

### Keys to Poverty Alleviation

10,000Kms of new LVRR's for:

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

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



Kolao



Isuzu



Gaz 66

### SEACAP 003

### LVRR Standards and Specifications

Presented  
by  
Mick O'Connell

### LVRR pavement designs

Designs have been prepared for

- Gravel pavements
- Bitumen sealed pavements
- Concrete pavements

### Rear axle weights and tyre pressures

Vehicle type	Rear axle weight	Tyre pressure, psi
Kolao	2.5	45
Isuzu	4.5	55
<b>Heavy</b>	<b>9.0</b>	<b>100</b>

For a given subgrade strength:

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

### 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

### 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

### Heavy vehicle



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

### LVRR design vehicles

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

## 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)



## 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)



## WLAC Balance of costs

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



## Designs: Gravel

Subgrade Soaked CBR%	Traffic Group A		Traffic Group B		
	Pavement Layer	Layer Thickness D (mm)	Subgrade Soaked CBR%	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



## 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.



## 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



## 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



## Capping layers

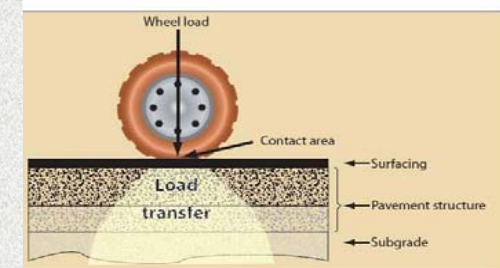
In the designs capping layers are used instead of thicker sub-bases and road bases to keep the upper pavement as economical as possible. They provide:

- 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%



## Pavement design concepts



## 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



## 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



## 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



## 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



## 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.



## 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%



## SEACAP 003

## LVRR Standards and Specifications

Thank you



## 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



## 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%

