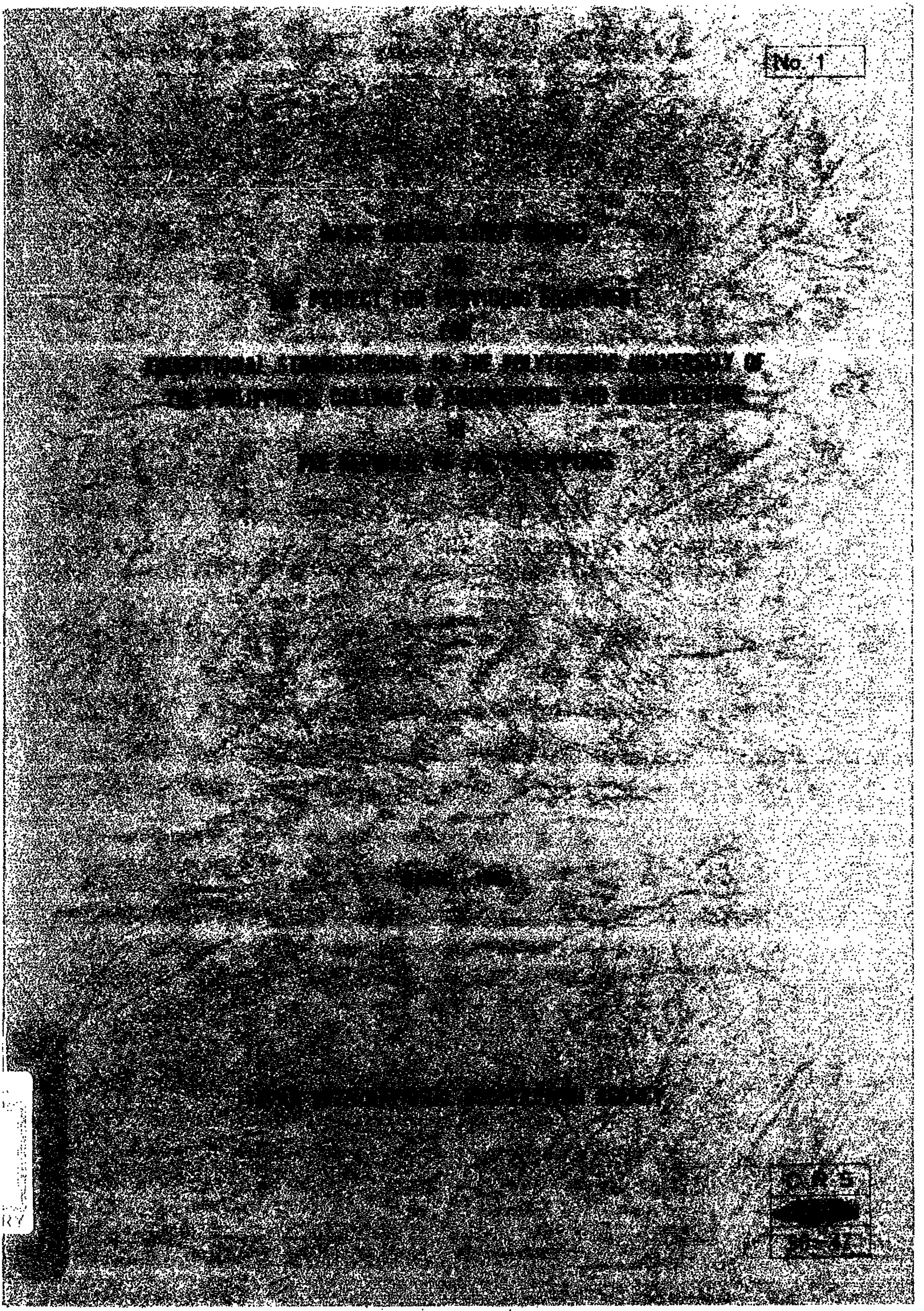
No. 1



BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR PROVIDING EQUIPMENT
FOR
EDUCATIONAL STRENGTHENING IN THE POLYTECHNIC UNIVERSITY OF THE PHILIPPINES, COLLEGE OF ENGINEERING AND ARCHITECTURE
IN
THE REPUBLIC OF THE PHILIPPINES

MARCH 1990

JAPAN INTERNATIONAL COOPERATION AGENCY

PREFACE

PREFACE

In response to the request of the Government of the Republic of the Philippines, the Government of Japan has decided to conduct a Basic Design Study on the Project for Providing Equipment for Educational Strengthening in the Polytechnic University of the Philippines, College of Engineering and Architecture and entrusted the study to the Japan International Cooperation Agency (JICA). JICA sent to the Philippines a survey team headed by Dr. Masazumi Kumagai, Associate Professor, Department of Electronic Engineering, Sendai National College of Technology, from 28th of November to 21st of December, 1989.

The team exchanged views on the Project with the officials concerned of the Government of the Philippines and conducted a field survey in Santa Mesa, Manila. After the team returned to Japan, further studies were made and the present report has been prepared.

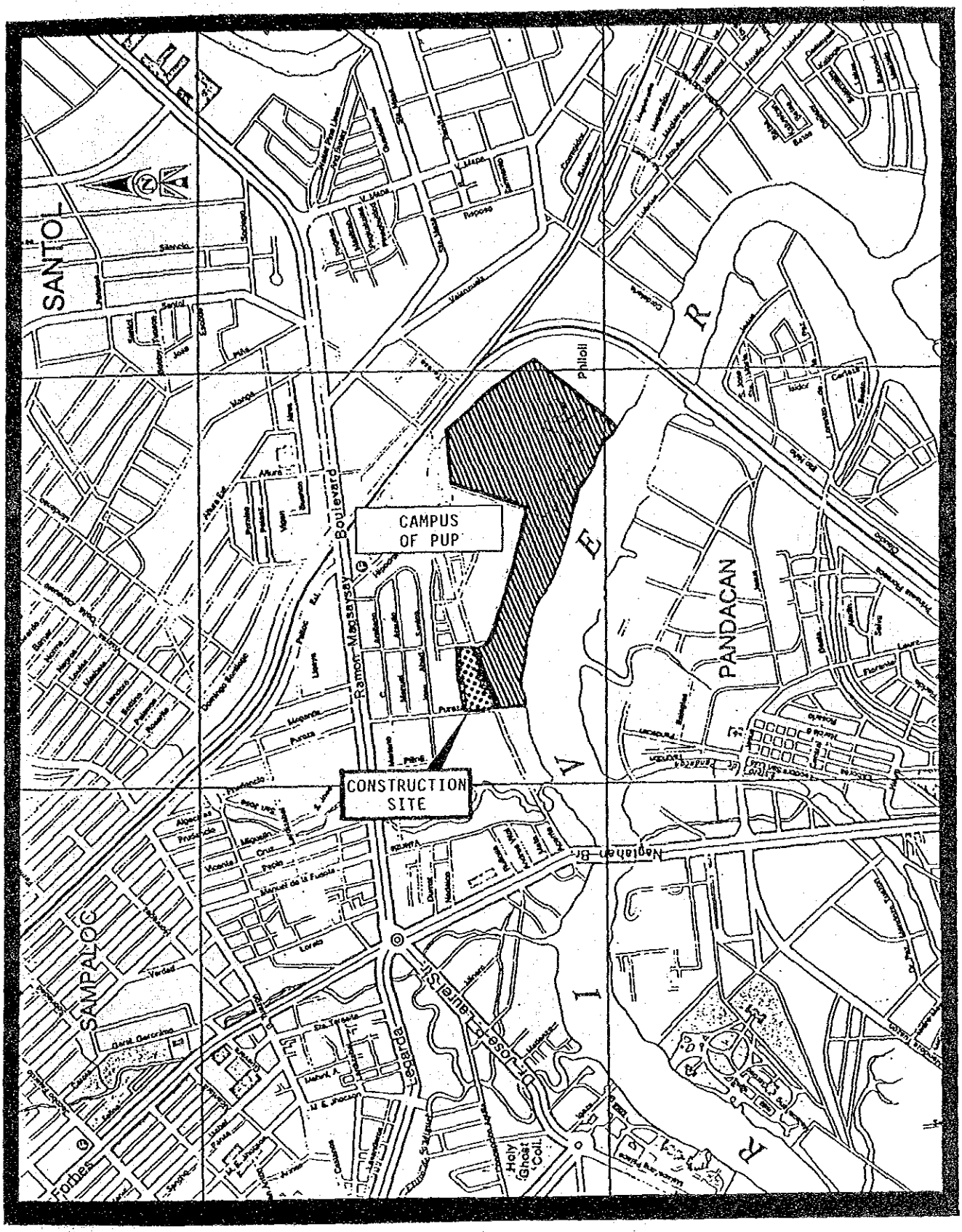
I hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between our two countries.

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

March, 1990

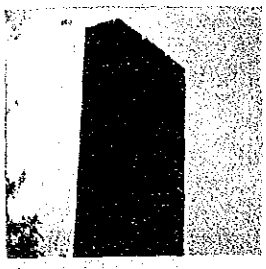
Kensuke Yanagiya

Kensuke Yanagiya
President
Japan International Cooperation Agency

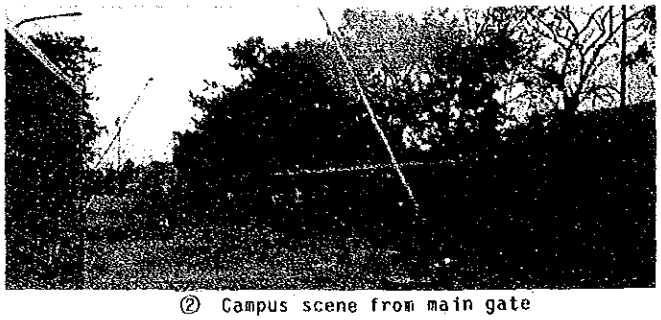


LOCATION OF PROJECT SITE

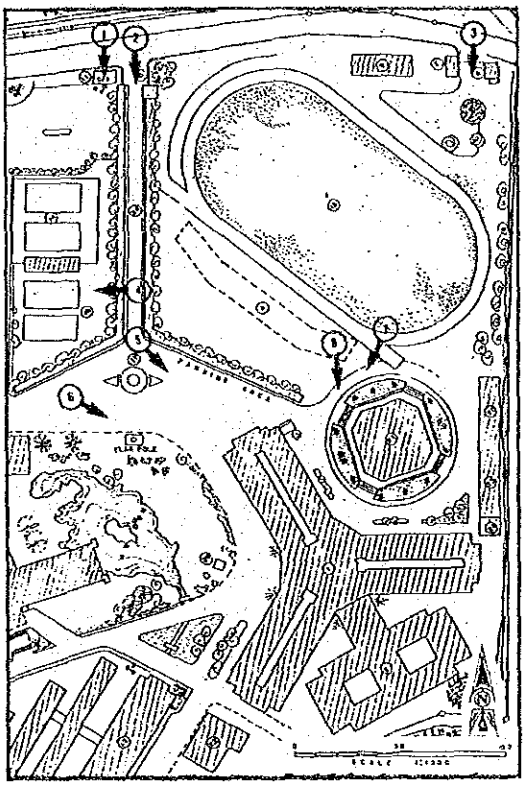
PUP campus

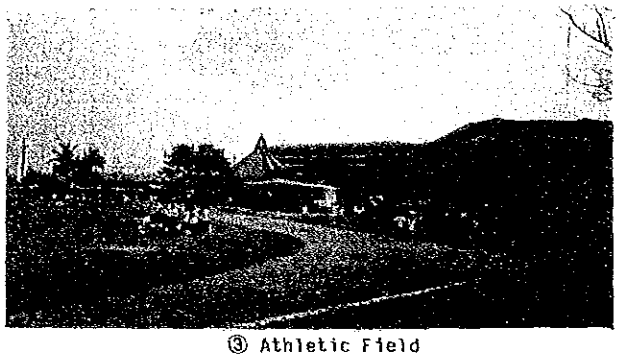


① Gate pillar of main gate



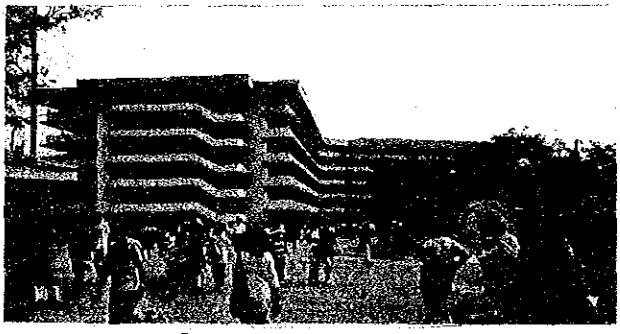
② Campus scene from main gate



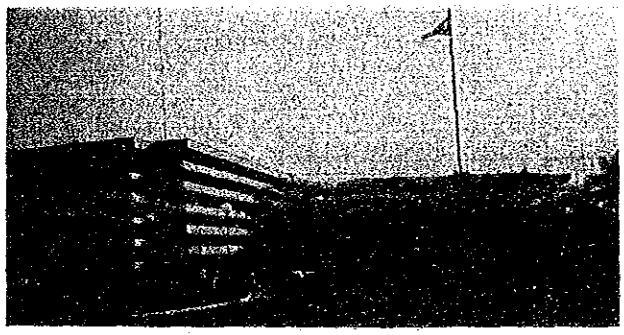


③ Athletic Field

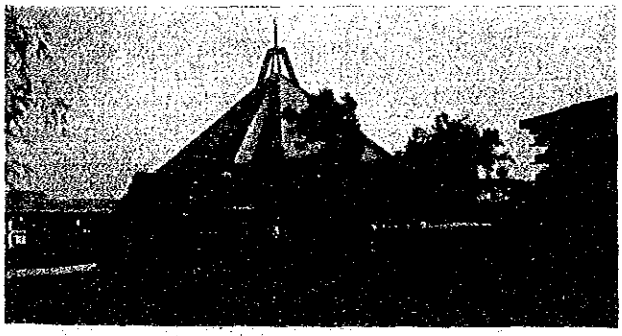
④ Recreatuin spot



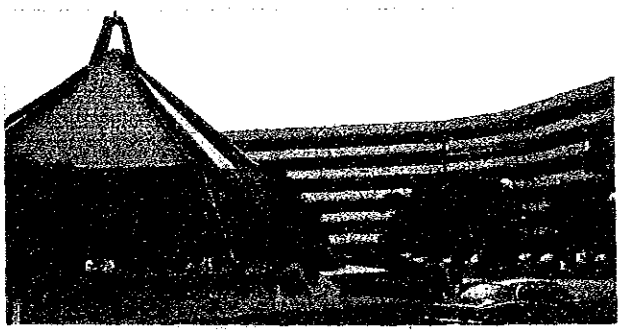
⑤ Existing school building



⑥ Existing school building



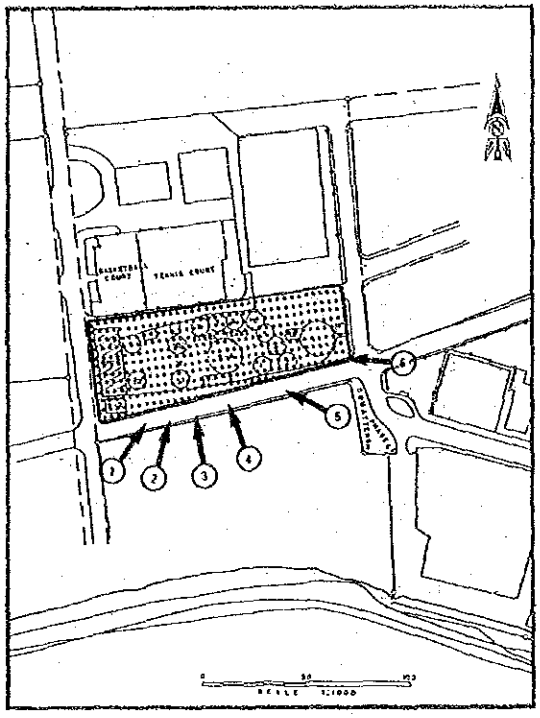
⑦ Chapel



⑧ Chapel

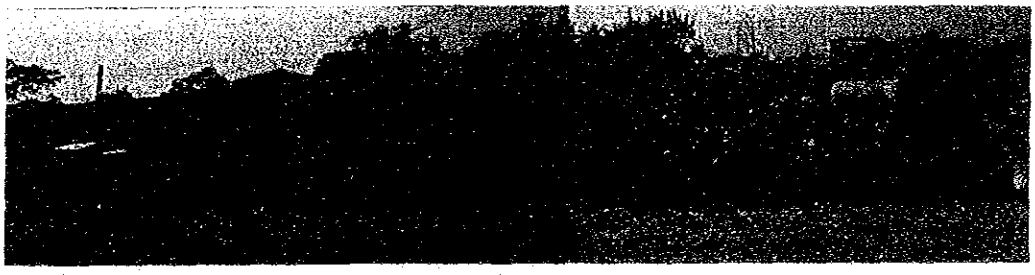
Construction Site of New CEA Building

Scene from ①



Scene from ②

Scene from ③



Scene from ④

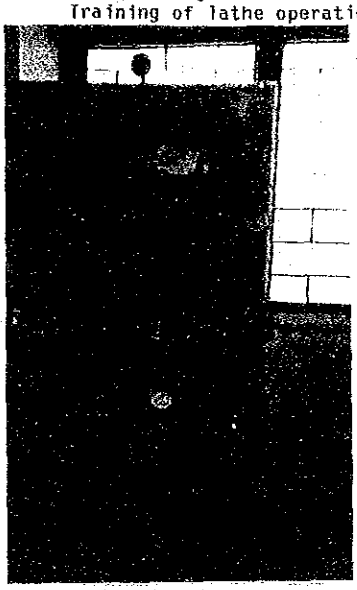
Scene from ⑤

Scene from ⑥

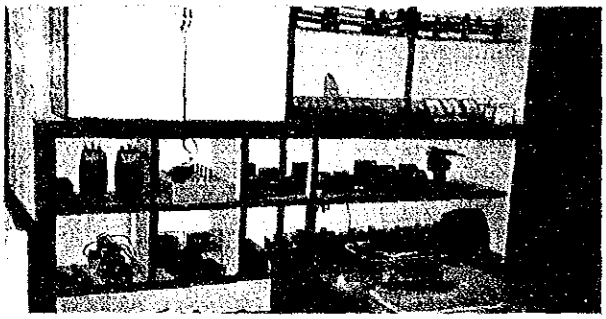
TRAINING SCENE IN CEA

Electrical Eng.
Lecture using hydropower model

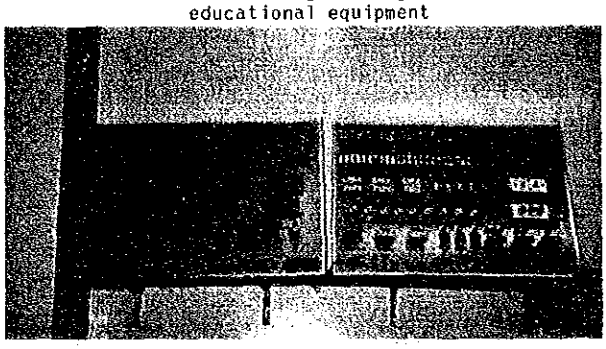
Mechanical Eng.
Training of lathe operation



Mechanical Eng. Model of
refrigeration system

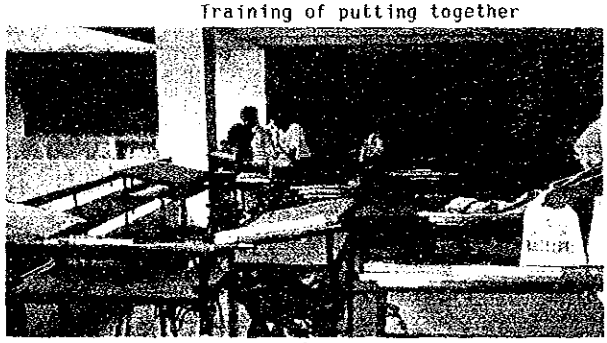


Electrical Eng. Storage of
educational equipment



Electrical Eng. Sequence model

Electrical Eng.
Training of putting together



Architecture Training of drawing

Computer training

SUMMARY

SUMMARY

The core of the industry structure in the Philippines had been a primary industry based on the traditional agriculture . Following the tendency of the times in 1950's, the promotion of industrialization was taken as one of the important policies, which was quite successful in the 60's and 70's. But the second oil crisis beginning at the end of 1979, affected seriously the economy of the Philippines which had not fully developed yet. In the 1980's, the domestic economy continued to be overshadowed by the stagnation and confusion, causing to aggravate the social unrest of the Philippines constructed on a fragile socio-economic foundation.

The Aquino government, emerged under these conditions in February, 1986 with her basic policy of the Medium Term Philippine Development Plan for 1987 to 1992 and her slogans of recovering democracy, developing rural areas, and reducing regional differentials, has been trying to correct social inequalities. The goals of the policy is to provide equal opportunity and improve the quality of education from the standpoint of the socially weak based on the recognition that "improvement of education and training" is essential for achieving the goals. The goals were specified as follows:

(1) to correct of inequality of educational opportunities,
(2) to improve the quality and the contents of education and training, and
(3) to increase employment, productivity and self-reliance, and to promote human resource development in order to realize the economic recovery and growth.

The fact that the enrollment rate of the elementary education reaches nearly 90 percent shows that the people are highly interested in education in the Philippines. The people have a strong desire for the secondary and higher education. The number of schools in the country as of 1986 is, 33,156 elementary schools, 5,375 secondary schools, and 1,078 universities or colleges with the total number of students of more than 13 millions. There are 293 state universities and colleges and some other private ones. The National Capital Region has 176 universities and colleges, 16 percent of all, and about 34 percent of all the students in the country, indicating a tendency of maldistribution to the capital. In fact, each

local Region has a substantial number of universities and colleges, but high quality education is available only in those located in Manila except some local state universities. In such relatively well-equipped universities, however, the departments of engineering and technology have insufficient facilities and equipment for experiments and training.

Though experiments and training are essential for the education of engineering and technology, many universities have difficulty in securing necessary facilities and equipment and personnels due to the shortage of the operation budget. Furthermore, the fact is that many students seeking for the tertiary education are forced to give up or leave school because of financial problems. It is a pressing need for the Philippines aiming at economic recovery through industrialization to train engineers who can offer effective labor power in each field of industry. Thus, it is a great task that should be tackled in the years to come to provide a high quality education with a small amount of school expenses to the students who wish to become engineers.

Polytechnic University of the Philippines (PUP), based on its educational ideology, aims at providing opportunities of tertiary education with a small amount of school expenses to the young people from the families of low income as many as possible. PUP, embracing 43,500 students, is the largest university in the Philippines as far as the number of students is concerned, but the school expenses per one student is about 690 peso per semester, much lower than that of University of the Philippines, one of representative state universities, which amounts to about 2,150 peso.

In the Philippines, there are many cases that a student temporarily leaves his school and will return to the school after he finds a job. Therefore, PUP has a unique educational system called Ladder Curriculum in which a specific skill can be given to a student in every grade so that the student who is forced to leave school due to a financial reason can be employed easily.

This educational policy of PUP aims at coping with the current issues of the Philippines. In PUP, however, where a number of students are enrolled, its educational facilities are quite inadequate, inducing the unexported situation affecting the educational standard. Most of all, the College of Engineering and Architecture (CEA) which is to provide the education in the fields of engineering and technology lacks proper facilities and equipments indispensable for experiments and training, so

that effective education is not available. In every department, only a limited number of students can use the educational equipment at the same time within a limited period of time due to large number of students compared with those of the equipment.

In order to solve the current problems by completing and expanding CEA, PUP made an appropriation of 96 million peso following its own five year development plan for constructing new building in CEA, and was obtained the approval from the government. This project is planned to start working in the first half of 1990. The planned building is five storied reinforced concrete building with its total floor area of about 12,000 m^2. In its 1st to 4th floor, it provides the rooms of laboratory, training and workshop of each department as well as the common space such as the administration office of the College, AV room, a library, etc. In a portion of the 5th floor, it provides an auditorium with its capacity of 300 persons and a canteen. It is planned the other portion of the 5th floor and the 6th floor could be extended in future. The construction of the building is planned to be commenced in March of 1990 and be completed by April of 1991.

From these backgrounds the government of the Philippines requested the government of Japan for the grant aid for providing educational equipment to CEA. The content of the request is the supply and installation of the equipment of 13 fields including 11 technical departments, general basic science (physics and chemistry) field and supplemental educational and administrative field common to all the departments in the newly constructed buildings of CEA.

REQUESTED FIELDS

Existing Department	Newly Established Department	Supplemental Field
Computer Engineering	Chemical Eng.	General science
Civil Eng.	Geodetic Eng.	(Physics & Chemistry)
Mechanical Eng.	Sanitary Eng.	Supplemental
Industrial Eng.	Mining Eng.	educational equipment
Electric Eng.		
Electronics & Communication Eng.		
Architecture		

The field survey was conducted from November 28 to December 21, 1989. Based on the results of the survey, the educational contents and curricula of CEA were analyzed, and the basic design was formulated with an appropriate scale considering the level of administration and technology. The four newly established department were requested to be included in the Project. However they are merely in a planning stage in the present time and not have any achievement. More specifically, Geodetic Engineering and Sanitary Engineering are included in Civil Engineering course, and can be covered by the existing civil engineering course. Chemical Engineering and Mining Engineering are underdeveloped fields in the present Philippines where it is difficult for the student to find employment immediately after the graduation due to the fragile social basis. Furthermore, from view point of the planed scale, the educational effectiveness of their equipment seem lower than those of the existing department as many large size machine are requested in the plan.

From these angle, the newly established departments will be eliminated from this Project.

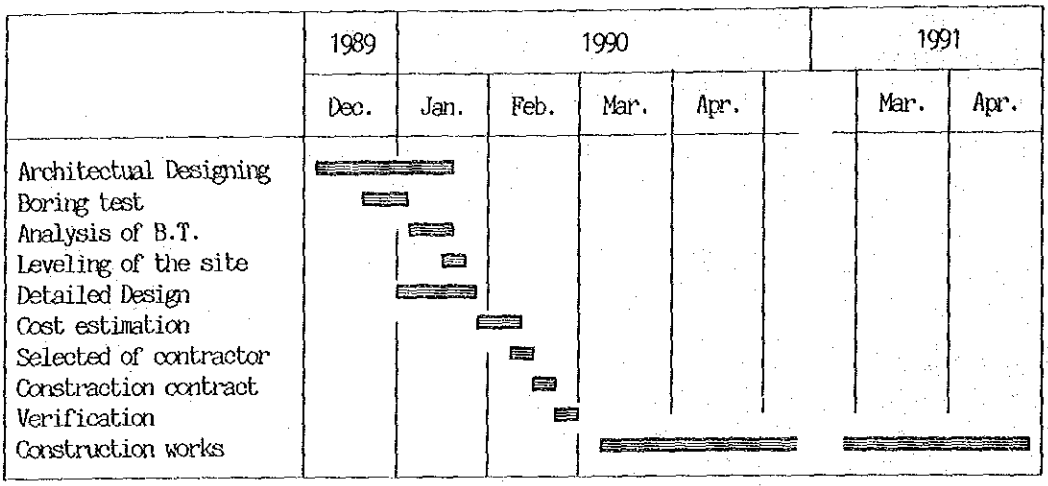
The required equipment in this Project has been selected based on the educational curricula of the recipient side. As the number of CEA students is large, it is planned a common subject among the departments will use a common laboratory in the Project. Based on this, the layout plan of the equipment in each room was prepared and then the requested quantity of the equipment has been decided. The coordination with the construction plan of the new building of CEA has been also taken into consideration.

The outline of the main planned equipment in the basic design is shown in the following table.

SUMMARY OF REQUESTED FIELDS & ITEM OF EQUIPMENT

Requested Field	Item of Equipment	Quantity
Computer Engineering	Personal computer(practice/CAD), Micro-computer trainer, Related equipment, Measuring instruments, others.	23
Civil Engineering	Material testing machine(Universal testing machine, Consolidation testing machine, others), Plumbing equipment, Testing equipment of soil, concrete, mortal, etc. Geodetic equipment, Related measuring instruments, others.	106
Mechanical Engineering	Machine tool(lathe, milling/drilling/press machine), Cut away engine model, other model for practice, Experimental equipment for refrigerator/heat exchanger and heat conductivity, Training equipment for cast & weld, Related measuring instruments, other.	112
Industrial Engineering	Work analysis equipment(Video, etc.), Equipment for photograph, block copying printing, others.	26
Electrical Engineering	Training equipment for electric motor/ transformer/power supply/electric circuit/ controller, Measuring instruments, others.	59
Electronics & Communication Engineering	Training equipment for electronic circuit/ communication circuit, Measuring instruments, others.	48

CONSTRUCTION SCHEDULE OF THE NEW CEA BUILDING



The supply and installation work period of the Project is approximately 8.5 months. Undertaking by both government are shown in the table below.

Undertakings by Japanese side
(1) Procurement of equipment (2) Transportation to the Philippines and internal transportation (3) Installation of equipment (4) Test run, adjustment, training, etc.
Undertakings by Philippine side
(1) Electrical works Substation power transmission/trunk line/light/outlet, etc. (2) Water supply and drainage. (3) Equipment/furniture. (4) Necessary procedures for custom clearance of the equipment. (5) Cost for operation/maintenance.

PUP, being the implementing agency of this Project, is responsible for all the works involved in carrying out this Project. The related organization of PUP in the project is composed of two departments headed by each vice-president in charge. One is Administration and Finance Department which is in charge of services of designing, cost estimation, contract and supervision concerning the construction of the new CEA building, and procurement of necessary materials and budget control concerning the equipment provided by the Project. The other is Educational Affairs Department in charge of the educational affairs of all the departments in CEA. As for the supplied equipment, plans of layout, management and usage will be made based on the consideration of the coordination with the educational plan, aiming at effective use through proper maintenance. The appropriation of the operational budget of CEA will be included in the central budget of PUP. Personnel expenses will be allotted from the item of personnel expenditure of the university-wide budget, and maintenance expenses of the equipments and facilities, from the item of operation expenditure of the same budget.

The objective of the Project is in conformity with the policy goals of the government of the Philippines. PUP, as an implementing agency, will also carry out the construction plan of the new CEA building following its own development plan, and keeping a close coordination with the said goals. It is expected the supplied equipment will upgrade the effectiveness of the education, providing opportunities of higher quality education of engineering and technology to many students with small expenses. The upgrading of the education in CEA will not only stimulate other departments of PUP but also show a good example of improving education to other universities; and thereby activate the whole industry in the Philippines. It is very significant that the government of Japan will perform a grant cooperation to implement this Project.

TABLE OF CONTENTS

7. EVALUATION OF THE PROJECT

8. CONCLUSION AND RECOMMENDATION

APPENDIX

Appendix 1

Appendix 2

1. INTRODUCTION

1. INTRODUCTION

The Aquino government, emerged in February 1986 with her basic policy of the Medium-Term Philippine Development Plan for 1987 to 1990 and her slogans of recovering democracy, developing rural areas, and reducing regional differentials, has been trying to correct social inequalities. The goals of the policy is to provide equal opportunity and improve the quality of education from the standpoint of the socially weak based on the recognition that "improvement of education and training" is essential for achieving the goals. But the confusion and stagnation of the international economy produced by the second oil crisis beginning at the end of 1979 gave a strong effect on the economy of the Philippines whose social and economic foundation had been fragile. It is urgently required for the Philippines involved in shifting herself to the industrialized country and promoting her economic recovery, to produce well-trained engineers who can offer effective labor immediately in each field of industry.

Polytechnic University of the Philippines (PUP), based on its educational ideology, aims at providing opportunities of tertiary education with a small amount of school expenses to the young people from the families of low income. Since PUP was originally established as a business college, the existing 10 departments are business oriented with practical curriculum. This educational policy of PUP aims at coping with the current issues of the Philippines. In PUP, however, where a number of students are enrolled, its educational facilities are quite inadequate, inducing the unexported situation affecting the educational standard. Most of all, the College of Engineering and Architecture (CEA) which is to provide the education in the fields of engineering and technology lacks proper facilities and equipment indispensable for experiments and training, so that effective education is not available.

Under such circumstances, the Government of the Philippines formulated its own project of constructing a new building for CEA with the purpose of improving the engineering and technology education, and requested the Government of Japan for the grant aid. In response to this request, the Government of Japan dispatched a basic design study team headed by Mr. Masazumi Kumagai, Assistant Professor, Department of Electronic Engineering, at Sendai National College of Technology, from November 28 to December 21, 1989 through the Japan International

Cooperation Agency (JICA). The team confirmed the background of the request and objectives of the Project, explained the Japanese grant aid system to the relevant government officers of the Philippines, and confirmed the undertakings by both governments. After the requirement of equipment, the optimum scale of the Project, the organization of operation and maintenance and the effect of the grant aid were analyzed, and the significance and appropriateness of the Project were evaluated, the basic design of the Project was formulated.

This report is the summation of the results of the above described study. Members of the study team, the survey itinerary, lists of members contacted and Minutes of Discussions are attached in the APPENDIX 1.1 - 1.4.

2. BACKGROUND OF THE PROJECT

2. BACKGROUND OF THE PROJECT

2.1 Outline

2.1.1 Socio-economic Conditions in the Philippines

The core of the industry structure in the Philippines had been a primary industry based on the traditional agriculture. But following the tendency of the times in 1950's, the promotion of industrialization was taken as one of the policies by the government. Then, as the protective tariff system was introduced, and the industrialization policy for import substitution in which the stress was placed on light industries was promoted successfully, the annual industrial production rate increased to 6 percent in the 1960's. Furthermore, in the 1970's, as a result of the more positive policies such as the introduction of foreign funds and import promotion, the average growth rate of GDP during this period reached 5.1 percent in the 1960's, and 6.2 percent in the 1970's.

The world wide depression, however, which was triggered by the second oil crisis beginning at the end of 1979, affected seriously the economy of the Philippines. The stagnation of the world economy caused a considerable jump in the prices of the imported goods including oil products and drop in the international market prices of main export commodities of the country such as sugar, coconut oil, etc., increased the trade imbalance drastically (See APPENDIX 2.1). As the decreased foreign currency reserves reduced the amount of the imported materials and industrial parts, the industry of the Philippines, which is mainly composed of packing and assembly industries, was seriously damaged.

These conditions overshadowed for a long time the socio-economic activities in the Philippines which had been constructed on a fragile foundation, and the recovery of GDP which turned minus in 1984 has become a big problem to be solved. The Aquino government has introduced new policies protecting the economically weak, including reducing social inequalities, developing rural areas, fostering minor enterprises, etc. Specifically, it has formulated the Medium-term Philippine Development starting in 1987, and is now making an effort to carry out the plan to achieve the formulated goals. But the socio-economic conditions of the Philippines are still unstable with

such difficulties as the accumulation of a huge external debt, and the stagnation of industrial activities in the country.

Under such conditions, the labor power in the Philippines, which is of good quality and low-cost, is being highly evaluated by the Asian neighboring countries with active economy such as NIES. With these foreign capital flowing in, the industrialization based mainly on the assembly and processing industries is proceeding gradually, providing new energy to the economy of the Philippines.

2.1.2 Medium-Term Philippine Development Plan

The Philippines has carried out six national development plan since 1967, unfolding positive economic development. But as a result of the above described international situations, it was forced to change and revise the goals to be achieved in the latter half of the period. The Medium-Term Philippine Development Plan (1987-1992) formulated by the Aquino government declares the following four policies emphasizing the relief to the socially weak.

(1) Alleviation of poverty
(2) Generation of more productive employment
(3) Promotion of equality and social justice
(4) attainment of sustainable economic growth

As for the premise of attaining these policies, the necessity of education and training personnels was acknowledged. the goals were specified as follows:

(1) Correction of inequality of educational opportunities
(2) Upgrading of the quality and the contents of education and training
(3) Increasing employment, productivity and self-reliance and promotion of human resources improvement of medium and high level quality in order to realize the economic recovery and growth

As the educational policies seeking for equality of opportunity have been carried out, the participations rate to tertiary education of the

people of middle and low income is increasing. At present it is urgently required to train engineers in each field in order to reconstruct the industrial fields in the Philippines. Above all, people of middle and low income have a strong desire to go on to a technology school of the tertiary level. It is necessary to provide effective technology education and training so that these students can be self-reliant in the society immediately after the graduation.

2.2 Present State of the Education of the Philippines

2.2.1 Educational System in the Philippines

(1) Outline of the educational system in the Philippines

The educational system in the Philippines is divided largely into two categories of Formal Education and Non-formal and Specialized Education(Table 2.1). Formal education is a system in which students proceed from the compulsory elementary education to the secondary education and then to the tertiary education. The preschool education equivalent to the kindergarten is also established prior to the elementary education. Non-formal education is intended for children and youth who have not received the formal school education, providing language and technical training. Specialized education is a special school for the handicapped.

The fact that the participation rate of the elementary education reaches nearly 90 percent shows that people are highly interested in education in the Philippines. People have a strong desire for the tertiary education, and most of the students wish to enter a school of the tertiary level. It is a big social problem, however, that the students are often forced to give up such desire or leave school mainly for financial reasons.

TABLE 2.1 EDUCATIONAL SYSTEM IN THE PHILIPPINES

Type of education	Level of School	Term of school
Formal education		
Pre-school	Kindergarten	Before 6 years old: 1 to 2 years
Elementary	Elementary school	7 to 12 years old: 6 years
Secondary	Secondary school	13 to 16 years old: 4 years
Tertiary	College & University	More than 17 years old:
	Medical Dept.	8 years
	Law Dept.	8 years
	Dept. of Engineering	5 years
	Others	4 years
Non-formal & specialized education		
Non-formal	Non-formal school	As occasion demands
Specialized	Specialized school	As occasion demands

(2) Number of students and schools in the Philippines

The number of the students of the elementary and secondary schools in the Philippines in 1984-85 reached about 12.1 million, and those of the tertiary education, about 1.1 million. In the elementary education 95 percent, and in the secondary education 59 percent belong to the state and public schools.

The total number of the state, public and private schools in 1985-86 is as follows: 2,254 kindergartens, 33,156 elementary schools, 5,375 secondary schools, and 1,078 universities and colleges (See APPENDIX 2.2). The percentage of the private schools is low in 4 percent for the elementary schools, though nearly 75 percent for the universities. The details are shown in the Table 2.2.

TABLE 2.2 NUMBER OF SCHOOL IN THE PHILIPPINES (1985-86)

Type of of school	State & Public (%)	Private(%)	Total (%)
Pre-school	1,257 (56)	997 (44)	2,254 (100)
Elementary	31,817 (96)	1,339 (4)	33,156 (100)
Secondary	3,357 (62)	2,018 (38)	5,375 (100)
Tertiary	293 (27)	785 (73)	1,078 (100)

2.2.2 Tertiary Education in the Philippines

(1) Universities and colleges in the Philippines

At present there are 1,078 universities and colleges all over the country as of 1985-86. As far as the number of the facilities is concerned, the tertiary education provides fairly good educational environments. These universities, though somewhat different among Region, are located scattering in 13 Regions including National Capital Region (NCR). 293 of them are state universities and colleges. In NCR there are 176 universities, 12 state universities plus other private ones. Manila has about 16 percent of all the universities and colleges and about 34 percent of all the students in the country.

Among the state universities and colleges, the University of the Philippines (UP) is the largest university with its principal school in Quezon City and branch schools in the suburbs of Manila and local areas. The 1988 yearly records indicate that the annual budget amounts to approximately 701 million peso. This figure is far greater than the amounts of other state universities, such as the Mindanao State University (Region XII) placed second on the list recording 174 million peso. Our PUP, which has the greatest number of registered students, ranks the third in terms of the original annual budget that amounts to 84 million peso in that year.

(2) National College Entrance Examination

Those who have completed the secondary education and passed the National College Entrance Examination (NCEE), which is given every year, can go on to the universities and colleges to receive tertiary education. The passing score of the examination is 45, and those who get the marks below this line go on to the vocational and technological training schools. The number of successful candidates from 1984 to 1987 reached

about 400,000 with the passing rate of about 55 percent (See APPENDIX 2.3).

(3) Problems of tertiary education in the Philippines

As mentioned before, the students in the Philippines have a strong desire to enter a university. The opportunity is obtainable even in a cOre city of the local Regions, but a qualified education is available only in some of the state universities or those in NCR. Most of local universities and colleges are poor-equipped in terms of educational facilities compared with those in NCR. Although well-off students are free to choose a well-equipped private university or a state university, most of the students are compelled to struggle for entering a limited choice of universities.

It is an urgent matter to be solved for the present Philippines to provide and expand the tertiary education in the local university and colleges. In most case of relatively well equipped universities, however, the departments of engineering and technology have insufficient facilities and equipment or have old ones.

Under these present conditions, the following problems have been raised concerning the tertiary education in the Philippines.

1. Superfluous applicants for a specific sector of educational fields, sector.
2. Expensive tuitions of private universities with good facilities.
3. Many students who give up or leave school for financial reasons.
4. Few employment opportunities after graduation owing to the chronic depression.
5. Insufficient expenses for improving facilities due to limited operational budget and high ratio of personnel expenses.
6. Difficulty in securing capable staff because of low level of salary.

These problems are generally found in the university education, especially in the fields of technology and engineering. Thus technological and engineering universities in the Philippines today are suffering from such problems as inappropriate and old equipment and facilities for experiments and training, and imperfect instruction and curriculum owing to the shortage of teaching personnels. Experiments and training that are essential for such fields require considerable budget for purchasing

necessary equipment and facilities, operation and maintenance, as well as a number of teaching personnels to give effective guidance and instruction. However, most of the universities find difficulty in meeting these requirements due to the limited budgets.

Although it is impossible to solve these problems in a single day, it is a great task that should be tackled in the years to come to provide a high quality level education for majority of students with low school expenses.

2.3 Polytechnic University of the Philippines (PUP)

2.3.1 Outline of PUP

PUP is the state university which is operated with its principal object of providing equal opportunity of higher technical education to the rich and the poor alike. It was formerly Manila Business School which was established in the Manila city in 1904, and later called Philippines Business School in 1908. As more and more departments were added, it was expanded into the present scale in 1978. Such historical background has made the campus be scattered in various areas besides the main campus in Manila.

At present PUP has a large scale of educational facilities including four branch campuses of PUP Bataan (Bataan), PUP Lopez , PUP Unisan (Quezon), PUP Maragondon (Cavite), and vocational training schools, affiliated high schools, etc. around the 10 Colleges of the main campus of Santa Mesa.

The number of the students in each department in 1989-90 is as shown in the Table 2.3.

TABLE 2.3 NUMBER OF STUDENTS IN PUP

Unit : Person

DEPARTMENT	SUB-TOTAL	TOTAL
GRADUATE SCHOOL		773
Doctoral Course	65	
Master Course	708	
UNDERGRADUATE COURSE (By College)		36,989
College of Accountancy & Law	8,669	
College of Arts & Science	2,415	
College of Business	6,588	
College of Computer Mgnt. & Information Technology	2,363	
College of Economics and Politics	2,031	
College of Engineering & Architecture	5,017	
College of Hotel and Rest. Mgnt. & Food Science Tech.	1,742	
College of Languages and Mass Communication	2,041	
College of Office Adm. and Business Teacher Education	5,400	
College of Physical Educ. and Sports	603	
Institute of Cooperatives	120	
PUP LABORATORY HIGH SCHOOL		463
PUP-BRANCH		3,402
PUP-BATAAN	1,345	
PUP-LOPEZ	1,349	
PUP-MARAGONDON	599	
PUP-UNISAN	109	
PUP VOCATIONAL SCHOOL		1,992
TOTAL		43,619

Source : PUP

2.3.2 Educational Ideology of PUP

The ideology of PUP is to provide equal educational opportunities to many students regardless of their financial condition. Therefore, the school expenses such as tuitions are considerably lower than those of other state universities to say nothing of private schools. The average school expense imposed on the students of PUP is about 690 peso per one semester (two semesters in one year). It costs about 2,150 peso in the

University of the Philippines (UP), and about 1,890 to 6,200 in the other main private universities in NCR, being much higher than PUP (Table 2.4).

Thus PUP, one of the few universities aiming at providing sufficient higher technical education to those who are from the families of low income with a small amount of school expense, has an increasing number of applicants every year. A majority of nearly 43,500 students enrolled in PUP today are from such families. Another university with this kind of characteristic is TUP in NCR, and some industrial universities in local areas provide the education based on the same ideology.

PUP, however, has facilities of classrooms and educational equipment insufficient for the enormous number of the students enrolled. Consequently, it adopts a triple-shift school system, offering classes for as long as 13.5 hours from 7:30 a.m. to 9:00 p.m. The instructors are supposed to teach 27 hours a week in standard, but in fact, many of them teach more than 35 hours, imposing the working load about three times as much as the standard load in Japan.

Based on its ideology, PUP has a unique educational system called Ladder Curriculum. In this system the curriculum of the specified field completes at the end of every grade when a certificate is issued to authorize the qualification at that time. This system is based on the consideration that a student who is forced to leave school due to a financial reason can be employed according to the qualification given at that point, and start the next grade when he comes back to school.

TABLE 2.4 TUITION OF PRINCIPAL UNIVERSITIES IN METRO MANILA

UNIT:Peso

ITEM	PUP	UP	Adamson U.	Mapua I.T.	Ateneo
Tuitions(1 credit)	9	40	249+40/unit	63	4335 *2
23credit/semestor*1	207	920	1169	1449	4335
Experiment expense	23	75	46	124	777
12credit/semester*1	276	900	552	1488	777
Registration fee	3	30	22	62	97
Others	208	299	103	137	993
Total	691	2149	1892	3136	6202

*1 Tuition and experiment expense was calculated on the assumption of the standard credits of 23 and 12 given in one semester.
*2 Tuition and experiment expense of Ateneo Univ. is the total sum required in one semester.
Source : PUP

2.3.3 Faculty of PUP

The number of the faculty in the 10 Colleges of PUP in 1989-90 is 1,015, and the number of the allocated students to one instructor is 36 on the average. The faculty is composed of full-time and part-time workers and some assistants in addition. Full-time faculty are paid on the monthly salary basis, and part-time faculty are paid by the hour of teaching classes. PUP employs some students as assistants in order to help them work for a part of their living expenses.

In College of Engineering and Architecture (CEA) of this Project, the number of the allocated students to one instructor is 40, somewhat larger than the average number of PUP. On the other hand, in a technical college in Japan the standard number of the allocated students to one instructor is 14. This standard cannot be simply applied to the case of the Philippines where the method of education and guidance are different from Japan, but the less the number of the allocated students to one instructor, the more effective training is given in a department of engineering and technology. In the future it is necessary for CEA to improve the educational environment based on this viewpoint by upgrading the quality of education and increasing the number of the faculty.

TABLE 2.5 NUMBER OF FACULTY IN EACH COLLEGE OF PUP IN 1989-90

College	Full-time Teacher	Part-time Teacher	Assistant Teacher	Teacher Total	Student/ Teacher*
College of Arts & Science	121	124	12	245	35.4
College of Accountancy & Law	62	75	3	137	17.6
College of Business	51	45	4	96	68.6
College of Computer Management & Info. Technology	15	46	8	61	38.7
College of Economics & Politics	41	46	4	87	23.3
College of Engineering & Architecture	75	50	12	125	40.1
College of Hotel & Restaurant Management & Food Technology	10	-	3	10	174.2
College of Languages and Mass Communication	62	54	7	116	17.6
College of Administration & Business Teacher Education	58	18	3	76	71.1
College of Physical Education & Sports	42	20	15	62	9.7
Total	537	478	71	1015	36.3

* Number of students faculty shows the number of the allocated students to one instructor

Source: PUP

2.3.4 Budget of PUP

As the budget of the state universities in the Philippines are under the direct control of the government, PUP formulates a draft budget every year and submits it to DBM. A draft budget is prepared based on the past records and project plans, and reviewed by Department of Budget and Management (DBM) to be determined its budget scale.

Table 2.6 shows the actual budget records in 1987-90, and the requested budget for fiscal 1991. Among the budget items the operation and personnel expenditures are increasing due to the expansion of PUP itself, the inflation, etc. Meanwhile, the capital outlays investment cost, depends on the project plans of the year. The capital outlays are considerably increasing as a result of the insertion of the school building expansion project of College of Hotel & Restaurant Management & Food, and the college library construction project for the fiscal 1988, and the new CEA building construction project for the fiscal 1989.

As afore mentioned in 2.2.2 (1), the original budget in 1988 was 84 million peso, and then the budget of 95 million peso for the construction of the college library, that of 11 million peso for purchasing the equipment and that of 106 million peso for other purpose were additionally requested and approved. The budget in 1989 was the same amount of the originally requested amount (See APPENDIX 2.5).

TABLE 2.6 BUDGET RECORD OF PUP

Unit : Million Peso

Budget Items	1987	1988	1989	1990	1991 *
Personnel expense	78.4	87.2	121.6	149.8	429.4
Operation & maintenance exp.	19.3	15.6	38.6	39.3	80.0
Capital outlays	61.0	193.4	40.9	120.9	315.0
Total	158.7	296.2	201.0	310.0	824.5

*:Proposed budget
Source : PUP

2.3.5 Five-Year Development Plan of PUP

PUP formulated a five-year development plan (1987-1992) in order to improve the educational environments, aiming at the objective of "development of education and human resources", which is a principal theme

of the Medium-Term Philippine Development Plan made by the government. In this plan it is declared to reacknowledge the educational philosophy pursued up to now in PUP of the equal opportunity for democratic education, and over 30 projects were formulated, and being carried out as concrete measures to realize such ideology (Table 2.7). Among the major projects are included the repairing project of branch schools and affiliated facilities, the repairing project of the building of College of Hotel & Restaurant and Management & Food with the total cost of 48.5 million peso, and the construction project of four-story college library with the total cost of 64.8 million peso in 1989. For the fiscal 1990, the construction of a new building of CEA is planned with the total cost of 96 million peso. The college library being under construction now has almost the same scale as the new building of CEA included in this Project. The work construction will be started in April, 1989 and will complete in June, 1990.

TABLE 2.7 MAIN PROJECTS IN PUP

Project	Project year
-Repair/renovation of PUP Hotel and Restaurant Management Bldg.	1988
-Repair and improvement of road and facilities inside the Campus, etc.	1988
-Renovation of Laboratory High School Building	1988
-Construction of Computer and Mass Communication Building.	1988/90/91
-Construction of Medical and Dental Building	1988/91/92
-Construction of Administration Building	1988
-Construction of University Library	1989
-Construction of College of Engineering and Architecture Building.	1990
-Construction of gymnasium and swimming pool	1990
-Construction of the College of Medical Technology Building and the College of Nursing Building	1991/92
-Construction of the College of Criminology and Law Building	1991/92

Source : PUP Five Year Development Plan (1987-1992)

2.4 College of Engineering and Architecture (CEA)

2.4.1 Outline of CEA

College of Engineering and Architecture (CEA) is a major College established for the purpose of educating and training engineers, located in the principal school building (See APPENDIX 2.6). In 1989-90, the number of the enrolled students is 5,017, and the number of the faculty is 125. The graduates of CEA are expected to be precious labor power for the Philippines aiming at the industrialization. However, the present conditions of the educational facilities are extremely insufficient with scarcely one or two laboratory in each Department caused by lack in absolute number of the classroom. Almost none of the educational equipment exist or there are few, old-fashioned equipment or simply improvised one.

Classes, experiments and training in CEA are now given in the classrooms of the principal school buildings. Lectures are partially carried out in a common classroom among Colleges, but the absolute number of the classrooms for the students is deficient, causing to exceed the limit of the capacity of the classrooms even though they are used from 7:30 a.m. to 9:00 p.m. Furthermore, the subjects indispensable for the College of Engineering such as basic science and computer science are taught in the other Colleges. For the education of technology which essentially requires experiments and training, the present educational environments are far from satisfactory to meet the needs of the majority of the students.

In consideration of the importance of training engineers in the Philippines, PUP has set about the project designed for the expansion of the Colleges and the improvement of the educational environments by constructing a new building of CEA. Installation of the complete educational equipment appropriate for the new building constitutes a significant part of the project to be carried out. On this part of the work the request has been made to the Government of Japan.

2.4.2 Present State of CEA

(1) Number of students

The enrollment of the students are performed every semester. Table 2.8 shows the number of the students in each Department in the first

semester of 1989-90.

TABLE 2.8 NUMBER OF ENROLLED STUDENTS IN CEA
IN THE FIRST SEMESTER OF 1989-90

	School year					
	1st	2nd	3rd	4th	5th	Total
Computer Eng.	189(4)	382(6)	375(8)	258(6)	255(4)	1459(28)
Civil Eng.	122(3)	141(3)	107(3)	82(3)	120(2)	572(14)
Mechanical Eng.	130(3)	126(3)	105(3)	93(2)	88(2)	542(13)
Industrial Eng.	111(3)	114(3)	78(2)	81(2)	68(2)	452(12)
Electrical Eng.	132(3)	134(3)	162(3)	129(3)	82(2)	639(14)
Electronics & Communication Eng.	177(4)	259(5)	296(5)	198(4)	144(3)	1074(21)
Architecture	118(3)	107(3)	54(1)	-	-	279(7)
Total	979 (23)	1263 (26)	1177 (25)	841 (29)	757 (15)	5017 (109)

*Figures in parentheses show the number of classes.
Source : PUP

(2) Composition of students

Table 2.9 shows the courses given in CEA, and the distribution ratio of males and females of the students which is about 3:1.

TABLE 2.9 NUMBER OF STUDENTS OF CEA BY SEX

Unit : Person

Sex	Morning/day shift	Night shift	Total (%)
Boys	2,712	1,077	3,789(76)
Girls	913	315	1,228(24)
Total	3,625	1,392	5,017(100)

Source : PUP

2.4.3 Future Plan

CEA plans to accept more students in the future, as this Project will improve the educational environments. It also plans to increase the number

of classes and faculty, so that about 30 students are allocated to one instructor, which is regarded as a proper number compared with 40 students allocated now. Table 2.10 shows the planned future scale of CEA up to 1996.

According to the plans of CEA, the estimated number of students is 8,546 in 1995-96, which is 70 percent increase, and 9,046 in 1996-97, 80 percent increase over the present figure.

TABLE 2.10 FUTURE PLAN OF CEA

Year	1989	1990	1991	1992	1993	1994	1995
No. of students	5017	5214	5804	6142	6809	7654	8546
No. of sections	109	114	138	144	161	183	204
No. of hours (hrs/wk)	3270	3420	4140	4320	4830	5490	6120
No. of faculty needed (total)	125	163	197	206	230	261	291
Faculty-Student Ratio	1:40	1:32	1:29	1:30	1:30	1:29	1:29
			No. of Department Needed				
Computer Eng.	27	43	46	42	40	44	49
Civil Eng.	28	18	21	21	22	25	26
Mechanical Eng.	17	18	21	21	22	25	26
Industrial Eng.	10	16	19	20	22	25	26
Electrical Eng.	13	21	23	21	22	25	26
Electronics & Communication Eng.	18	34	40	38	39	44	49
Architecture	12	13	18	20	22	25	26
Chemical Eng.			3	6	10	15	19
Geodetic Eng.			3	6	10	15	19
Sanitary Eng.			3	6	9	12	14
Mining Eng.			3	6	9	12	14

*1 Total sum of the class hours per week in each department
*2 The number of faculty in 1989 is the actual record. The required number is 156.

2.4.4 Employment Opportunities for the Graduate

Many of th graduates of CEA find employment in private enterprises depending on their enrolled Department. The College help them find the places of the employment or the students apply for a position by themselves. Among the existing Departments, the Department of Architecture has not yet produced graduates, but the employment rate of the graduates of other six Departments has reached 85 to 90 percent, indicating a high demand for CEA students from the enterprises in the Philippines where it is difficult to find jobs.

Table 2.11 shows the actual records of the number of the graduates of CEA in the past five years. The increase or decrease of the number depending on the year is due to the students who transfer or leave school. The percentage of the number of the graduates in 1988-89 compared with the number of the same students when they entered the College in 1984-85 is also shown. The percentage of the graduates is 73 in the Computer Technology Department, and 78 in the Electronics & Communication Department. They are higher than the other Departments because many students transfer from other Departments.

TABLE 2.11 NUMBER OF GRADUATES OF CEA IN THE PAST FIVE YEARS

Unit : Person

Dept.	'84-85	85-86	86-87	87-88	88-89	Graduation rate 88-89*
Computer Eng.	16	135	120	162	93	93/128(73%)
Civil Eng.		75	87	58	57	57/117(49%)
Mechanical Eng.		35	41	22	57	57/119(48%)
Industrial Eng.		51	78	39	71	71/169(42%)
Electrical Eng.	84	71	80	55	59	59/124(48%)
Electronics & Communication Eng.	41	31	65	78	96	96/123(78%)
Architecture			(No graduate students)			
Total	141	398	471	414	433	433/780(56%)

*The graduation rate in 88-89 is the number of graduates in 88-89 divided by the number of newly registered students in 84-85, being indicated in parentheses.

2.4.5 Contents of Education in CEA

In the Philippines a College of engineering adopt a five-year system, and the graduates can obtain a degree of Bachelor of Engineering. Therefore, each Department of CEA adopts a five-year system with two semesters in one year. One semester is composed of 17 weeks, and classes are given six days a week from Monday to Saturday from 7:30 a.m. to 9:00 p.m. for 13.5 hours in a day. Students select one of the courses given in the morning, afternoon and evening, depending on their own circumstances.

The number of faculty of CEA as of 1989-90 is the total of 136 including 125 mentioned in "2.3.3 Faculty of PUP", and 11 who are transferred from the College of Arts and Science to teach basic chemistry. Meanwhile, the total number of hours in one week in the whole departments in the same period is 3,270 hours, with the average of about 24 hours per one instructor. In PUP the standard hours are supposed to be 27 hours a week for full-time faculty and 12 hours for part-time workers. As considerably heavy load is given on the full-time workers now, it is desirable that 20 full-time workers are to be added.

The contents of education depend on each Department, and the students are supposed to obtain the average of about 230 credits until they graduate. The subjects are composed of liberal arts, basic science and technology, and specialized subjects. The former three subjects are mostly common to all the Departments (Table 2.12).

(1) Liberal Arts

Besides language training (English conversation and writing English reports), liberal arts are given such as social science, economics and history. According to the curriculum of each Department, credits are supposed to be obtained during any period from the first to the fifth grades. It is required to take physical education for 1 credit and military science and training for 1.5 credit in one semester during the first and second grade in each Department, totaling 10 credits for two years.

(2) Basic Science and Technology

This is the basic subject in the technical field of engineering which is supposed to be completed in the first and second grade as a rule. The contents are mathematics, physics, chemistry, basic engineering, drawing practice, etc.

(3) Specialized Subjects

Required and elective subjects are given according to the curriculum of each Department. As for the subjects common to the Department, the classes are given in the Department where the course is offered, and the required credits are to be obtained.

TABLE 2.12 REQUIRED CREDITS BY EACH DEPARTMENT

Department	Liberal arts & Basic science Common subjects	Specialized subjects	Total
Computer Eng.	122	107	229
Civil Eng.	118	115	233
Mechanical Eng.	122	106	228
Industrial Eng.	125	102	227
Electrical Eng.	116	105	221
Electronics & Communication Eng.	116	106	222
Architecture	111	137	248
Chemical Eng.	119	121	240
Geodetic Eng.	118	107	225
Sanitary Eng.	119	118	237
Mining Eng.	115	112	227
Average	118	112	230

Source : PUP

2.5 Background and Contents of the Request

2.5.1 Background of the Request

The Aquino government emerged in February, 1986 has been carrying out the basic policy of Medium-Term Philippine Development Plan (1987-92). It aims for three goals mentioned in 2.1.2 for the purpose of relieving the socially weak based on the acknowledgment that "improvement of the education and training" is essential for achieving the goals. It is urgently required for the Philippines seeking for the economic recovery and promoting shifting herself to the industrialized country to produce well-trained engineers in every field of technology. In the Philippines, where major fields of technology are processing and assembly industries, engineers who can offer effective labor immediately in the field are required rather than researchers and high level technical experts.

Based on its educational ideology, PUP aims at providing opportunities of higher education with a small amount of school expenses to the students from the families of low income. The process of its establishment has produced the curriculum with many vocational training contents, which also agrees with the realization of the above-mentioned goals.

However, in CEA which is to provide the education in the field of engineering and technology the facilities and equipment are quite inadequate, falling short of the expected standard, and causing the limitation of the number of students to be registered. The fact is that it is impossible now to give sufficient education to the students due to the shortage of the equipment necessary for experiments and training that are to be given in the curriculum.

In order to improve these situations the construction of buildings and expansion of CEA has been quite properly planned and carried out as one of the five-year development projects of PUP. The Government of the Philippines recognized the importance of this project and requested for the grant aid to the Government of Japan on the construction of a new building in the beginning stage, and the installation of educational equipment. But in later stage, for the expenses of the construction the budget was prepared in the fiscal 1990 to proceed the project independently. In response to the self-reliant efforts by the Philippines, this request has been made to the Government of Japan for the supply and installation of educational equipment as a grant aid.

PUP plans to start construction of the new CEA building in March, 1990, hoping to reflect the equipment layout plan in the architecture design. It also plans to start establishing four new Departments in 1991 when the new buildings are to be completed. The supply and installation of the equipment for these Departments are also included in the request.

2.5.2 Contents of the Request

(1) Requested fields

The requested fields where the equipment will be installed include the existing seven Departments and the four newly established Departments, as well as general basic science (physics and chemistry), and supplemental fields for commonly used ones and office administration equipment (Table 2.13).

TABLE 2.13 REQUESTED FIELDS

Requested Field	Name of Certificate
Existing Dept.	
Computer Eng.	BSCoE
Civil Eng.	BSCE
Mechanical Eng.	BSME
Industrial Eng.	BSIE
Electrical Eng.	BSEE
Electronics & Communication Eng.	BSECS
Architecture	BSArch
Newly established Dept.	
Chemical Eng.	BSChE
Geodetic Eng.	BSGE
Sanitary Eng.	BSSE
Mining Eng.	BSMiE
Common field	
General science (Physics & Chemistry)	
Supplemental educational equipment	

(2) Requested equipment

The major items of the requested equipment are shown in Table 2.14.

TABLE 2.14 MAJOR ITEMS OF THE REQUESTED EQUIPMENT

(1/2)

Dept.	Major items of the requsted equipment
1) Computer Engineering	Personal Computer(practice, CAD), DC stabilized power supply, Electric measuring equipment & tester, Microcomputer trainer, Basic logic trainer, others.
2) Civil Engineering	Universal material testing machine, Consolidation testing machine, Unconfined compression testing machine, Vibration testing machine, Multi-triaxial compression testing machine, Universal cutting machine, Measuring Instruments, Experimental tools, others.
3) Mechanical Engineering	Surface plate, Coordinate measuring machine, Lathe, Universal milling machine, Drilling machine, Hydraulic press, Automobile constitution model, Engine model, Refrigerant experimental equipment, Boiler experimental equipment, Heat conductivity measuring device, Measuring instruments, others.
4) Industrial Engineering	Video analysis equipment (Video camera, Monitor, Timer), Process camera set, Developing set, Color enlarging equipment, Off-set printing machine, others.
5) Electrical Engineering	DC power supply, Transformer trainer, Electric motor, Synchronizing unit, Electric measuring equipment & tester, Logic circuit experimental equipment, Servo control experimental equipment,Others

Dept.	Major items of the requsted equipment

6) Electronics & Communication Engineering
Current meter, Volt meter, DC stabilized power supply, Multi tester Low frequency oscillator, Semi-conductor experimental equipment, Electric circuit experimental equipment, FM/AM experimental equipment, others.

7) Architecture
Drawing set (Architectural/Mechanical drawing), Panthograph, Lettering equipment, Compass, Spectrometer, Daylight factor units, Heliodon, Calorimeter, others.

8) Chemical Engineering
Fluid circuit fraction experimental apparatus, Water to water heat exchanger bench, Spray dryer, Filter press experimental apparatus, Chemical balance, Centrifuge, Gas chromatograph, Chemical experimental tools, others.

9) Geodetic Engineering
Survey instruments, Drawing set, Transit & level, Solar eyepiece, Stereoscope, Transparent celestial globe, others.

10) Sanitary Engineering
Chemical balance, Liquid limit device, Moisture content determination apparatus, pH meter, Spectrophotometer, Water quality testing apparatus, Chemical experimental equipments, others.

11) Mining Engineering
Ball mill & crusher, Sample making equipment, Atomic absorption spectrophotometer, Chemical experimental equipments, others.

12) General Science
Basic physic experimental equipment, Basic chemistry experimental equipment, others.

13) Supplemental Educational Equipment
Micro bus, Station wagon, Projectors, Copying machine, Mimeographing machine, Audio visual equipments, others.

3. CONTENTS OF THE PROJECT

3. CONTENTS OF THE PROJECT

3.1 Purpose of the Project

The purpose of the project is to strengthen the education of engineering, architecture and science, through educating and training the students in PUP and to develop appropriate human resources in the industrial fields in to meet the requirements of specialized engineering technology in the Philippines.

3.2 New Building Construction Plan

3.2.1 Background of the New Building Construction Plan

It is planned that the new CEA building will be constructed as one of the 1990 projects based on the PUP's five-year development scheme. CEA, which is located in the main campus as well as the other Colleges, has overpassed the limitation in the number of classrooms, space, facilities and equipment. In view of the importance of technology education in the Philippines, it is necessary to construct a new building and secure sufficient facilities and equipment for experiments and training in order to develop and expand CEA.

The Government of the Philippines approved the new CEA building construction project and appropriated the budget of 98 million peso for the fiscal 1990. The similar construction projects such as the school building construction project of College of Hotel and Restaurant Management in 1988 and the college library construction project in 1989 are also under construction now. These projects are given a top priority in the field of education in the Philippines and treated favorably in the budget execution and materials supply.

3.2.2 Contents of the New Building Construction Plan

(1) *Construction site*

The construction site of the new building is a part of PUP's existing site, about 400 meters away from the main campus where PUP's main building is located. In the future an access road will be built to connect the two buildings.

The site is plain, and the old building on the site would be no hindrance to the construction work. The construction condition is good as the site faces three roads.

(2) Building

The building to be constructed is five-story concrete building with the area of 12,000 m^2. On each floor, from the first to the fourth, there are laboratories, training rooms, workshops and office rooms as well as a common space including the College administration office, audio-visual room, and library. In a portion of the fifth floor an auditorium with the capacity of 300 people, and a canteen are located. It is possible to expand other portion of the fifth and the sixth floor in the future.

(3) Layout plan

The first floor plan includes laboratories with large size equipment which requires its foundation work and equipment that generates noise and vibration, and those require delivery of materials and samples, or generate heat and dust. The room height will have five meters only for the first floor as laboratories need sufficient ceiling height for the experiments.

In the first floor, laboratories and workshops are to be located for the Departments of Mechanical Engineering, Civil Engineering, Mining Engineering, and both of Electrical Engineering and Chemical Engineering which have large scale equipment. In the second floor, all the laboratories for Architecture, Industrial Engineering, Geodetic Engineering and some laboratories for Civil Engineering and Computer Engineering are to be located. In the 3rd floor, laboratories and training rooms for Computer Engineering , Electrical Engineering and Electronics & Communication Engineering are to be located. In the 4th floor, laboratories for Sanitary Engineering, Chemical Engineering, Physics and Chemistry are to be located.

TABLE 3.1 FLOOR PLAN

Floor	Use, Room name	Number of room	Floor space
First floor	Civil engineering technology lab.	4	
	Mechanical engineering lab. & shop	8	
	Electrical engineering lab. & shop	2	
	Faculty	1	
	Others	4	
	Sub-total	19	3,028 m^2
Second floor	Computer engineering CAD room	1	
	Civil engineering preparation room	1	
	Industrial engineering lab.	3	
	Architecture	8	
	Others	10	
	Sub-total	23	2,920 m^2
Third floor	Computer engineering lab.	9	
	Electrical engineering lab.	3	
	Electronics & communication engineering lab.	4	
	Others	5	
	Sub-total	21	2,608 m^2
Fourth floor	General Science(Physics & Chemistry) lab.	4	
	Common room	3	
	Others	6	
	Sub-total	13	2,500 m^2
Fifth floor		2	876 m^2
TOTAL		78	11,932 m^2

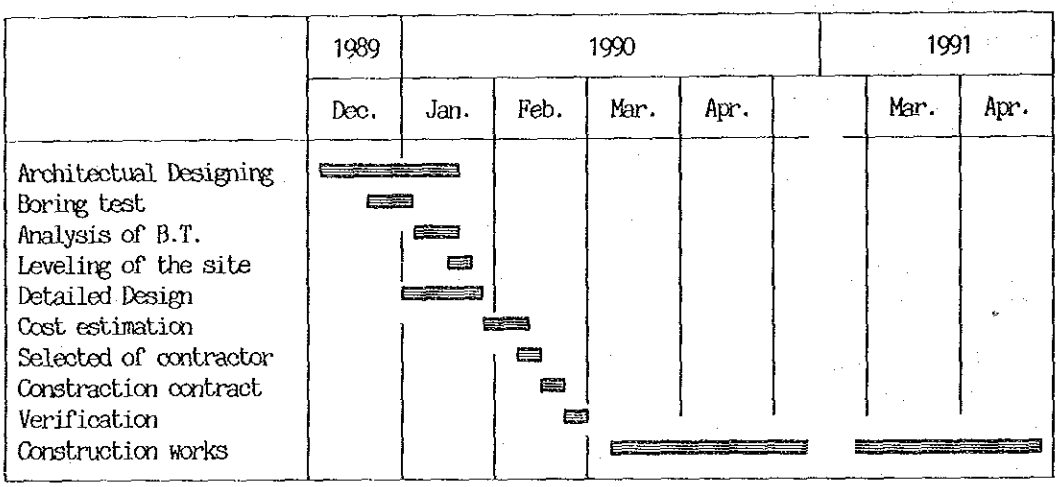
3.2.3 Construction Schedule

The construction schedule is planned to be twelve months after starting the work. The procedure prior to starting the work includes site boring survey and its analysis and land clearance as well as detailed design of the building. Based on the detailed design the Department of

Public Works and Highway (DPWH) will estimate the construction cost.

During the cost estimation by DPWH the constructor will be selected, and the construction contract will be made between PUP and the contractor based on the detailed design and the result of the cost estimation. After the contract is verified by the President's office, the construction work will start. Table 3.2 shows the construction schedule.

TABLE 3.2 CONSTRUCTION SCHEDULE



3.2.4 Budget Action

The budget of PUP is to be disbursed directory from the national treasury. The estimated budget of 309,987,000 peso in total for fiscal 1990 is appropriated. The new CEA building construction cost is included in the cost item of construction and purchasing land, facilities and equipment which amounts to 120,860,000 peso, of which approximately 80 percent, namely, 96,000,000 peso is appropriated for the new CEA building construction cost.

As soon as the contract is verified, the construction cost will be disbursed to PUP.

3.3 Evaluation of the Project

3.3.1 Evaluation of the Request

The request items of the equipment of PUP confirmed in the field survey are as follows;

1) Educational equipment for the existing seven departments (Computer Engineering, Civil Engineering, Mechanical Engineering, Production Engineering, Electrical Engineering, Electronics and Communication Engineering, Architecture)
2) Educational equipment for the newly established four departments (Chemical Engineering, Geodetic Engineering, Sanitary Engineering, Mining Engineering)
3) Educational equipment for the general science (Physics and Chemistry) common to all the departments
4) Supplemental educational equipment such as audio-visual equipment, teaching materials equipment, administration equipment, vehicles common to all the departments

PUP has been carrying out a five-year development plan based on its own ideology. As a part of the plan CEA's improvement scheme has been promoted in order to expand the technological education. As of 1989, 5,017 students are enrolled in the existing seven Departments in CEA, but few of them are benefited from the present facilities and equipment which are inadequate for experiments and training essential to technological field. Thus it has been planned that the new CEA building will be constructed to improve the educational circumstance and establish four new Departments.

In consideration of the self-reliant efforts by PUP, it is appropriate and proper to supply the equipment for the existing seven Departments mentioned in No.1 of the above request list. The educational equipment for the general science in No.3 are also indispensable for the basic technological education. The supplemental educational equipment mentioned in No.4 are also effective to support the educational activities, which are planned by CEA to start in 1991 in the new building. It is necessary to supply a sufficient amount of such equipment.

Due to the above described reasons it is determined that it is quite

appropriate for Japan to give grant aid in carrying out the project on the above described request in No.1, No.3 and No.4.

However, as to the four newly established Departments in No.2 it is merely a planning stage at the present time when no students are enrolled and faculty is being selected and recruited. Therefore, it is impossible to evaluate the achievement of these newly established Departments now. More specifically, Geodetic Engineering and Sanitary Engineering are originally included in Civil Engineering course, and can be covered by the existing course. Chemical Engineering and Mining Engineering are underdeveloped fields in the present Philippines where it is difficult for the students to find employment immediately after the graduation due to the fragile social basis. Furthermore, from view of the planned scale, the educational effectiveness of their equipment seems lower than those of the existing departments as many large size machines are requested in the plan.

From these angles, the newly established divisions of No.2 will be eliminated from this Project.

As a result of the above considerations, the equipment will be supplied for the following fields.

Existing seven Departments: Computer Engineering Department
Civil Engineering Department
Mechanical Engineering Department
Industrial Engineering Department
Electrical Engineering Department
Electronics and Communication Engineering Department
Architecture Department

General science : (physics and chemistry)

Supplemental educational equipment

3.3.2 Project Field

This project is intended for the nine fields including existing seven Departments, general science(physics and chemistry), and Supplemental educational equipment. The outline of each field is as follows.

(1) Computer Engineering Department

Recently the application and development of computer technology is remarkable in the Philippines. In PUP the computer education has been the most important field of education. The fact is, however, the classes such as computer training, programming are given using the facilities of College of Computer & Information with an insufficient educational effect. In this Project most of the department in CEA include computer training in their curriculum. In Architecture Engineering, Civil Engineering and Mechanical Engineering Departments the application training such as data processing and CAD system are the prior subjects. In this Project these training are concentrated in CEA and shared by all the Departments, and thereby improve the efficiency of the operation. As for the technological subjects in this Department, the equipment concerning basic digital circuits, micro-computer hardware and computer control are necessary.

(2) Civil Engineering Department

It seems that the demand for civil engineers to promote public works and infrastructure will increase more and more hereafter. PUP has been unable to give adequate education owing to the shortage of the equipment necessary for the basic experiments and training of civil engineering. This Project will enable the completion of the facilities required for basic education such as material tests and soil dynamic experiments as well as practical field training and surveys.

(3) Mechanical Engineering Department

Mechanical engineering is the most basic and general-purpose field in all the industrial fields. At present mechanical training using several machine tools such as small lathes and millers are given, but the educational effects have been low due to insufficient quality and quantity of equipment. This Project will enable the experiments and training of the basic technological subjects such as machine element, hydromechanics, thermodynamics, materials dynamics etc. In the application subject, the experiments and training are given relating automotive engineering, casting and freezers. The requested equipment also include machine tools for mechanical works as well as these experiment apparatus and teaching materials.

(4) Production Engineering Department

Lately as the technology has been advanced in the industrial field in the Philippines, the importance of manufacturing technology has been acknowledged. The curriculum of this Department includes the subjects of social science such as basic distribution and economics in addition to basic production technology, production control, quality control, etc. The request equipment include work analysis apparatus, printing and photography technology training equipment.

(5) Electrical Engineering Department

At present there are simple measurement apparatus such as ammeter, voltmeter,tester, etc., but they are inadequate in model, type and specification. This project is intended to improve the education of electrical engineers of power engineering based on the experiments and training relating basic direct and alternating current circuit, motor, generator, and electric control. The request equipment include apparatus and teaching materials necessary for these experiments and training as well as electric work machinery.

(6) Electronics and Communication Engineering Department

As basic education of electronics engineering, the experiments and training will be given in order to comprehend fundamental ideas of the function of electronic circuit components like transistor, and amplification, oscillation and modulation circuits. The application fields are also included in the curriculum such as TV or radio transmission apparatus training, production training of electronics circuit, and repairing technique training.

This department has many common subjects with Computer Engineering Department and Electrical Engineering Department. It is to be considered to share the facilities and equipment depending on each curriculum so that they are used effectively.

(7) Architecture Department

The purpose of the division is to provide education in such fields as architectural design, townscape, environmental planning. Practical training are given concerning architectural design and drawing, environmental measurement, and landscaping using models. Small drawing

boards and scales are used for the current training for drawing, causing a big technical gap with the private designing offices. The requested equipment include drawing machines which are used for all the training concerning machine drawing and architectural drawing.

(8) Basic General Science (Physics and Chemistry)

It is a basic field common to all the departments in CEA in which the experiments of physics and chemistry are given in addition to the studies of mathematics and basic engineering. The curriculum, divided into the first and second semester, includes chemistry in the first grade and physics in the second grade.

(9) Supplemental Educational Equipment

These equipment are managed and operated in the college level of CEA. They include audio-visual and teaching materials equipment and AV room apparatus, etc.

3.3.3 *Contents of the Project Equipment*

As described above, the request equipment of this Project are composed roughly of 13 fields. PUP is a five-year technical university aiming for training engineers with its unique curriculum intended for technical self-reliance of the graduates in society. Therefore, the educational content is composed of practical curriculum emphasizing basics and applications of every industrial field. According to these policies, the content of the request equipment includes mainly experiments and training apparatus and teaching materials, processing training machines and tools, models, measurements equipment, etc.

Besides the broad scale objective fields of this Project, CEA has a great number of students. It is necessary to make a carefully prepared equipment plan based on the consideration of this point in order to realize the effective use of the equipment by the Project. It is difficult to evaluate the usage conditions of the equipment from the actual achievement of the present education because the existing equipment are scarce in quality and quantity. Thus, it should be planned to select practical and general-purpose equipment following the request list in each field of existing seven Departments general basic science and supplemental educational equipment, and determine the quantity so that effective

education can be provided.

3.4 Project Implementation

3.4.1 Executing Agency

PUP, being the executing agency of this project, is responsible for all the works involved in carrying out this Project.

3.4.2 Implementation Organization

The organization system of the related sector of PUP that implement this Project is composed of two Sector headed by each vice-president in charge. Figure 3.1 shows the organization chart of the executing agency.

(1)Administration and Finance Sector

It is a department in charge of personnel affairs, administration, procurement, contract, etc., and is responsible for all the works relating the implementation of this Project, including design, cost estimation, contract and execution supervision. After the equipment are provided, it is to perform budget control, personnel plan, materials procurement, etc. in the operation stage.

(2)Educational Affairs Sector

It is in charge of the measurement of the educational plans and the related affairs of all the Colleges in PUP. In carrying out this Project it is responsible for curriculum preparation of the existing and newly established Department, educational plans, equipment and layout plans. After the equipment are supplied it is to make an operation plan for each equipment and perform management, maintenance and repairing.

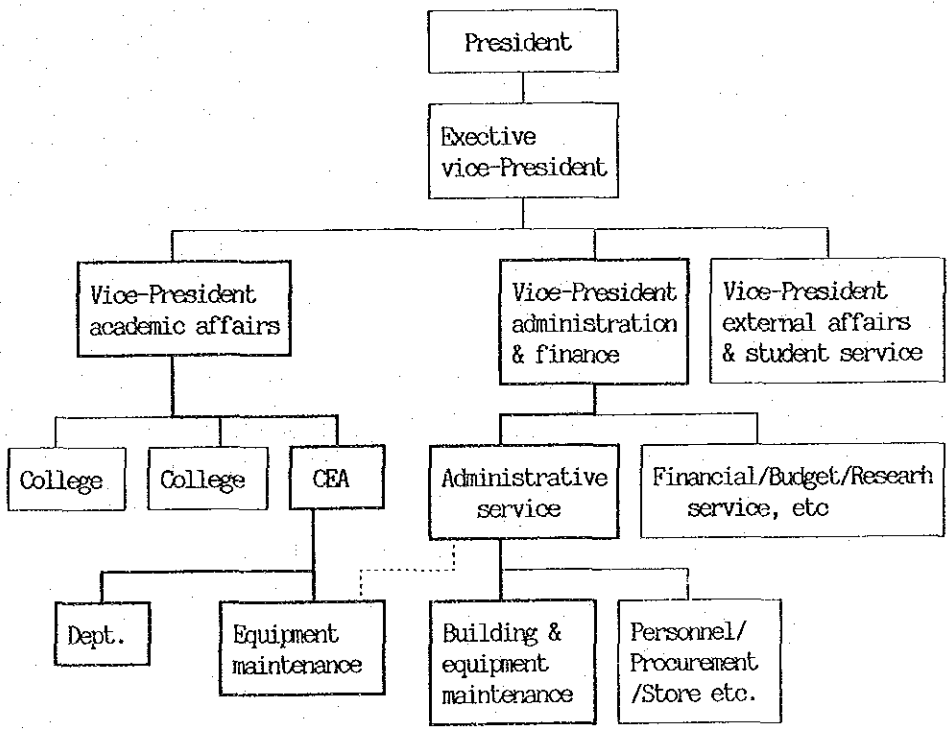


FIG. 3.1 IMPLEMENTATION ORGANIZATION CHART OF THE PROJECT

4. BASIC DESIGN

4. BASIC DESIGN

4.1 Basic Design Principles

The curriculum of CEA has many subjects common to all the Department throughout the five years of its educational period. Consequently, an individual planning in each Department will cause overlapped schedule of using equipment and laboratories with the result of useless expansion of scale and wastefulness. Therefore, it is necessary to coordinate the educational content based on the curriculum of each Department and make an effective equipment plan in a proper scale. The basic design of this Project will be made in accordance with the following Principles.

(1) The selection of the equipment should be made on the condition that they meet the requirements of the curriculum and agree with the technological and educational level in PUP as well as the Philippines.

(2) The equipment that can be commonly used in the same Department or with the other Departments should be shared as far as they can produce proper educational effect.

(3) The experiments and training should be given in a group of appropriate number of students producing educational effect with the quantity of the equipment required for each group unit.

(4) Based on the coordination with the construction plan, the room scale and equipment items should be taken into consideration so that they are properly installed in the room.

4.2 Basic Design Conditions

4.2.1 Conditions of Equipment Selection

PUP has an educational ideology of providing equal opportunity to the students with low income level. But many students leave school before they graduate due to a financial reason. Therefore, PUP adopts a unique curriculum that enables them to acquire a certain level of technique in each grade so that they can apply the technique to be self-reliant after leaving school. Thus, the educational content of PUP tends to emphasize vocational training rather than academic research.

As the number of students is so large that it is impossible to provide education in an ideal system to all the students in the present situation. It is also difficult to meet such requirement owing to the content and scale of the new CEA building construction project. The equipment selection should be made according to the educational content in the present situation in PUP and the new CEA building construction project.

The object of this Project is the equipment for experiments and training in basic technological and engineering field and technical subjects. The layout of the new CEA building is planned with a priority on laboratories in which these equipment are installed. As a result, few classrooms are to be used for lectures, considering the lectures can be given in the main school building of PUP as before.

The conditions of equipment selection is as follows.

1) The educational equipment should be basic and general-purpose. High level and technical research equipment or special educational equipment should be eliminated.

2) The equipment that require advanced technique or technical maintenance should be eliminated.

3) The equipment that require high operational cost for expensive consumables and experimental materials should be eliminated.

4) Special apparatus that require high voltage, large quantity of electricity or water should be eliminated.

5) The equipment that require special environmental settings such as high level air conditioning, dust aspiration, dehumidification, etc. should be eliminated.

6) The equipment should agree with PUP's educational plan, curriculum and experiments.

7) The equipment should be durable of high frequency of usage by many students, and easy to be maintained, repaired and inspected.

8) The equipment should be general-purpose in the industrial field of the Philippines.

9) The repair parts, comsumables and experiment materials should be easily obtained in the Philippines.

4.2.2 Conditions of Quantity Scale Estimation of Equipment

In estimating the quantity scale of the equipment, the following standpoints should be taken into consideration. As the number of the students in CEA is large, the laboratories open to all the Departments will be shared for the common subjects. Thus, the quantity is determined by the method of estimating a total number based on the layout plan and the required number per each laboratory.

(1) Flow of quantity scale estimation of equipment

The Flow of quantity scale estimation of equipment is as follows (Fig.4.1).

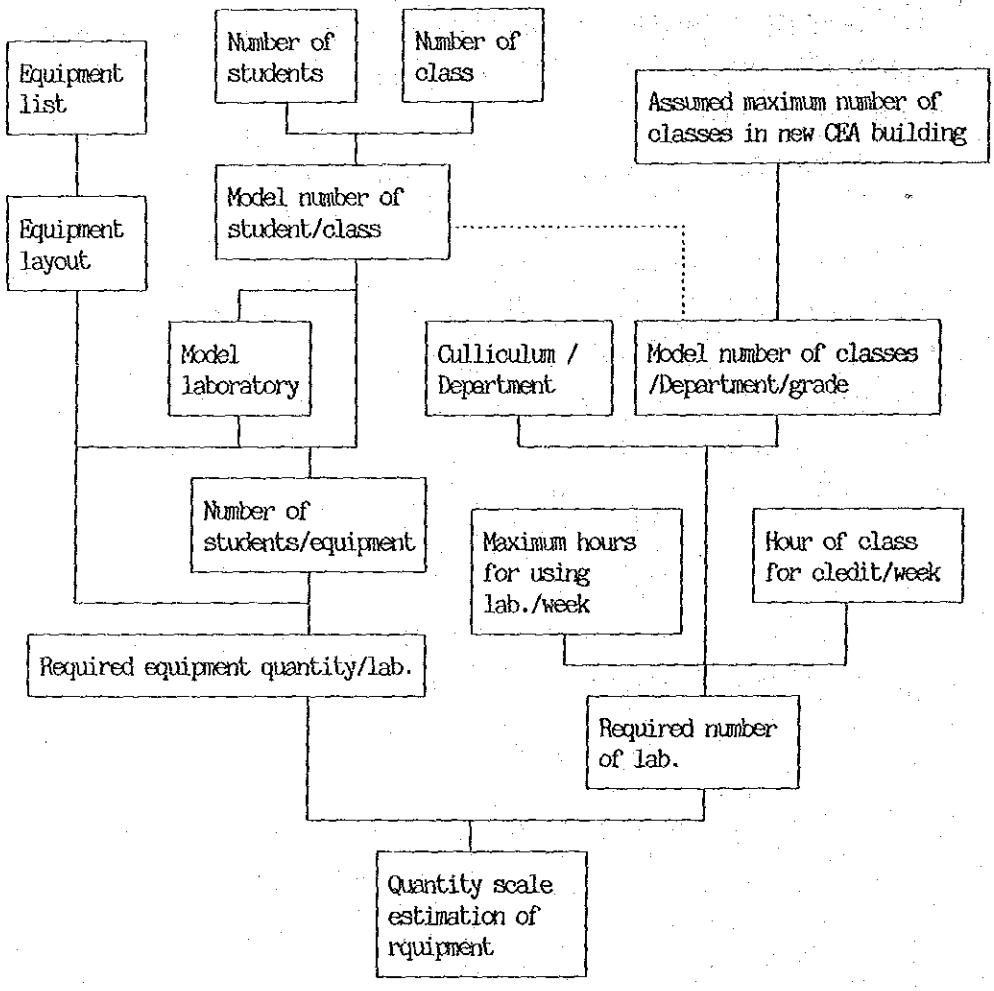


FIG. 4.1 FLOW OF QUANTITY SCALE ESTIMATION OF EQUIPMENT

(2) Estimated number of students per class

Number of students per class in CEA varies widely depending on the Department, with the maximum of 64 and the minimum of 27. The number of students per class is to be estimated based on the present average number of students.

The number of classes is 109 while the total number of students in CEA as of 1989-90 is 5,017. Thus, the present average number of students per class is calculated as follows.

5,017 (students) / 109 (classes) = 46 (number of students/class)

Based on this figure and the layout of standard laboratory, one group unit will have 12 students. If one class is divided into 4 groups, the number of students per class will be 48.

<Estimated number of students per class, group scale>

Number of students per class	: 48
Standard number of experiment groups	: 4 (12 students/ one group)

Basic laboratory model is as follows (Fig. 4.2).

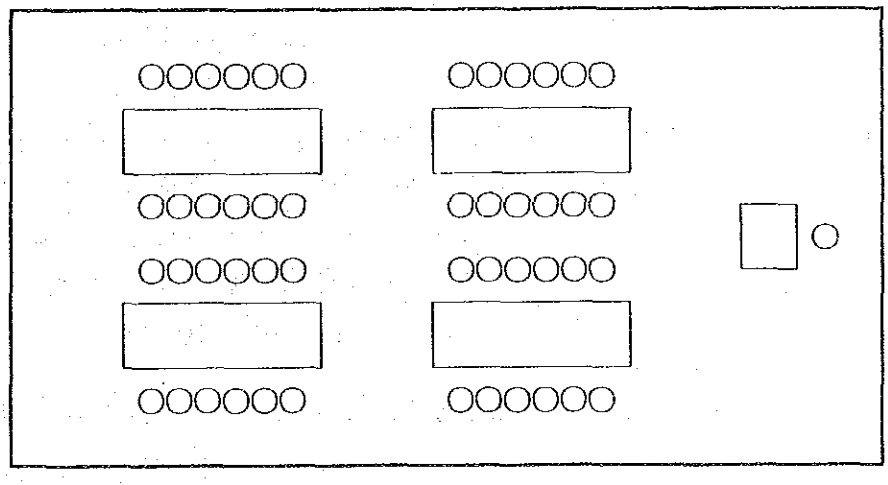


FIG. 4.2 LABORATORY MODEL

(3) Estimation of number of classes in CEA

The equipment plan will be made for the largest number of classes in the new CEA building. The model number of classes will be estimated in each Department in CEA for each grade. In this way, the largest possible number of classes in the new CEA building will be estimated.

1) Number of classrooms in the new CEA building

According to the design layout of the building, the number of classrooms available for lectures, experiments and training is 66.

1F	19 (Mechanical workshop is counted as two rooms)
2F	18
3F	18
4F	11
TOTAL	66

2) Hours of one available room per week

In PUP classes are given on six days a week from Monday to Saturday, for 13.5 hours (7:30-21:00) in one day. As it is probable that every room is fully occupied for one week, efficiency rate is estimated as 80 percent. Thus the hours of one available room per week is calculated in the following way.

$$13.5 \text{ (hour/day)} \times 0.8 \times 6 \text{ (day/week)} = 64 \text{ (hour/week)}$$

3) Total number of classes in the new CEA building

The total number of classes in the new building per week is 4,224.

$$64 \text{ (hour/week,room)} \times 66 \text{ (room)} = 4224 \text{ hour/week}$$

4) Average class hour per week

According to the hearing to CEA, the average class hour per week is 30 (hour/class).

5) Largest possible number of classes per week

The largest number of classes given for one week in the new CEA

building is 140.

4224 (hour/week) / 30 (hour/class,week) = 140 (class)

6) Number of credits annually obtained in each Department

The average number of credits annually obtained in each Department is 230, being composed of 118 credits for liberal arts, and 112 credits for technical subjects. About one thirds of liberal arts classes are to be given in other Colleges, and two-thirds are given in CEA by the instructors of other Colleges according to the hearing to CEA.

7) Percentage of classegiven in CEA

As calculated below, the average number of credits for classes given in CEA is 191, which is 83 percent of the whole credits.

118 credits x 2/3 + 112 credits = 79 + 112 = 191 credits
191 credits / 230 credits = 0.83 (83 percent)

8) Largest number of classes in CEA

With 83 percent of credits for classes given in the new CEA building and the maximum number of 140 classes, the upper limit of class number in each Department of CEA will be 168.

140 (class) / 0.83 = 168 (class)

(4) Estimated model number of classes in CEA

As a result of the above estimation, the total number of classes of all Departments that is closest to 168 is 161 in the year of 1993-94 shown in CEA's future plan. Consequently, the model number of classes of each Department will be estimated as follows according to the above fiscal year to determine the scale of this Project (Table 4.1).

TABLE 4.1 MODEL OF CLASSES OF THIS PROJECT

Unit : Person

Dept.	School year 1st	2nd	3rd	4th	5th	Total	Person per class
CoE	336(7)	274(6)	260(6)	182(4)	228(5)	1280(28)	45.7
CE	192(4)	137(3)	130(3)	124(3)	118(3)	701(16)	43.8
ME	192(4)	137(3)	130(3)	124(3)	118(3)	701(16)	43.8
IE	192(4)	137(3)	130(3)	124(3)	91(2)	674(15)	44.9
EE	192(4)	137(3)	130(3)	124(3)	118(3)	701(16)	43.8
ECE	336(7)	274(6)	260(6)	182(4)	228(5)	1280(28)	45.7
Arch	192(4)	137(3)	130(3)	124(3)	91(2)	674(15)	44.9
ChE	144(3)	91(2)	87(2)	43(1)	41(1)	406(9)	45.1
GE	144(3)	91(2)	87(2)	43(1)	41(1)	406(9)	45.1
SE	96(2)	91(2)	87(2)	43(1)	41(1)	358(8)	44.8
MiE	96(2)	91(2)	45(1)	43(1)	41(1)	316(7)	45.1

*Number in parenthesis indicates the number of classes.

(5) Estimated quantity of required equipment

As a rule, the quantity of required equipment is to be one for a group. Depending on the kind of equipment, the number of students who use the equipment is estimated, and thereby determine the number of group per one laboratory. In this way the quantity of equipment required for experiments given by every class unit in each laboratory can be determined.

Depending on the kind and use, there are some cases in which one to three items are used for the whole class or extra items are required for an instructor or sample in addition to the student groups (Table 4.2).

TABLE 4.2 EQUIPMENT QUANTITY AND NUMBER OF STUDENT IN ONE GROUP

Equipment quantity (Number of groups for experiment)	Number of student per equipment
1	48
2	24
4 *	12 *
8	6
16	3
48	1

*Number estimated from the standard experimental condition

(6) Estimated number of classrooms

The appropriate number of classrooms will be estimated as for the main laboratories where many equipment are installed. Table 4.3 shows the related laboratories.

TABLE 4.3 ROOM LIST FOR ESTIMATION OF NUMBER OF ROOMS

Room	Dept.	No.of rooms	Use
Personal computer room	CoE	6	Computer training Basic & application level
CAD room	CoE	1	Practice of CAD
Archit. drafting room	Arch	2	Practice of basic drafting and specialized subject of Arch, CE, GE, MiE
Mech. drafting room	Arch	2	Practice of basic drafting and specialized subject of CoE, ME, IE, EE, ECE ChE,SE

For these laboratories the number of classes and hours per week is to be estimated, and the appropriate number of rooms is to be determined. The following is the procedure of the estimation.

(1) Hours of availability of one room per week

The hours of availability of one room per week is 64.

(2) Hours of classes for one credit of experiments and training

The hours of classes for one credit of experiments and training in CEA is 2 hours per week.

(3) Number of credits for classes given in each laboratory

First, the total number of credits for classes given in the same laboratory is estimated. Next, classes given in each room in each semester are drawn from the curriculum of each Department and the number of the credits is to be totaled (Table 4.4; See APPENDIX 2.7).

TABLE 4.4 NUMBER OF CREDITS GIVEN IN EACH ROOM

	Number of credits	
	First semester	Second semester
Personal computer room	163	159
CAD room	30	23
Archit. drafting room	57	60
Mech. drafting room	58	60

(4) Number of required rooms

According to the result from the above (1) to (3), the number of required rooms is estimated. The estimation method is based on the larger number of credits in the first and second semester given in each room. The number of credits (3) multiplied by the hours of class for one credit (2) is the hour of classes per week, which is to be divided by hours of availability of one room per week (1). The calculation of the number of required rooms is expressed as follows.

(Total credit number of each room) x
(Hours of class per credit) / (Hours of availability of one room)
= Number of rooms

The result is shown in Table 4.5.

TABLE 4.5 NUMBER OF REQUIRED ROOMS

Room	Semester	Calculation	No.of rooms
Personal computer room	First	163 x 2 / 64 = 5.09*	6
CAD room	First	30 x 2 / 64 = 0.93*	
Archit. drafting room	Second	60 x 2 / 64 = 1.88*	2
Mech. drafting room	Second	60 x 2 / 64 = 1.88*	2

* Number of rooms was calculated by raising decimals to the next whole number.

In CEA future plan, the estimated number of classes and students will be 161 and 6,809 in 1993-94. In this model the appropriate number of students is determined following CEA plan on the estimation of 48 students per class.

Here the total number of classes in each Department in the new CEA building is estimated to be 168 in the maximum, but if calculated with the number limit of 48, the figure will correspond to the total number of 8,064 students.

Here the efficiency rate of classroom is estimated to be 80 percent. If, for example, the rate becomes 90 percent due to increased efficiency, it will be possible to make as many as 181 classes, totaling 9,072 students which reaches the level of 9,046 in 1996-97.

The fact is, however, the number of students who are registered or proceed to the next grade varies depending on Departments, causing the number to be changeable. It should be taken into consideration that overcrowded plan is forced to be made according to the class composition of each Department.

Here the upper limit in number of classes is made. In case the number of students increases in the future, exceeding 48 in some classes, more students should be included in one experiment group using the equipment, or more equipment should be added in order to solve the problem.

4.3 Equipment of the Project

4.3.1 Selection of Equipment

The required equipment in this Project has been selected based on the educational curricula of each Department and laboratory, considering methods of experiments and training for each equipment. The criteria for selection of main equipment by educational field are described as follows.

(1) Computer Engineering Department

Main equipment are the personal computers for training of programming and CAD. One computer for programming training is presently used by four or five persons in PUP, but this computer should be provided at the rate of one to three persons in this Project in consideration of educational

effectiveness. While the quantity of computer for CAD has been planned at the rate of one computer to four persons, because CAD training is based on such group training. The mechatoronics trainer and the logic analyzer will be used by the class as a whole.

(2) Civil Engineering Department

The major equipment in this field are those for material testing such as universal radial cross cut saw, consolidation test apparatus, cement autoclave, soil mixer, etc. As the experiment using each equipment will be done by each group alternately, the quantity of each equipment has been planned to be one.

(3) Mechanical Engineering Department

The major equipment in this field are divided into two groups, i.e., machine tools such as universal milling machine, radial drilling machine, lathe, universal tool grinder, etc., and training/applied machines such as universal steam prime mover tester, synthetic hydro experimental unit, air conditioning laboratory unit, CNC machine, etc. The quantity of these equipment has been planned to be one each, considering that training with each machine will be done by each group in turn.

(4) Industrial Engineering Department

Each specific training will be done by each group alternately. The quantity of each equipment has been planned to be one.

(5) Electrical Engineering Department

Power-driven machines such as synchronous machine, squirrel cage induction motor, DC generator etc., and training/applied machines such as transmission/distribution trainer, transformer trainer module, etc. are major equipment in this field. The quantity of these equipment has been planned to be one each, considering that each specific training with each machine will be done by each group in turn.

(6) Electronics & Communication Engineering Department

Considering that each training by FFT analyzer, spectrum analyzer, microwave trainer, etc. will be separately done by each group in turn, the quantity of these equipment has been planned to be one or two. In case of measuring apparatus used by all groups simultaneously, the