Flexible Pavement Design Techniques:

DEMAC Material Classification System & Pavement Number Method

Dr Fenella Johns

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Course Objectives

- Design Equivalent Material Classification System (DEMAC)
- Pavement Number (PN) Structural Design Method

- *Understand background to methods*
- *How the methods work*
- *Experience using methods*

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Background

- **TG2 (2002)**
  - Uncomfortable with structural design method
  - Conservative designs
  - Loose links between mix and structural design
  - Wanted to use real field performance (LTPP)

- **SAMDM (Mechanistic-Empircal)**
  - Powerful, but many flaws
  - Loose guidelines for inputs
  - Very difficult to validate new criteria (transfer functions) with real field data

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Background

- **TG2 (2009)**
  - Relook at methods
  - Sponsored by SABITA and Gauteng (GDPTRW)
  - Started process in 2005
  - Much discussion with relevant role players
- **Priorities**
  - Use real field data to develop and validate structural design methods
  - Robust systems, not open to abuse
  - Strong links between mix design, structural design and specifications
  - Clear guidelines for use

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Background

- **Resulted in Material Classification and Pavement Number Methods**
  - Formally published in TG2 (2009)
  - Not only applicable to BSMs
- **TG2 updated in 2020**
  - Includes updates on DEMAC and PN
  - Sponsored by Sabita

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Today's Program

Introduction and Background to Methods
Introduction to Statistics
Statistics Exercise
Introduction to Material Classification System
TEA
Material Classification Worked Example
Material Classification Exercise
Introduction to Pavement Number Structural Design
LUNCH
Pavement Number Worked example
Pavement Number Exercise
TEA
Future Development
Closure

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Project Information

- P24/1 between N12 and North West and Gauteng border
- 2 lanes, single carriageway
- 26 km
- Category B
- Moderate climate
- Pavement structure from 1964:
  - Seals
  - 150 crushed stone
  - 150 C3
  - 150 G7
  - G9 subgrade
- Carried between 1.7 to 4.3 MESA

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Available Data

- Trial pits
  - Various material tests
  - DCP
  - FWD backcalculations
- These data available in:
  - Materials.xls
  - Backcalcs.xls

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Statistics

Lies, damn lies and statistics

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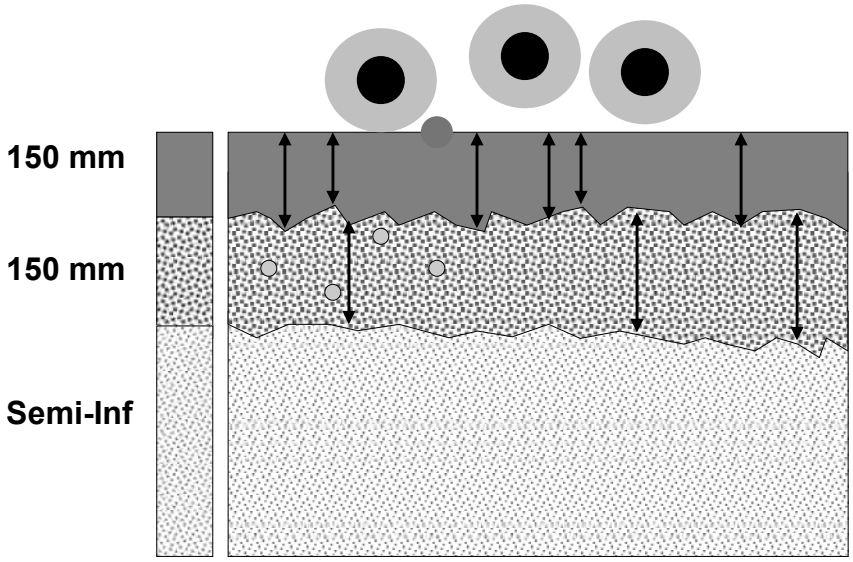
Variability in Pavements



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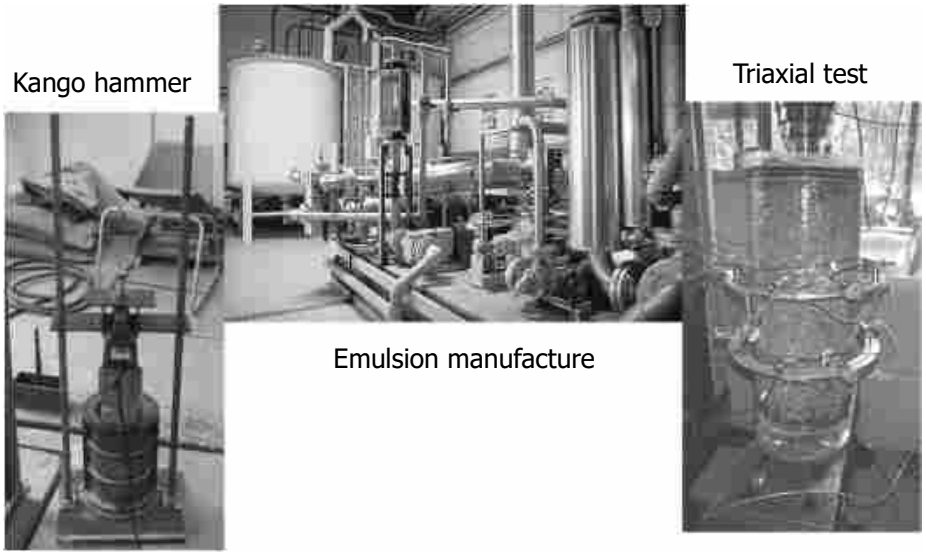
Variability in Testing



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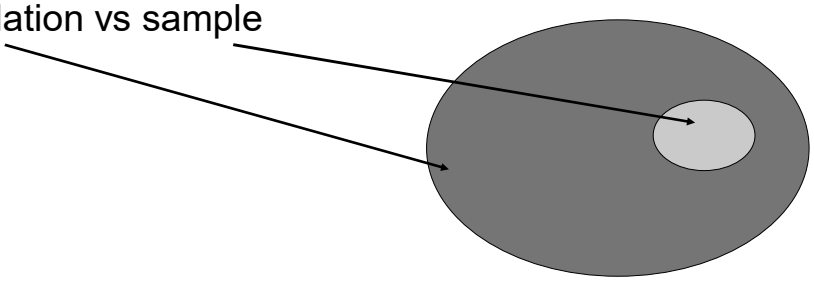
Statistical Tools

- The properties of pavement materials differ significantly from one point to another
  - *Variability*
- Because of variation, data collected from one data point to another are different
  - *Sample or data set*
- Population vs sample



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Statistical Tools

- **Descriptive statistics** describe the characteristics of a data set
- **Mean or average**
  - sum of the observations divided by the number of observations
- **Median**
  - middle number of the group when ranked in order
- **Percentile**
  - value of a variable below which a certain percent of observations fall
- *More useful than minimum or maximums as less influenced by outliers*

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Mean vs Median

1
3
3
4
5
7
8
8
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Σ **54**

Mean or average

= sum/no obs

= 54 / 9

= 6

Median

Middle no in ordered data

= 5

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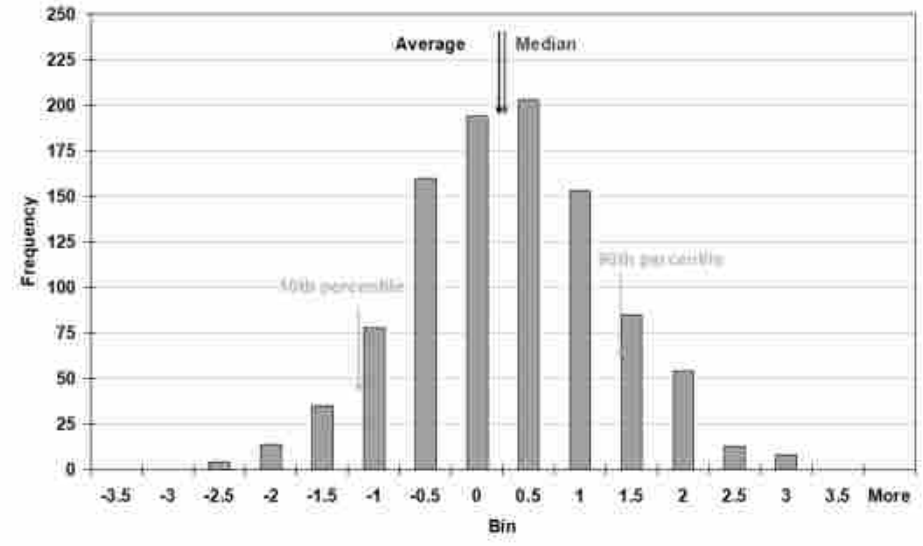
Histogram



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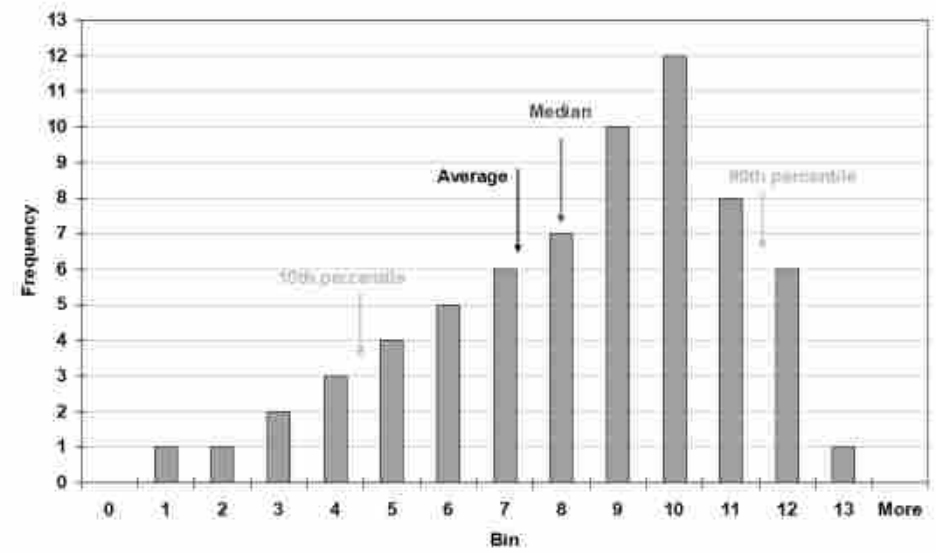
Histogram



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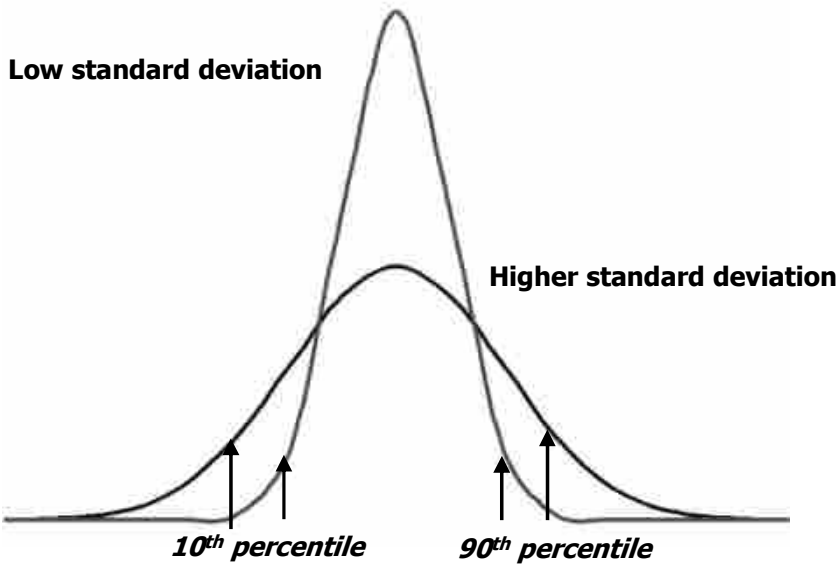
Distribution Types: Normal



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DEMAC Material Classification System

- **Uses statistics extensively**
  - Captures inherent variability in materials and testing

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Statistics Assignment

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