SEACAP 003

LVRR Standards and Specifications

Presented
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The LVRR Standards

Three volumes:

- **Document I - Classification and Geometric Standards**, containing the definition of the traffic limits for LVRRs
- **Document II - Technical Specifications**, pavement designs, materials and specifications for an initial matrix of options
- **Document III: Guidelines on the Application of the Standards and Specifications**, containing advice on the application of Parts I and II within an Environmentally Optimised Design strategy

LVRR design vehicles

- Kolao type: vehicle width 1.8m
- Isuzu or Gaz 66 type: vehicle width 2.3m

Design vehicles used at early stages of road development (LVRR's)


Kolao


Isuzu


Gaz 66

Rear axle weights and tyre pressures

Vehicle type	Rear axle weight	Tyre pressure, psi
Kolao	2.5	45
Isuzu	4.5	55
Heavy	**9.0**	**100**

For a given subgrade strength:

- Axle weight – controls pavement thickness, and
- Tyre pressure – Pavement material strength and stiffness

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Heavy vehicle

Not suitable: based on: axle load, tyre pressure and vehicle dimensions –**and not necessary for LVRR's**

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Keys to Poverty Alleviation

10,000Kms of new LVRR's for:

- Access to markets
- Access to education
- Access to health services

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LVRR pavement designs

Designs have been prepared for

- Gravel pavements
- Bitumen sealed pavements
- Concrete pavements

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Whole life asset costs

Economic road development depends upon:

- Construction cost **plus** maintenance cost
- And maintenance must be provided otherwise the asset will be lost

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WLAC Balance of costs

Pavement	Construction	Maintenance
Gravel	Low	High
Sealed	Medium	Medium
Concrete	high	Low

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Pavement options:

- Therefore the designs include the options of sealed or concrete pavements
- A lowest asset cost decision can be made on the most economic according to availability of construction materials and other factors

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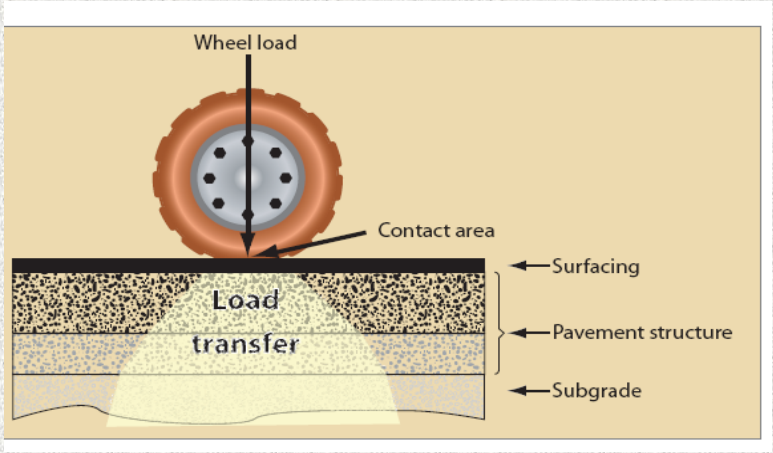
Pavement design concepts



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Road subgrades - Lao climate

- Rainfall 1600mm to +3000mm
- 7.5 months wet season
- Evaporation less than rainfall for most months
- Subgrades are expected to be wet

Pavement designs currently based on soaked strength designs (soaked CBR strength)

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Traffic groups A and B for pavement loading (esa's)

- Group A < 10,000 esa's
- Group B > 10,000 to 100,000 esa's

esa's are found by counting or estimating the cumulative total of Kolao and Isuzu (Gaz) type of vehicles, factored as necessary.

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Capping layers

In the designs capping layers are used instead of thicker sub-bases and road bases to keep the upper pavement as economical as possible. They provide:

- Best use of local materials without demanding sub-base quality
- A good construction platform
- A raised road and drier (stronger) conditions in the upper pavement

Requirement for a capping layer is CBR 10%

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Gravel road designs

Gravel roads are suitable when:

- Gravel loss is low and
- Maintenance regime and funding for routine and periodic (regravelling) is high, and assured
- Health and safety targets are met (dust and visibility)

Frequently these requirements cannot be assured:

Because of climate (rainfall), terrain (steep gradients> 6%, maintenance funding - also depletion of resources

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Designs: Gravel

Traffic Group A			Traffic Group B		
Subgrade Soaked CBR%	Pavement Layer	Layer Thickness D (mm)	Subgrade Soaked CBR%	Pavement Layer	Layer Thickness D (mm)
2-3.9	Wearing Course Capping Layer	200 250	2-3.9	Wearing Course Capping Layer	200 300
4-6.9	Wearing Course Capping Layer	200 100	4-5.9	Wearing Course Capping Layer	200 150
>7	Wearing Course Capping Layer	200	6-7.9	Wearing Course Capping Layer	200 100
			>8	Wearing Course Capping Layer	200 0

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Designs: Bitumen sealed

Subgrade Soaked CBR%	Pavement Layer	Traffic Group A Layer Thickness (mm)	Traffic Group B Layer Thickness (mm)
2-3.9	Surface Base Sub-Base Capping Layer	Seal 100 100 200	Seal 100 150 275
4-6.9	Surface Base Sub-Base Capping Layer	Seal 100 100 100	Seal 100 150 175
7-10.9	Surface Base Sub-Base Capping Layer	Seal 100 100 0	Seal 100 150 100
>11	Surface Base Sub-Base Capping Layer	Seal 100 100 0	Seal 100 150 0

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Design: concrete

Subgrade Soaked CBR%	Pavement Layer	Traffic Group A Layer Thickness (mm)	Traffic Group B Layer Thickness (mm)
2-6.9	Surface (concrete) Sub-Base	150 150	150 150
>7	Surface (concrete) Sub-Base	150 100	150 100

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Pavement material quality: sealed designs

Based on lower tyre pressures than heavy trucks, the road base material quality can be reduced:

- Very light CBR 25%
- Kolao type only CBR 50%
- Other CBR 80%

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Summary of pavement material quality

Pavement layer	Traffic Group A		Traffic Group B	
	Unsealed GWC CBR%	Sealed Flexible CBR%	Unsealed GWC CBR%	Sealed Flexible CBR%
Base/GWC	25	50	25	80
Sub-Base	NA	25	NA	25
Capping	10	10	10	10

For **concrete roads** the requirements for pavement layer materials in all subgrade categories are:

Concrete, minimum 28-day cube strength: 20 MPa

Sub-base CBR 25%

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Innovative approach

- For LVRR's Longitudinal pavement and surfacing design for the target road is *not* necessarily constant,
- It is based on providing *ALL WEATHER ACCESS*

Usually pavement design provides for different thicknesses of pavement as subgrades vary but the perception is of ***one*** pavement for the link; gravel, sealed or concrete; this is not necessary

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Spot Improvement and Environmentally optimized design EOD

- The most suitable (WLAC) design is used for a given length of the target road, according to ACCESS *rule*
- Basic: Improve the road at the "trouble" spot to provide all weather access for the lowest (WLAC)
- EOD provide the most suitable (WLAC) for a series of target road sub-lengths, let it be: gravel, sealed or concrete.

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Framework for Pavement Design Selection

A two phased process:

Phase 1: General Assessment of Pavement Options

Phase 2: LVRR pavement and surfacing option design

Requirements for the elements of each Phase are detailed in Document III and its appendices

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Framework: Phase 1 processes

For Phase 1:

- Project road within LVRR envelope?
- Outline suitable road dimensions
- Overview of material resources
- Likely budget available, suitable for Spot Improvement or EOD.
- Reassess - will road meet accessibility objective? If yes, proceed to Phase 2

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Framework: Phase 2 processes

For Phase 2:

- Detailed assessment of traffic
- Road alignment technical survey for hydrological design and subgrade strength
- leading to detailed road and pavement design, and Bill of Quantities

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Thank you