National Roads Administration

The Republic of Mozambique

No.

BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR IMPROVEMENT OF BRIDGES
IN
ZAMBEZIA AND TETE PROVINCES
IN
THE REPUBLIC OF MOZAMBIQUE

November 2006

JAPAN INTERNATIONAL COOPERATION AGENCY

CHODAI CO.LTD.

NIPPON KOEI CO.LTD.

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PREFACE

In response to a request from the Government of the Republic of Mozambique, the Government of Japan decided to conduct a basic design study on the Project for Improvement of Bridges in Zambezia and Tete provinces in the Republic of Mozambique and entrusted the study to the Japan International Cooperation Agency (JICA)

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JICA sent to Mozambique a study team from August 21 to October 14, 2005, and conducted a field study at study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Mozambique in order to discuss a draft basic design, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Mozambique for their close cooperation extended to the teams.

November, 2006

Masafumi Kuroki
Vice-President
Japan International Cooperation Agency

November, 2006

Letter of Transmittal

We are pleased to submit to you the basic design study report on the Project for Improvement of Bridges in Zambezia and Tete Provinces in the Republic of Mozambique.

This study was conducted by the Consortium of Chodai Co., Ltd. and Nippon Koei Co., Ltd., under a contract to JICA, during the period from August 2005 to November 2006. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Mozambique and formulated the most appropriate basic design for the project under Japan's Grant Aid scheme.

Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

Yusuke Kajimura
Project Manager,
Basic design study team on
the project for improvement of bridges
in Zambezia and Tete provinces
in the Republic of Mozambique
the Consortium between Chodai Co., Ltd.
and Nippon Koei Co., Ltd.

SUMMARY

Summary

1) Overview of the Country

The Republic of Mozambique (hereafter referred to as Mozambique) is located in southern Africa, surrounded by Tanzania, Malawi, Zambia, Zimbabwe, Swaziland, and the Republic of South Africa. The country, land area is about 802,000 km^2, extends from the tropical to the subtropical zones. Its population has been increased to18.96 million as shown by the statistics 2004. The country's economy has been growing steadily having overcome the chaotic aftermath of civil war, showing the average annual growth rate of 9.3% between 2000 and 2004.

2) Background and Outline of the Project

Road network in Mozambique its function are seriously damaged through the prolonged civil war and lack of road maintenance activities Since civil war ended in mid-1990s, the emergency improvement project of the road network has been carried out by the assistance of a number of foreign countries, and rehabilitation of the major trunk roads has been moving ahead at a fast pace. The Road/Bridge Improvement Plan entitled "Roads III", which is the upper plan of this project, is a ten (10) year Plan started in 2001. In Phase I of the project, maintenance of the road network, long-term plan for road improvement, and implementation of high-priority projects are performed. In Phase II and Phase III, regular maintenance activities and rehabilitation of roads/bridges of high priority are planned. Phase I is expected to be completed by the end of 2006 due to its delayed implementation.

In "Roads III", sixty-two (62) projects are prioritized and sixteen (16) started by the end of 2005. The projects that have been implemented so far are mainly for major trunk roads. Improvement of a number of regional trunk road networks is planned in and after Phase II. The target road of this project is placed as the secondary trunk road of high priority and included in the scope of Phase II. Securing stable traffic on this road will contribute to enlargement of the transportation volume of agricultural and mineral produces, which is essential to the regional economic growth.

To secure financial support for "Roads III" implementation, the Mozambique government established, as special revenue for road improvement, a "Road Fund" budget, financed mainly by the petroleum tax. However, at present it primarily goes to routine road maintenance works of the existing road network system. Most of the rehabilitation and the improvement projects for the road network are carried out by the donation from foreign countries and international organization independently

Based on this situation, the Mozambique government requested the Japanese government to provide funding for nine (9) bridge improvement projects, which are a part of the regional trunk

road network in the two (2) northern provinces of Zambezia and Tete. (Although the number of the bridges stated in the request is eight (8), the total number of the bridges is deemed nine (9), because it was decided that the adjacent Licungo Bridge II and the Licungo Bridge III be treated as two separate bridges. The reasons for this are that, although located adjacently, a land space exists between the two bridges, and that the types of the bridges are different.)
These nine bridge projects includes construction of new bridges to replace temporary bridges, and damaged bridges, which exist on the regional trunk road network that link to the main trunk road system, and are key road improvement projects in the Roads III Plan.

3) Outline of the Preliminary Study Result and the Project
In response to the request by the Mozambique government, the Japanese government decided to implement a basic design study for these nine bridge sites. Accordingly, the Japan International Cooperation Agency (JICA) dispatched a team to Mozambique in August to October 2005 to conduct this study. Based on their field survey and data, the study team prepared a draft report based upon the basic design study. In June 2006, JICA sent a team to Mozambique to conduct a series of meetings with representatives of the Mozambique government to review and discuss the basic design study results and evaluate implementation of the bridge projects.

The request for two (2) of the nine (9) bridges was withdrawn, because their improvement was decided to be implemented by the Mozambique government, thus seven (7) bridges became the target for the field survey. In the field survey, the existing condition of the originally requested 9 bridges was investigated through site visits, and surveys on traffic, land form, and soil and analysis of data on socio-economic conditions and construction-related data were conducted regarding the 7 bridges of the survey target. One of the target bridges was excluded from the project because the scope of work for constructing a bridge as a permanent structure was determined to be beyond the scale of grant aid scheme. Another bridge was also excluded, from a diplomatic point of view, because there existed a plan for establishing river transportation with Malawi.

All of the other five (5) bridges are temporary bridges or bridges having high risk of collapsing caused by streamflow, of which improvement is critical in the road improvement project. Because current traffic volumes are not high on those roads, bridge widths will typically be one lane, with the exception of two (2) lanes to match the existing bridges.

The Table below shows the scope of work for these projects. The superstructures for these bridges will be pre-stressed concrete girders and the foundations will be reinforced concrete piles.

Bridge Name	Bridge Length (m)	Width	Approach Road Length (m)	Remarks
Licungo II	50.26	2 lanes	50.0	Utilizes existing bridge, Replace temporary bridge
Licungo III	80.70	2 lanes	71.3 + 50.0	Replaces a temporary & a destroyed bridge
Cuacua I	110.90	1 lane	110.0 + 90.0	Replaces a temporary & a damaged bridge
Cuacua II	44.30	1 lane	129.0 + 109.0	Replaces temporary bridge
Chueza	110.90	1 lane	60.0 + 58.0	Reconstruction of flood damaged bridge

4) Project Work Period and Cost Estimation

The project period is expected to be 4 months period of detailed design and 27.5 months period of bridge construction works. Project cost is estimated to be 1.826 billion Japanese Yen, of which 1.820 is borne by Japanese Grant Aid and 0.006 billion Yen by Mozambican counter budget, respectively.

5) Appropriateness of the Project

The beneficiaries of this project are the regional residents, of which estimated population is about 551,000 (as of 2005). This is about 3% of the total population of Mozambique (18.96 million). Expected effect of implementation of this project is discussed in the following.

Direct Effect

- Damaged and/or aging bridges will be replaced, which will eliminate the risk of collapsing of a bridge by traffic of heavy vehicles or flood, and enhance safety of a trunk road.
- No traffic closure by flood during the rainy season (about 2 month per year).
- Vehicle weight limit (currently 25ton) will be alleviated.

Indirect Effect

- Provision of stable link to major trunk road network system will expand the market where products can be transported to, leading to activation of local industries, such as agriculture, fishery, and mining.
- Traffic convenience to the provincial capital will be improved, providing easier access to medical and educational facilities.
- Products in Tete can be transported to the east areas of the country such as Nampula and the Port of Nacala without going through Malawi by directly linking Tete and national road No.1,

The maintenance works required for the bridges and approach roads that will be improved by this project are regular checkup/repair of each part of the bridges and repaving of the bridge surface. ANE, executing agency of this Project, is currently implementing such maintenance works by using the budget from the Road Fund exclusively for road works financed by revenues such as petroleum tax. Therefore, the maintenance cost for the bridges and roads of this project will be well covered by the Road Fund.

As discussed above, by improving or reconstructing the bridges which have been the bottleneck of the secondary trunk road network, this project will indirectly promote distribution of agricultural, marine, and mineral products which are economic potentiality of the surrounding region. In addition, provision of stable link to the provincial capital and major trunk road network will contribute to improvement of the standard of living of the local residents. Furthermore, the road improvement of this project relates to the improvement of national highway No.1 in the Project for Reconstruction of Bridges on the Main National Roads and the Project for Reconstruction of Bridges on the Main National Road II which carried out by the Japanese grant aid in the past, therefore it is consistent with the fundamental course of policy Japan has been taking.

Based on the above considerations, this project is expected to provide substantial effect on the development of the surrounding region and contribute to the improvement of the living standard of the local residents, leading to reduction of poverty. Therefore, this project deems appropriate as a Japanese grant aid project.

The Project for Improvement of Bridges in Zambezia and Tete Provinces
in the Republic of Mozambique Basic Design Study Report

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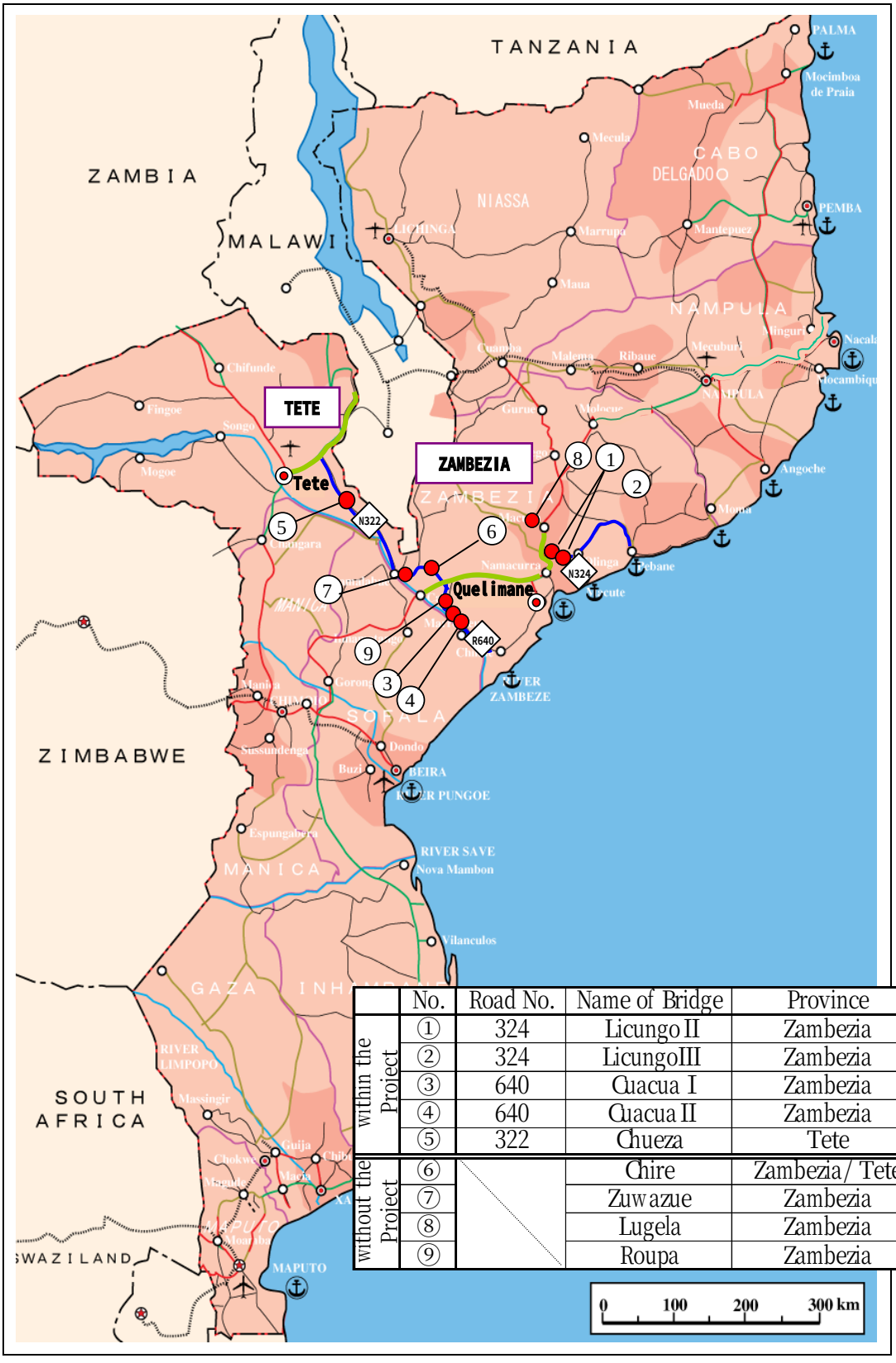
5. Results of Traffic Volume Count
6. Results of Geological Investigation
7. Results of Hydrological Study
8. Chire Bridge Plan

* About the unit of the local currency in this report

The currency of Mozambique was devaluated to 1/1,000 in January 2006. In this report, the devaluated rate is used.

Example; 1,000MT before January 2006 ⟶ 1MT after January 2006



	No.	Road No.	Name of Bridge	Province
within the Project	①	324	Licungo II	Zambezia
	②	324	LicungoIII	Zambezia
	③	640	Cuacua I	Zambezia
	④	640	Cuacua II	Zambezia
	⑤	322	Chueza	Tete
without the Project	⑥		Chire	Zambezia/ Tete
	⑦		Zuwazue	Zambezia
	⑧		Lugela	Zambezia
	⑨		Roupa	Zambezia

Project Location Map

Perspective View of Licungo Ⅲ

List of Figures & Tables

Abbreviations

ANE: National Roads Administration
DEN: Directorate of National Roads
DER: Directorate of Regional Roads
EOJ: Embassy of Japan
FE: Roads Fund
IDA: International Development Association
JICA: Japan International Cooperation Agency
MOFA: Ministry of Foreign Affairs and Cooperation
Roads Ⅲ: Roads and Bridges Management and Maintenance Programme
ROCS: Roads and Coastal Shipping Project

CHAPTER 1

Background of the Project

Chapter 1 Background of the Project

The government of Mozambique has placed a high priority on the implementation of programs for improvement to the transportation infrastructure to facilitate the reconstruction of the country, which suffered extensive devastation during the civil war. Consequently, east west corridor connecting between inland counties and Indian Ocean and north south road connecting major city are improved considerably. On the other hand the road net work connecting regional city to the trunk road are not enough developed and the trunk roads are not utilized efficiently. Bridge on the national highway connecting Zambezi province and Tete province along the Zambezi river are flood away or wrecked by the flood and the developments of both provinces are hindered by the lack of function of connection road. Although, Zambezi province has one of the largest population in the Mozambique and has large number of poor, it product high level of crop. It is considered efficient to develop road network to transport these crop to the major towns for the reduction of poor and development of the economy in the region. It is essential to develop the road for the transportation of mineral that are produced in Tete province to the major port.

Based on these back ground, the government of Mozambique requested to the Japanese government for the development of the bridges on the road which connect two north south trunk road in the Zambezi province and the Tete province. According to the request, Japan International Cooperation Agency organized and dispatched a basic design study team to Mozambique at August 2005. Following nine bridges are nominated in the request.

1. Licungo II Bridge
2. Licungo III Bridge
3. Cuacua I Bridge
4. Cuacua II Bridge
5. Chire Bridge
6. Zuwazue Bridge
7. Chueza Bridge
8. Lugela Bridge
9. Roupa Bridge

Mozambique government has decided to maintain Lugela bridge and Roupa bridge by themselves and the scale of the construction of Zuwazue bridge is over the scope of work of the grant aid project. There is a inland waterway project to connect the Malawi lake and Zambezi river through Chire River and it is necessary to examine the

navigation clearance for the water traffic. The negotiation between the government of Mozambique and the government of Malawi is not yet finalized and the condition of the navigation is not yet clear at the moment. Based on the examination of the above mentioned condition, Lugera bridge, Roupa bridge, Zuwazue bridge and Chire bridge are excluded from scope of work in this project and five bridges will be maintained in this project.

(1) River Condition

The target bridges in the project are parted into both Licungo and Zambezia river basins. The result of hydrological study of the each river is shown in Table 1-1.

Table 1-1 Design discharge (50years probable)

River name	Design Discharge (m^3/s)	Velocity (m/s)	River Bed Elevation (m)	High Water Level (m)	Target Bridges
Licungo	4,752	3.9	19.00	24.90	Licung II, III
Cuacua	1,326	3.0	10.50	16.70	Cuacua I, II
Chueza	954	4.8	152.00	154.70	Chueza

(2) Environmental and Social Considerations

This project is specified as Category C of JICA Guidelines for Environmental and Social Considerations, because Ministry of Environment of Mozambique (MICOA) has concluded that no environmental impact assessment is required for this project because of the reasons that it involves no resettlement of residents, is considered to be having no impact to the natural environment, and the sites of the project are outside of a natural reserve such as a national park. However, MICOA has asked for formulation of an environmental management plan by National Roads Administration (ANE). Because basic information of the bridge construction, such as the bridge location and materials to be used for construction, is required to formulate an environmental management plan, such information will be provided after completion of basic design and drawing by the Japanese side. Based on this information, ANE will formulate an environmental management plan for approval from MICOA. Since the river areas of some target bridge sites are used as a communal laundry and a playground by the nearby residents, the study team suggested to consider this situation when formulating the environmental management plan in a meeting held at the time of the field survey.

CHAPTER 2

Contents of the Project

Chapter 2 Contents of the Project

2-1 Basic Concept of the Project

(1) National Strategy and the Objective of the Project

The condition of the road network in Mozambique has generally improved through the aid from donor countries and international organizations to establish the social and the economical network in the national and regional level. Improvement of the roads in Mozambique from rand lock country to the ports along the Indian Ocean and the road traveled through north and south region of the country are vastly improved. However, regional inconsistency of the economic development and low service levels for secondary and tertiary roads still present significant problems to uniform and efficient flow of commercial goods within the country. The Roads III Plan as road and bridge maintenance plan was established in 2000 and the plan has started at 2001. The Roads III is implemented by Phase I, II, and III over 10 years. Maintenance of the road network and urgent rehabilitation of roads and bridges were carried out and a long term plan has been established in the Phase-I from year 2001 to 2004. Periodical maintenance and improvement of the roads and the bridges with high priority which evaluated in the Phase-I will be carried out in the Phase-II and the Phase-III. Maintenance of the road network is focused in the Roads III to improve the level of the total road traffic. Improvement of the second trunk road will be carried out to stabilize the distribution of goods from the local area and ease the economical difference between the north and the south region.

(2) Project Concept

In order to support the above mentioned national strategy, improvement of secondary trunk roads in the provinces of Zambezia and Tete in northern Mozambique will be carried out through the project. Thus, the market area will be expanded and the regional industry including the agriculture and the fishery will be activated and the access to the hospital or school will be improved by the regional road network.

2-2 Basic Design of the Requested Japanese Assistance

2-2-1 Design Policy

(1) Basic Policy

Objective of the project are to improve five bridges on the second trunk road in Zambezia province and Tete province based on the Road and Bridge Improvement Plan of the Mozambique. Government The existing traffic at the bridge sites which nominated in this project passes through the temporary bridge or the river bed. The second trunk road is a connection road between local areas and first trunk roads and it is expected to activate the regional economy by the improvement of the roads. The wrecked or decrepit bridges on the road shall be improved through the project to keep safety traffic by the following principle.

(2) Design Standard and Criteria

1) Design Standard

The Southern Africa Transport and Communication Committee (SATCC) standards, which are currently used in Mozambique, were applied for the designs of structure. In addition 60 tons check vehicle loading is applied to design for the bridge on Route 322, taking into account the characteristics of its regional trunk road.

2) Road and Bridge Width

The highway design code was applied to determine the bridge width, however, bridge widths and approach road width are also determined taking into account the traffic volumes at the bridge sites.

3) Protection for the Flood

Flood is a major cause of failure of the existing bridge and the following counter measure will be adopted for the design of the bridges in the project..

1. Bridge length and vertical clearance are determined by the discharge of flood. The return period of the flood is 50 year.
2,. Abutment of the bridge shall be located at the safety area for the river bank erosion.
3. Bank protection or river bed protection will be constructed where bank erosion or scour of river bed will be expected.

4) Recycle of the exsisting structure

In case that the structure of the existing bridge has enough strength, the structures will be utilized for the renewal of the bridge.

5) Construction schedule taking into account the weather condition.

There is a lot of rainfall at the rainy season in the project area and the construction of substructure and foundation become difficult by the increased discharge of the river flow. The structures shall be planed to construct at the dry season.

(3) Natural environmental condition

There are dry season and rainy season in Mozambique. Rainy season will start at the beginning of November and will end at March. Road traffic will be obstructed during the rainy season because of the muddy road at the area. Major construction equipment and the material shall be planned to transport to the construction site at dry season. In addition, the construction of substructure and foundation shall be constructed during the dry season because the construction will be disturbed by the rainfall at the rainy season. The high temperature over 30℃ are common at the dry season and the natural condition shall be taken into account for the quality control of the concrete.

(4) Socio economic condition

Local material such as the concrete aggregate and the timber shall be used for the construction as much as possible to have a share in local economy. The local labor will be employed as much as possible for the common work of the construction to enlarge the chance for employment of local resident.

(5) Construction Conditions

1) Procurement of Construction Material and Equipment

Local materials, such as the cement (for substructure), the aggregates and the diesel oil are available in Mozambique, however construction materials available in Mozambique are limited because of the quantities and the quality levels. Other construction materials will be procured from South Africa due to the geographical advantage, however, procurement of materials from Japan will also shall be examined as an alternative based on the price and quality.

2) Labor Force

Road construction work has been underway in Mozambique since the mid-1990's, with a satisfactory level of quality. However, in the past these projects were performed primarily by companies with foreign capital, with foreign construction supervision and skilled labor were dependent upon foreign resources. With that in mind, local labor will be considered for common labor works.

3) Local Contractor

The major local contractors are generally local companies financed by foreign capital. These companies will have enough experience and skills to carry out the road and bridge construction and may be qualified to perform subcontractor work for this project. On the last two (2) Japanese grant aid projects for bridge construction, local contractors performed satisfactorily as subcontractors for the projects.

(6) Maintenance and Operation Capacity of ANE

The National Roads Administration (ANE) will maintain the structures after construction is completed and the structures are hand over to the government. ANE has been performing ongoing maintenance works of existing road network by the budget from the Road Fund. Each provincial office has the responsibility for maintenance works of the road networks in their province and maintenance work are outsourced to private enterprise every year. The provincial office monitors such outsourcing works periodically to keep the maintenance works as satisfactory level. This system is working well at present and the level of the maintenance work seems to be adequate. Concrete bridges do not need special maintenance in general. Major maintenance works for the bridges are the inspection of the pavement ,the handrails and the slope of embankment. Therefore, these maintenance activities shall be included in the routine maintenance work for the roads to minimize the maintenance work of the concrete bridges, considering the current road maintenance system in Mozambique.

(7) Recycle of the existing facilities

Sufficiency rate of the existing superstructures and the piers of Licungo II are high enough and the improvement of this bridge will be carried out at the part where the temporally bridge is installed. The Cuacua I bridge will be totally reconstructed because the existing structures are decrepit and the loading capacity is not sufficient. The Licungo III bridge , the Cuacua II bridge and the Chueza bridge will be reconstructed as new bridges because these bridges are totally deteriorated or lost by the flood.

2-2-2 Basic Plan (Construction Plan)

Flow chart for planning of road and bridge is shown in Figure 2-1

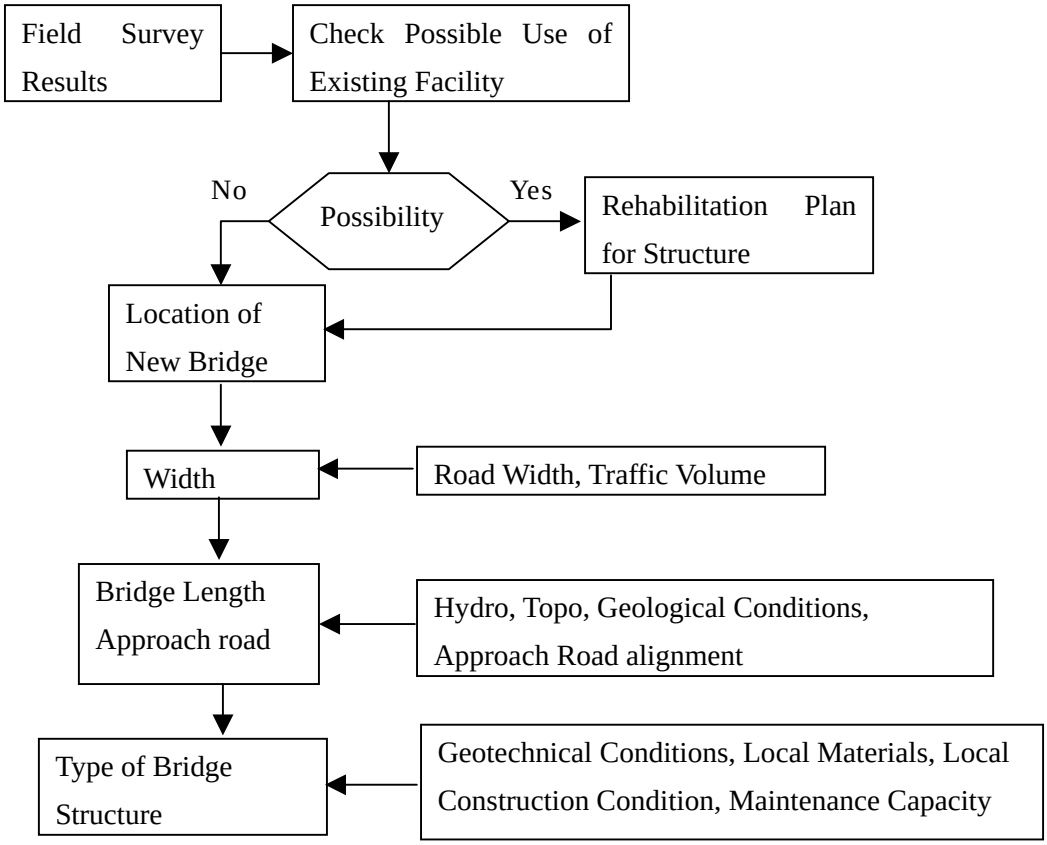


Figure 2-1 Flowchart for the road and the bridge planning

Dimensions and details of the bridges in the project are shown in Table 2-1.and design criteria for road and design criteria for bridge are shown in Table 2-2 and 2-3 respectively. The Licungo II and III are two (2) lanes carriageway because the existing bridge has two (2) lanes and has relatively large traffic volume. The superstructure type of the bridges will be prestressed concrete “T” girders. The pile foundation will be used considering the soil bearing conditions at the construction site.

Table 2-1 Dimensions of the Bridges

Bridge Name	Length (m)	Width	App. Road (m)	Remarks
Licungo II	50.26	2 lanes	50.0	Utilizes existing bridge, Replace temporary bridge
Licungo III	80.70	2 lanes	71.3 + 50.0	Replaces a temporary & a destroyed bridge
Cuacua I	110.90	1 lane	110.0 + 90.0	Replaces temporary & a damaged bridge
Cuacua II	44.30	1 lane	129.0 + 109.0	Replace temporary bridge
Chueza	110.90	1 lane	60.0 + 58.0	Reconstruction of bridge

Table 2-2 Road Design Criteria

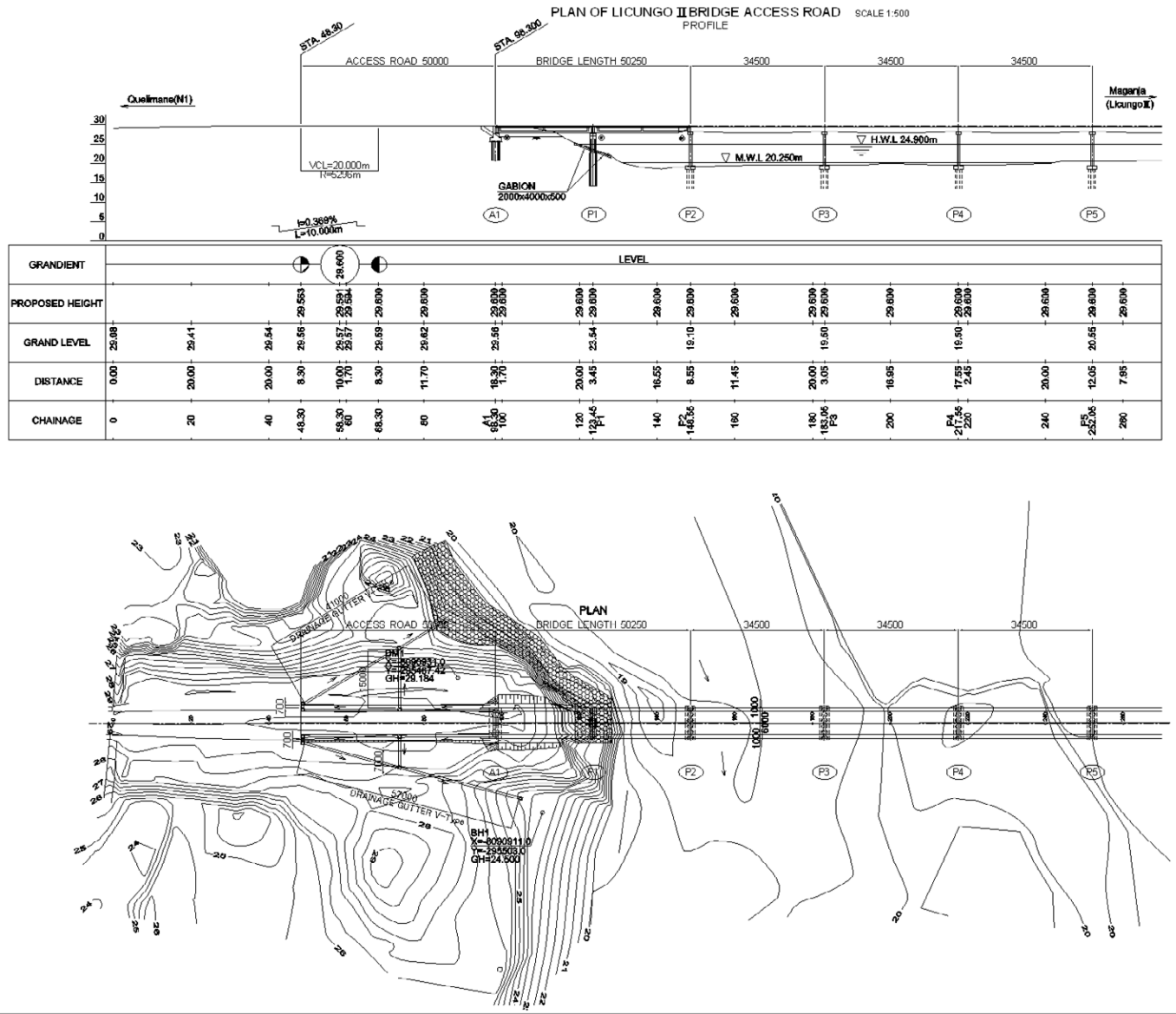
Design Item	Design Condition	Basis of Determination
Classification of Road	Secondary Trunk Road, Un-surfaced	Mozambican Rd. design standard
Design Speed	60 km/h	Mozambican Rd. design standard
Radius of Curvature	min. 90 m	Mozambican Rd. design standard
Longitudinal Gradient	max. 8%	Mozambican Rd. design standard
Lateral Gradient	2.5 %	Mozambican Rd. design standard
Lane Number	2 lanes: Licungo II/III 1 lane: Cuacua I/II, Chueza	Mozambican Rd. design standard, corresponding with existing road
Road Width	W = 5.0 m (1 lane) W = 6.0 m (2 lanes)	Mozambican Rd. design standard, minimum width

Table 2-3 Bridge Design Criteria

Design Item		Design Condition	Basis of Determination
High water discharge		Current max. or discharge of 50 years prob.	results of analysis on natural condition and hydrological study
Clearance of girder		1.0 m	Japanese Standard
Load	Dead load	Steel : 77.0 KN/m3 R. concrete : 24.5 KN/m3 A. concrete : 22.5 KN/m3	
	Live load	NA, NB, NC	SATCC Standard
		60 ton check load (Chueza Br.)	Mozambican Rd. design standard
	seismic load	lateral seismic coefficient 0.03 g	SATCC Standard
	Temperature	+49 ^{o}C - 0 ^{o}C	SATCC Standard
Concrete deign strength		Foundation/substructure: C30 (24 Mpa) PC girder: C40 (32 Mpa) Leveling concrete: C20 (16 Mpa)	

2-2-3 Basic Design Drawings

Figures 2-2 to 2-6 show general project plans. Figures 2-7 to 2-11 show general plans for the bridges.



NATIONAL ROADS ADMINISTRATION(ANE)	THE PROJECT FOR IMPROVEMENT OF BRIDGES IN ZAMBEZIA AND TETE PROVINCES	JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)	TITLE	SCALE	DATE	DRAWING NO.
			PLAN OF LICUGO Ⅱ BRIDGE ACCESS ROAD	1:500	27/03/06	000

Figure 2-2 General Project Plan of Licungo Ⅱ Bridge

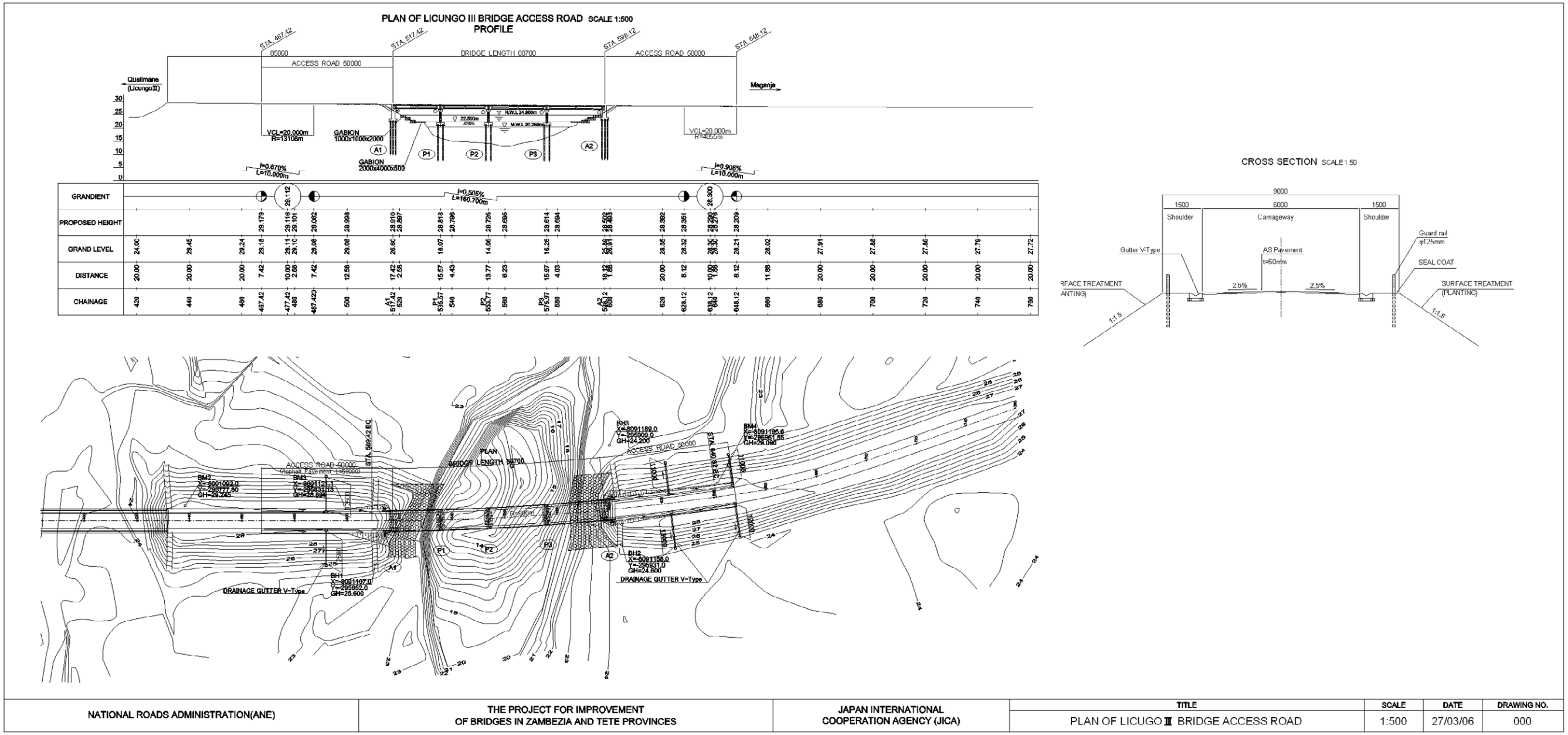
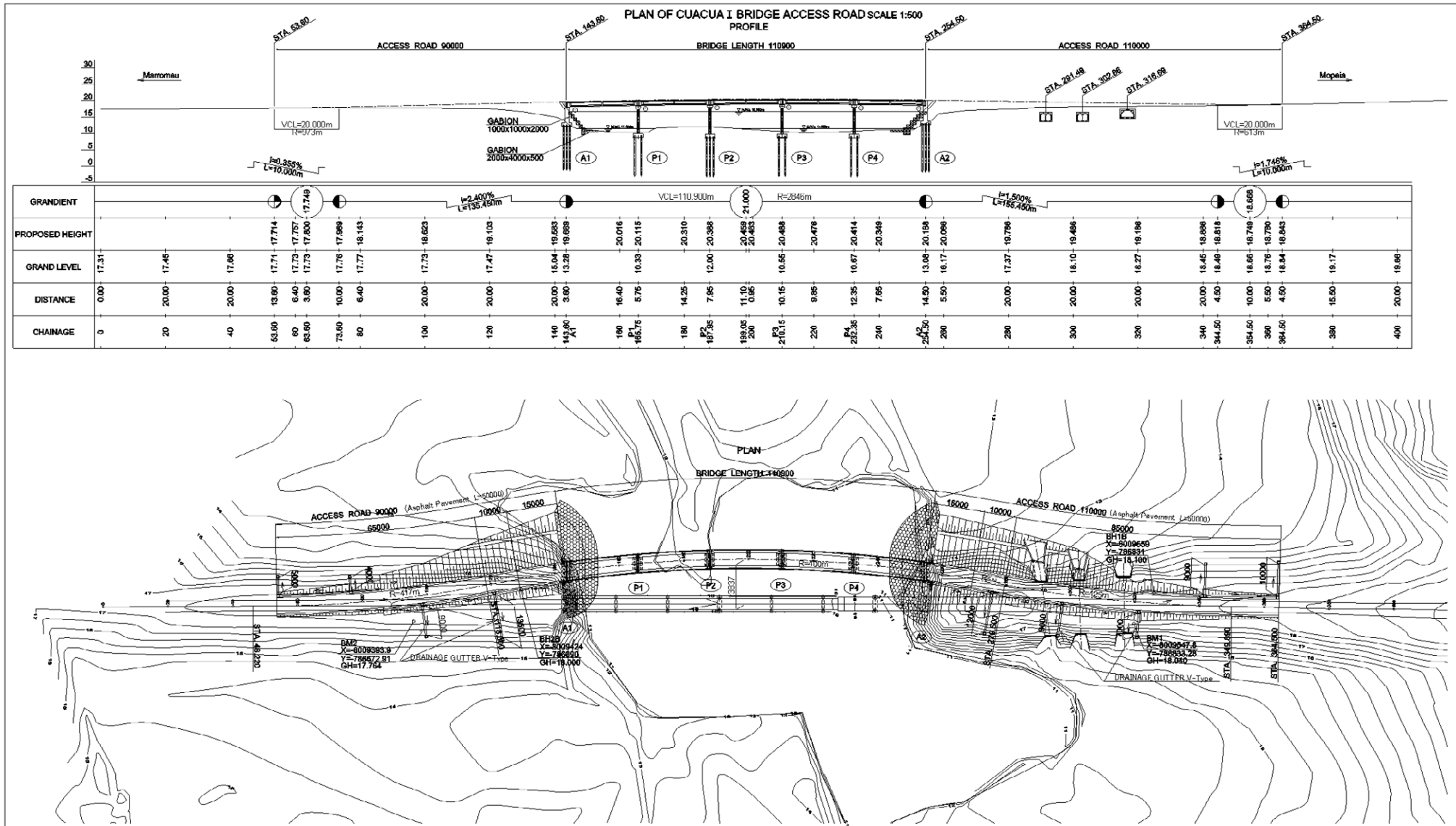


Figure 2-3 General Project Plan of LicungoⅢ Bridge



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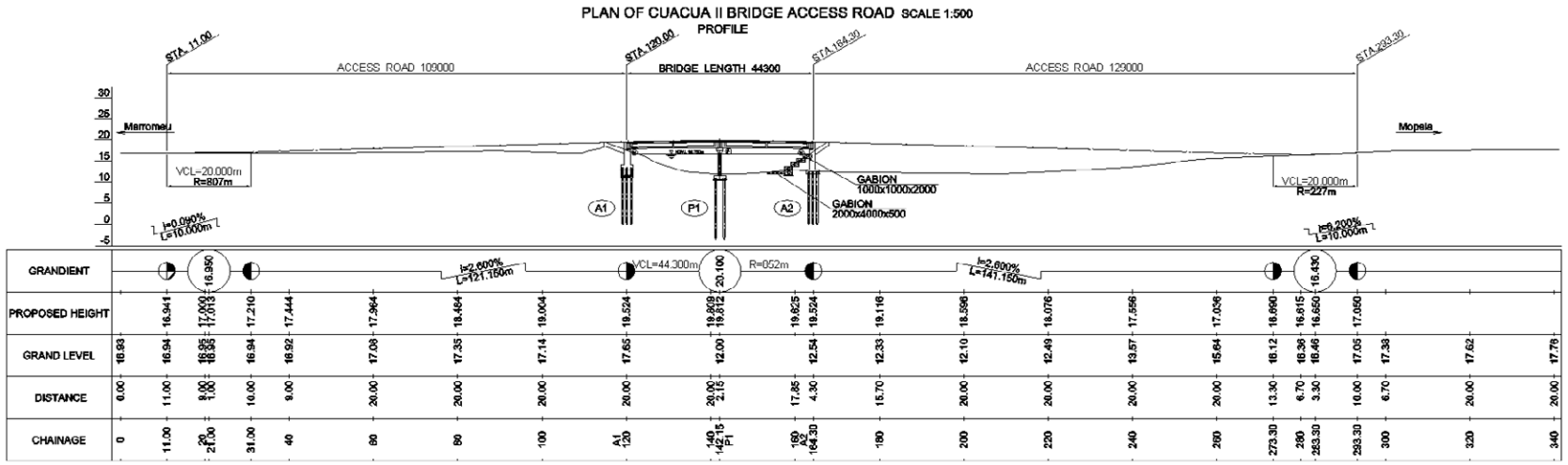
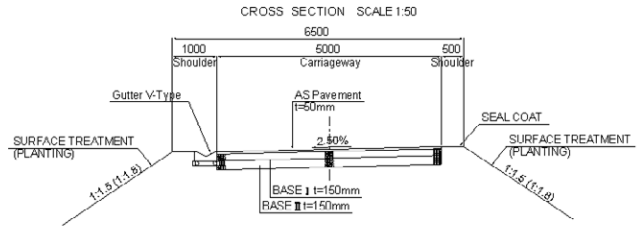
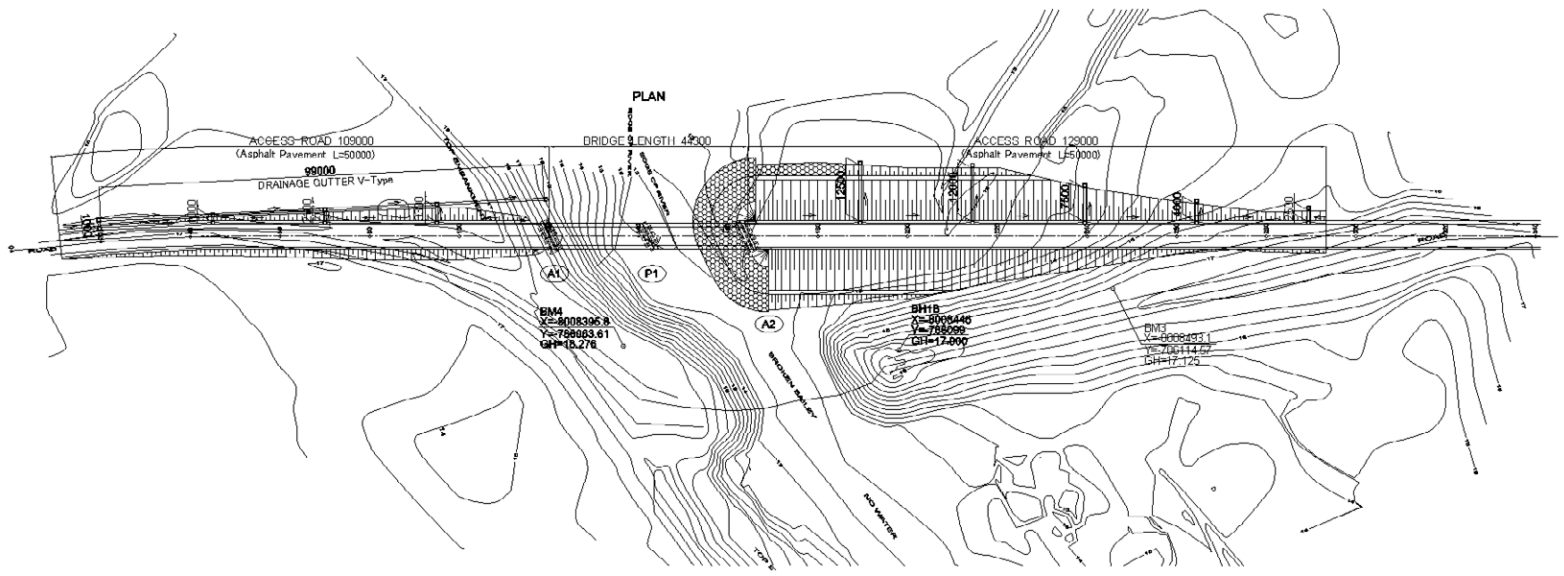
			PLAN OF CUACUA Ⅰ BRIDGE ACCESS ROAD	1:500	27/03/06	000

Figure 2-4 General Project Plan of Cuacua Ⅰ Bridge







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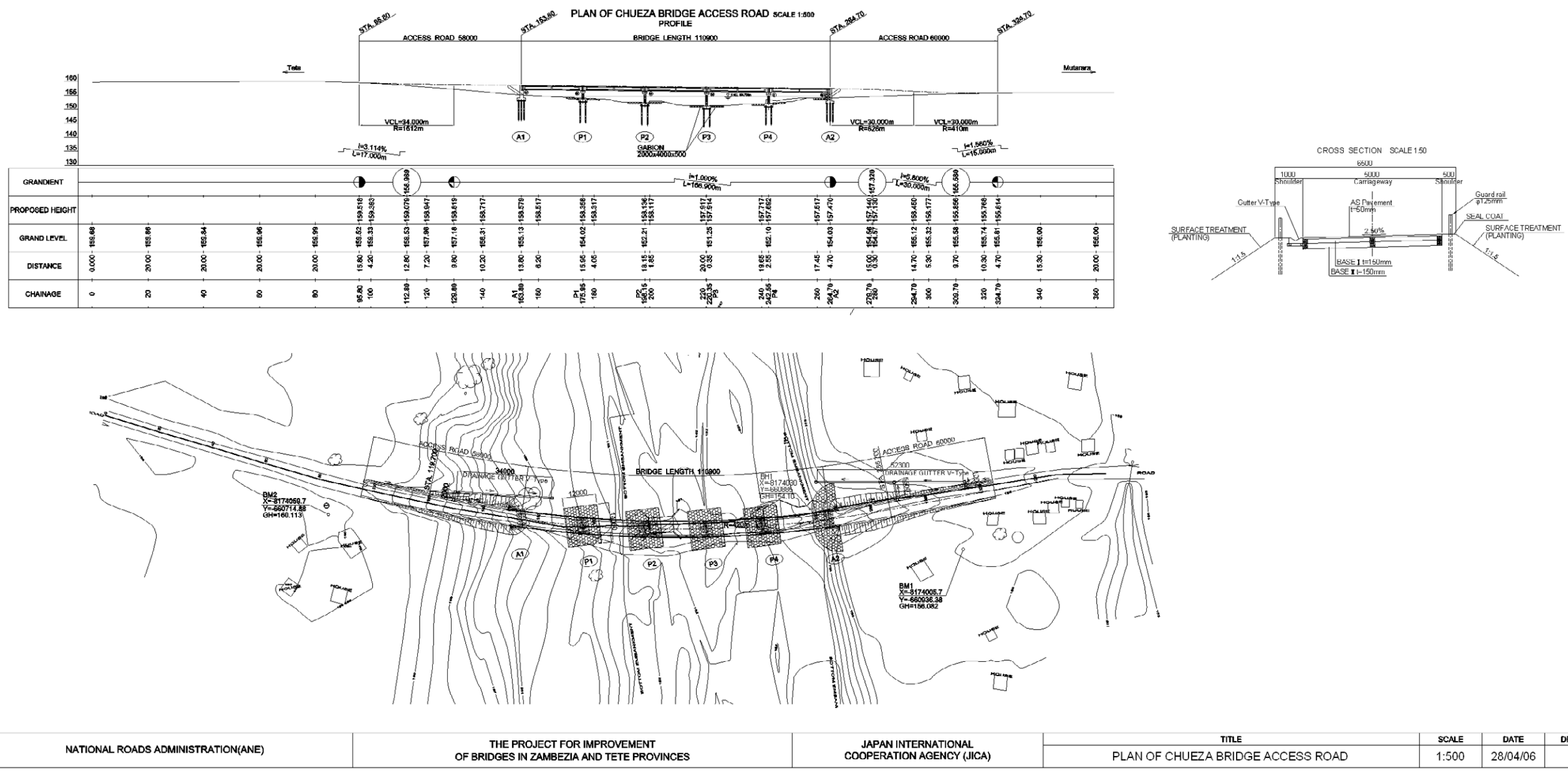
			PLAN OF CUACUA Ⅱ BRIDGE ACCESS ROAD	1:500	30/01/06	000

Figure 2-5 General Project Plan of Cuacua Ⅱ Bridge



NATIONAL ROADS ADMINISTRATION(ANE)	THE PROJECT FOR IMPROVEMENT OF BRIDGES IN ZAMBEZIA AND TETE PROVINCES	JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)	TITLE	SCALE	DATE	DRAWING NO.
			PLAN OF CHUEZA BRIDGE ACCESS ROAD	1:500	28/04/06	000

Figure 2-6 General Project Plan of Chueza Bridge

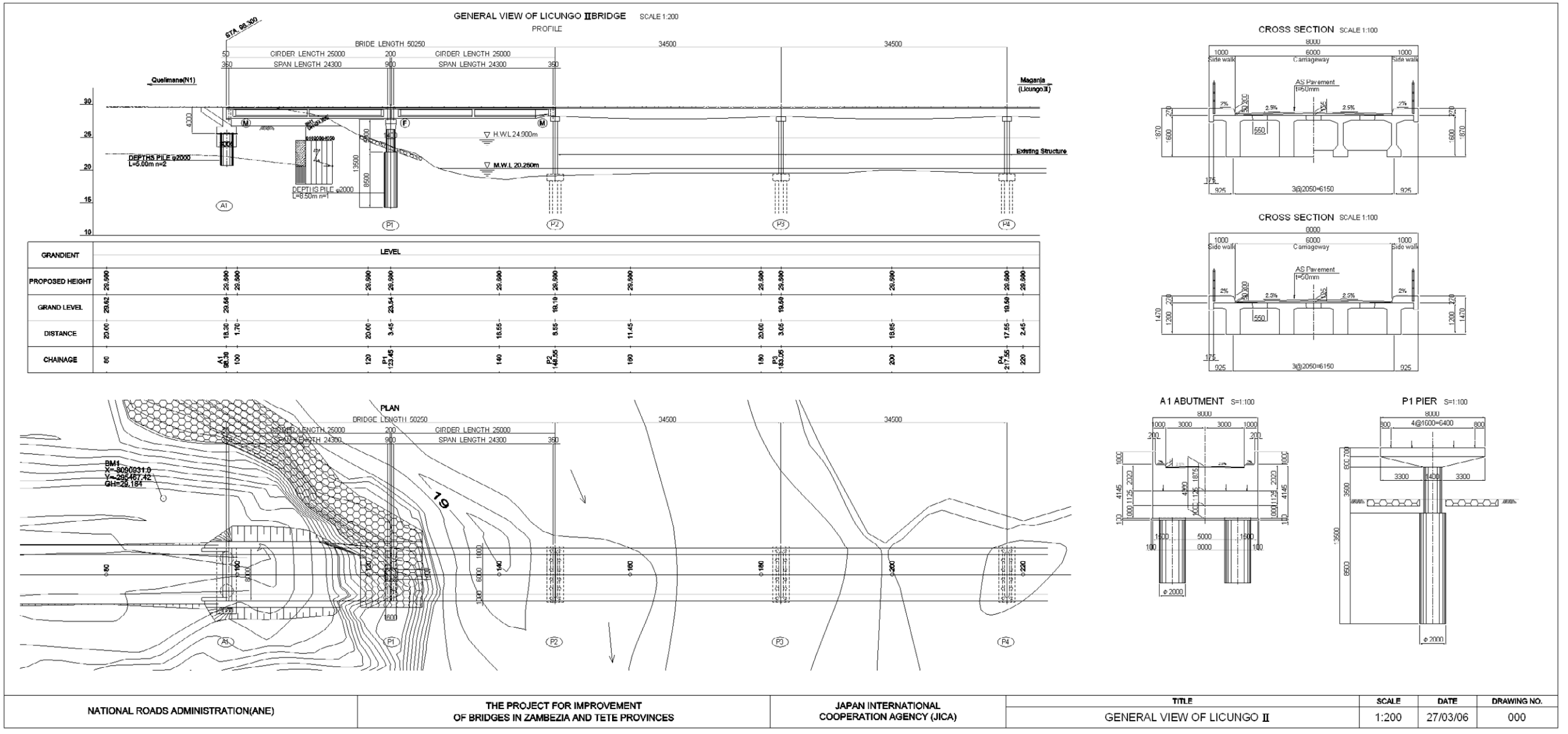
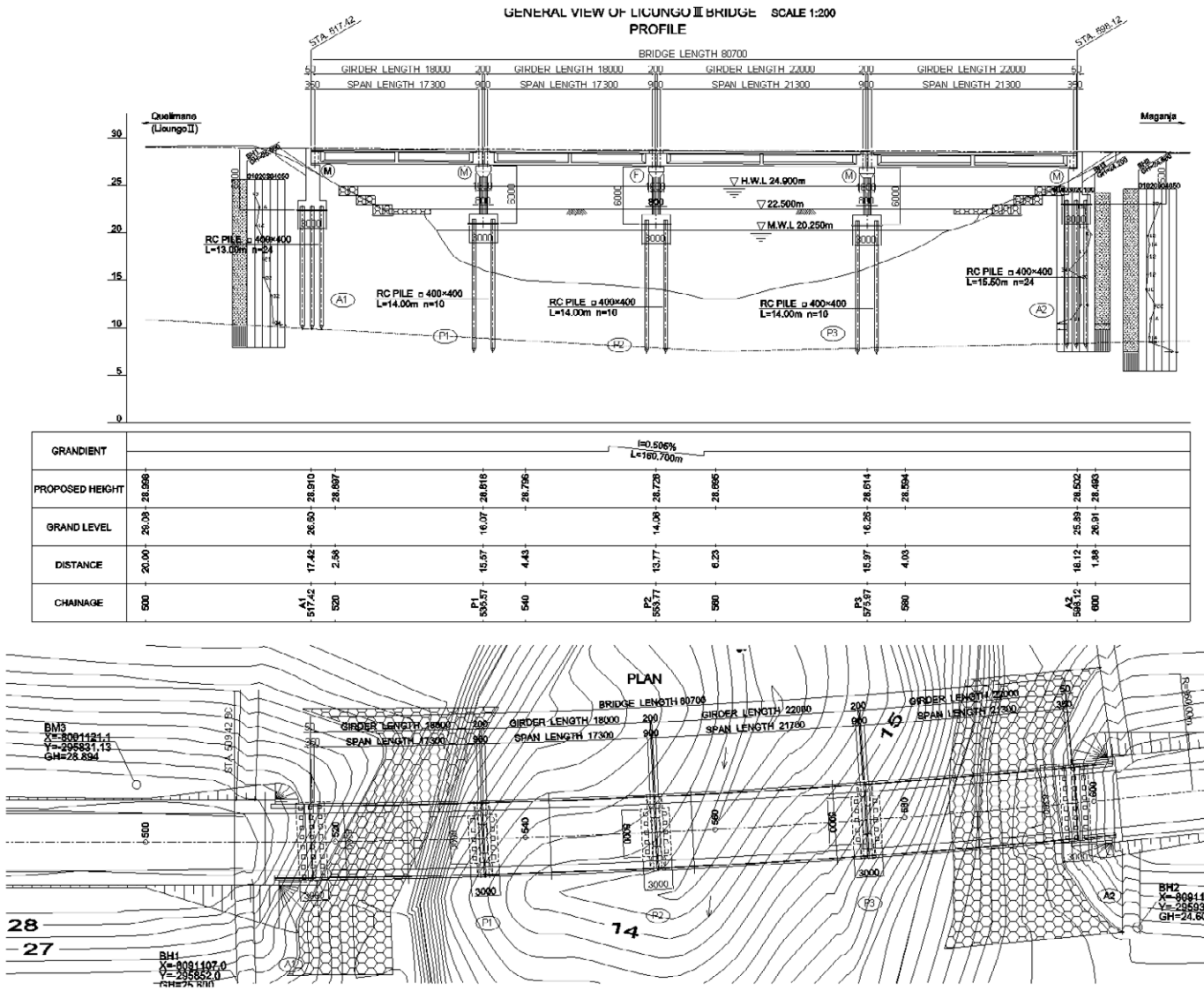
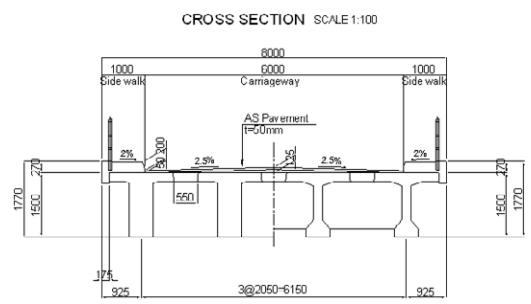
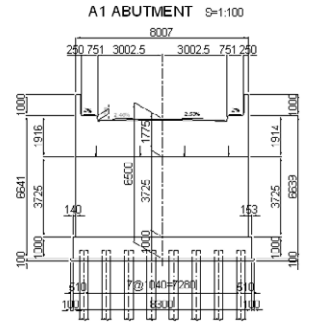
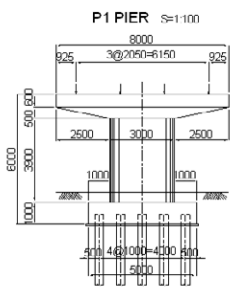


Figure 2-7 General Plan of Licungo Ⅱ Bridge









NATIONAL ROADS ADMINISTRATION(ANE)	THE PROJECT FOR IMPROVEMENT OF BRIDGES IN ZAMBEZIA AND TETE PROVINCES	JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)	TITLE	SCALE	DATE	DRAWING NO.
			GENERAL VIEW OF LICUGO Ⅲ	1:200	27/03/06	000

Figure 2-8 General Plan of LicungoⅢ Bridge