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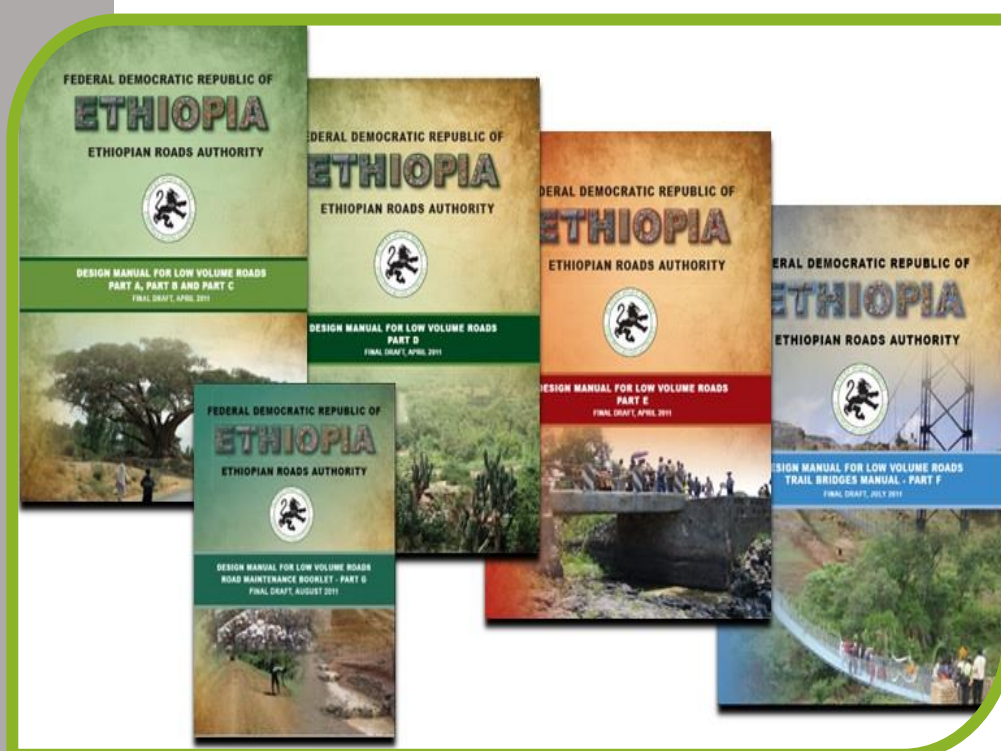


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Finalisation of the Design Manual for Low Volume Roads for the Ethiopia Roads Authority (ERA)

Report on Peer Group Meeting



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Cover Photo: Robert Geddes

<i>Quality assurance and review table</i>			
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Abstract

AFCAP is supporting the Ethiopian Roads Authority (ERA) in finalising the Low Volume Roads Design Manual, which was published in draft form in 2011. The assignment includes rectifying typing errors and incorrect cross-references throughout Parts A, B, C, D, E and G of the LVR Design Manual, responding to technical comments provided by users of the manual, and incorporating new technical content reflecting developments in LVR technology since 2011. The assignment includes the development of a new field maintenance handbook for use at the wereda level. The purpose of this report is to summarise key points and actions arising for the Peer Review Group meeting held in Addis Ababa from 24th to 26th February 2016 to discuss the first draft of the updated documents.

Key words

Low Volume Roads, Manuals, Maintenance, Ethiopia

Acronyms, Units and Currencies

AFCAP	Africa Community Access Partnership
ASCAP	Asia Community Access Partnership
billion	One thousand million
Birr	Ethiopian national current exchange rate US\$1 = 20.6 Birr
DFID	Department for International Development
ERA	Ethiopia Roads Authority
ERTTP	Ethiopia Rural Travel and Transport Programme
GDP	Gross Domestic Product
GPS	Global Positioning System
GTP	Growth and Transformation Plan
ILO	International Labour Organisation
Kebele	The smallest administrative division in Ethiopia
LCS	Low Cost Surfacing
LVR	Low Volume Roads
PIARC	World Road Association
RECAP	Research for Community Access Partnership
RRA	Rural Road Authority
RSDP	Road Sector Development Programme
UK	United Kingdom
UKAid	United Kingdom (Department for International Development)
URRAP	Universal Rural Road Access Programme
USD	United States Dollar
Wereda	The third level administrative division of Ethiopia, similar to district

Contents

Abstract	3
Key words	3
Acronyms, Units and Currencies	4
Executive Summary	6
1 Background	7
2 Research objectives	7
3 Process	8
4 Summary of Peer Review Group Discussions	8
4.1 Key Issues and Agreements	8
4.2 Route Selection and Geometric Design	8
4.3 Site Investigation and Materials	10
4.4 Pavement Design and Drainage	11
4.5 Maintenance of LVRs	12
4.6 Other Issues for Inclusion	12
Annex A: Attendance at Meeting	14

Executive Summary

AFCAP is supporting the Ethiopian Roads Authority (ERA) in finalising the Low Volume Roads Design Manual, which was published in draft form in 2011. Civil Design Solutions was appointed to manage the updating process.

The Consultant's Team Leader, Lead Authors and Expert Reviewer (Route Selection and Geotechnical Engineering) visited Addis Ababa from 23rd to 27th February 2016. The purpose of the visit was to attend a three day Peer Review Group meeting to present and discuss key proposed changes to the 2011 version of the manual. Each of the Lead Authors and the Expert Reviewer presented the changes in their area of responsibility and this was followed by a discussion period. The meeting was attended by the ReCAP Infrastructure Research Manager and the AFCAP Regional Technical Manager.

The feedback from the Peer Group was useful in affirming most of the proposed changes to the manual. Some key decisions were made, for example to include the DCP-DN method as an option for pavement design for Low Volume Sealed Roads. It was agreed that the Maintenance Manual (Part G) should include works specifications for each of the identified maintenance activities.

The Peer Group and associated team discussions led to a proposal to streamline the existing Parts B and D by combining these two Parts. This would make the manual more user-friendly and reduce printing costs. This proposal, including a detailed structure for the new design manual (Part B) has subsequently been submitted to ERA. It was also proposed that a new document covering the "Construction of Low Volume Roads" should be added to the manual as the new Part D and that the manual should be renamed the "ERA Manual for Low Volume Roads".

1 Background

The Africa Community Access Programme (AFCAP) is a programme of research and knowledge dissemination funded by the UK government through the Department for International Development (DFID). The first phase of AFCAP commenced in June 2008 and ended in July 2014. The second phase, which will also run for 6 years, commenced on the 1st August 2014. The management of AFCAP 2 is contracted by DFID to Cardno Emerging Markets, UK. The aim of the new AFCAP initiative, under the overall Research for Community Access Partnership (ReCAP) umbrella, is to build on the programme of high quality research established under AFCAP phase 1 and take this forward to a sustainable future in which the results of the research are adopted in practice and influence future policy.

As part of AFCAP 1, support was provided to Ethiopia through the Ethiopian Roads Authority (ERA). The support included the preparation of new design manuals, specifications, standard drawings and bidding documents for Low Volume Roads (LVRs) as well as the updating of the existing 2002 series of road design manuals for high volume roads and the development of a new Geotechnical Design Manual and Route Selection Manual.

The Design Manual for LVRs was published in draft form in May 2011 and distributed for use for a period of 2 to 3 years. An independent review was undertaken in October 2013 of the use of the new manual following which the draft manual was scheduled for updating as part of AFCAP 2.

Following meetings with ERA management during project scoping visits of 3-14 November 2014 and 23-27 March 2015 to identify priority projects for funding through AFCAP 2, it was agreed that there was an urgent need to start the process of updating and finalising the LVR Design Manual. It was agreed that this should be undertaken by the original drafting team of the manual.

The project team subsequently visited Addis Ababa from 17th to 19th November 2015. The purpose of the visit was to discuss the comments received from users of the manual and from the independent review of its use, which was carried out in 2013. Responsibility was assigned to each team member to effecting the agreed changes. The main agreements were presented to ERA at the conclusion of the visit (see Aide Memoire dated 2nd December 2015).

The first draft of the updated manuals was submitted to ERA in January 2016. These drafts were discussed at a three day Peer Review Group meeting in Addis Ababa from 23rd to 27th February 2016. Each of the Lead Authors and the Expert Reviewer presented the changes in their area of responsibility and this was followed by a discussion period. This report includes a summary of the key discussion points and agreements.

2 Research objectives

The objectives of the assignment are:

- To prepare a revised draft LVR design manual based on comments received for presentation to a Peer Review Group meeting to agree the proposed changes.
- To develop a new shorter, pocket-sized, site-friendly, pictorial supplement of the Maintenance manual (Part G) to complement Part G.
- To prepare a final draft based on comments from the Peer Review Group for final Executive Review by ERA.
- To prepare a final print-ready master document of the ERA Design Manual for Low Volume Roads (including the new development for Part G) that has been approved by ERA and representatives of the peer and executive review groups.

3 Process

The process for the updating of the LVR manual includes the following steps:

- Conversion of PDF files of existing manuals to MS Word (Parts A, B and D are complete)
- Redrafting of illustrations (in progress)
- Collecting replacement photographs (in progress)
- Review of road maintenance practice in the weredas (completed in October 2015 – see separate report)
- Review of comments collected by ERA on existing manuals (completed during visit of Lead Authors to Ethiopia in November 2015).
- Preparation of draft revisions to existing manuals (submitted to ERA in January 2016)
- Peer group meetings to review proposed changes (Feb 2016)
- Submission of final drafts to Executive Review Group (Due to be submitted in March 2016)
- Presentation to Exec Review Group (Planned for May 2016).
- Launch of manuals (Planned for July 2016).

4 Summary of Peer Review Group Discussions

4.1 Key Issues and Agreements

The key issues arising and agreements made during the Peer Review Group meeting are summarised below. It was agreed that if members of the group had any additional comments or contributions these should be sent to Eng Alemayehu or direct to the Team Leader Robert Geddes.

4.2 Route Selection and Geometric Design

(Wednesday, 24th February 2016, 09:00 – 12:30)

Subject	Key Issues Arising and Agreements
Route Selection in Mountainous and Escarpment Terrain and Unstable Terrain (Dr Gareth Hearn)	<ul style="list-style-type: none"> • The level of detail for route selection of LVRs: no change is required to the current draft. • Proper analysis of available data should be encouraged at the start of all projects. • It is important to select the best alignment when the road is first established because in future it will be more difficult to improve the alignment as traffic increases. But it is necessary to balance the cost and time of detailed design against the need to urgently construct more roads. It was agreed that time spent getting the alignment right was time well spent because poor decision making could have significant repercussions during construction, operation and later improvement. • The 2013 Route Selection Manual is now the reference document for route selection and the LVR Manual makes frequent reference to it. • The cost of the desk studies and investigations required to fully evaluate route options is probably no more than 5% of the construction cost. • It was suggested that ERA employ a geotechnical specialist to assess all new road alignments, including those on URRAP.

	<ul style="list-style-type: none"> • There was no disagreement that “Table D.2.2: Summary of Survey Requirements for Route Selection and Design”, should provide more direction on surveys to be undertaken; there should be a minimum standard for investigations. • The wereda environmental officer should be consulted on route selection with regard to environmental issues in order to ensure that local knowledge regarding ecology, biodiversity and other environmentally-sensitive issues is captured. • Change “Google earth” to “Google Earth” in Section D.2.2.
<p>Cut and Fill Slopes (Dr Gareth Hearn)</p>	<ul style="list-style-type: none"> • Table B5.15 – Recommended Cut Slopes – Rock: <ul style="list-style-type: none"> ○ Leave the Table as it is, including quoting slopes as vertical: horizontal. ○ The Table shows that, as the cut slope height increases, the specified excavation angle decreases. The ‘norm’ in ERA is to steepen cut slope angles as excavation depth increases. ○ Include guidance on benching. ○ Include more guidance on cut slopes in variable material. ○ Include guidance on when to seek expert advice. • Table B5.17 – Recommended Side Slopes for Standard Cross-Sections: for 1V:3H side slopes change the safety classification to “not recoverable” to “marginal”. • Check that 1:3 side slope recommended in Table B.5.17 is stable in accordance with Table B.5.16. • Delete following from the note below Fig B.5.10: “Retained full fill is shown here for convenience”. <p>A discussion was held outside of the meeting between Gareth Hearn and interested parties regarding cut slope height versus cut slope angle and it was accepted that the geotechnical and engineering logic should prevail. A note will be added to the manual to say ‘the final decision on design excavation angles should be made by the supervising (geotechnical) engineer during construction when materials are fully exposed’. Include advice on warning signs than might indicate an unsafe slope.</p>
<p>Minimum Geometric Design Standards, Maximum Gradients, including Super Elevation (Dr John Rolt)</p>	<ul style="list-style-type: none"> • The proposed new Table – “Components of Horizontal Alignment on Design speed for Paved Roads” was not opposed. The changes will appear in the next submission to go to the Review Panel. • Since there is consensus on maximum gradients, relief gradients and their lengths the Authors should include their best recommendation. • Incorporate guidance on linking vehicle speed before they reach the gradient and the maximum gradient.

	<ul style="list-style-type: none"> • “Table B4.2: Average Equivalency Factors for Different Vehicle Types”, is adequate, and should be left as it is. The alternative Table suggested, “No axle load information – 2-axle Trucks VEFs” could be incorporated. Include warnings about overloaded vehicles transporting primary products. • “Table B5.3: Increased ‘Shoulder’ Widths (Each Side) for Paved LVRs” Escarpment and mountainous – increase the shoulder widths to 1 metre for DC3 & 4. • “Table B5.3: Increased ‘Shoulder’ Widths (Each Side) for Paved LVRs” – Check the shoulder widths on DC2. See the notes after the Table. As it is a narrow road, it has wider shoulders to allow passing.
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4.3 Site Investigation and Materials

(Wednesday, 24th February 2016, 14:00 – 17:00)

Subject	Key Issues Arising and Agreements
Design of Retaining Walls (Dr Gareth Hearn)	There were no objections to the proposed changes to the manual.
Use of Gabion Walls, Dry Stone Walls and Mortared Stone Walls (Dr Gareth Hearn)	<ul style="list-style-type: none"> • There were no objections to the proposed changes to the manual, but more specific advice should be included where possible. • Standard Specification 3405 refers to dry stone walls, and is included in the Standard Drawings (W-04C). • Dry stone walls should only be used as erosion protection, not for structural purposes. Standard details and specifications for dry stone walls are contained in the ERA documents and the maximum permissible height is 1.5m. • Review dry stone walls in Part E and the ERA Specifications and review the guidance in Part D. • Check gabion details in Part E (e.g. location of filter fabric).
Bio Engineering Methods (Dr Gareth Hearn)	There were no objections to the proposed changes to the manual.
Expansive Soils (Mike Pinard)	<ul style="list-style-type: none"> • Countermeasure B (page 210), item 6.21.3, bullet 5: Ensure minimum earthworks cover of ... add DC4 (i.e.: DC3 and DC4). • Add another variable of paved vs unpaved, in terms of countermeasures.

	<ul style="list-style-type: none"> • Expansive Soils – Degree of Expansion, Figure D.2.1: Guide to Collapsibility and Expansion ...: look for additional information of where the vertical lines are. • Table – Expansive soils – Countermeasures. Leave Table as is.
<p>Additions to Materials Specifications for DN Design Method</p> <p>(Mike Pinard)</p>	<p>There were no objections to including these additions to the manual.</p>

4.4 Pavement Design and Drainage

(Thursday, 25th February 2016, 09:00 – 12:30)

Subject	Key Issues Arising and Agreements
<p>DCP-CBR Method for New Roads and DCP-CBR Method for Upgrading an Existing Road</p> <p>(Dr John Rolt (JR))</p>	<ul style="list-style-type: none"> • There were no objections to the proposed additions to the manual. • JR to prepare a revised flow chart on new road design.
<p>DCP-DN Method for Sealed Roads</p> <p>(Mike Pinard)</p>	<p>It was agreed that the DCP-DN should be in the main manual rather than as an annex. The use of the alternative methods can be compared over a period of time.</p> <p>The use of the DN method is increasing in the region and has been seen to give better results than the CBR method because it does not include the step of converting DN values to CBR. However the CBR and DN catalogues are effectively interchangeable using the conversion formula.</p> <p>The design worked example should be included in an annex.</p>
<p>Other pavement issues</p>	<p>Remedial methods for collapsible soils should be included. The detail required is not contained in Part D.</p>
<p>Storm Design Return Period and Climate Change Precautions</p> <p>(Rob Geddes)</p>	<ul style="list-style-type: none"> • There were no objections to the proposed additions to the manual. • Clarify the use of the “check flood” in Table B.8.3.

<p>Design Procedure for Fords (Rob Geddes)</p>	<ul style="list-style-type: none"> • There was no objections to including the ford design procedure in the manual. • It was request to make the minimum culvert pipe size 900mm, as this is what is being used in Ethiopia. (Check Part E).
<p>Use of Cut-Off Drains (Dr Gareth Hearn)</p>	<ul style="list-style-type: none"> • There were no views expressed on whether there was sufficient detail on cut-off drains. • Remove the reference to stilling basins. • Consider moving some of the explanatory text from Part B to Part D.

4.5 Maintenance of LVRs

(Friday, 26th February 2016, 09:00 – 10:30)

Subject	Key Issues Arising and Agreements
<p>Restructuring of Part G and the New Maintenance Field Guide (Rob Petts)</p>	<ul style="list-style-type: none"> • There is poor motivation for maintenance to the politicians who control the budgets; motivations are too technical; the implications of poor maintenance needs to be expressed in a language understood by politicians. • The increased state budget contribution in RSDP V for maintenance to supplement the Road Fund shows political commitment to future maintenance in Ethiopia. • More guidance is required on how to identify defects – training will be required, and demonstration of good practice. • Consider transferring ownership of local roads to community committees and away from wereda administrations. • Poor design of drainage for initial construction cause unnecessary maintenance problems later. • The Wereda Maintenance Field Guide must be in A5 format. • Part G: Include a specification for maintenance with new coding system specifically for this manual and related to low volume roads. The specifications must include minimum materials qualities. • Detailed guidance on the organisation of maintenance will not be included in the manual. • Asset management is a separate issue and is not included. • Include maintenance intervention periods.

4.6 Other Issues for Inclusion

(Friday, 26th February 2016, 11:00 – 12:30)

Subject	Key Issues Arising and Agreements
Road Safety on Low Volume Roads (Mike Pinard)	<ul style="list-style-type: none">• Trees too close to the road, traffic mix and high speeds are key road safety issues in Ethiopia.• Village treatment should be included in the manual (as per Tanzania manual)• Section D.6.6.3: traffic counts for LVRs should include NMT.
Life Cycle Costing (Mike Pinard)	This should be included in the LVR manual.

Annex A: Attendance at Meeting

The table below includes a list of people attending the Peer Review Group meeting.

ERA LVR Manuals updating- peer review group meetings Wednesday, 24 to Friday 26 February 2016, Capital Hotel, Addis Ababa - Attendance Register											
Delegate Information							Session				
	Title	Name	Position Held	Organisation	E-mail	Telephone	1	2	3	4	5
1	Eng	Rob Geddes	Team Leader	Civil Design Solutions	rgeddes@cdsafrika.com	+263 4708624	✓	✓	✓	✓	✓
2	Dr	John Rolt	Lead Author	Freelance	j.rolt@sky.com	+44 11 89788482	✓	✓	✓	✓	✓
3	Eng	Nkululeko Leta	Regional Technical Manager	AFCAP	nkululeko.leta@cardnouk.com	+27 76 995 6241	✓	✓	✓	✓	✓
4	Eng	Mike Pinard	Lead Author	Infra Africa Consultants Botswana	mipinard@global.bw	+267 71311629	✓	✓	✓	✓	✓
5	Eng	Dawit Tisabu	P Engineer	ERA	dawitenu@yahoo.com	+251 924 338750	✓	✓	✓	✓	✓
6	Eng	Ezra Mersha	Highway Engineer	AEC	aecethiopia@gmail.com	+251 911 505419	✓				
7	Eng	Nuru Dawud	Senior Staff Ass.	ERA	nurudawud@yahoo.com	+251 973 991082	✓	✓	✓	✓	✓
8	Eng	Abebe Assefa	Team Leader	ERA	abebeassefa2000@gmail.com	+251 912 616703	✓		✓		
9	Ato	Mohammed A	DDG ERA	ERA	mhabdol13@gmail.com		✓				
10	Eng	Alemayehu Ayele	Research Director	ERA	alem.nhm@gmail.com	+251 911 638033	✓	✓	✓	✓	✓

Finalisation of the ERA Design Manual for Low Volume Roads

11	Mr	Les Sampson	Infrastructure Research Manager, ReCAP/ASCAP	AFCAP PMU	les.sampson@cardno.uk.com	+27 82 447 2641 +251 912 384146	✓	✓	✓	✓	✓
12	Dr	Gareth Hearn	Engineering Geological Specialist	Hearn Geoserve Ltd	garethjhearn@gmail.com	+44 7905 457333	✓	✓	✓	✓	
13	Eng	Bezawit Tesfaye	Director, Central Region, ERA	ERA	zebawit@yahoo.com	+251 911 670414	✓		✓		
14	Eng	Genet Wolde	Bridge Engineer	Private Consultant	genetwezg@yahoo.com	+251 911 485973	✓		✓		