SEACAP AFCAP

Low Cost Structures Guideline

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The Presentation

- The Context
- The Challenge
- Why do we need another Guideline?
- Some features of the Guideline
- Future Initiatives?

The Context

The World Bank Transport Business Strategy (2008-2012) advises:

- **1.2 billion of the world's poor still lack access to an all-weather road**
- **Between 40 and 60 percent of people in developing countries live more than 8 km from a healthcare facility. Few transport services exist**
- **In some regions less than 15% of roads are paved**

Without effective rural transport systems, the MDGs and ALL rural development & poverty initiatives, agriculture & growth are substantially constrained

There are serious concerns that the MDGs may not be achieved, unless radical new initiatives are taken

The Challenge

Conventional rural road provision usually costs
> US$100,000/km

Basic Access could be provided to many rural communities for <US$10,000/km

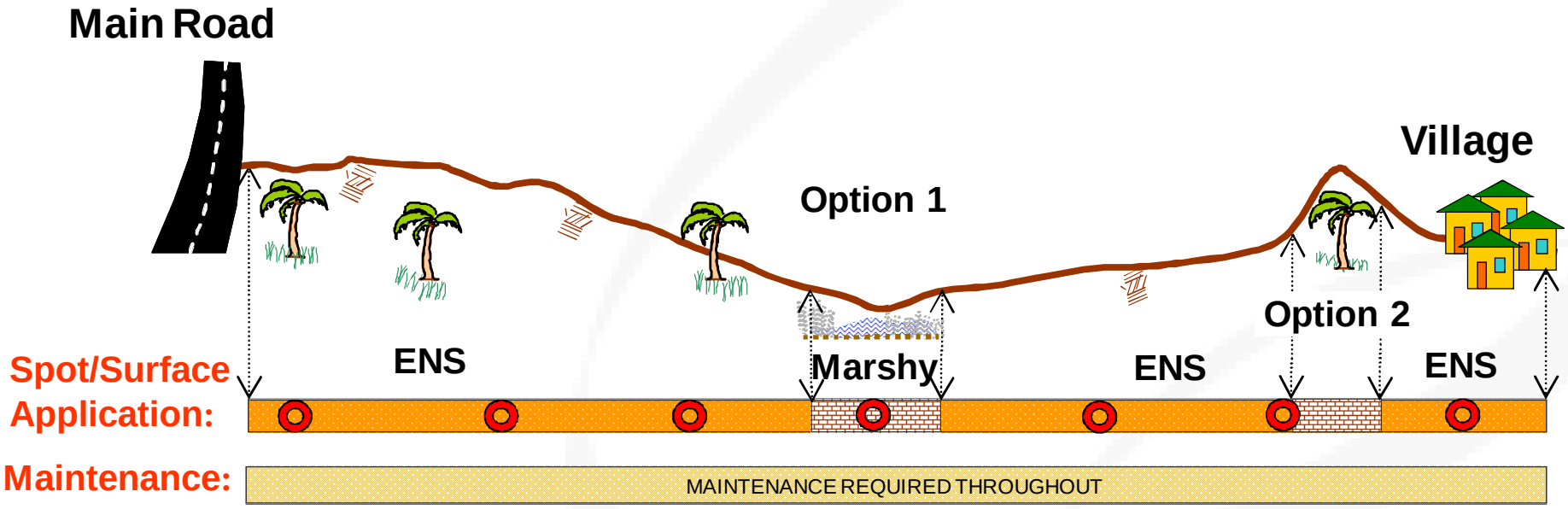
Using:

- **In situ soils to form Engineered Natural Surface**
- **Improved surfaces for limited problem sections**
- **Provision of simple structures**

to provide affordable year round access

Spot improvement strategy

Example application over a typical rural route



Low Cost Structure or culvert

Surface Options

Engineered Natural Surface (ENS)

Maintenance

(Earth Road)

Why do we need yet another Guideline?

- **The existing internationally accepted guidelines are based on the 'traditional' use of reinforced concrete**
- **Not enough consideration give to the use of local-resource-based road works:**
  - **Local labour (skilled and unskilled)**
  - **Local materials**
  - **Local enterprises**
  - **Local communities and social structures**

Why use Local-Resource-Based methods?

The resource base is very different in developing countries:

- **Labour wage rates typically <US£10/day (instead of >US$100/day in developed countries)**
- **Credit scarce and expensive >20%p.a. (instead of <10%p.a. and usually available in developed countries)**
- **Some local materials do not meet normal international guidelines, however can provide affordable solutions**
- **Local carpentry, masonry skills and local community and enterprise resources usually not mobilized in road works**

We cannot directly transfer technology from developed countries

Why do we need yet another Guideline?

The developing world has abundant examples of BAD PRACTICE in structures provision for rural roads

Stone: an under-utilised resource

Masonry skills available in many communities

Can be used mortared or un-mortared

Fired Clay Brick: an under-utilised resource

Especially in areas with lack of hard stone resources

Small scale kilns using agricultural waste can produce engineering quality bricks

Timber: an under-utilised renewable resource

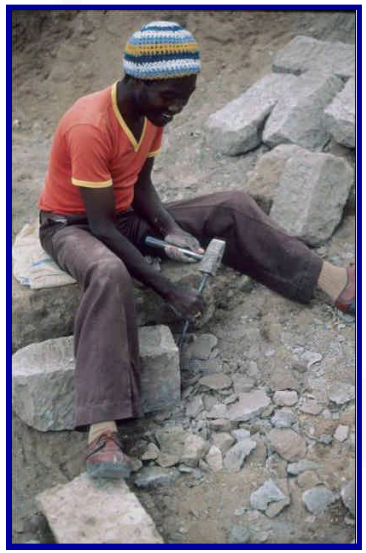
Low carbon footprint if managed sustainably

Carpentry skills available in many communities

People: an under-utilised resource

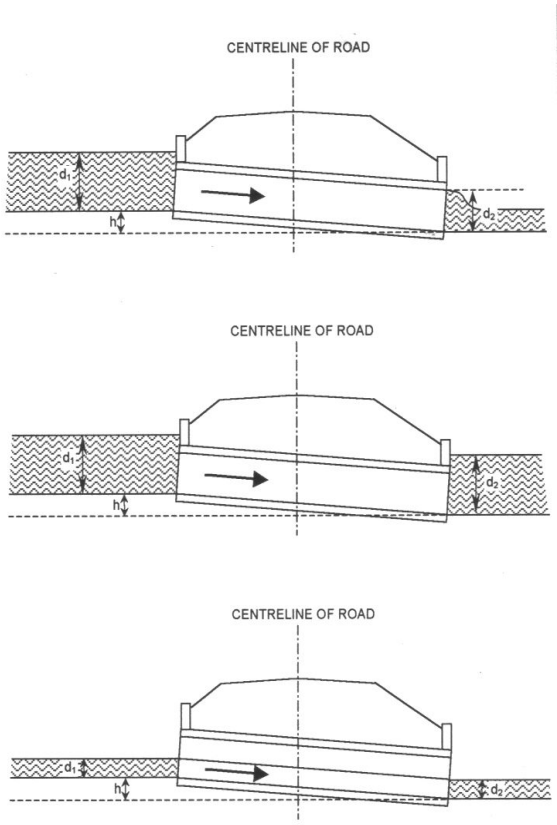
Often ready to be involved in creating and maintaining their own access

Local people, enterprises and communities can be helped with knowledge and support



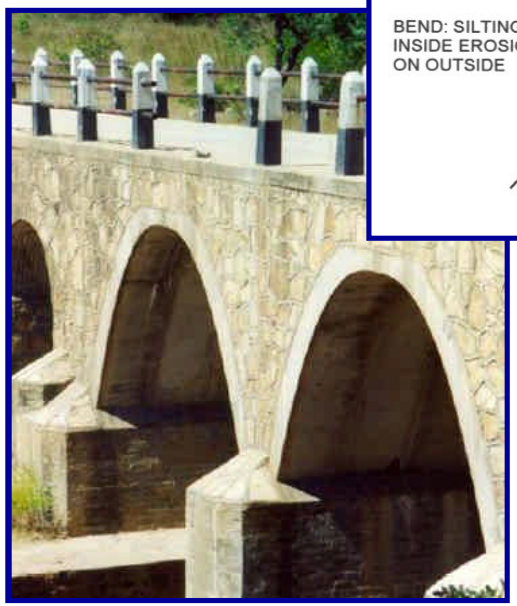
Aims of the Guideline

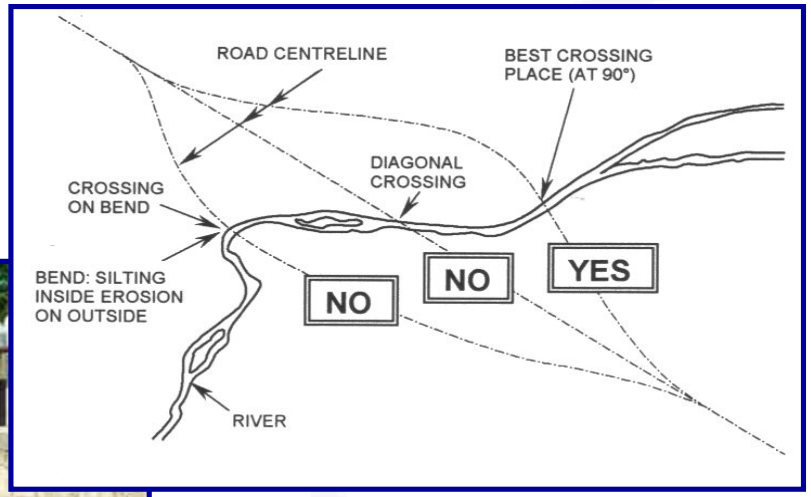
- Concise and complete information in one place
- Provide the engineering background required to
  - Complete planning and assessment
  - Select the correct structure
  - Complete design
- Guidance on costing, construction and maintenance of structures
- Assist in the approval and adoption of low cost structural designs
- Utilisation of low cost labour, local materials & artisans
- Improving economic returns and reducing environmental impacts by using local resources

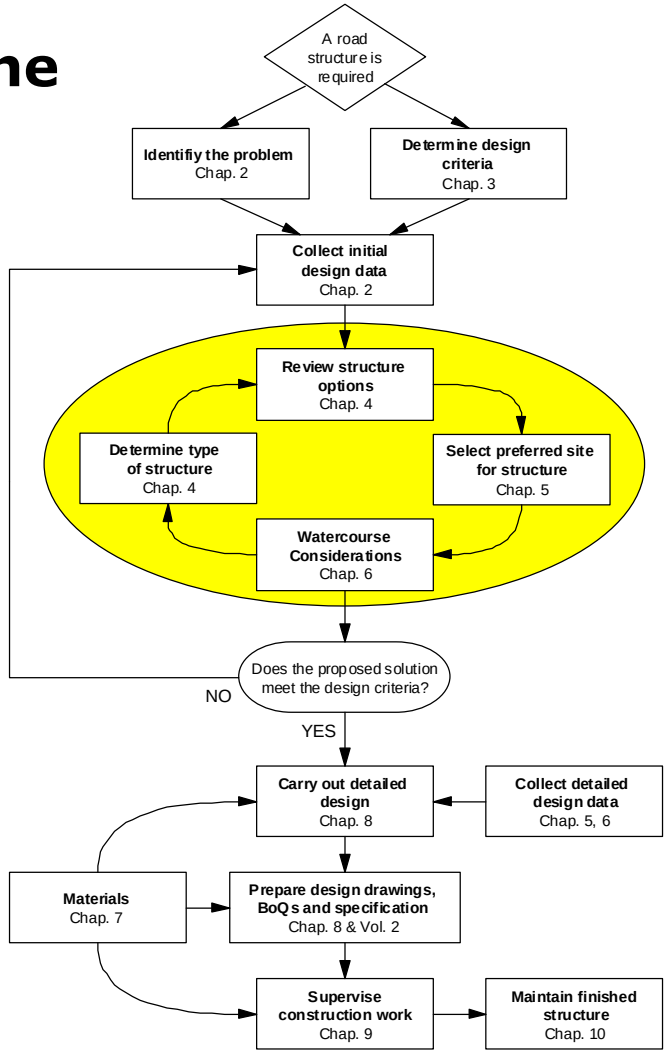


Guidance on design

The Guideline helps users through the planning, selection and design process with essential technical issues

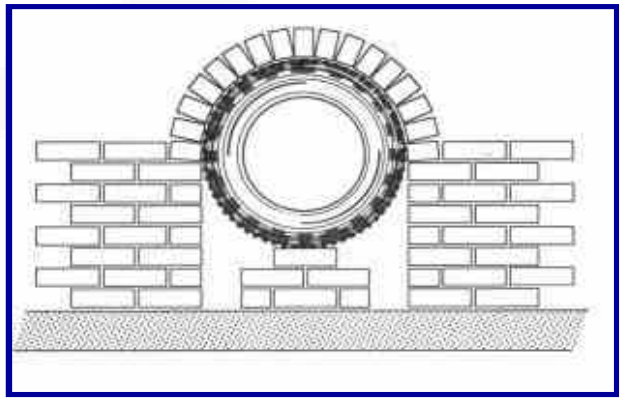




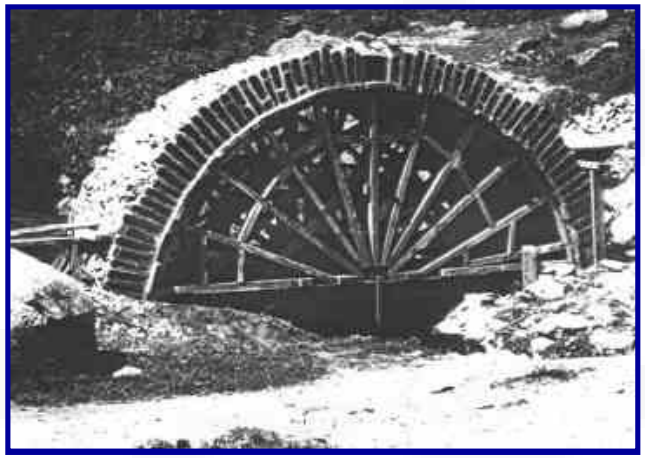


Guidance on construction

Techniques, productivity, specifications etc.

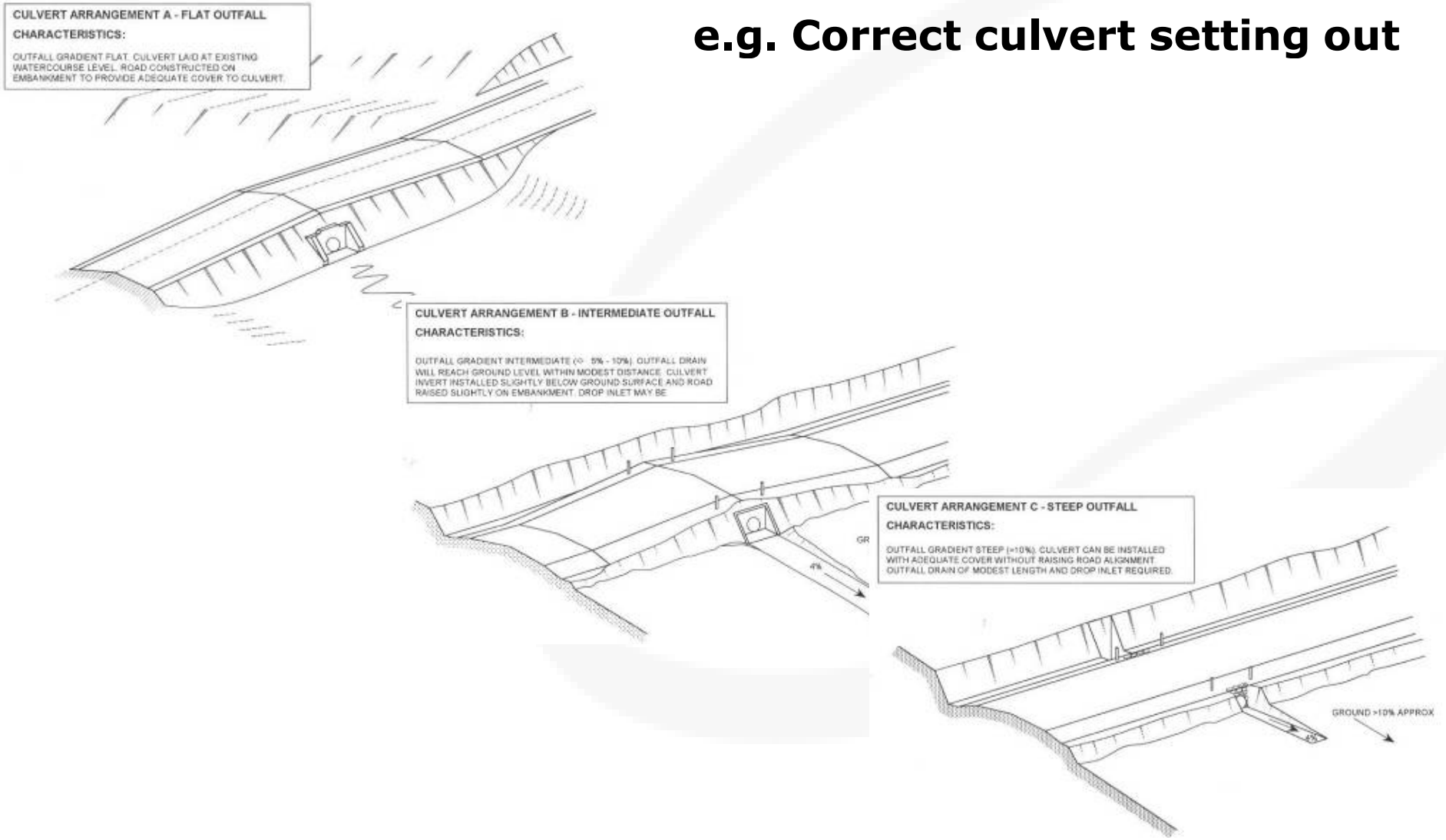


Recommended productivity standards	
Site clearance (bush clearing, tree felling, etc.)	100 – 350m^2 / worker day
Removal of tree stumps	1 / worker day
Soil excavation (and stockpiling alongside)	2 - 5m^3 / worker day
Rock (fractured) excavation	0.8m^3 / worker day
(solid rock will require drilling and blasting/splitting)	8.5m^3 / worker day
Loading	8.5m^3 / worker day
Haulage by wheelbarrow	7.0m^3 / worker day
0 - 20m	6.5m^3 / worker day
20 - 40m	5.5m^3 / worker day
40 - 60m	5.0m^3 / worker day
60 - 80m	4.5m^3 / worker day
80 - 100m	0.8 - 1.2 lin.m / worker day
100 - 150m	1.0m^3 / worker day
Install only 600 or 900mm diameter culvert lines (including excavation and backfill)	1.0m^3 / worker day
Mix and place concrete	
Erect masonry work	



Guidance on construction

e.g. Correct culvert setting out



Guidance on maintenance

Often neglected until failure occurs – then it is too late!

Routine

1. Cleaning/clearing
   a. sweeping
   b. de-silting
   c. unblocking
   d. removal of vegetation and flood/wind borne debris).

(This includes inlets and outlet channels as well as culvert openings themselves)

1. Repair of loose/missing connectors and fixings
2. Replacement of damaged/missing planks or kerbs
3. Painting
4. Wood preservation
5. Pointing/repair of masonry
6. Repair of parapets, marker posts, safety barriers and features/signs

Standard Designs

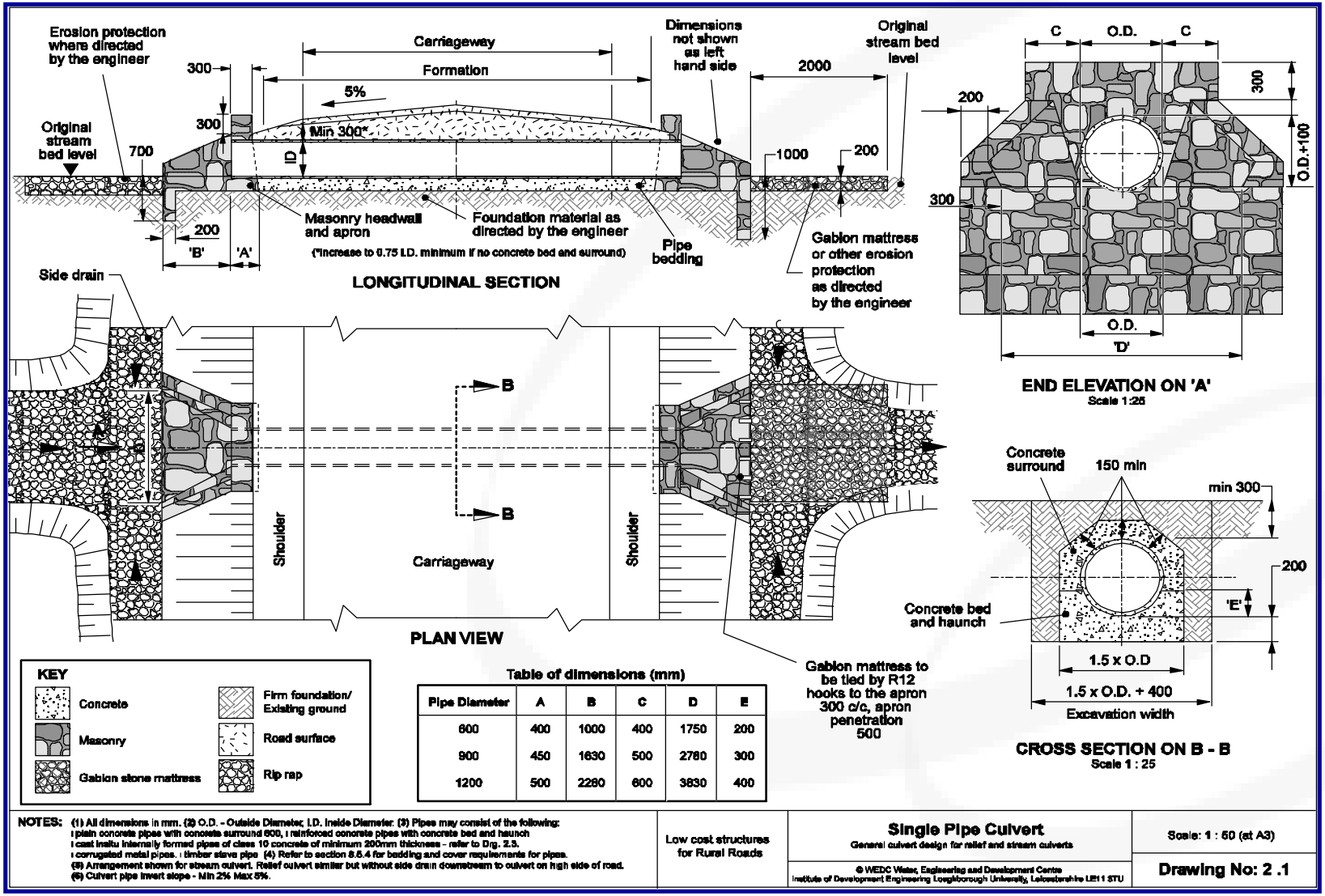


Table of dimensions (mm)

Pipe Diameter	A	B	C	D	E
600	400	1000	400	1750	200
900	450	1630	500	2780	300
1200	500	2280	600	3830	400

NOTES: (1) All dimensions in mm. (2) O.D. - Outside Diameter, I.D. Inside Diameter. (3) Pipes may consist of the following: i plain concrete pipes with concrete surround 600, i reinforced concrete pipes with concrete bed and haunch i cast insitu internally formed pipes of class 10 concrete of minimum 200mm thickness - refer to Dg. 2.3. i corrugated metal pipes. i timber stave pipe (4) Refer to section 8.6.4 for bedding and cover requirements for pipes. (5) Arrangement shown for stream culvert. Relief culvert similar but without side drain downstream to culvert on high side of road. (6) Culvert pipe invert slope - Min 2% Max 5%.

Low cost structures for Rural Roads

Single Pipe Culvert
General culvert design for relief and stream culverts

Scale: 1 : 50 (at A3)

Drawing No: 2 .1

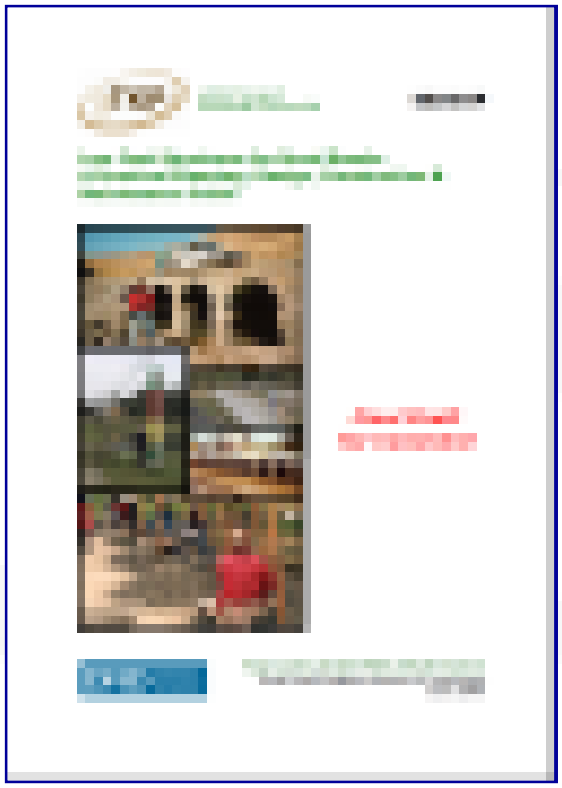
Low Cost Structures Guideline Status

Currently web posted in final draft format on gTKP website:

http://www.gtkp.com/sectors.asp?step=4&contentID=3319

Comments/contributions invited by 30 November 2009 latest

Final version to be web posted in January 2010



The Future

- **Challenge: to mainstream this knowledge**
- **Facilitate incorporation into local standards, specifications, training, academic courses and everyday agency practice and community awareness**
- **Arrange regular review and updates**

But don’t just ‘leave it on the shelf’!

Further Information

The following important dissemination forums are supporting Rural Roads & Transport knowledge:

global Transport Knowledge Partnership:
www.gtkp.com

AFCAP **Africa Community Access Programme**
www.crownagents.com/AFCAP/About-AFCAP.aspx
jeff.turner@afcap.org & **rgeddes@africaonline.co.zw**

IFRTD **www.ifrtd.org**

Further information may be obtained from the above websites and the gTKP Rural Transport Theme Champion:
rob.petts@gtkp.com

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