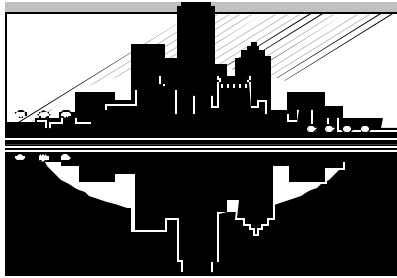


PAVEMENT MANAGEMENT TRAINING FOR LOCAL AGENCIES



Measurement Research Corporation (MRC) currently provides pavement management software and related services to over 40 Washington State local agencies and has specialized in this field for over 20 years. MRC also provides training classes on pavement management related topics several times a year in both Eastern and Western Washington. These are one-day classes and they are free and open to anyone that wishes to attend. The materials are applicable to any pavement management software package except for software specific topics. Please join other local PMS users and share your experiences and learn more about how to effectively manage your pavements and related infrastructure/Assets

The following classes are available. These classes are available to current subscribing MRC users at

any time at our office and most are available on a regular schedule. The scheduled classes start at 8:30 am and end at 4:00 pm. Private classes can be scheduled at any time by making arrangements with MRC. Private classes can cover any desired topic. Please call MRC if you have questions or would like to register for a class. Sample reports, manuals and other printed materials will be provided as needed for each topic. Also, free demo software can be provided.

Available Classes

See the attached class segment outlines for details on the specific class agendas for all classes listed here. The numbers at the end of each class description refer to this attachment. These segments can be assembled in any desired order to define a given class or personal training session.

Pavement Management Overview

This class covers the entire Pavement Management Process from the development of the database through developing rehabilitation and maintenance strategies, the related analysis, and the final presentation of the results. This course is meant as a survey class of all components of pavement management. It is intended as both an introduction to pavement management concepts as well as for the individual that needs a refresher. This class can also be offered as an Executive Level Training class or as a first time startup class for new users. See segments 1, 2 & 3 for more details.

Applied Pavement Management

This class follows a similar format as the PMS Overview class, but with full examples and more detail on specific topics. The student will learn how to setup and use different data indices and

their related project performance models. They will also learn how to develop, setup and apply all of the available options for MR&R project and network level strategy development. The creation of repair lists and final project development will also be covered. See segments 3, 4, & 7 through 12 for more details. This class will only include an overview of Segment 9. See next class for a detailed coverage.

Multi-Year Maintenance and Rehabilitation Planning and Final Reporting

This class covers the steps of pavement management implementation after the database has been developed and the distress prediction models are completed. It will cover the Network Analysis Module and its related setup. It also covers basic Project Level components of PMS, including the generation of a MR&R repair list from your Network Level PMS.

The class will also train the individual on how to develop a multi-year MR&R plan and how to organize this material for presentation to their agency board/council. It is intended to focus attention on the parameters affecting the budget and rehabilitation decisions as well as interpreting the results. See segments 8, 9, 12 & 13 for more details.

Data Collection - Pavement distress & related Topics

This class will train the student how to correctly use the rating procedures for the Washington State Flexible & Rigid pavement distress identification methods. Discussion of the history of pavement ratings in Washington State and how to use and integrate older methods with current procedures will be covered. The Streetwise system will also

be included along with the MTC and PAVER distress identification methods. The development of deduct curves and index algorithms will also be included. It will also cover the collection and use of non-destructive pavement deflection data and how this data is analyzed and used in your pavement management operations. See segments 4.5, 6 & 7 for more details.

Computer Software Classes

This class covers all aspects of the operation and use of the CenterLine pavement management system software. This includes data entry and editing, all parameter updates and related analysis features, project and network level repair strategy development and editing, and all reporting and interfacing options. It will also cover asset database features and related maintenance and work management functions. See segment 15 for more details.

Non-Destructive Testing (NDT) & Pavement Design

This class will cover what an individual will need to know about Non-Destructive Testing (NDT) and Pavement Design and how to integrate this with your PMS operations. It covers everything from pavement materials & testing through AASHTO & WSDOT pavement design procedures. These NDT and pavement design tools are fully integrated into the CenterLine PMS software and this software will be used in teaching this class. See segments 20 through 29 for more details.

GIS – Its Use & Integration with Pavement & Asset Management

This class will cover all basic aspects of the PMS and Asset database design and use and how this

relates to your GIS. It will cover basic data entry and editing, GIS fundamentals and how you interface to the GIS and PMS/Asset data. It will also cover how to develop, display and generate hard-copy maps that display your Asset and PMS related data. The class will use the latest ArcView GIS software, however, other GIS software can be used such as AutoCAD Map, MapInfo and GeoMedia if requested. Attendees will have hands on PC training. See segment 16 through 18 for more details.

Special Topics for classes and Seminars

These classes/seminars cover a wide range of subjects. Topics would include any material from segment #14. However, topics can be defined by individual needs or by request.

Class Dates:

The following free Pavement Management training classes are being offered to all interested local agencies. These classes start at 8:30 am and end at 4:00 pm. Please share this with others in your organization that may have an interest in the above topics. Call 1-253-851-3200 if you want more details or to register.

Instructors

Derald Christensen and Bud Furber will be the instructors. Derald was a UW Civil Engineering Department researcher and facility member for 18 years and has over 19 years of consulting experience in the development and implementation of Pavement Management Systems. Bud has a consulting firm that specialized in materials testing and pavement design and has over 20 years experience in pavements.

2005-2006 Class Schedule

All attendees must register prior to attending classes.

Introduction to PMS Concepts and Using the Software

December 13, 2005 Gig Harbor
December 20, 2005 Spokane

Pavement Rating and Field Operations

February 7, 2006 Gig Harbor
February 14, 2006 Spokane

Multi-Year Maintenance & Rehabilitation Planning, Final Reporting & Presentations

June 6, 2006 Gig Harbor
June 13, 2006 Spokane

GIS – Its Use & Integration with Pavement & Asset Management

Sept 12, 2006 Gig Harbor
Sept 19, 2006 Spokane

Pavement & Asset Management Overview & Using the CenterLine Software

On request

Advanced Pavement Management Class

On request

Introduction to CenterLine Backcalculation & Pavement Design Modules and Related Analysis

On request

Annual CenterLine PMS Conference

To be scheduled



MEASUREMENT RESEARCH CORPORATION

4126 4th Street NW - Gig Harbor, WA 98335-7703
(253) 851-3200, FAX 851-4334;

E-mail mrc@harboret.com

Available Class Segment Outline for Pavement & Asset Management, GIS, NDT Analysis & Pavement Design Training

The following training segments can stand-alone or they can be combined into any number of different classes or presentations. All predefined classes are made up of these segments, as indicate by the segment numbers included with each class description. This outline of class segments also defines the general format of the CenterLine help system and documentation.

The following class segments cover all aspects of pavement & asset management, the related software, NDT analysis and pavement design. This will train the student in how to understand and perform these operations along with integrating these functions and data into their PMS & other database & GIS systems. These classes are intended for individuals involved in pavement MR&R operations, and Pavement Management Systems and related functions, which include Asset management.

PAVEMENT MANAGEMENT

1. Introduction & Overview of PMS - (5 hrs)

- 1.1. Getting Started in Pavement Management
 - 1.1.1. Define level & type of commitment
 - 1.1.2. GIS/Data referencing systems
 - 1.1.3. Creating segments & building the database & map
 - 1.1.4. Integration with GIS and Assets
 - 1.1.5. Software selection and evaluation
 - 1.1.6. Should PMS have its own database or should it be interfaced to existing or other database/s
- 1.2. Data Collection
 - 1.2.1. Pavement Distress
 - 1.2.2. Traffic Counts & Classifications/ESAL's
 - 1.2.3. Non-destructive Testing (NDT) deflection data
 - 1.2.4. Assets - Bridges, safety, equipment, human etc
- 1.3. Use of non-distress data in PMS
- 1.4. Computing pavement distress indices/Scores
- 1.5. Performance Curve Generation & Use
- 1.6. Defining and Implementing MR&R Strategies
- 1.7. Understanding life cycle cost analysis (LCCA)
- 1.8. Generating project level repair lists using ranking, prioritization & decision tree procedures

- 1.9. Modeling Network Performance using multi-year prioritization, optimization & full simulation
 - 1.10. Generating network level repair list
 - 1.11. Developing final projects
 - 1.12. Interpreting & Presenting your results
- #### 2. PMS Operations - (15 min.)
- 2.1. Where should PMS reside – maintenance, engineering, planning or IT/GIS departments & how should it be used and managed?
 - 2.2. What level of person should operate the PMS?
 - 2.3. Who should they answer to & what are their responsibilities
 - 2.4. Comparing the needs of cities, counties and state
 - 2.5. Unique problems associated with small and rural agencies
 - 2.6. Unique problems associated with larger cities & counties
 - 2.7. What should PMS include, such as distress, traffic, assets
 - 2.8. How to manage systems with extremely high & low average scores
 - 2.9. Importance of NDT & pavement design in PMS
 - 2.10. Desktop vs Client Server installation
 - 2.11. Using internal or other vendors database or PMS database
- #### 3. Guidelines for Establishing PMS/AMS Setup & Implementation Information - (25 min.)
- 3.1. First time &/or possible re-evaluation
 - 3.1.1. Communicating with others in & out of your agency
 - 3.1.2. Database Requirements – also see Segment #16
 - 3.1.2.1. Segmentation
 - 3.1.2.2. Referencing systems
 - 3.1.2.3. Data tables & access/relationships
 - 3.1.2.4. Database Design & reports
 - 3.1.2.5. Desktop vs. Client Server installation
 - 3.1.2.6. Database & GIS options
 - 3.1.2.7. Use current database or PMS database
 - 3.1.3. Establishing PMS data collection needs
 - 3.1.3.1. Distress rating data options
 - 3.1.3.2. Roadway inventory/asset options
 - 3.1.3.3. Traffic data needs
 - 3.1.3.4. NDT data needs
 - 3.2. Annual evaluation
 - 3.2.1. Establishing project performance models
 - 3.2.2. Developing MR&R Strategies

- 3.2.2.1. Establishing sorting and prioritization options
 - 3.2.2.2. Developing decision trees – Project, Network & Maintenance
 - 3.2.2.3. Establishing MR&R Actions & When to Use Them
 - 3.2.2.3.1. Routine maintenance
 - 3.2.2.3.2. Preventative maintenance
 - 3.2.2.3.3. Overlay thickness, grinding, fabric--
 - 3.2.2.3.4. Reconstruction
 - 3.2.2.3.5. Special treatments
 - 3.2.2.4. Establishing Unit costs for MR&R actions
 - 3.2.2.4.1. What items to include
 - 3.2.2.5. Establishing individual network budgets
- #### 3.2.3. Establishing network performance goals & Criteria
- 3.2.3.1. Establishing a target system wide average pavement distress score/s
 - 3.2.3.2. Establishing a level deferred backlog
 - 3.2.3.3. Do all reconstruction projects in 10 years
 - 3.2.3.4. etc.
- #### 3.2.4. When to Use Engineering/Pavement Design Options
- #### 3.2.5. Miscellaneous Related Questions & Considerations
- 3.2.5.1. How & why did you develop these criteria?
 - 3.2.5.2. What review process do you use to judge how well you are doing?
 - 3.2.5.3. How can outside political decisions & policy effect your operations
- #### 3.2.6. Establishing Asset data collection options & management strategies. (AM/FM/WM strategies)
- #### 3.2.7. # Also see segment #11
- #### 4. Data collection & Use – Pavements - (2 hrs)
- 4.1. Pavement distress identification & rater training
 - 4.1.1. History of rating procedures & score calculations in Washington State & nationally
 - 4.1.2. Types of distress surveys and their proper use - Automated, visual walking & driving Surveys
 - 4.1.3. Types of pavement related data including distress, deflections, coring & material properties

- 4.1.4. What data should you collect to meet your goals
- 4.1.5. How will this data relate to your PMS Operations and its use in decision making
- 4.2. Distress identification training
- 4.3. Developing a quality control program
- 4.4. Field data collection using pocket PC's
- 4.5. Real-time RF/Cell Phone data interfacing using the internet or your own LAN / WAN
- 4.6. Overview of automated distress data collection
- 4.7. Field experience with automated distress data collection
- 4.8. NDT/deflection data collection
- 4.9. Using NDT & Non-Distress Data in PMS
- 4.10. Materials sampling and coring & Laboratory testing
- 5. Data Collection – non-pavement - (30 min)**
 - 5.1. Traffic Data Collection and Use
 - 5.1.1. Using the sign, striping & signal asset module
 - 5.1.2. Using CenterLine's traffic module
 - 5.1.3. Developing ESAL's from your traffic data
 - 5.1.4. How traffic data is used in PMS & NDT/Pavement design
 - 5.2. Inventory asset data requirements for PMS (history, roadway structures, utilities, etc.)
 - 5.3. Collecting and using Asset data
 - 5.4. Collecting and using GPS data
 - 5.5. Collecting and using Video & still images
 - 5.6. GASB 34 Requirements & implementation issues
- 6. Index Score Calculations - (30 min)**
 - 6.1. How scores are computed – a review of all options
 - 6.2. History of Washington State rating procedures
 - 6.3. Modifying index score algorithm parameters
 - 6.4. Developing & modifying algorithms and procedures for computing distress indices
 - 6.5. Modifying & developing deduct curves
 - 6.6. Advantages and use of multiple indices
 - 6.7. Advantages and use of a composite index
 - 6.8. Examples of how different indexes effect network performance
- 7. Performance Curves - (30 min)**
 - 7.1. Types of performance curve modeling – Regression, Statistical, & Expert System based
 - 7.2. Performance Curve Modeling for Default, project & network deterioration curves
 - 7.3. Developing Default/Family curves from your data
 - 7.4. Developing and managing individually modified & statistically generated project curves
- 7.5. Examples of how performance curve modifications affect network performance
- 8. Modeling Project Level MR&R Strategies - (2 hrs)**
 - 8.1. Project versus network level PMS
 - 8.1.1. Is PMS a planning/network or project level tool & what does this imply
 - 8.1.2. Where do project level operations fit in PMS
 - 8.1.3. Integration of project & network level operations
 - 8.2. Types of MR&R Models
 - 8.2.1. Matrix
 - 8.2.2. Decision trees
 - 8.2.3. Multi-dimensional Decision trees
 - 8.2.4. Expert Systems
 - 8.3. Developing MR&R strategies for project level operations and network setup/use
 - 8.3.1. Implementing & using separate maintenance, and project decision trees
 - 8.3.2. Managing routine maintenance at the project level
 - 8.3.3. Using custom prioritization algorithms
 - 8.4. Using Project level life cycle cost analysis (LCCA), cost effectiveness (CE) & marginal CE (MCE) / incremental cost benefit (ICB) procedures
 - 8.5. Using Ranking by worst score first, least initial cost, custom prioritization algorithms, multi-year prioritization (MYP) and related topics & procedures
 - 8.6. Using repair file & report system for RM & MMS operations
 - 8.7. Developing project level maintenance and repair lists
 - 8.8. Modeling and managing gravel roadways
 - 8.9. Examples of different strategies & their affect on network performance from a project level perspective
- 9. Modeling Network Level MR&R Strategies, Budget Planning & Multi-Year Analysis - (2 hrs)**
 - 9.1. Data Requirements for Multi-Year Analysis
 - 9.2. Developing Network MR&R strategies
 - 9.2.1. Including TIP, utility and pre-funded projects
 - 9.2.2. Using custom prioritization options
 - 9.2.3. Using multiple budgets
 - 9.2.4. Using separate maintenance, project and network decision trees
 - 9.2.5. Defining RM and preparation cost models
 - 9.2.6. Implementing different prioritization procedures & how it effects budgets & network performance
 - 9.2.7. Defining network level live cycle cost analysis (LCCA) or letting your network model define your interactive LCCA
 - 9.2.8. Limitations in use of CE & ICB at the network level (for Multi-Year prioritization applications)
 - 9.2.9. How does current network health effect strategy planning
 - 9.3. Implementing Network Strategy options (or “What if” Scenarios)
 - 9.3.1. Preventative and routine maintenance - where, when and how much.
 - 9.3.2. Modeling Chip seal roadways and pre-scheduled cyclical maintenance operations.
 - 9.3.3. Modeling reconstruction needs and its impact
 - 9.3.4. Other examples will be defined
 - 9.4. Developing long-term network level strategies.
 - 9.4.1. Budget required to reach & maintain an OCI=80 in 5 years
 - 9.4.2. Budget required to eliminate reconstructs in 10 years
 - 9.4.3. Budget to reach and maintain a steady state deferred backlog
 - 9.4.4. Predicting Current & Future Network condition
 - 9.4.5. Other examples will be defined
 - 9.5. The importance of modeling your current operations or of calibrating your PMS
 - 9.6. Optimizing your network repair options – how & why
 - 9.7. Comparing PMS network modeling options
 - 9.7.1. Ranking, multi-year prioritization
 - 9.7.2. CE, MCE & incremental cost benefit (ICB)
 - 9.7.3. Traditional optimization & full simulation
 - 9.8. Integrating NDT and other project functions into your network model
 - 9.9. Developing network level repair lists & Final Project Planning
 - 9.10. Interpreting your network strategy and analysis results using a comparison of local WA agencies PMS results:
 - 9.10.1. Modeling maintenance - PM & RM
 - 9.10.2. Modeling preparation costs

- 9.10.3. Evaluate the long term consequences of your current budget/s
- 9.10.4. Using a reconstruction budget
- 9.10.5. Evaluate the use of NDT/Pavement design
- 9.10.6. Project list development
- 9.10.7. Others examples will be defined
- 9.11. Developing lists of streets for Non-Destructive Testing
- 9.12. Modeling and managing gravel roadways
- 10. Using NDT, Backcalculation & Pavement Design in PMS – Also see segments 20-29- - (30 min)**
- 10.1. Using NDT data in driving PMS network and project level operations
 - 10.1.1. Direct use of pavement design results
 - 10.1.2. Direct computation of project performance curves
 - 10.1.3. Developing & using NDT performance curves
 - 10.1.4. Direct use in decision process
- 10.2. Overview of Pavement materials used in PMS MR&R options
- 10.3. Overview of Backcalculation Procedures and Pavement Design (Also see segments 20 thru 27)
- 11. Feedback & Updating the database - (20 min)**
- 11.1. Updating segment, rating and history data
- 11.2. Re-compute your default/family curves
- 11.3. Re-evaluate repair strategies/prioritization
- 11.4. Compare PMS repair lists to actual
- 11.5. Re-evaluate network Strategies
- 11.6. Re-evaluate actual budgets vs network performance - Are you getting the performance predicted by your PMS from the dollars spent?
- 11.7. Update budgets and unit costs
- 12. How MR&R/Repair operations are reported and accessed in CLPMS - (30 min)**
- 12.1. Generating & Updating Repair Data
 - 12.1.1. Maintenance operations
 - 12.1.2. Project based repair operations
 - 12.1.3. Network generated repair operations
- 12.2. Repair file definitions and reporting
- 12.3. Using the database report module to manage maintenance & repair operations
- 12.4. Using the repair features in the PMS Report module
- 13. Developing reports, interfacing to other software packages and data presentations - (2 hrs)**
- 13.1. Using CenterLine report/export module to develop tabular MR&R reports & for interfacing & maintenance op's
- 13.2. Using MS Excel, MS Word and Adobe Acrobat in CenterLine
- 13.3. Using the Import Module
- 13.4. Using the PMS Report Module
 - 13.4.1. Individual report options
 - 13.4.2. Adding custom report features
 - 13.4.3. Integrating GIS maps into final report
 - 13.4.4. Editing and building/merging the final report
- 13.5. Using Crystal Reports
- 13.6. Setting up & maintaining GIS interface
- 13.7. Generating reports for internal, city/county councils, conference, R&D use etc.
- 13.8. Final Presentation of Multi-Year Analysis
- 13.9. Using GIS in your Presentations & Analysis
- 13.10. Example presentations of analysis results
- 13.11. Using the internet/intranet as a presentation tool
- 14. General Topics - Special Topics for Classes & Seminars**
- 14.1. Agency directors and managers & their special needs & expectations for PMS
- 14.2. Implementing a Preventative Maintenance program
- 14.3. Modeling your Seal Coat & other internal budgets
- 14.4. How to select the Correct Rehab & When to Reconstruct & How & when to use Stabilized Base Materials
- 14.5. Creative financing of MR&R operations, grants, utility tax and other financial topics for Pavement Managers
- 14.6. Emerging technologies
- 14.7. GASB implementation - Asset & Maintenance Manage.
- 14.8. ESA issues and their effect on PMS
- 14.9. Small agency experiences and special needs
- 14.10. Can your PMS model your current & future operations?
- 14.11. What should your PMS Model/Software Include? - Data Options, Decision Strategies, Network module, Traffic Module, NDT Module, Pavement Design & ASM, MMS, EqM, WkM etc.
- 14.12.
- 14.13. Updating Raters Manual and other field tools
- 14.14. Developing a local internet repository for sharing of pavement related data
- 14.15. What data collection standards should be developed to help guide the private sector
- 14.16. Should WSDOT Local Agencies develop a new index algorithm and what form should this take
- 15. PMS & Related Computer Software Training – (4 hrs)**
- 15.1. Overview of the entire CenterLine Software
- 15.2. Data entry, editing & importing
- 15.3. Setting up the Budgeting Module and Decision Trees
- 15.4. Managing and Customizing the Performance Curves
- 15.5. Setting up and running Multi-Year Analysis (MYA)
- 15.6. Setting up and using custom prioritization algorithms
- 15.7. PMS Report Module
- 15.8. Custom Report Generation
- 15.9. Database Operation and Use
- 15.10. Assets, including attribute data and video images
- 15.11. The integration of PMS with GIS software
- 15.12. Pavement overlay design and use in PMS
- 15.13. Interfacing to CRIS/Mobility, TIB & other systems
- 15.14. Others as needed/requested – ArcView, Excel, Acrobat
- GIS & Asset Management (AM/FM)**
- 16. Database design & integration with existing data - (? Hrs)**
- 16.1. Roadway/Network Segmentation
- 16.2. GIS referencing systems
- 16.3. Database design - Databases, data tables & relationships
- 16.4. Using MS Access, SQL Server & other database software
- 16.5. GIS Integration & use in PMS
- 16.6. CRIS/Mobility Data Conversion &/or Interface
- 16.7. GASB 34 database & GIS requirements
- 17. Mapping/GIS/GPS Topics**
- 17.1. Interfacing to Mapping and GIS applications.
- 17.2. General concepts in GIS implementation and use.
- 17.3. Example use of GIS in PMS
- 17.4. Demonstrations of ArcView, Map Info, GeoMedia and AutoCAD/MAP software
- 17.5. How does the S/W relate to internal operations
- 17.6. GIS/Mapping and the Internet
- 18. Assets & Maintenance Management**
- 18.1. Are we getting Side Tracked - Where does PMS fit with asset inventory, GIS and other related data operations?

- 18.2. Using the Asset Management Module
 - 18.2.1. Roadway related inventory of drainage, shoulders, sidewalks, signs, water systems, traffic etc.
 - 18.2.2. Asset and Maintenance Management - ASM, AM/PM, MMS etc.
 - 18.2.3. GASB 34 implementation
 - 18.2.4. Maintenance management integration with PMS
 - 18.2.5. Acquisition & use of video & still image data in PMS related inventory applications.
- 18.3. ESA issues and their effect on PMS
- 19. Evaluation of Existing Software – GIS & PMS**
 - 19.1. Key features to look for
 - 19.2. Integration with existing and future operations
 - 19.3. How does this relate to city vs county and rural vs urban agencies?
 - 19.4. CenterLine, PCPro, CRIS_PMS, PAVER, MTC, ERIS, Braun, CarteGraph, Hansen, etc.
 - 19.5. ArcView, ArcExp, ArcPad, MapInfo, Geomedia, AutoCAD Map

NDT Analysis & Pavement Design

20. Fundamentals of Pavement Design (45 MIN)

- 20.1. AASHTO Pavement Performance Model
- 20.2. Performance Parameters
 - 20.2.1. Design life
 - 20.2.2. Traffic Loading
 - 20.2.3. Reliability
 - 20.2.4. Standard Deviation
 - 20.2.5. Serviceability Levels
- 20.3. Structural Parameters
 - 20.3.1. Subgrade Support
 - 20.3.2. Structural Number
 - 20.3.3. How sensitive is thickness to change in:
- 20.4. Relative Influence of Parameters
 - 20.4.1. EASL volume
 - 20.4.2. Axle load
 - 20.4.3. Design reliability
 - 20.4.4. Subgrade modulus
- 20.5. Ranking of parameters by their relative degree of influence

21. Traffic Loading Estimates (30 MIN)

- 21.1. Load Equivalency Factors
- 21.2. Truck Factors
- 21.3. Directional Distribution
- 21.4. Traffic Growth

- 21.5. Estimates from Classified Counts
- 21.6. Estimation using Composite Truck Factors
- 21.7. Estimates by Functional Class
- 21.8. Special Considerations
 - 21.8.1. Buses
 - 21.8.2. Bulk Transport

22. Design Reliability (30 MIN)

- 22.1. Reliability Concept
- 22.2. Typical Reliability Levels
- 22.3. Effect on Average Design Life

23. Resilient MODULUS (60 MIN)

- 23.1. Definition
- 23.2. Laboratory Measurement
- 23.3. Influence of Non-linearity
- 23.4. Influence of Compaction
- 23.5. Influence of Moisture
- 23.6. Evaluation of Design Value by Laboratory Testing
- 23.7. Estimation by Correlation
- 23.8. Seasonal Variation

24. Structural Number (30 MIN)

- 24.1. Definition
- 24.2. Layer coefficients
 - 24.2.1. Typical values
- 24.3. Aggregate Base

25. Thickness Design (60 MIN)

- 25.1. Layered Analysis Procedure
- 25.2. Drainage
- 25.3. Frost

26. NDT Analysis (120 MIN)

- 26.1. Fundamental concept
- 26.2. Types of Analysis
 - 26.2.1. Deflection analysis
 - 26.2.2. Component analysis
 - 26.2.3. Deflection analysis
 - 26.2.4. Deflection basin analysis
 - 26.2.4.1. Thickness deficiency
 - 26.2.4.2. Structural response
- 26.3. Simple backcalculation models
 - 26.3.1. AASHTO
 - 26.3.2. SNOL
- 26.4. Theory vs. Reality
 - 26.4.1. Non-linearity
 - 26.4.2. Layered subgrade
 - 26.4.3. Apparent hard layers
 - 26.4.4. Finite duration of load pulse
- 26.5. Surface Modulus – a deflection basin diagnostic tool
- 26.6. AASHTO C-Factor Procedure
- 26.7. Advanced backcalculation methods

- 26.7.1. EVERCALC
- 26.7.2. PAVBACK

27. Design Analysis (60 MIN)

- 27.1. Dealing with Variability
- 27.2. Limitations of Using Average Values
 - 27.2.1. Analysis unit delineation
 - 27.2.2. Percentile estimation
- 27.3. Overlay Design
 - 27.3.1. Point by Point
 - 27.3.2. Average Basin

28. CenterLine PMS NDT & Pavement Design Module

- 28.1. Overview
- 28.2. Database features
- 28.3. Backcalculations
- 28.4. Pavement Design
- 28.5. Integration with PMS

29. Traffic Module

- 29.1. Traffic counts & classifications
- 29.2. Schedule vehicles
- 29.3. ESALS
- 29.4. Integration with PMS and NDT modules