSHOP:

To provide an opportunity, in a workshop environment, for participants, as a team, to apply the information presented in Course Text Chapter 1 through 13 to:

1. Identify data requirements necessary for them to evaluate safety improvement projects, under a variety of selected categories, that might logically be incorporated into a safety improvement program.

2. Code required input forms to select, sort, and report data to assimilate the selected information from the master file containing approximately 1000 hazard files (master file prepared in advance for this workshop).

3. Evaluate and document reasoning for selection, sorting, and reporting criteria chosen and prepare defense of same for class presentation in Workshop No. 5

TRAINING OBJECTIVES:

The participants, as teams, should be able to:

1. Select, sort, and report, using the Management Program procedures, the data chosen under their criteria.

2. Use the generated reports to develop a suggested safety program to prioritize safety improvement alternatives in a manner that they, as professionals, would be expected to do in their daily working environment.

3. Prepare a documented defense for their developed program for class presentation.

SPECIAL INSTRUCTIONS AND COMMENTS:

1. Computer listing of the prepared data file must be made available to each team for this workshop.
2. No slides are used.
3. Teams must be provided ready access to keypunch equipment, computer input facilities and rapid computer turn around time for this workshop (each team can be expected to submit several computer runs (Management Program) during the workshop).

TITLE: WORKSHOP NO. 5 -- TEAM PRESENTATION OF SAFETY PROGRAM

WORKSHOP TIME: 2 hours

PURPOSE OF WORKSHOP:

To provide an opportunity, in a workshop environment, for individual teams to:

1. Obtain experience of presenting their safety program to an audience, defending their reasoning, development, and evaluation of the safety program developed in Workshop 4.

2. Critically evaluate and challenge other team presentations in a "debate" environment to stimulate factual defense of critical elements of the safety program developed.

TRAINING OBJECTIVES:

The participants should be able to:

1. Substantiate development of their safety program by stating individual state policy or practice governing selection choices, analytical evaluation techniques or deductive reasoning.

2. Present the program in a concise, logically organized format summarizing the information within 15 minutes including class discussion.

SPECIAL INSTRUCTIONS AND COMMENTS:

1. No slides used.

2. Participant discussion should be encouraged through this workshop.

COURSE CRITIQUE

The subject training course was developed, by contract, to be presented only one time to Federal Highway Administration personnel, National Highway Institute personnel, and State personnel from FHWA Region 4 selected by the Federal Highway Administration. Since, the Atlanta training course, in effect, represented a "pilot" presentation to which there would be no subsequent courses in which improvements could be made and evaluated, the Atlanta course offered the only source of participant feedback and suggestions for modifications.

Each participant was asked, at the introduction of the course, to evaluate material, presentation, and visual aid quality after each presentation or workshop, on a rank scale as shown in Exhibit 1, "Evaluation Form." The evaluation forms were reviewed by TTI and the Texas SDHPT after the course was conducted. Many of the suggested improvements from participants and from the FHWA Contract Manager have been incorporated in the Course Text and the Instructor's Manual.

EVALUATION FORM

A TRAINING COURSE

ON HIGHWAY SAFETY IMPROVEMENT PROGRAMMING

Your Job Title: _____

Your Work Responsibility: _____

_____

Please circle the number on the scales below each session title which best represents your opinion. The rating should be based on the following scale:

7 Excellent
6 Very Good (Well above average)
5 Good (Above average)
4 Average (Acceptable)
3 Below Average
2 Well Below Average (Needs some improvement)
1 Poor (Requires substantial revision)

A. INDIVIDUAL SESSION EVALUATION

The material, the presentation and the visual aids should be evaluated for each session. The criteria for evaluation are

Material - accuracy and depth of coverage as they relate to the session objectives.

Presentation - clarity and simplicity of presentation, effective use of the visual aids and holding the interest of the group.

Visual Aids - quality and suitability to the subject material.

B. OVERALL COURSE EVALUATION

1. Please rate the overall value and significance of the course to you. 1 2 3 4 5 6 7

Comment: _____

_____

_____

(continued on reverse side)

2. Have the stated objectives of the course been reasonably accomplished in the available time?

_____ Yes _____ No

3. The length of the course was:

___Much Too Long ___Too Long ___About Right ___Short

___Very Short

4. What additional TOPICS should be covered?

_____

_____

_____

5. Should some topics be reduced or eliminated?

____Yes ____No

Explain: _____

_____

_____

6. For meeting the needs of the safety program manager, the level of technical detail was:

___Far Too Detailed ___Too Detailed ___About Right

___A Little General ___Too General

Comment: _____

_____

_____

7. What constructive suggestions would you offer for improvement of similar workshops? Please be as specific as possible.

_____

_____

_____

_____

_____

COURSE EVALUATION FORM

POOR		BELOW AVERAGE	AVERAGE	GOOD		EXCELLENT
1	2	3	4	5	6	7

POOR		BELOW AVERAGE	AVERAGE	GOOD		EXCELLENT
1	2	3	4	5	6	7

POOR		BELOW AVERAGE	AVERAGE	GOOD		EXCELLENT
1	2	3	4	5	6	7

	MATERIAL							PRESENTATION							VISUAL AIDS						
SESSION 1 - INTRODUCTION AND CONCEPT OF COST EFFECTIVENESS	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
SESSION 2 - NCHRP 148 CONCEPTUAL MODEL	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
SESSION 3 - TEXAS COST-EFFECTIVENESS ANALYSIS PROCEDURE DEVELOPMENT	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
SESSION 4 - APPLICATION OF PROCEDURE	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
SESSION 5, 6 - ROADSIDE HAZARD INVENTORY	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
SESSION 7 - ROADSIDE HAZARD IMPROVEMENT FORM	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
SESSION 8 - ENCODING OF CASE EXAMPLES (WORKSHOP ACTIVITY)	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
SESSION 9, 10, 11 - CONDUCT OF FIELD INVENTORY PROCESS (FIELD ACTIVITY)	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
SESSION 12 - BUILDING AND UPDATING OF INVENTORY MASTER FILE	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
SESSION 13 - ACCIDENT DATA INCORPORTATION	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
SESSION 14 - PROCEDURE ADAPTATION FOR INDIVIDUAL STATES	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
SESSION 15, 16 - MANAGEMENT PROGRAMS	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
SESSION 17 - PREPARATION OF FIELD DATA FOR COMPUTER ANALYSIS (WORKSHOP ACTIVITY)	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
SESSION 18 - INSPECTION OF COMPUTER OUTPUT AND CORRECTION OF ERRORS (WORKSHOP ACTIVITY)	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
SESSION 19 - DEVELOPMENT OF SAFETY PROGRAM	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
SESSION 20 - EXPERIENCE IN TEXAS	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
SESSION 21, 22, 23 - DEVELOPMENT OF SAFETY PROGRAM (WORKSHOP ACTIVITY)	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7