



Technical Assistance Consultant's Report

Project Number: 51115-001
February 2021

Democratic Republic of Timor-Leste: Baucau to Viqueque Highway Project

DRBFC Manuals for Operations

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For Ministry of Planning and Finance, Development Partnership Management Unit; and
Directorate of Roads, Bridges and Flood Control

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Asian Development Bank



MINISTRY OF PUBLIC WORKS



TA-9502 TIM: BAUCAU TO VIQUEQUE HIGHWAY PROJECT

7 DRBFC MANUALS FOR OPERATIONS

Reference No. TIM 51115 - 001
Prepared for Asian Development Bank



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Preface

This document is prepared to guide the development of the road network in Timor Leste and achieve the key road sector objectives included in the Strategic Development Plan 2011-2030. It is the outcome of a technical assistance (TA) funded by the ADB to support the Government of Timor Leste in this effort. The TA was designed to develop the following:

- Output 1a: Integrated national road network strategy and plan.** Support will be provided to DRBFC to draft a comprehensive national road network strategy and plan that will encapsulate the following: (i) 20-year capital investments and operation and maintenance (O&M) strategy, (ii) organizational reform plan to implement the strategy; (iii) defined levels of service (LOS) expected from the national road network that will include communication mechanism to the public for feedback and performance measurement; (iv) asset management plan linked to an appropriate asset management system to support network prioritization and intervention thresholds; (v) an operational manual and training for planning, budgeting, procurement, supervision, and monitoring and evaluation, and (vi) operational plan targeting development of national road contracting and consulting industry, human resources and capacity development, and financing instruments to support private sector participation. Suitable policy instruments would be considered to integrate the draft strategy and plan in the wider context of Transport Sector Master Plan currently under review and endorsement by the Government.
- Output 1b: Concept design for a sustainable road maintenance program.** This output will build on road maintenance initiatives by donors including ADB, JICA, European Union and the Roads for Development program financed by the Government of Australia to deliver (i) a draft policy paper to introduce Road Maintenance Fund; and (ii) a design for donor-supported 10-year road maintenance and operation program. An initial concept proposal for the program has been shared with the government and development partners, and broad support has been received (see attachment 1). An extensive stakeholders' consultations and high-level policy dialogue will need to take place to draft the policy paper and the program suitable for donors' technical and financial support.

This document provides an executive summary of the output of this work. It presents the key recommendations for the sustainable development and maintenance of the road network and it will hopefully serve as a reference and guideline in formulating the Government of Timor Leste's future road sector strategies and plans. The list of reports summarized here in order are:

OUTPUT	DELIVERABLE
1	Road Subsector Assessment
2	Road Investment and Maintenance Strategy
3	Maintenance Program 2020-2030
4	Road Maintenance Fund Policy Paper
5	Organizational Reform Plan
6	DRBFC Training Program
7	DRBFC Manuals for Operations
8	Road Asset Management Plan
9	Levels of Service
10	Operational Plan for National Industry

The TA's conclusions and recommendations are based on the professional judgement and views of the TA consultants derived through a series of seminars, workshops, and consultations with various government agencies and offices, under the overall guidance received from the Ministry of Public Works, the Ministry of Finance and the Asian Development Bank.

The team is grateful for the support and information provided to it by the various units within the DRBFC and other government ministries.

Executive Summary

1. This study is undertaken as part of the ADB Technical Assistance project TA-9502 TIM Baucau to Viqueque Highway Project. Fieldwork for the study was undertaken during August 2019.

Scope and Objective

2. The scope of the study is limited to routine, periodic, rehabilitation and emergency maintenance of National and Municipal roads, bridges, and flood control. The scope excludes Rural Roads managed by R4D program, and the design and construction of major road and bridge development projects.

3. The objective of the study is to formulate a process to develop a DRBFC Operations Manual, using a combination of existing Guidelines and Manuals and development of new Manuals where required, through leadership and active involvement of DRBFC staff, assisted by Donor funded Subject Matter Experts.

Fieldwork

4. The methodology adopted for Fieldwork consisted of:

- Interviews with DRBFC Department Heads and Section Heads on the manuals and guidelines available for the tasks and activities they are responsible for, and the level of usage of such Manuals.
- Collecting the Manuals that have been prepared or that are currently being prepared, on behalf of DRBFC and MPW, which were not available with the interviewed personnel.
- Preliminary review of the existing Manuals to assess improvements needed to make them suitable for the activities involved in Program Development and Management, Project Development, Procurement, Construction Management, and Handover.
- Where a Manual does not exist for any key activity, nominating an appropriate international Manual that can be used as the basis for developing a Manual for DRBFC.

Key Findings

5. The assessment of the existing manuals and guidelines identified the following key findings:

- Sixteen (16) Guidelines and Manuals are available covering most of the activities undertaken by DRBFC in: Project Development; implementation; handover; and, maintenance. Only one of these (Standard Specifications 2014) has been formally issued as a Final version. The status of others, whether final or draft, is not clear.
- Critical activities for which a Manual is not available are: Program Development and Management; Road Safety in Project Development; and, Procurement (Rehabilitation Works). Three (3) new Manuals could cover these activities.
- Some of the available Manuals and Guidelines are used by DRBFC Departments. Most widely used is the Standard Specifications (White Book) intended for contract quality management and used for that purpose, but also wrongly used for design reviews and other activities. Some of the Manuals and Guidelines are dormant with most staff in DRBFC unaware of their existence.
- A system for document control, including revision management and distribution of controlled copies, was not witnessed.
- The Maintenance Department uses a set of standard bid documents, spreadsheets and drawings to assist planning and procurement of routine and periodic maintenance contacts. These have been developed by a combination of in-house and an external consultant inputs.

Way Forward

6. The following organisation structure and methodology is proposed in the development and implementation of the DRBFC Operations Manual, in order to maximise the DRBFC involvement.

- Director, DRBFC to provide the leadership.
- A Steering Committee consisting of Department Heads to provide high level guidance.

- Six (6) Working Groups in various subject areas to be responsible for review, updates, and finalising Sub Manuals. Each Working Group to consist of Four (4) Section Heads led by one (1) Department Head.
- Subject Matter Experts to be commissioned by the Donor Agencies to assist in development of Sub Manuals but not to take the lead role.
- Department of Training and Cooperation to be responsible for collating the Sub Manuals to progressively form the DRBFC Operations Manual, and for document control including management of periodic revisions.
- Implementing the use of the DRBFC Operations Manual to be undertaken through a number of 'Champions' who are conversant with the subject areas in Sub Manuals, and willing to assist others in their use.

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1 Introduction

7. The objectives of this document are to:

- Prepare an inventory of the manuals and guidelines available in the DRBFC for maintenance of National, Municipal roads, for routine, periodic, rehabilitation and emergency maintenance, and for bridge rehabilitation. The manuals and guidelines used for the activities of the complete life cycle from Program Development and Management, Project Development, Implementation, and Handover are considered.
- Preliminary review of the available manuals and guidelines to assess the adequacy and appropriateness (fit for purpose), in comparison with standard practices, and recommend improvements.
- Identify activities for which manuals or guidelines are not available, and recommend appropriate international manual or guideline to be adopted.

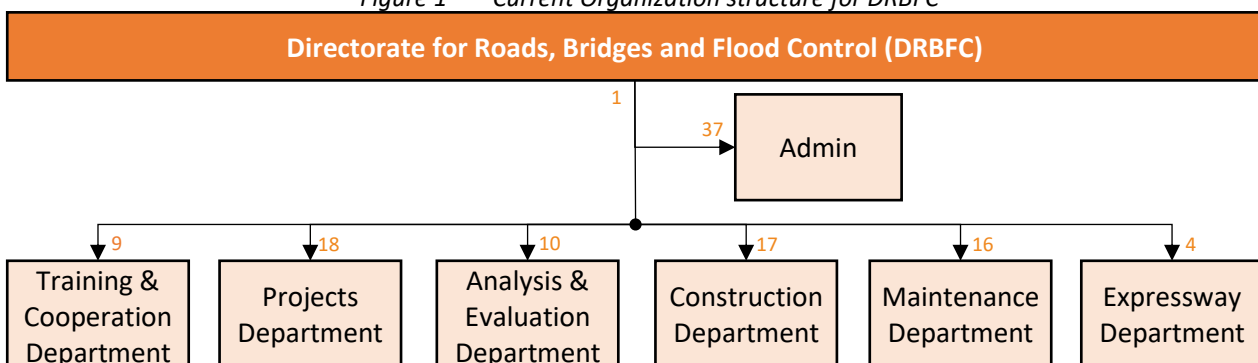
8. The scope of this document will be limited to:

- National and Municipal Roads.
- Routine, periodic, rehabilitation and emergency maintenance.
- Document reviews and recommendations made will be preliminary only. Detailed reviews and detailed recommendations will need to be undertaken as the next stage.

9. Maintenance of rural roads is excluded, as the R4D Program has developed a comprehensive set of guidelines and standards. Also, a review is underway to consolidate these documents into an Operations Manual for Rural Roads management. Any gaps, overlaps, and inconsistencies are to be identified and rectified through this process. Design and construction of major road and bridge development projects is also excluded.

10. The current organisation structure of the DRBFC, and the activities undertaken by each of the Departments is listed in Figure 1. Deliverable 3 under this assignment, Organisational Reform Plan, will propose a new organisation structure. However, the key tasks and activities of the DRBFC is expected to remain same in the foreseeable future, therefore the recommendations from this report will be applicable irrespective of the proposed organisation structure.

Figure 1 Current Organization structure for DRBFC



2 Existing Manuals

11. The existing manuals, guidelines and other related documents for DRBFC Operations were sourced from:

- DRBFC Maintenance Department
- DRBFC Projects Department
- Capacity Development of Road Services (CDRS) for DRBFC Project by Japan International Cooperation Agency (JICA)
- National Development Agency (ADN)
- National Laboratory of the Ministry of Public Works

12. Table 1 below lists the manuals, guidelines, and standards available against the project lifecycle tasks undertaken by the DRBFC. There are a total of 16 existing manuals and guidelines that are described in the following sections.

- 1) Road Geometric Design Standards
- 2) Slope Protection Guideline
- 3) Road Guidelines – Slope Protection – Landslide Investigation
- 4) Road Guidelines – Slope Protection – Retaining Wall & Slope Collapse
- 5) Pavement Design Manual
- 6) Road Guidelines – Drainage – Culvert Design
- 7) Bridge Design Standards & Manual
- 8) Rural Roads Environmental Safeguards Manual
- 9) Social Safeguards for Rural Road Works
- 10) DRBFC Department of Maintenance Guide Manual
- 11) DRBFC Department of Maintenance - Standard Bid Documents
- 12) Contract Administration Manual
- 13) Standard Specifications, MPWTC
- 14) Laboratory Testing Guidelines
- 15) Performance Based Maintenance Works Specifications

13. For each manual / guideline an overview is provided in the following sections based on a preliminary review of the document, looking at the following aspects:

- Issue details
- Contents
- Referenced International standards
- Current level of usage (based on the interviews with the target users)
- Suggested improvements
- Similar International Manuals (where applicable)

Table 1 Existing Manuals for DRBFC Operations

MAIN ACTIVITY	SUB-ACTIVITY	EXISTING MANUALS & STATUS
Program Development and Management	<ul style="list-style-type: none"> • Program development using RAMS outputs, Visual Surveys • Project prioritising for reliability, safety, asset preservation. • Strategic planning to minimise network life cycle cost. • Program Reviews: Budget, expenditure, forecast, earned value • Program issues on environment, safety, social safeguards. • Reporting to senior management and other Ministries 	<ul style="list-style-type: none"> • No Manual
Project Development	<ul style="list-style-type: none"> • Geometric Design 	<ul style="list-style-type: none"> • Road Geometric Design Standards, July 2010. Under MPW and SKM names. Not formally issued.
	<ul style="list-style-type: none"> • Slope Protection Design including Retaining Walls - Investigation, Testing and Design 	<ul style="list-style-type: none"> • Road Guidelines – Slope Protection – Landslide Investigation (CDRS JICA – Working Draft) • Road Guidelines – Slope Protection – Retaining Wall & Slope Collapse (CDRS JICA - Final Draft) • Slope Protection Guideline 2008. Under MPW name, prepared by JICA.
	<ul style="list-style-type: none"> • Pavement Design – Condition assessment, traffic data analysis, Geotechnical investigation and materials and testing, Design 	<ul style="list-style-type: none"> • Pavement Design Manual, 2008 • Above document is under MPW name, prepared by JICA. Not formally issued. Main document in English. Appendices in Bahasa Indonesia.
	<ul style="list-style-type: none"> • Drainage and Culvert Designs – hydrological and hydraulic designs, structural designs. 	<ul style="list-style-type: none"> • Road Guidelines – Drainage – Culvert Design (CDRS - JICA - Final Draft)
	<ul style="list-style-type: none"> • Bridge Rehabilitation Condition Assessment and Designs 	<ul style="list-style-type: none"> • Bridge Design Standards & Manual, October 2012. Under the names MPW and SKM. Not formally issued.
	<ul style="list-style-type: none"> • Review of Environmental Factors, Mitigation measures, Environmental Licences, Environmental Management Plans 	<ul style="list-style-type: none"> • Rural Roads Environmental Safeguards Manual April 2018. Draft. (Prepared by Australian Aid and ILO)
	<ul style="list-style-type: none"> • Review of social impacts, Mitigation measures, Social safeguards plan, Community liaison, Resettlement 	<ul style="list-style-type: none"> • Social Safeguards Framework for Rural Road Works, 2018. Draft (Prepared by Australian Aid and ILO)
	<ul style="list-style-type: none"> • Road Safety in design 	<ul style="list-style-type: none"> • No Manual
Procurement	<ul style="list-style-type: none"> • Tender document preparation - Contract conditions, scope definition, technical specifications, BoQ • Tendering – Pre-qualifications, Types of tenders, Pre-tender and Post tender activities, Tender Evaluation, Contract Award. 	<ul style="list-style-type: none"> • DRBFC Department of Maintenance Guide Manual 2015 (Not formally issued) • DRBFC Department of Maintenance - Standard Bid Documents 2016 (Not formally issued) • No Manual for procurement of Rehabilitation Projects.

MAIN ACTIVITY	SUB-ACTIVITY	EXISTING MANUALS & STATUS
Contract management	<ul style="list-style-type: none"> Quality Management – Earthworks, Base & Subbase, Bituminous and Concrete Surface Courses, Bridge construction, Drainage and Slope Protection Structures, Bio Engineering, Routine Maintenance, Measurements for Payment, Traffic Management Environmental Safeguards. Social Safeguards, Health & Safety 	<ul style="list-style-type: none"> Standard Specifications, November 2014. Final. Issued by Director Public Works. Replaces 'Road and Bridge Technical Specification 2005'. (generally referred to as 'White Book') Pavement Guide, 2008 This document is under MPW name, prepared by JICA. Not formally issued. Executive Summary in English, main document in Bahasa Indonesia.
Contract Administration	<ul style="list-style-type: none"> Pre-construction meetings, Progress Payment Certification, Scope and Cost Variations, Contract correspondence, Practical Completion, Defects Management, Final Completion 	<ul style="list-style-type: none"> DRBFC Contract Administration Manual, March 2016. Draft.
Laboratory Testing	<ul style="list-style-type: none"> Soil, Aggregate, Cement, Concrete, and Asphalt Testing. 	<ul style="list-style-type: none"> Soil Testing Manual 2008 Concrete and Aggregate Testing Manual 2008 Asphalt Testing Manual, 2008. Geo Guide 2008. The above 4 documents are under MPW name, prepared by JICA. Not formally issued. Executive Summary in English, main document in Bahasa Indonesia.
Performance Based Contracts	<ul style="list-style-type: none"> Surveillance on Levels of Service compliance, Payment deductions for non-compliances 	<ul style="list-style-type: none"> Performance Based Maintenance Works Specifications
Project Handover	<ul style="list-style-type: none"> Works - As-Executed drawings, RAMS Update, Operations & maintenance manuals, Asset Handover to relevant Authority 	<ul style="list-style-type: none"> DRBFC Contract Administration Manual, March 2016. Draft.

2.1 Road Geometric Design Standards

ASPECT	DETAILS
Issue Details	Prepared in 2010 under the names of Ministry of Infrastructure, and SKM (consultant that prepared the document under an ADB TA). Not formally issued.
Contents	<ul style="list-style-type: none"> • Summary of the standards and design criteria including management of deviations from standards • Guidance in road management, preliminary design considerations, identification of potential alignments in the route corridor, survey requirements (based on TRL Overseas Road Note 5, 2005) • Criteria affecting the selection of the geometric design values including road hierarchy, functional classification; terrain considerations; density and character of adjoining land use; design traffic volume and design speed. • Cross sectional elements including lane widths, shoulders, cross fall, side slopes and back slopes, roadside ditches, clear zones, and right-of-way. • Sight distance, formulae and application of both stopping and passing sight distances. • Horizontal alignment including tangent sections, curves, and superelevation. • Vertical alignment, crest and sag curves, sight distances, maximum and minimum gradients, climbing lanes, and vertical clearances. • Phasing between horizontal and vertical design, problems with mis-phasing. • Earthwork quantities and the mass haul diagram. Optimizing alignment to minimize costs. • At-grade junctions, design requirements, selection of junction type, T-junctions, cross junctions and roundabouts; sight distances; turning lanes and traffic islands. • Design of safety rest areas and scenic overlooks, bus lay-by and parking bays, parking lanes, public utilities, railway grade crossings, safety barriers and emergency escape ramps. • Pavement marking different types, principles of application and material specifications.
Referenced International Standards	<ul style="list-style-type: none"> • Overseas Road Note 5 - A guide to road project appraisal, Department for International Development, UK.
Current level of usage	Used by the DRBFC's Projects Department – Design Section, for review of designs provided by Contractors.
Suggested Improvements	<ul style="list-style-type: none"> • Include a Summary of Road Design Standards for National and Municipal road hierarchies. • Provide additional details for urban roads, e.g. Intersection details. • Formalise the document status by issuing for use by Director General, Public Works.
Similar International Manuals	<ul style="list-style-type: none"> • Overseas Road Note 5 - A guide to road project appraisal, Dept for International Development, UK.

2.2 Guidelines for Slope Protection and Retaining Wall Designs

ASPECT	DETAILS
Issue Details	<p>There are 3 Guidelines on this, one in Final version and two in Draft stage as follows:</p> <ul style="list-style-type: none"> • Slope Protection Guideline, 2008, Issued by the Ministry of Infrastructure, Public Works. Prepared by JICA. Final Version. • Road Guidelines – Slope Protection – Landslide Investigation, 2019 (CDRS - JICA – Working Draft). • Road Guidelines – Slope Protection – Retaining Wall & Slope Collapse, 2019 (CDRS - JICA - Final Draft).
Contents	See Table 2
Referenced International Standards	<ul style="list-style-type: none"> • International Organization for Standardization - ISO.
Current level of usage	<ul style="list-style-type: none"> • The Road Guidelines – Slope Protection – Retaining Walls and Slope Collapse (Final Draft) is used by the DRBFC's Projects Department – Design Section, for review of designs provided by Contractors. • The Slope Protection Guideline, 2008, which is in Final version, is being kept in ADN, and DRBFC is not aware of this document. • The Road Guidelines – Slope Protection – Landslide Investigation, (Working Draft) includes the results of the investigation on Aituto Landslide in Ainaro Municipality in an Appendix.
Suggested Improvements	<ul style="list-style-type: none"> • Investigate the possibility of combining these three Guidelines to a single Manual that can be used for Design and Construction of slope stability treatments including retaining walls (Gabion, Masonry, Reinforced Concrete, and Reinforced Earth). • Include retaining wall design component of 'Bridge Design and Standards Manual' into above document.
Similar International Manuals	<ul style="list-style-type: none"> • Guide to Road Slope Protection, 2007 – Philippines (Prepared by JICA).

Table 2 Guidelines for Slope Protection and Retaining Wall Designs

SLOPE PROTECTION GUIDELINE	ROAD GUIDELINES – LANDSLIDE INVESTIGATION	ROAD GUIDELINES – RETAINING WALL & SLOPE COLLAPSE
<ul style="list-style-type: none"> • Review of the existing condition: Network condition, Physiography, Lithology and Stratigraphy, Tectonic and Seismicity, Climate, soil and rock movement, • Survey & Investigation: Scope of survey; Desk study; Reconnaissance survey; Topography survey; Geotechnical survey; Hydrology and Drainage survey. Slope failure survey. • Slope Stability Analysis: Modes of failure; Causes of soils mass movement; Factor of Safety; Slope stability analysis methods; Selection of analysis method; Stability analysis charts. • Stability of Embankment and out slope: Stability of cut slopes; Stability of embankment slopes; Rock falls and avalanches; Riveting with wire mesh; Vegetation cover, Rock fall barrier. • Design of slope protection: Methods of slope protection; Selection of slope protection methods; Unloading method; Design and construction of retaining structures; Soil reinforcement. • Design of Gabion Retaining Structures: Loads imposed by backfill; Coefficient of pressure; Earth pressure due to surcharge; Criteria for stability analysis; Soil reinforcement gabion type; Design criteria for Gabion structures. • Maintenance of slope protection: Scope of maintenance; Maintenance of drainage system; Activities of drainage maintenance. 	<ul style="list-style-type: none"> • Definition of the term “landslide” • What is a Landslide Warning Signs? • Flow chart of landslide investigation • Preliminary investigation: Topographic investigation; Interpretation of aerial photographs; Reconnaissance survey; Geological surface mapping • Detailed investigation; Simple method to measure movement; Drilling works; Confirmation of the surface of rupture by Inclinator measurement. • Analysis of mechanism of the landslide: Development of Geological profile; Slope stability analysis • Counter-measures for landslide prevention 	<ul style="list-style-type: none"> • Investigation (Minimum Required Information for Design): Ground Shape: Geological Information. • Design of Gravity Retaining Wall: Design Procedure; Each step of the procedure; Active Earth Pressure by Backfill; Foundation. • Gravity Retaining Wall in the Common drawings; Shape of the Walls; Result of stability calculation; Over-turning Condition; Sliding Condition; Bearing Capacity Condition. • Bearing Capacity; Terzaghi’s Ultimate Bearing Capacity; Influence of shear strength for ultimate bearing capacity; Influence of front side slope for ultimate bearing capacity; Step Cut Foundation • Slope; Classification of Slope; Natural Slope; Cut Slope; Embankment Slope; Embankment Body; Boundary between embankment and foundation ground. • Slope Disaster; Classification of Slope Disaster; Principle of Slope Disaster Countermeasure; Representative Countermeasure • Slope Stability Calculations: Calculating Formula; Calculating Conditions; Soil Characteristics; Excel worksheets for slope stability calculations. • Influence of factors in slope stability calculation formula; Slope Gradient; Shear Strength; Ground Water. • Design Example of Countermeasure against Shallow Slope Collapse

2.3 Guidelines for Pavement Design

ASPECT	DETAILS
Issue Details	Pavement Design Manual 2008. Prepared for MPW by JICA. Not formally issued.
Contents	<ul style="list-style-type: none"> • Introduction: Purpose; Scope; References; Definitions; Design aspects and policy; Pavement design system. • Environment: Environment factors; Moisture environment; Temperature environment. • Subgrade: General; Specifications of subgrade soils; Factors to be considered in estimating subgrade support; Field determination of subgrade CBR; Adoption of presumptive subgrade CBR values; Subgrade failure criterion; Subgrade classification; Representative subgrade moisture content; Classifying design subgrade strength. • Pavement Materials: Granular materials; bituminous materials. • Design Traffic: Axle configurations and equivalencies; Design lane; Design period; Traffic growth; Calculation of design traffic. • Construction and Maintenance Considerations: Extent and type of drainage; Availability of equipment; Use of staged construction; Use of stabilisation; Environment and Safety constraints; Social considerations. • Problems in Soil Conditions: United Soil Classification System; AASHTO Soil Classification System; Soil condition problems in road construction. • Design of Flexible Pavement for New Road: Design variables; Performance criteria; Material properties for structural design; Flexible pavement structural characteristics; Components of flexible pavement structure; Design of structural thickness – design parameters, thickness design formula. • Rehabilitation of Bituminous Pavement: Pavement evaluation; Rehabilitation design methods; Rehabilitation options; Methods to prevent reflective cracking. • Bituminous Surfacing: Function and factors affecting bituminous surfacing; Factors to be considered in selecting bituminous surfacing types; Types of bituminous surfacing; Sand sheet; Asphaltic concrete; Hot rolled Asphalt; Penetration Macadam. • Gravel Roads: Design principles; Material requirements; improved subgrade and pavement design.
Referenced International Standards	<ul style="list-style-type: none"> • American Association of State Highway and Transportation Officials (AASHTO), • Indonesian National Standards - SNI • International Organization for Standardization - ISO.
Current level of usage	The document was obtained through ADN. Not used by the DRBFC's Projects Department – Technical Support or Design Sections, for design briefs or review of designs provided by Contractors.
Suggested Improvements	<ul style="list-style-type: none"> • The Guideline is targeted to DRBFC level of designs and include pavement designs for both new roads and road rehabilitation. • Include sections on the: design of lime and cement stabilised pavements; design of rigid pavements. • Exclude sections on 'Construction' as they duplicate with MPW's Standard Specifications.

2.4 Guidelines for Drainage and Culvert Design

ASPECT	DETAILS
Issue Details	Road Guidelines – Drainage – Culvert Design, Final Draft stage, September 2018. Prepared for DRBFC - CDRS by JICA.
Contents	<ul style="list-style-type: none"> • Planning: Selection of structure; Overview of culverts; Application of culverts; Alignment of culverts; Design process. • Data Collection: Basic site investigation; Topographical investigation; Cartographic investigation; Rainfall data. • Rainfall Analysis: Classification of roads; Return period; Preparation of rainfall data; Frequency analysis; Synthetic procedure. • Design Flood: Catchment area; Watercourse properties; Time of concentration; Intensity of rainfall; Coefficient of runoff; Rational method. • Open-channel hydraulics: Material of culverts; Size of culvert; Geometry of culverts; Design capacity of culverts; Type of flow. • Protection Works: Inlet protection; Outlet protection; Selection and detailing of protection measures.
Referenced International Standards	<ul style="list-style-type: none"> • International Organization for Standardization - ISO.
Current level of usage	Used by the DRBFC's Projects Department – Design Section, for review of designs provided by Contractors.
Suggested Improvements	<ul style="list-style-type: none"> • The Guideline is targeted to DRBFC level of designs. The method of short duration rainfall calculations based on empirical method, and the recommendation for short duration rainfall data collection at existing weather stations are appropriate. • Provide spreadsheet or software that can be conveniently adopted for each of the design steps. • Provide reinforcing details for typical sections of box culverts, when reinforced concrete is used for their construction. • Finalise and formal issue by DRBFC for use.

2.5 Bridge Design Standards & Manual

ASPECT	DETAILS
Issue Details	Under the names of Ministry of Infrastructure, and SKM (consultant that prepared the document under an ADB TA). Not formally issued.
Contents	<ul style="list-style-type: none"> • Introduction: Appropriate Design for Timor Leste conditions; Basic Design Principles; Stages of Design; Loads and Load configurations; Document management. • Materials: Steel; Concrete; Reinforcing steel; Prestressed concrete. • Bridge Form and Design Considerations: Typical bridge forms and bridge elements; Methods of construction; Bridge geometric requirements; Bridge bearings – pot bearings, spherical bearings, metal rocker bearings, roller bearings, bearing installation process; Expansion joints; Foundations and substructures; Retaining walls; Safety barriers and fences; Drainage on bridge deck. • Design process: Design stages; Investigation process; Conceptual design phase; Schematic design process; Detailed design phase; Road clearance for bridges; Hydraulic analysis; Hydrological study; Standard structural depths of bridge superstructures; Procedure for bridge structure analysis; Abutment designs; Pile foundations; Design of piers; Retaining wall design; Loads; Traffic barriers; Reinforced concrete box culverts;
Referenced International Standards	American Association of State Highway and Transportation Officials (AASHTO) Standards.
Current level of usage	Used by the DRBFC's Projects Department, Design Services Section, for review of designs submitted by Contractors, prior to sending them to MPW's Procurement Directorate.
Suggested Improvements	<ul style="list-style-type: none"> • Focus more on the design and construction of bridge rehabilitation works, and minor bridges (such as Bailey bridges) as these are the main functions of DRBFC. Design and Construction of any major bridges will involve competent designers and contractors, whose functions are beyond the scope of this document. • Change the name of the Manual to 'Bridge Rehabilitation Manual'. Include: project selection; survey, investigation, design, construction, and, maintenance phases. • Provide more details on repair of common bridge defects such as: replacement of bearings and expansion joints; repairs to scouring; repairs to damaged bridge barriers, hand rails; bridge deck re-surfacing. • Include safety controls including: typical safe work method statements; traffic control plans. • Include environmental controls including protection of waterways. • Separate out the section on retaining walls so that it can be incorporated under slope stability protection. • Separate out the section on culverts, so that it can be incorporated under drainage structures.
Similar International Manuals	<ul style="list-style-type: none"> • There are several bridge manuals available in the Internet from developed countries such as New Zealand, US, and Canada. A cursory review of a few of them indicated that they at a higher level than that will be appropriate for use in Timor Leste.

2.6 Environmental Safeguards Manual

ASPECT	DETAILS
Issue Details	Rural Roads Environmental Safeguards Manual, April 2018. Draft Prepared for DRBFC by Australian Aid and ILO. Version Status: Draft – Not signed off by the Director DRBFC.
Contents	<ul style="list-style-type: none"> • Project Phases and Environmental Safeguards Overview: Environmental Screening; Environmental Licensing; Environmental Compliance. • Application of Environmental safeguards: Project characteristics and Environmental Category; Environmental Licensing Procedure- EIA for Category A projects, IEE for Category B projects. • Enforcement and Monitoring – Environmental Management and Monitoring Plan (EMMP). • Operational Procedures and standard forms and guide documents.
Referenced International Standards	None
Current level of usage	Used by the DRBFC's Rural Roads Program.
Suggested Improvements	<ul style="list-style-type: none"> • Change the focus of the projects to rehabilitation, periodic and routine maintenance of roads and bridges. • Change focus of Operating Procedures, targeting medium sized contractors. • Add new Operating Procedures to include activities for rehabilitation and periodic maintenance. E.g. bituminous surface treatments (asphalt, spray seals).

2.7 Social Safeguards Manual

ASPECT	DETAILS
Issue Details	Social Safeguards Manual for Rural Road Works, 2018. Draft. Prepared for DRBFC by Australian Aid and ILO. Version Status: Draft – Not signed off by the Director DRBFC.
Contents	<ul style="list-style-type: none"> Rural Roads Social Safeguards Provisions: Standard Social Safeguards Provisions; Social Risk Mitigation Measures. Social Safeguards and Rural Roads Project Cycle: Social Screening and Analysis in Road Selection and Design; Social Safeguards Facilitation in Bidding Process; Social Safeguards Compliance during Implementation Standard forms and guides. Phases and Environmental Safeguards Overview: Environmental Screening; Environmental Licensing; Environmental Compliance.
Referenced International Standards	None
Current level of usage	Used by the DRBFC's Rural Roads Program.
Suggested Improvements	<ul style="list-style-type: none"> Change the focus of the projects to rehabilitation, periodic and routine maintenance of roads and bridges.

2.8 DRBFC Department of Maintenance Guide Manual

ASPECT	DETAILS
Issue Details	<p>Issued by: Department of Maintenance, DRBFC</p> <p>Issued in: 2016 (Revised)</p> <p>Version Status: Draft – Not signed off by the Director EPCC</p>
Contents	<p>List of Contents include: Introduction, Organization Structure, Function and coverage Areas, Manuals and Guidelines, Staffing, Facilities, Operational cost, Maintenance Works Budgeting, Asset Inventory and Condition Surveys (Roads, Bridges and Flood Control Structures), Communication and coordination, Jobs Descriptions, Maintenance Contract Implementation Guidelines.</p> <p>The Manual can be separated into following parts based on the contents, though they are not strictly in this sequence:</p> <ul style="list-style-type: none"> • The importance of road maintenance, the needs of the Maintenance Department, in terms of staff numbers, facilities, and recurrent operational budget. • Organisation structure and the job descriptions of key staff. • Procurement: types of contracts, when to use them, financial limits, • List of maintenance activities, a very brief specification, units of measurements, current contract rates (range).
Referenced International Standards	None
Current level of usage	Used within the DRBFC's Maintenance Department, by the Head of MD, and Regional Section Heads.
Suggested Improvements	<ul style="list-style-type: none"> • Include objectives of road and bridge maintenance • Include typical defects and repair methods. This is addressed to some extent in 'Maintenance Contract Implementation Guidelines' however needs to be further expanded to include methodology and materials, with references to 'White Book'. • Include Management of Environment, Safety, Social Safeguards, Incidents. (Refer to White Book).
Similar International Manuals	<ul style="list-style-type: none"> • Routine Maintenance Manual, January 2009. South African National Roads Agency Limited (SANRAL).

2.9 DRBFC Department of Maintenance - Standard Bid Documents

ASPECT	DETAILS
Issue Details	<p>Issued by: Department of Maintenance, DRBFC</p> <p>Issued in: In use since 2016</p> <p>Version Status: Not a single document, but a collection of documents and spreadsheets, therefore needs updating as required.</p>
Contents	<ul style="list-style-type: none"> • Spreadsheet for planning routine and periodic maintenance: Strip maps for each National Road indicating current or planned upgrades; routine and periodic maintenance planned for National and Municipal roads; contract packaging; summary of budgets needed. • DRBFC maintenance planning and budget cycle. • Bidding Documents: Instructions to Bidders; Bid data; Bid submission forms; Employer's requirements; Conditions of Contract; Contract Forms; Drawings. • Standard forms of contract for the different types of Contracts: Routine Maintenance Depot (RMD); Routine Maintenance Private – using Community resources (RMP/C); Yearly Maintenance Contract (YMC); Multi Year Maintenance Contract (MYMC) – Routine Maintenance Only, Routine & Periodic Maintenance; Emergency Maintenance Contract (EMC) – Direct Approach, Quotation.
Referenced International Standards	None
Current level of usage	Used for two of the maintenance contracts prepared and awarded in 2017 (Multi Year) and 2018 (One Year).
Suggested Improvements	<p>The set of documents are considered 'fit for purpose' for the level of contract work undertaken by the Department of Maintenance. Improvements could be:</p> <ul style="list-style-type: none"> • Planning the road maintenance, particularly periodic maintenance, based on RAMS information. • Introduce a priority ranking for projects based on: Safety; Reliability; Asset Preservation; Vehicle Operating Costs/Rider comfort. • Improving cost estimation through more realistic historical contract costs. • Reference to the relevant parts of 'White Book' for periodic maintenance, as the specifications under 'Works Requirements' are not deemed adequate for contract management. • Include requirements for Environment, Safety, Social Safeguards, and Incidents.

2.10 Contract Administration Manual

ASPECT	DETAILS
Issue Details	Issued by: DRBFC Issued in: March 2016 Version Status: Draft. No evidence that the document is being progressed towards a Final version.
Contents	<ul style="list-style-type: none"> • Administration and Staff responsibilities: Project Manager, Project Engineer, Surveyor, Works Supervisor, Design Engineer, Geotechnical / Materials Engineer, Materials Technician. • Contractual Obligations: Basic contractual concepts; Project Manager's Approvals and Directions; Drawings; Schedules and Programs; Measurement of Work; Control of Contractor's Sub-contractors; Reports and Records. • Delegations, File System, Feedback from the Project, Contract Register, Contractual Correspondence • Project commencement; Issue of drawings and other documents; Approval of subcontractors. • Site instructions; daily Diaries and reports; Handover book. • Quality Control – Field Inspections; Survey checks; Photographs • Quality Audits; Site Meetings and Minutes; General Meetings • Monitoring of progress; Financial Progress Monitoring; Progress reports • Measurement and certification of quantities; Interim payments • Issues; Variations; Extensions of time; Contractual claims and disputes • Dayworks; Works-As-Executed Drawings; Contract Completion; Completion report.
Referenced International Standards	
Current level of usage	No evidence of use within the DRBFC Departments of Construction or Maintenance.
Suggested Improvements	The document contains the essential elements of contract administration. Following improvements are suggested: <ul style="list-style-type: none"> • Align the contract management staff position names with the Conditions of Contract (i.e. 'Engineer' in FIDIC) or provide a table of reference to that effect for different s Conditions of Contract in use. • Progress the document to a Final Version signed off by DRBFC and implement its use.

2.11 Standard Specifications

ASPECT	DETAILS
Issue Details	Issued by: Director of Public Works Issued in: November 2014 Version Status: Final, signed off by the Director General, Public Works.
Contents	<ul style="list-style-type: none"> • General: Summary of work; Mobilisation; Contractor’s Field Offices and facilities; Engineer’s Office and accommodation; Vehicles for Engineers; Laboratory testing services; Transportation and handling; Traffic management and safety; Field engineering (site inspections and setting out); Reference standards; Materials and storage; Construction schedules; Cleaning; Environmental safeguards; Relocation of utilities and services. • Earthworks: Clearing and grubbing; Removal of structures and obstructions; Excavation; Structure excavation; Embankment; Subgrade preparation; Overhaul. • Subbase and Base course: Aggregate subbase course; Unsealed Road base; Crushed aggregate base course; Lime stabilised road mix base course; Portland cement stabilised road mix base course; Asphalt stabilised road mix base course; Portland cement Treat Plant Mix base course; Aggregate stockpile. • Surface Courses: Aggregate surface course; Bituminous Prime coat; Bituminous tack coat; Bituminous Seal coat; Bituminous surface treatment; Bituminous Penetration Macadam; Bituminous Road Mix Surface Course; Bituminous Plant Mix Surface Course; Bituminous Surface Course, Cold Laid; Bituminous Plant Mix (Stockpile Maintenance Mixture); Bituminous Concrete Surface Course, Hot-Laid; Portland Cement Concrete Pavement. • Bridge Construction: Piling; Railings; Timber Structures; Metal Structures; Reinforcing Steel; Structural Concrete; Prestressed Concrete Structures; Concrete Structures; Steel Bridges; Welded Structural Steel; Treated and Untreated Timber; Bearings; Paint. • Drainage and Slope Protection Structures: Pipe Culverts and Storm Drains; Under Drains; Manholes, Inlets and Catch Basins; Cleaning and Reconditioning Existing Drainage Structures; Riprap and Grouted Riprap; Stone Masonry; Hand-laid Rock Embankment; Sheet piles; Concrete Slope Protection; Gabions; Shotcrete Batter Protection. • Miscellaneous Structures: Curb and/or Gutter; Sidewalk; Monuments, Markers and Guide posts; Guardrails; Fencing; Road Signs; Pavement Markings; Reflective Pavement Studs; Topsoil; Reflectorized Thermoplastic Pavement Markings; Moisture Barrier; Reinstatement of Existing Pavement; Reinstatement of existing shoulders and sealed roads; Reinstatement of existing bridge structures. • Bioengineering: Nursery establishment, operations, management and plant production; Provision of seed collection and hardwood cuttings; Slope protection; Miscellaneous structures; Site planting; Sprigging; Sodding; Site protection, aftercare and maintenance. • Materials Details: Hydraulic Cement; Construction lime (Hydrated); Bituminous materials; Aggregates; Mineral Filler; Masonry units; Joint materials; Concrete, clay, plastic and fibre pipe; Metal pipe; Concrete curing materials and admixtures; Paints; Reinforcing steel and wire rope; Fence and guardrail; Structural metal; Treated and untreated timber; Water. • Dayworks: Dayworks – Material and equipment, Execution of Daywork, Measurement and Payment. • Routine Maintenance Works: Routine maintenance of pavement, shoulder, drainage, road furniture and bridges; Maintenance of adjacent roads and bridges.
Referenced International Standards	Some references are made to ‘American Association of State Highway and Transportation Officials (AASHTO) Standards’ however this not consistent.
Current level of usage	Commonly known as the ‘White Book’. Replaces the previous version of ‘White Book’ – Road and Bridge Standard Specifications 2005. Used as Technical Specifications of road rehabilitation contracts, managed by Contracts Department of DRBFC.
Suggested Improvements	A preliminary review indicated following potential improvements: <ul style="list-style-type: none"> • A clear statement of the target users - whether this is a technical specification for inclusion in contracts or whether this is a document to be used for program and project development by Client. If it is for technical specifications, then the document needs to be able to be separated

ASPECT	DETAILS
	<p>out into chapters aligning with contract activities, so that only those relevant to a contract need to be issued.</p> <ul style="list-style-type: none"> • The main chapters need to be structured to align with the road asset classes or the main road construction and maintenance activities. For example, the Chapter - Miscellaneous Structures includes: Road furniture, signs, lines and pavement markings – which can be separated to one chapter (Road Safety Facilities). Also, same Chapter includes Road pavement and shoulder repair – which should be in the Chapter – Routine Maintenance Works (which can be re-named ‘Road Maintenance’ to include routine, periodic and specific maintenance). • Include separate Chapters for: Environmental Management; Social Safeguards Management; and, Occupational Health and Safety Management. The contents on these critical aspects are deemed inadequate with insufficient emphasis of their importance. • Some erroneous references were identified which needs correcting. Eg. Lime and cement stabilised base courses: The specified contents of lime (4 to 10% - page 63) and cement (6 to 10% - page 66) are deemed too high for tropical climates, where 6% by dry soil mass is generally the maximum for both materials. • Some inconsistent references were identified which needs consistent referencing. Eg.in the Bituminous Surface Treatment sections, terminology is confusing between ‘Asphalt’, ‘Asphalt Cement’ , and ‘Bituminous Concrete’. Suggest terminology consistent with AASHTO. • Some of the sub sections can be consolidated. E.g. a number of the bituminous surface treatments can be consolidated to standard treatments of: penetration macadam, bituminous spray sealing, and, asphalt concrete (hot and cold mix).
<p>Similar International Manuals</p>	<ul style="list-style-type: none"> • Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects, US Department of Transportation, Federal Highway Administration.

2.12 Laboratory Testing Guidelines

ASPECT	DETAILS
Issue Details	<ul style="list-style-type: none"> • Soil Testing Manual 2008 • Concrete and Aggregate Testing Manual 2008 • Asphalt Testing Manual, 2008. • Geotechnical Investigation Guide 2008. <p>Above Manuals and Guide were prepared for MPW by JICA in 2008. They have not been formally issued. The Executive Summary of these documents are in English, and the main body of the documents are in Bahasa Indonesia.</p>
Contents	<ul style="list-style-type: none"> • Soil Testing Manual: Natural Water Content (Moisture Content) Test; Specific Gravity Test; Atterberg Limits (Liquid Limit, Plastic Limit, Shrinkage Limit); Laboratory CBR Test; Particle Size Distribution; Organic Matter Content Test; Standard Compaction Test; California Bearing Ratio (CBR) Test; Direct Shear Test; Unconfined Compressive Strength Test; Triaxial Compressive Strength Test (Stress / Strain; Cohesion, Friction Coefficient). • Concrete and Aggregate Testing Manual: Cement Testing; Compressive Strength of Hydraulic Cement Mortar; Aggregate Testing: Sieve Analysis; Unit weight and voids; Specific Gravity and water absorption (Coarse and Fine aggregates); Los Angeles Abrasion; Organic content (fine aggregates); Friable particles test; Mineral aggregate test; Concrete slump test; Concrete compressive strength test; Concrete hammer test. • Asphalt Testing Manual: Asphalt penetration; Asphalt Softening Point; Asphalt Ductility; Asphalt Fire Point; Asphalt Specific Gravity; Asphalt Solubility; Asphalt Viscosity; Weight reduction by Thin Film Oven Test; Marshall Stability Test; Dynamic Cone Penetrometer (DCP); In-situ CBR Test.
Referenced International Standards	<ul style="list-style-type: none"> • American Association of State Highway and Transportation Officials – AASHTO. • Indonesian National Standards – SNI. • American Society for Testing and Materials - ASTM.
Current level of usage	<p>Discussions with the Chief Testing Manager of the MPW's National Laboratory revealed:</p> <ul style="list-style-type: none"> • They are unaware of the above Manuals. • Currently there is no Laboratory Testing Manual for the National Laboratory. • A list of tests for soils, aggregates, cement, concrete, and Asphalt were provided (Appendix 1). • Most of the tests are done for a fee for construction contractors. The samples are made by the contractors and brought to the National Laboratory for testing. Eg. For concrete compressive strength, the cylinders are cast by the contractors and brought to the Lab for testing crushing strength at 7 and 28 days. The quality assurance related to sampling is the responsibility of the contract supervision team, not the National Laboratory. • Test methods are based on AASTO as it is the standard used in the contract specifications. • Equipment are calibrated annually, by an Indonesian company. • There is no National Accreditation system for laboratories similar to, say, Papua New Guinea, PNGLAS (Papua New Guinea Laboratory Accreditation Scheme).
Suggested Improvements	<ul style="list-style-type: none"> • Consider the appropriateness of the language for the Manuals, whether Bahasa Indonesia, one of the National Languages, or English. • Use more commonly used standard terminology. Eg. Instead of Natural Water Content Test, use Moisture Content Test in Soil Testing Manual. • Take out the DCP and In-situ CBR from Asphalt Testing Manual and include in Soil Testing Manual. • Prepare a Laboratory Testing Manual for the tests currently undertaken by the National Laboratory (Appendix 1), based on the above three Manuals. • As samples for testing are made by the contractors who bring them into the Laboratory for testing, specify a requirement in the Laboratory Testing Manual, for quality assurance of sampling, by introducing a Hold Point to be released by the Contract Supervision Engineer. • Consider introducing a National Accreditation System for Materials Testing Laboratories.

2.13 Performance-Based Maintenance Works Specifications

ASPECT	DETAILS
Issue Details	Part of the Specifications of World Bank funded Dili – Ainaro road, Lot2, which comes into effect after the end of the Defects Liability Period, for a period of 3 years.
Contents	General Specifications; Specifications of Service Quality Criteria; Output Carriageway Maintenance; Roadside Maintenance; Road Roughness; Methods of Inspections of Service Quality Levels; Procedures for Inspection and Evaluation of Service Levels; Means used for Inspections; Methodologies for evaluation of conditions of pavement.
Referenced International Standards	<ul style="list-style-type: none"> IRI – International Roughness Index as a KPI.
Current level of usage	Used by the Project Management Unit (PMU) of MPW for contract management of the 22 km Lot 2 of Dili – Ainaro road, which is under a Performance Based Maintenance Contract for a duration of 3 years.
Suggested Improvements	None

3 Required New Manuals

14. The assessment of the existing manuals also identified the need for 3 new manuals that are required. These are described in the following sections.

3.1 Program Development and Management

3.1.1 Deliverables under this Technical Assistance Project

15. A number of Deliverables under this TA can be used to provide the vital information for Road Asset Management Program Development. These will include:

- Road and bridge asset inventory and condition data.
- Road hierarchy based on traffic, connectivity and economic considerations.
- Deterioration models for periodic maintenance and rehabilitations.

3.1.2 Similar International Manuals

16. The Following International Manuals can be used to form the basis for the proposed new Manual.

- Road Transportation Asset Management Guidelines, June 2013, Road Controlling Authorities Forum, New Zealand.
- Operational Guidelines for District Roads Maintenance, December 2014, The United Republic of Tanzania.
- Chapters 2 and 3 of Routine Road Maintenance Manual, 2009, by South African National Roads Agency Limited (SANRAL). These chapters discuss methods of minimising life cycle cost.

3.1.3 Adapting existing Manuals to develop new Manual

17. In order to develop the new Manual, extensive work may be required to harmonise the outputs and recommendations from this TA, with contents of similar International Manuals. The objective of program development should be to maintain the levels of service whilst minimising the whole of life cost of the road and bridge asset, however the key constraints in achieving this needs to be balanced when selecting projects. Most of these constraints are discussed in detail in other Deliverables of this TA, including budget constraints, contractor capacity, lead times in procurement and payment, skills shortages etc.

18. The project selection and prioritisation criteria should be appropriate for local conditions, where reliability and safety should be given prominence over asset preservation and ride quality.

3.2 Project Development: Road Safety in Design

3.2.1 Appropriate International Manuals

19. Following Manuals can be used to provide parts of the required information and specifications for the proposed new Manual.

- Guide to Road Design Part 6: Roadside Design, Safety and Barriers, 2010, by Austroads. This document includes designs for roadside safety including clear zones and barriers.
- Chapter 4 – Road Safety, Routine Road Maintenance Manual, 2009, by South African National Roads Agency Limited (SANRAL). This document includes role of signs and road markings in road safety.

3.2.2 Adapting existing Manuals to develop new Manual

- Road Geometric Design Guide (2.2) covers determination of design speed based on road environment, and geometric parameters for horizontal and vertical alignments based on sight distances for determined design speed. For existing roads, where major realignments may be cost prohibitive, the design speeds and other road safety considerations should be consistent with existing alignment. The information from Geometric Design Guide can be used to specify design speeds and other safety requirements where existing alignments are to remain as is.
- Roadside safety, signs and lines are covered by the two Manuals listed above.

- Safety reviews (audits) at completion of concept and detailed designs, and the incorporation of recommendations from them, should be included in the Manual.

3.3 Procurement of Contracts

3.3.1 Appropriate National and International Manuals

20. Following Manuals can be used to provide parts of the required information and specifications for the proposed new Manual.

- Procurement Best Practice Guide 2: Tender Specification Planning and Writing. Ministry of Finance, Government of Timor Leste. This document includes the essential attributes of a technical specification, however does not include specific details related to procurement of road contracts.
- Procurement Best Practice Guide 3: Tender Processes and Tender Documents. Ministry of Finance, Government of Timor Leste. This document includes: procurement methods based on financial limits (MPW responsibility); and, tendering and tender evaluation (NPC responsibility).

21. The above two Guides are written for procurement in general, not focussed on road or bridge projects.

- DRBFC Department of Maintenance Guide Manual 2015 (revised)
- DRBFC Department of Maintenance - Standard Bid Documents (2016)

22. The above two Guides are written for procurement of routine and periodic maintenance, not for larger rehabilitation works.

3.3.2 Adapting existing Manuals to develop new Manual

23. Some of the information from above four manuals will be useful to include in new proposed Procurement Manual. However, there are several areas that need to be improved, and some of these are:

- Including stringent requirements in Tender Documents for: Occupational Health and Safety including traffic management, Safe Work Method Statements; Environmental Management including erosion and sedimentation control, containment of spills, dust and noise control.
- When and how to include Special Conditions of Contract, and deviations to Standard Specifications.

4 Structure of DRBFC Operations Manual

24. From the assessments in previous Sections, there are 16 Guidelines and Manuals that are available for DRBFC Operations. These can be used to form parts of an overall DRBFC Operations Manual, after required improvements, some of which are listed under the review of each of the existing Guidelines and Manuals as 'Suggested Improvements'.

25. There are some DRBFC operations for which Manuals are not available, and four new Guidelines or Manuals are proposed for these operations in Section 3. Appropriate similar international Guidelines or Manuals that can be adapted for DRBFC use are suggested, after a preliminary review on available international Manuals.

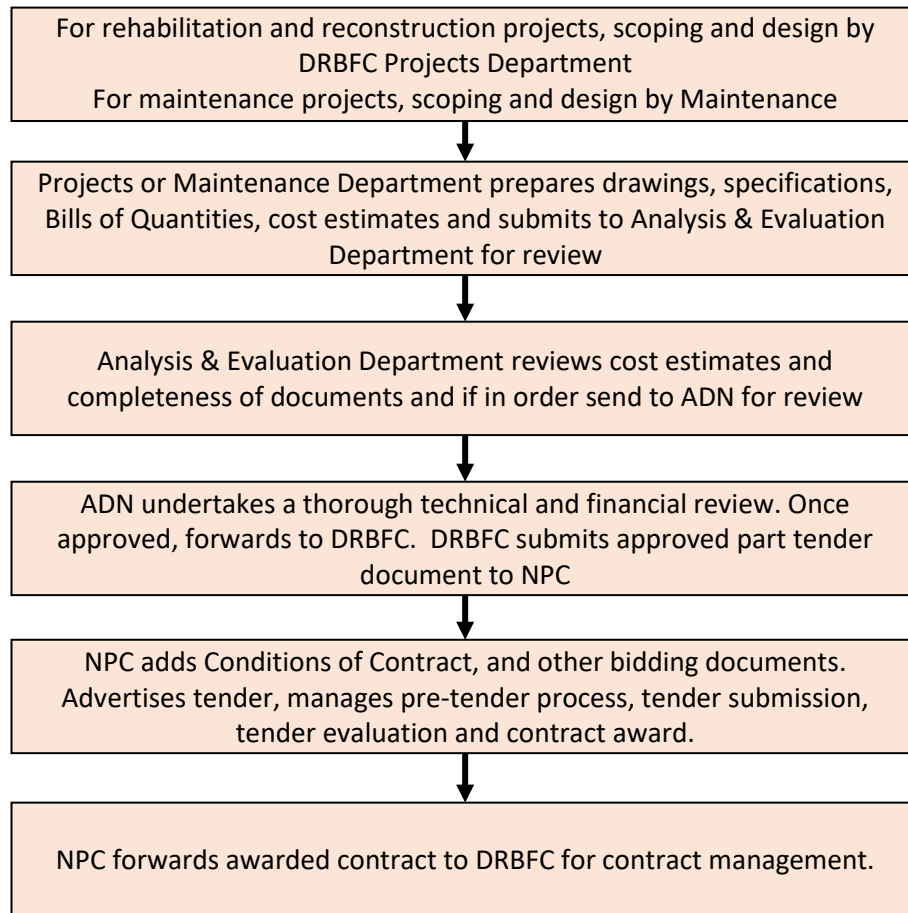
26. The following Sub-Manuals are proposed to form the DRBFC Operations Manual, based on the existing and new Manuals stated above.

Table 3 Proposed Structure of DRBFC Operations Manual

#	SUB-MANUAL	BASE DOCUMENTS	ACTIONS REQUIRED
1	Program Development & Management		
1.1	Program Development & Management	<ul style="list-style-type: none"> Road Transportation Asset Management Guidelines, 2013, NZ Operational Guidelines for District Roads Maintenance, 2014, Tanzania Routine Road Maintenance Manual, 2009, South Africa 	<ul style="list-style-type: none"> Project selection criteria based on reliability, safety, asset preservation to minimise life cycle costs, and ride quality Forward programming consistent with budget and contractor resource constraints using RAMS data, road priority ranking, deterioration modelling, and project selection criteria Program management by monitoring / reporting on outputs, targets, expenditure, budget Amend applicable methodologies from Base Documents to suit TL conditions
2	Project Development		
2.1	Road Geometric Design	<ul style="list-style-type: none"> Road Geometric Design Standards, 2010. MPW/SKM 	<ul style="list-style-type: none"> Include Road Design Standards for National and Municipal roads Provide additional design details for Urban roads including intersections
2.2	Road Pavement Design	<ul style="list-style-type: none"> Pavement Design Manual 2008. MPW/JICA 	<ul style="list-style-type: none"> Include design of stabilised pavements and rigid pavements Exclude sections on construction as they duplicate with MPW Standard Specifications
2.3	Drainage Design	<ul style="list-style-type: none"> Road Guidelines – Drainage – Culvert Design 2018. MPW/JICA 	<ul style="list-style-type: none"> Provide templates for design calculations where applicable for user convenience Provide structural detailing or design methodology for box culverts
2.4	Slope Protection Design	<ul style="list-style-type: none"> Slope Protection Guideline, 2008. MPW/JICA Slope Protection – Landslide Investigation, 2019. MPW/JICA Slope Protection – Retaining Wall & Slope Collapse, 2019. MPW/JICA 	<ul style="list-style-type: none"> Combine 3 Base Documents into a single Manual Include design of retaining walls - Gabion, Masonry, Reinforced Concrete, and Reinforced Earth
2.5	Bridge Rehabilitation Design	<ul style="list-style-type: none"> Bridge Design Standards & Manual, 2012. MPW/SKM 	<ul style="list-style-type: none"> Focus on bridge rehabilitation works and minor bridges including: replacement of bearings and expansion joints; bailey bridges, scour repair and river training, etc. Focus on safety and environmental controls Exclude sections on retaining walls and culverts to avoid duplication with other Sub-Manuals
2.6	Road Safety Facilities	<ul style="list-style-type: none"> Guide to Road Design Part 6: Roadside Design, Safety and Barriers, 2010, Austroads, Australia Routine Road Maintenance Manual, 2009, SANRAL, South Africa 	<ul style="list-style-type: none"> Extract from the two Base Documents intervention requirements for guardrails, guideposts, signs, lines and markings Include safety audits during design

#	SUB-MANUAL	BASE DOCUMENTS	ACTIONS REQUIRED
3	Project Procurement		
3.1	Procurement Manual	<ul style="list-style-type: none"> • Procurement Best Practice Guide 2: Tender Specification Writing. MOF • Procurement Best Practice Guide 3: Tender Processes and Tender Documents. MOF • DRBFC Department of Maintenance Guide Manual 2015 • DRBFC Department of Maintenance - Standard Bid Documents 2016 	<ul style="list-style-type: none"> • Combine the applicable sections of the four base documents to form a DRBFC Procurement Manual • Flowchart indicating current procurement process involving MPW, ADN and NCP as per Figure • Requirements for: Work Health and Safety, Environmental and social safeguards • Special Conditions of Contract and deviations to Standard Specifications
4	Contract Management		
4.1	Contract Administration	<ul style="list-style-type: none"> • Contract Administration Manual, 2016, DRBFC 	<ul style="list-style-type: none"> • Include contractor progress certification process involving ADN as per Figure 3 • Include provisions for administering Quality Assurance contracts including review and approval of contractor's management plans for quality, safety, environmental and social safeguards • Include requirements for contractor compliance to Work Health Safety and Environmental regulations (for Quality Control type contracts) • Include requirements for Road Safety & Traffic Management
4.2	Environmental and Social Safeguards Management	<ul style="list-style-type: none"> • Rural Roads Environmental Safeguards Manual, 2018, DRBFC • Social Safeguards Manual for Rural Road Works, 2018, DRBFC 	<ul style="list-style-type: none"> • Change the focus from Rural Road projects to National and Municipal road maintenance projects • Change focus of Operating Procedures to medium sized contractors • Add Operating Procedures for rehabilitation and periodic maintenance projects
5	Project Handover		
5.1	Project Handover	<ul style="list-style-type: none"> • Contract Administration Manual, 2016, DRBFC 	<ul style="list-style-type: none"> • Include requirements for RAMS update, contractor performance reporting, archiving Works-as-Executed Drawings

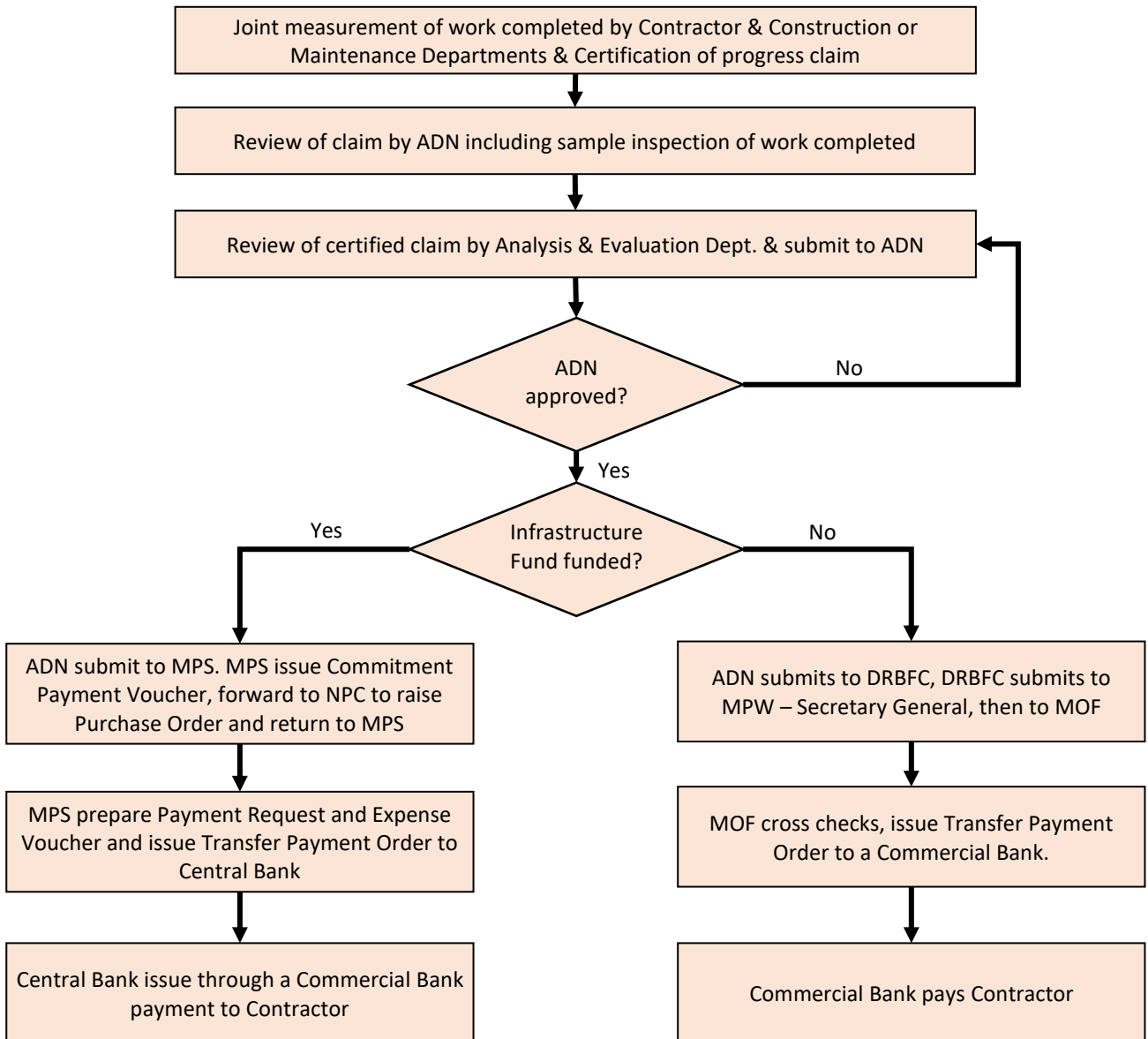
Figure 2 Contract Procurement Process



Note: Most of the recent projects in DRBFC have been limited to Emergency Works, which do not require to follow the above procurement process.

Note: With the establishment of the Infrastructure Fund in 2011, following Government institutions were set up for its management: CAFI - Council of Administration for the Infrastructure Fund, MPS - Major Projects Secretariat to provide technical and administrative support to CAFI, ADN – National Development Agency for detailed technical and financial review of capital development projects, and NPC – National Procurement Commission to provide procurement services for major infrastructure projects.

Figure 3 Contractor Progress Payment Process



5 Development of DRBFC Operations Manual

5.1 Improving DRBFC Involvement

27. From the reviews undertaken on existing Manuals, indications are that during the development of some of them, there was lack of consultation with relevant DRBFC staff, which may be the reason why some of them are not used, and that the relevant DRBFC staff are not even aware of some of them. In order to avoid a similar outcome, and to improve the sense of ownership, it is recommended that the development of DRBFC Operations Manual be undertaken in close consultation with, and under the leadership, of the relevant DRBFC staff, with the subject matter experts commissioned by the donor agencies providing required technical assistance without exerting a lead role.

28. In order to improve the DRBFC involvement and commitment to the development and implementation of the DRBFC Operations Manual, it is recommended to delegate the responsibilities to various management levels as described below.

29. The **Director of DRBFC** shall be responsible for formulating policy for development and implementation of the DRBFC Operations Manual to achieve:

- Compliance of DRBFC Operations with the policy, procedures, and standards set out by the Ministry of Public Works and the Government of Timor Leste.
- Consistency in delivering DRBFC goods and services to its customers and stakeholders, including contractors, Municipalities and the general public.
- Continuity in delivering above objectives, through staff turnovers and transitions, with the DRBFC Operations Manual used to induct and guide new staff

30. A **Steering Committee** should be formed, consisting of selected Department Heads, shall be responsible for:

- Providing leadership and high-level guidance for development of Manuals.
- Progress monitoring and removing any roadblocks to development process.
- Obtaining final acceptance from the Director or the Minister to final version of Manuals.
- Providing leadership and motivation to the relevant users to comply with the Manuals.
- Commitment to implement recommendations from compliance audits on the use of Manuals.

31. **Working Groups** should be formed, consisting of middle management staff from target users, and possibly one Department Head. Seven Working Groups are proposed, with their compositions and the Sub Manuals they are responsible for listed in Table 2. These Working Groups shall be responsible for:

- Reviewing the drafts prepared by Subject Matter Expert and providing timely feedback. The reviews should take into account: appropriateness and applicability to the specific DRBFC activities; missing out on any important DRBFC activity; compliance with existing regulations and norms.
- Reporting to the Steering Committee on the development process, and any significant roadblocks that require Senior Management intervention.
- Submission of the Final Draft to the Steering Committee for Director or Minister's signature.
- After signing off, provide leadership in implementation which involves getting the relevant staff to use the Manuals; monitoring activities for compliance to Manuals' requirements; appointing a "Champion" to lead this process and to assist the users if they come across any problems.

32. A **Subject Matter Expert (SME)** should be contracted to support DRBFC. This will be an expert with extensive experience in the specific area, commissioned by a donor agency. The SME shall be responsible for:

- Development of the Manual for the subject area, either through review and update of an existing Manual, or adapting an appropriate international Manual for local conditions.
- Liaise closely with the DRBFC Working Group to identify local needs and practices and to incorporate measures to match them where feasible.

- Aim for the best current international practices, however keep the requirements within the reach of local capabilities.
- Aim for an end product that is user friendly, easy to read, and structured for easy navigation.
- Provide ongoing assistance as required during the implementation stage.

33. The **Chief of the Training & Cooperation Department** shall be responsible for collating the various Sub Manuals as they are finalised, to form the DRBFC Operations Manual. This can be undertaken progressively as the Sub Manuals are signed off by the Director, DRBFC, without waiting for finalisation of all the Manuals. Table 4 below provides the framework for collating the Sub Manuals to form the DRBFC Operations Manual, and the proposed composition of the Working Groups responsible for development of the Sub Manuals.

5.2 Estimated inputs of Subject Matter Experts

34. The inputs required from Subject Matter Experts of different disciplines will vary based on the extent of improvements required for existing Manuals and the scope of work required in the new Manuals. Table 2 provides the expertise required to improve existing Manuals and to develop new Manuals, and the indicative inputs from Subject Matter Experts of different disciplines. The estimated total input of Subject Matter Experts is 33 months.

5.3 Format for DRBFC Operations Manual

35. To improve user friendliness, it is proposed that:
- A flow chart providing a road map to the various Sub Manuals be included in the beginning of the DRBFC Operations Manual. In soft copy format, this can be a flow chart with hyperlinks to Sub Manuals using either a web-based storage (such as DropBox), or a software similar to Office 365, with the Sub Manuals stored in a server.
 - A standard format for all the Sub Manuals, with a flow chart at the front for easy navigation.

Table 4 Collating Sub Manuals to form DRBFC Operations Manual

MAIN ACTIVITY	PROPOSED WORKING GROUP COMPOSITION	SUB-ACTIVITY	SUB-MANUAL	EXPERT	INPUT
Program Development and Management	Working Group 1: <ul style="list-style-type: none"> • Head, Projects Department • Head, Program Section, Projects Department • Head, Database Section, Maintenance Department • 1 – Construction Department • 1 – Maintenance Department • SME on Asset Management 	<ul style="list-style-type: none"> • Program development using RAMS outputs, Visual Surveys • Project prioritising for reliability, safety, asset preservation. • Strategic planning to minimise network life cycle cost. • Program Reviews: Budget, expenditure, forecast, earned value • Program issues on environment, safety, social safeguards. • Reporting to senior management and other Ministries 	New Manual - To be developed as per Section 3.1.	Asset Management	5 months
Project Development (Roads, Bridges & Flood Control) Design, Specifications, BoQ	Working Group 2: <ul style="list-style-type: none"> • Head, Construction Department • Head, Technical Support Section, Projects Department • Head, Planning Section, Projects Department • 1 – Construction Department • 1 – Maintenance Department • SMEs' on Geometric Design, Slope Protection Monitoring & Design, Design of Pavements, Drainage and Culverts, Bridge Rehabilitation 	• Geometric Design including surveying	Existing Guide updated as per 2.2	Road Design	2 months
		• Slope Protection Design including Retaining Walls	Existing 3 Guides updated as per 2.3 and combined to one Manual	Geotechnical / Structural	2 months
		• Pavement Design	Existing Manual updated as per 2.4	Pavement Design	2 months
		• Drainage and Culvert Designs (hydrological and hydraulic)	Existing Guide updated as per 2.5	Hydraulics /Structural	1 month
		• Bridge Condition Assessment and Rehabilitation Designs	Existing Manual updated as per 2.6	Bridge Engineer	4 months
Project Development (Roads, Bridges & Flood Control) Environmental Safeguards, Social Safeguards, Road Safety	Working Group 3: <ul style="list-style-type: none"> • Head, Training & Cooperation Department • Head, Social & Environmental, Projects Department • Head, Environmental & Rural, Training & Cooperation Dept. • Head, Social & Resettlement, Training & Cooperation Dept. • 1 – Maintenance Department • SMEs' on Environmental, Social Safeguards, Road Safety 	• Review of Environmental Factors, Preparation of Environmental Management Plans	Existing Manual updated as per 2.7	Environmental Specialist	2 months
		• Review of social impacts, Preparation of Social safeguards plan	Existing Manual updated as per 2.8	Social Safeguards	1 month
		• Road Safety in designs.	New Manual as per Section 3.2.	Road safety	3 months

MAIN ACTIVITY	PROPOSED WORKING GROUP COMPOSITION	SUB-ACTIVITY	SUB-MANUAL	EXPERT	INPUT
Procurement	Working Group 4 <ul style="list-style-type: none"> Head, Maintenance Department Head, Roads Section, Construction Department Head, Construction Section, Analysis & Evaluation Department 1 – Projects Department 1 – Training & Cooperation Department SME on Procurement 	<ul style="list-style-type: none"> Tender document preparation - Contract conditions, scope definition, technical specifications, BoQ Tendering – Pre-qualifications, Types of tenders, Pre-tender and Post tender activities, Tender Evaluation, Contract Award. 	For routine and periodic maintenance, existing Guide and system updated as per 2.9 and 2.10. For Rehabilitation works New Manual required as per 3.3	Procurement Specialist	3 months
Contract Management (Scope, Cost, Time, Quality, Safety, Environment, Social Safeguards)	Working Group 5 <ul style="list-style-type: none"> Head, Construction Department Head, Roads Section, Construction Department Head, Construction Section, Analysis & Evaluation Department Head of a Region, Maintenance Department Head, M & E, Training & Cooperation Department. SME Contract Management 	<ul style="list-style-type: none"> Quality Management – QA and QC Contracts, Traffic Management, Safety, Environmental and Social Safeguards Management 	Existing Manuals updated as per 2.12	Contract Management Specialist	6 months
Project Handover		<ul style="list-style-type: none"> Progress review, progress payment certification, time and cost variations, contract correspondence, Practical Completion, Defects Management, Final Certificate 	Existing Guide updated as per 2.11		
		<ul style="list-style-type: none"> Completion Report, As-built drawings, RAMS Update, Contractor Evaluation, Operations & maintenance manuals 	Existing Guide updated as per 2.11		
Laboratory Testing	Working Group 6 <ul style="list-style-type: none"> Chief Testing Officer, National Testing Laboratory SME – Materials Testing 	<ul style="list-style-type: none"> Soil, Aggregate, Cement, Concrete, and Asphalt Testing. 	Combine 3 Manuals as per 2.13	Materials Engineer	2 months
Performance Based Maintenance		<ul style="list-style-type: none"> Levels of Service compliance, Payment deductions 	Existing specifications as per 2.14		Nil
Total Inputs from Subject Matter Experts					33 months

5.4 Implementing the use of DRBFC Operations Manual

36. Implementing the use of DRBFC Operations Manual needs to be done by following methods:

- Senior Management Commitment to encourage the use of the Manual: This needs to be done as part of the routine business of DRBFC Departments, through the leadership and guidance provided by the Heads of Departments.
- Nomination of 'Champions' for implementing the Sub Manuals for each of the Main Activities or a group of Sub Activities as deemed appropriate. The Champion should be preferably staff selected from middle management (ie. Section Head) or below, who has a working knowledge of the Manual, and who is willing to assist others in the use of the Manual, as a mentor.
- Providing the training required for using the Manual. This can be formal training provided through a training course or a workshop, or on the job training provided by working with the relevant staff in the normal work environment.
- Compliance Auditing: Periodic auditing of selected activities within the DRBFC for compliance with the DRBFC Operations Manual requirements. This will provide the impetus for staff to commence using the Manual, and also to provide feedback to Senior Management on the level of usage. It is imperative to implement recommendations from these audits, and to undertake follow up audits to ensure of such implementation.

5.5 Document Control

37. Responsibility for Document Control should lie with a Department with overarching responsibilities, such as the Training & Cooperation Department. Document Control involves management of revisions and updates to the Manual. This involves:

- Determining when to update a Manual. This could be due to periodic reviews undertaken, say, every 3 to 5 years, and updating to reflect organisational changes, or due to changes in technology or legislation.
- Authorising who can update a Manual. The responsibility for updates should be limited to one or two nominated Middle Management staff. While the general staff may comment and provide feedback on the updates required, collating them to do the updates should be limited to the nominated staff.
- Distribution of the updated versions to relevant users. The version updates should be tracked, and updated versions distributed to relevant users either by hard copy or soft copy (email or web based).

Appendix A Material Tests undertaken by MPW

NO.	TESTING SERVICE DESCRIPTION
A. Soil	
A-1	Soil moisture content test
A-2	Liquid limit and plastic limit
A-3	Specific gravity of soils
A-4	Density and unit weight of soil in place by the sand cone method
A-5	Particle size analysis of soils
A-6	Determination of the dry density /moisture content relation of a soil
A-7	Laboratory CBR
A-8	Determination of the compressive strength of a soil
A-9	Dutch Cone Penetration (Sondir) Manual Operation
A-10	Dutch Cone Penetration (Sondir) Hydraulic Operation
A-11	Direct shear test
A-12	Consolidation test
A-13	Dynamic Cone Penetrometer
A-14	Unconfined Strength test
A-15	Boring test
B. Aggregate	
B-1	Unit weight and voids in aggregate
B-2	Specific gravity and water absorption of fine aggregate
B-3	Specific gravity and water absorption of coarse aggregate
B-4	Sieve analysis of fine and coarse aggregates
B-5	Materials finer than 75 um in mineral aggregates by washing
B-6	Flakiness & Elongation index
B-7	Clay lumps and friable particles
B-8	Los Angeles value
B-9	Sand Equivalent
B-10	Aggregate Crushing Value
C. Cement Test	
C-1	Normal consistency and setting time of hydraulic cement mortar
C-2	Compressive strength test of cement
D. Concrete Test	
D-1	Slump of hydraulic cement concrete
D-2	Compressive strength of cylindrical concrete specimens
D-3	Making and curing concrete
D-4	Concrete mixture design
D-5	Concrete Hammer Test
E. Asphalt Test	
E-1	Laboratory Penetration test
E-2	Ductility of Bituminous Materials test
E-3	Softening Point test (titik nyala)
E-4	Loss on Heating/Thin-Film test (kehilangan Berat)
E-5	Centrifuge Extractor test
E-6	Marshall test
E-7	Benkleman Beam
E-8	Core Drilling test
E-9	Specific gravity of Bitument
E-10	titik lembek

local people
global experience

SMEC is recognised for providing technical excellence and consultancy expertise in urban, infrastructure and management advisory. From concept to completion, our core service offering covers the life-cycle of a project and maximises value to our clients and communities. We align global expertise with local knowledge and state-of-the-art processes and systems to deliver innovative solutions to a range of industry sectors.