CHAPTER 5 CONSTRUCTION PLAN

5-1 CONSTRUCTION PLAN METHODOLOGY

5-1-1 Points to Consider

Points to consider in construction are as follows;

(1) Observance of Labour Standard

The Contractor shall observe the active Burundi's laws and regulations related to construction, respect applicable conditions and practices of employment and obviate disputes with labours while ensuring the safety of labours.

(2) Environmental Conservation during Construction

The Contractor shall supervise the construction work complying with the requirements of the environmental aspects which are prerequisite for issuance of "Construction Permit" before starting construction. In addition, the contractor shall supervise the works in a way to mitigate the environmental impacts such as construction wastes, dust and murky water brought by the pavement work including demolition work of the existing pavement to conserve the current environment.

(3) Traffic Safety Measure

The proposed site is one of arterial road in Bujumbura which is congested with traffic in the morning and in the evening and busy with traffic of route bus during daytime as well as that of pedestrian. Considering the current situation of the proposed site, the minimum traffic control shall be planned to satisfy both the safety and the smoothness of the traffic.

5-1-2 Preparatory Work Plan

(1) Transportation Plan of Construction Equipment

As for the construction equipment which is not available locally, it will be transported from outside of Burundi. Transportation period is planned to be approx. 2 months including removal, packing, customs clearance and inland transportation.

(2) Construction Yard

The construction yard shall be planned at free space near the starting point of the RN7. To use of the space has been discussed with commune authority and the approval has also been obtained.

After the land preparation work of the yard, hauling roads with DBST pavement shall be provided. Guard fences shall be built around the site to prevent unauthorized entrance to the site and property loss.

Figure 5-1 Proposed Location of Construction Yard

PHOTOGRAPHS OF PROPOSED LOCATION

5-1-3 Main Works

(1) General Description of Main Works

1) Concrete Production and Precast Concrete Production

Concrete will be produced by hand mixing considering the small necessary volume of concrete. Precast concrete for the side strip work (kerbstone) and U-shaped drain cover will be produced at the construction yard.

2) Construction Road

By using the existing 2-lane road effectively, a construction of the road for the use of construction works will not be necessary. However, safety facilities shall be placed at intersections to secure the normal traffic flow.

(2) Construction Method of Main Works

Each of the main works is detailed as below.

1) Demolition Work of Existing Pavement

The existing pavement of shoulders will be cut by the road cutter. After that, the existing roadbed materials will be excavated by the backhoe (0.28m3). The excavated materials will be transported to the disposal area by the dump truck (4ton).

2) Pavement Works

・ Leveling

After the demolition work of the existing pavement, the spreading and compaction of the base surface will be implemented manually. Manual construction is adopted here as the construction by using machines is difficult due to narrow shoulders with approx. 1m width only.

・ Subbase Course

Borrow material (G25) will be transported to the site, and the materials will be filled with designated thickness. After the spreading by the motor grader (3.1m), they will be compacted by the road roller (macadam 10-12 ton) and by the tire roller (8-20 ton). Controlling of the optimum moisture content shall be implemented by the sprinkler truck at the same time.

・ Base Course

By using the borrow material (CRS) as the material, the base course work will be implemented in a same manner as the subbase course work. The roadbed materials will be filled with designated thickness.

・ DBST

Surface treatment shall not commence until the existing surface has been repaired of any defects and clean by use of brooms, water, compressed air or any other.

The nominal rates of binder and aggregate shall be 20mm with 1.0 litter of hot bitumen for the first layer.

Any areas deficient in aggregate shall have additional material added so as to leave the carpet with a single layer of chippings lying shoulder to shoulder.

The nominal rates of binder and aggregate shall be 10mm with 0.7 litter of hot bitumen for the second layer.

The second application of binder shall preferably take place within 48 hours of the application of the first coat when penetration grade bitumen is used for the first coat and not less than ten days of the application of the fist coat when cutback bitumen is used in the first coat.

3) Drainage Work

Existing U-shape drain will be continuously used. Extremely damaged section (60m) shall be repaired.

The concrete U-shaped drain cover (1,000×500×100mm) will be produced at the construction yard, and placed on the drain at the bus-bay.

4) Road Attached Facility Works

・ Slope Protection Work

Mattress basket work will be implemented. Stones will be filled in the wire mat placed on the base surface by hand to make basket walls.

Stone work will be implemented by man power. Wet masonry breast wall will be placed on the slope surface.

Riprap work will be implemented. Riprap will be placed at the collapsed slope in the water to prevent further collapse of the slope.

・ Kerbstone

Concrete Precast materials produced at the base camp will be used as the kerbstone materials. As for the side strip work, the base mortar will be placed by hand and the precast will be laid on it.

・ Road Marking Work

Solid lines and dashed lines will be marked on the surface of the pavement at the

center line, shoulders, zebra zones and sidewalks by using line markers and 4 t truck used for the material transportation.

5-1-4 Safety Measures Plan

(1) Safety Facility Plan

Safety facilities such as caution signs during construction, speed-limit signs, no trespassing signs and barricades will be planned. Reflector tapes shall be put on the barricades for the attention of general traffic during nighttime.

(2) Traffic Control Plan

To prevent traffic accidents by the construction vehicles as well as to prevent the workers' accidents related to the machine operation, 2 traffic controllers will be stationed at each end of the work section.

(3) Safety Control & Safety Measure Plan

To prevent thefts of materials and equipment as well as to prevent crimes which will be harms to Japanese and/or foreign expatriates, 2 safety guards will be stationed day-and-night, and a security manager will be appointed. In addition, Floodlights will be set in each corners of the site for the night watch.

5-1-5 Engineering Control Plan

(1) Quality Control Test Plan

A laboratory with facilities required to implement necessary tests for bituminous pavement works shall be placed in the construction yard.

(2) Construction Management (Control of Quality, Work Progress, Work Schedule, etc.) Plan

Equipment (surveying equipment, drawing apparatus, photographic equipment, OA equipment, etc.) required to control the work progress based on the Construction Management Plan (Control of Quality, Work Progress, Work Schedule, etc.) shall be arranged.

5-2 SETTING OF PROCUREMENT PLAN

5-2-1 Subcontractor

In the Republic of Burundi, there are 12 private contractors that are capable to contract construction projects. These contractors are classified into 3 classes (Class A~C) according to

indices such as amount of annual orders received per work type, construction equipment owned, etc.

As for the road construction, 4 contractors classified as Class A have human resources and equipment sufficient to contract road construction projects. These contractors are capable as subcontractors of the contractor of this project. Loans of human resources and/or equipment between each private contractor are commonly conducted. Labor procurement from the local private contractors is possible.

5-2-2 Construction Materials

(1) Procurement Condition for Construction Materials

Procurement division of major materials to be used for the works was discussed on 2.2

Major materials of the works, namely stones for road, bitumen materials, cements, reinforcing bars, aggregates for concrete and wood, are available in Burundi.

Grounds for the procurement division of major materials are as below stated.

- Crushed Stone for Road and Aggregate for Concrete

Materials to be used for the roadbed, the DBST and as concrete aggregates of satisfactory quality are procurable from the contractor who produces these materials in Bujumbura.

Though sands are collectable from surrounding area of Tanganyika Lake which is located within 5km from the proposed site, they will be purchased from the local supplier considering that the necessary volume of sands is small and the sand collection is subject to permission.

- Bituminous Material

Bituminous materials are generally procured from Kenya through local contractors. They have sufficient supply records. Though the major materials of asphalt related products are imported, they are purchasable from the local market and are of good quality. Therefore, local purchase is adopted.

- Cement

Cement is not produced locally. Domestic demand is fully satisfied with imported cement from Uganda and/or Zambia in quantity as well as in quality. In this project, as concrete use is limited to production of kerbstones and U-shaped drain covers and repair of

U-shaped drain only, the concrete volume required is very small. Therefore, cement will be procured locally.

- Reinforcing Bar

As there is no steel factory in Burundi, reinforcing bars shall be procured from Ukraine, Turkey or Kenya. Though they are somewhat inferior in quality, they will be procured locally as use of reinforcing bars is limited to production of U-shaped drain cover only in this project.

- Other Materials

Wood for concrete forms (plywood, scantling, timber) and oil paint will be procured locally as imported products of quality are available at local market.

Fast and oils will also be procured locally as they are available at petrol stations in the city or from the local contractors.

5-2-3 Construction Equipment

(1) Procurement Condition for Construction Equipment

Procurement division of major construction equipment is shown in Table 4-1

Table 5-1 Procurement Division of Major Construction Equipments

Name of Equipment	Specification	Burundi	Others	Major Origin
Bulldozer	15ton	X		
Backhoe	Hydraulic-crawler type 0.13m^3, 0.28m^3, 0.8m^3	X		
Wheel loader	1.2m^3, 2.1m^3	X		
Dump truck	Loading capacity 10t		X	Kenya
Dump truck	Loading capacity 2t, 4t	X		
Truck	Loading capacity 2t, 4t	X		
Motor grader	Blade width 3.1m	X		
Road roller	Macadam, 10~12t		X	Kenya
Tire roller	8t~20t		X	Kenya
Vibration roller	Combined, 3~4 ton		X	Kenya
Vibration roller	Hand guide, 0.8~1.1 ton	X		
Asphalt plant	60 t/h class		X	Kenya
Asphalt finisher	Wheel type, 2.4~6.0m		X	Kenya
Asphalt distributor	Tank capacity 6,000 litter		X	

Name of Equipment	Specification	Burundi	Others	Major Origin
Generator	Diesel drive, 300kVA		X	Kenya

Public works entities do not own construction equipment for road construction works, as road construction works and road maintenance works are basically commissioned to the local contractors. There is no specified equipment renting/leasing company in Burundi, but the local contractors loan their owned construction equipment each other. This works as renting/leasing system substantially.

Though major equipment are available locally except for some equipment, the procurement plan shall be made considering that they are aged and degraded, and that they are not sufficient in number.

Grounds for the procurement division of major construction equipment are as below stated.

- Excavation Equipment

Local contractors own several excavation equipment such as bulldozers and backhoes. Though they are aged, excavation equipment shall be procured locally as earthwork volume in this project is small.

- Loading Equipment

Local contractors own several loading equipment such as wheel loaders. They are relatively new and good for use in this project, loading equipment shall be procured locally.

- Transportation Equipment

Local contractors own several transportation equipment such as dump trucks and trucks. However, they are extremely aged. Therefore, dump trucks (10t) which will play key rolls in the construction schedule shall be procured from the neighboring countries. Other transportation equipment have less importance and will be procured locally.

- Leveling Equipment

Though leveling equipment such as motor graders owned by local contractors are aged, they will be procured locally considering that each contractor owns various kind of equipment, and that the work volume is small.

- Compaction Equipment

Compaction equipment such as road rollers, tire rollers and vibration rollers are extremely aged. As compaction of the pavement is one of the major works in this project, compaction equipment shall be procured from the neighboring countries.

- Pavement Equipment

There is no local contractor who owns asphalt plant and asphalt finisher, as surface treatment is a major method applied in road pavement work in Burundi.

(2) Source Countries

As source countries of road construction equipment which is not available in Burundi, Uganda or Kenya will be considered.

5-3 SETTING OF WORK SCHEDULE PLAN

5-3-1 Construction Procedures

Construction procedure of the project is shown in Figure 4-2

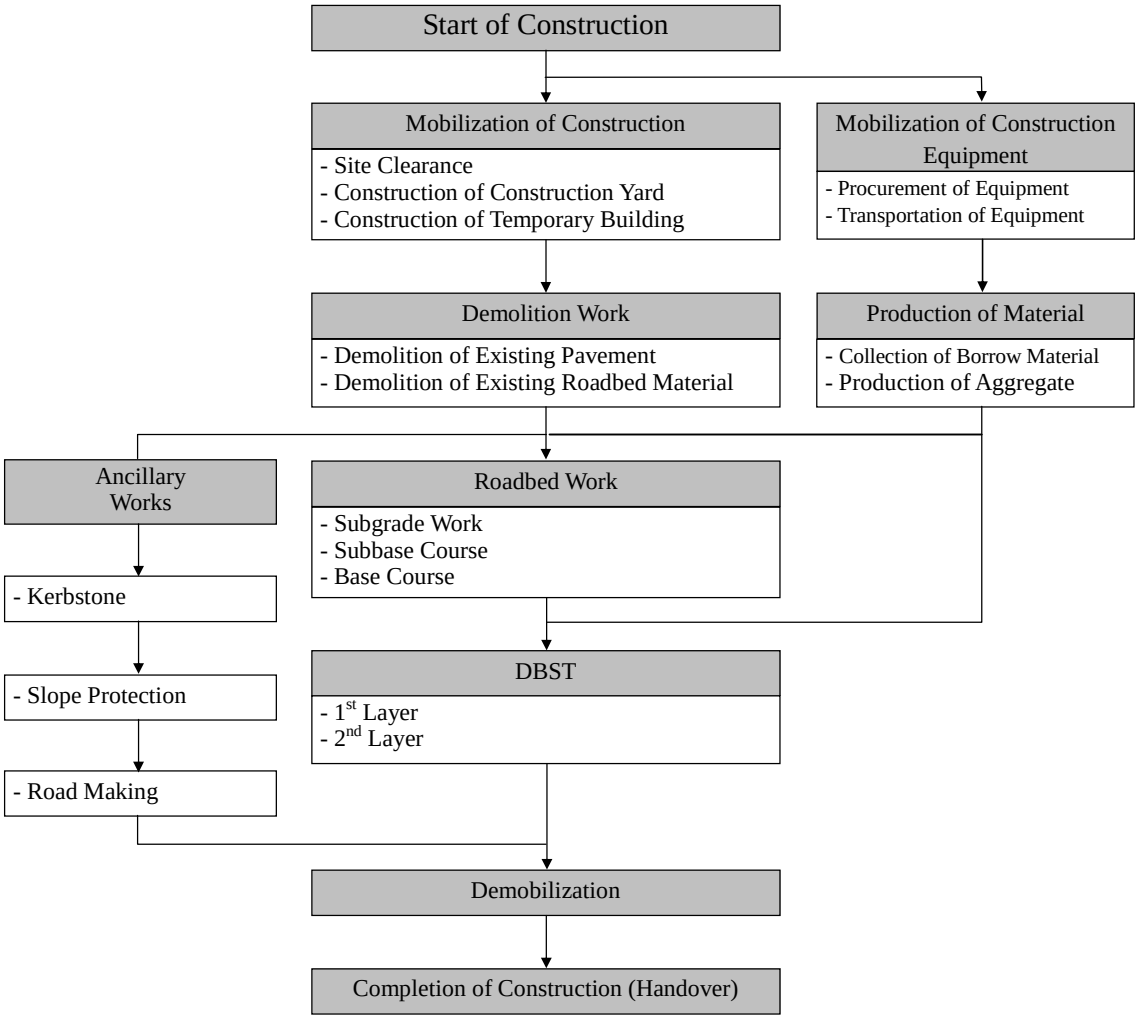

Figure 5-2 Construction Execution Flow

5-3-2 Setting of Construction Schedule

(1) Transportation of Equipment and Installation Period

As for the construction equipment to be imported from Kenya or Uganda, the transportation period is planned to be approx. 2 months including removal, packing, customs clearance and inland transportation.

(2) Selection of Equipment

Selection of equipment shall be made in accordance with "Cost Estimation Standard for Civil Works, Ministry of Land, Infrastructure and Transportation, JAPAN".

(3) Setting of Team

Working formation will be determined by combination of the equipment to be used in the most critical equipment work (critical path) in the designated work volume and the related equipment. Considering that the total work volume is small, and that the work will be implemented in one lane of the existing road, the working formation will be one team.

(4) Calculation of Working Days

DBST work, the major work of the project, is a work affected greatly by rainfall. As the DBST work is scheduled to be implemented from mid December to early February, in semi-rainy season, suspended factor 1.35 is considered.

(5) Setting of Equipment Capacity

Working performance of each equipment has been calculated in accordance with "Cost Estimation Standard for Civil Works, Ministry of Land, Infrastructure and Transportation, JAPAN". Equipment capacity has been calculated taking the equipment capacity productivity adjustment rate (Africa region 70%) of JICA Cost Estimation Guideline into account.

5-3-3 Work Schedule

The work schedule and the equipment schedule considering the work items and proper timing of work are as shown in the followings.

Table 5-2 Proposed Working Schedule

Description	Q'ty	Workload (per day)	Adjusted Workload	Suspended Factor	Working Days	Sep	Oct	Nov	Dec	Jan	Feb	Mar
		A	B=0.7A	C	D=Q/BC							
Tender						▼						
Preparation of Agreement						▼						
1. Mobilization												
Construction Equipment												
Temporary Facilities												
2. Demolition Work												
Cutting of Existing pavement	1,657 m	300.0	210.0	1.35	11							
Removal of Existing Pavement	3,760 cu.m	150.0	105.0	1.35	49							
3.. Pavement Work												
Sub grading	19,020 sq.m	500.0	350.0	1.35	74							
Subbase Course	4,580 sq.m	180	126.0	1.35	50							
Base Course	19,020 sq.m	1,110	777.0	1.35	34							
DBST 1st Layer	19,020 sq.m	2,000	1400.0	1.35	19							
DBST 2nd Layer	19,020 sq.m	2,000	1400.0	1.35	19							
4. Drainage												
Repair of U Shape Drain	60 m											
U Shape Drain Cover	102 N											
5. Ancillary Work												
Slope Protection	60 cu.m											
Kerbstone	614 m											
Road Marking	4,200 m											
6. Demobilization Work												

CHAPTER 6 TENDERING

6-1 TENDER METHODOLOGY

As described in preceding chapter, it was judged that the Burundian local contractor does not have enough capability for execution of the Project, alone, so international general or pavement contractors are focused as the candidate of the contractor to the EWPP.

As also described, there are two methodologies for selection of the contractor, in general. In this EWPP, the methodology of the short-list is adopted in consideration of time constraint and budget size of the Project.

6-2 TIME SCHEDULE OF TENDER

In order to select a contractor for the Project among short-listed contractors, the tender took place in Bujumbura in accordance with the following time schedule.

(1)	August 21, 2007	Invitation to tender to short-listed three contractors by e-mail. Necessary information and documents to the tender were distributed from yahoo briefcase website.
(2)	September 3, 2007	Closing date of questionnaire from the tenderers
(3)	September 10, 2007	Receiving and opening of tender documents (at JICA Study Team office, Bujumbura, Burundi)
(4)	September 11, 2007	Price negotiations with the lowest tenderer
(5)	September 12, 2007	Signing of the Contract

6-3 SHORT-LISTED CONTRACTORS

The Study Team noticed the Tender for the EWPP by e-mail on 21st August 2007 and distributed tender documents to short-listed three contractors from yahoo briefcase website. .

Prior to the Notice, the short-listing is carried out by the Study Team and the criteria of short-list was set to be work experience of the restoration project after civil conflict and pavement work. As the result, the following three international general contractors were short-listed;

(1) Billdock Enterprises and Contractors Ltd, Kenya

(2) STRABAG International GmbH-RWANDA

(3) URBAN TONE CORPORATION, Japan

6-4 DISTRUBUTION OF TENDER DOCUMENTS

The tender documents were distributed to the short-listed contractors on August 21, 2007. The tender documents consisted of:

(1) Instructions to the Tenderers;

(2) Form of Contract;

(3) Specifications;

(4) BOQ for Tenderer;

(5) Form of Tender; and

(6) Detailed Design Drawings.

6-5 TENDER OPENING

In accordance with the Tender opening procedure described in the Instructions to Tenderers, the Tender was opened in meeting room at the Office of JICA Study Team, Bujumbura at 2:00 pm on 10th September 2007. The attendees were as follows:

1) Attendees from the Tenderers

- Billdock Enterprises and Contractors Ltd:

  Eng. Alphonce K. Mutoka

- URBAN TONE CORPORATION:

  Mr. Shuichi HAMAOKA, General Manager, Mr. Koichi YAMADA

STRABAG International GmbH-RWANDA declined in this tender.

2) Attendees from the Counterparts/ Republic of Burundi

Mr. Vital NARAKWIYE: Chairman of Steering Committee, General Director, MTPT

Mr. John NDIKUMWAMI : Technical Adviser, Road Department, MTPE

3) Attendees from JICA

Mr. Kensuke Oshima: JICA Regional Support Office for Eastern and Southern Africa

4) Attendees from the Study Team

Mr. Yasushi OHWAKI: Team Leader

Mr. Hiroaki TAKAHASHI: Deputy Team Leader

Mr. Atsushi ITO: Interpreter

6-6 SUBSTANTIAL RESPONSIVENESS & ANALYSIS OF TENDER PRICE

6-6-1 Examination of Tender Documents

The tender proposal consisted of (1) Power of Attorney and (2) Certificate of Signature (3) Envelop-A containing Construction Schedule and (4) Envelop-B containing the Tender Form of tender price.

The Tender submitted by the Tenderers were received and opened in the presence of Mr. Vital NARAKWIYE, General Director of MTPT, Mr. John NDIKUMWAMI, Technical Advisor of MTPE and Mr. Kensuke Oshima, JICA Regional Support Office for Eastern and Southern Africa at the office of the Study Team, Bujumbura, Burundi on September 10, 2007.

After receiving two tender documents, at first, the Study Team opened and checked and confirmed, and all of documents submitted from two tenderers were satisfied and complied with tender requirement. Thereafter, the Counterparts and observer also confirmed the said documents.

6-6-2 Reading out of Tender Price

After confirming the above tender documents, the Study Team opened the Envelop-B which contained the Tender Price and its break down.

The Tender estimates were read out and ranked as indicated in the table below.

Table 6-1 Submitted Tender Prices

	Billdock Enterprises and Contractors Ltd	Strabag International GmbH	Urban Tone Corporation	Engineer's Estimate
1st Tender	2,358,624USD	Decline	1,674,000USD	1,270,991USD
2nd Tender	2,240,000USD	Decline	1,570,000USD	
3rd Tender	2,150,000USD	Decline	1,500,000USD	
Ranking	-	-	1	

Two tender prices among two tenderers were exceeding the Engineer's Cost Estimate. Therefore, two tenderers were asked to re-submit the Second tender.

Two tender prices among two tenderers were still exceeding the Engineer's Cost Estimate at the Second tender. Therefore, two tenderers were asked to re-submit Third tender.

Third tender price among two tenderers were still exceeding the Engineer's Cost Estimate at the third tender.

The lowest tender price of One million Five hundred thousand (1,500,000) USD at the third submission by Urban Tone Corporation was not still within amount of the Engineer's Cost Estimate which was One million Two hundred Seventy thousand Nine hundred Ninety One (1,270,991) USD

Therefore, in accordance with JICA procurement guideline, the Study Team and the lowest tenderer i.e.M/S Urban Tone Corporation and the counterparts proceed to a negotiation meeting.

6-7 NEGOTIATION MEETING

The Study Team conducted the negotiation meeting. During negotiation meeting, M/S Urban Tone Corporation was requested to submit discount offer price to the JICA Study Team.

Responding the request, Urban Tone Corporation proposed to reduce the scope of works as follows,

Table 6-2 Revised Tender Price by Lowest Tenderer

Objective Roads	RN7	Rohero Area Roads
Original requirements	L=1.65km	Total L=0.372km Av. de Industrie Rohero（L=0.070km）, Av. de Government(L=0.125km), Av. des Palmiers(L=0.177km)
Offer from Urban Tone Corporation	L=1.65km	Av. de Government（L=0.125km）

As the results of submission of revised price from M/S Urban Tone Corporation in accordance with the proposed scope , the price offered as One million Two hundred Sixty Five (1,265,000) USD has been reached within the Engineer's Cost Estimate.

The Study Team and the Counterparts accepted this price as the prospective Contract Price for the EWPP. And the Study Team, the Counterparts and M/S Urban Tone Corporation agreed to start preparatory work for finalizing Contract documents.

6-8 TENDER EVALUATION

After receiving and opening of tenders, the itemized statement of the tender price estimated by M/S. Urban Tone Corporation, the lowest tenderer, was submitted and carefully examined by the Study Team, compared with the Engineer's Estimate. Sequent on the examination and comparison of the itemized statement, it was found generally reasonable and acceptable.

Also the construction schedule was submitted by the lowest tenderer and it was found effective/reasonable and acceptable after the Consultant's examination.

As a result of the tender evaluation and tender price offered, it was recognized that M/S. Urban Tone Corporation has satisfactory ability for carrying out the EWPP and is the contractor who is suitable for concluding the civil work Contract with the Study Team.

6-9 CONCLUSION OF TENDER

Table 6-3 Conclusion of Tender

	Tender Price / Offer Price	Engineer's Estimate	Scope of Works
1st Tender	1,674,000USD	1,270,991USD	RN7(L=1.65km)&Rohero Area Roads(Total L=0.372km: Av. de Industrie Rohero（L=0.070km）, Av. de Government(L=0.125km), Av. des Palmiers(L=0.177km))
2nd Tender	1,570,000USD		
3rd Tender	1,500,000USD		
Discount Offer Price	1,265,000USD		RN7(L=1.65km)&Rohero Area Roads(Av. de Government(L=0.125km))

CHAPTER 7 PROJECT SUPERVISION

7-1 SCOPE OF WORKS

The scope of works for the EWPP was as shown below:

1) Breaking up and excavation of existing pavement layers and the removal thereof to spoil dumps or to stockpiles for later reprocessing
2) Re-construction of Subbase course G25 materials as well as construction of Base course of CRS class
3) Construction of Double Bituminous Surface Treatment (DBST)
4) Installation of Kerbstone
5) Road marking
6) Protection of river erosion and repair of drain

7-2 CONSTRUCTION SUPERVISION

The supervision of the civil works has been carried out by the Study Team Supervisors in collaboration with the counterpart (Ministry of Transport, Posts and Telecommunication & Ministry of Public Works and Equipment) representatives.

The supervisory activities done were the inspection of construction works, supervision of materials testing and etc. Generally the Supervisors main duty was the quality control (i.e. materials and workmanship quality control) as well as advising the Contractor as regard to the progress control and safety measures at site.

7-3 EXECUTIVE ORGANIZATION

The executive organization for the EWPP was composed of the Supervisors of the Study Team and the Contractor. The following charts was illustrated the relation-ship for the executive organization.

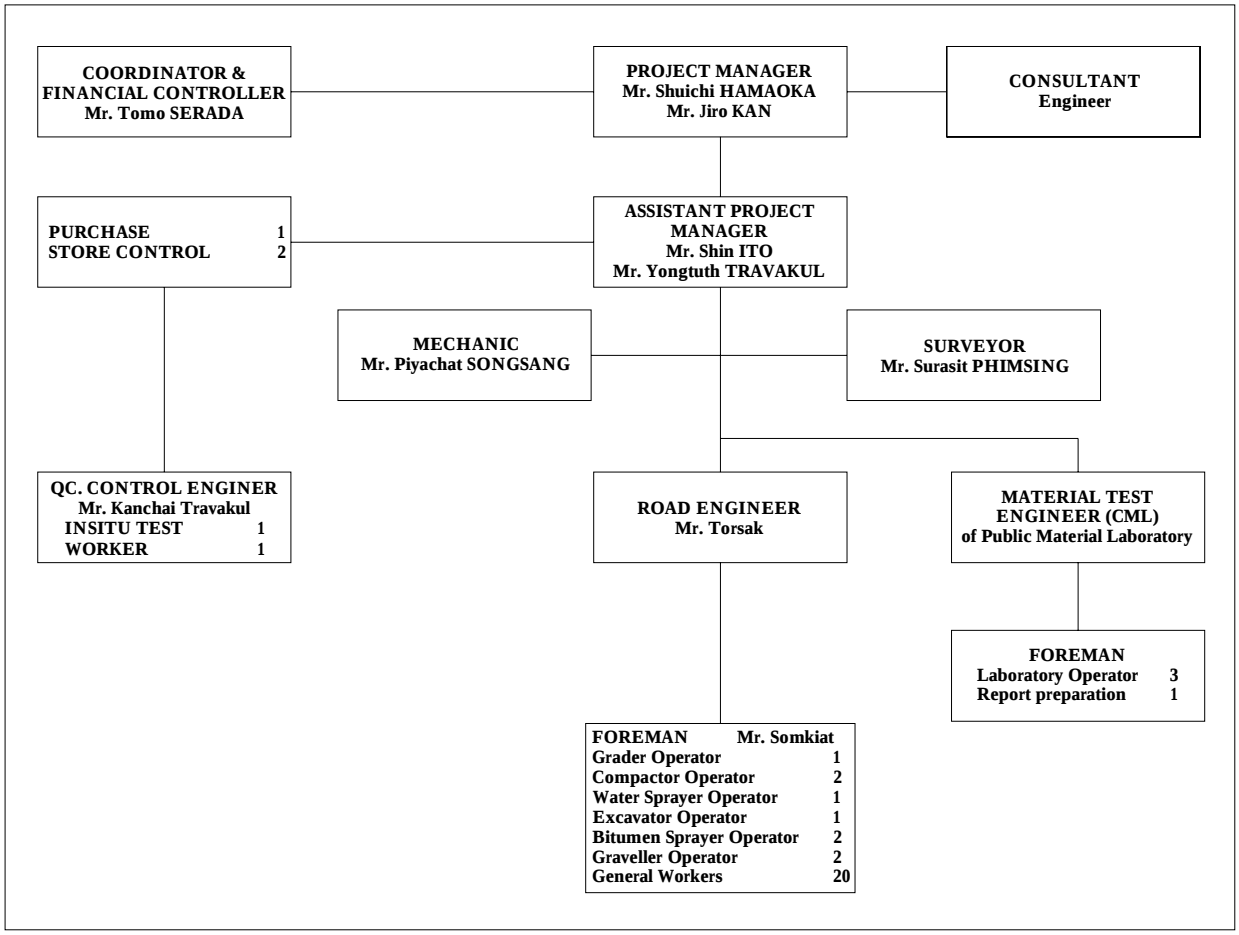

Figure 7-1 Executive Organization Chart for the EWPP

7-4 QUALITY CONTROL

The quality of all elements of the civil work (hereinafter referred to as "the Work") was checked on a regular basis so as to ensure compliance with the specified requirements. Test was conducted and measurement taken for controlling the relevant properties of the workmanship and materials supplied and the results of such tests and measurements was assessed on the basis of the prescribed criteria specified in the projects' specifications.

7-4-1 Material Quality

The following test has been conducted to check and control the quality of material at the laboratory

1) CBR test
2) Atterberg limits
3) Grading

4) Particle strength (TFV dry and soaked test)

5) Shape Test (Flakiness index)

7-4-2 Road Works

On supervision, the following inspection and test has been conducted in order to check the work done by the Contractor.

1) Static Penetration test (DCP test)

2) Proof rolling

3) Field Density Test

7-4-3 Progress Control

The supervisory team always checked the progress at each milestone of the Works comparing to the planed progress. The delay of the Works is sometime caused by unnecessary operation and negligence by the Contractor, when such behavior is found out; the team reminds/instructs the Contractor to correct methodology of operation. Even if there is no error on the Contractor's operation, some delay is experienced due to unavoidable circumstance such as abnormal rainfall and loss time for importation of materials.

Actually, there was continuous rainy day making the Works to stop in November and December 2007, and however the effect on the progress was not so serous, therefore the Works is expected to complete as per schedule.

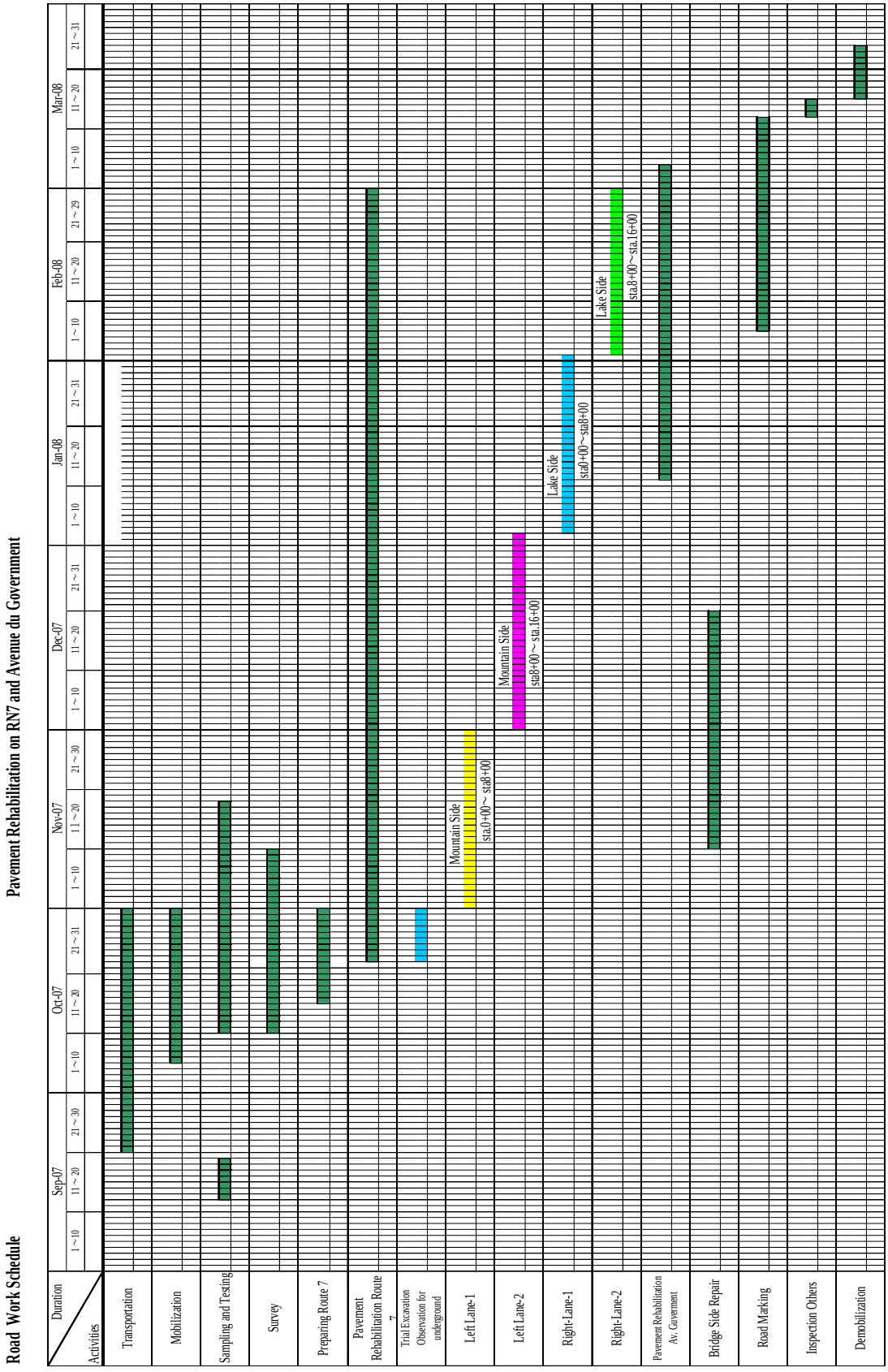

Figure 7-2 Planned Work Progress

7-5 SAFETY CONTROL

Prior to the Work, the Contractor was requested to submit the detailed safety program in accordance with the specification. The following measurements were mentioned on the program;

(1) Traffic Control Devices

The Contractor proposed to install the following devices at critical location;

1) Road signs and barricades
2) Channelisation devices
3) Barriers
4) Warning devices

(2) Existing Traffic Control

The public transporter, mini bus, requested to open at least a lane for their corridor during the Work period and the Supervisory Team and the Contractor accepted the request The Contractor made an arrangement of opening of a lane with 3.0m wide at least and the lane was introduced to be the alternation traffic with appropriate and visible distance for all the time. The flag mans were positioned at starting and ending points for the section with alternation traffic so as to regulate existing traffic.

(3) Diversion

A lane was secured for both the traffic originating from CBD and the public transport. One the other hand, the traffic to the CBD was designed to use diversion shown in below. Before introducing this system, information was provided and announced through the public channel. As the result, no serious conflicts were made; the drivers of public transporter and private vehicle were generally cooperative with this system.

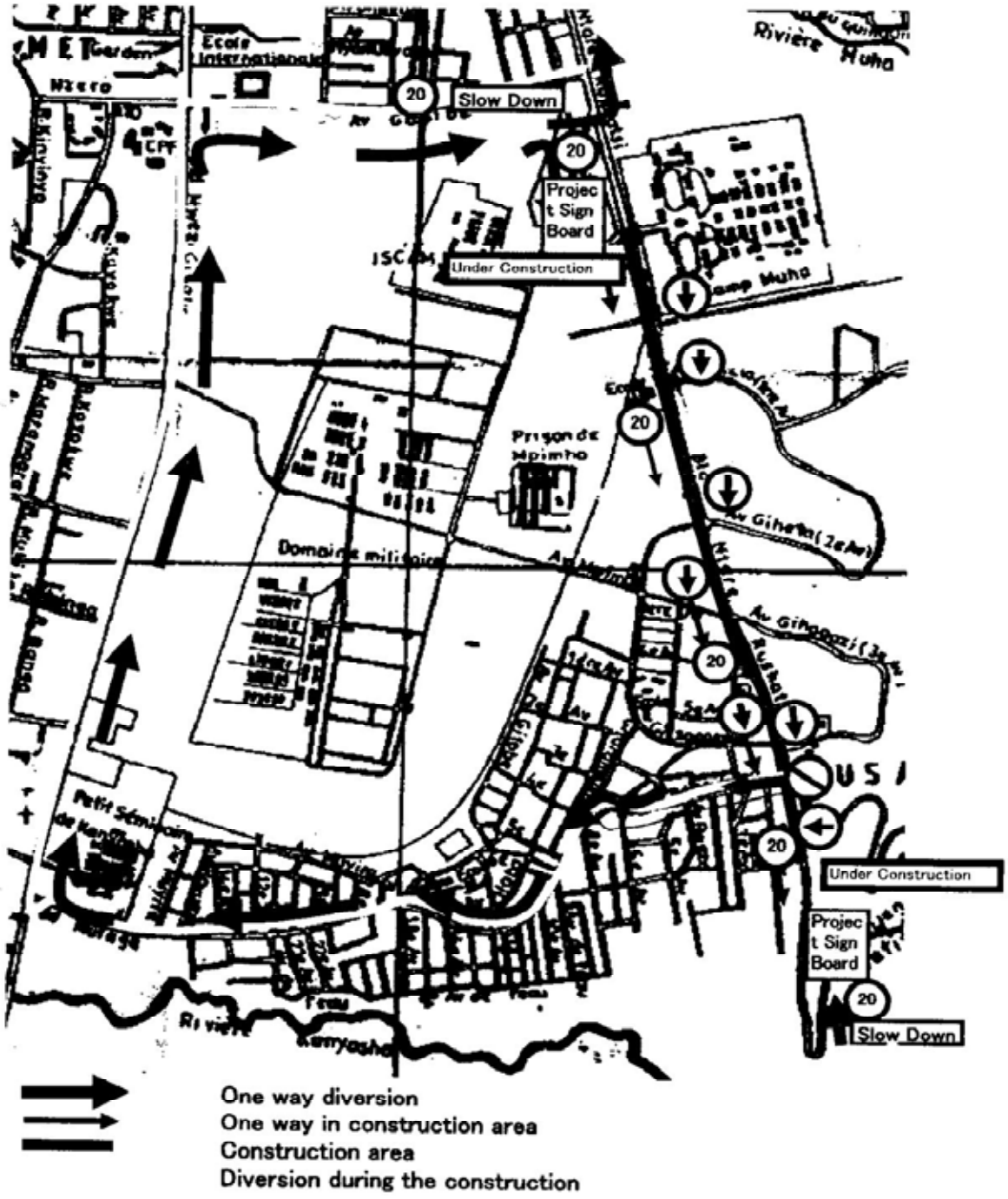

Figure 7-3 RN7 Diversions Route

For Av. Government, the road was entirely closed and diversion route was not provided because the stretch was short (100m approximately) and there were alternative routes. However warning sign and other control facilities were put in place.

(4) Safety Meeting

The safety meetings were conducted with the Contractor's initiative at every morning. All workers were reminded with safety issue on their minds. The highlights of the meeting were as follows;

1) Slogan "Safety First." and "Zero traffic and heavy equipment accident"
2) Traffic safety report and traffic safety instruction
3) Confirmation of the daily progress of work

(5) Safety Measure for Properties and Pedestrian

The periodic orientation to public through dialogues to individual has been carried out to create awareness for the safety at the construction area as well as its vicinity. The cooperation -ship with the Traffic Police was also established.

In night hours, the site was controlled by the security guard who was armed solders so as to avoid necessity accident.

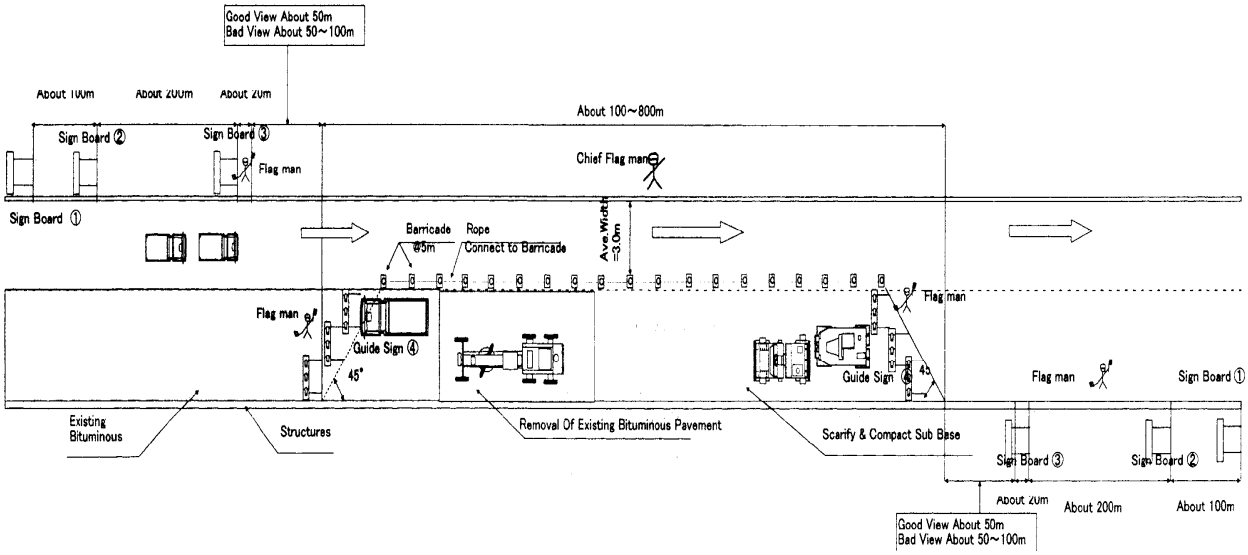

Figure 7-4 Standard Layout of Placing Safety Facilities

7-6 PROCUREMENT

(1) Construction Materials

The construction materials were obtained from several sources, the raw materials such as aggregate and soil was available at Bujumbura area. The petroleum products such as bitumen and diesel were imported from Tanzania. The materials are unloaded at Dar es Salaam port and transported to Bujumbura via the Central Corridor with 2 or 3 days.

(2) Equipments

The equipments for earth work were available in Burundi; others had to be arranged at outside of Burundi.

The Contractor posses some equipments at Juba, Sudan, so those equipments were transported to Bujumbura via Uganda and Rwanda. Some inappropriate arrangement for clearance was experienced at the Custom Office of Sudan; the equipments were forced to be stopped. Other than this incident, the importation of equipments had no problem.

The following table shows the procurement plan submitted by the Contractor for both materials and equipments.

Table 7-1 Equipments and Materials Procurement Plan

Major Equipment/Materials	Specifications	Status	Qty	Unit	Proposed procurement place
Gabion	1x0.5x2m	New	60	no	Thailand
Geotextile	400m2	New	1	roll	Thailand
Asphalt		New	63	ton	Kenya/South Africa
Cement		New	260	ton	Kenya
Paint		New	300	kg	Kenya
Fuel		New	105	m^3	Bujumbura, Burundi
Gabion rock		New	60	m^3	Bujumbura, Burundi
Crushed rock base course	19,050m^2x0.15m	New	3,050	m^3	Bujumbura, Burundi
Natural gravel for subbase course	3,616m^2	New	904	m^3	Bujumbura, Burundi
Kerbing stone	500x100x250	New	1,228	pcs	Bujumbura, Burundi
Crushed rock for DBST	10mm, 20mm	New	300	m^3	Bujumbura, Burundi
Dump truck	10 wheel	Used	3	no	Juba, Sudan

Major Equipment/Materials	Specifications	Status	Qty	Unit	Proposed procurement place
Excavator	0.45m3	Used	1	no	Juba, Sudan
Motor grader 85 Kw	3m	Used	1	no	Juba, Sudan
Truck with 3 ton crane	10 wheel	Used	1	no	Juba, Sudan
Truck mixer	2.5 m3	Used	1	no	Juba, Sudan
Wheel loader	0.5 m3	Used	1	no	Juba, Sudan
AS Engine sprayer	200L	Used	1	no	Juba, Sudan
Combination roller	4Ton	Used	1	no	Juba, Sudan
Generator	75KVA	Used	1	set	Juba, Sudan
Generator	400KVA	Used	1	set	Juba, Sudan
Pickup truck		Used	3	no	Juba, Sudan
Store container and camping	40 feet box	Used	6	no	Juba, Sudan
Store container and camping	20 feet box	Used	4	no	Juba, Sudan
Tamper	100kg	Used	3	no	Juba, Sudan
Tyre roller	3ton	Used	2	no	Juba, Sudan
Welding machine	300-500A	Used	2	no	Juba, Sudan
Rough Terrain crane	20T	Used	1	no	Juba, Sudan

(3) Labours

Construction labours were employed by the Contractor, directory, and they were assigned on simple works such as cleaning and small scale excavation. The availability of skied labours at Bujumbura was not in good condition and it was evaluated that their skill level was extremely low because the construction industry was not developed.

Accordingly, most of the skilled labours were brought from outside of Burundi, and operators for particular machinery were from Thailand because the Contractor had close relation-ship with contractors in Thailand. There was no conflict with local people in term of the employment of Thai labours.

7-7 ARRANGEMENTS BY THE GOVERNMENT

7-7-1 Tax Exemption

Tax exemption was applied for the EWPP and its issues were arranged by the Counterpart. The exemption issues were well –managed in general and however some delay in its process occurred when the exemption requests were concentrated at same or short time because of limited capability of the administration.

The system of exemption is that tax amount is removed from its good price at purchase when the exemption certificate is prepared and presented.

7-7-2 Immigration Issue

The Contractor used some foreign labours, and the arrangement of their permit related to staying and working in Burundi was also administrated by the Counterparts. There were no significant problems for issuing permits.

7-7-3 Consultations to Publics

The consultations to the publics were arranged by Musaga Administrator and the publics were well- controlled by him so that publics were very cooperative for the EWPP. Moreover the Administrator arranged some night guard from Army without any expense from budget of the EWPP.

7-8 BILL OF QUANTITIES AND PROGRESS

7-8-1 Bill of Quantities

The project bill of quantities is tabulated in below;

Table 7-2 Bill of Quantities

		Description	Rate (USD)	Qty	Unit	Amount (USD)	Remark
10	**.00**	**General**					
	.01	Insurance (Works and Contractor's equipment, Third party, Accident or Injury to Workmen)		1	LS		
	.02	Mobilization and Demobilization of Construction Yard		1	LS		
	.03	Mobilization and Demobilization of Construction Equipment		1	LS		
	.04	Project Board		2	unit		Wooden made
		(1) Sub-total					
20	**.00**	**Concrete Kerbing**					
	.01(a)	Kerbstone		577	m		500x100x250

		(2) Sub-total					
21	**.00**	**Pitching Stone Work and Protection against Erosion**					
	.01 (b)	Grouted Stone Pitching		12	sq.m		
	.02 (b)	Dumped Rip Rap		0.5	Cu.m		
	.03 (b)	Repair of U Shape Drain		60	M		
		(3) Sub-total					
22	**.00**	**Gabion**					
	.03 (b)	Galvanized Gabion Mattress (1.0x1.0x1.0)		60	cu.m		
		(4) Sub-total					
32	**.00**	**Breaking up Existing Pavement Layers**					
	.01 (a)	Excavating Material from an Existing Pavement Granular Materials		2680	cu.m		
	.02 (a)	Sawing or Cutting Concrete, Asphalt or Cemented Material, Bituminous Materials		1657	m		
		(5) Sub-total					
35	**.00**	**Pavement Layers of Natural Gravel Material**					
	.02 (b)	Natural Gravel for Subbase, Natural Gravel Class G25		409	cu.m		
	.04 (b)	Scarification, Mixing, Watering and Compaction		16340	sq.m		
		(6) Sub-total					
36	**.00**	**Crushed Aggregate Base Course**					
	.01 (a)	Crushed Aggregate for Base Course, Class CRS		2510	cu.m		
		(7) Sub-total					
40	**.00**	**Prime and Curing Membranes**					

	.01(a)	Prime Coat, MC-30 Cut Back Bitumen		26140	lit		
		(8) Sub-total					
41	**.00**	**Bituminous Base Course and Asphalt Concrete Surfacing**					
	.02	Hump		2.9	cu.m		
		(9) Sub-total					
418	**.00**	**Double Surface Dressings**					
	.01 (a)	20mm and 10 mm Aggregate in 1st and 2nd Layer , Cutback		16340	sq.m		ADDT>1000
		(10) Sub-total					
50	**.00**	**Road Markings**					
	.01(a)	Dotted White Line (@5.0m)		1450	m		W=100
	.01(a)	Continuous White Line		320	m		W=100
	.01(a)	Dotted White Line (@1.0m)		162	m		W=100
	.01(d)	Pedestrian Crossing (W=4m L=6.5m)		3	N		
		(11) Sub-total					
61	**.00**	**Concrete for Structure**					
	.01(b)	U-Shape Drain Cover		102	N		1,000x500x100
		(12) Sub-total					
		Total					

7-8-2 Work Progress

As of end of January 2008 the total progress has reached up to 79%. This achievement was contributed by the completion of LHS lane and approx. 800m of the RHS lane at RN7 as well as construction up to subbase course at Avenue de Government. In view of the current progress, the project completion date is forecasted to be on 15th March 2008 which will be in accordance with scheduled completion day.

The following chart shows record of the progress;

PROGRESS CHART
Jan-08

(The Original Plan) (Actual)

		%	2007				2008			
			9	10	11	12	1	2	3	total
General	Insurance Other	2.8%	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
			90.0%	10.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
	Mobilization and Demobilization Yard	3.2%	20.0%	40.0%	0.0%	0.0%	0.0%	0.0%	40.0%	100.0%
			20.0%	40.0%	0.0%	0.0%	0.0%	0.0%	0.0%	60.0%
	Mobilization and Demobilization	16.6%	20.0%	40.0%	0.0%	0.0%	0.0%	0.0%	40.0%	100.0%
			20.0%	40.0%	0.0%	0.0%	0.0%	0.0%	0.0%	60.0%
Protection for Erosion	Pitching Stone Work	1.0%	0.0%	0.0%	50.0%	50.0%	0.0%	0.0%	0.0%	100.0%
			0.0%	0.0%	0.0%	50.0%	50.0%	0.0%	0.0%	100.0%
	Gabion Work	1.0%	0.0%	0.0%	50.0%	50.0%	0.0%	0.0%	0.0%	100.0%
			0.0%	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%	100.0%
Road rehabilitation	Procurement	25.0%	0.0%	50.0%	50.0%	0.0%	0.0%	0.0%	0.0%	100.0%
			0.0%	60.0%	40.0%	0.0%	0.0%	0.0%	0.0%	100.0%
	Breaking up Existing Pavement	2.0%	0.0%	22.5%	22.5%	22.5%	22.5%	10.0%	0.0%	100.0%
			0.0%	2.0%	38.0%	10.0%	50.0%	0.0%	0.0%	100.0%
	Base Couse	21.7%	0.0%	22.5%	22.5%	22.5%	22.5%	10.0%	0.0%	100.0%
			0.0%	0.0%	40.0%	10.0%	40.0%	0.0%	0.0%	90.0%
	Double Surface Dressing	23.0%	0.0%	0.0%	25.0%	25.0%	25.0%	25.0%	0.0%	100.0%
			0.0%	0.0%	0.0%	25.0%	40.0%	0.0%	0.0%	65.0%
	Road Marking	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	75.0%	25.0%	100.0%
			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Concrete Kerbing	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	75.0%	25.0%	100.0%
			0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
	Others	1.7%	0.0%	0.0%	20.0%	20.0%	20.0%	20.0%	20.0%	100.0%
			0.0%	0.0%	0.0%	10.0%	40.0%	0.0%	0.0%	50.0%
Total		100.0%	6.8%	25.8%	24.9%	12.4%	11.4%	10.0%	8.8%	100.0%
			6.5%	23.2%	19.4%	9.8%	20.1%	0.0%	0.0%	79.0%
Plan(%)		Monthly	6.8%	25.8%	24.9%	12.4%	11.4%	10.0%	8.8%	100.0%
		Cumulative	6.8%	32.5%	57.4%	69.9%	81.3%	91.2%	100.0%	
Actual(%)		Monthly	6.5%	23.2%	19.4%	9.8%	20.1%	0.0%	0.0%	
		Cumulative	6.5%	29.7%	49.2%	59.0%	79.0%	79.0%	79.0%	

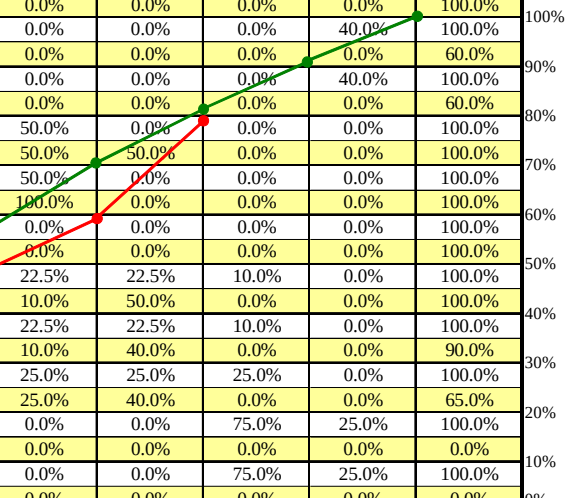

Figure 7-5 Progress Record for the EWPP

7-9 TECHNOLOGY TRANSFER

Technology transfer has been associated with the diffusion of technologies and processes or flow of ideas and knowledge across national boundaries or between organizations. One of the objectives of the Study is to make Burundi to be proper recipient country for future similar project from the experience of the implementation. Therefore the EWPP apart from contributing in the improvement of living condition of citizens at Bujumbura city, it aimed also to transfer the technology and skill from the Japanese expert to the counterpart (representative from the relevant Ministries of the republic of Burundi) so as to make them utilize the transferred technologies and skills in the future project and maintenance activities.

7-9-1 Transfer Method

The counterpart representative was fully involved in the Project supervision ranging from site construction inspection, materials quality testing and discussion in the various site meetings. In general they participated in the exchange of ideas and knowledge between the project experts during the project implementation within the specified technical specification framework.

7-9-2 Counterpart Participant List

The participants list from the onset of the project is hereby shown in the table below

Table 7-3 Participants List

No.	Name	Position	Organization
1	John NDIKUMWAMI	Counselor, Road Department	Ministry of Public Works and Equipment
2	Nestor HAVYARIMANA	Counselor, Road Office	Ministry of Public Works and Equipment
3	Sylvestre NSANZERUGEZE	Counselor, Road Office	Ministry of Public Works and Equipment
4	J. Paul MPAWENIMANA	Counselor, Road Office	Ministry of Public Works and Equipment
5	Gorges HAKIZIMANA	Counselor, Road Office	Ministry of Public Works and Equipment

7-10 PROBLEM AND ISSUES RAISED DURING THE EXECUION

In general, the EWPP was carried out as per plan without any problems, It was evaluated that the success of the Project was contributed by the good cooperation- ship by the Project relevant such as the Commune and Ministries concerned and it was also because of making efforts for catching up the schedule by the Contractor.

In the end of this chapter, it discusses the problems and issues raised during the execution.

(1) Limited Capacity of Material Production

The biggest problem raised during the execution was limited capacity of material production on aggregate and course materials. The project used two sources of stone quarry; there were no problems of quality and quantity of raw materials. However, there was a problem of the production that daily production volume was very little because the crushing plant was limited and old and not well-maintained. This affected to work progress as well as quality.

(2) A Few Availability of Human Resources for Road Works

The Contractor did not employ skilled labour at Bujumbura because that there was a few availability of human resources for road works. He judged that bringing foreign skilled labours was more effective despite paying transportation costs.

(3) Undeveloped Construction Industry

In Burundi, there are no original construction products; even cement is imported from Uganda and/or Kenya. This environment crates that all construction materials are relatively expensive comparing to other Eastern African countries. That is supposed to be because of limited and small scale market size for construction industry.

CHAPTER 8 CONCLUSION AND RECOMMENDATIONS

8-1 EVALUATION AND LESSONS

The EWPP is completed at 15th March 2008; the actual construction time was approx. 6 months which was in accordance with planned construction time. No serious incidences were experienced during the construction period. From those results, it can be evaluated that the EWPP is completed successfully. The rehabilitated roads are expected to contribute to improvement of the living standards of Bujumbura people in near future.

This final chapter discusses lessons as well as recommendation from the Project implementation by different aspects.

8-1-1 Design

The content of the Work was the pavement rehabilitation with DBST pavement. No large scale structures such as bridge and box culverts were introduced in the scope of works. Among the scope of works, there were no difficulties at construction stage, however most of skilled labour was arranged from outside of Burundi. Therefore, generally when the design is made with an assumption of use of local labours, detailed instruction for construction work sequence is recommended to be prepared even for simple works (in French).

The original design did not consider the provision of diversion because the traffic volume was not much and length of road was not long, so existing traffic was supposed to be managed by alternation of one way traffic. But the fact was that the diversion was provided reflecting opinions from the public transporter. In Bujumbura, ratio of paved road is relatively high. With this situation, when the construction of roads within the city is planned, the diversion route shall also be designed together with necessary safety facilities.

8-1-2 Construction Plan

(1) Cost Estimation

The original Engineering Cost Estimate was USD 1,270,991 with scope of RN7 for 1.66km and some collector roads for 3,975 sq.m.

However, the agreed scope was those of RN7 for 1.66km and collector road for 1,290 sq.m with amount of USD 1,265,000.

When estimation is made for applying 1,290sq.m for collector road and 1.66km for RN7 only using unit price of the original Engineering Cost Estimate, total amount is estimated to

be USD 1,166,708 which is 92.2% of the original estimation. This rate of 92.2% can be considered as range of tolerance.

For the Engineering Cost Estimate, Japanese Cost Estimation Manual was used. From the result of above, it is proved that Japanese Manual can be used for estimation for pavement work in Burundi and the estimation by the Study Team was done properly.

(2) Construction Plan

1) Time Schedule

Planned construction time was estimated by using Japanese Cost Estimation Manual and actual construction time met the planned time. Therefore, Japanese manual can be used for the estimation of construction time.

Although the EWPP consumed small quantity of the stone material, there was some critical pass on material production due that crushing plant is limited number with small capacity. When the project with large scale scope of works is planned, mobilization of new crashing plant shall be considered.

2) Procurement

Imported materials were arranged at Dar es Salaam, Tanzania although the Construction Plan considered the main point of the procurement to be at Nairobi or Mombassa, Kenya. The route from Dar es Salaam is considered as not stable because some section of the route is not paved. When the procurement plan is established for the next project, further investigation and comparison is necessary.

8-1-3 Tender

The EWPP adopted short-listed method for selection of contractor, there was no problem and its process was well- known among Burundian.

8-1-4 Supervision

Human resources at Ministry of Public Works and Equipments is limited, so it is difficult to expect that the engineer from the Ministry supervise the detailed subject, the consultant shall be employed so as to assure material and construction quality.

8-2 RECOMMENDATIONS

(1) Early Notification and Local Involvement

The EWPP was notified to public at early stage of the Project and information was presented at meetings for the public consultation. As the result, the EWPP succeeded to have aggressive cooperation from residents at the Commune. For the future projects, early notification is recommended and exchanging opinion with the Administrator from designing stage is also necessary so as to have proper understanding on the projects.

(2) Government Initiative for Development Industry

By the implementation, it was clarified that the construction industry in Burundi is not well developed

In order to attain restoration form civil conflict, development of infrastructure including public transportation system is very necessary, however the still budgets for the development is a little and human resources involved in infrastructure sector is also limited.

In this circumstance, the Government shall seek a possibility of participation of private sector in the development. However the size of capital of private sector is small, therefore some counter measure, with authorization by decree and /or law, such as relaxation of taxation and incentive shall be introduced to the private sector when it carries out the public works. For instance, currently the maintenance work for road is carried out by the governmental and/or public institution directly, if such works is handed over to private sector, it will help to accelerate development of construction industry. When this consideration is developed for all construction activities, it results to attain development of engineering skill for work as well as strengthening capital on private sector.