LOW VOLUME ROADS WORKSHOP
Napier, New Zealand, July 2009

Low Cost Structures Manual
Dr Paul Larcher - AECOM
Current Situation

- Basic road network is essential for economic development in low income countries.
- Roads often passable for 95% of their length, but impassable at a water crossings.
- Low volume road manuals usually only have a ‘chapter’ on structures.
- Proven materials options such as masonry, brick, timber are usually ignored.
Problems

- Insufficient attention has been paid to the use of local resources, proven materials and indigenous skills
- Locally trained engineers have often undertaken civil engineering courses based on European/US university syllabuses, standards & best practices.
- Lack of access to /availability of local ‘design data’
- No ‘standard’ designs
- Many structures poorly designed & constructed
- Limited resources not used effectively
Issues To Be Addressed

- Increasing the level of construction of low cost and readily maintainable structures on rural roads (spot improvement strategy)
- Increased workload for, local labour, artisans and contractors
- Increased use of local materials and demand on local suppliers and material manufacturers
- Introduce appropriate standards & specifications with alternatives to reinforced concrete
- Improved maintenance of structures
Requirements of the Manual

- The manual is aimed at private contractors and consultants, local government highways departments and other organisations involved in Low Volume Rural Road infrastructure provision.

- Credibility of the manual with potential users through the involvement of project partners:
  - TRL
  - IRF
  - gTKP
  - SEACAP

- Applicable worldwide – draft manual draws on case studies from 5 diverse countries

- All information contained in 1 manual (2 volumes design & drawings)
Aims of the Manual

- 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

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Low Cost Structures Manual – Dr. Paul Larcher
Volume 1 Design Manual

1. Introduction
2. Project Planning
3. Design Criteria
4. Structural Options
5. Site Selection and Appraisal
6. Watercourse Characteristics
7. Materials
8. Structural Design
9. Construction
10. Maintenance
Low Cost Structures Manual – Dr. Paul Larcher

Masonry Drift

Cement bound natural stone, alternative to concrete.

Low cost structures for Rural Roads

Drift warning sign to be placed on approaches 100m before drift.

Max flood level to be 5 or 10 year flood depending on road importance.

Top of drift to be at existing stream bed level.

Drift running width may be increased according to national standards.

NOTES: (1) All dimensions in mm.
(2) Dimension B: 1m - 1.5m depending on scour risk.
(3) Gabion downstream protection may be substituted by rip-rap.
(4) Guide stones to be painted white.
(5) Drift warning sign to be placed on approaches 100m before drift.
(6) Maximum flood level to be 5 or 10 year flood depending on road importance.
(7) Top of drift to be at existing stream bed level.
(8) Drift running width may be increased according to national standards.
NOTES: (1) All dimensions in mm. (2) O.D. - Outside Diameter, I.D. - Inside Diameter. (3) Pipes may consist of the following:
   - plain concrete pipes with concrete surround 600
   - reinforced concrete pipes with concrete bed and haunch
   - cast in situ internally formed pipes of class 10 concrete of minimum 200mm thickness - refer to Drg. 2.3
   - corrugated metal pipes.
   - timber stave pipe.
   (4) Refer to section 8.5.4 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%.
Next Steps

- Obtain practitioners comments on web published manual by October 2009
  
  Visit
  www.gtkp.com/sectors.asp?step=4&contentID=3319

- Review and incorporate comments into final published version of the manual

- Training / mentoring of local engineers

- Demonstration of standard designs

- Review of designs against national standards and specifications

- Review of engineering curricula
Further Information

The following dissemination forums support Low Traffic Volume Rural Roads (LVRR) knowledge in the REAAA region:

**global Transport Knowledge Partnership:**

www.gtkp.com

**SEACAP**

Southeast Asia Community Access Partnership:

www.seacap-info.org