JAPAN INTERNATIONAL COOPERATION AGENCY
DEPARTMENT OF FINANCE AND PLANNING
PAPUA NEW GUINEA

BASIC DESIGN STUDY REPORT ON THE PROJECT FOR CONSTRUCTION OF GEREHU NATIONAL HIGH SCHOOL IN PAPUA NEW GUINEA

January, 1994

SOZOSHA CO., LTD.
CONSULTANTS, ARCHITECTS & ENGINEERS

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PREFACE

In response to a request from the Government of Papua New Guinea, the Government of Japan decided to conduct a basic design study on the Project for Construction of Gerehu National High School and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Papua New Guinea a study team headed by Seiji Utsumi, JICA Specialist and constituted by members of Sozosha Co., Ltd., from July 10, 1993 to August 8, 1993.

The team held discussions with the officials concerned of the Government of Papua New Guinea, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Papua New Guinea in order to discuss a draft report, 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 Papua New Guinea for their close cooperation extended to the teams.

January, 1994

Kensuke Yanagiya

Kensuke Yanagiya
President
Japan International Cooperation Agency

January, 1994

Mr. Kensuke Yanagiya
President
Japan International Cooperation Agency
Tokyo, Japan

Letter of Transmittal

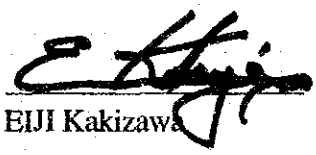
We are pleased to submit to you the basic design study report on the project for the Construction of Gerehu National High School in Papua New Guinea.

This study was conducted by Sozosha Co., Ltd., under a contract of JICA, during the period from July 2, 1993 to January 31, 1994. In conducting the study, we have examined the feasibility and rationality of the project with due consideration to the present situation of Papua New Guinea and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

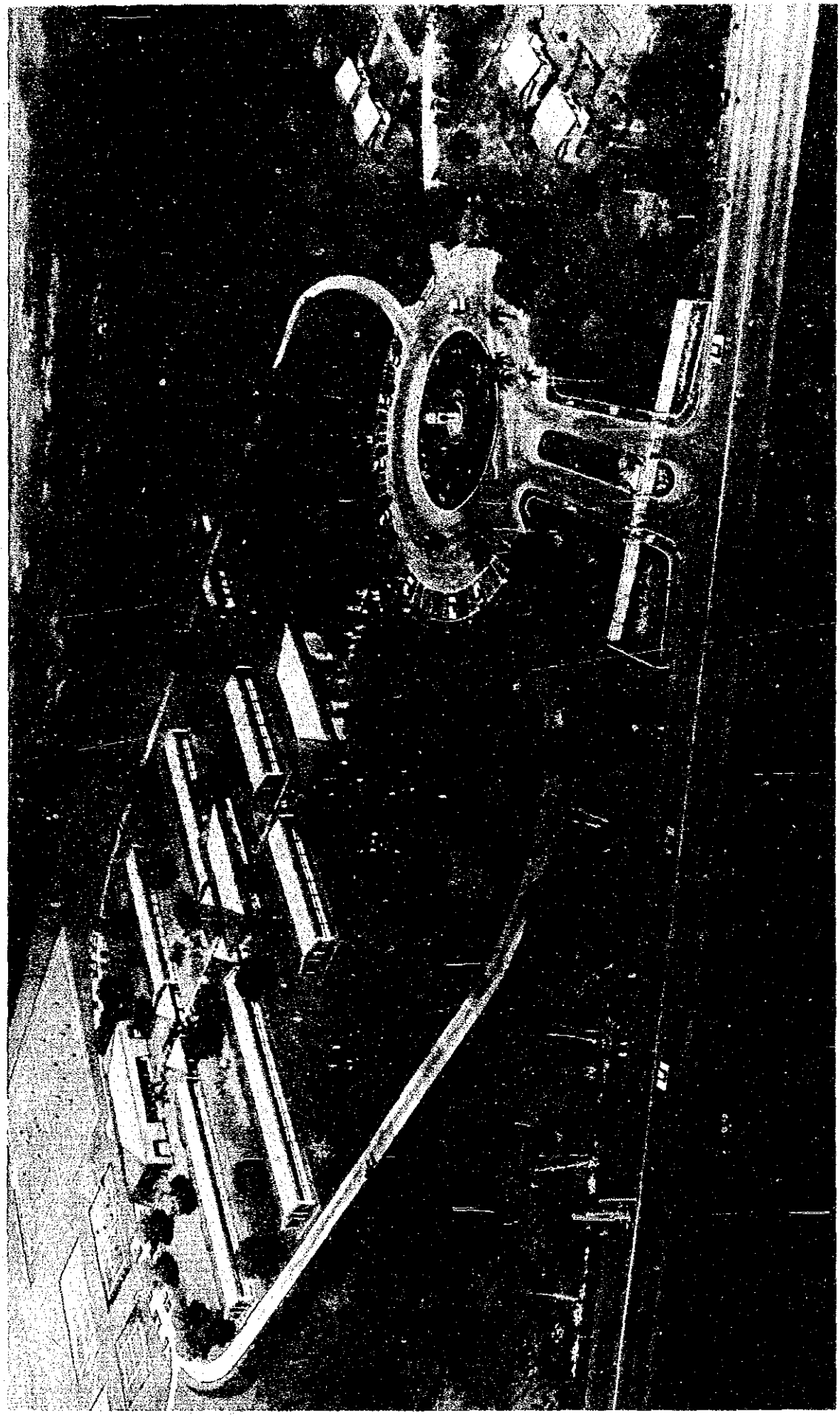
We wish to take this opportunity to express our sincere gratitude to the officials concerned of JICA, the Ministry of Foreign Affairs, and the Ministry of Education, Science and Culture. We would also like to express our gratitude to the officials concerned of the Foreign Aid Management Division, Department of Education, the JICA Papua New Guinea office, the Embassy of Japan in Papua New Guinea for their cooperation and assistance throughout field survey.

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

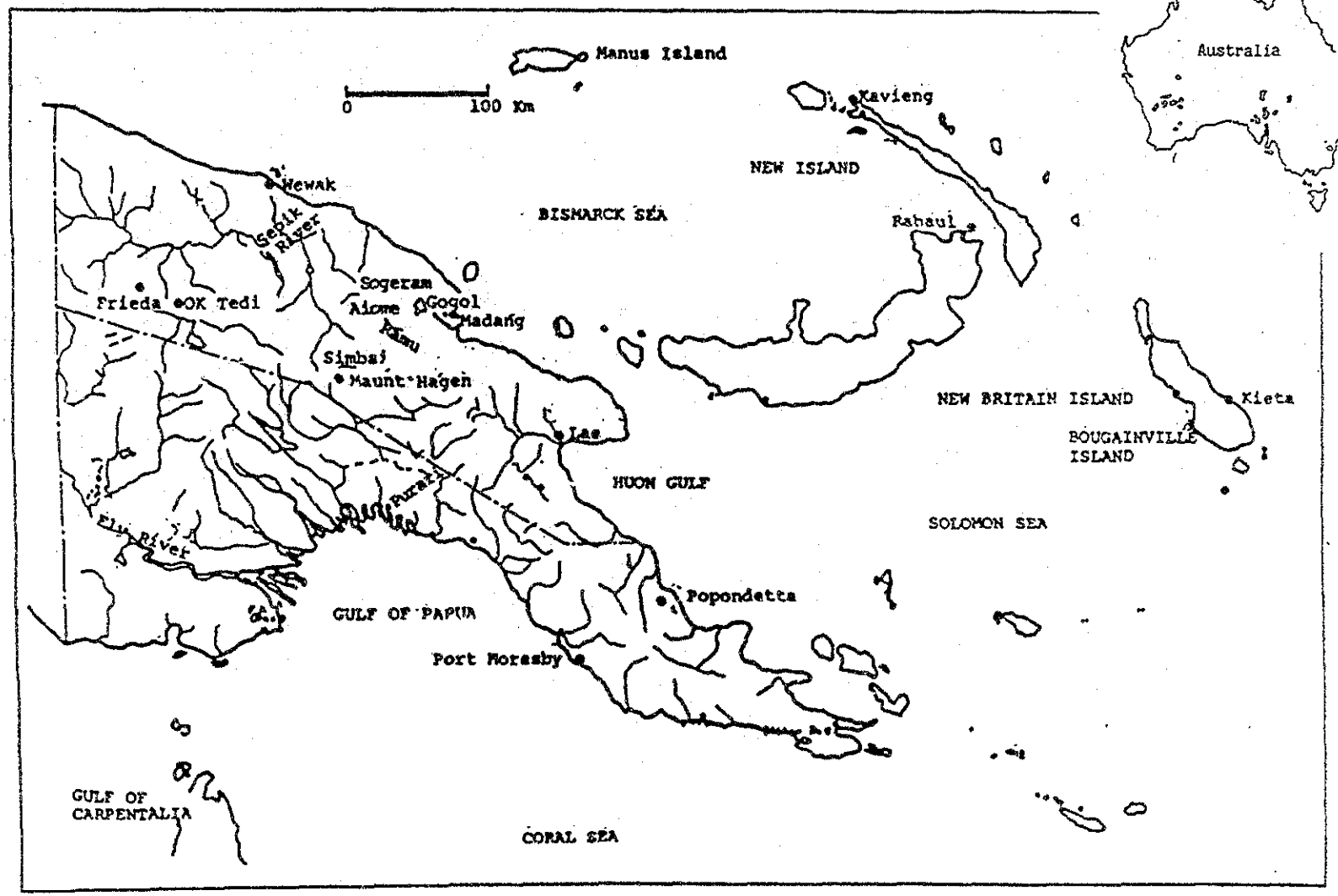
Very truly yours,

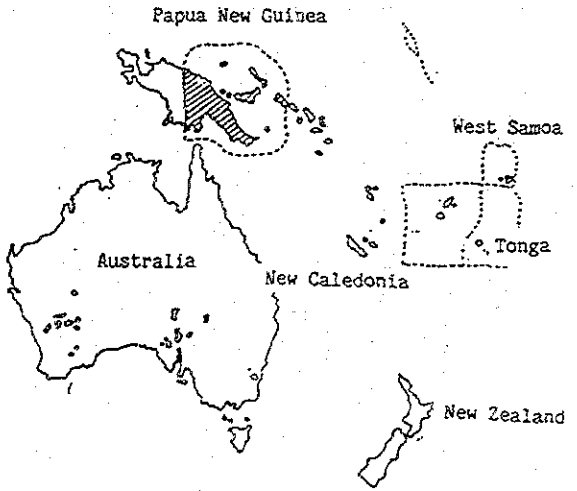


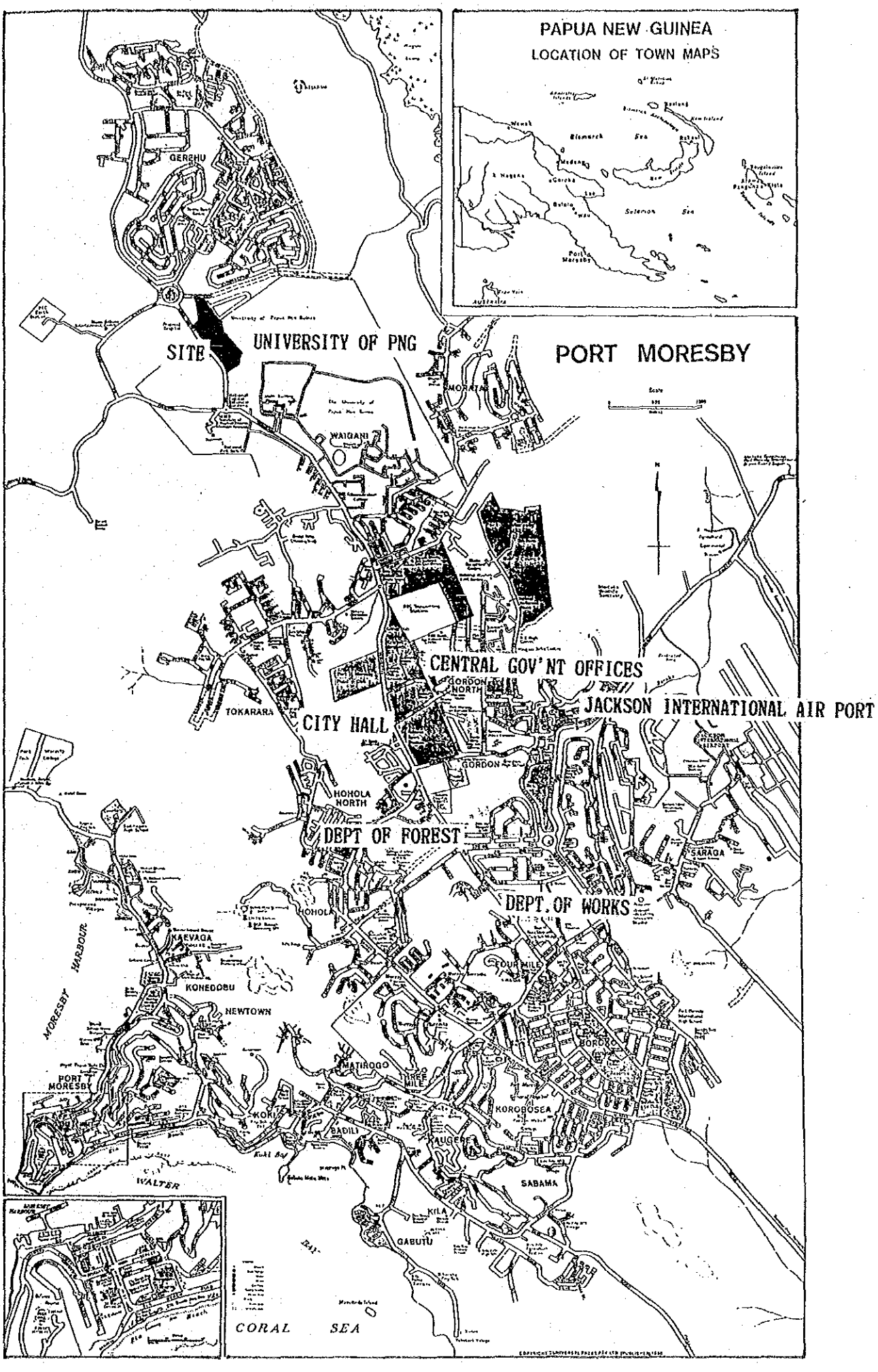
EIJI Kakizawa
Project manager,
Basic design study team on
the project for the construction
of Gerehu National High School
Sozosha Co., Ltd.



PAPUA NEW GUINEA






PAPUA NEW GUINEA
LOCATION OF TOWN MAPS
PORT MORESBY
SITE
UNIVERSITY OF PNG
CENTRAL GOV'NT OFFICES
JACKSON INTERNATIONAL AIR PORT
CITY HALL
DEPT OF FOREST
DEPT. OF WORKS
GEREHU
WAIGANI
MORATA
TOKARARA
GORDON NORTH
GORDON
HOHOLA NORTH
HOHOLA
KAEVAGA
KONEDOBU
NEWTOWN
PORT MORESBY
KOKI
BADILI
MATIROGO
TREE MILE
FOUR MILE
KOROBOSEA
KAUGERE
SABAMA
KILA
GABUTU
WALTER
MORESBY HARBOUR
CORAL SEA

SUMMARY

SUMMARY

Papua New Guinea consists of the eastern half of the island of New Guinea, the second largest island in the part of the world, and approximately 600 smaller islands with a total land area of 460,000 km^2 and the stastical number of the population in 1988 was approximately 3.58 million.

It became independent in 1975 as a constitutional monarchy. Its capital is Port Moresby, the political and economic center.

The educational level of Papua New Guinea has not yet reached that of other countries of the same income level, as indicated by a literacy rate of 45 percent; enrollment rate at community schools is at 73 percent, at provincial high schools 16 percent, and at national high schools 2 percent. Therefore, the quality of laborers has not improved and has become a considerable obstacle to the economic development of the country. Therefore, this has become a burden on the national budget which has to be borne to cover the employment of a contracted foreign labor force consisting of a number of experts in many fields.

In order to improve these conditions and achieve the national objectives stipulated in the Constitution, the Government of Papua New Guinea has instituted a policy of improvement of education under the slogans "Integral Human Development" and "Proper and Relevant Education and Man-Power Development" that are conceived of as development goals for the National Investment and Development Program. The tightest bottleneck in the educational system of the country is in national high school education. At present there are only four national high schools in the country, and what makes matters worse, there are no national high schools in the metropolitan area. Since 1993, the total number of students in four national high schools has increased to 1,000 for each grade and has reached to 2,000 in total for G11 and G12. The Government of Papua New Guinea has recognized that the construction of new schools is needed to improve enrollment at high schools, and has issued the "National High School Improvement Plan" which is trying to establish five (5) additional new national high schools in the country by the year 2000.

Among these planned 5 national high schools, The Gerehu National High School, which is to be established in Port Moresby, is top priority due to its geographically advantageous location. However, since 24 percent of the national budget now depends on foreign aid, it is rather difficult for the Government to accomplish this plan only using the national budget. Then consequently, the Government of Papua New Guinea made a request to the Government of Japan for grant aid for the construction of the Gerehu National High School.

In response to this request, the Government of Japan decided to conduct a Basic Design Study on the Project. Thus, Japan International Cooperation Agency (JICA) sent to Papua New Guinea a basic design study team headed by Seiji Utsumi, JICA development specialist from July 10 to August 8, 1993.

The study team had a series of discussions on the Project with the concerned officials of the Govenment of Papua New Guinea and they explored the planned construction site, surveyed similar and alternative facilities, collected related data, etc. based on which the team discussed the scope of the Project as well as the scope of work that Papua New Guinea would be bearing responsibility for. After returning to Japan, the scale of facilities, selection of equipments for the Project were discussed and finalised based on the results of the site survey.

JICA made a draft final report covering all the contents mentioned above, and sent a study team to Papua New Guinea from November 1 to November 12, 1993 to explain and discuss the contents of the draft final report. Then consequently, both parties had basic agreement on this report.

The objective of this project is to construct new national high schoools to help raise the enrollment at national high school, which now forms a bottleneck in the Papua New Guinea educational system.

The Gerehu National High School which is to be established will be managed by the Ministry of Education. It is a day school holding a total number of 500 students in two grades and is the only national high school in the capital, Port Moresby from where admission of students is announced.

Phase Ⅰ

<Facilities>

Ward Name	Main Room Name	Total Area
1 Regular classroom ward	8 rooms for G11 and teacher's room.	839.4 m²
2 Special classroom ward (Science)	Special classrooms for chemistry, biology, and physics. Teachers' room, preparation room, etc. for G11.	557.4 m²
3 Presentation classroom ward (Expressive arts)	Classrooms for painting, drafting and drawing, textiles, dramatic performances, and music, etc. Teachers' room, etc. for G11.	586.8 m²
4 Library ward	Reading corner, bookstack corner, office, book lending counter, etc.	571.1 m²
5 Administrative office ward	Room for principal and assistant principal, office, teachers' room, bulletin corner, etc.	564.0 m²
6 Residence	15 numbers of residences for teachers (H65 type)	1169.1 m²
	5 numbers of residences for staff (L-40 type)	226.8 m²
Total		4514.6 m²

Phase Ⅱ

<Facilities>

Ward Name	Main Room Name	Total Area
1 Regular classroom ward	8 rooms each for G12.	839.4 m²
2 Special classroom ward (Science)	Special classrooms for chemistry, biology, and physics. Teachers' room, preparation room, etc. for G12.	557.4 m²
3 Assembly hall and Gymnasium ward	Arena for school events and sports, stage, booth, etc.	1260.0 m²
4 Residence	12 numbers of residences for teachers (H65 type)	935.28 m²
5 Relative facilities	Electrical compartment, lavatories, storage, workshop, etc.	98.0 m²
Total		3690.8 m²
Grand Total (Phase Ⅰ and Ⅱ)		8204.68 m²

Phase II

<Equipments>

Classification	Principal Equipment Name
1 Equipment for education	Computers, projectors, video sets, etc.
2 Equipment for science education	Testers, experimental devices, microscopes, balances, barometers, centrifuges, etc.
3 Audiovisual equipment	Broadcasting equipment, acoustic equipment for music room, acoustic equipment for dramatic performances, etc.
4 Sports equipment for physical training	Table tennis, volleyball, soccer, basketball, etc.
5 Equipment for maintenance and management	Tools for wood working and metal working
Total	

The Project affects general society indirectly by creating well-educated people. The facility will be maintained and operated by Papua New Guineans themselves. It completely matches the objective of the National Development Plan and Public Investment Plan of Papua New Guinea. On these point of view, it is expected valuable effect on implementation of this project under the Grant Aid of the Government of Japan.

CONTENTS

Basic Design Study Report on The Project for Construc-tion of Gerehu national High School

Contents

CHAPTER I INTRODUCTION

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Papua New Guinea consists of the eastern half of the island of New Guinea, the second largest island in the part of the world, and approximately 600 smaller islands with a total land area of 460,000 km^2 and the stastical number of the population in 1988 was approximately 3.58 million.

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CHAPTER 2 BACKGROUND OF THE PROJECT

2-1 Summary of Educational Field
2-2 Current Situation of Related Programs
2-3 Evolution and Details of Request

CHAPTER 2 BACKGROUND OF THE PROJECT

2-1 Summary of Educational Field

2-1-1 Administrative Organization of Related School Education

The Government of Papua New Guinea adopted a decentralization policy in 1978, and educational institutions for Gl0 and under were placed under the control of individual provinces. Ever since then, educational institutions in Papua New Guinea have thus been classified into those under the control of the National Government of Papua New Guinea and those of the provincial governments.

Community schools, provincial high schools, and vocational centers belong to the category of provincial educational institutions.

On the other hand, teachers' colleges, technical colleges, national high schools, international schools, and universities belong to the category of national institutions under the control of the Government of Papua New Guinea.

2-1-2 Structure of Present Educational System

The educational system under the control of the Department of Education is divided into three stages such as primary education, secondary education (lower secondary education, upper secondary education), and higher education.

[1] Primary Education

Primary education starts at the community school level. The lowest age for enrolling school is seven. Students that have completed the six-year course of community school education can either be in employment or proceed to lower secondary educational courses in selection of three categories mentioned at paragraph [2], ① as their next step.

[2] Secondary Education

① Lower Secondary Education

ⓐ Provincial high school

There are four years of provincial high school (G7~G10), but if students fail to pass the screening examination at the end of G8, they may not proceed to G9.

ⓑ Vocational center

Students are given basic technical training courses.

ⓒ Correspondence school

This school is for the G8 students who have failed to proceed to G9.

② Upper Secondary Education Stage

The students who have graduated Gl0 or obtained equivalent qualification can proceed to any one of the following courses.

ⓐ National High School

The students who have graduated Gl2 can proceed to the diploma course of the university (University of Papua New Guinea, UPNG, or Papua New Guinea University of Technology, UNITEC).

Students who complete all of the available education of 6 years at a community school, 4 years at a provincial high school, 2 years are national high school and then go on to university are those having exceptional ability.

ⓑ Preliminary year university course

In some cases, students enter university via preliminary year university course.

ⓒ Technical college

The students who have graduated the PETT (Pre-employment Technical Training) course are qualified to work as apprentice technicians.

ⓓ Community school teachers college

Training for teachers of provincial high schools is conducted at the University of Papua New Guinea or its branch (Goroka teacher training high grade college).

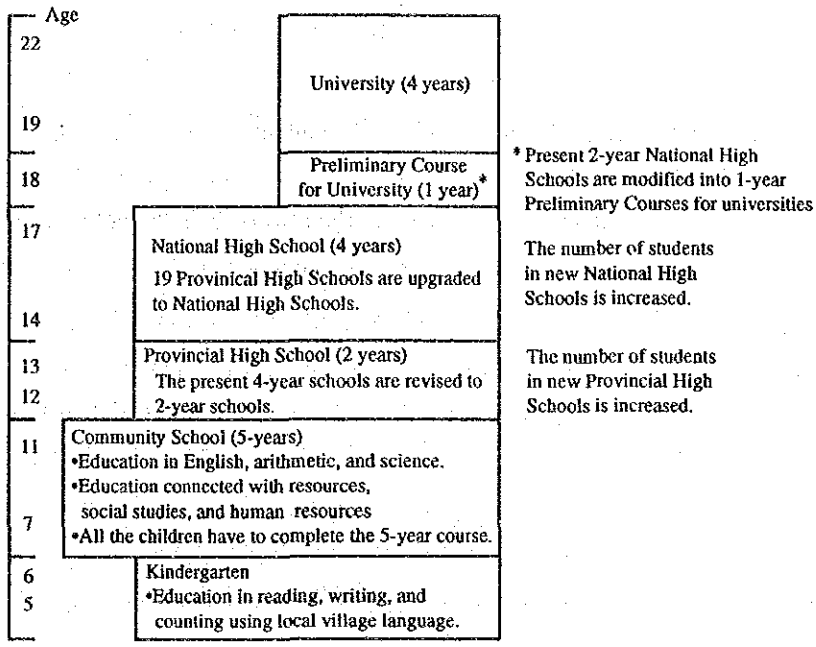
ⓔ Other educational training institutions

[3] Tertiary Education Stage

Two national universities, such as University of Papua New Guinea and Papua New Guinea University of Technology have been established as the centers of tertiary education.

2-1-3 Structure of Future Education System

The Government of Papua New Guinea is now examining the new education system in order to change the period of study in national high schools from the current 2 to 4 years. The proposed new system is shown in Fig.2-1.



(From:"Report of the Task on the Philosophy of Education Ministerial Committee Report, page 256, International Cooperation Comprehensive Research, JICA)

Fig. 2-1 The New System Proposal

The education activities adopted in the Project should comply with the current curriculum and classes as stated in [3] of 2-1-6.

2-1-4 Current Status of Each Educational Institutions

[1] Primary Education

Primary education refers to the first 6 years of education in a community school. Currently (1993), 407,748 students between the ages of 7 to 12 are registered in 2,597 schools throughout the country. Compulsory education for the primary education course is one of the future political goals of the Government. In "Decisions to Avert Crises," Prime Minister Rabbie Namaliu says that enforcement of compulsory primary education should be accelerated as far as state finances allow and that the conditions enabling all children in Papua New Guinea to enjoy primary education can be achieved once a mineral resources boom occurs. The actual target date for achievement of 100 percent enrolment at community schools and 50 percent enrollment at provincial high schools is 1999.

However, there are both regional and sex discrimination and the drop out rate has been in excess of 30% recently.

The followings are considered as reasons for students dropping out:

① Either parents do not know the value of school education, or they do not feel the necessity of school education in their way of life.

② It is very difficult, especially for families engaged in subsistence agriculture to pay the yearly tuition of about 40 kina. Their situation contrasts sharply with that of salaried city dwellers who are guaranteed a salary which is relatively high compared with that of the traditional farmers.

③ Children play an important part in the farming labor force.

[2] Lower Secondary Education

Lower secondary education consists of two stages. The first stage is the 4-year provincial high-school which covers G7 - G10 and the other one is lower secondary education conducted at other educational institutions.

① Provincial high School

The current (1993) total number of provincial high schools throughout the country is 122, and the total number of students is 49,766. Roughly one-third of the students in the final year of primary education are admitted to provincial high schools. The conditions for admission to provincial high schools are different in each province. Usually the admission decision is based on the results of an examination conducted by the Government. However, in some provinces, admission priority is given to female applicants

and applicants from remote on secluded areas, both of those groups having more limited opportunities for education.

② Other Educational Institutions

Other institutions are the College of Correspondence Education and vocational centers.

ⓐ Correspondence Education (G7 to G10)

The Correspondence Education provides education by means of radios and other communications media. Graduates of this institution can get diplomas for the G7 through G10 course. The number of students in 1987 was 14,942; 362 of these got the diploma for the G10 course and 523 got one for the G7 through G9 course.

ⓑ Vocational Center (Two to three year courses)

Vocational centers are institutions for people who graduated from the G6 course and could neither get a job nor enter the provincial high school, or those who have dropped out of the provincial high school.

The purpose of the training conducted in the vocational centers is both to improve the chances of employment of people who drop out from the G7 through G10 course and to improve their standard of living.

In Papua New Guinea, any education different from the regular education course of G7 through G10 is classified as "Non-Formal Education", and the vocational centers can be called typical institutions for this purpose. Most of these centers are operated by the Christian missions or churches. Subjects comprise agricultural technology, preparation and maintenance of machinery, carpentering, and the like, emphasizing practical technical training.

[3] Upper Secondary Education

The upper stage of secondary education comprises the two-year national schools and secondary education conducted by other educational institutions.

① National High Schools (G11 and G12)

At present, there are four national high schools as shown below:

ⓐ Sogeri National High School, located near Port Moresby, with 493 students;

ⓑ Keravat National High School, located near Rabaul, with 497 students;

ⓒ Aiyura National High School, located in East Highland, with 493 students; and

ⓓ Passam National High School, located in East Sepik, with 497 students.

According to "Development of Education after Independence" issued by the Ministry of Education, the objective of establishing the national high schools is the achievement of the following three goals:

- To train Papua New Guinean who are willing to enter university or other tertiary educational institutions for preliminary education.
- To train and provide preliminary higher education for Papua New Guinean so that they will become human resources welcomed by both the private and Government sectors.
- To develop and foster the national awareness of students selected from throughout the country.

The number of students entering the national high schools is only 9.87 percent of the total students graduating from G10. The students entering the national high schools are entitled to extremely generous financial benefits. For example, they are awarded scholarships that include tuition, as well as expenses that cover dormitory, boarding and textbook costs, etc.

The subjects in the national high schools for students of G11 consist of English, mathematics, natural science (biology, chemistry, and physics), sociology (geography, history, politics, and economy) and expressive arts. Japanese language is an optional subject at Sogeri National High School.

In G12, all students are required to take the English course. Mathematics is divided into exclusive-study and sub-exclusive-study courses, and students have to select one of the two. Three optional subjects have to be selected from among the seven courses.

The students of the national high schools aim at entering higher educational institutions, and most of the graduates enter universities or other tertiary education institutions.

② Other Educational Institutions

Other educational institutions constitute technical colleges, Teachers' Colleges and Post-secondary Training Courses.

ⓐ Technical Colleges (Technical Training Courses)

There are eight technical colleges in the country at present: two in Port Moresby, and one in each of Goroka, Mt. Hagen, Madang, Lae, Rabaul, and Arawa.

The numbers of students in these schools (registered in the PETT course in the day-school system in 1989) are shown in Table 2-1 below:

Table 2-1 Number of Students in Day-school PETT Course (1989)

	Arawa	Goroka	Lae	Mt. Hagen	Madang	Port Moresby	Rabaul	Total
No. of students	190	163	107	199	139	307	119	1,224

ⓑ Teachers' College

The Teachers' College is for students that have completed Grade 10. It trains teachers for the community schools and is a two-year education and training institution.

[4] Tertiary Education

Tertiary education is conducted at the University of Papua New Guinea (UPNG) and Papua New Guinea University of Technology (UNITEC).

The University of Papua New Guinea was established in May, 1965 and students were first received at the University in February of the following year.

In 1969, major facilities of UPNG were constructed at Waigani, Port Moresby. The faculties of arts, education, law, and science were included in those facilities.

Also a faculty of medicine was set up at the Tarama campus which is located 7km from the Waigani campus and adjacent to Port Moresby General Hospital to which the faculty of medicine is attached.

The Goro Kaega Teachers' College was established as a branch of the University of Papua New Guinea in East Highland Province at a site requiring a one-hour air trip from Port Moresby.

All of the above faculties provide a diploma course (post-graduate diploma in the faculty of science), bachelor's-degree course as well as master's-degree courses.

2-1-5 Current Status of Training Institutions for Teachers

[1] Teacher Training Institution for Community School

There are nine teachers' colleges in the country, seven of which are managed by churches, the other two being managed by the Government.

(Schools Operated by Churches)

① Dauli Shcool, Dauli.
② Balob School, Lae.
③ Gaulim School, Rabaul.
④ Kabaleo, Bunapope.
⑤ St. Paul's School, Gazele.
⑥ St. Benedict's, Wewak.
⑦ Holy Trinity School, Mount Hagen.
⑧ Sonoma School, Gazele.

(Schools Operated by the Government)

① Madang School, Madang
② Port Moresby School in metropolitan area

Port Moresby School is an institution for improving the quality of teachers already in service. Therefore, there are total of eight schools throughout the country for education training of people not already engaged in teaching.

[2] Provincial High School Teachers

The educational training for the provincial high school teachers is conducted on the Waigani campus (faculty of education) of University of Papua New Guinea (UPNG), and at Goro Kaega Teachers' College as a branch of the University of Papua New Guinea.

The diploma course of Goroka College is a two-year course. It takes four years to acquire a bachelor's degree in education at Waigani.

[3] National High School Teachers

Due to the rather strict requirement that only holders of Bachelor Degrees are allowed to become teachers at national high schools , it is quite difficult to implement a policy of localization if potential native teachers feel discouraged from undergoing the necessary training. Another factors is that those who do hold Bachelor's Degrees tend to select jobs with higher salaries than those offered for teaching jobs at the national high schools.

2-1-6 Current Status of National High Schools

[1] Numbers of Schools and Students

At present, four national high schools exist in Papua New Guinea, namely Sogeri National High School, located on the highlands approximately 40 km northeast of Port Moresby; Aiyura National High School, in the east Highland Province northwest of Port Moresby; Passam National High School, in East Sepik Province on the northern shore of New Guinea Island; and Keravat National High School, in the east of New Britain Island, on which Rabaul is located. There are no national high schools either in the metropolitan area of Port Moresby nor in Lae, Morobe Province, which is the country's second-largest city. This shows a regionally unbalanced condition. The average number of students at one national high school in Papua New Guinea is approximately 500. The number of students at the four existing national high schools is shown in Table 2-2 below:

Table 2-2 Number of Students, Teachers, and Staff in National High Schools

School	Boys	Girls	Total	Teachers	Staffs
Sogeri	362	146	508	29	34
Kerevat	368	135	503	27	32
Aiyura	354	149	503	27	32
Passam	355	141	496	22	30
	1,439	571	2,010	105	128

(Based on replies by the Department of Education to the questionnaire.)

[2] Enrollment Rate at National High Schools

Out of the number of graduates from Lower Secondary School, the number of students graduating from G10 of the provincial high schools gradually increased in the period from 1986 to 1992. However, the enrolment percentage for national high schools is decreasing somewhat. This is because the number of students accepted by educational institutions has remained steady while the number of graduates is increasing, which limits the possibility of increasing the enrollment rate. The rate of students from G10 is shown in Table 2-3.

Table 2-3 Number of Students Graduating from Grade 10 and Entering Grade 11

Year	Number of G10 Graduates	Number of Entering G11	Attendance Rate (%)
1986	9,273	1,000	10.8
1987	9,643	1,000	10.4
1988	9,988	1,000	10.0
1989	10,216	1,000	9.8
1990	10,275	1,000	9.7
1991	10,856	1,000	9.2
1992	10,677	1,000	9.4

Source: The table is based on "Statistics for Educational Staff and Students Entering Higher Grades, 1986 - 1992."

The numbers of students studying in Australia and New Zealand are not included in the above table.

[3] School Term, Curriculum, Schedule of Classes

There are four school terms per year at the national high schools in Papua New Guinea. These school terms are:

First school term: February 1 - April 8
Second school term: April 19 - June 25
Third school term: July 12 - September 19
Fourth school term: September 27 - November 12

The registration procedures for entering the schools have to be completed in December. The whole month of January is a vacation period, and schools are closed. The schedule and allocation of lessons are shown in Table 2-4.

Table 2-4 Allocation of Classes

Grade 11					Grade 12				
	Subject	No. of Hours/w	No. of Classes	Total		Subject	No. of Hours/w	No. of Classes	Total
1	English	6	8	48	1	English	7	8	56
2	Mathematics	6	8	48	2	(Mathematics)			
3	(Natural science)					Main major study	8	5	40
	Biology	2	8	16		Sub-major study	4	3	12
	Chemistry	2	8	16	3	(Natural science)			
	Physics	2	8	16		Biology	3	5	15
4	(Social science)	5	8	* 40		Chemistry	3	6	18
	Economy					Physics	3	6	18
	Geography				4	(Social science)			
	History					Economy	4	6	24
	Modern society					Geography	4	3	12
5	Expressive arts	4	8	32		History	4	2	8
6	Computer	1	8	8	5	Expressive arts			
7	Guidance	1	8	8		Graphics	4	2	8
						Music	4	2	8
					6	Computer	1	8	8
					7	Guidance	1	8	8
		29		232			50		235

* In Grade 11, one subject is studied each school term, totaling four subjects for one year. One class lasts 50 minutes.

Extracurricular activities on weekdays at Sogeri National High School are:

Monday: Cleaning day

Tuesday: Sports day

Wednesday: Club activites, exchange of activities with other schools

Thursday: Cleaning day

Friday: Free

2-2 Current Situation of Related Programs

Ever since its independence in 1975, the Government of Papua New Guinea has been going ahead with the national development with emphasis both on the improvement in the infrastructure as well as on the economic development. It is willing to press the National Development Program forward with the utmost effort from now on. Since Papua New Guinea depends on foreign aid and loans for approximately 24 percent of the state budget (based on 1989 figures), it is especially important to utilize foreign aid effectively in propelling national development forward in the future.

2-2-1 National Goals

The National Development Program of Papua New Guinea covers the national objectives stipulated in the Constitution, the development objectives for achieving these national objectives as well as a Public Investment Program which is a practical plan of how to meet the objectives. The various targets and programs are as described in the following paragraphs 2-2-1 to 2-2-5.

The following contents are stipulated in the preamble of the Constitution. Each of them conceptually defines the national goals which are:

① Integral Human Development
All people should be released from any kind of domination or oppression and be able to develop themselves as healthy human beings.

② Equality and Citizen's Participation
All citizens should have the opportunity to work for the development of Papua New Guinea and equally benefit from it.

③ National Sovereignty and Self-Reliance
Papua New Guinea should be politically and economically independent.

④ National Resources and Environment
Natural resources and the environment of Papua New Guinea should be conserved and used throughout the nation so that they will be assets for future generations.

⑤ Papua New Guinea's Unique Path to Development
Development goals should be achieved with social, political and economic means that are specific only to Papua New Guinea.

2-2-2 Development Goals

The development goals have forty-two items and are outlined in the National Development program. The most important are summarized as follows:

① Law and Order

No promotion or expansion of investment is possible without proper maintenance of law and order, which is also necessary for fair distribution of profits from development. Since 1980's, due to the increase in the crime rate and in case of disturbance of the public peace in Papua New Guinea, the Government has then forced both the power of the police force and of other law related institutions.

② Development of both an Adequate Educational System and Manpower

One of the basic conditions for national expansion is the extremely important area of proper education and upbringing. Tertiary education following primary and secondary education together with vocational training will provide an opportunity for education with benefits lasting a lifetime and thus help to upgrade the potential for human talent.

③ Economic Development and Securing of Opportunities for Employment

Economic growth and the securing of opportunities for employment are closely related to each other. To secure sufficient opportunities for employment, there should be a high level of integration between completion of education, advancement of human talent and the economic development.

④ Reform of Administration

To implement the national development effectively, the administration mechanism should be fortified and made efficient.

Based on the above National Development Plan, the practical development targets for the educational field are summarized as follows:

ⓐ Education and protection of children
ⓑ Promotion of participation in the community services by the young generation
ⓒ Development and improvement of education system and education of children in local areas
ⓓ Compulsory provision of basic education to all children
ⓔ Availability of tertiary education and training to meet the human resources requirements of Papua New Guinea

Due to Papua New Guinea having achieved independence not long before 1984, Papua New Guinea National Development Plan at that time stressed the economic development as well as national self sufficiency. Since then the national development plan has changed somewhat. In 1991, the plan was considered to include not only the economic development but also maintenance of law and order, educational concerns and the administration mechanism by reflecting the country's economical and social situation. It also stated that, during development, its effect on the social and natural environment should be taken into account. This indicates that the project is aimed at an integrated development throughout the country.

2-2-3 Investment and Development Program

The Public Investment and Development Program of Papua New Guinea is a five-year plan that is reviewed and revised every year. Means of putting into practice the national objectives and development objectives, and means of putting them into the state budget, are stipulated in the Public Investment and Development Program. The plan of investment and the development program item by item is shown in Table 2-5.

Table 2-5 Public Investment Plan (1990-1994)

Item	1990	1991	1992	1993	1994	Total
Economic development	30 (14%)	47 (17%)	54 (19%)	54 (21%)	47 (21%)	232 (19%)
Preparation of infrastructure	76 (37%)	93 (36%)	104 (38%)	91 (37%)	88 (40%)	452 (38%)
Social policy	32 (15%)	40 (15%)	35 (12%)	41 (16%)	39 (17%)	187 (15%)
Law and order	7 (3%)	13 (5%)	9 (3%)	7 (3%)	5 (3%)	41 (3%)
Administration	1 (0.5%)	3 (1%)	2 (1%)	2 (1%)	1 (0.5%)	9 (1%)
Agricultural bank *1	15 (7%)	21 (8%)	25 (9%)	26 (10%)	13 (6%)	100 (8%)
C.S.A. *2	40 (19%)	39 (15%)	43 (15%)	23 (9%)	19 (9%)	167 (13%)
Local development	8 (4%)	9 (3%)	9 (3%)	8 (3%)	8 (4%)	42 (3%)
Total	209	265	281	252	220	1227

Unit : 1 billion Kina

Note : 1) Budget related to the Papua New Guinea Agricultural Bank.

2) Budget for Commercial Statutory Authority (a public organization affiliated to the Government of Papua New Guinea)

Source: Ministry of Finance and Plannning

Table 2-5 shows that more than 70 percent of Public Investment has been allocated on Economic Development, Preparation of Infrastructure and Social Policy. It means that this is concentrated allocation of the budget on these three plans in order to have a quick improvement in these behind field.

2-2-4 National High School Improvement Plan

In driving forward the above development plans, Papua New Guinea has decided on the following activities for improvement of the national high schools:

[1] National High School Expansion Program

In the Upper Secondary Education Expansion Program, there are plans for the establishment of five new national high schools. They are Gerehu National High School in the metropolitan area, Morobe National High School in Markham Valley, Embi National High School in Oro Province, Fatima National High School in West Highland Province, and the national high school in New Ireland Province.

The project related to the construction of Gerehu National High School is considered as part of the Upper Secondary Education Expansion Program mentioned above.

It has been already decided that Morobe National High School will be built under a loan from China. The scope of assistance by China covers the construction of 16 general classrooms, 6 science rooms, 4 fine arts rooms, a library, an administration ward, a dining room ward, boarding houses accommodating 480 students, and 26 residences for teachers and staff. This national high school will operate entirely on a boarding-school system.

[2] Student Assistance Program

Under the Student Assistance Program for studying in Australia and New Zealand, about 200 students are sent to these countries for study in high schools operating entirely on a boarding-school system by every year.

[3] Plan to Upgrade the Provincial Schools to Upper Secondary Educational Institutions

To improve the enrollment rate at national high schools, the Government of Papua New Guinea is planning to add G11 and G12 in the provincial high schools and to upgrade the quality of those schools to upper secondary educational institutions. This measure will be applied to three schools or so every year on a gradual basis.

In this way, G11 was added at Hoskin (WNB) and Malala (Madang) in 1993. G12 will be added to these two schools in 1994, at which time G11 and G12 will also be set up in four other schools.

Using the conversion rate of three schools per year, upper secondary institutions will be set up in all the provinces by the year 2000.

In view of the financial conditions of the Government of Papua New Guinea, however, it is feared there may be difficulties involved in the execution of this plan.

[4] Plan to Increase Number of Students and to Improve The Existing Four National High Schools

In order to increase the number of students enrolling to the existing four national high schools, as part of Secondary Education Plan III in the 1980's and after, the enlargement of facilities and improvement of equipment were carried out by the Government of Papua New Guinea, and the student capacities in G11 and G12 was increased from a total 400 to a total of 500. This plan was executed with the assistance of the World Bank in 1984 through 1990. The total expense was around 4 million Kina. The items improved and the expenses thereof are shown in Table 2-6.

Table 2-6 Modification and Improvement of Existing Four National High Schools

School	Modification	Improvement	Cost(Kina)
Passam	Water supply and sewage equipment	Residences 6 Nos.	
		Regular school rooms 2 Nos.	
		Science rooms 2 Nos.	
		Administration ward 1 No.	
		Dormitories for boys (48 students) 2 Nos.	726,121
Sogeri	Dormitories for girls 2 Nos.	Dormitories for boys (80 students) 1 No.	
	Regular school rooms	(40 students) 2 Nos.	
	Water supply equipment	Dining room 1 No.	
	Remodeling of music room	Dormitory for girls (48 students) 1 No.	
		Residences (H65) 4 Nos.	
		Regular school rooms 2 Nos.	
		Science rooms 2 Nos.	
		Teachers' room, fine arts room	
		Expansion of AV room	1,463,699
Aiyura	Library	Regular school rooms 2 Nos.	
	Water supply equipment	Science rooms 2 Nos.	
		Boarding houses (24 students) 3 Nos.	
		Residences (H65) 4 Nos.	
		Expansion of dining room	
		Dispensary	
		Storage area	770,603
Kerevat	Dormitories for boys (48 students) 3 Nos.	Boarding houses (48 students) 3 Nos.	
	Dining room	Residences (H65) 4 Nos.	
	Regular school room	Science rooms 2 Nos.	
	Boarding houses		
	Water supply equipment		1,080,624
Total			4,041,624

(Based on reply to questionnaire.)

In connection with the above improvement plan for national high schools, the Government of Papua New Guinea has requested the Government of Japan to construct the Gerehu National High School as one of the five schools planned in the expansion program for national high schools, stated in ① of 2-2-4.

2-3 Evolution and Details of Request

2-3-1 Evolution of Request

For the purpose of improving the enrollment at national high schools, which now forms a bottleneck in the educational system of Papua New Guinea, and of upgrading the educational level to improve the quality of labor and secure manpower for economic expansion, the Government of Papua New Guinea is attempting to improve the educational facilities by the establishment of new national high schools, send students to educational institutions abroad and add G11 and G12 in provincial high schools. However, there is no national high school in the National Capital District area at present and the total number of students in the existing four national high schools has reached only 1,000 students per grade, even after increasing their rated capacity. Without the expansion of facilities on increase in the enrollment rate cannot be expected. Under these circumstances, the Government of Papua New Guinea has requested assistance for the construction of Gerehu National High School on the grant aid basis.

2-3-2 Implementation Body for Project Execution

The Office of International Development and Assistance (OIDA) attached to the Planning and Budget Division of the Department of Finance and Planning administrates the execution of the Project in cooperation with the Department of Education, which is in charge of the project execution, and the Department of Public Works, which is in charge of technological matters. The roles of each institution is as follows: (Also, the organization of OIDA is illustrated in Fig.2-2.)

OIDA:
Organizing, monitoring and evaluation of foreign aid program.
Management and supervision of financial aspects of foreign aid.
Giving advice regarding foreign aid to the Government and related organizations.
Liaison and adjustments with all donors.

Department of Education:
Driving the Project forward in practical, concrete ways.
Playing the role of project manager.

Department of Works:
Organizing the technological aspects of the Project at the
request of the Department of Education.

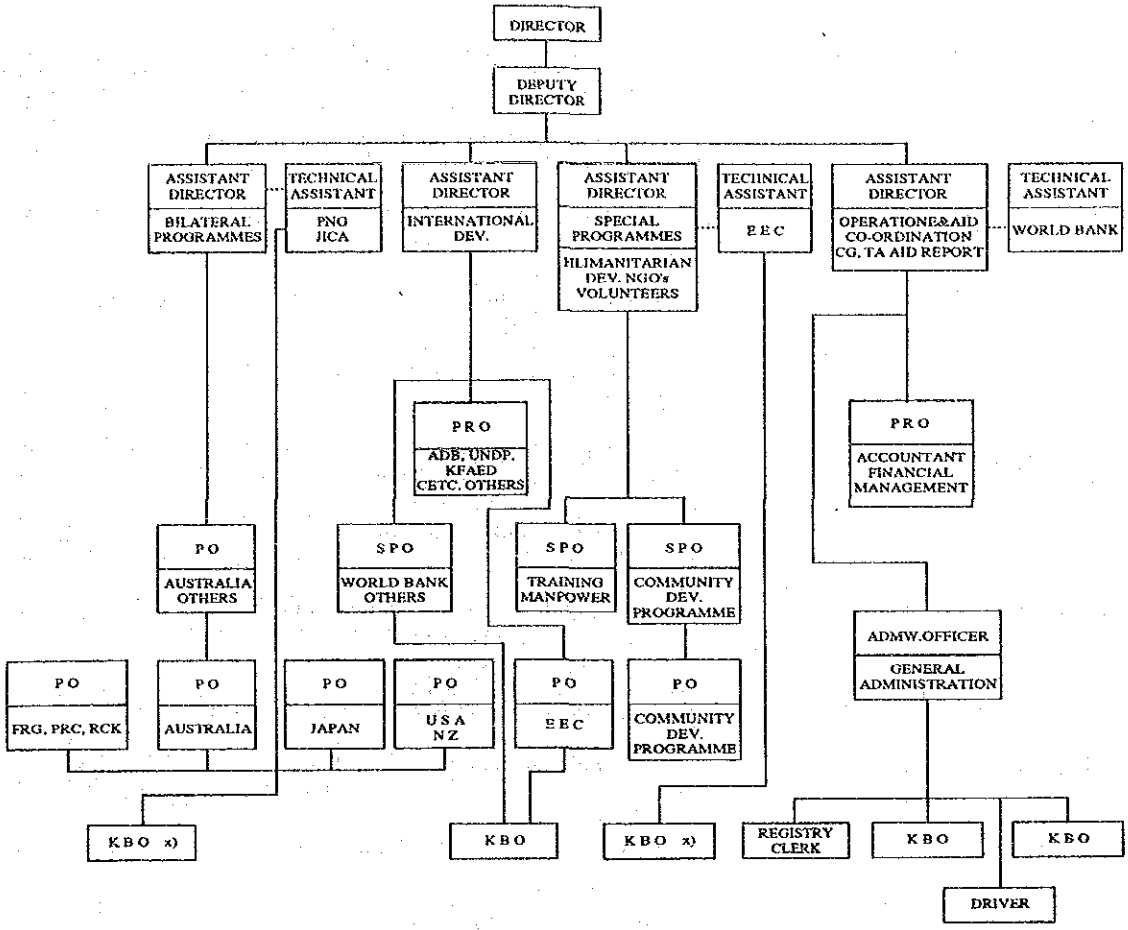


Fig. 2-2 Organization of OIDA

2-3-3 Details of Request

The requested Gerehu National High School is a day school institution for G10 graduates living in the metropolitan area and its vicinity. The number of students who can be accepted is 500 for G11 and G12. The contents of the request are shown in Table 2-7 below.

Table 2-7 Facilities

	Name of Wards	Contents of Facilities	
1	Regular classroom ward	General Classrooms for Grades 11 and 12	16
		Waiting room for teachers	16
		Storage area for general schools	4
		Lockers for classes of 35 people	16
2	Special science room ward	For G11 Chemistry room	1
		Biology room	1
		Physics room	1
		For G12 Chemistry room	1
		Biology room	1
		Physics room	1
		Waiting room and preparation room for teachers	6
		Computer room	1
3	Library	Open-stack style library (80M)	
		Reference space (12M)	1
		Reading space (with 70 carrels)	1
		Lending service office and counter	1
		Browsing space	1
4	Special room for arts	Painting, graphics and textile rooms for G11 and G12	1
		Waiting room and preparation room for teachers	
		Drama performance room for G11 and G12	1
		Music room for G11 and G12	1
		Waiting room and preparation room for teachers	
5	Assembly hall and gymnasium	Arena accommodating basketball court	1
		Dressing rooms, toilets and shower room	
		Recreation room	
		Stands	
6	Administration ward	Principal's room, reception room	1
		Assistant principal's room	1
		Room for general affair servicing personnel	1
		General office	1
		Teacher's office	1
		Medical care room	1
		Toilets, kitchen, storage areas and rest rooms	
7	Various storage areas	Storage rooms for general use, sport equipment and repair tools	
8	Maintenance workshop	Workshop for wood working	1
		Workshop for metal working	1
9	Substation	Guard room, toilets and substation	1
10	Residences	Residences for teachers	27
		Residences for staff	5
		Recreation facilities	

Equipments

No.	Class	Name of Major Equipments
1	Education	Computers, projectors and video sets, etc.
2	Science education	Testers, experimental devices, microscopes, balances, barometers and separators, etc.
3	Audiovisual equipment	Broadcasting equipment, acoustic equipment for music room and for drama performance room, etc.
4	Physical training and sports	Table tennis, Volleyball, soccer and basketball, etc.
5	Maintenance and administration	Tools for wood working and metal working

2-3-4 Background of Request for Residences for Teachers and Staff

[1] General Housing Situation

The supply of general housing in the cities of Papua New Guinea is extremely poor. Therefore, many people are forced to live with relatives or in a group under overcrowded conditions. It is extremely difficult to find empty rooms or empty houses. The rental cost is extraordinarily high and may be 500 to 800 Kina per room per week. It is almost impossible for local people to pay such high rents. The supply of official residences for the staff of official institutions is very tight and this poses quite a big problem in the employment of staff.

For these reasons, the supply of residences for employees is an absolutely essential condition for employment of personnel in both Government and private sectors.

[2] Present Status of Residence for Teachers and Staff in Metropolitan Area

The present status of housing for the teachers and staff of seven provincial high schools in the metropolitan areas is shown in Table 2-8.

Table 2-8 Status of Housing for Teachers (D: day-school)

Name of School (D indicates a day school)	No. of Teachers	Housing		
		Official Residences	Owned Houses and Rented Houses	Living with Other Families
Badihagwa (D)	24	8	6	10
Bomana	18	18	---	---
Gerehu (D)	25	15	9	1
Kila Kila (D)	30	12	3	15
Gordon (D)	30	14	10	6
Marianville	18	10	4	4
Tokarara (D)	18	13	5	---

There are no problems in such schools as Tokarara and Bomana, which can supply a comparatively good number of official residences to the teachers, but the problems are serious and make it difficult to obtain teachers in such schools as Kila Kila and Badihagwal, which can supply only a small number of official residences.

All of the official residences of the Government of Papua New Guinea have reached their full capacity over the post ten years so that no further vacancies are available.

[3] Income of Teachers at Gerehu National High School

8,775 Kina (approximately l million Yen) is expected to be paid yearly to local teachers, 36,872 Kina (approximately 4.2 million Yen) to foreign contract teachers and 47,670 Kina (5.6 million Yen) to masters or principals who are going to be employed in Gerehu National High School.

CHAPTER 3 OUTLINE OF THE PROJECT

3-1 Objective
3-2 Study and Examination on The Request
3-3 Project Description

CHAPTER 3 OUTLINE OF THE PROJECT

3-1 Objective

The objective of this project is to construct new national high schools to help raise the enrollment at national high schools, which now forms a bottleneck in the Papua New Guinea educational system.

3-2 Study and Evaluation of the Contents of the Request for Assistance

3-2-1 Study of Adequacy and Necessity of the Project

There are four national high schools in the country. In spite of a good reputation, the total rated capacity of students in these four schools is only 1,000 per each grade. In other words, the percentage of students those who to be allowed to proceed to national high school among graduates of provincial high school is less than 9 percent.

Therefore, the number of students in national high schools is small and it becomes a bottleneck in the country's educational background.

Implementation of this National High School Expansion Program is given high priority in educational development field by above reason.

This National High School Expansion Program will be assisted by the Government of China in loan and also be assisted by the European Union in financial part.

On above circumstances, it is judged that both adequacy and necessity of implementation of this Project are extremely high.

3-2-2 Study of Operation Activity Program

The Department of Education allotted 1.9 million Kina (220 million yen) in 1994 and 1.5 million Kina (170 million yen) in 1995 as Papua New Guinea's own contribution in establishing the new Gerehu National High School. These budgets are quite adequate from the viewpoint of school administration, facility maintenance and management.

The Department of Education is planning to employ native English speaking teachers due to the lack of proficient teachers in Papua New Guinea.

High competition is anticipated for the admission of Gerehu National High School, this being the first national high school operating on the day school system, without boarding facilities, to be established in the densely populated area of the metropolis. Among the students graduating from the existing four provincial high schools in the metropolitan area, the expected number of students possibly entering national high schools will be 662 boys and 595 girls.

Gerehu National High School is the first national high school to be established in the metropolitan area, and the planned construction site is just next to University of Papua New Guinea, forming a first-class cultural zone. Establishment of this school is keenly anticipated and is expected to bring multifaceted benefits.

It follows, then, that this project is perfectly adequate and appropriate for execution for all the above reasons.

3-2-3 Study of Structural Elements of Facilities

Structural elements of the Project are classified roughly into school buildings, residences for teachers and staff, and educational equipment. The major elements of the planned establishment of the high school consist of the construction of school buildings such as an administration ward, library, gymnasium, various special classrooms, general classooms, and workshops. The special classrooms should be set up in compliance with the content of curricula; the present request conforms to the curricula. The scale of facilities should be studied based on the frequency of use, and such a study is described below.

The workshops are provided for the maintenance of school facilities. Exclusive-use facilities such as these must be provided in the school because maintenance skills in Papua New Guinea have not yet reached an appropriate level.

The provision of residences for teachers in this project has high priority for the reasons given in paragraph 3-2-4, [2].

The equipment for the school has been limited to the minimum amount required for use in the classrooms.

3-2-4 Study of Requested Facilities and Equipment

Although the content of the request should be considered highly adequate from the viewpoint of the curricula of national high schools, the following points have to be studied and reviewed:

[1] Music rooms, fine arts rooms, and dramatic performance rooms

Two rooms each are required for the music lessons, fine arts lessons, and dramatic performance lessons. The lessons conducted in these rooms are four hours weekly of expressive arts for eight classes of G11 and four hours weekly of graphics and music for four classes of G12. The use of these six rooms is totally 48 hours per week, or 8 hours per room per week while two rooms each with experimental facilities are required for physics and chemistry and biology, giving a use rate of more than 15 hours per room per week. This is about twice the use rate of the music, fine arts, and dramatic performance rooms.

The number of subjects could be reduced in the future by the introduction of computer education for G11 students. Since Gerehu National High School is a day school, the utilization of rooms for extra-curricular activities, such as fine arts, drama performances, etc., would not be as high as that of boarding schools. Further, an assembly hall is to be set up in this school, and some of the drama performance classes can be performed there.

It is thus appropriate that fewer rooms be provided for music, fine arts, and drama performance, changing the plan to only one room each, or three rooms in total. If this is done, however, each room should be larger than the proposed one, because the amount of equipment to be installed in each room would be increased accordingly.

[2] Residence of teachers

As studied in 2-3-4, official residences and private housing are in extremely short supply in the metropolitan area of Papua New Guinea. Therefore, securing residences for teachers following the construction of high schools is extremely difficult. If rental houses are offered as residences for teachers, several hundred thousand Kina would be required yearly for one single residence, which is not practical under the circumstances. The construction of such residences is essential because the supply of proper residences is a major factor in securing highly qualified teachers.

Since the teachers are to be employed from the provinces and from abroad, housing to be built should accommodate at least 90% of the teachers (30). This contrasts with housing for teachers in other secondary and higher education institutions. However, since the staff are expected to be employed within the metropolitan area, it should be adequate to construct about 20% of the residences for principals, deputy-principals and secretaries (28).

[3] Educational Equipment

In selecting the equipment, items equivalent in type and quality to those introduced into the high schools in Japan must be chosen in order to secure standard quality. The equipment should be selected in accordance with the standards specified by the Science Education Promotion Law in Japan.

3-2-5 Basic Policy for Execution of The Project

It was judged adequate and reasonable that the execution of this project should be supported by grant aid of Japan because the above study showed that it would be effective, within the execution capability of the Papua New Guinea side and in conformity with the system of grant aid. As described below, the details of the project were studied based on the conditions of grant aid of Japan in order to draw up the basic design. As already described in the study of elements constituting the project and the details of requested facilities and equipment, parts of the request may be amended.

3-3 Project Description

3-3-1 Executing Agency and Operational Structure

The Office of International Development and Assistance (OIDA) attached to the Planning and Budget Division of the Department of Finance and Planning is the division in charge of aid and assistance projects, and the Superintendent of Overseas Aid Division of the Department of Education acts as administrator of the Project under the guidance of OIDA.

Prior to execution of this project, one project manager and one assistant project manager are selected from the Department of Education as the executive body, and First Secretaries are nominated from the General Education Services and Special Education Services respectively as the directors of the project. Technical phases in terms of designing and construction work are offered by the Department of Public Works. The organization of the executive body is shown in Fig.3-1.

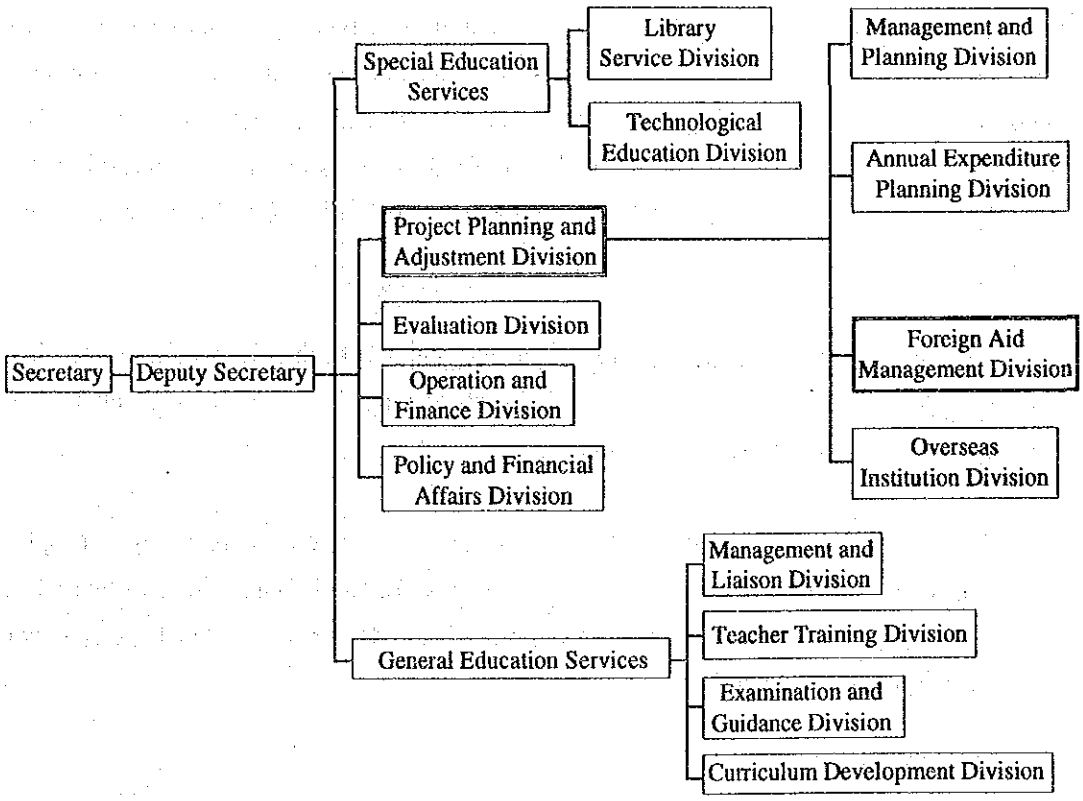


Fig. 3-1 Organization Chart of Department of Education

The operation organization of this project will form an Operation Committee headed by the principal of Gerehu National High School after cooperation is completed.

3-3-2 Plan of Activities

[1] Number of students to be admitted

The rated number of students for one grade in the existing 4 national high schools in Papua New Guinea is 250, the Gerehu National High School students in G11 and G12 will be 250 each for a total in both grades of 500. The ratio between boys and girls should ideally be 1:1.

[2] Plan for Employment of Teachers

The number of teachers required in Gerehu National High School is estimated at thirty. Since this project will establish new schools, all teachers are publicly invited to seek employment. As the teachers' training institutions in Papua New Guinea, there are the faculty of education of University of Papua New Guinea and Goroka Teachers' Training College, a branch of University of Papua New Guinea. A Bachelor of Arts degree is required for acquiring qualification as a teacher for national high schools. Although this strict condition is effective in ensuring a high quality level in education, what actually happens is that the local people that have acquired Bachelor of Arts degrees are likely to take other jobs that offer better monetary conditions than teaching. The result is difficulty in reaching localization of national high school teachers.

The present status of special subjects in the national high schools shows that it is extremely difficult to get local teachers for the fields of natural science (biology, chemistry, and physics), computer lessons, and English.

Under the above circumstance, the Department of Education is planning to employ foreign teachers for science and engineering as well as for English and this was taken into account when planning the budget. The nationalities and numbers of teachers in Sogeri National High School are as follows:

Total number of teachers:	29	
Local teachers:	17	
Foreign teachers:	12	
consisting of citizens of:		
Australia	5	
Sri Lanka	4	
USA	1	
Philippines	1	
Japan	1 (An expert of Japanese education dispatched from JICA)	

The number of staff members in the office is 28, they are all local people.

[3] Budget Planning

The budgets for the preparatory first year in which 250 G11 students will be admitted, the second year in which 250 G12 students will be added, through to full capacity in Gerehu National High School are as follows (reply by the Department of Education to the questionnaire):

① First year: Preparatory period

Equipment procurement costs	K125,000	(¥ 14,000,000)	Including teaching materials, equipment for facilities, etc.
Furniture costs	K102,380	(¥ 11,600,000)	Including furniture in general, office equipment, etc.
Infrastructure supply costs	K682,000	(¥ 77,400,000)	Including electrical work, removal of existing facilities, etc.
Residence-related costs	K1,000,000	(¥ 113,000,000)	
Total	K1,909,380	(¥ 216,000,000)	

② Second year: First year with 250 Grade-11 students

Equipment procurement costs	K125,000	(¥ 141,180,000)	
Furniture costs	K 90,000	(¥ 102,100,000)	
Residence-related costs	K 770,000	(¥ 874,000,000)	
Salaries for teachers	K 248,520	(¥ 282,000,000)	For 16 teachers (17,860,000 per teacher)
Student-related costs	K 275,950	(¥ 313,200,000)	For 250 students (1,250,000 per student)
Total	K 1,509,470	(¥ 1,713,100,000)	

③Third year: Full capacity with 500 Grade-11 and Grade-12 students

Salaries for teachers	K 479,049	(¥ 543,700,000)	For 30 teachers (18,000,000 per teacher)
Student-relating costs	K 413,925	(¥ 469,800,000)	For 500 students
Total	K 892,974	(¥ 1,013,500,000)	

3-3-3 Location and Status of Planned Site

[1] Construction site

The construction site is located in the Sogeri district which is 15 km northwest of Waigani district where the Government office and buildings are situated. There are a Sogeri Residence Zone and a Teachers' Residence zone of University of Papua New Guinea in the neighborhood, and the whole area is constituted of university and residential zones. Approximately 21ha has been secured as the building site, which is sufficient for the facilities, although part of that area is not suitable for use. Although the shape of the site is rather unusual, there are no unusable areas. There is a gentle slope (the maximum difference in level is approximately 6 m) extending from the street in front to the back of the site; the slope in no way interferes with construction on the desired site.

Infrastructure of access roads, power supply, water supply, sewage, etc. is almost completed. The location of the planned construction site is shown in Fig. 3-2 below:

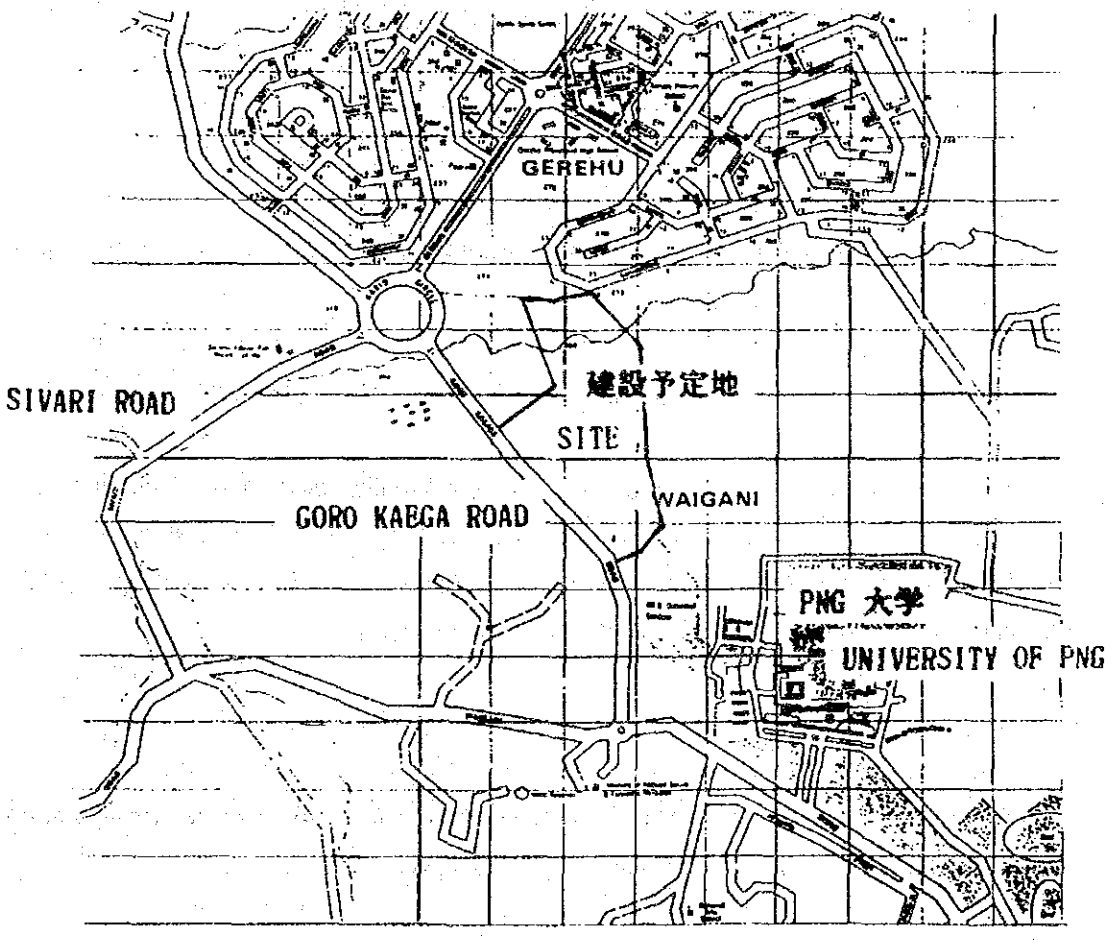


Fig. 3-2 Planned Construction Site

[2] Infrastructure

① Access road

The Goro Kaega Road is one of the heavy transport roads of the city and forms an access road to the site. The width of the road is 40 meters, of which 20 m are paved. The paving condition is very good, and the accessories, such as roadside gutters, are of excellent quality.

② Power supply

High-voltage (11 kV) electric lines are provided on road side poles on the western front of the project site.

③ Telephone

The public telephone cable is already provided on the front road.

④ Water supply

The main pipe (250 ϕ) for water supply lies along the west front side of the project site.

⑤ Sewage

The main sewage pipe (300 ϕ) lies at the northern side of the project site.

⑥ Rainwater drain

Rainwater within the site can be drained into the gutter (5 meters wide and 2 meters deep) on the west side of the site.

3-3-4 Outline of Facilities and Equipment

The results of evaluation in paragraph 3-2 which was made based on the discussions and related surveys at the site, the summary of individual functions of facilities and equipment required for achieving the scope of the Project and the purposes of the Project as appropriate and reasonable to be executed under grant aid of Japan are as follows:

[1] Facilities

① Regular class room function: The class rooms and lecture rooms required for education in English, mathematics, social science, guidance, etc.

② Special class room function: The class rooms and lecture rooms required for education in biology, chemistry, physics, expressive arts, computers, etc.

③ Data and information function: Facilities required for improving learning efficiency through data and information.

④ Assembly and physical training function: Facilities required for various kinds of school events and sports.

⑤ Operation and administration function: Facilities required for the operation and administration of the schools.

⑥ Auxiliary function: Facilities required for outdoor sports, toilets, lockers, internal roads, etc.

[2] Equipment

① Educational equipment: The equipment used for instruction in regular class rooms and special class rooms. Computers, projectors, videos, screens, etc.

② Physical training and sports equipment: The equipment used for physical training facilities and outdoor facilities. Basketball, volleyball, soccer, etc.

③ Audiovisual equipment: The equipment used for various kinds of broadcasting, special class rooms, outdoor facilities, etc. Equipment for broadcasting to all school buildings, music rooms, drama performance rooms, and outdoor stages.

④ Maintenance and administration equipment: The equipment used for maintenance, administration, and preservation of facilities and equipment. Tools for wood working and metal working.

⑤ Science education equipment: The equipment used for biology, chemistry, and physics. Experimental equipment, microscopes, balances, centrifuges, etc.

[3] Housing

① Teachers' residence: To be used as housing facilities for teachers. The residence for married couples is the H65 type.

② Senior staff residence: To be used as housing facilities for the senior staff members. The residence for married couples is the L40 type.

Facilities and equipment used for the required functions above are shown in Table 3-1 and 3-2.

Table 3-1 Contents of Facilities

Ward Name • Division Name		Description
1	Regular school rooms	Regular school rooms for G11 and G12, and teachers' room
2	Natural science rooms	Chemistry room, biology room, physics room, and Computer room for G11 and G12, and teachers' room
3	Library	Open-stack style library storing 10,000 books, and reading room
4	Expressive arts rooms	Painting, graphics, and textile room for G11 and G12 Drama performance room for G11 and G12 Music room for G11 and G12 Teachers' room
5	Gymnasium, assembly hall	Arena accommodating basketball court, recreation room, and stage
6	Administration ward	Principal's room, drawing room, assistant principal's room, office, teachers' room, and medical care room
7	Storage areas	Storage for general use, storage for sports equipment
8	Maintenance and administration workshop	Workshop for wood working and metal working
9	Residences	Residences for teachers and senior staff

Table 3-2 Contents of The Equipments

Division		Description
1	Educational equipment	Equipment used for instruction in regular class rooms and special rooms Computers, projectors, videos, screens, etc.
2	Science equipment	Equipment for education in biology, chemistry, and physics Experimental instruments, microscopes, balances, centrifuges, etc.
3	Audiovisual equipment	Equipment for various kinds of broadcasting, special rooms, and outdoor facilities Equipment for broadcasting to all school buildings, music room, drama performance room, and outdoor stage
4	Physical training and sports equipment	Equipment for physical training facilities and outdoor facilities Basketball, volleyball, soccer, etc.
5	Maintenance and administration equipment	Equipment for maintenance, administration, and preservation facilities and equipment Tools for wood working and metal working

3-3-5 Operation and Maintenance Plan

[1] Maintenance and Management Plan for Facilities

The maintenance and management of facilities should be carried out by engineers working exclusively on servicing the facilities. For the purpose of proper maintenance and management of facilities, it is important that service is performed by engineers who are familiar with the daily maintenance and inspection routine. Thus, periodic inspections are to be executed in compliance with the equipment manuals. In case of emergency guide response is essential. It is desired, therefore, that a maintenance and management system emphasizing the following points should be established:

① Securing a professional standard of maintenance and management

The number of maintenance and management engineers for public facilities in Papua New Guinea is very limited, and it is hard to get satisfactory service. It is common practice fund the training of engineers for service personnel. Under this project, it is both important to secure staff members working exclusively in the servicing sector as well as adequate workshop facilities.

The function and durability of the facilities depend entirely on the degree of knowledge and understanding of construction and service engineers, their knowledge of how to maintain and manage, and how quickly they can respond in an emergency. In this project, it is desired that the specialist workers, one person each for metal working and woodworking, hold various joint discussions throughout the period of construction work to gather practical experience in fulfilling their own duties and functions immediately after completion of facilities.

② Securing spare parts for equipment

There are a lot of cases in Papua New Guinea in which equipment is out of order and not used at all because of erroneous operation caused by insufficient knowledge of how to handle the equipment after the completion of various facilities. In most cases, the equipment can be immediately put into operation if the parts are provided. In this project, therefore, the spare parts budget for most of the equipment should be secured. Facility in contacting the vendors for each item is also desirable as well as knowledge of the scope of services offered by them, and also any related matters so that the engineers working exclusively for the project can take necessary steps immediately when they need supplies and spare parts.

[2] Maintenance and Management Plan for Equipment

The maintenance and management plan for the planned equipment should respond to needs more quickly than those for the facilities. Past experience shows that problems generated due to idle equipment are more severe than those related to other facilities.

Equipment requiring expendable supplies and equipment for which expendable supplies and spare parts are difficult to obtain has been excluded from this project.

The following points should be taken into consideration to facilitate maintenance and management for the long term maintenance of functions of the supplied equipment:

① Instructions for storing and managing the expendable supplies and repair parts should be presented to the persons in charge, along with guidelines for use.

② Operation manuals, daily maintenance manuals, and simplified repair manuals for all the equipment should be prepared in English.

③ At the time of delivering and setting up the planned equipment, adequate descriptions and explanations of its use, storage, and maintenance will be given to the persons in charge by Japanese experts in this field.

In addition to the above points, the Papua New Guinea side is requested to observe the following points in relation to the equipment to be supplied:

① A contract for the equipment requiring maintenance agreements should be made with the sales representative, this would include computers, copiers, and the like. Subsequently, the procedures for renewing the agreements should be arranged and completed and lists of how to get in touch with the users and related information should be compiled.

② For the equipment not covered by the maintenance agreements and requiring special expert knowledge for maintenance, such as audio equipment, science education equipment, and others, lists including the names of the users and customers, how to get in touch with them, and the scope of services should be arranged and compiled.

③ As far as the repair and maintenance of equipment by the users and customers themselves is concerned, such as various kinds of physical training equipment, engineers working exclusively for the project and in charge of metal working and woodworking should take care of such repairs.

④ For the purpose of centralizing the various kinds of information, such as how to operate and how to manage various items of equipment, a system should be established to nominate persons responsible for specified equipment.

[3] Maintenance and Management Expenses

The estimation of costs required for maintenance and management for facilities and equipments in this project is shown in Table 3-3.

Table 3-3 Required Costs

	Item	First Year	Second Year	After Second Year on
1	Personnel costs	32,600	65,200	65,000
2	Building repair costs	-----	20,000	22,000
3	Light and fuel costs	13,996	19,955	19,955
4	Communications costs	4,000	5,000	5,000
5	Equipment repair costs	3,000	3,000	34,690
	Total	53,596	113,155	146,845
	Total except personnel costs	20,996	47,955	81,645

(Unit: ten thousand yen)

Notes:

1: The items tabulated here relate to the facilities and equipment other than those described in 3-3-2 [3].
2: Items required as office or operation expenses are not included in the table.
3: Any upward variation in the time factor of the facilities and equipment is not taken into consideration for expenses from the third year on.
4: The numerical values for office staff members in the reply to the questionnaire prepared by the Department of Education are used in personnel costs.
5: The number of students and office staff members for the first year is 1/2 that of the regular fiscal years.
6: The personnel costs include 28 office staff members (14 office staff members only for the first year).
7: The telephone installation fee (K200) is included in the first year of communications costs.
8: The water supply set-up fee to be imposed (K250) is included in the first year of power and fuel costs.
9: Residences are excluded from the building repair costs.

CHAPTER 4 BASIC DESIGN

CHAPTER 4 BASIC DESIGN

4-1 Design Policy

The proposed facilities and equipment proposed in the Project are based on the following design concepts taking into account the construction period and the special characteristics of the Project, etc. based on the environmental and social conditions in Papua New Guinea, the construction and procurement conditions, the ability to maintain and manage the facility and equipment, and the conditions under grant aid assistance.

① The method shall be appropriate to the local living conditions and shall take into account the environmental conditions including the average temperature, maximum monthly rainfall and average humidity in the Port Moresby area.

② Assuming the construction work is to be executed by local laborers, each work should be appropriate to the skill level of local labors.

③ In principle, the construction materials shall be produced or procured locally if there are no cost and procurement problems.

④ The building shall be as maintenance free as possible to keep maintenance and management costs as low as possible.

⑤ Assuming this project is executed by grant aid assistance of the Government of Japan, it should have the design contents allowing construction work per single fiscal year required by that cooperation.

⑥ This project shall take into account the current student accommodation needs, the numbers of teachers and the required functions, but it shall also be able to respond to future changes in the system.

The Project shall use following conditions based on the above design concepts.

4-1-1 Policy for Environmental Conditions

① The average temperature in the Port Moresby region of 27.7°C shall be used.
② One quarter (1 week approx.) of the February rainfall of 194 mm shall be used as the maximum daily rainfall.
③ An average humidity of 77% shall be used as the humidity conditions.
④ Since typhoons do not strike Papua New Guinea and the wind velocity throughout the year are 2 to 7 m/s, specifications shall not be set for high winds.
⑤ Since the seismic conditions are classified as Zone IV, a seismic coefficient of 0.1 shall be used.
⑥ Since the building height is less than 12 m, lightning-strike earthing facilities are not required.

The design shall incorporate the following concrete ideas based on the above conditions.

① To cope with solar radiation, the facility rooms shall face south to provide shade from direct sunlight.
② The north side of the facility shall be designed as a corridor which shall be under the eaves.
③ Ample natural ventilation shall be provided in main rooms starting with classrooms via windows, wainscoting and the ceiling plenum.
④ To cope with heavy rainfall, the large-roof method shall be used, the rainwater runoff shall be handled by gutters in the eaves.
⑤ A berm shall be provided around the footings of the building to prevent rainwater splashing into the facility.
⑥ The high-floor method shall be used to cope with high humidity, and, in addition to ③, thermal insulation shall be used in the ceiling plenum.

4-1-2 Policy for Social Conditions

① In principle, the design of this facility does not need to consider use by non-school local events.

② Since the Project location cannot be described as a really secure area, security measures such as a security office, gate and fence in the school, as well as security bars on each building window shall be provided.

③ The Project site is in the centre of Port Moresby, and the transport infrastructure such as buses is already in place. Consequently, the Project does not need to give special consideration to transport methods because the site is approached on foot and by bus.

4-1-3 Policy for Legal Regulations and Design Standards

① This design shall be in compliance with the Papua New Guinea Building Construction Code and related regulations.

② This Project shall involve various formalities such as application and approval of building design drawings, and inspections.

③ The above matters shall be handled in consultation with the Department of Public Works, Papua New Guinea.

4-1-4 Policy for Construction Work

① The construction materials and equipment shall basically be locally made or locally procured based on the design drawings.

② Local methods shall be used as the main construction methods and special methods beyond the skills of local engineers shall not be used.

③ Consideration shall be given to the skill of local laborers and suitable work force, work allocation and procedure plans shall be made in accordance with the construction period.

4-2 Study and Examination on Design Criteria

4-2-1 Configuration of The Facilities

Gerehu National High School will have a total of 500 students with 250 of them in G11 and 250 in G12. It will have 30 teaching staff and 28 ancillary staff, making the total number of staff 58. The facilities which it comprises are listed below.

Facilities

① Administration Block
staff rooms, meeting rooms, student information area, medical room, printing room, offices, computer room, principal's office, deputy principal's office, secretaries' room, registered office, teamaking room, toilets

② Library Block
offices, browsing area, library, reading room, lending counter, workshop, store, toilets, book and stationery shop

③ Assembly Hall Block
Assembly hall, stage, recreation area, dining room, changing rooms, shower rooms, toilets, equipment store

④ Drama & Music Block
music studio, drama room, teachers' offices (2), preparation rooms (2)

⑤ G11 Curriculum Block
biology classrooms, chemistry classrooms, physics classrooms, teachers' offices (3), preparation rooms (3), toilets, store

⑥ G12 Curriculum Block
biology classrooms, chemistry classrooms, physics classrooms, teachers' offices (3), preparation rooms (3), toilets, store

⑦ Expressive Arts and Computer Block
computer classrooms, art classrooms, teachers' offices (2), preparation rooms (2),

⑧ G11 Classroom Block
classrooms (8), teachers' offices (8), toilets, store

⑨ G12 Classroom Block
classrooms (8), teachers' offices (8), toilets, store

⑩ Workshop Block
workshops (mechanics', carpenters' workshops)

Related Facilities

① Teachers' housing
Type-H65 27 units

② Staff housing
Type-L-40 5 units

③ Sports facilities
tennis courts (2), netball courts (2), rugby pitch (1), soccer pitch (1) basketball court (1), volleyball court (1)

④ Elevated tank

⑤ Water receiver tanks

⑥ Transformer facility

⑦ Dangerous object and drug warehouse

⑧ Gas cylinder warehouse

External Works

① Information Plaza

② Campus roads, footpaths

4-2-2 Determination Policy of The Scale of The Project

The following guidelines have been drawn up for determining the total area of the facilities overall and calculating the size of the individual rooms and external facilities.

① Similar facilities in Japan and Sogeri High School in Papua New Guinea have been used as the basis for calculating the total area of the facilities overall.

② The following will be used in addition to data from similar facilities described in 1) above as a basis for calculating the areas of individual rooms and external facilities:
ⓐ Building Design Data Book in Japan
ⓑ Architectural Systems in Japan
ⓒ Area desired by the Government of Papua New Guinea
ⓓ Standard design documents of public utilities in Papua New Guinea

③ In the case of facilities and rooms for which it is difficult to fix the size for the number of people they are to accommodate, the required size will be calculated after deciding on the equipment to be located in them.

④ The size of facilities has been calculated from the number of people they are to accommodate where it is possible to do so but local office formalities, equipment to be installed and the receiving of visitors has also been considered.

⑤ For such facilities as toilets, changing rooms, shower rooms, etc., the area has been determined in consideration of the ratio of men to women but the local custom of desiring the same area for men as for women has also been considered.

⑥ The standard types of housing in Papua New Guinea have been adopted for the housing facilities.

4-2-3 Policy for Determining Overall Size

The total area of the school has been calculated using the following steps.

① Determine the layout of the general classrooms by considering the relationship between the number of students to be accommodated in each general classroom and the teachers' offices.

② Calculate the area of a standard general classroom by analyzing the frontage and depth.

③ Determine the layout of the curriculum block classrooms by considering the equipment to be located in the rooms and the relationship between the teachers' offices and the preparation rooms.

④ Determine the shape of standard curriculum block classrooms by analyzing the frontage and depth.

⑤ Determine the size of the size of each curriculum block classroom after placing the equipment required in each one.

⑥ Calculate the minimum required area for each room in the Administration Block by analyzing the number of people to be accommodated in each one.

⑦ Calculate the optimum size for a library which has 10,000 books and uses an open shelf system for the books.

⑧ In determining the size of the assembly hall block, calculate the size of a standard gymnasium using the basketball court as a standard.

⑨ From the above results, sizes and the number of the primary space (for living) such as standard general classrooms, curriculum block classroom, office, library and gymnasium are determined. Then the secondary space (shared space, not for living) is calculated as compared with the primary one. Finally the total area is reviewed.

4-2-4 Calculation of Each Room Sizes

[1] General classrooms and curriculum rooms

While the amount of floor space per student is 1.4m² for high schools in Japan, it is relatively larger for Sogeri National High School in Papua New Guinea, which is 2.2m² . This is because, while the platform and the student desks are facing each other in Japan, a space is given in front of the platform (so the teacher or students can exhibit things there and explain about them or make a speech), and desks are located around that space in Papua New Guinea.

This project, as a principle, adopts the Papua New Guinean style arrangement, though the space per student is 1.8m² and the size of one room (for 31 persons) is 56m² as the space in front of the platform can be made smaller.

For the curriculum room, both rooms in Japan and in Papua New Guinea have a ratio of area of 1:1.5 with the general classrooms. Therefore this project follows that ratio, making a room of 84m².

[2] Administration Block

The school is assumed to have a total of 58 staff comprising 30 teaching staff and 28 other staff.

① Offices 12 persons
- general offices: 4.5 - 7 m²/person (from collected Building Design Code)

[value used] 4.5 m²/person

[floor area] 54 m² (4.5m² × 12 persons)

② Staff rooms (staff Nos.: 58)
- recreation rooms: 0.9 - 1.8 m²/person (from collected Building Design Code)

[value used] 0.95 m²/person

[floor area] 54 m² (58 × 0.95)

③ Principal's office 1 person
- principal's office: 18 - 25m²/person (from collected Building Design Code)

[value used] 18 m² + area for receiving visitors

[floor area] 33 m² (furniture for visitors to be provided)

[3] Library

The library will have 10,000 books and use an open shelf system for them.

- library area: 150 - 200 books/m^2 (from collected Building Design (average 200/m^2) Code)
- reading room: 2.2 - 2.8 m^2 (from collected Building Design Code)

[value used] book storage area 200 books/m^2; reading room 2.7 m^2

[floor area] 300m^2 (book storage: 115m^2; reading room: 2.7m^2 x 70 persons = 190m^2)

[4] Assembly Hall

Size of assembly hall has been decided based on the size of 20m x 30m for basketball court.

[court] 600 m^2

[stage] 20 m x 6 m deep (including offices) = 120 m^2

[5] Housing

For teachers: Local standard type for teacher's residence; H65 (3 bed room)

For staff: Local standard type for leading staff's residence; L40 (2 bed room)

The area determined in this project is shown in Table 4-1 and 4-2.

Table 4-1 Comparison of Desired and Project Plan Room Sizes

Facility	Size in plan m²	Remarks
[Classroom Block]		
• classroom	56 (31 pers)	• 31 students and 1 teacher
• office	16	• furniture layout
[Curriculum Blocks]		
• classroom	84	• Education eqipment for 31 students
• preparation room	16	
• store		
• office	12	
[Adm. & Manag. Blocks]		
• principal's room	33	• visitors' furniture
• dep. principal's rm.	24	
• registered office	27	
• office	54	• 18 office staff
• staff room	54	• recreation room
• first aid room	21	
• computer room	12	
[Library Block]		
• library and reading room	282	• 10,000 books stored
• office	23	• 3 office staff
• browsing area	79	• combined with hall
[Assembly Hall Block]		
• sports ground	540	• Basketball court
• stand	250	
• stage	108	
• recreation area	144	
[Workshops]		
• mechanic's	49	
• carpenter's	49	

Table 4-2 Comparison of Overall Sizes

Block	Size in plan m^2	Difference
1. Administration Block	564.0	
2. Library Block	571.1	
3. Assembly Hall	1,260.0	
4. Drama & Music Block	293.4	
5. G11 Curriculum Block	557.4	
6. G12 Curriculum Block	557.4	
7. Expressive Arts & Computer Block	293.4	
8. G11 Classroom Block	839.4	
9. G12 Classroom Block	839.4	
10. Workshop Block	98.0	
Store		
Subtotal	5873.5	area/person desired: 10.9 m^2 this plan: 12.2 m^2
[Ancillary Facilities]		
11. teachers' housing	2,104.38	
12. staff housing	226.8	
Subtotal	2,331.18	
Total	8,204.63	

In Japan, the floor area/ per student in ordinary high schools is 10 m^2
and 20 m^2 in technical high schools (from Building Standards for High Schools)

4-2-5 Setting of Grade of The Facilities

The planned each grade of the facilities is as follows:

[1] Grade of the facilities overall

The facilities overall, in principle, have to be set based on the grade of public facilities in Papua New Guinea. The classroom blocks will be constructed from concrete blocks, the administration and library blocks will have a Rahmen structure consisting of concrete columns and beams (walls made from concrete blocks) and the assembly hall block will have a steel frame structure.

[2] Grade of Each Part of Building

The determination of the grade of these facilities includes consideration of cost, durability, maintenance and other factors which is based on the local standard of public facilities. The table below (Table 4-3) compares the grades of individual parts for Sogeri National High School, University of Papua New Guinea (UPNG) and Gerehu National High School.

Table 4-3 Comparison of Grades

Part		Sogeri High School	UPNG	Project
Ext.	roof	steel sheet roof	steel sheet roof	steel sheet roof
	ext. wall	boarding	concrete block	concrete block
Int.	floor	wood boarding	finish layer on concrete	finish layer on concrete
	wall	boarding	paint finish on concrete block	paint finish on concrete block
	ceiling	no ceiling	paint finish on board	paint finish on board

4-3 Basic Plan

Since the construction work of this project includes a number of blocks and have large floor area in total, the work will basically be divided into 2 phases - Phase I and Phase II.

4-3-1 Site and Layout Plan

This project has been divided into 2 zones on the basis of school facilities and housings. The following points have been considered in the planning.

① School facilities is placed along The Goro-Kaega Road and aligned with the north-south axes so they can effectively prevent the direct sunlight.
② The school facilities are to be located in the center of the site where they are isolated from noise from the front road and the slant at the center of the site is relatively moderate.
③ The housing for the teachers and staff have been located in separate positions in order to ensure privacy, easy access to the school facilities and enable direct access from the road at the front of the site.

Figure 4-1 shows the zoning of facilities based on the above discussion.

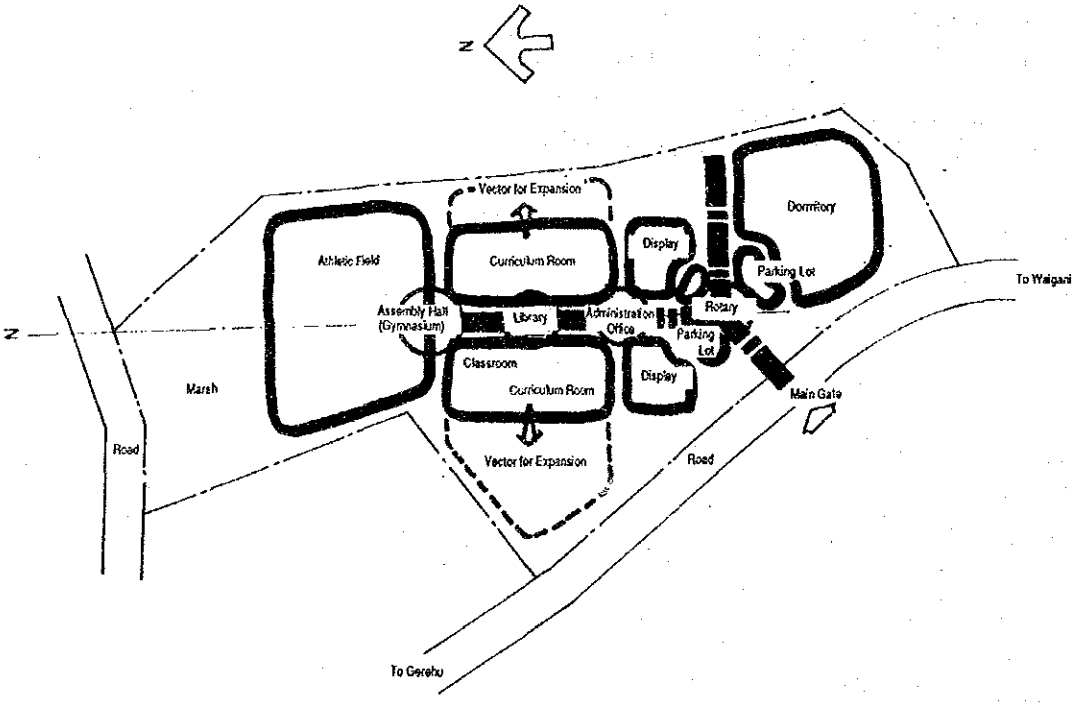


Fig. 4-1 Facilities Zoning

The layout plan has been drawn up on the basis of the above zoning details as well as in consideration of the points listed below.

① Locate the school buildings so that the flow paths of students, teachers and visitors are separated and the facilities overall function as one unit.
② Stress the functional connections between school buildings.
③ As the site slopes gently inwards from the road on the south side, locate the buildings along the slope to ease the work of site preparation.
④ Locate the buildings along the slope to allow rainwater and drainage from the buildings to drain away naturally.
⑤ Locate the sanitary facilities and the electrical facilities in the central part of the school facilities, etc. from the point of view of economy and functional considerations.
⑥ Use natural ventilation because of the high humidity in the area. As the prevailing wind is from the northwest in the rainy season and from the southeast in the dry season, arrange to have the windows in the north and south facing sides of school buildings to improve ventilation.
⑦ Ensure that there is space between buildings to improve the ventilation and increase the amount of sunlight.
⑧ Cater for extensions in the planning.

Figure 4-2 shows the layout plan based on the above discussion.

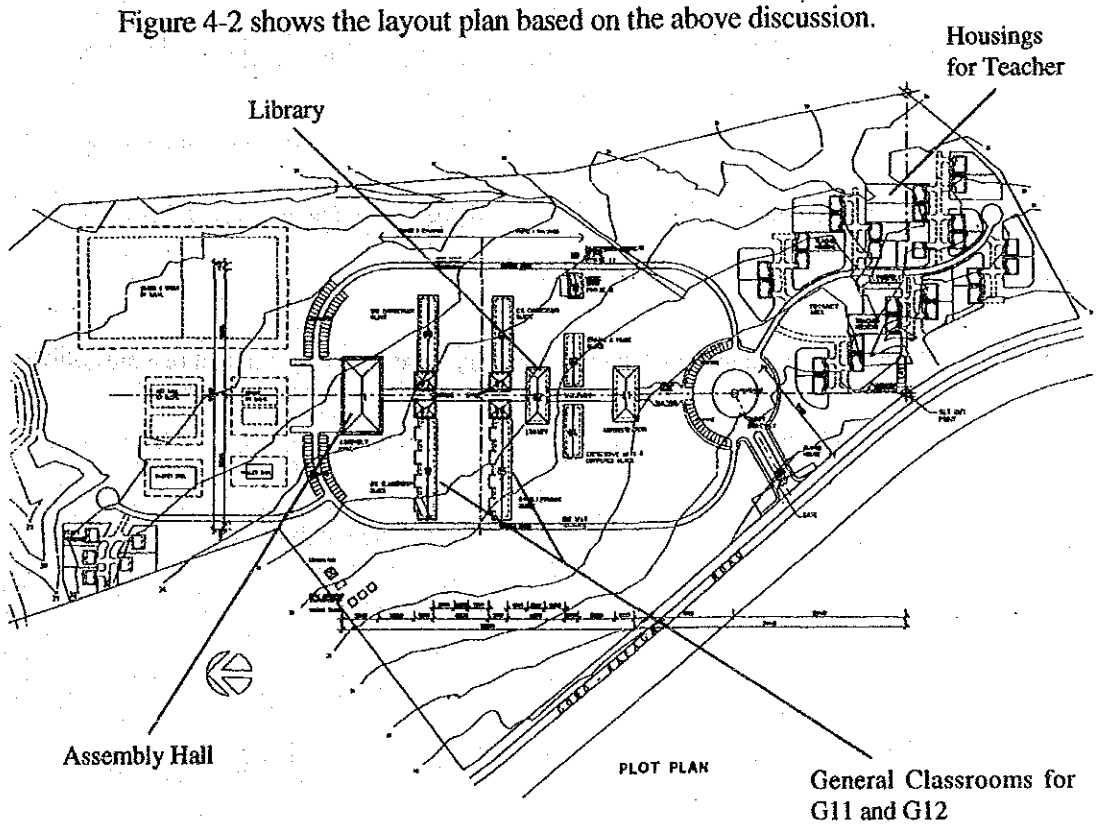


Fig. 4-2 Layout Plan

4-3-2 Architectural Design

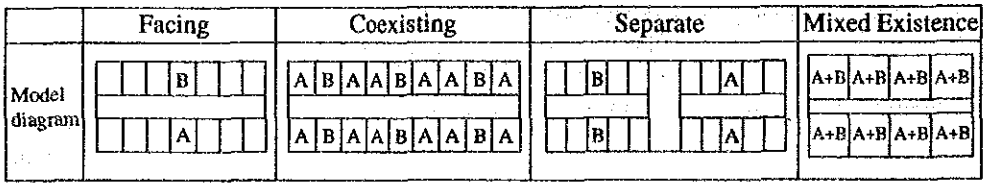
[1] Floor Planning

The spans corresponding to the areas calculated in the paragraph 4-2-4 and the configuration and the number of rooms were decided based on the following ideas:

① For setting an appropriate module for the general classrooms. A 7 m x 4 m spanning has been adopted as the module in consideration of adoption of concrete blocks most commonly used in the local construction method with the locally available material. So, a 7 m x 8 m room plan has been adopted for the general classrooms as a floor area of 56 m^2 is required for them (Sogeri National High School: 7.2 x 8 m)

② In the curriculum block classrooms, an area of 85 m^2 is required for the furniture layout so 3 spans of each 4m were put together for the room plan of 7 m x 12 m.

③ Following the example of Sogeri National High School, the teachers' offices and preparation rooms have been arranged to be facing in the case of the general classrooms and coexist in the case of the special classrooms.



A : classroom B : preparation rooms

Fig. 4-3 Layout of Classrooms, Teachers' Offices and Preparation Rooms

④ The classroom corridors have been made the gallery type in consideration of ventilation.

[2] Plan for Elevation and Cross Section

In consideration of local building styles, local building methods, etc. The planning of the elevation and cross section of the school buildings has been based on following points.

① Local construction methods will be employed for the structure of buildings. For two-story buildings, columns, beams and floors will be of reinforced concrete and external wall and partitions of locally made concrete blocks. For one-storey buildings, columns will be fabricated from locally made reinforced concrete blocks, beams and floors from reinforced concrete and external walls and partitions from locally made concrete blocks.

② Roofs will be either the gable or hip type constructed using either wooden or light steel frame trusses and locally manufactured steel plates as roofing material.

③ Ceiling plenum will be provided as well as insulating roofs.

④ As the sun's rays are very strong during the day, eaves will protrude largely to protect classrooms from direct sunlight.

⑤ Room ventilation will be improved by using Jalloje windows for external walls and providing vents in wainscoting so that the hot air inside them is channeled to the outside as much as possible.

A standard cross section based on the above is shown below (See Fig. 4-4):

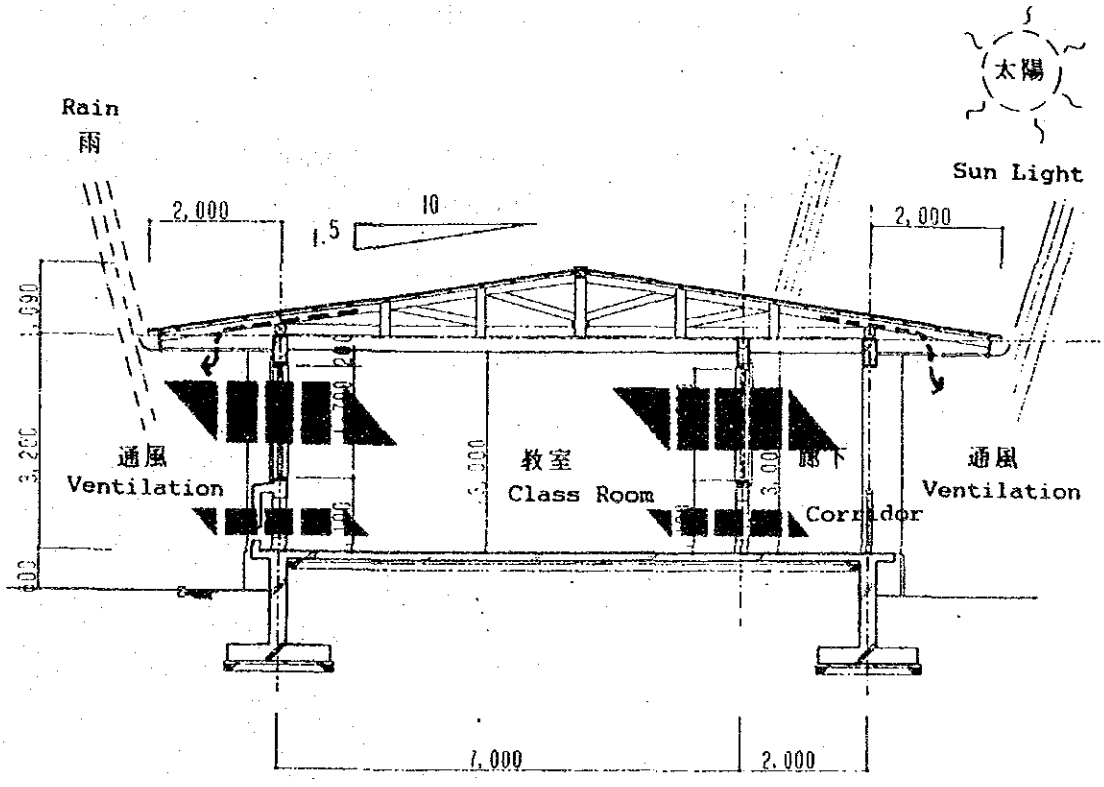


Fig. 4-4 Standard Cross Section

4-3-3 Structural Plan

[1] Structual Design Concept

The non-bearing construction method shall be used to withstand long-term loads such as bending and vibration.

In addition, the building shall have sufficient safety to withstand short-term loads. The building design shall meet the building construction standards of Papua New Guinea and reference shall be made to Japanese building standards.

[2] Frame Construction Method

The frame construction has been determined in accordance with the plan and features of each ridge.

① Office Ridge/Library

The live loads on the second floor are high so a RC and rigid-frame construction will be used. The roof will use the timber-truss construction method.

② Assembly Hall (Gymnasium)

The boundary walls will be constructed using reinforced concrete blocks and the 24-m span frame will use steel girders.

③ Classroom Ridge

The boundary and internal dividing walls will be constructed of reinforced concrete blocks and the roof will use the timber-truss construction method

C. Loads

Classification	Live Load (Kpa)
Assembly Room	4.0
Laboratory	3.0
Office	3.0
File Room	5.0
Class and Lecture Room	3.0
Toilets	2.0
Kitchen	5.0
Dining Room	2.0
Corridor	3.0
Gymnasium	2.0
Balcony	4.0
Roof	0.25

1 Kpa ≠ 102 kg/m²

① Live Loads (from PNG. S. 1001-Part 2)
② Seismic Loads (from PNG. S. 1001-Part 4)

$$V = C \cdot I \cdot K \cdot T$$

where,

V: Standard floor shear force
C: Coefficient of reference shear force
I: Coefficient of importance
K: Coefficient of framework

The values used in this project are as follows:

C = 0.1 (seismic zone 4)
I = 1.0 (general building)
K = 1.0 (frame construction)

③ Distribution of floor shear force

$$Fi = wi \times hi / S(wi \times hi) \cdot V$$

Fi: Floor i shear force
Wi: Weight of floor i
hi: Height of floor i above bedrock

④ Combined Loads (from PNG. S. 1001-Part 1)

The loads are as follows for the allowable response design method.

• Long-term load	D + L
• Short-term load	
at earthquake	D + L + 0.8E
(With E)	0.7 • D + 0.8E
• Wind load	D + L + W

where,
D: Dead load
L: Live load
W: Wind load

D. Foundation Method

The quality of the ground at the site of this project is composed of clay at the surface with compacted gravel and sand at lower levels.

The ground bearing strength for the room foundation at a depth of GL (Grand Level)-1.2 m is believed to be 5 ton/m^2 which is sufficient for the very low load so a mat foundation is suitable. In addition, the ground bearing strength of the gravel and sand at GL-2.0 will support the higher loads of the offices and library. The ground bearing strength is believed to be at least 8.5 ton/m^2 so a mat foundation can be used.

In addition, the base of the foundation can be changed according to the set design GL.

4-3-4 Building Facilities Design

① Electricity

ⓐ High-voltage (11 kV) electric lines are provided on poles on the road on the west front side of the site of this project. The high-voltage cable and the transformer is installed on the pole within the site, and low-voltage power is provided to the facilities. The installa tion of the transformer is within the scope of work executed by the Power Supply Corpo ration (ELCOM). ELCOM supplies the low-voltage power to each of the residences.

ⓑ This design covers all the electrical services for the school and offices and the electrical materials shall be locally procured.
The design deals with lighting, power outlets and ceiling fans.
Fluorescent lights will be used for lighting in the building and mercury or halogen lamps will be used outside the buildings.
In principle, power outlets will be located around the teacher's rostrum as well as in private rooms.

ⓒ Papua New Guinea side is responsible for the preliminary work of branching the cable from the public telephone cable already provided on the front road and connecting it to the main distribution panel installed within the site. The project covers the work of installation of switch boards, telephones and the private cables.

②Water Supply and Drainage

ⓐ The main pile (250 ϕ) for water supply is laid along the west front side of this project, and the branch piping can be laid from the main pipe. It is feared, however, that the overall water supply would be degraded if the branch piping is laid, and advice has been given for setting up a water tank holding a volume equivalent to 2 days consumption under this project.

ⓑ The city reticulated water supply will be received by a water tank and will then be supplied to each facility through an elevated tank.
For the residential facilities, the water supply is branched from the drop water supplying pipe and then supplied using metered inlets and water tanks of $2m^3$ to each facility.
The waste water and sewerage from the facilities will be handled together by connection to the main sewer constructed along a road to the north of the site.

Receiving Tank:	FRP 60 m^3 2 units
Elevated Tank:	FRP 9 m^3 1 unit
Piping:	PVC
Toilets:	Ceramic western style
Urinals:	Stainless
Sinks:	Ceramic

ⓒ The sewage main piping (300 f) is laid within the northern side of the site of this project, and sewage water of the facilities to be built under this project can be drained as is, in the form of untreated water.

ⓓ Rainwater within the site can be drained into the gutter (5 meters wide and 2 meters deep) on the west side of the site.

③ Air Conditioning and Ventilation
Air conditioning will be installed in the offices, computer room and library.
In principle, ventilation will make use of natural ventilation through the building but some ventilators may be installed as necessary.

4-3-5 Building Material Plan

[1] Basic Items

The parts required for the buildings shall be investigated in general as follows based on the climate and geology, requested conditions, required functions, local construction details, construction period, low construction cost, and low maintenance costs.

① Structural Materials
In principle, the materials shall be reinforced concrete for the main frames with concrete block walls as is used generally for buildings in Papua New Guinea. There is no problem with quality and quantity in production of locally-manufactured cement, framework and concrete blocks.

② Finishing Materials

In principle, the finishing materials shall have high durability and maintainability. The finish materials of the external walls and roof, etc. shall be selected in consideration with lifespan as well as economics. Easy-to-repair local materials shall be used for other parts.

[2] Finishing Materials for Each Part

① Roof

Silicon-polyester-finished steel/zinc galvanized corrugated sheets, which have better corrosion resistance than galvanized steel, will be used for the roof.

② External Walls

Unfinished locally-produced concrete blocks will be used for external walls.

③ Fittings

External windows will be steel framed; windows facing onto corridors will be timber framed.

[3] Internal Finishing

① Floors

Finishing of classroom and corridor floors shall be concrete [ST] which is most popular method in Papua New Guinea and vinyl sheet will be used for office and library floors. Surface shall be easy-to-clean at low cost.

② Internal Walls

Concrete block for internal walls other than classroom walls will be painted.

Easily-moved lightweight steel-frame partitions will be used for wall partitions for future removal.

The lower parts of walls in toilets, etc. will be ceramic tiled.

③ Ceilings

Classroom and office ceilings will be furnished with soundproof rockshet.

4-3-6 Equipment Plan

Based on the result of survey in Papua New Guinea and the result of evaluation of data, following equipments in Table 4-4 will be considered as necessary items for this project.

Table 4-4 Equipment List (1/3)

Content	Equipment Name	No.
1. Classroom Equipment		
	Classroom computers	
	Personal computers	33
	Printers	13
	Student personal computer desks and chairs	10
	Office personal computer desks and chairs	3
	Voltage stabilizers (AVR)	12
	Non-interruptible power supplies	12
2. Laboratory Equipment		
	Physics	
	Circuit testers	20
	Electricity generator testers	20
	Water wave generators	2
	Flasco vacuum bells	20
	Air boards	10
	Vacuum pumps	10
	Biology	
	Aquarium sets	20
	Small animal cages	20
	Monocular microscopes	20
	Microscope lamps	20
	Binocular microscopes	20
	Slide educational material sets (plant and cells)	2
	Microscope materials (plant, animal, physiology)	2
	Chemistry	
	Molecule models	20
	Electronic balances	1
	Pan balances	10
	Precision balances	10
	Barometers	2
	Hygrometers and dessicators	20
	Electric centrifuges	1
	Manual centrifuges	5
	Refrigerators	6
	Dangerous chemicals and materials store	2

(Continued)

Table 4-4 Equipment List (2/3)

Content	Equipment Name	No.
3. Audiovisual		
	Overhead projectors	1
	Slide projectors	1
	Screens	2
	Video set	1
	Copier	2
	Music room materials (stereo set)	1
	Drama room materials (stereo set)	1
	Music keyboards	6
4. Physical Education Equipment		
	Table tennis sets (table and net, etc.)	3
	Volley ball set (net and balls, etc.)	1
	Soccer set (goal post and net, etc.)	1
	Shot putt set (cannonballs, etc.)	1
	Track and field equipment (starter and mats, etc)	1
	High jump set (bar, etc.)	1
	Javelin set (javelins, etc.)	1
	Basket ball set (net, etc.)	1
	Softball set (bases, etc.)	1
	Rugby set (Goal post, etc.)	1
5. Maintenance Equipment		
	Tools (facilities)	1
	Fixed bench grinder	1
	Gas welding set (tanks and accessories)	1
	Fixed bench bowl plate	1
	Arc welding equipment	1
	Spanner set	1
	Disc grinder	1
	Metal band saws	1
	Pipe cutter	1
	Pipe bender	1
	Pipe wrench	1
	Buffer set	1
		1
	Socket set	2
	Torque wrench set	1
	Clamps	1
	Gages	1
	Small gages	1
	Air pressure meter	1
	Metric tool set	1
	Tachometer	1
	Air compressor	1

(Cont inued)

Table 4-4 Equipment List (3/3)

Content	Equipment Name	No.
5. Maintenance Equipment (Continued)		
	Carpentry tools	1
	Electric drill (portable)	1
	Chisel and plane sharpening stone	1
	Drill sharpener	1
	Angle adjuster	1
	Vertical/horizontal circular saw	1
	Long plane	1
	Electric plane	1
	Timber band saw	1