



AFCAP



ERA/AFCAP Workshop
Issues and Concerns Related to the Revised ERA
Specifications and Design Manuals

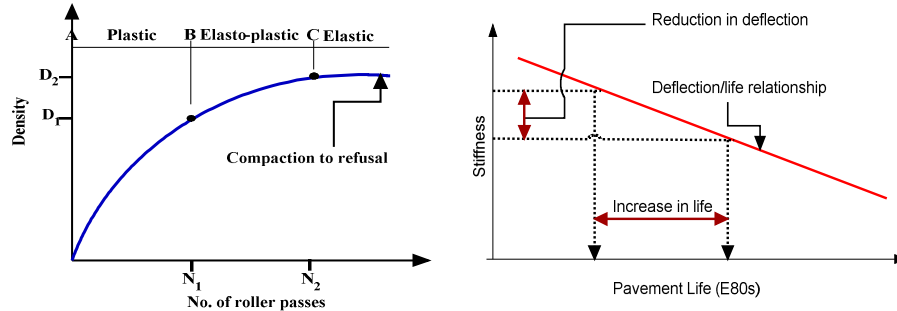
Density Measurement: Issues and Concerns

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Outline of Presentation

- Importance of Compaction Control
- Methods of Compaction Control
 - Advantages/disadvantages
- Issues and Concerns

Importance of Compaction Control



- Level of subgrade compaction affects density/strength/stiffness
- Stiffness related to performance/pavement life
- Need to ensure that minimum specified density is achieved so that design assumptions are realised in service.
- Measurement of density should ideally be **quick, simple, cost-effective**

Methods of Compaction Control

Commonly used methods include:

- **Destructive**

- ❖ Sand Replacement/Cone
- ❖ Core Cutter
- ❖ Water Balloon

➤ **Advantages**

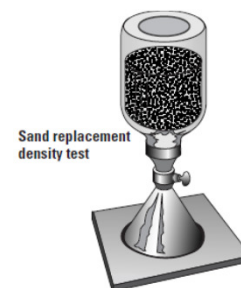
- Proven accuracy in relatively fine grained soils
- Basic level expertise
- Relatively cheap and simple equipment

➤ **Disadvantages**

- Time consuming
- Prone to error in coarse grained soils

➤ **Other**

- Can be used in conjunction with nuclear density gauge to verify calibration

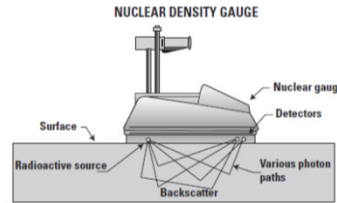


Methods of Compaction Control

Commonly used methods include:

- Non/partially destructive

- Nuclear density gauge
 - Direct transmission
 - Back Scatter
 - Air Gap



➤ Advantages

- Relatively quick/non-destructive measurement of DD and MC

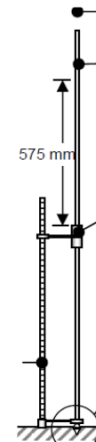
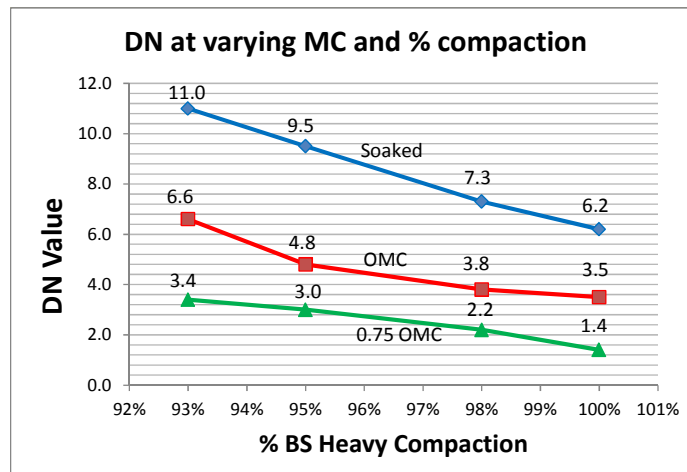
➤ Disadvantages

- Potentially hazardous – dealing with radioactive device
- Need for relatively skilled operator
- False readings from organic or salt laden soils
- Use of gravimetric or gauge moisture content affects DD results
- Requires calibration
- Relatively costly

Methods of Compaction Control

Less commonly used methods:

➤ DCP



Issues Concerning Density Measurement

- Sand Replacement is definitive method used in Ethiopia
- Reluctance to use Nuclear gauge
- What is the regional experience of using the nuclear device for field density measurements, in particular its reliability and correlation with simultaneous sand replacement tests?
- Should Ethiopia be more flexible in the use of the nuclear device given its efficiency of use on site? Is this decision highly material dependent?
- Possible use of the DCP as a quality control tool for compaction.

Thank You for Your Attention

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