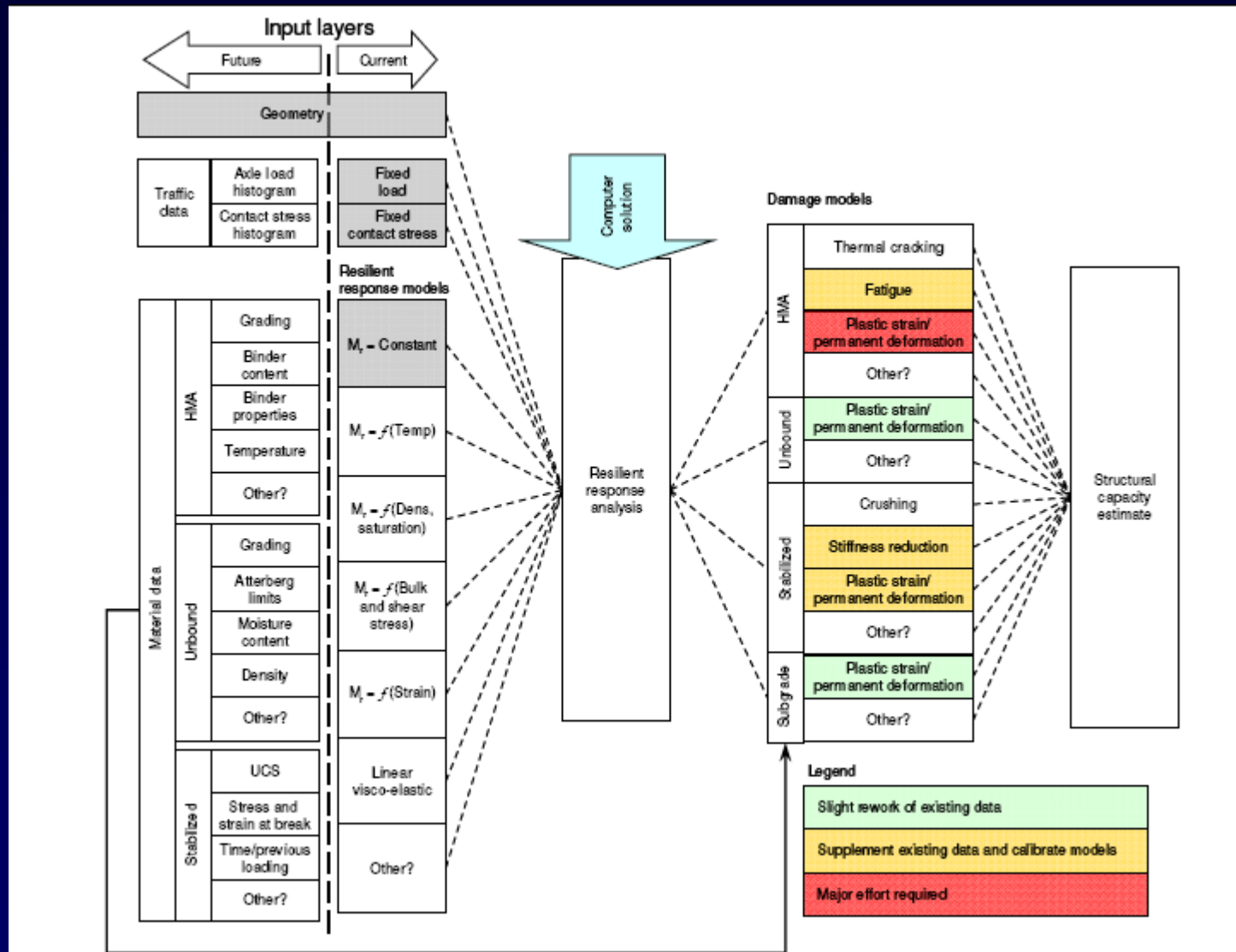
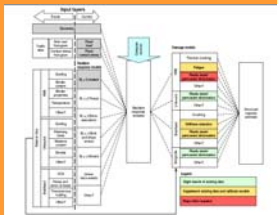
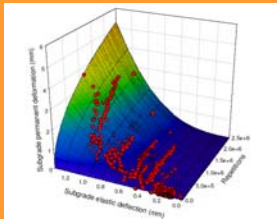
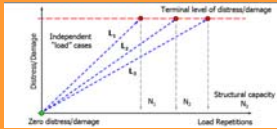


# Improving the Mechanistic Design Method



# Improving the DESIGN Method

## Mechanistic Principles



## Field Performance



## HVS Performance



## Catalogue Design





# Three Focus Areas/Challenges

- Validated Response Model
- Robust Model Inputs linked to design specifications
- Transfer Functions validated for field performance over 1 to 30 MESA range

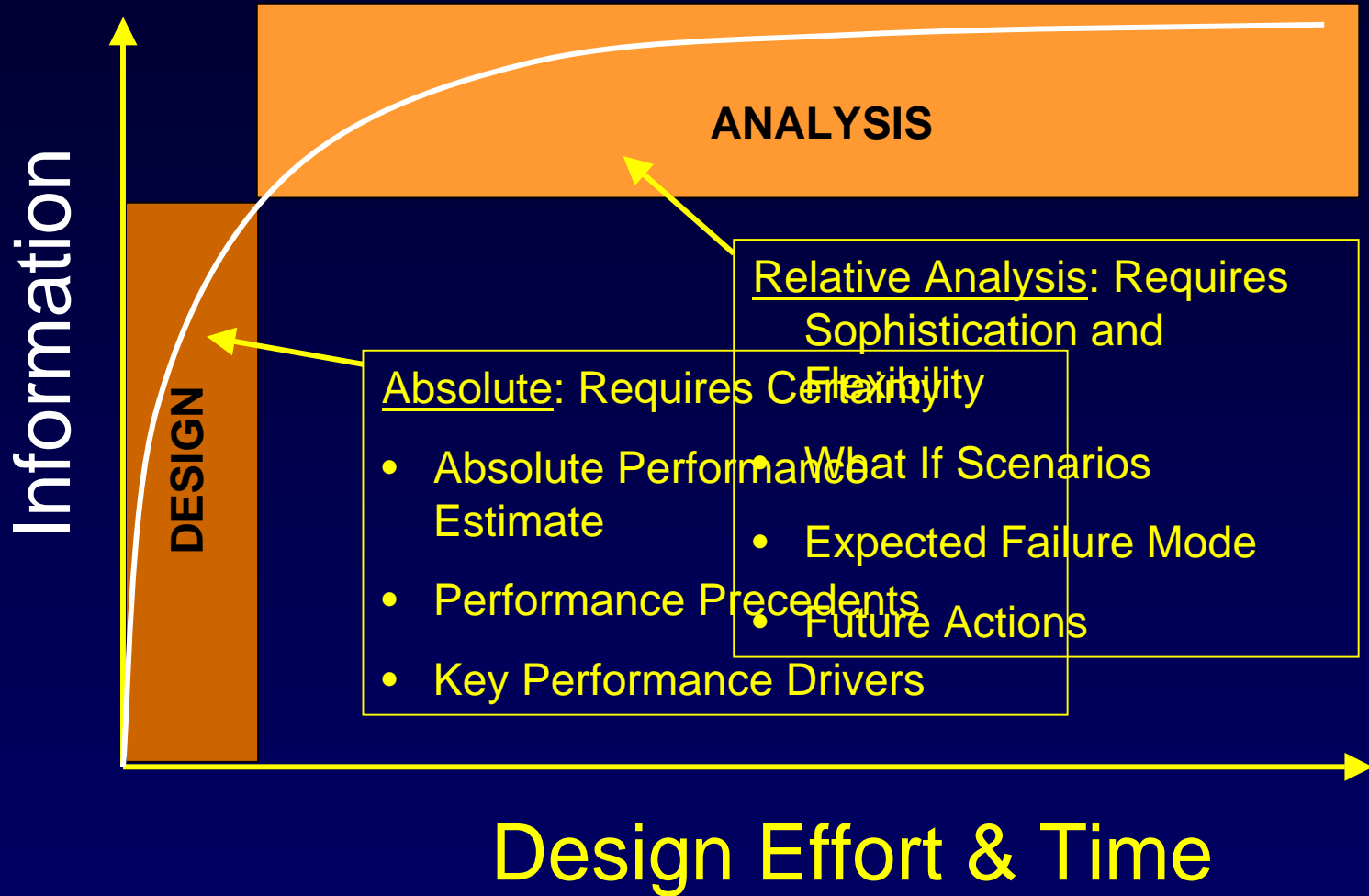
## Key Questions:

- Do We Have Data?
- What Will it Cost?
- Are there more Cost-effective Alternatives?

# Yes, we do have data. But:

- Material Stiffnesses are method or approach specific (subjective)
- We have very little performance data measured at  $> 3$  MiSA
- We have limited observations at failure (this requires extrapolation)
- We have no measured stresses & strains
- Discrepancies exist between DEPARTURE POINTS and Field Observations

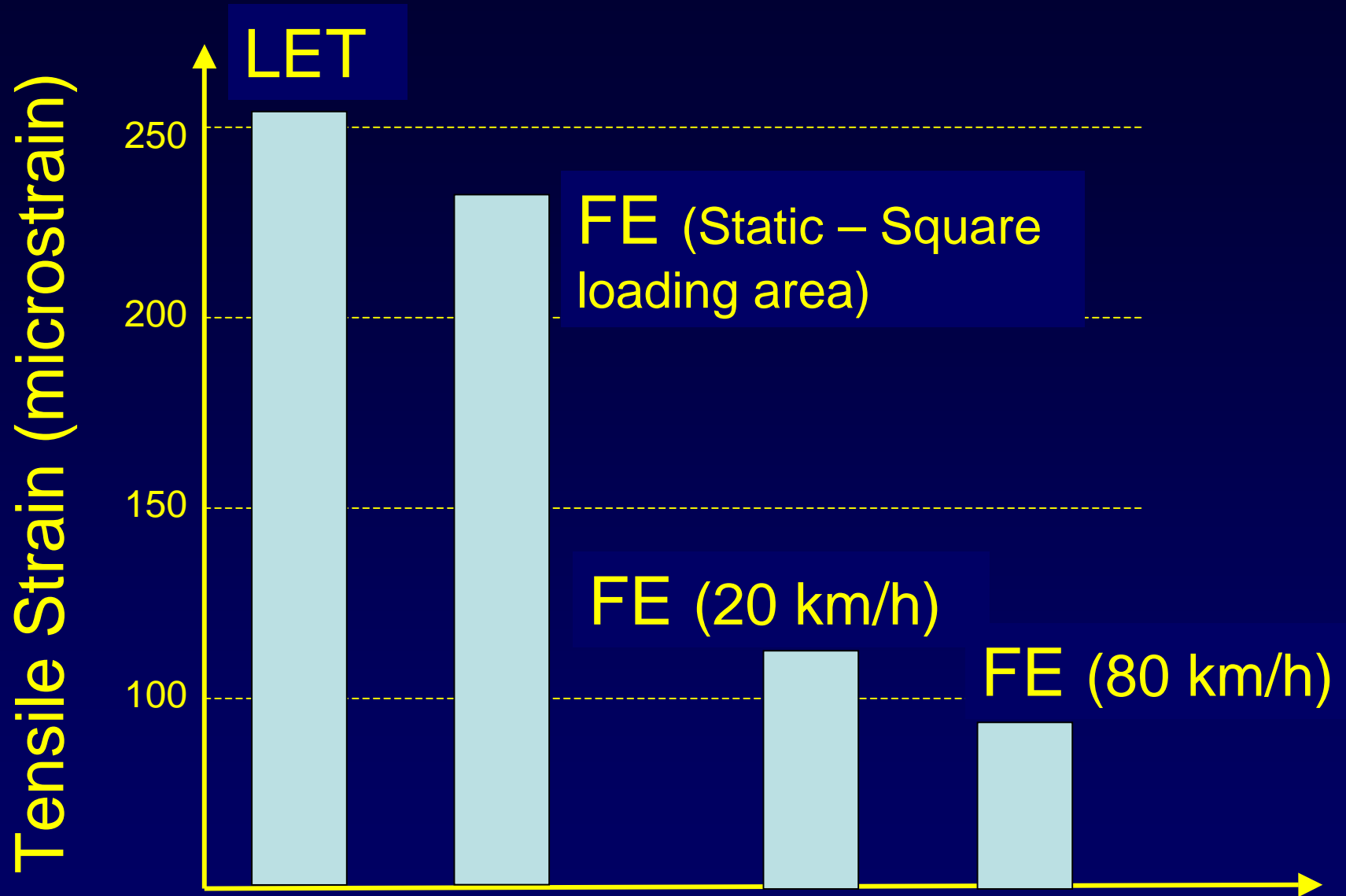
# Appropriate Solutions



# Three Focus Areas/Challenges

- Validated Response Model
- Robust Model Inputs linked to design specifications
- Transfer Functions validated for field performance over 1 to 30 MESA range

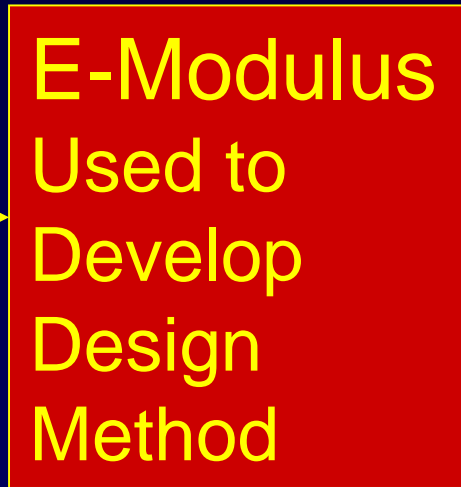
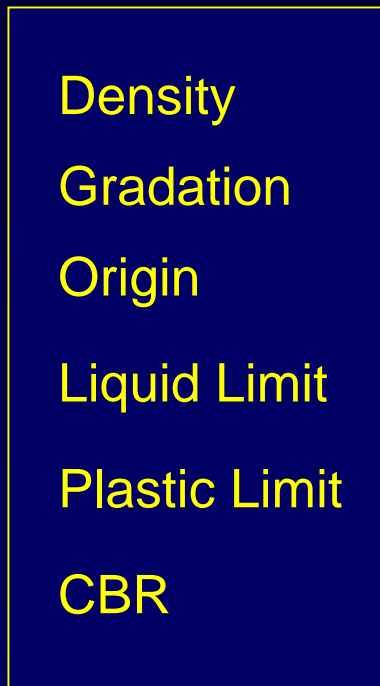
# Response Model



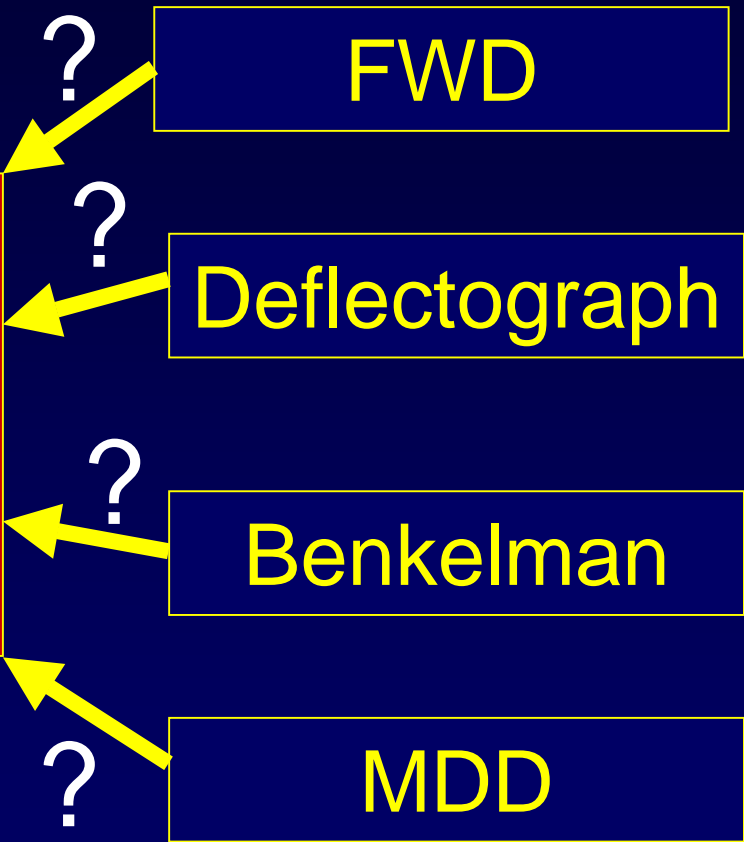


# Model Inputs (E-mod)

## New Design

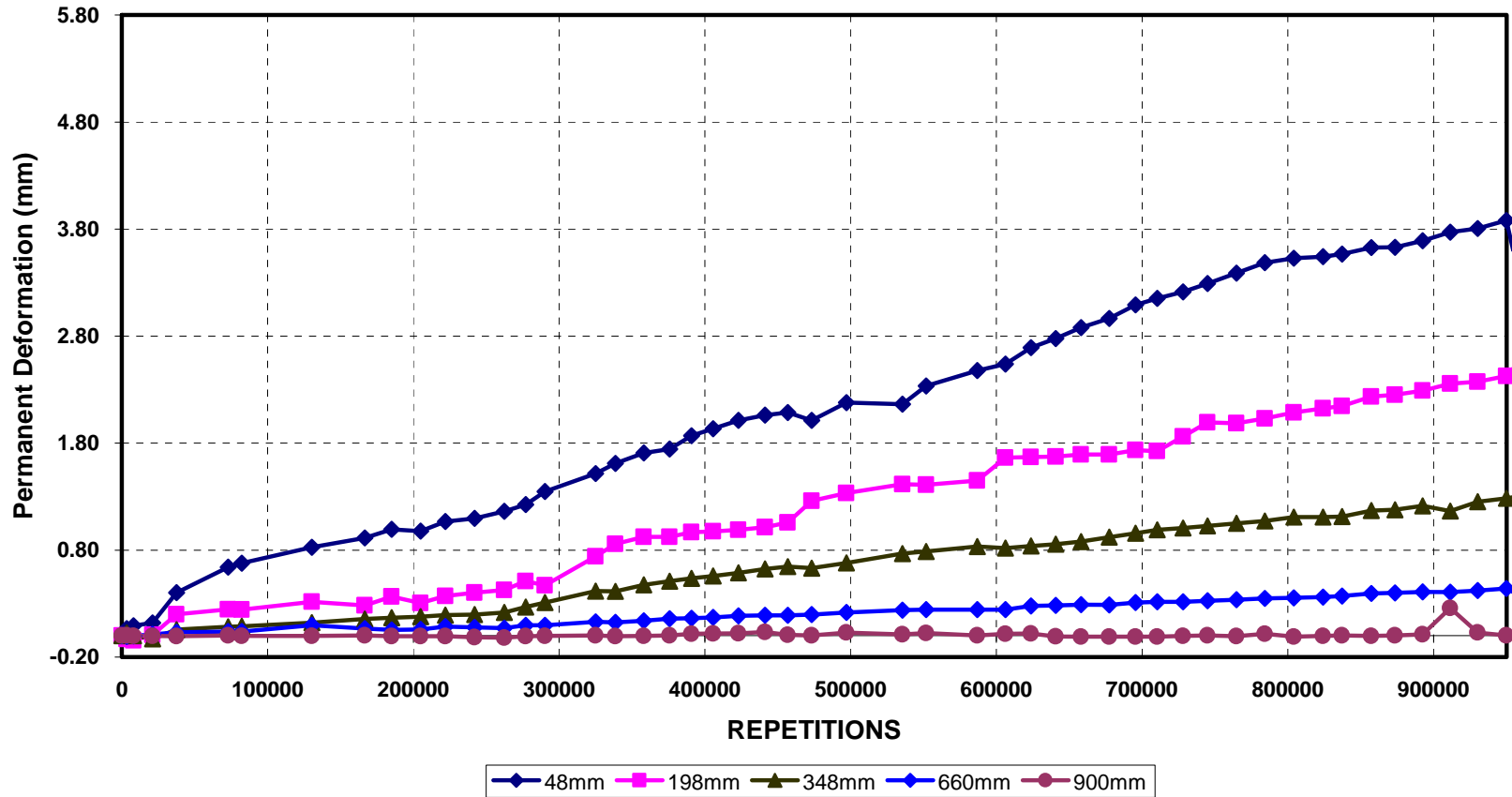


## Rehabilitation



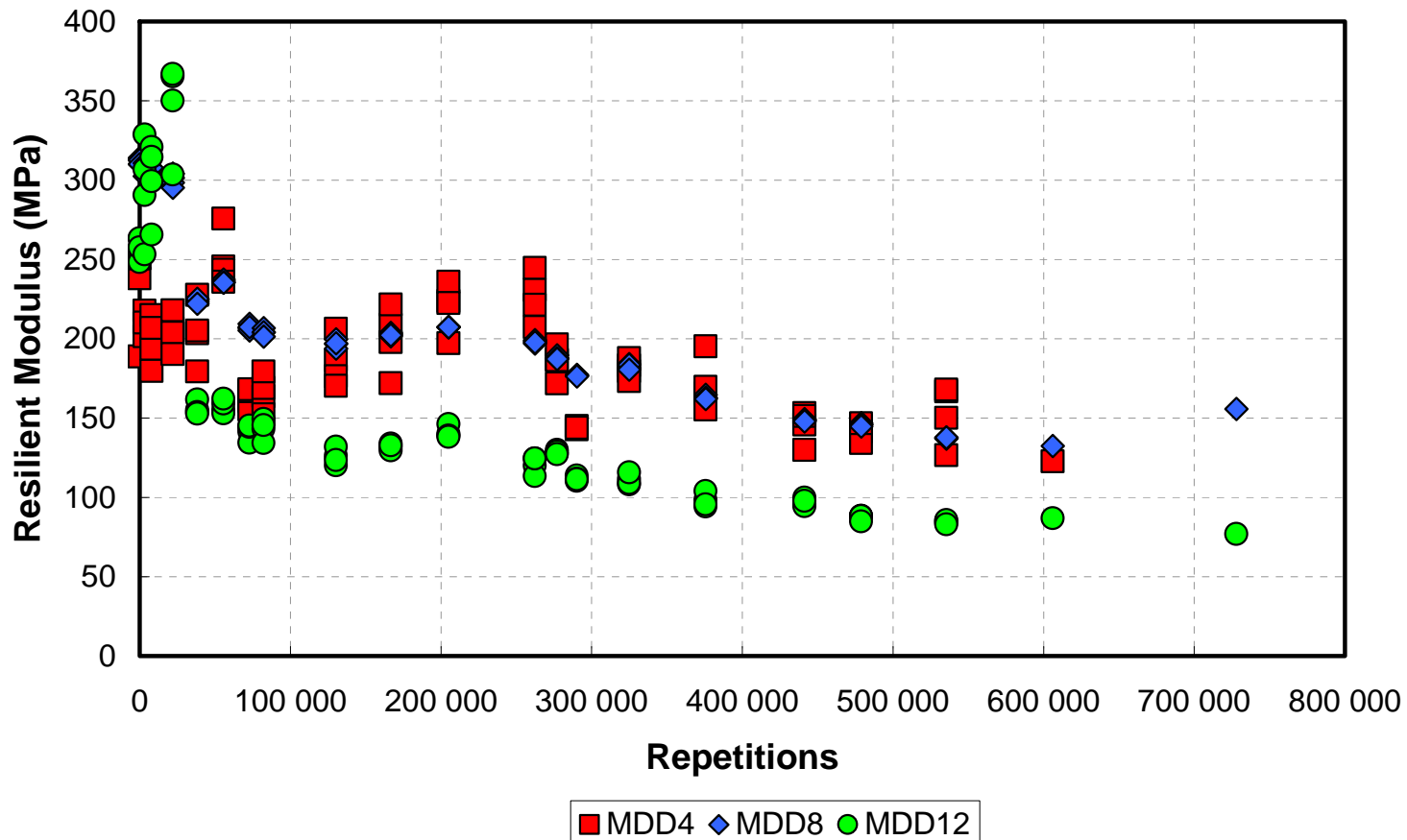
# N12: Rutting vs. HVS Reps

MDD 4 Permanent Deformation SECTION 425A5



# Stiffness vs. HVS Repeats

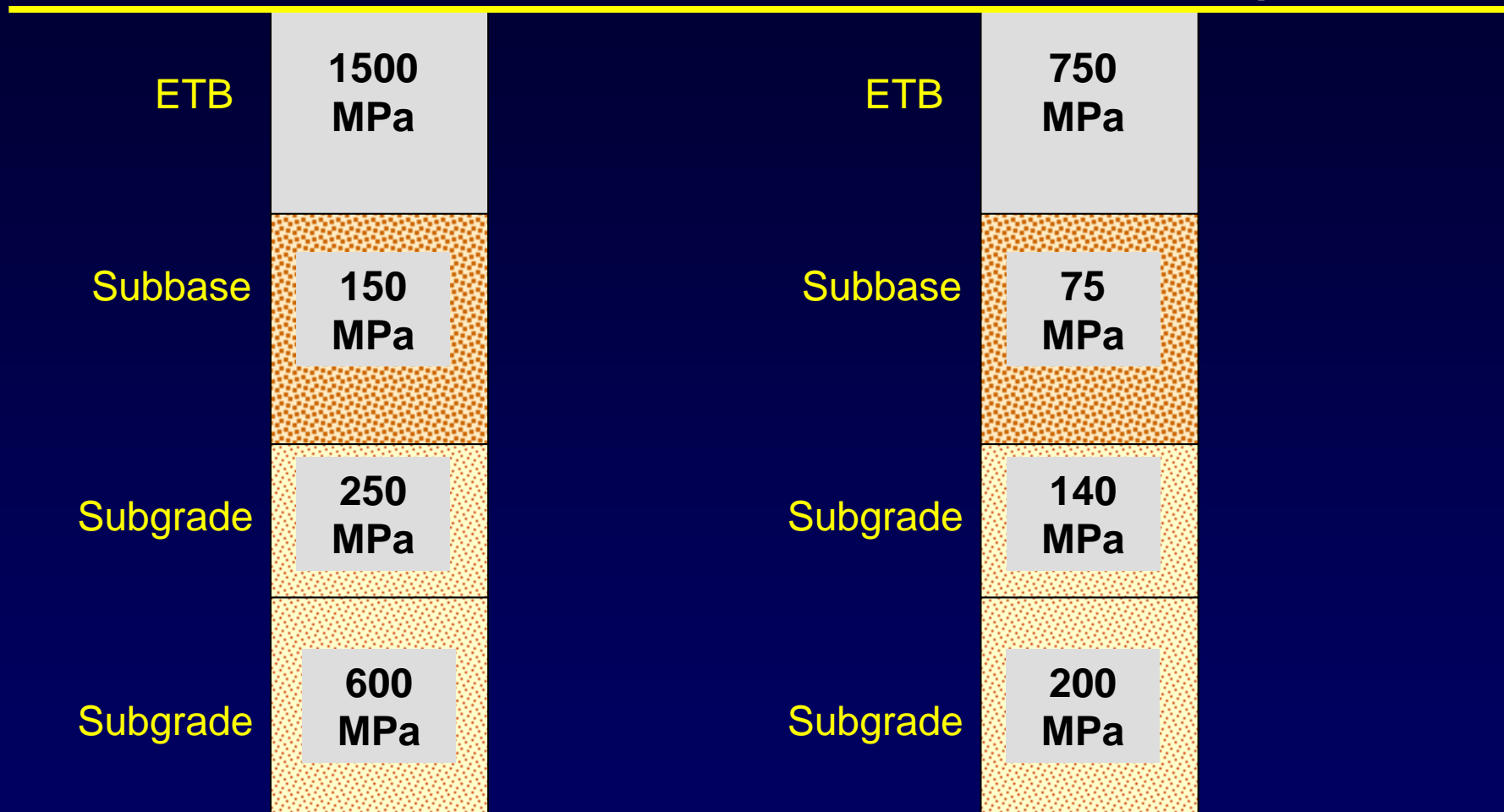
Phase I: HVS test 425A5  
Upper subgrade resilient modulus at 40 kN



# Subjective Measurement & Analysis

0 Reps

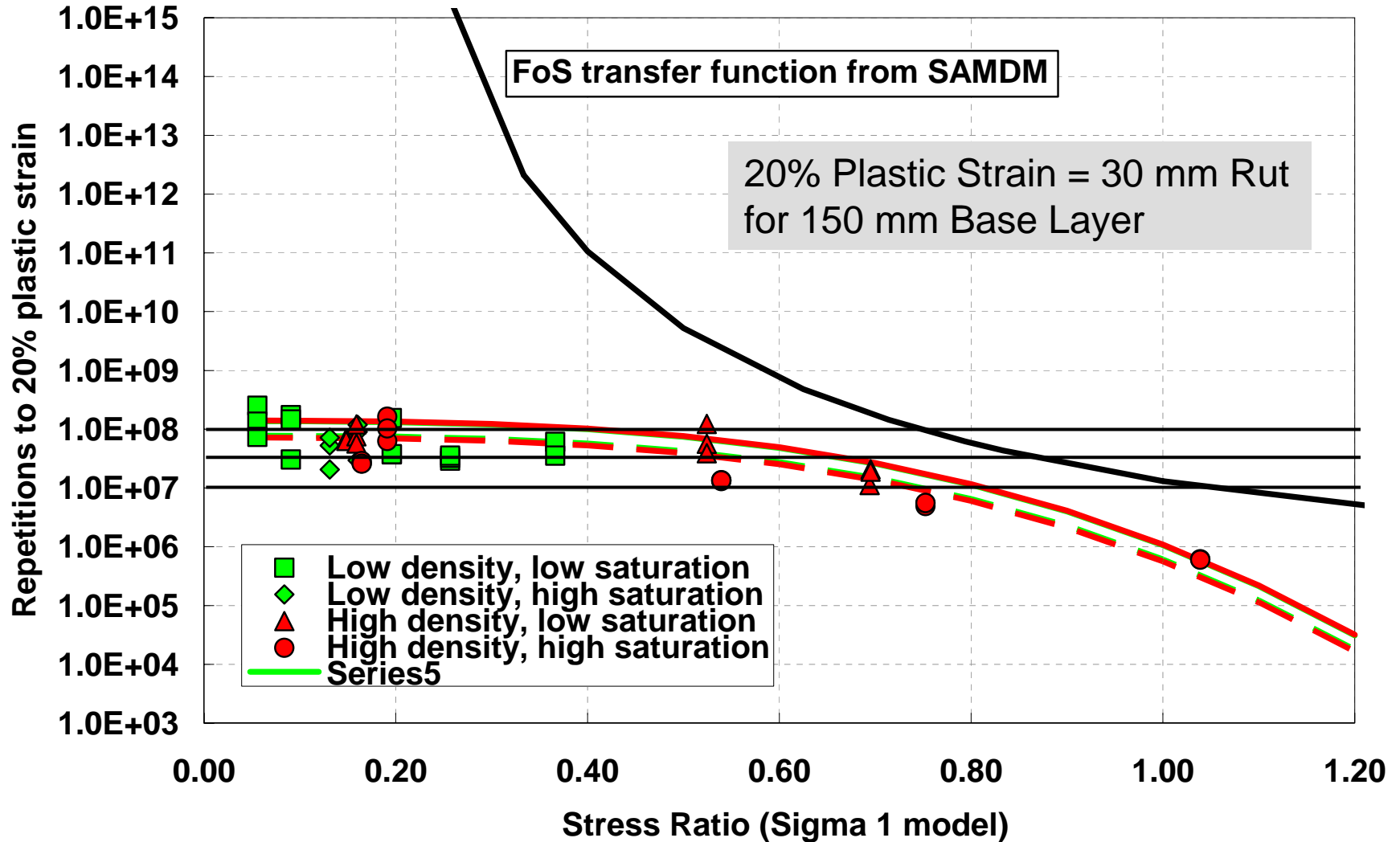
500,000 Reps



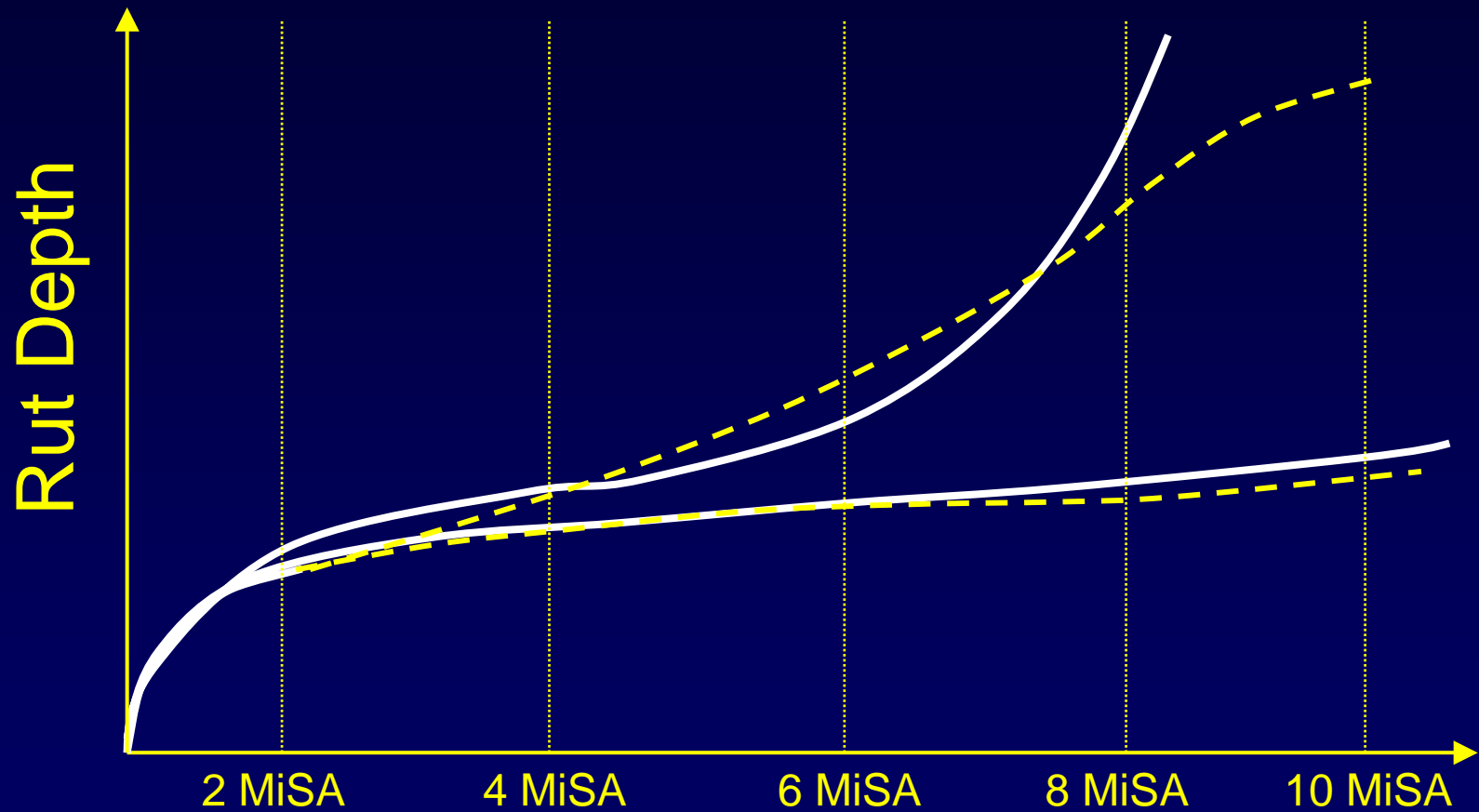
Rut Rate:  
3 mm/MESA

Rut Rate:  
3 mm/MESA

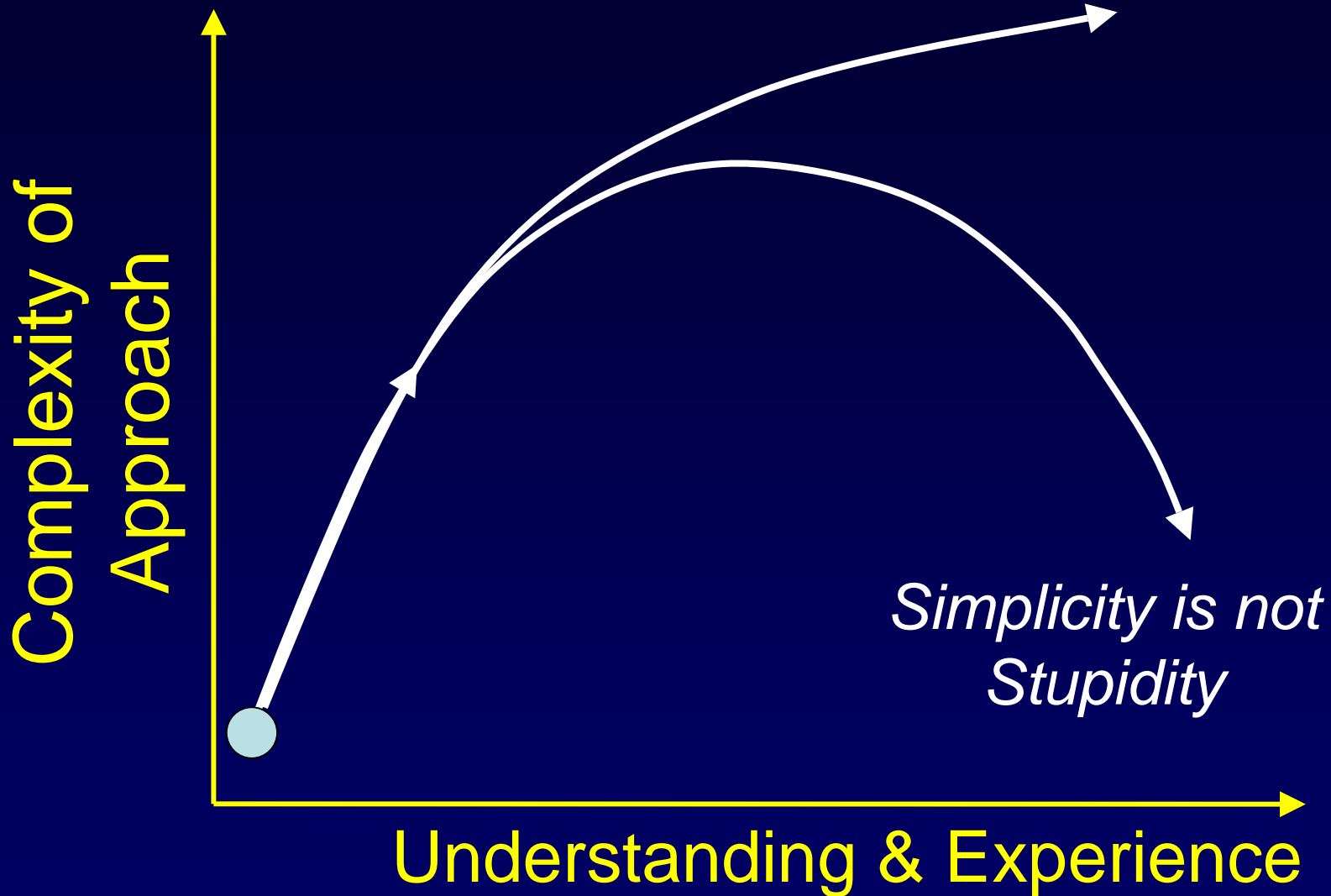
# TRANSFER FUNCTIONS



# Transfer Function Extrapolation



# Appropriate Solutions



# Field performance data first

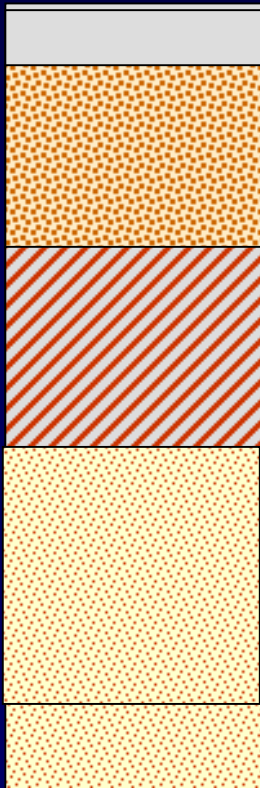
50 mm AC

150 mm G1

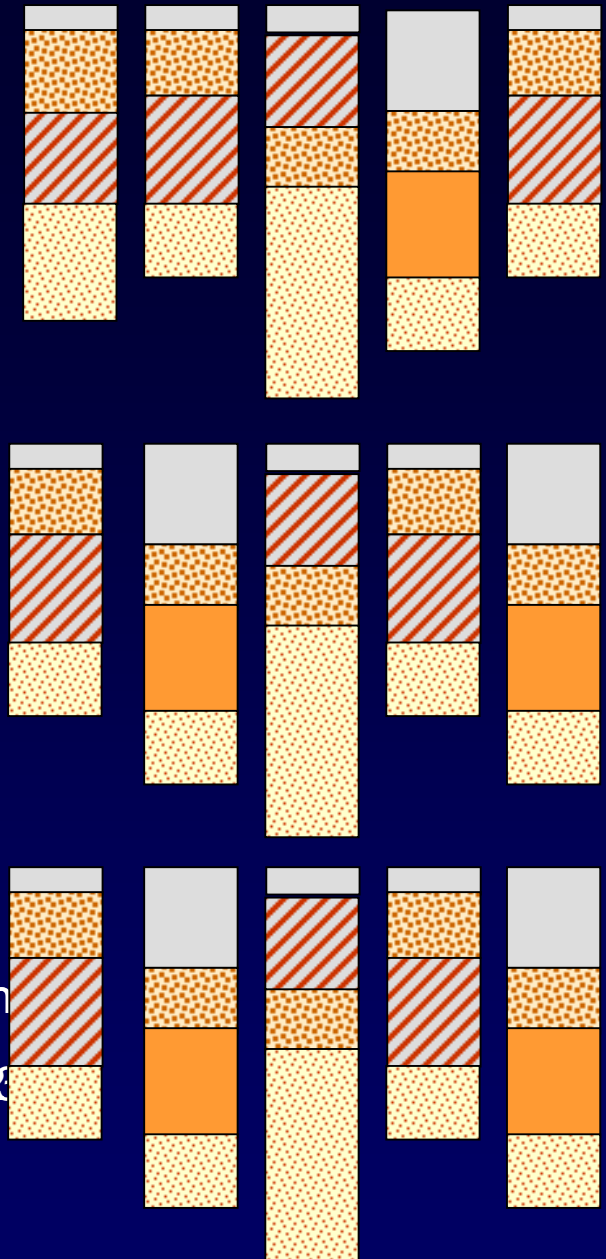
200 mm C4  
250 mm C4

150 mm G7

150 mm G7



- 81 Years to Re-Resurface
- 16000 Heavy Veh./Day
- Local Intensity 4/5
- Rehabilitation at 146 MESSA
- Terminal Rut 855<sup>th</sup>hog % = 162mm
- Struct. Cracking Deep 34, Ext 2





# Field performance

## data first

Design Option



- 8 Years to Resurface
- 1278 H/day
- 8 MESA to Rehab
- Terminal Rut = 16 mm

[Click here for Design Report](#)

[Click here for Situation Summary](#)

[Click here for Rehab. Report](#)



- Not Resurfaced
- 987 H/day
- 5 MESA to Rehab
- Terminal Rut = 12 mm

[Click here for Design Report](#)

[Click here...](#)



- 11 Years to Resurface
- 1250 H/day
- 9 MESA to Rehab
- Terminal Rut = 14 mm

[Click here for Design Report](#)

[Click here...](#)

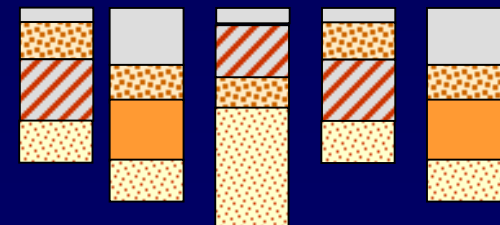
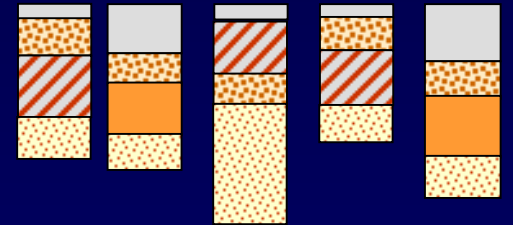
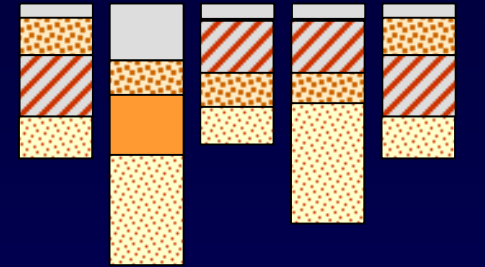
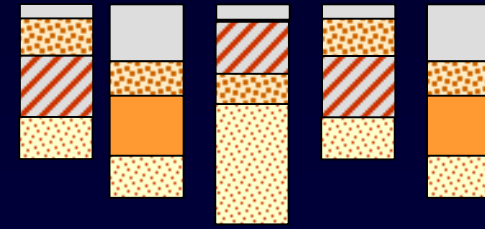


- 10 Years to Resurface
- 1400 H/day
- 12 MESA to Rehab
- Terminal Rut = 17 mm

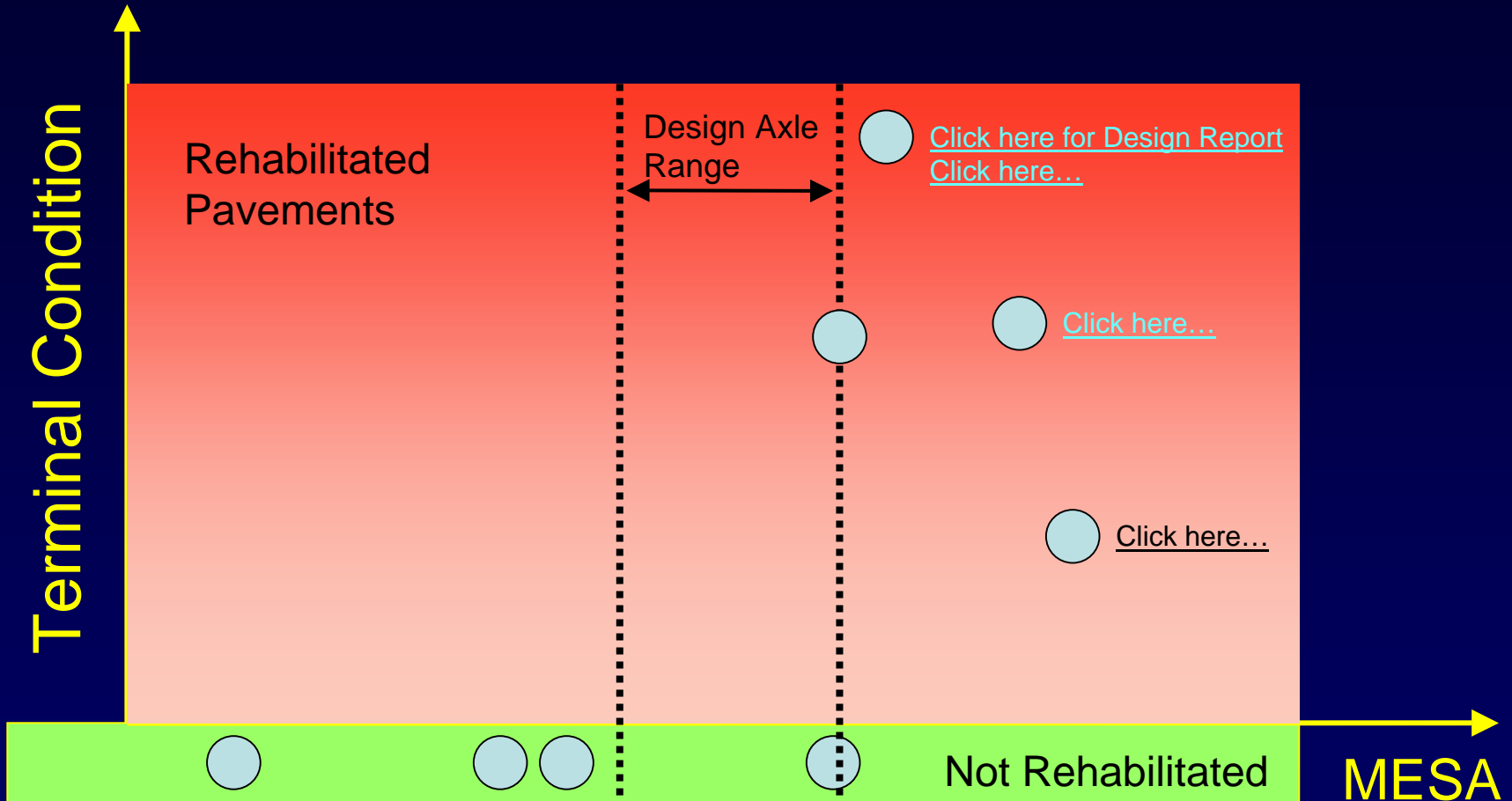
[Click here for Design Report](#)

[Click here...](#)

## Performance Database



# Performance Calibration



# Continued Performance Feedback System

- Develop database and include recently rehabilitated projects (R 400,000)
- Continued monitoring of rehabilitation projects
  - Obtain rehabilitation design report (pdf)
  - Obtain added construction data
  - Write 3 page situation summary
  - Enter into database
  - R10,000 per entry
- 100 pavements will cost ~R 1.4 million

# Appropriate Solutions

