Overall Project Evaluation

Introduction

Concept - Overall goal of rehabilitation design is to provide:

- **Cost-effective Solution**
- **Address deficiencies**
- **Satisfy constraints**

Importance of through evaluation

Data Requirements

Consider data categories

Requirements also depend upon potential rehabilitation candidates

Develop checklist

Consider purposes

- **Qualitative**
- **Quantitative**

Strive for balance

Project Evaluation Flow Chart

- Office / Historical Data Collection
  - Initial Site Visit
    - Primary Field Survey
      - Initial Data Analysis
        - Secondary Field Survey
          - Laboratory Materials Characterization
            - Secondary Data Analysis
              - Structural Capacity Analysis

(Part 3) APEP 4

Step 1: Office / Historical Data Collection

Office Files

Historical record

(Part 3) APEP 5

Step 2: Initial Site visit

Design and maintenance engineers

- **Scope of primary survey**
- **Assess potential mechanisms**
- **Identify candidate rehabilitation treatments**
- **Assess traffic control needs**

Subjective information on distress, roughness, surface friction and drainage

“Windshield” or Shoulder survey

(Part 3) APEP 6

Step 3: Primary Field Survey

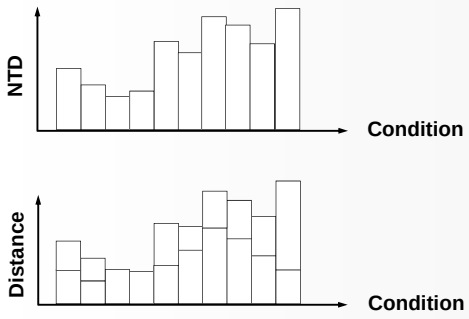
Condition
- **Distress**
- **Roughness**
- **Friction**

NDT

Drainage

Traffic

Step 4: Initial Data Analysis



Step 4: Initial Data Analysis

NTD
- **Max / Min deflection**
- **Deflection indices**
- **Layer moduli**

Condition
- **Distress**
- **Roughness**
- **Surface friction**

Step 4: Initial Data Analysis

Structure / Soils

- **Layer thickness**
- **Soil type or cut / fill**

Moisture / drainage

Step 5: Second Field Survey

Destructive sampling

- **NDT variability**
- **Backcalculation problems**
- **Stripping**

Additional NDT

- **Intensive deflection testing**
- **Other NDT devices**

Step 6: Laboratory Materials Characterization (if necessary)

Indirect tensile strength

Resilient modulus

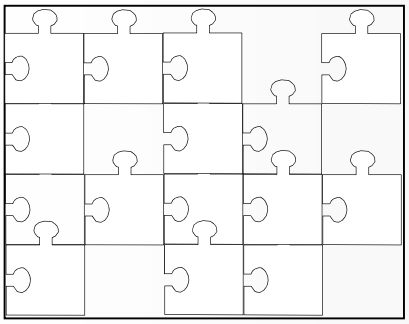
R - Value

CBR

Existing mix properties

Density / Gradation

Step 7: Secondary Data Analysis (if necessary)



Step 8: Structural Capacity Assessment

Three basic methods are available

By Existing Distress

Compare current structural distress levels with "failure" criteria

By Component Analysis

Layer	Thickness	Condition	SC
HMA	T_1	X_1	SC_1
Base	T_1	X_2	SC_2
Subbase	T_3	X_3	SC_3

Effective Structural Capacity = Total

Nondestructive

NDT - Valuable engineering tool in assessing uniformity and structural adequacy

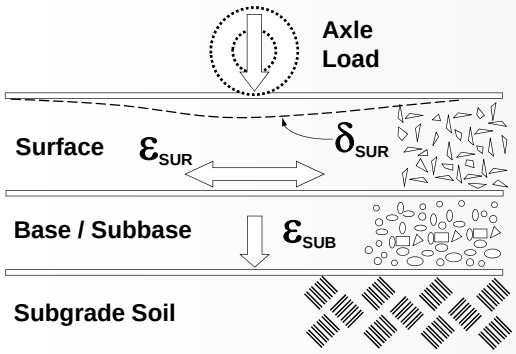
Useful

- **Identify subsections**
- **Identify locations for sampling / testing**
- **Characterize material properties**
- **Rational basis for structural capacity assessment**

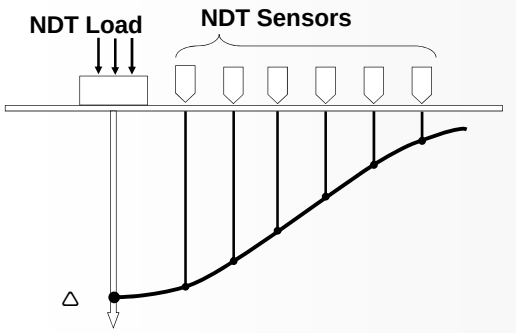
Nondestructive

- **Productive - 200 to 400 measurements per day repeatable**
- **Repeatable**
- **Used by some states for project and some network evaluations**

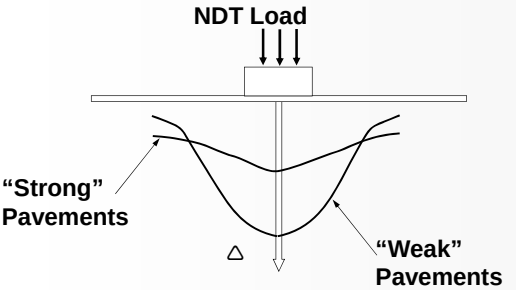
Pavement Responses Under Load



Measurement of Surface Deflection



Strong vs. Weak Pavements



Potential Results From NDT

- Project variability
- Subgrade soil support
- In-situ material properties
- Structural adequacy

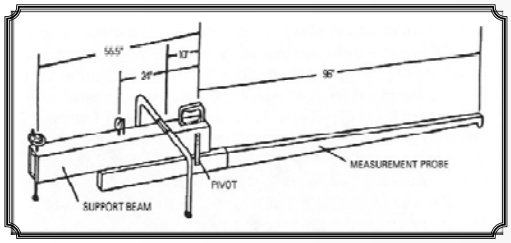
Types of NDT Equipment

- Static
- Vibratory
- Impulse
- Surface wave propagation

"Static" Load Device

- Benkelman beam
- California Traveling Deflectometer
- La Croix Deflectograph

Benkelman beam



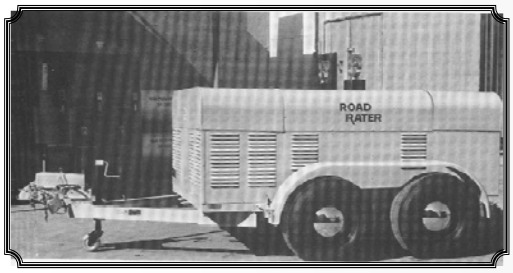
Vibratory (steady state dynamic) Equipment

Dynaflect

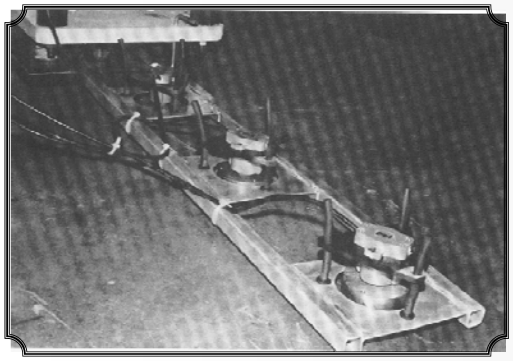
Road Rater (3 models)

Dynaflect

Road Rater

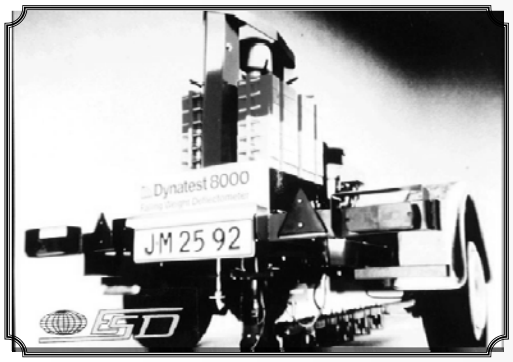


Road Rater - Close - up of Sensors

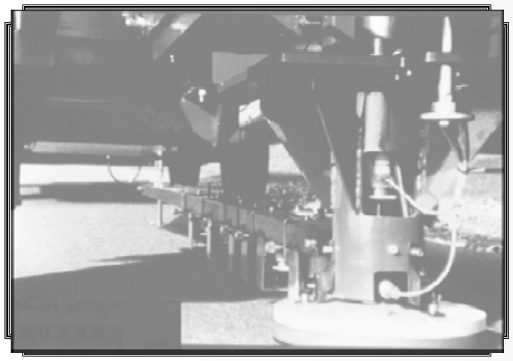


KUAB FWD

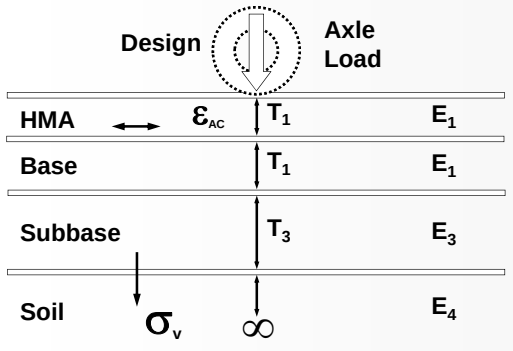
Dynatest FWD



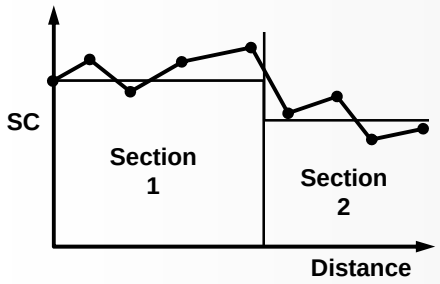
Dynatest FWD - Close - up of Sensors



Pavement Response(s)



Average Structural Capacity



Summary

Benefits / importance

Data requirements

Project evaluation flowchart

Coffee Break