

AFCAP

AFCAP Ethiopia Workshop



Subgrade Strength Considerations in Pavement Design (in-situ vs laboratory)

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Introduction



- **Issue:** Subgrade strength is a key component of pavement design. Is it the in-situ strength or laboratory strength which should be considered for design and why?
- DCP-DN or CBR for upgrading unpaved to paved roads
- DCP-DN or CBR for new construction and unconsolidated roads
- How appropriate are these approaches for the different circumstances faced by the engineers involved in road provision?

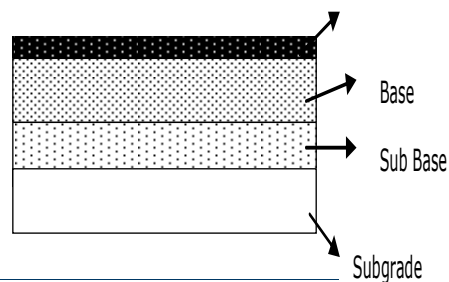


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Components of a road pavement



- Surfacing: Structural, semi-structural, structural
- Base: Except sealed with a semi structural and structural surfacing it's critical in distributing the load.
- Sub-base: Also distributes the load onto the subgrade – the foundation of the road.



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Subgrade



- What is the extent of the subgrade?
 - Everything below the subbase including all layers below the roadbed.
 - The compacted layer between the subbase and the road bed
 - The layer(s) below the roadbed
- Which layer below the subbase should be considered for subgrade strength for pavement design?
 - Everything below the subbase including all layers below the roadbed.
 - The compacted layer between the subbase and the road bed.
 - The layer(s) below the roadbed.



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Construction of Subgrade



Roadbed with poor material



Construction of subgrade
(half widths) using imported
red sand



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Consideration of subgrade strength



- What is the extent of the subgrade?
- Which layer below the subbase should be considered for subgrade strength for pavement design?

RECOMMENDATION:

The strength of the subgrade layer after compaction should be considered as the design subgrade strength.

The in-situ subgrade strength should only be considered as the design subgrade strength if the subgrade is highly consolidated and the strength matches or surpasses that of the compacted subgrade.

The roadbed should be consolidated through heavy compaction supercompactors (up to 50 ton pneumatic rollers)



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Concepts



- LVRs: this approach leads to leaner and cheaper pavements – usually 1 base layer, 150 mm thickness will suffice.
- HVRs with pavement over very weak materials: leads to leaner, cheaper and adequate pavements considering the design subgrade strength as that of the capping layer.
- In-situ strength tests results (undisturbed) have limited use in design – appropriate when a road is well consolidated. Inappropriate for poorly consolidated roads or new construction.
- Compacted subgrade strength – appropriate in poorly consolidated existing pavements indicating where subgrade needs reworking and compaction (compacted vs in-situ strength)



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Concepts



- Use of in-situ strength in poorly consolidated existing pavements or natural virgin ground will show low strength (low CBR or high DCP-DN) leading to overdesign of pavements.



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Thank you

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