No.

BASIC DESIGN STUDY REPORT
ON
THE PROJECT FOR THE EXPANSION OF THE CENTRE
FOR
MATHEMATICS, SCIENCE AND TECHNOLOGY EDUCATION
IN AFRICA
IN
THE REPUBLIC OF KENYA

May, 2006

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

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PREFACE

In response to a request from the Government of the Republic of Kenya, the Government of Japan decided to conduct a basic design study on the Project for the Expansion of the Centre for Mathematics, Science and Technology Education in Africa and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Kenya a study team from December 1 to December 24, 2005.

The team held discussions with the officials concerned of the Government of Kenya, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Kenya in order to discuss a draft basic design, and as this result, the present report was finalized.

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

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

May, 2006

Masafumi Kuroki
Vice-President
Japan International Cooperation Agency

May, 2006

Letter of Transmittal

We are pleased to submit to you the basic design study report on the Project for the Expansion of the Centre for Mathematics, Science and Technology Education in Africa in the Republic of Kenya.

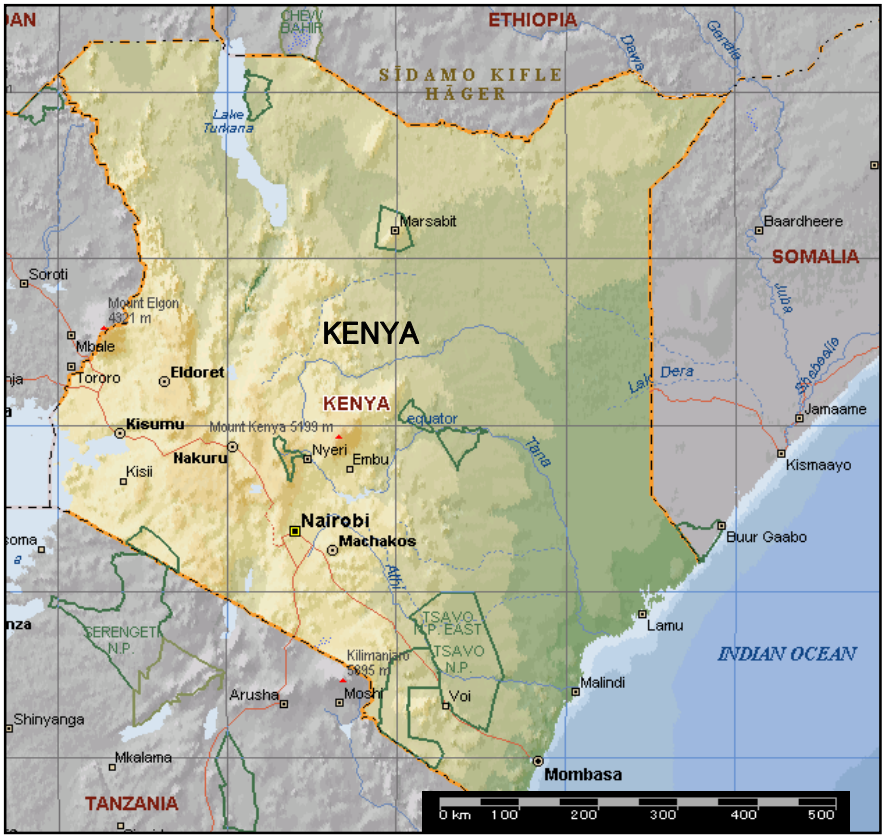
This study was conducted by the joint venture between Kume Sekkei Co., Ltd. and Intem consulting, Inc., under a contract to JICA, during the period from November 2005 to May 2006. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Kenya and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

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

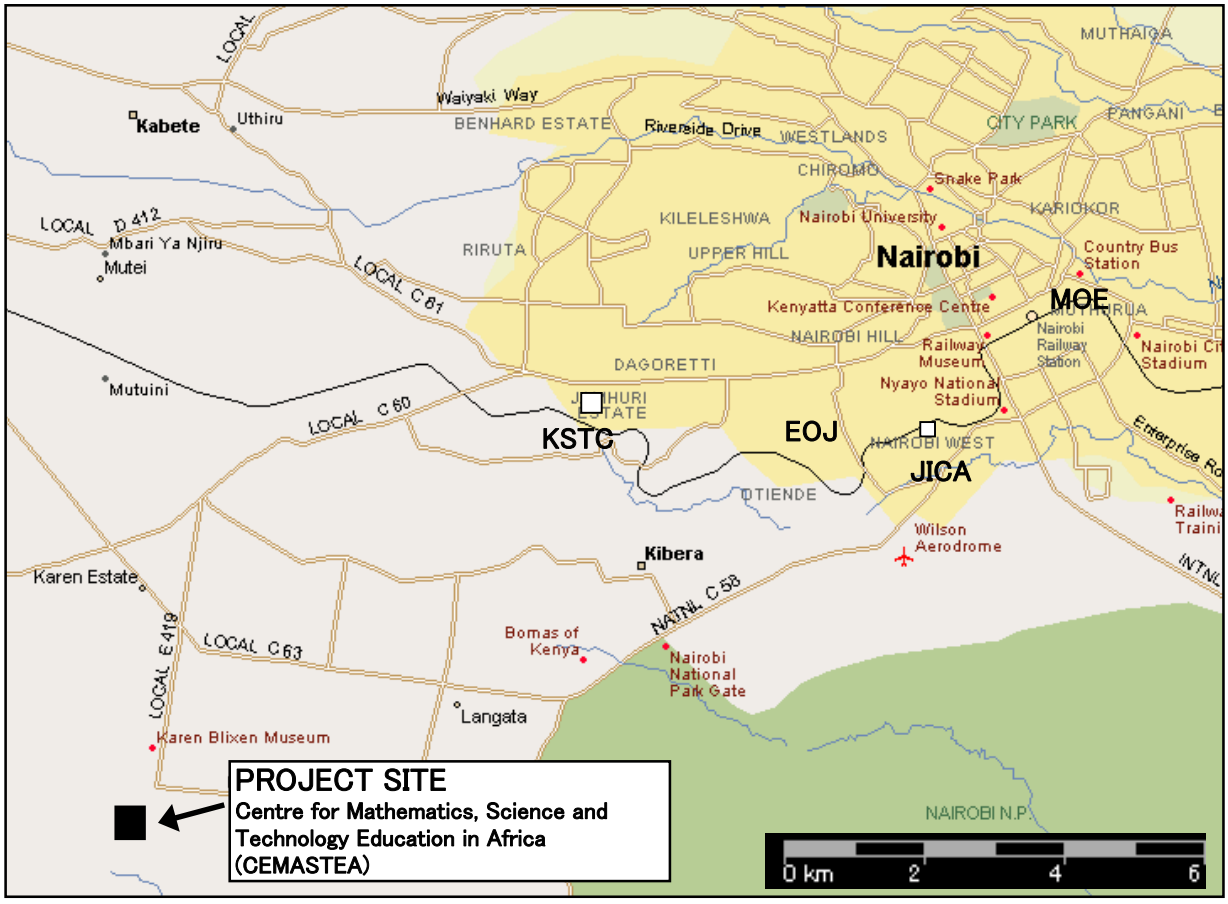
Very truly yours,

Shigeru Yasumatsu
Project Manager,
Basic Design Study Team on
The Project for the Expansion of the Centre
for Mathematics, Science and Technology Education in Africa
The Joint Venture between Kume Sekkei Co., Ltd.
and Intem Consulting, Inc.

■ Project Location Map



■ Nairobi and Project Site



NEW ADMINISTRATION AND NEW DINING HALL

NEW ADMINISTRATION,LECTURE HALL,LECTURE ROOM AND LABORATORY

NEW HOSTEL BUILDING

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List of Abbreviations

Abbreviations	Full Words
AICAD	African Institute for Capacity Development
ASEAN	Association of South East Asian Nations
ASEI/PDSI	Activity Student Experiment Improvisation/ Plan Do See Improve
AVR	Automatic Voltage Regulator
BS	British Standard
BOD	Biochemical Oxygen Demand
CB	Concrete Block
CEMASTEA	Centre for Mathematics, Science and Technology Education in Africa
DEO	District Education Officer
EFA	Education for All
ERS	Economic Recovery Strategy
FPE	Free Primary Education
GDP	Gross Domestic Product
GER	Gross Enrolment Rate
GL	Ground Level
ICT	Information and Communication Technology
IMF	International Monetary Fund
INSET	In-service Education Training
JCC	Joint Coordinating Committee
KCPE	Kenya Certificate of Primary Education
KCSE	Kenya Certificate of Secondary Education
KESSP	Kenya Education Sector Support Programme 2005-2010
kN	Kilo Newton
KNEC	Kenya National Examinations Council
KSSHA	Kenya Secondary School Heads Association
KS	Kenya Standard
KSTC	Kenya Science Teachers College
LAN	Local Area Network
LPG	Liquefied Petroleum Gas
MOE	Ministry of Education
MORPW	Ministry of Roads & Pubic Works
NEPAD	New Partnership for Africa's Development
NPC	National Planning Committee
PTR	Pupil/Teacher Ratio
PVC	Polyvinyl Chloride
QASO	Quality Assurance and Standards Officer
SMASSE	Strengthening of Mathematics and Science in Secondary Education
SMASSE-WECSA	Strengthening of Mathematics and Science in Secondary Education- Western, Eastern, Central and Southern Africa
TICAD	Tokyo International Conference for African Development
TIVET	Technical, Industrial, Vocational, Education and Training Institutes
TSC	Teachers Service Commission Kenya
UPE	Universal Primary Education
VAT	Value Add Tax
WHO	World Health Organization
WSSD	World Summit on Sustainable Development

Summary

Summary

The Government of the Republic of Kenya (hereinafter referred to as "Kenya") considers education to be an important basis to achieve its national target of "shifting the country's economic foundation to industry by 2020" in its Ninth National Development Plan (2002 – 2008) and others plan and calls for the implementation of free primary education (FPE) and the strengthening of mathematics and science education in secondary education.

While the progress of pupils to secondary education and higher education in Kenya is determined based on their performance in national examinations, the number of pupils successfully passing the KCSE (Kenya Certificate of Secondary Education) in such science subjects as mathematics, physics, biology and chemistry is less than ideal. The retraining of existing mathematics and science teachers (INSET: In-Service Education Training) has been conducted at 15 local pilot centres under the Strengthening of Mathematics and Science in Secondary Education (SMASSE) Project since July, 1998 as one measure to redress this undesirable situation.

As a result, the effectiveness and sustainability of such in-service training of mathematics and science teachers has been confirmed and its positive impact on the improvement of classroom teaching has been highly evaluated, leading to the implementation of the SMASSE Phase 2 Project nationwide since July, 2003. This SMASSE Phase 2 Project not only includes the training of existing teachers as well as district trainers who are responsible for conducting in-service training but also widens the geographical scope of the training to those involved in mathematics and science education in member countries of the Strengthening of Mathematics and Science in Secondary Education – Western, Eastern, Central and Southern Africa (SMASSE-WECSA) Project.

For the implementation of these training activities, the Government of Kenya has established the Centre for Mathematics, Science and Technology Education in Africa (CEMASTEA) as a training base using a former vocational training facility. However, the existing hostel of the CEMASTEA is only capable of accommodating 92 trainees. The fact that district trainers training, which is the central training programme, requires almost six months to complete because of the limited accommodation capacity leaves insufficient time for the implementation of other training programmes. Moreover, the shortage of training facilities, including a lecture hall, means that the CEMASTEA is forced to use the dining hall for multiple purposes. The difficult prospect of the continued use of the existing administration building because of its conspicuous deterioration and the converted use of facilities designed to serve other purposes as laboratories and lecture rooms underlines the serious shortage of proper training facilities faced by the CEMASTEA among other problems.

Since the commencement of the SMASSE Phase 2 Project, a technical cooperation project of the Government of Japan, the need for both domestic training in Kenya has been increasing as the Government of Kenya has launched a policy of institutionalising the in-service training of mathematics and science teachers for secondary education. At the same time, the need for similar training covering SMASSE-WECSA member countries has also been increasing. In response to these growing needs, it is planned to increase the scale of district trainers training and the SMASSE-WECSA third country training at the CEMASTEA to 1,600 persons/year and some

150 persons/year respectively. As other training programmes will also be held at the CEMASTEA, an increase of the accommodation capacity to some 200 persons is urgently required.

To improve the situation, the Government of Kenya has formulated the Project for the Expansion of the Centre for Mathematics, Science and Technology Education in Africa (hereinafter referred to as "the Project") to expand the CEMASTEA located in the Karen District of Nairobi and has requested the Government of Japan's provision of grant aid for the construction of facilities and the procurement of related equipment as components of the Project.

As such, the Project aims at the construction of facilities and the procurement of equipment, both of which are essential to expand the capacity of the CEMASTEA to simultaneously train up to 200 trainees, in view of the expansion of training programmes contributing to the improvement of mathematics and science education in the near future.

In response to this request, the Japan International Cooperation Agency (JICA) dispatched the Preliminary Study Team to Kenya in June, 2005 to confirm the necessity and relevance of the Project.

The JICA then dispatched the Basic Design Study Team to Kenya for the period from 30th November to 25th December, 2005 to learn about the activities and existing facilities of the CEMASTEA and related as well as similar facilities and to gather relevant information and data. The Basic Design Study Team also discussed the training programmes, operation and maintenance plan and available facilities and equipment of the CEMASTEA with officials of the Government of Kenya. Furthermore, the Basic Design Study Team conducted a natural conditions survey involving the surveying of the proposed construction site as well as a geological survey of the said site.

On its return to Japan, the Basic Design Study Team analysed the activities and the operation and maintenance cost of the CEMASTEA based on the field survey results and prepared the Basic Design Study Report (draft final) after examining the optimal contents of the facilities and equipment, the selection of equipment, estimation of the project cost and formulation of a project implementation plan.

The JICA then dispatched the Draft Report Explanation Team to Kenya for the period from 18th to 26th March, 2006 to explain and discuss the contents of the above draft Summary and also to conduct additional field surveys.

In finalising the basic design for the Project, three issues were considered to be the most important for examination: ① the utilization rate of the training facilities under the training programmes, ② the feasibility of the continued use of the existing facilities and infrastructure and ③ the appropriate scale of the Project based on the likely operation and maintenance budget of the Kenyan side. Due consideration was, therefore, given to the natural and social conditions, state of the construction industry and prospect of local procurement and the operation and maintenance capability of the project implementation body in Kenya and also to the required construction period under Japan's grant aid scheme.

After analysis, the annual utilization rate of the CEMASTEA after expansion was estimated to be 81% for the entire facilities and 73% for the accommodation facilities (hostel) based on the number of training programmes and participants indicated by the Kenyan side. Consequently, the Project was judged to be both appropriate and feasible.

The original request by the Kenyan side consisted of some 7 – 10 buildings with a total floor area of approximately 5,300 m^2 and 625 items of equipment. The contents and scale of the Project were finally adjusted to suit the actual situation of the CEMASTEA after examination of the possible use of the existing facilities and selected equipment which could be frequently used and maintained by the Kenyan side. The revised contents of the Project received the consent of the Kenyan side.

As described earlier, the Project formulated by the Government of Kenya aims at training district trainers for the in-service training of mathematics and science teachers through the expansion of training programmes featuring not only Kenyan district trainers but also those from SMASSE-WECSA member countries. This is made possible by expanding the accommodation capacity at the CEMASTEA from the current 92 to 200. Meanwhile, the requested grant aid cooperation features the construction of administration and laboratory and lecture facilities, hostel and a dining hall and the procurement of the required equipment as listed below, all of which are essential for effective training at the CEMASTEA.

< Facilities >

Building Name	Structure	Rooms	Planned Floor Area
Administration Building	Reinforced Concrete, 2 Story	Offices, Director Room, Deputy Director Room, Administrative Officer Room, Secretary Room, Meeting Room, Printing Room and etc.	1,163.4 ㎡
Laboratory and Lecture Building	Reinforced Concrete, Single and 2 Story	Lecture Hall, Lecture Room, Laboratory, Computer Room, Library and etc.	1,841.4 ㎡
Hostel	Reinforced Concrete, 3 Story	55-Twin Rooms, Reception, Sick Bay, Linen Laundry and etc.	2,174.1 ㎡
Dining Hall	Reinforced Concrete, Single Story	Dining Hall, Office, Kitchen, Food Store, Cold Room and etc.	480.4 ㎡
Infrastructure Facility	Reinforced Concrete, Single Story	Transformer Room, Electrical Room, Pump room	82.1 ㎡
Mechanical and Electrical System		Water and Hot Water Supply, Drainage, Fire-Fighting, Power Receiving, Cable and Lighting, Fire Alarm, Lightning Arrester	
Total Floor Area			5,741.4 ㎡

< Equipment >

The main equipment is listed below.

Category	Major Equipment
Equipment for Physics training	Free fall experimental apparatus, Table balance, Stroboscope, Ammeter, Voltmeter, Set of pulley, Linear air track, Heat expansion ball and ring etc.

Equipment for Chemistry training	Analytical balance, Drying oven, Mantle heater, Hot plate, Water bath, Centrifuge, Draft chamber etc.
Equipment for Biology training	Incubator, Draft chamber, Centrifuge, Models, Microscope, Autoclave, etc.
Equipment for Mathematics training	Programmable calculator , Geometric models etc.
Lecture support equipment	OHP、Projector, Computer for projector etc
Equipment for Computer room	Computer, Printer etc.
Equipment for Laboratory	Laboratory central experimental table, Side table, laboratory table for lecturer, Laboratory table for preparation room etc
Equipment for Lecture hall	Sound equipment, Projector, Screen etc.
Others	Lecture chair, Dinning table etc

The Kenyan Ministry of Education (MOE) will act as the responsible agency for the design, tender and construction work under the Project while the CEMASTEA which will use the new facilities will act as the counterpart organization and will coordinate the work during the project implementation period.

In the case of the Project's implementation with grant aid provided by the Government of Japan, the project implementation period will be 18 months, consisting of six months for the completion of the detailed design and 12 months for construction and procurement. The estimated project cost is approximately ¥1,172 million (Japanese portion of approximately ¥1,161 and Kenyan portion of approximately ¥11 million to cover the cost of demolishing the existing administration building on the site, felling of trees, ground levelling, landscaping, obtaining of the legal design approval, connection of infrastructure, bank arrangement commission for the contract sum and procurement of general furniture). This estimated project cost will be further examined to obtain its approval by the Government of Japan and does not necessarily means the grant limit referred to in the E/N.

The construction of the new facilities at the CEMASTEA is expected to have the following direct effects.

① The number of trainees to be accepted at the CEMASTEA at one time will increase from 92 to 200.

② The annual number of trainees at the CEMASTEA will increase from 1,476 in 2005 to 5,423 in 2008.

Year	Record in 2005		Plan in 2008	
Training Course	Training Plan	Trainees (person)	Training Plan	Trainees (person)
1. INSET Training in Kenya	(person) (week) (time/year)	1,381	(person) (week) (time/year)	5,273
(1) National INSET Training	90 x 2 x 12	1,017	200 x 2 x 8	1,600
(2) Principal Workshop	90 x 1 x 3	204	200 x 1 x 6	1,200
(3) DEO's Workshop	72 x 1 x 1	47	72 x 1 x 1	72
(4) Deputy DEO's Workshop	—	—	72 x 1 x 1	72
(5) QASO Workshop	90 x 1 x 1	60	200 x 1 x 3	600

(6) Stakeholder Workshop	600 x 1 x 1	Not Operated	200 x 1 x 3	600
(7) INSET for Secondary Teacher Colleges	90 x 1 x 1	53	93 x 1 x 1	93
(8) INSET for Primary Teacher Colleges	—	—	200 x 1 x 3	480
(9) INSET for TIVET Math. and Science	—	—	200 x 1 x 3	556
2. SMASSE-WECSA Third Country Training	92 x 5 x 1	95	150 x 5 x 1	150
Total		1,476		5,423

③ The number of training courses to be held in a year will increase from 7 in 2005 to 10 in 2008.

In addition, the following indirect effects can also be expected.

① Teaching on mathematics and science will improve not only in Kenya but also in the rest of Africa as the ex-trainees of the CEMASTEA will spread their newly acquired knowledge and skills.

② The understanding of mathematics and science among secondary school pupils in Kenya and the rest of Africa is expected to grow.

Apart from the number of effects listed above, the Project will contribute to the development of human resources which will promote the national target of “shifting the economic foundation to industry by 2020”, confirming the relevance of the Japanese grant aid for the Project. Moreover, the Kenyan side has assured the funding for the work to be conducted by itself, the operation and maintenance cost and the arrangement of the required manpower.

For the implementation of the Project, the Kenyan side must undertake the following.

(1) Assured funding to cover the management cost of the SMASSE-WECSA third country training

The SMASSE-WECSA third country training began in 2004 and the cost of participating in the training, including air fares, has almost exclusively been paid by Japan up to the present. Even though the Kenyan side gives third country training high priority, it faces the difficult task of securing funding for the training cost, including air fares, for the actual implementation of this training. As the competent ministry, the MOE is required to promptly secure the necessary budget for the training every year while examining potential financial aid by donors and others.

(2) Assured appropriation of the operation and maintenance budget

The operation and maintenance cost of the CEMASTEA will be met by the MOE and this funding must be made without fail every year. The estimated operation and maintenance cost suggests that it can be met within the budget amount of which the appropriation is promised by the MOE.

(3) Establishment of the maintenance system

The mechanical and electrical equipment and systems for the new facilities are planned based on such conditions as local procurement, simplicity and ease of maintenance as in the case of the existing facilities. However, as such equipment as the generator and pump, etc. require periodic inspection and maintenance, the conclusion of periodic maintenance contracts with local companies is necessary.

(4) Increase of the staff strength

In line with the expansion of the CEMASTEA, it is planned to increase the staff strength from the current 88 to 144. Although it is planned to recruit new academic staff and non-academic staff through the transfer of staff members of the MOE, the recruitment of new staff must be conducted as planned despite the restriction imposed by the Government of Kenya on an increase of civil servants due to the tight financial situation.

(5) Obtaining of the title deeds

For government-owned land, it is possible to apply for and obtain a legal design approval based on a letter of allotment which has already been acquired without any title deeds. However, it is judged to be preferable to obtain the title deeds to prevent any future problems involving the land and efforts to obtain the title deeds for the land on which the new facilities will be constructed should continue.

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CHAPTER 1 BACKGROUND OF THE PROJECT

Chapter 1 Background of the Project

1.1 Background of the Project

(1) Background

The Government of Kenya is emphasising the strengthening of mathematics and science education in secondary education in a drive to achieve the national target of "shifting the country's economic base to industry by 2020". However, the KCSE results have shown comparatively poor results for mathematics and such science subjects as physics, biology and chemistry for some time. To improve the situation, the in-service training of mathematics and science teachers has been conducted at 15 pilot centres under the SMASSE, a technical cooperation project which commenced in July, 1998.

The results of this SMASSE Project have been highly evaluated, leading to the extension of such in-service training throughout Kenya under the SMASSE Phase 2 Project which commenced in July, 2003. The training under the SMASSE Phase 2 Project not only features existing teachers as well as district trainers in Kenya but also those involved in mathematics and science education in member countries of the SMASSE-WECSA (third country training).

To implement these training activities, the Government of Kenya renovated former vocational training facilities and established the CEMASTEA. However, the existing hostel is only capable of accommodating 92 trainees. Such a small accommodation capacity means that district trainers training, which is the central training programme, requires almost six months to complete and that only limited time is available for the implementation of other training programmes. Moreover, the CEMASTEA is experiencing many problems, including a shortage of training facilities epitomised by the absence of a proper lecture hall and the out of use administration building due to conspicuous deterioration.

Since the commencement of the SMASSE Phase 2 Project, there has been an increasing need for training for not only Kenyan teachers and district trainers but also for those attending the third country training held at the CEMASTEA, making an increase of the accommodation capacity to the 200 level essential.

To improve the situation described above, the Government of Kenya has formulated the Project for the Expansion of the CEMASTEA (hereinafter referred to as "the Project") located in the Karen District of Nairobi. As the Project aims at expanding the facilities and equipment required for the strengthening of mathematics and science education in secondary education, which will contribute to achieving the national target of "shifting the country's economic foundation to industry by 2020", the implementation of the Project is highly necessary.

(2) Request

In connection with the Project, the Government of Kenya made a request to the Government of Japan for the provision of grant aid for the construction of facilities and the procurement of

related equipment. In response to this request, the Preliminary Study for the Project was conducted in June, 2005 and the necessity and relevance of the Project were confirmed.

The outline of the request, including the items confirmed by the Preliminary Study, is given below.

1) Date of the request : September, 2003

2) Amount of the request : approx. ¥1.2 billion

3) Contents of the request

Facility	Equipment
5-Laboratories (50persons), Computer Room(50persons), 6-Lecture Rooms(50persons), Office Building (including Lecture Hall for 300 persons, Sick Bay), Hostel (55-twin rooms), Dining Hall for 200 persons	Chemistry/Physics/Mathematics/Biology/Equipment for INSET primary teacher colleges/Kitchen/Hostel etc
Infrastructure (Generator, Deep Well, Water Supply and Drainage etc.), Furniture for the above	
7-10 buildings, Total Floor Area of 5,300 ㎡	625 items

CHAPTER 2 CONTENTS OF THE PROJECT

Chapter 2 Contents of the Project

2.1 Basic Concept of the Project

2.1.1 Goal and Objective of the Project

(1) Higher Plans and Objective of the Project

The Project intends to contribute to the strengthening of mathematics and science education in secondary education as envisaged by the Ninth National Development Plan and other plans to achieve the national goal of “shifting the country’s economic foundation to industry by 2020”.

As part of the measures to strengthen mathematics and science education in secondary education, the training of mathematics and science teachers in service commenced in 1998 under the SMASSE, a technical cooperation project of the JICA. Based on confirmation of the effectiveness and prospect of the sustainable development of such in-service training, the SMASSE Phase 2 Project, another technical cooperation project of the JICA, commenced in July, 2003. To prepare for the implementation of this SMASSE Phase 2 Project, the Government of Kenya established the CEMASTEA as the central training base and the training of district trainers and others followed.

Since the commencement of the SMASSE Phase 2 Project, there has been an increasing need for not only the training of Kenyan teachers and district trainers but also for third country training for SMASSE-WECSA member countries which began with the launch of the SMASSE Phase 2 Project. Coupled with the government’s decision to institutionalise the in-service training of all mathematics and science teachers in secondary education, the Project was formulated by the Government of Kenya.

The expansion of the training capacity of the CEMASTEA under the Project from the current 92 trainees to 200 trainees will contribute to improving mathematics and science education in Kenya’s secondary education. Such expansion of the training capacity will also expand the scale of the third country training, improving the mathematics and science education in secondary education in SMASSE-WECSA member countries.

The objective of the Project is to promote the following activities through the expansion of the CEMASTEA’s facilities to enable the training of 200 trainees at a time.

① Training and strengthening of mathematics and science district trainers (and teachers) through the expansion of training programmes for Kenyan personnel

② Training and strengthening of mathematics and science district trainers (and teachers) in SMASSE-WECSA member countries

(2) Outline of the Project

The Project aims at expanding the facilities of the CEMASTEA to enable the training of 200 trainees at a time to achieve the above-described objective, thereby contributing to the training of mathematics and science instructors and teachers in not only Kenya but also in SMASSE-WECSA member countries. The mathematics and science education in secondary education in Kenya and SMASSE-WECSA member countries will be strengthened through the training at the CEMASTEA and will undoubtedly contribute to the development of the national economy of each country.

Among the components of the Project, the grant aid cooperation provided by the Government of Japan will cover the construction of such new facilities as the administration building, laboratory and lecture building and hostel and dining hall building and the procurement of equipment required for training.

2.1.2 Outline of the Planned Activities of the CEMASTEA

The CEMASTEA plans to expand the training activities currently in progress under Phase 2 of the SMASSE Project after the completion of the said project in June, 2008. The planned activities is explained below.

(1) Planned Activities

1) Compulsory In-Service Training

In the near future, all secondary education teachers in Kenya will be required to undergo in-service training and this position was confirmed by the Joint Review of the Education Sector issued in November, 2005.

2) Planned Training Activities

The CEMASTEA envisages that training activities will take place in 45 weeks, i.e. 87% of 52 weeks, a year. Of these weeks, 16 weeks (1,600 persons) are allocated to domestic central INSET training in Kenya and 14 weeks (2,544 persons) are allocated to the training of such educators as principals of primary/secondary schools. These two types of training account for two-thirds of the training weeks. A further 10 weeks are allocated to the training of mathematics and science tutors of primary, secondary and TIVET teacher training colleges. The remaining five weeks are allocated to a single SMASSE – WECSA third country training session involving 150 persons. While the Kenyan side has promised continual efforts to maintain the CEMASTEA as a core educational facility in Africa or an international educational facility, it believes that the continuity and expandability of the third country training at the CEMASTEA depends on the availability of financial assistance by Japan (JICA) and other donors given the fact that the current third country training relies on financial assistance under Phase 2 of the SMASSE Project. As such, the current plan for third country training envisages only one session a year as is the case under Phase 2 of the SMASSE Project.

Table 2-1 Summary of Training Plan at the CEMASTEA

	Total Trainees	Training Duration	Ratio
(1) INSET Training in Kenya		40 weeks	89%
1) National INSET Training	1,600	16 weeks	(36%)
2) Educator Training	2,544	14 weeks	(31%)
3) Primary, Secondary Teacher and TIVET Teacher training	2,000	10 weeks	(22%)
(2) SMASS-WECSA Third Country Training	150	5 weeks	11%
Total	6,294	45 weeks (87% of year)	100%

The training plan presented by the CEMASTEA includes teachers for subjects other than mathematics and science as the target trainees for the INSET for tutors of secondary teacher training collects and the INSET for tutors of primary teacher training colleges. By limiting the target trainees to mathematics and science teachers because of the objective of the Project, the number of target trainees will be reduced as shown in the table below.

Table 2-2 Training Plan at the CEMASTEA

A. INSET Training in Kenya							
Training Course		Target Trainees	Qualification of Participants, If any	Record of Training in the Past	Training Programme After SMASSE-2		
					Nos. of Participant	Duration	Times/year
1	National INSET Training (District Centre Trainers Training)	100 Centres×4 subject×4 persons ＝1,600 persons	M･Ed, B･Ed, Dip･Ed,AT4	1,017 persons in 2005(1-7), 90 persons×2 weeks×12 Group	200 persons	2 weeks	8 times
2	Educator Training						
	(1) Principal Workshop	4,000 principal of secondary schools	M･Ed, B･Ed, Dip･Ed,AT4	253 persons in 2004, 204 persons in 2005, 1 week	200 persons	1 week	6 times
	(2) DEO's Workshop	72 DEOs	M･Ed, B･Ed	72 persons in 2003, 47 persons in 2005, 1 week	72 persons	1 week	1 time
	(3) Deputy DEO's Workshop	72 Deputy DEOs	M･Ed, B･Ed		72 persons	1 week	1 time
	(4) QASO Workshop	1,800 persons QASO	M･Ed, B･Ed, Dip･Ed, AT4, P1	178 person in 2004, 60 in 2005, 1 week	200 persons	1 week	3 times
	(5) Stakeholder Workshop	600	M･Ed, B･Ed, Dip･Ed,AT4	300 persons in 2004, 1 week	200 persons	1 week	3 times
3	Pre-service Tutors and the Other Training						
	(6) INSET for Secondary Teacher Colleges	93 tutors	M･Ed, B･Ed HND, Dip･Ed	150 persons in 2005, 1 week	93 persons	1 week	1 time
	(7) INSET for Primary Teacher Colleges	480 tutors	M･Ed, B･Ed		200 persons	1 week	3times
	(8) INSET for TIVET Math. and Science	556 tutors	M･Ed, B･Ed HND, Dip･Ed		200 persons	1 week	3 times
	(9) JOCV Training	Depending on needs					
	(10) Others if any	Depending on needs					

B. The Third Country Training under SMASSE-WECSA							
	Third Country Training			42 and 85 persons in 2004, 95 persons in 2005, 5 weeks	150 persons	5 weeks	1 time

3) Annual Utilisation Ratio

The annual utilisation ratio of the facilities under the training plan described in 2) above will be 81% as training will take place in 42 weeks a year. Meanwhile, the annual utilisation ratio of the hostel capable of accommodating 200 persons will be 73%. Civil servants in Kenya have 40 paid holidays a year and they tend to take these holidays around Christmas time in December. It will, therefore, be difficult to organize training sessions between mid-December and mid-January when many staff members take long holidays. In consideration of this, the annual utilisation ratio of 81% based on 42 training weeks for the training facilities and the annual utilisation ratio of 73% for the hostel are judged to be reasonable as well as feasible. Given the fact that the continuity and expandability of third country training are believed to depend on the financial assistance of donors, the annual utilisation ratios of the training facilities and the hostel will drop to 71% based on 37 training weeks and 66% respectively if such financial assistance of donors is not forthcoming. As these figures exceed the generally required utilisation ratio of 60 – 65% for training facilities, the current training plan presented by the CEMASTEA is still reasonable even in this case.

Table 2-3 Facility Utilisation Ratio of the CEMASTEA

	Facility Utilisation Ratio				Facility Utilisation Ratio (Except Third Country Training)			
	Facility		Hostel		Facility		Hostel	
Item	Week Base (Week)	Ratio(A/B)	200 Beds/Week	Ratio(A/B)	Week Base (Week)	Ratio(A/B)	200 Beds/Week	Ratio(A/B)
Utilization Ratio(A)	42	81%	7,623	73%	37	71%	6,873	66%
Week/Year(B)	52	100%	10,400	100%	52	100%	10,400	100%

4) Training Method

① Training Method

While the national INSET training adopts the cascade method, other types of training directly train the target persons. In the case of the national INSET training, the cascade method using district INSET centres is judged to be more effective because of the large number of mathematics and science teachers (some 16,000) in secondary education are scattered throughout the country.

② Future Direction for Training

- The CEMASTEA considers that that the Cycle 1 through Cycle 4 INSET training to be completed in 2007 has been well received by secondary school teachers and plans to upgrade the training contents after Phase 2 of the SMASSE Project.

- It is planned to issue a certificate corresponding to the specific training contents to those completing the Cycle 5 training and thereafter, excluding those for educator training.

③ Qualification of Participants

Table 2-4 Qualification of Participants

M･Ed	Master of Education
B･Ed	Bachelor of Education
Dip･Ed	Diploma Education
AT4	Approved Teacher Status 4
P1	Primary Teacher College 1
NHD	Higher National Diploma

(2) Training Contents

1) National INSET Training

① Objective

This training aims at training district trainers for four subjects (mathematics, physics, chemistry and biology) at the district INSET centres based on the cascade method. Under the SMASSE-2, Cycle 1 through Cycle 4 training is being conducted and post-Cycle 4 training is planned under the Project.

② Target Trainees

The Ministry of Education (MOE) plans to increase the secondary school transition ratio from the current 40% to 70% in 2015 following the introduction of free primary education. At present, the number of mathematics and science teachers at secondary schools is estimated to be some 16,000. This figure must increase to some 20,000 if the enrolment ratio is increased to 70%.

A district INSET centre is set up at the rate of one centre per 200 teachers but this rate will increase to approximately one centre per 50 – 100 teachers in sparsely populated areas. As of December, 2005, there are 96 district INSET centres nationwide and the number is expected to increase to 100 by March, 2006. It is estimated that the number must increase to 120 by 2008 and further to some 130 by 2010.

A standard district INSET centre is composed of 16 district trainers (four trainers per subject x four subjects). The training plan presented by the CEMASTEA intends the training of 1,600 district trainers at 100 district INSET centres (expected number in March, 2006) and the scale of the training is judged to be reasonable. The target trainees include teachers to replace previously trained teachers who are due to retire or who have already retired and mathematics and science teachers of private schools who were not previously included in the scope of training.

③ Training Programme

Eight sessions of training, each lasting for two weeks and involving 200 participants, are planned to train 1,600 persons a year. 1,017 persons were trained in approximately six months in 2005 and the target figure is feasible once the facility has been expanded to accommodate 200 persons.

④ Training Curriculum

- Implementation of training based on improved curriculum
  Compared to the trainers at the CEMESTEA, district trainers undergo less intensive training consisting of only two weeks of national INSET training a year and, therefore, their training capability at the district INSET centres may not meet the expectations. To improve the situation, the training curriculum will be reviewed and improved under the Project.

- The training for district trainers will incorporate topics corresponding to particular local needs.

Table 2-5 National INSET Training Schedule in SMASSE-2

1st Week	Mon	Tue	Wed	Thu	Fri
8:00-10:30	All	All/Subject	All/Subject	All/Subject	All/Subject
11:00-13:00	All/Group	All/Subject	All/Subject	All/Subject	All/Subject
14:00-17:00	All/Opening	All/Subject	All/Subject	All/Subject	All/Subject
2nd Week	Mon	Tue	Wed	Thu	Fri
8:00-10:30	Subject/Group	Subject/Group	Subject/Group	Subject/Group	Subject
11:00-13:00	Subject/Group (Practice)	Subject/Group (Practice)	Subject/Group (Practice)	Subject/Group (Practice)	Subject
14:00-17:00	Subject/Group (Practice)	Subject/Group (Practice)	Subject/Group (Practice)	Group/Subject	Subject/Closing

2) Principal Workshop

① Objective

This workshop aims at facilitating understanding of the importance of mathematics and science education among principals who play an important role in promoting mathematics and science education as school administrators. Training for principals is also necessary to ensure the smooth and efficient operation of district INSET training as principals control the expenses of the participation of school teachers in district INSET training.

② Target Trainees

According to MOE statistics for 2003, there are 3,547 public and 452 private secondary schools (total of 3,999 schools) in Kenya. The principal workshop targets are all principals of these schools. Even though there is the uncertainty of whether or not the principals of all private schools will participate in the workshop, the planned number of

target trainees is judged to be reasonable in view of the increasing trend of secondary schools.

Table 2-6 Number of Secondary Schools in Kenya

Category	1999	2000	2001	2002	2003
Public	2,785	2,888	3,242	3,247	3,547
Private	412	357	389	420	452
Total	3,197	3,245	3,631	3,667	3,999

Source : MOE

③ Training Programme

Six training sessions, each lasting for one week and involving 200 principals, are planned to train 1,200 principals a year. The training of some 4,000 principals will be completed in approximately 3.3 years and a new training cycle will commence thereafter. This programme is judged to be reasonable in view of the likely review of the national INSET training programme and the cycle of change of social needs. 253 and 204 principals participated in this workshop in 2004 and 2005 respectively. The planned scale is six times larger than that in these two years and is feasible once the facilities have been expanded to accommodate 200 trainees.

④ Training Curriculum

The training curriculum for the principal workshop will be improved in line with the review of the curriculum for the national INSET training programme.

Table 2-7 Principal Workshop Schedule in SMASSE-2

1st Week	Mon	Tue	Wed	Thu	Fri
8:00-10:30	All/Opening	All	School Visits	All	All
11:00-13:00	All	All		Subject (Practice)	All
14:00-17:00	All	All		Subject (Practice)	Subject/Closing

3) DEO's Training

① Objective

This training aims at strengthening the capability of district education officers (DEOs) to operate and manage training as heads of the district INSET training centres and facilitating their understanding of the importance of teacher training.

② Target Trainees

The target trainees are 72 DEOs nationwide.

③ Training Programme

One training session lasting for one week and involving 72 DEOs is planned for each year. 72 DEOs and 47 DEOs were trained in 2003 and 2005 respectively. As the scale of the planned training is similar to that of the past training, the plan is highly feasible.

④ Training Curriculum

The training curriculum will be improved in line with the review of the national INSET training programme.

Table 2-8 DEO's Training Schedule in SMASSE-2

1st Week	Mon	Tue	Wed	Thu	Fri
8:00-10:30	All/Opening	All	All	All	All
11:00-13:00	All	All/Group	All	All/Group	All
14:00-17:00	All	Group/All	All	Group/All	All/Closing

4) Deputy DEO's Training

① Objective

This training aims at strengthening the capability of district education offices to operate and manage the district INSET training centres. As reliance on only DEOs has been found to be insufficient to spread district INSET training, the training of deputy DEOs who will assist the DEOs is planned.

② Target Trainees

The target trainees are 72 deputy DEOs nationwide.

③ Training Programme

One training session lasting for one week and involving 72 deputy DEOs is planned for each year. Even though there is no precedence for this training, the plan is highly feasible given its similar scale to that of the DEO's training.

④ Training Curriculum

The training curriculum will be improved in line with the review of the national INSET training programme.

5) QASO Training

① Objective

This training aims at facilitating understanding of the contents of the INSET training among QASOs (quality assurance and standards officers) who are in charge of the quality control of education and the monitoring/evaluation of INSET training.

② Target Trainees

As the MOE statistics for 2004 put the number of QASOs at 1,849 nationwide, the planned scale of the training involving 1,800 QASOs is judged to be reasonable.

Table 2-9 Number of QASOs in Kenya

	Grade	Establ.
1	Chief Inspector of Schools	1
2	Snr. Deputy Chief Inspector of Schools	2
3	Deputy Chief Inspector of Schools	2
4	Assistant Chief Inspector of Schools	16
5	Snr. Inspector of Schools	106
6	Inspector of School II/I	1,719
	Total	1,846

Source : MOE Newsletter 2003/2004

③ Training Programme

Three training sessions, each lasting for one week and involving 200 participants, are planned for each year. As 600 QASOs are trained each year, the training of the entire 1,800 QASOs will be completed in three years. The training will continue afresh thereafter. The scale of the annual training is judged to be reasonable given the review schedule of the national INSET training programme and the cycle of change of social needs. 178 QASOs and 60 QASOs were trained in 2004 and 2005 respectively. Although the scale of the planned training is more than three times that of the previous training, it is still feasible once the facilities have been expanded to accommodate 200 persons.

④ Training Curriculum

The training curriculum will be improved in line with the review of the national INSET training programme.

Table 2-10 QASO Training Schedule in SMASSE-2

1st Week	Mon	Tue	Wed	Thu	Fri
8:00-10:30	All/Opening	All/Group	School Visits	All	All
11:00-13:00	All/Group	Group(Practice)		All	All
14:00-17:00	Group/All	Group(Practice)	Group/All	All	All/Closing

6) Stakeholder Workshop

① Objective

This training commenced for the purpose of making stakeholders at schools obtain knowledge of the INSET training at the district INSET centres but has subsequently been changed to the workshop style to discuss and find measures to solve the specific problems encountered at such centres.

② Target Trainees

The target trainees are 600 stakeholders at the district INSET centres (DEOs, QASOs, principals and district trainers), consisting of six stakeholders from each of 100 district INSET centres.

③ Workshop Programme

Three workshop sessions, each lasting for one week and involving 200 persons, are planned for each year. The total number of participants will be 600 a year. As the district INSET centres are said to encounter various training-related problems every year, it is desirable for all stakeholders to get together to discuss matters with a view to ensuring the smooth implementation of the district INSET training. From this viewpoint, the planned scale of the stakeholder workshop is judged to be appropriate. In 2004, 600 stakeholders participated in such workshops. The planned scale of the workshops is same that of the workshops in 2004 and is feasible. Given the fact that there are not many opportunities for DEOs, QASOs, principals and district trainers to get together, these workshops will be effectively used to ensure the smooth implementation of the district INSET training.

④ Training Curriculum

The specific problems encountered by each centre will be discussed in the workshop style to find improvement measures.

Table 2-11 Stakeholder Workshop Schedule in SMASSE-2

1st Week	Mon	Tue	Wed	Thu	Fri
8:00-10:30	All/Opening	All	Group	All	All
11:00-13:00	All	All	Group	All	All
14:00-17:00	All	All	Group	All	All/Closing

7) INSET for Tutors of Secondary Teacher Training Colleges

① Objective

This INSET training serves mathematics and science tutors of secondary science teacher training colleges where mathematics and science teachers for secondary schools are trained. The training aims at improving the teaching techniques used by these tutors and making newly trained mathematics and science teachers aware of the ASEI/PDSI.

② Target Trainees

The target trainees are 93 mathematics and science tutors among the 201 tutors at the Kenya Science Teacher College (KSTC) and the Kagumo Teacher College.

③ Training Programme

One training session lasting for one week and involving 93 teachers is planned for each year. Given the fact that 53 mathematics and science teachers of the KSTC underwent

the Cycle 1 training in 2004, followed by Cycle 2 training for 150 teachers, including those of other disciplines in 2005, the planned training of 93 teachers is definitely feasible.

④ Training Curriculum

The INSET training will start with Cycle 1 but the curriculum will be changed after the completion of Cycle 4 in line with the expected improvement of the curriculum for the national INSET training.

8) INSET for Tutors of Primary Teacher Training Colleges

① Objective

This INSET training serves mathematics and science tutors of primary teacher training colleges where mathematics and science teachers for primary schools are trained. This training aims at improving the teaching techniques used by these tutors and making newly trained mathematics and science teachers aware of the ASEI/PDSI.

② Target Trainees

There is a total of 21 primary teacher training colleges in Kenya with a total of 1,197 tutors. The ratio of mathematics and science teachers is 480, i.e. approximately 40%.

③ Training Programme

Three training sessions, each lasting for one week and involving up to 200 tutors, are planned for each year to cover all 480 tutors. Even though there is no precedence for this training, similar training has been conducted for tutors of secondary teacher training colleges. The plan is feasible once the scale of the CEMASTEA's training facilities have been expanded to accommodate 200 trainees.

④ Training Curriculum

It is planned to conduct a survey on and an assessment of the needs to formulate a suitable curriculum by 2008.

9) INSET for Mathematics and Science Teachers of TIVETs (Technical, Industrial, Vocational, Education and Training Institutes)

① Objective

This INSET training serves mathematics and science teachers of TIVETs to improve the teaching techniques used by these teachers. INSET training starting with Cycle 1 is strongly hoped for as the pass rates of the students of these institutes of the KNEC examination are generally very low. One good example is the Kiambu Institute of Science and Technology which is regarded as an excellent TIVET. The pass rate of its

students for science subjects in the said examination in 2005 was as low as approximately 16% for both mathematics and physics and approximately 5.5% for biology.

② Target Trainees

The target trainees are 556 mathematics and science teachers of 37 technical training institutes, national polytechnics and institutes of technology in Kenya.

Table 2-12 Mathematics and Science Teachers of TIVETs

Category	Number of Institute	Number of M/S Teachers
Technical Training Institutes	19	239
National Polytechnics	4	148
Institutes of Technology	14	169
Total	37	556

③ Training Programme

Three training sessions, each lasting for one week and involving up to 200 teachers, are planned for each year to cover 556 teachers in total. Even though there is no precedence for this training, the implementation of this training is important because it is identified as priority INSET training by the MOE. In view of the similar type of training for tutors of secondary teacher training colleges, the plan is highly feasible once the scale of the CEMASTEA's training facilities have been expanded to accommodate 200 trainees.

④ Training Curriculum

The first INSET training of this type is scheduled to take place in August, 2006. By that time, a suitable curriculum will have been formulated based on the survey and assessment results of the needs. If this training is postponed, the curriculum will have been formulated by 2008.

10) SMASS - WECSA Third Country Training

① Objective

This training aims at spreading the training for mathematics and science teachers and stakeholders in secondary education under the ASEI/PDSI in the member countries of the SMASSE – WECSA to improve mathematics and science education in African countries.

② Target Trainees

The target trainees are mathematics and science teachers and stakeholders in education in the 31 member countries of the SMASSE – WECSA. The number of target trainees will increase when new members join the SMASSE – WECSA.

③ Training Programme

One training session lasting for five weeks and involving 150 trainees is planned for each year. Given the fact that two training sessions involving 42 and 85 persons respectively were held in 2004, followed by another two sessions involving 95 and 75 persons respectively in 2005, the plan is highly feasible once the scale of the CEMASTEA's facilities have been expanded to accommodate 200 trainees.

④ Training Curriculum

The curriculum for this training has been developed and training has been in progress under the SMASSE-2. The continued use of the same curriculum is planned. While this curriculum is similar to that for the national INSET training programme, the contents are modified to reflect the specific circumstances, for example, differences in the educational system, when applied to individual countries.

⑤ Funding

The scale of the needs for third country training after the SMASSE-2 is expected to be much larger than the currently planned scale of training. In view of the fact that the third country training under the SMASSE-2 has been predominantly funded by Japan, the feasibility of the planned third country training in the future depends on the availability of funding by a donor(s) and/or the Government of Kenya. The CEMASTEA has provided third country training under the SMASSE-2 and the MOE has promised to make efforts to make the CEMASTEA become a central or international organization for mathematics and science education in Africa. In 2005, third country training accounting for 19% of the total number of training weeks was the second-most frequent training at the CEMASTEA after national INSET training which accounted for 65%. Provided that there is viable funding, the CEMASTEA considers third country training to be the second highest priority training after national INSET training and hopes to make itself a base for mathematics and science education in Africa.

As many member countries of the SMASSE-WECSA have made enquiries to the Secretariat regarding possible participation in third country training at the CEMASTEA and the possible dispatch of lecturers by the CEMASTEA, there appears to be a consensus among all stakeholders regarding the continuation of this third country training at the CEMASTEA.

Table 2-13 SMASSE – WECSA Third Country Training Schedule in SMASSE-2

1st Week	Mon	Tue	Wed	Thu	Fri
8:00-10:30	All/Opening	All	All	All/Group	All/Group
11:00-13:00	All	All	All	Group	Group
14:00-17:00	All	All	All	Group/All	Group/All
2nd Week	Mon	Tue	Wed	Thu	Fri
8:00-10:30	Subject/Group	Subject/Group	Subject/Group	Subject/Group (Practice)	Group(Practice)

11:00-13:00	Group	Group	Group	Group(Practice)	All
14:00-17:00	Group	Group	Group(Practice)	Group(Practice)	Prep. For School Visits
3rd Week	Mon	Tue	Wed	Thu	Fri
8:00-10:30	Subject/Group	Subject/Group	All/Group (Practice)	All/Group (Practice)	All/Group (Practice)
11:00-13:00	Group	Group	Group(Practice)	Group(Practice)	Group(Practice)
14:00-17:00	Group	Group	Group(Practice)	Group(Practice)	All/Group (Practice)
4th Week	Mon	Tue	Wed	Thu	Fri
8:00-10:30	All/Group	All/Group	All/Group	All/Group	All/Group
11:00-13:00	Group	Group	Group	Group	Group
14:00-17:00	Group	Group	Group	Group	Group
5th Week	Mon	Tue	Wed	Thu	Fri
8:00-10:30	All/Group	Group	All/Group	All	Report Writing
11:00-13:00	Group	Group	Group	Report Writing	All
14:00-17:00	Group	Group/All	Group	Report Writing	All/Closing

(3) Other Activities

The sections responsible for academic training at the CEMASTEA will develop their respective training curricula and training materials, etc. in addition to the implementation of the actual training. The Monitoring and Evaluation Section will be responsible for the development of monitoring and evaluation tools and actual monitoring and evaluation along with the publication of newsletters and library management. Meanwhile, The Regional Cooperation Section will be responsible for the preparation of third country training programmes, network management, publication of newsletters and HP (web-site) management, etc.

Table 2-14 Functions and Tasks of CEMASTEA Sections

Section Name		Outline of Function and Task
Director		Centre Management
Internal Auditor		Audit
Academic Section		
	Deputy Director	Academic Programme Management
	Biology	Training operation, INSET curriculum and material development
	Chemistry	Training operation, INSET curriculum and material development
	Physics	Training operation, INSET curriculum and material development
	Mathematics	Training operation, INSET curriculum and material development
	Monitoring & Evaluation	Monitoring and evaluation tool development, Monitoring and evaluation, Newsletter publishing, Library management
	TIVET	Training operation, INSET curriculum and material development
	Regional Cooperation	Third country training programme making, network management, Training coordination, Newsletter publishing, HP(Web-site) management

2.2 Basic Design of the Requested Japanese Assistance

2.2.1 Design Policies

2.2.1.1 Basic Policies

(1) Policies Regarding the Scope of Assistance

The CEMASTEA provides INSET training for mathematics and science teachers, educators and other stakeholders in education to perform its two functions. One of these functions is to act as the National INSET Centre to provide facilities for INSET training to improve mathematics and science education in Kenya's secondary education while the other function is to act as a core base for mathematics and science education in Africa to provide SMASSE – WECSA third country training. At present, the temporary rehabilitated workshop building and other facilities which comprise part of the vocational training facilities are used to provide such INSET training. The limited training capacity of up to 92 trainees and the shortage of rooms required for training mean that any available rooms on the premises must be used as makeshift classrooms. Meanwhile, the expanding needs for INSET training in Kenya and SMASSE – WECSA third country training are making it necessary to expand the facilities to enable the accommodation of up to 200 trainees at one time. This necessity indicates the over-riding need to introduce exclusive facilities which are capable of accommodating 200 trainees for INSET training.

The facilities requested by the Kenyan side are composed of three blocks, i.e. an administration building to manage the entire facilities of the CEMASTEA and to develop training plans/programmes, a laboratory and lecture building to actually conduct the training and a hostel and dining hall to provide a base for trainees undergoing a training session lasting for one or two weeks. All of these facilities are essential for the CEMASTEA, which was established as a body to provide INSET training in Kenya and SMASSE – WECSA third country training, to perform its duties in a comprehensive manner. The construction of these new facilities is also extremely urgent in terms of assisting the promotion of a national goal of the Kenyan government, namely "transition of the economic base to industry by 2020".

In view of the necessity and urgency of the new facilities described above, the policy regarding the scope of assistance has been determined to cover ① administration facilities which are sufficiently large enough to administer the training of up to 200 trainees, ② training facilities which are sufficiently large enough to conduct the training of up to 200 trainees and ③ a hostel and dining hall which are capable of providing a base for up to 200 trainees. The existing facilities have been taken into consideration to meet these policy objectives. The fact that the scale of the planned facilities must be within the maintenance capacity of the Kenyan side is also an important consideration.

(2) Policies Regarding Facilities

1) Linkage to Existing Facilities

As the overall planning envisages the effective linkage of the new facilities to the existing facilities, each of the planned new facilities is located at a site from where linkage to the existing facilities performing the same function can be easily established.

① The new lecture hall, lecture rooms and laboratory in the laboratory and lecture building are placed close to one another so that group sessions, which characterise the training at the CEMASTEA, can be efficiently conducted. These are linked via covered walkways and are located near the existing laboratory building and existing lecture room building.

② The new hostel building is located between the existing hostel buildings to ensure the efficient use of the limited land and to achieve effective linkage with the existing hostel buildings. As it is necessary for the new dining hall to be effectively linked to the new hostel building, it is located near the existing dining hall building.

2) Minimum Scale of New Facilities with Use of Existing Facilities

① The new and existing classrooms and lecture hall will be used for group sessions based on lectures.

② The new and existing laboratories will be used for practical group sessions.

③ The scale of the new dining hall is determined to supplement the seating capacity shortage of the existing dining hall.

3) Scale of Facilities to Suit the Planned Activities

The necessary but minimum scale of facilities is planned by means of analysing the feasibility of each training plan which the CEMASTEA envisages will be applied after the completed expansion of its facilities.

4) Scale and Contents of Facilities to Minimise the Maintenance Cost

① To ensure an affordable maintenance cost for a long period of time, the area to be air-conditioned is limited with the effective use of natural ventilation to minimise the maintenance cost.
② The introduction of air-conditioning is limited to the computer room and an independent air-conditioning system is used to serve only the target room.

5) Appropriate Facility Layout to Ensure Smooth Activities

As described earlier, the new facilities are divided into three blocks: ① administration building expecting many visitors, ② laboratory and lecture building requiring an environment in which the trainees can concentrate on their work and ③ hostel and dining hall block requiring an environment where the trainees can comfortably spend time outside their training. All of the facilities are located in areas which are suitable for them to perform their expected functions.

(3) Policies Regarding Equipment

1) Basic Policy on Equipment Selection
For equipment selection examination, priority which put on each requested equipment item by Kenyan side shall be taken into consideration. Priorities are as follows.

Priority-A: Equipment which is necessary to implement training program

Priority-B: Equipment which is desirable to install for the implementation of training program

Priority-C: Equipment which will be purchased by Kenyan side

Equipment which were put Priority-C is considered to be purchased by Kenyan side so that they will be excluded from the planned equipment under the Project. Equipment which were put Priority-A and B were examined their appropriateness as planned equipment according to Equipment Selection Criteria shown below.

A. Equipment which fulfills the following criteria is considered to be <u>included</u> in the Project.

1) Equipment which is necessary to be replaced because the existed equipment is too old for work.
2) Equipment which is necessary to be added because quantity of existed equipment is in short for experiment and training.
3) Equipment which is necessary for INSET curriculum implementation
4) Equipment which can be operated by users' skill

B. Equipment which fulfills the following criteria is considered to be <u>excluded</u> in the Project.

5) Equipment which is used for high-grade experiments
6) Equipment which is difficult to be installed into building and difficult to be managed by user
7) Expensive equipment which is low frequency in use
8) Consumables, spare parts and reagent
9) Equipment which user is difficult to purchase its consumables and spare parts
10) Equipment which is required expensive cost for maintenance

2) Quantity of the Equipment
Quantity of the Equipment shall be decided by the following policies.

① Equipment which is used for demonstration by the lecturer : 1 (one) unit
② Equipment which is used by the groups of trainees : follow the number of group
③ Equipment which is used by the individuals : 50 (fifty) unit

In addition to the above policies, quantity of existing equipment will be taken into account to decide quantity of equipment.

3) Grade of the Equipment
Grade/Specification of the Equipment shall be minimum requirement to implement INSET curriculum. It shall be fully operated by the trainers as well.

2.2.1.2 Planned Contents of the Facility Components

(1) Characteristics of the Training at the CEMASTEA

1) Group Sessions

The CEMASTEA aims at spreading the movement called the ASEI/PDSI approach designed to restructure mathematics and science lessons to secondary schools. The main focus of this approach is placed on changing the conventional teaching method whereby teachers one-sidedly fill the pupils with new knowledge to the participatory method whereby pupils are actively involved in lessons to learn a scientific way of thinking. Accordingly, group activities have become the principle feature of the training at the CEMASTEA with both classroom lectures and practical laboratory sessions as described below with emphasis on the initiative of the training participants. The planned facilities are, therefore, designed to make such group training easier.

① Exposition: This is usually a brief presentation lasting for an average of 20 minutes, during which the facilitator articulates the rationale, outlines the session objectives and session plan and raises key issues for discussion.

② Group discussion: Guided by well-defined group tasks, small groups with an average of 6 – 8 participants discuss topical issues by reviewing the target status/practice, weaknesses/strengths, their individual/collective role and an alternative/more effective approach.

③ Group reporting and wrapping up: Each discussion group presents a report to the entire group. During this session, the participants also clarify and further discuss the issues to arrive at common conclusions which the facilitator encapsulates during the wrapping up.

2) Main Rooms Used for Training

Because of the predominance of group training sessions, the almost even use of the lecture hall, lecture rooms and laboratories is planned. An example of the room utilisation for the national INSET training in 2005 vividly shows such even use of the training facilities.

Table 2-15 Room Utilisation for National INSET Training in 2005

Remarks(LH):Lecture Hall、(L):Lecture Room、(P):Laboratory

1st Week	Mon	Tue	Wed	Thu	Fri
8:00-10:30	All	All/Subject	All/Subject	All/Subject	All/Subject
Room	(LH)	(LH) (L)	(LH) (L)	(LH) (L)	(LH) (L)
11:00-13:00	All/Group	All/Subject	All/Subject	All/Subject	All/Subject

Room	(LH) (L)	(LH) (L)	(LH) (L)	(LH) (L)	(LH) (L)
14:00-17:00	All/Opening	All/Subject	All/Subject	All/Subject	All/Subject
Room	(LH)	(LH) (L)	(LH) (L)	(LH) (L)	(LH (L)
2nd Week	Mon	Tue	Wed	Thu	Fri
8:00-10:30	Subject/Group	Subject/Group	Subject/Group	Subject/Group	Subject
Room	(LH) (L)	(LH) (L)	(LH) (L)	(LH) (L)	(L)
11:00-13:00	Subject/Group (Practice)	Subject/Group (Practice)	Subject/Group (Practice)	Subject/Group (Practice)	Subject
Room	(P)	(P)	(P)	(P)	(L)
14:00-17:00	Group/Subject (Practice)	Group/Subject (Practice)	Group/Subject (Practice)	Group/Subject	Subject/Closing
Room	(P)	(P)	(P)	(LH) (L)	(L) (LH)

3) Scale of the Facilities to Ensure a Tight Training Curriculum

The planned training to be conducted at the CEMASTEA will be based on the curriculum which has been elaborated through the process of trial and error under the SMASSE-1 and SMASSE-2. As the training only lasts for one or two weeks, its density is quite high and allows only a one hour lunch break. Most of the training courses involve 200 trainees and there are many general sessions in which the entire trainees participate. If the time allowed for the lunch break exceeds one hour, it will be difficult to implement the training curriculum which has been elaborated through the phases of the JICA's technical cooperation project. Therefore, it is essential that all of the trainees finish their lunch within the one hour lunch break.

Table 2-16 Training Time Schedule

Time	Action	Time	Action
6:45-7:45	Breakfast	13:00-14:00	Lunch
8:00-8:30	Registration	14:00-17:00	Training
8:30-10:30	Training	17:00-17:30	Tea Break
10:30-11:00	Tea Break	18:45-19:45	Dinner
11:00-13:00	Training		

4) Room Size to Match the Furniture Size

The size of the furniture currently used in the existing facilities is larger than that in Japan or Asia which is the standard size in Kenya because of the larger body size of Kenyans than that of Japanese or Asians in general. For the Project, the room sizes are calculated based on the standard furniture size in Kenya to avoid any possible complaints. For reference purposes, the body size of the West African trainees attending the SMASSE – WECSA third country training is even larger than that of Kenyans.

(2) Required Rooms and Their Sizes

The rooms required to implement the training planned by the CEMASTEA and their sizes are described in this section.

1) Administration Building
   ① Section Offices

There will be a total of five offices serving the biology, chemistry, physics, mathematics and TIVET sections. These offices will be used by the staff members of each section to develop the training curriculum and materials and to prepare for the implementation of training. According to the planned organizational structure, five rooms serving 18 staff members each are planned. The required office space is calculated based on a unit floor area per person of 6 m^2 as recommended in Japan. Furniture will be transferred from the existing facilities and any shortage will be met by the Kenyan side.

Table 2-17 Comparison Between Planned Offices and Existing Facilities

	Floor Area (㎡)	Accommodation (persons)	Unit Floor Area (㎡/person)
CEMASTEA	108	18	6
Existing	55.2	12	4.6

② Director's Room

This room will be used by the director who runs the CEMASTEA. Furniture will be transferred from the existing facilities.

Table 2-18 Comparison Between Planned Director's Office and Existing and Similar Facilities

	Floor Area (㎡)	Accommodation (persons)	Unit Floor Area (㎡/person)
CEMASTEA	36	1	36
Existing	42.2	1(3)	42.2
AICAD	48	1	48
KSTC	32	1	32

③ Deputy Directors' Rooms

There will be two deputy directors responsible for administration and finance and the academic programme respectively. Given the completely different nature of the work, two rooms are planned. The floor area of each room will be half of that of the director's room. Furniture will be provided by the Kenyan side.

④ Administrative Officer's Room

This room will be used by the administrative officer who is responsible for general administrative affairs, including the handling of cash, such work requiring privacy as counselling and arrangements for facility and equipment maintenance. A document storage area required to perform such work will be provided next to this room. Furniture will be transferred from the existing facilities.

Table 2-19 Comparison Between Planned Administrative Officer's Room and Existing Facilities

	Floor Area (㎡)	Accommodation (persons)	Unit Floor Area (㎡/person)
CEMASTEA	18	1	18
Existing	18.5	1	18.5

⑤ Counselling Room

This room will be used by the administrative officer to provide counselling/consultations for staff members and to conduct business talks with outsiders and internal meetings. The planned size is similar to that of the existing facilities from which furniture will be transferred.

Table 2-20 Comparison Between Planned Counselling Room and Existing Facilities

	Floor Area (㎡)	Accommodation (persons)	Unit Floor Area (㎡/person)
CEMASTEA	18	10	1.8
Existing	19.2	10	1.92

⑥ Secretaries' Room

This room will be used by six persons, consisting of four secretaries, a registrar and an office messenger, and will be located adjacent to the director's room. Furniture will be transferred from the existing facilities and any shortage will be met by the Kenyan side.

Table 2-21 Comparison Between Planned Secretaries' Room and Existing Facilities

	Floor Area (㎡)	Accommodation (persons)	Unit Floor Area (㎡/person)
CEMASTEA	36	6	6
Existing	31.2	2	15.6

⑦ Meeting Room

This room will be used for meetings of the Advisory Council (15 members) and Academic Board (20 members) as well as weekly meetings of senior members of the CEMASTEA (30 persons: director, two deputy directors, 12 assistant deputy directors of seven sections and 15 national trainers from five sections, i.e. three trainers from each section). As the tables and chairs for the existing meeting room designed to accommodate 32 persons will be transferred, the floor area of this room is determined based on the size of these tables and chairs.

Table 2-22 Comparison Between Planned Meeting Room and Existing Facilities

	Floor Area (㎡)	Accommodation (persons)	Unit Floor Area (㎡/person)
CEMASTEA	72	30	2.4(referred to furniture layout)
Existing	81	32	2.53

⑧ Printing Room

This room will be used for the preparation of training materials and other purposes. As it will house the two existing copiers, a binding machine, a work table, paper racks and desks and chairs for three staff members, a similar floor area to the existing floor area is planned.

Table 2-23 Comparison Between Planned Printing Room and Existing Facilities

	Floor Area (㎡)	Accommodation (persons)	Unit Floor Area (㎡/person)
CEMASTEA	36	3	referred to equipment layout
Existing	31	1	referred to equipment layout

2) Laboratory and Lecture Building

① Lecture Hall

The lecture hall will be used for the opening and closing ceremonies of each training course, sessions involving all participants and workshops. The sessions (and workshops) involving all of the participants will involve 200 trainees while the opening and closing ceremonies which take place an intervals of one or two weeks will involve some 300 persons, including guests and staff members of the CEMASTEA. To enable the use of the lecture hall by up to 300 persons, the size of the lecture hall will be sufficiently large to seat 300 persons. Among these 300 persons, 200 will be catered for by chairs with an arm-table (650 mm wide and 900 mm long) while the remaining 100 will be catered for by removable chairs without an arm-table to calculate the required floor area. In addition, a fixed trainer stage and storage for the removable chairs are planned. All of the furniture and AV equipment is planned under the equipment portion of the Project.

Table 2-24 Comparison Between Planned Lecture Hall (Except Stage) and Existing and Similar Facilities

	Floor Area (㎡)	Accommodation (persons)	Unit Floor Area (㎡/person)
CEMASTEA	288	300	0.96
AICAD	224	220 (chair case)	1.02

② Lecture Rooms

As the lecture hall and the existing lecture rooms can be used for group lectures, four new lecture rooms (mathematics, physics, chemistry and biology) are planned. As a larger floor area can easily accommodate groups of trainees, each lecture room will be designed to seat 50 persons instead of the introduction of two lecture rooms seating 25 persons each. All four lecture rooms will have the same floor area allowing the use of chairs with an arm-table (650 mm wide and 900 mm long) which are the standard in Kenya and which are used in the existing lecture rooms. Apart from the blackboards which fall under the facility portion, all of the lecture room furniture is planned under the equipment portion of the Project.

Table2-25 Comparison Between Planned Lecture Rooms and Existing Facilities

	Floor Area (㎡)	Accommodation (persons)	Unit Floor Area (㎡/person)
CEMASTEA	96	50	1.92
Existing	54	23	2.34

③ Laboratories

As the existing laboratories can be used for group sessions, three new laboratories (physics, chemistry and biology) are planned. For the same reason as in the case of lecture rooms, the planned floor area of each laboratory is capable of seating 50 trainees. All of the three new laboratories will have the same floor area capable of easily arranging laboratory tables (1,200 mm wide and 4,200 mm long) which are commonly used in Kenya. As a practical group session is conducted with the trainer showing an example of the training theme, a laboratory table for the trainer will also be provided. The height of the laboratory tables will be 90 – 92 cm which is the common height for such tables in Kenya. Apart from the trainer stages and blackboards, both of which are planned under the facility portion of the Project, all of the laboratory tables and furniture in the laboratories are planned under the equipment portion. Black curtains which are required for experiments using light will be provided for the physics laboratory.

Table 2-26 Comparison Between Planned Laboratories and Existing Facilities

	Floor Area (㎡)	Accommodation (persons)	Unit Floor Area (㎡/person)
CEMASTEA	135	50	2.7
Existing	81	23	3.5

④ Computer Room

This room will be used for the trainees to become accustomed to using computers and to create training materials. The floor size will be sufficient to accommodate 25 two-seater computer desks. An air-conditioning system will be introduced to ensure the stable use of the computers. All of the computers and furniture in this room are planned under the equipment portion of the Project.

Table 2-27 Comparison Between Planned Computer Room and Existing and Similar Facilities

	Floor Area (㎡)	Accommodation (persons)	Unit Floor Area (㎡/person)
CEMASTEA	94.5	50	1.89
Existing	Nil	Nil	Nil
AICAD	112	30	3.63

⑤ Library

The plan for the new library is the storage on open shelves of some 5,000 books consisting of some 3,000 books which are already possessed by the CEMASTEA and a further 2,000 books to be added in the coming years. As the library will be used by not only academic staff but also by trainees at the weekends as well as at night, it will have 12 reading desks and one desk for the library assistant. All of the open bookshelves, reading desks, library assistant desk and chairs are planned under the equipment portion of the Project.

Table 2-28 Comparison Between Planned Library and Existing and Similar Facilities

	Floor Area (㎡)	Accommodation (persons)	Unit Floor Area (㎡/person)
CEMASTEA	67	12 seats + 5,000 books	referred to furniture layout

Existing	47	1,000 books	referred to furniture layout
AICAD	104	24 seats + 10,000 books	referred to furniture layout

3) Hostel and Dining Hall

① Twin Rooms

Although only 54 rooms are required to expand the present accommodation capacity of 92 persons to 200 persons based on simple calculation, 55 twin rooms are planned to avoid mixed occupancy which will occur when the number of female trainees is an odd number.

As the existing twin rooms do not have their own shower and toilet facilities, the trainees use common shower and toilet facilities. Here have been many complaints that the lack of room partitioning fails to provide privacy for the occupants. In view of the facts that many trainees hold senior positions, including that of principal, and that the training lasts for one to two weeks, all of the new twin rooms will be provided with their own shower and toilet facilities. In addition, partitioning will be introduced between the two beds to ensure the privacy of the trainees and their continual commitment to the training. Each room will have one door for the easy management of room keys and convenience of room use.

Because of the qualitative difference between the existing and new twin rooms, the CEMASTEA plans to manage the hostel facilities by allocating rooms based on the position held by each trainee and other criteria.

The planned bed size is the same as that of the existing twin rooms (1,150 mm wide and 2,000 mm long). Such furniture as beds and study desks will be either fixed or semi-fixed and are planned under the facility portion of the Project.

Table 2-29 Comparison Between Planned Twin Rooms and Existing and Similar Facilities

	Floor Area (㎡)	Accommodation (persons)	Unit Floor Area (㎡/person)
CEMASTEA(with shower & toilet)	24	2	12
Existing(without shower & toilet)	18.7	2	9.4
AICAD(with shower & toilet)	24	2	12

② Sick Bay

The sick bay will be used to temporarily accommodate anyone who falls ill during the training period. These people will subsequently be transferred to hospital, if necessary. For example, during the SMASSE – WECSA third country training from 7th November to 9th December, 2005, an average of 12 trainees reported ill: three occasions with one patient, three occasions with two patients and one occasion with three patients. As people who are ill are believed to appear at a similar rate during the domestic INSET training, a sick bay with two beds is planned.

The beds, a drug cabinet and a nurse's desk and chair are planned under the equipment portion of the Project.

Table2-30 Number of Patients During SMASSE – WECSA Third Country Training (7th November – 9th December, 2005)

Date	patients (person)	Transport to Hospital
Nov. 10 (Thu)	1	Nil
Nov. 15 (Tue)	2	2 persons
Nov. 24 (Thu)	1	Nil
Nov. 25 (Fri)	3	1 person
Dec. 1 (Thu)	1	1 person
Dec. 7 (Wed)	2	2 persons
Dec. 8 (Thu)	2	2 persons
Total	12	

③ Washing Rooms

The existing hostel does not have any laundry facilities for the trainees staying at the hostel and the trainees have to wash their clothes, etc. by hand using the common shower and toilet area. Many complaints regarding the lack of such facilities have been made by the trainees. One washing room on each floor of the new hostel building is, therefore, planned to cater for the needs of 200 trainees. Three rooms are judged to be necessary as there is likely to be a rush of washing during the evening shower hour and after dinner.

Each washing room will be provided with three washing machines, three irons and three ironing boards, all of which will be procured under the equipment portion of the Project.

- CEMASTEA: 200 users ÷ 9 machines ÷ 22 users/machine
- Similar facilities (AICAD): 80 users ÷ 6 machines ÷ 13.3 users/machine (six washing machines in two washing rooms are available to serve 80 users)

④ Dining Hall

The lunch time is set at one hour for each of the training courses planned at the CEMASTEA. Most of the training courses involve 200 trainees and there are many sessions which require the participation of all trainees. It is, therefore, essential for all trainees to finish their lunch within one hour. Tea-time which is common in Africa is provided twice a day and all 200 trainees will have their tea at the same time. As it is practically impossible to expect 200 trainees to finish their meal within one hour based on two shifts as African people have a custom of leisurely enjoying their post-meal time, a dining hall with 200 seats is planned. Priority will be given to use of the existing dining hall and additional facilities will be constructed to meet the shortfall of the existing dining hall in terms of the number of seats.

Because of the absence of structural documents, including structural calculations, for the existing dining hall, structural safety cannot be guaranteed if an external wall of the existing dining hall is demolished to extend the facilities to seat 200 persons. A

separate new dining hall with the required number of additional seats will, therefore, be constructed. As the existing dining hall has 80 seats, the new dining hall will have 120 seats. Meals are currently provided in buffet-style and it is planned that the dining hall will allow 200 persons to finish their meal in one hour with the use of heated serving tables which will shorten the time for serving and seating. As in the case of the existing dining hall, the new dining hall will be provided with two heated serving tables.

The floor area of the new dining hall is planned based on the use of 2.25 m long tables with three seats on each side which are commonly used in Kenya. The heated serving tables are planned to be provided under the facility portion of the Project while the dining tables and chairs for the new dining hall are planned under the equipment portion. The dining tables and chairs in the existing dining hall which cater for 80 persons will continue to be used or will be replaced by the Kenyan side.

Table 2-31 Comparison Between Planned Dining Hall and Existing Dining Hall

	Floor Area (㎡)	Accommodation (persons)	Unit Floor Area (㎡/person)
New Dining	180	120	1.5 (referred to furniture layout)
Existing	157	92	1.96 (room is not square)

⑤ Kitchen

The floor area of the existing kitchen is large enough to serve 200 diners provided that the Japanese style of kitchen use where the same cooking table is used from preparation to serving is employed. However, the common cooking method in Kenya involves the placing of large pans after heating in a passageway for the further mixing of cooked food, making the maximum use of a wide passageway necessary. The present kitchen is not large enough to cater for 200 diners based on this local cooking method. In fact, the space for food storage, preparation and the washing up of dishes is already insufficient to cater for 92 diners. Consequently, preparation and the washing up of dishes are conducted outdoors, resulting in an unhygienic situation.

The cooking of 200 meals in one place is more efficient in terms of manpower and time and a new kitchen which is capable of serving 200 diners will be constructed as part of the new dining hall. The transportation of meals from the new kitchen to the existing dining hall will be conducted using carts which will carry packed meals. For this reason, a covered walkway will be constructed to link the new kitchen to the existing dining hall. Almost all of the existing kitchen equipment procured at the time of rehabilitation in 2004 is still usable and will be relocated to the new kitchen. The planned new kitchen equipment to be procured under the facility portion of the Project will be limited to kitchen equipment to meet the shortage of the existing equipment to cater for 200 diners, equipment to replace broken down equipment and equipment necessary for the smooth provision of meals. Because of the complicated connection between the kitchen equipment and gas, electricity and water supply/drainage lines, relocation and connection of the kitchen equipment are planned under the facility portion of the Project to meet the required high level of safety. As the storage and washing up of the tableware used in the existing dining hall can be efficiently conducted in the existing

kitchen, some of the existing kitchen equipment required for heating (to serve tea), storage for and washing up of the tableware will remain in the existing kitchen.

Table 2-32 Comparison Between Planned Kitchen and Existing Kitchen

	Floor Area (m^2)	Accommodation (persons)	Unit Floor Area (m^2/person)
New Kitchen	93.6	200 persons meal	Referred to kitchen equipment layout
Existing	64.8	92 persons meal	Referred to kitchen equipment layout

2.2.1.3 Planned Contents of the Equipment Components

(1) Physics

Major components of the Equipment for Physics department are necessary for experiment, practice, generating teaching materials, preparation of lecture plan and Peer teaching. Equipment will be used for the Physics subjects such as Force, Motion, Wave, Sound, Magnetism, Electric and Electronic.

(2) Chemistry

Major components of the Equipment for Chemistry department are necessary for lecture, experiment and practice for the Chemistry subjects such as Electrochemistry, Thermal chemistry and Metals. As basic experimental equipment and measuring equipment are used generally for the training, they shall be included into planned equipment.

(3) Biology

Major components of the Equipment for Biology department are necessary for experiment, practice, generating teaching materials, preparation of lecture plan and Peer teaching. Equipment will be used for the Biology subjects such as classification, Excretion and homeostasis, Stimulus and response, Reproduction, Genetics, Evolution and Transport. As basic experimental equipment and measuring equipment are used generally for the training, they shall be included into planned equipment.

(4) Mathematics

Major components of the Equipment for Mathematics department are necessary for experiment, practice, generating teaching materials, preparation of lecture plan and Peer teaching. Equipment will be used for the Mathematics subjects such as Measurement and Geometry.

(5) Primary education equipment

Pre-service INSET for Primary Teacher College is planned to be established as new INSET scheme. Primary education equipment will be used for this INSET activities such as lecture, experiment and practice.

(6) Lecture support equipment

Lecture support equipment will be used for lecture and Peer teaching.

(7) Computer room equipment

Computer is necessary to implement computer based lecture, generating lecture plan and preparing teaching materials. Major components of Computer room equipment are computers for trainer and trainee.

(8) Lecture hall equipment

Major components for Lecture hall equipment are sound equipment and furniture for 300 persons (200 trainees and 100 lecturers/guests).

(9) Others (furniture)

Generally existing furniture shall be used continuously. Necessary furniture for new building ,however, will be included into planned equipment.

2.2.1.4 Policies Regarding Natural Conditions

(1) Temperature and Solar Radiation

Nairobi where the project site is located is in the semi-arid savannah zone along the equator but its high altitude of 1,700 m means minor temperature fluctuations throughout the year as illustrated by the mean maximum monthly temperature of 26°C in February and March and the mean minimum monthly temperature of 10°C in July, providing a fairly comfortable climate. The seasonal winds in Kenya are the north-easterly monsoon from December to March, an easterly wind from March to May, a south-easterly wind from June to August and a north-easterly wind from September to December. Most local facilities employ a natural ventilation system to make the best use of such a gentle temperature and the seasonal winds and rooms which are served by an air-conditioning system are limited. In view of this local custom, natural ventilation will be employed for the planned new facilities except for the computer room where an air-conditioning system is required to maintain its proper functioning. The ceiling height will be that which is common in Kenya and large openings, such as windows, will be made as large as possible. Strong solar radiation will be shut out by the eaves of the sloping roof which is common in Kenya and which is used by the existing facilities of the CEMASTEA while ensuring natural ventilation. The existing facilities are arranged along the east-west axis to face the seasonal winds and the new facilities will also be arranged along the same axis.

(2) Rainfall

There are two rainy seasons in Kenya, i.e. the major rainy season from March to May and the minor rainy season from October to December. While the annual rainfall is approximately 1,050

mm, maximum monthly rainfall of approximately 260 mm occurs in April when short downpours, such as squalls, occur. The elevation of the project site is slightly higher than the elevation of the surface of the surrounding roads. As these roads are provided with side ditches, it is unlikely that any rainwater will be drained from the surrounding area to the project site.

The north-eastern part of the project site is the highest part of the site and the land dips by some 18 m towards the south-west. Using this slope, rainwater on the site drains from the south-western corner outside the site via open ditches and underground piping. Rainwater from the planned new facilities will be discharged by connection with the existing rainwater drainage pipes. The fact that the green area on the project site will be reduced due to the construction of the new facilities and increased area of paved road surface means an increase of the rainwater to be discharged due to reduction of the land surface for rainwater infiltration. Accordingly, rainwater drainage channels corresponding to the roof area of the new facilities will be necessary. However, it is judged that any potential problems regarding rainwater drainage will be solved by connection to the existing drainage system because of the relatively small size of the area covered by the new facilities and paved road surface compared to the total area of the site. The planned facilities will be located on the mid-slope and the GF level of each building will be set at 20 cm higher than the highest ground level around the building to prevent inundation of the building. Together with the drainage ditches to be introduced around the building, rainwater from the vicinity of each building will smoothly drained.

(3) Lightning

The relatively large scale of each planned facility means the obligatory installation of a lightning arrester system and, therefore, the installation of such a system is planned. In addition, the introduction of measures to prevent a stray current is planned to prevent any damage to electronic equipment by a stray current caused by a thunderbolt.

(4) Earthquakes

An aseismatic structural design is planned for the new facilities based on the Code of Practice for the Design and Construction of Buildings and Other Structures in Relation to Earthquakes: 1973.

(5) Ground Strength

The results of the test pit survey conducted at three locations on the site indicate that red silty coffee soil prevails below the surface layer of 20 cm to the bottom of the test pits (GL -3.0 m) at all three locations. Black cotton and other soil types which are problematic as bearing soil were not found.

The allowable bearing strength calculated on the basis of the results of the plate load test conducted along with the test pit survey is approximately 185 kN/m^2 which is sufficiently strong enough to support the planned new one to three story buildings under the Project. Accordingly, the use of direct foundations using the red silty coffee soil layer as the bearing soil layer is planned.

2.2.1.5 Policies Regarding Social Conditions

(1) Temporary Relocation Site During the Construction Work

It is planned to relocate the staff currently using the Block A building (administration building) which will be demolished to the SMASSE Project office on the KSTC premises situated some 15 minutes' drive from the CEMASTEA towards Nairobi city centre during the construction period. This office building has a sufficiently large unoccupied area to accommodate the said staff currently using the Block A building.

(2) Harmonious Appearance of the CEMASTEA Facilities

The external appearance of the existing CEMASTEA facilities comprises red clay brick tile walls and grey cement roof tiles. This appearance creates composed scenery through its harmony with the surrounding trees. The planned facilities will have a slightly more modern appearance than that of the existing facilities to maintain harmonious and composed scenery.

(3) Measures to Address Shortcomings of the Existing Facilities

The existing Block A building (administration building) is experiencing rainwater leakage through the roof as well as many cracks in the floor caused by the uneven subsidence of the foundations. The rainwater leakage through the roof is caused by the zinc roofing which does not have any underlay. The roof of the new facilities will be made of cement roof tiles on top of underlay using 30 gauge galvanised mild steel sheets as in the case of the other existing facilities which are not experiencing such leakage through the roof. The floor cracks are presumably caused by uneven subsidence due to the insufficient thickness of the foundations and also by either the subsidence or erosion of the soil below the slabs-on-earth forming the floor. For the new facilities, sufficient depth of the foundations to reach the foundation bed and the introduction of footing beams are planned to prevent the subsidence as well as erosion of the soil.

(4) Measures to Solve Complaints by the Trainees

In view of the complaints made by the trainees currently staying at the CEMASTEA, measures to solve such complaints will be incorporated in the facility plan.

1) The trainees have to hand wash their clothes because of the absence of washing machines.

2) None of the bedrooms have their own shower and toilet facilities.

3) Daily necessities cannot be bought on the premises (a bus service is currently provided on Saturdays and Sundays for shopping trips).

4) The dining hall is small and there is not sufficient space to dine peacefully.

(5) Security Measures

The law and order situation in Kenya has been deteriorating in the last few years and Nairobi is experiencing frequent burglaries involving firearms. For this reason, many buildings in the city are protected by guards and their openings have burglar bars. Burglar bars are installed at such openings as windows and doors at the CEMASTEA together with security lights on the walls. The planned new facilities will be equipped with burglar bars and security lights.

(6) Reduction of the Running Costs

The following measures will be introduced to achieve the conservation of resources and energy to make it easier to fund the operation and maintenance cost for a long period of time.

① Electrical system capable of serving a target area when only part of the facilities is in use

② Preferential selection of commonly used equipment and systems in Kenya so that a local contractor can conduct their maintenance

2.2.1.6 Policies Regarding Local Construction Industry

(1) Building Regulations and Relevant Laws

The building regulations governing the project site stipulate a building to land ratio of 25% and a maximum building height of three stories. However, there are no regulations relating to the proximity of a building, etc. to a nearby road. The layout plan for the new facilities will make the best use of the existing road network on the site to secure smooth access to each facility on the site where many buildings exist.

As buildings in Kenya are subject to the Building Standards Act and the Fire Service Act, etc., the new facilities will comply with these acts.

(2) Environmental Regulations

Although there are no relevant regulations regarding facilities to treat waste water from laboratories which could have adverse impacts on the surrounding environment, a neutralisation tank is planned to neutralise such waste water prior to discharge because of the simplicity and easy maintenance of this tank.

(3) Use of Locally Procurable Materials

Most types of building materials are either produced in Kenya or permanently available in the local market. These markets which are durable and pose few maintenance problems will be selected from locally procurable materials.

(4) Use of Local Construction Method and Local Workers

The common construction method in Kenya uses RC pillars, beams and floors, concrete block walls with a clay brick tile/Nairobi stone or mortar face with a paint finish and sloping roof made

of cement roof tiles. As local workers are familiar with this method, the construction plan will adopt this method so that the buildings can be constructed by local workers without external assistance.

2.2.1.7 Policies Regarding Local Subcontractor

Construction companies in Kenya have developed sufficient technical capability through their work in the country and can work as satisfactory subcontractors of the Japanese contractor as local as the common local construction method is employed. For this reason, priority will be given to the employment of the construction method with which local construction companies are familiar.

2.2.1.8 Policies Corresponding to the Operation and Maintenance Capability of the Project Implementation Body

(1) Easy to Operate Equipment and Systems

The planned building service equipment and systems for the new facilities will be the same or similar to those used by the existing facilities except for the air-conditioning system for the computer room. As this equipment and systems will be maintained by an outside contractor, the Japanese contractor will provide guidance on maintenance for the relevant staff members of the CEMASTEA at the time of handing over upon completion to ensure a proper understanding of the required maintenance methods by the Kenyan side.

(2) Inspectable and Repairable Building Service Equipment, Systems and Equipment

The maintenance of the building service equipment and systems for the existing facilities and independent equipment is entrusted to suitable companies. For this reason, priority will be given to the planning of building service equipment and systems which can be maintained and repaired in Nairobi.

2.2.1.9 Policies Regarding Facility and Equipment Grades

The objective of the planned facilities is to train mathematics and science teachers as well as educators and the planned grades of the facilities are those required to implement such training. As in the case of the existing facilities on the site, locally procurable building materials will be used while aiming at slightly improving the facility grades above those of the existing facilities to make them comparable with those of the SMASSE Project office on the KSTC site.

Grade/specification of the equipment shall be minimum requirement for implementation of INSET curriculum. It shall be operated fully by the trainers.

2.2.1.10 Policies Regarding Construction Method, Procurement Method and Construction Period

The planned facilities include a three story hostel building. If the planned facilities are constructed using locally procurable materials and the common local construction method under the grant aid scheme of the Government of Japan, all of the facilities can be constructed in approximately 12 months. The procurement and installation of equipment within this period are judged to be feasible.

2.2.1.11 Policies Regarding Temporary Work Plan

The project site currently has many facilities and only the area at the south end of the site can be used as a temporary work area. However, a septic tank and others exist in this area and the overall size of the area is not large enough to accommodate the required temporary work area, making the rental of nearby land essential for use as an additional temporary work area. Moreover, given the existence of many trees, the felling of some trees will be necessary.

To prevent the designated construction area from disrupting training in progress, the construction area will be divided into three areas, i.e. the administration and training area, the hostel area and the dining hall area. Each area will have temporary fencing so that the construction work can be safely conducted within these fenced areas. Each area will have one gate at which a guard(s) will be stationed on a full-time basis.

In the case of the hostel area in particular, it is anticipated that the lines of flow of the trainees staying at the hostel will significantly overlap with those for the construction work, making the introduction of an access road necessary for the delivery of construction materials from the north side of the site which is currently not used. Approval for the use of this access road for the delivery of construction materials must be obtained from the CEMASTEA on the grounds that the present state of the land will be restored after the completion of the construction work. The gate for this access road will be manned by a guard 24 hours a day as a security precaution.

In the case of the dining hall area and the administration and training area, it will be difficult to ensure safety if the delivery of construction materials relies entirely on access through the main gate. For this reason, a temporary access road with a gate will be constructed at the south-eastern corner for use by work vehicles, workers and delivery vehicles. The travelling of vehicles from the gate to each area will be accompanied by a guard to ensure traffic safety.

The new access road will be constructed between the existing road on the site to the gate serving the hostel area and the administration and training area. Any damage to the existing roads caused by the subcontractor during the construction period will be restored to their original state by the subcontractor.

2.2.2 Basic Plan

The contents of the original request were the construction of such facilities as an administration building for the administration of training, a laboratory and lecture building where actual training based on lectures and laboratory work takes place and a hostel and dining hall to provide accommodation and meal facilities for trainees spending one or two weeks at the site and a range of equipment attached to these facilities. The overall picture of the requested Japanese assistance involves facilities and equipment similar to the requested facilities and equipment, all of which are required to implement the training programmes envisaged by the CEMASTEA.

Table 2-33 Necessity for Each Facility

Facility	Necessity
Administration Building	Necessary for the development and management of training programmes
Laboratory and Lecture Building	Necessary for the implementation of training
Hostel and Dining Hall	Necessary for training lasting for one to two weeks (longest training period: five weeks)

However, the originally requested facilities and equipment were found ① not to have considered the use of the existing facilities, ② to be too large compared to the staff deployment plan and ③ to have included unnecessary equipment for the planned training activities. Accordingly, the scope of the Japanese assistance has been determined at the minimum required scale and contents of additional facilities to implement the training programmes on the premise of using the usable existing facilities and to ensure the feasible operation and maintenance of the new facilities.

The resulting facilities and equipment to be provided under the Japanese assistance are outlined in the table below. To be more precise, they are such facilities as an administration building, lecture hall, laboratory and lecture building, water reservoir tank, pump room and electrical room, etc. and a range of equipment attached to these facilities.

Table 2-34 Outline of Facilities and Equipment Envisaged for Japanese Assistance

Necessary Rooms	Original Request			Scope of the Project		
	Accom. (person)	Room Number	Remarks	Accom. (person)	Room Number	Remarks
A. Administration Building						
1. Administration Building						
Office	20	5	Physics, Chemistry, Biology, Mathematics, TIVET	18	5	Physics, Chemistry, Biology, Mathematics, TIVET. Existing desk and chair use
Director room	1	1	With toilet	1	1	With toilet. Existing desk and chair use
Deputy Director Room	1	2	Administration & Finance, Academic Programme	1	2	Administration & Finance, Academic Programme
Administrative Officer Room	1	1	With document store	1	1	With document store. Existing desk and chair use
Counselling Room	-	1	Additional request. Existing desk chair use	10	1	Existing desk and chair use
Chief Advisor	1	1	For JICA Technical Cooperation	0	0	
Coordinator	1	1	For JICA Technical Cooperation	0	0	

Secretary Room	4	1	4 Secretary, registry, office messenger	6	1	4 Secretary, registry, office messenger. Existing desk and chair use
Reception	-	1	Reception counter	-	1	Reception counter at an office
Meeting Room	30	1		30	1	Existing desk and chair use
Pantry	-	1	With Sink counter	-	2	With Sink counter
Printing Room	-	1	Existing copy machine, biding machine, desk and chair use	3	1	Existing copy machine, biding machine, desk and chair use
B. Laboratory and Lecture Building						
2. Lecture Hall	300	1	With stage, audio visual equipment, chairs	300	1	With stage, store, audio visual equipment, chairs
3. Lecture Room Building						
Lecture Room	50	6	With black board, chair	50	4	With black board, chair
4. Laboratory Building						
Physics Lab.	50	1	With dark room, preparation room. Laboratory equipment, table, chair	50	1	With dark curtain, preparation room. Laboratory equipment, table, chair
Chemistry Lab.	50	2	With preparation room. Laboratory equipment, table, chair	50	1	With preparation room. Laboratory equipment, table, chair
Biology Lab.	50	2	With preparation room. Laboratory equipment, table, chair	50	1	With preparation room. Laboratory equipment, table, chair
Computer Room	50	1	Computer, desk, chair	50	1	Computer, desk, chair
Library	-	1	Open book shelf, 12 reading desk, 1 library assistant	1	1	Open 5,000 book shelf, 12 reading desk, 1 library assistant
C. Hostel and Dining Hall						
5. Hostel						
Twin Room	2	55	With shower and toilet	2	55	With shower and toilet
Reception	-	1	With desk and chair	4	1	With reception counter, desk and chair, KIOSK
Sick Bay	-	1	2 beds, 1 nurse, shelf	1	1	2 beds, 1 nurse, shelf
Common Room	-	1	Existing dining hall use		1	Lounge in Hostel and existing dining hall use
Washing Room	-	1	For 200 persons	-	3	For 200 persons. 3 washing machines and irons
Linen Laundry	-	1	Existing equipment use. Additional 1 Sheet iron machine.	-	1	Existing equipment use. Additional 1 Sheet iron machine.
6. Dining Hall						
Dining Hall	200	1	New built with 200 seats	200	1	Existing 80 seats, extension 120 seats, totaling 200 seats
Kitchen	-	1	For 200 persons capacity. Existing kitchen equipment use	-	1	New built with 200 persons capacity with preparation area and stores. Existing kitchen equipment use with additional necessary equipment.
D. Common space for the above such as toilet, store and corridor etc.						
E. Pavement, Drainage					Expansion	Pavement and drainage around new building. Septic tank and neutralization tank.
F. Power and Water Supply						
Generator Room	-	Existing	Expansion if necessary		Expansion	Transformer room, Distribution panel, generator add
Borehole	-	Existing	Expansion if necessary		Expansion	Water reservoir tank, pump, elevated water tank add
G. Annex Basic Furniture to the above						
Total Floor Area	Approximately 5,300㎡			Approximately 5,740㎡		

2.2.2.1 Policies for Site and Facility Layout Plan

(1) Characteristics of the Site

The CEMASTEA site has an area of some 13.51 acres (56,674 m^2) and is situated on south sloping land with an overall elevational difference of some 18 m. Flat land is mainly distributed near the northern end of the site and the inclination of the land becomes steeper towards the southern end.

Eight training-related buildings are scattered on this site and the large trees around these buildings create a calm atmosphere as the external brick walls of the existing buildings are in harmony with the greenery. In addition, staff housing which is currently being rehabilitated is located in the north-eastern corner and eastern side of the site.

(2) Site Evaluation Results and Other Conditions

① The site dips from north to south and the relatively flat area in the north with the highest elevation is the most suitable for the construction of the new facilities because of the easier implementation of a good drainage plan and other reasons. As the inclination becomes steeper towards the south, costly ground preparation work will be necessary to provide good drainage if the new facilities are located in the southern part.

② There are many buildings on the site. While the Block A building (administration building) near the centre can be demolished, the continued use of the other buildings restricts the availability of building land.

③ The existing facilities are laid out in three blocks, i.e. the administration block, the laboratory and lecture block and the hostel and dining hall block.

④ There are many large trees on the site and the felling of some of these will be necessary to provide the necessary building land.

(3) Layout Policies

① In accordance with the perceived function of each facility, the planned facilities will be classified into three types, i.e. administration facilities, training facilities and hostel/dining facilities. Using the inclination of the land in an effective manner, each of these three types of facilities will be planned as a separate building to perform the required functions.

② As the plan for the new facilities includes the continued use of the existing facilities, each of the new facilities will be located in a position from where linkage with the existing facilities with the same functions can be easily established. The lecture hall, lecture rooms and laboratories in the training block in particular will be located adjacent to each other to ensure efficient group sessions which are a leading characteristic of the training at the CEMASTEA. These will be connected by covered walkways for the easy movement of trainees at the time of rain. The new facilities will be positioned near the existing laboratory and lecture building.

③ The new administration building will be positioned nearer to the access road than the other facilities to allow easy access by visitors.

④ The new hostel building will be positioned between the existing hostel buildings to establish functional linkage with the existing facilities while utilising the limited available land in an effective manner.

⑤ The additional dining hall will be positioned near the existing dining hall to ensure easy supplementation of the seating shortage of the latter.

⑥ All of the new buildings will be positioned along the east-west axis as in the case of the existing buildings in view of better natural ventilation.

2.2.2.2 Building Plan

(1) Plan

① The laboratory and lecture room building will be a two story building in view of the land restrictions and ease of its use.

② The lecture hall building will be a single story building as it requires a long span structure without pillars over the entire floor space because of its assigned function.

③ The hostel building will be a three story building in view of the land restrictions and ease of its use through linkage with the existing hostel buildings.

④ The dining hall will be a single story building to allow its simultaneous use by many diners.

⑤ A courtyard will be introduced for the multi-story hostel building and the laboratory and lecture room building to create a good environment.

⑥ The size of each building will match the size of standard furniture in Kenya.

⑦ An air-conditioning system will only be installed in the computer room and natural ventilation, which is commonly used in Nairobi, will be employed in other rooms.

⑧ A ramp and toilet for the disabled will be added to the lecture hall which is most likely to be visited by the disabled.

⑨ Burglar bars will be installed on the openings of each building for security purposes.

Table 2-35 Floor Area of Each Planned Room

Room Name	Accommodation	Unit Floor Area	Planned Floor Area	Remarks
	(Person)	(㎡)	(㎡)	
Administration Building				
5-Offices	18×5=90	6	540	Each section 18 persons
Director room	1	36	36	
2-Deputy Director Room	2	18	36	
Administrative Officer Room	1	18	18	With document store
Counselling Room	10	1.8	18	Counseling and advise
Secretary Room	6	6	36	4 secretary + 2 persons
Meeting Room	30	2.4	72	Use for the board and staff meeting
Printing Room	3	Equipment layout	36	Existing copy and binding machine
Common Space	-	-	371.4	
Sub-Total			1163.4	
Laboratory and Lecture Building				
Lecture Hall	300	1.05	315	Chair with arm-table
4- Lecture Room	200	1.92	384	Chair with arm-table
3- Laboratory	150	2.7	405	5 Laboratory tables for 50 persons
3-Preparation Room	-	Furniture layout	81	Preparation and store
Computer Room	50	1.88	94	Computer Desk for 2 persons
Library	13	Furniture layout	67	5,000 books,12 reading desks
Common Space	-	-	495.4	
Sub-Total			1841.4	
Hostel				
55-Twin Room	110	12	1320	With shower and toilet
Reception	4	6	24	Registration, operation, KIOSK
Sick Bay	1	Equipment layout	24	1 Nurse, 2 beds
3-Washing Room	-	Equipment layout	48	3 Washing machine, 3 iron with table
Linen Laundry	-	Equipment layout	47	Existing equipment use
Common Space	-	-	711.1	
Sub-Total			2174.1	
Dining Hall				
Dining Hall	120	1.5	180	Table for 6persons with 2.25m (L)
Office	1	6	6	Management
Kitchen	-	Equipment layout	94	Existing equipment use
Food Store(dry, vege.)	-	-	30	With food shelf
Cold Room (-5, +5℃)	-	-	6	With hanger and shelf
Common Space	-	-	164.4	
Sub-Total			480.4	
Transformer, Electrical, Pump room		Equipment layout	82.1	Transformer, Generator, distribution panel, pump
Total			5741.4	

(2) Section

① In accordance with the preference for natural ventilation, a sloping roof will be adopted to deal with radiation heat caused by direct sunlight and to smooth drain rainwater. The roof will have gutters along the eaves for the swift drainage of rainwater via vertical drains from

the roof so that rainwater will not erode the ground of which the steep inclination is one of the site's characteristics.

② The GL level of each building will be set at 20 cm higher than the highest ground level of the surrounding area to prevent the inflow of rainwater into the building.

③ As the site dips by some 18 m from north to south, drainage facilities will be constructed around the planned facilities for the smooth drainage of rainwater. The introduction of sheathing using a retaining wall, etc. will be considered by examining the relationship between the gradient of the land and the GF level of each building.

(3) Building Design

All of the new buildings will be designed as suitable facilities for the CEMASTEA as the national INSET centre in Kenya as well as a core body for mathematics and science education in Africa while ensuring harmony with the existing buildings nearby. To be more precise, the appearance of the new buildings will be similar to that of the existing buildings on the site although a little more modern than the existing buildings to ensure harmony between the new buildings and the environment. A contrasting outlook will be created between the roof made of cement roof tiles and the walls made of clay brick tiles and exposed fair concrete. In principle, aluminium frames will be used for the windows. The colour arrangement of the new buildings will be the same as that of the buildings in the surrounding area as common local building materials will be used.

(4) Structural Plan

1) Design Policies

The structural design will be in line with the design load guidelines and structural design standards in Kenya as well as the corresponding BS standards. The standards of the Architectural Institute of Japan will also be used as supplementary standards. For the aseismatic design, the value of the shear modulus, etc. will be determined with reference to the Code of Practice for the Design and Construction of Buildings and Other Structures in Relation to Earthquakes (1973) and the design will follow the standards of the Architectural Institute of Japan.

2) Ground Conditions and Foundation Plan

The results of the test pit survey conducted at three locations on the site indicate that red silty coffee soil prevails below the surface layer of 20 cm to the bottom of the test pits (GL - 3.0 m) at all three locations. In view of the presence of such soil, the type of foundations for the planned facilities will be direct foundations using this silty layer as the bearing soil layer as in the case of the existing facilities. The allowable bearing strength calculated on the basis of the results of the plate load test conducted along with the test pit survey is approximately 185 kN/m^2 which is sufficiently strong enough to support the planned new one to three story buildings under the Project. The use of this layer as the bearing soil layer is expected to prevent the uneven subsidence of the new buildings.

Moreover, footing beams will be introduced to reinforce the slab-on-earth for the GF of each building so that any subsidence originating from the banking soil to compensate for the elevational difference on the site and/or backfilling soil will not cause any negative impacts on the building.

- Type of foundations : direct foundations
- Bearing soil layer : red silty coffee soil below GL -2.0 m
- Bearing strength : 150 kN/m^2 (safety side in view of the elevational difference on the site and other factors)

3) Skeleton Plan

The main skeleton will use a rigid frame structure which is common in Kenya. The types of structure for different parts of the building are listed below.

- Main structure : RC
- Gable roof : steel structure
- Internal and external walls : Concrete blocks

4) Design Loads

The types of design loads to be considered are the dead load, live load, wind load and seismic force.

① Live Load

A realistic live load for each room based on its expected use is adopted in accordance with Kenyan Standards KS02-755:1988 and BS6399-1:1966. The live load values to be used for the main rooms are listed below.

- Office : 2,500 N/m^2
- Lecture room : 3,000 N/m^2
- Laboratory : 3,000 N/m^2
- Twin room : 1,500 N/m^2

② Wind Load

The wind load is calculated in accordance with BS6399-2-1997.

③ Seismic Force

In accordance with Kenya's aseismic design standards, the seismic force is calculated as described below based on the purpose of use, type of structure and ground conditions of the planned facilities and the seismic zone in which the project site is located. In regard to the seismic zone, the planned facilities are judged to be located in

Zone VIII-IX for safety purposes as the project site is located near the boundary between Zone VII and Zone VIII-IX. The standard shear modulus (C) for the planned facilities is approximately 0.10 (0.2 in Japan).

< Calculation of Seismic Force >

$F = C \cdot W$

W : building height
C : standard shear modulus

C = 1.0 x Cb (based on the following conditions)

Purpose of use	: school, hostel → Class A	C = 1.0Cb
Type of structure	: rigid → framed structure (Flexible)	
Ground conditions (ground survey)	: medium	
Seismic zone (site location)	: Zone VIII-IX	

$Cb = 0.05/\sqrt[3]{T}$, $T = 0.09H\sqrt{D}$

(T: natural period, D: building width, H: building height)

3) Materials to be Used

The following materials which can be locally procured will be given the priority of use.

- Concrete : normal concrete with a design strength of C25 (BS5328)
- Reinforcing bars : deformed bars T10 – T25 (Grade 460: BS4449)
- Structural steel : C, L and H sections

(5) Mechanical Building Service Systems

1) Design Policies

All of the systems will be easy to operate and maintain. Apart from the computer room, natural ventilation will be used without mechanical air-conditioning.

2) Air-Conditioning and Ventilation Systems

① Air-Conditioning System

Air-cooled package air-conditioning units will be used for the computer room. In view of the possible partial use of this room, each unit can be independently operated to reduce the overall running cost. These units will be the wall-mounted type because of the short piping requirements for the cooling medium and drain and also because of easy maintenance.

③ Ventilation System

A ventilation system will be installed in the following rooms requiring ventilation.

- Shower and toilet area of each new twin room
- New kitchen
- New library
- New toilets

③ Cold Room

As in the case of the existing kitchen, two cold rooms (freezing room and chilled room) are planned for the storage of fresh food. The freezing room with a temperature of -5°C will be used for the storage of meat while the chilled room with a temperature of 5°C will be used for the storage of vegetables. The freezing room will be equipped with meat hooks and shelves while the chilled room will be equipped with shelves. Both of these rooms will be made of assembled insulation panels and the required temperatures will be achieved by the respective unit coolers.

3) Plumbing and Sanitary Work

The use of locally procurable sanitary fixtures and materials will be given priority in view of easy maintenance.

① Water Supply System

There are two boreholes on the site. The older borehole has a water lifting capacity of 0.8 m^3/hr while the new borehole dug in 2004 has a water lifting capacity of 2.4 m^3/hr. The use of boreholes in Kenya is restricted to one borehole per site and the use of the new borehole with the higher lifting capacity will be more effective. City water is only supplied to the site for half of the week because of water supply restrictions which are in force. In view of this situation, the borehole with a water lifting capacity of 2.4 m^3/hr will be used as the main water supply source. The estimated water consumption per day based on 200 trainees is approximately 53.5 m^3 which is judged to be within the supply capacity of the new borehole, including peak hours.

Table 2-36 Population for Estimation

	Trainees	Staff 1	Staff 2	Max. Population
Existing	92	20	68	180
Increasing persons by the expansion	108	0	56	164
Total	200	20 family (100 person)	124	344

Remarks: "Staff 1" means staff who is living at staff houses in the site including their family.(4 persons per 1 staff 1)
"Staff 2" means who is not living at staff houses in the site.

Table 2-37 Estimation of Water Consumption per Day

Type	Number of Persons	Unit Water Consumption [L/per.・day]	Daily Water Consumption [L/day]	
Trainees	200	※1 200	40,000	
Staff 1	20 (100)	490	9,800	
Staff 2	124	30	3,720	
Total	344 (424)	-	53,520	→ 53.5m^3/day

※1 Water consumption per-day and person of Hostel in Japan (referred to design standard of central government): 180L/person-day×110%

Table 2-38 Balance Sheet for Water Consumption and Water Supply

TIME	Total Water supply [m^3/h]	Volume of reserved water [m^3]	Water consumption [m^3／h]	Porpose of water consumption	Check of the balance
Remaining water	－	30.00	0		
0:00	2.4	32.40	0		－
1:00	2.4	34.80	0		－
2:00	2.4	37.20	0		－
3:00	2.4	39.60	0		－
4:00	0.7	40.30	0		－
5:00	0	40.30	0		－
6:00	2.4	37.30	5.4	Shower/ Washing	OK
7:00	2.4	31.70	8.0	Breakfast/ Washing	OK
8:00	2.4	33.10	1.0	Lecture	OK
9:00	2.4	34.00	1.5	Lecture/Washing Sheets	OK
10:00	2.4	34.50	1.9	Tea Time/Washing sheets	OK
11:00	2.4	35.40	1.5	Lecture/Washing Sheets	OK
12:00	2.4	36.30	1.5	Lecture/Washing Sheets	OK
13:00	2.4	31.20	7.5	Lunch	OK
14:00	2.4	32.10	1.5	Lecture/Washing Sheets	OK
15:00	2.4	33.50	1.0	Lecture/Washing Sheets	OK
16:00	2.4	34.90	1.0	Lecture	OK
17:00	2.4	35.90	1.4	Tea Time/Washing sheets	OK
18:00	2.4	38.20	0.1	Rest	OK
19:00	2.4	33.00	7.6	Supper/ Washing	OK
20:00	2.4	22.80	12.6	Shower/ Washing	OK
21:00	2.4	25.20	0	Going to bed	－
22:00	2.4	27.60	0		－
23:00	2.4	30.00	0		－
Total	53.5	-	53.5		OK

The planned water supply system consists of the existing borehole (newer borehole) and elevated water tanks. To reduce the risk of water supply suspension during peak hours due to seasonal fluctuation of the groundwater level, a water reservoir tank tank capable of storing the maximum daily water supply volume will be introduced. The configuration of the water supply system, including this tank, is outlined below.

i. Underground water reservoir tank tank capable of storing the maximum daily water supply (54 m^3)

ii. New elevated water tank (20 m^3) on the roof of the new three story hostel building, i.e. the highest building on the site, for gravity water supply to all of the new facilities via the new water supply network which is connected to the existing network to allow mutual back-up operation if one network fails

iii. Two new water lifting pumps (lift-up pumps) to exclusively lift up water from the new water reservoir tank to each of the existing elevated water tank (43 m^3) and the new elevated water tank (20 m^3) with the arrangement of piping to allow back-up operation of the two pumps

iv. Connection of the new water reservoir tank to the city water supply as an auxiliary source of water supply even though this supply is extremely unstable because of the restrictions in place

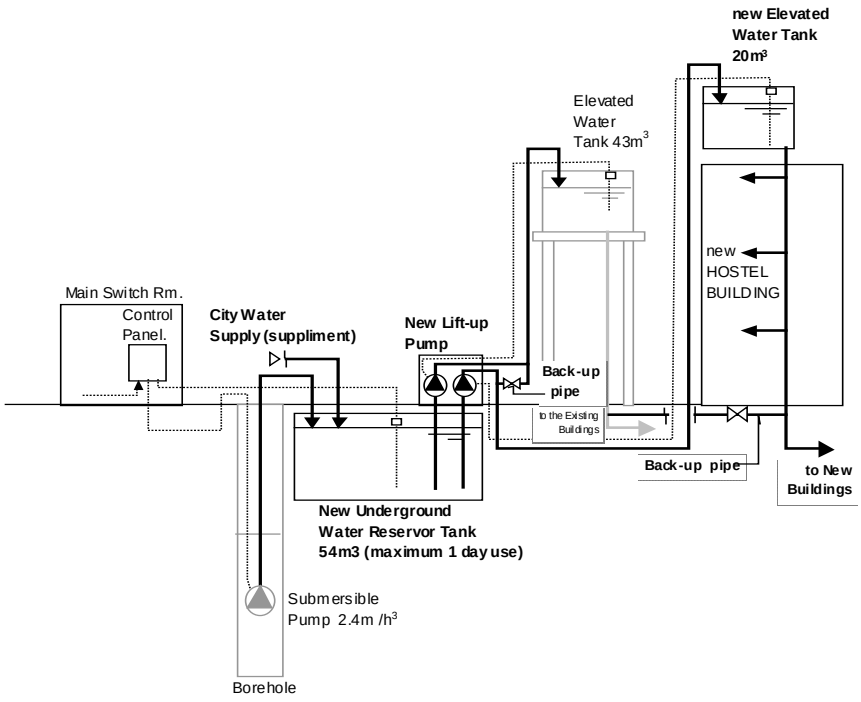


Figure 2-1 Water Supply System Diagram

② Hot Water Supply

Hot water supply is planned for the following rooms where hot water is required.

- Shower in each new twin room
- New kitchen

At present, hot water supply to the showers in the existing hostel building is made using solar panels installed on the roof and auxiliary water heaters. The overall supply volume of hot water is, however, insufficient as hot water is only supplied to the showers for common use. As each twin room has its own shower under the Project, the required hot water supply volume will significantly increase. If only solar panels are used to meet the increased demand for hot water supply, the required area for such panels will be almost comparable to the roof area of the new hostel building. Such large coverage is unrealistic and the maintenance of a large number of solar panels would be extremely difficult. Therefore, the idea of using solar panels to supply hot water to each twin room has, therefore, been abandoned. Instead, a shower head type electrical cassette, which is popularly used in Kenya, will be installed in each twin room to supply warm water to the shower which is a common practice in Kenya. This equipment is inexpensive, easy to procure in the local market and easy to maintain and repair.

Hot water supply to the kitchen and laundry will be provided by a water storage type, independent electric water heater in view of the need for the stable supply of hot water.

③ Sewer System

- Foul Water and Miscellaneous Waste Water
  Foul water and miscellaneous waste water will be discharged through separate channels indoors but will be conveyed outdoors for sedimentation and separation in the septic tank and the supernatant will be discharged for penetration into the ground. As neither the existing septic tank nor the penetration system have any surplus capacity, a new septic tank as well as penetration system are planned.

- Rainwater
  The drainage of rainwater from the new facilities outside the site will be conducted by connecting new drainage pipes to the existing open ditches and underground drainage pipes.

- Laboratory Waste Water
  Waste water from the laboratories will be discharged for penetration into the ground after its neutralisation to pH 6 – 8 in the neutralisation tanks which will be the semi-manually operated type for easy maintenance.

④ Sanitary Fixtures

- Closets : low tank type Western closets which are commonly used in Kenya

- Urinals : wall-mounted stall type
- Basins : single faucet type without hot water supply

⑤ Fire-Fighting System

In compliance with the local Fire Service Act, indoor hose reels and fire extinguishers will be introduced. Water supply to the indoor fire plugs will be made from the new elevated water tank using gravity.

- The specifications of the indoor hose reels will be a service radius of 30 m, a water discharge volume of 44 litres/min per point and a discharge distance of 11.43 m (at 2 Bar).

  - Installation points: near the staircases in each building, kitchen and lecture hall

- The existing gas extinguisher system at the existing kitchen will be relocated to the new kitchen.

- There will be three types of fire extinguishers, i.e. CO_2 extinguisher, water extinguisher and ABC dry chemical, the choice of which depends on the purpose of use of each room. A fire blanket (5 m x 5 m) will be provided in the kitchen to deal with cooking pan fires. The other installation standards are listed below.

  Installation Standards
  - CO_2 extinguisher (2.3 kg) and a pair of water extinguishers along the corridor of each floor
  - Water extinguisher along corridors facing such rooms as the document storage room where combustibles are stored
  - CO_2 extinguisher and a pair of water extinguishers along the corridor facing the computer room
  - Water extinguisher in such common spaces as corridors in the hostel building

⑥ Kitchen Equipment

Although the existing kitchen equipment will, in principle, be relocated to the new kitchen, some kitchen equipment will be newly procured to compensate for the shortage of existing equipment to serve 200 meals at a time. The relocation and connection of the existing kitchen equipment will be included in the scope of the Project to ensure the safe connection of gas pipes, etc.

New kitchen equipment: gas cooking range with oven, high pressure cooker, gas baking oven, potato peeler, potato chipper, food mixer, meat blender, boiling pan, S.B.S.D sink unit, SS work top, cutlery rack, automatic dish washer, refrigerator, food trolley, serving table with heater, tea urn, coffee urn, milk urn and beverage refrigerator, etc.

⑦ Gas Supply System

The existing LPG storage tank (1.5 m^3) installed to serve the kitchen will be used to supply gas to the new kitchen. The piping work for connection to the new kitchen will be included in the scope of the Project to ensure safe connection. A LPG cylinder yard will be planned to supply LPG to the biology and chemistry laboratories in the new laboratory building. The LPG cylinder yard serving the existing biology and chemistry laboratories will be kept to serve group sessions.

⑧ Laboratory Shower

As in the case of the existing laboratories, an emergency laboratory shower system will be installed in each laboratory to deal with incidents involving the accidental scattering of the chemicals used for laboratory experiments. This system will release a large amount of water when a chain located near the laboratory entrance is pulled.

(6) Electrical Installation Plan

1) Power Receiving and Transforming Systems

At present, the overhead power service line is extended from Karen Road to the east of the site to the existing electrical room. The replacement of breakers and meters, installation of an additional distribution panel and remodelling of the existing distribution panel will be necessary if the existing power receiving system is to be improved to supply power to the planned facilities. When considering the load capacity of the planned facilities, however, this cannot be met by the use of the available space for the installation of additional equipment in the existing electrical room. The construction of a new electrical room is, therefore, necessary.

In regard to the power receiving capacity to serve the planned facilities under the Project, the highest level of power consumption occurs during those hours when the hostel building, dining hall and kitchen are simultaneously used. Therefore, the power receiving capacity for the entire facilities at the CEMASTEA is determined by adding the service capacity for the existing hostel building and kitchen to the newly required service capacity. To be more precise, the service capacity for the planned facilities is 334 KVA and the service capacity for the existing facilities is 85 KVA, totalling 419 KVA which constitutes the power receiving capacity. The power is supplied to the site via an 11 kV high voltage service line. In accordance with the rules of the local electricity company, a transformer room for use by the electricity company will be newly constructed. Power will initially be received by this transformer room and will then be supplied to the existing power and receiving distribution system in the existing electrical room via the new power receiving panel to be installed in the new electrical room. A watt-hour meter will be installed at the primary side of the new incoming panel in the transformer room. Cabling to the incoming switch-gear, transformer, watt-hour meter and incoming panel will be conducted by the local electricity company as part of the work to be undertaken by the Kenyan side while the electrical installation work from the new incoming panel onwards will be conducted by the Japanese side.

According to the actual measurements, the voltage fluctuation of the supplied power in the range of between -5.7% and +7.9% is not particularly large and, therefore, no AVR (automatic voltage regulator) will be installed. At present, there is an emergency generator (250 kVA, 240 – 415 V) to provide power at the time of a power cut. This generator uses kerosene as the fuel and 500 litres (equivalent to approximately nine hours of generating operation) of kerosene is stored.

The existing generator appears to have a reserve generating capacity of some 50 kVA but this cannot meet the expected total load of 450 kVA of the entire planned facilities. Accordingly, a new generator which is capable of providing 450 kVA is planned for the new electrical room and the kerosene storage volume will be increased to 1,000 litres (equivalent to approximately 9 hours of generating operation).

2) Trunk Power System

Power will be distributed from the distribution panel in the new electrical room to the lighting distribution board and power control board in each building. The trunk distribution cables and power cables will be installed in conduits. Warning lights for the distribution equipment, generator, water pump and septic tank will be displayed on the alarm panel in the gate house.

The electricity system for the trunk branch circuits will be as follows.

- Trunk lighting circuit : three phase four wire, 415/240 V
- Branch power circuit : three phase three wire, 415 V
- Branch lighting circuit : single phase two wire, 240 V

3) Cabling and Lighting

Lighting areas corresponding to the zoning units of the lighting distribution boards will be introduced to allow the switching on and off of each area to reduce the running cost of lighting.

Apart from receptacles for general uses, receptacles for exclusive use will also be installed to serve equipment and laboratory tables in the laboratories, OA equipment in the offices and AV equipment in the lecture hall, etc. to match the arrangement and capacity of each equipment.

4) Lighting System

Lighting in the planned facilities will mainly used fluorescent lamps of sizes which can be locally procured to reduce the running cost. Lighting fixtures in the computer room will be those with louvers which can be locally procured. Exit route lights will be installed at strategic points to ensure safe evacuation at the time of a power cut.

The planned illuminance for the main rooms is listed below.

- Lecture hall : 350 lux
- Lecture rooms and laboratories : 350 lux
- Computer room : 500 lux
- Offices and library : 350 lux
- Kitchen : 250 lux
- Twin rooms : 250 lux
- Entrance and corridors : 150 lux

5) Telephone System

At present, two overhead incoming telephone lines are extended from Karen Road on the eastern side of the site to the existing Block A building (administration building). This Block A building is the only building equipped with a telephone system and two lines are used for outside calls and Fax/Internet connection. For the new facilities, five incoming telephone lines, including the two existing lines, are planned. Cabling for the telephone system to outlets in certain rooms which require telephone connection via the main terminal board and relay terminal board inside the buildings will be installed. The Kenyan side will be responsible for the work up to the connection of the incoming lines to the main terminal board and the cabling work and equipment installation after the main terminal board will be included in the scope of the Project, i.e. Japanese assistance.

A telephone exchange will be installed in the secretary's room and a telephone will be installed in those rooms which require a telephone facility. The system will allow in-house as well as outside telephone communication.

6) Fire Alarm System

Fire alarms will be installed in accordance with the relevant local regulations to ensure the early detection of a fire and initial fire-fighting. To be more precise, push buttons to report a fire will be installed at strategic points and a fire warning will be displayed on the alarm panel in the gate house and the administrative officer's room. Detectors will be installed in common areas and each twin room in accordance with the relevant local standards. A push button will be installed near each staircase and an additional button will be installed every 30 m of walking distance.

7) Lightning Arrester

The area around the site experiences many thunderbolts every year. The protection of the facilities and equipment from lightning damage is planned in accordance with the local requirements for such protection. Under the Project, an arrester will be installed for the power line and communication line to protect electronic equipment from an extraordinary voltage caused by a lightning surge so that any stray current caused by a lightning strike in the vicinity running reverse through the underground earthing system does not cause any damage to light electrical appliances.

8) Cabling for LAN System

Most of the academic staff currently use their own personal computers and there will be additional computers in the computer room and the library. The CEMASTEA plans to introduce a LAN system to connect all of these computers but the general picture of this plan is unclear at present. Conduits for the LAN system will be installed in the relevant rooms under the Project.

Target rooms: offices in the administration building, computer room and library

(7) Building Materials Plan

The basic policy for the selection of the building materials is the use of materials and construction methods which are firmly established in Kenya so that repair and maintenance can be easily conducted by a local maintenance contractor.

Table 2-39 Comparison of Construction Method

	Local Method	Applied Method	Reason for Apply
Sloped Roof	Gauge galvanized mild steel sheets＋Cement roof tile, light weight steel structure＋Color steel sheet	Gauge galvanized mild steel sheets＋Cement roof tile	Good weather proof and durability. Economical maintenance. Commonly use in local.
Flat Roof	Mortar＋Asphalt water proof	Mortar＋Asphalt water proof	Good weather resist and durability. Commonly use in local.
Exterior Wall	CB or Stone + Mortar + Clay brick tile or Nairobi stone. Mortar＋Paint	CB + Mortar + Clay brick tile and exposed fair concrete column	Good durability. Economical maintenance. Commonly use in local.
Fixture	Steel and aluminum sash, Wooden door, Burglar bar	Aluminum sash, Wooden door, Burglar bar	Good durability. Commonly use in local.
Interior: Ceiling	Chip Board＋paint, Acoustic board, Wood	Wood, Acoustic board, Calcium silicate board (toilet)	Good sound absorption. Commonly use in local.
Wall	Mortar＋paint, Tile	Mortar＋paint, Wood with glass wool mat, Tile	Commonly use in local.
Floor	PVC tile, Ceramic tile, Wooden floor, Polished terrazzo, Washed terrazzo	PVC tile, Wooden floor, Ceramic tile, Non slip tile, Washed terrazzo	Commonly use in local. Easy for clean.

The main interior finishing materials for the main rooms are shown in the table below.

Table 2-40 Main Finishing Materials

Room name	Floor	Wall	Ceiling	Reason for Apply
Office	PVC Tile	Mortal + Paint	Rock wool acoustic board(T-bar)	Economical, Sound absorption
Meeting Room	PVC Tile	Mortal + Paint	Rock wool acoustic board(T-bar)	Economical, Sound absorption
Lecture Hall	Wooden perket floor	Wooden board (with glass wool)	Wooden board (with glass wool)	Sound absorption
Lecture Room	PVC tile	Mortal + Paint	Rock wool acoustic board(T-bar)	Economical, Sound absorption
Laboratory	Ceramic tile	Mortal + Paint	Rock wool acoustic board(T-bar)	Anti chemical, easy for clean
Computer Room	PVC tile	Mortal + Paint	Rock wool acoustic board(T-bar)	Economical, Sound absorption
Twin Room	PVC tile	Mortal + Paint	Gypsum board	Economical, easy for clean

Shower・Toilet in Twin Room	Ceramic tile	Ceramic tile	Calcium silicate board + paint	Good water proof, easy for clean
Dining Hall	Ceramic tile	Mortal + Paint	Wooden board (with glass wool)	Economical, easy for clean
Kitchen	Non slip tile	Ceramic tile	Calcium silicate board + paint	Good water proof, easy for clean
Mechanical Room・Store	Mortar trowel	Mortal + Paint	Calcium silicate board + paint	Economical
Toilet	Ceramic tile	Ceramic tile	Calcium silicate board + paint	Good water proof, easy for clean

2-2-2-3 Equipment Plan

(1) Physics

Subjects of Physics are shown in the below table.

Table 2-41 Training Topics for Physics

Topic Code	Subject	Cycle of National INSET	Third Country Training (5 weeks)	Third Country Training (2 weeks)*	Planned Equipment
P1	Pressure	1	○	○	○
P2	Circular motion	1	○		○
P3	Fluid flow	1	○		
P4	Waves I & II	1,4	○		○
P5	Sound I & II	1	○		○
P6	Current Electricity	2			○
P7	Electro statistics	2		○	
P8	Magnetic effect of current	2		○	○
P9	Electromagnetic induction	2		○	○
P10	Heating effect of current	2			○
P11	Thin lenses	2			
P12	The atom	3			
P13	Electromagnetic spectrum	3			
P14	Radioactivity	3		○	
P15	Photoelectric effect	3			○
P16	X-rays	3			
P17	Electronics	3,4		○	○
P18	Linear motion	4			○
P19	Quantity of heat	4		○	○
P20	Improvisation work	1,2,3,4	○		○
P21	Innovative lesson activities	2,3,4	○	○	○
P22-1	Laboratory management	2		○	○
P22-2	Peer teaching	1,2,3			○
P22-3	Actualization	3			○

* : Third Country Training (2 weeks) was held as additional training in December 2005 in accordance with strong requests from member countries of SMASSE-WECSA.

As results of examination of requested equipment from Physics department, equipment will be planned to implement Physics subjects such as Pressure, Circular motion, Waves, Sound, Current electricity, Magnetic effect of current, Electromagnetic induction, Heating effect, Photoelectric effect, Linear motion, Electronics, Quantity of heat. However, consumables, spare parts and duplication of the equipment in the list are deleted or reduced the quantity.

(2) Chemistry

Subjects of Chemistry are shown in the below table.

Table 2-42 Training Topics for Chemistry

Topic Code	Subject	Cycle of National INSET	Third Country Training (5 weeks)	Third Country Training (2 weeks)	Planned Equipment
C1-5 (1)	Mole concept	1		○	
C1-5 (2)	Electrochemistry	1	○	○	○
C1-5 (3)	Thermal chemistry	1		○	○
C1-5 (4)	Radiochemistry	1			

C1-5 (5)	Organic chemistry	1	○		
C1-5 (6)	Metals	1			○
C2-10(1)	Mole concept	2			
C2-10(2)	Electrochemistry	2	○	○	○
C2-10(3)	Thermal chemistry	2	○	○	○
C2-10(4)	Organic chemistry	2		○	
C2-10(5)	Metals	2			○
C3-6(1)	Mole concept	3		○	
C3-6(2)	Electrochemistry	3		○	○
C3-6(3)	Thermal chemistry	3		○	○
C3-6(4)	Radiochemistry	3			
C3-6(5)	Organic chemistry	3	○	○	
C3-6(6)	Metals	3			○
C4-4(1)	Thermal chemistry	4			○
C4-4(2)	Organic chemistry	4	○	○	
C4-4(3)	Polymers	4			

As results of examination of requested equipment from Chemistry department, equipment will be planned to implement Chemistry subjects such as electrochemistry, Thermal chemistry and metals. As basic experimental equipment and measuring equipment are generally used for training, they will be included into planned equipment as well. Consumables, spare parts and duplicated equipment in the list, however, are deleted or reduced the quantity. Also as glass wares are easily to purchase at the local market in Kenya, so that they are excluded from planned equipment.

(3) Biology

Subjects of Biology are shown in the below table.

Table 2-43 Training Topics for Biology

Topic Code	Subject	Cycle of National INSET	Third Country Training (5 weeks)	Third Country Training (2 weeks)	Planned Equipment
B1	Classification	1	○	○	○
B2	Ecology	1	○		
B3	Cell structure and Physiology	1	○		
B4	Excretion and Homeostasis	2		○	○
B5	Stimulus and Response	2		○	○
B6	Reproduction	2			○
B7	Respiration	2			
B8	Preparation of common laboratory reagents	2	○	○	
B9	Genetics	3			○
B10	Support and Movement	3			○
B11	Evolution	3			○
B12	Growth and Development	4			○
B13	Transport in Plants and animals	4			○
B14	Nutrition in Plants and animals	4			○

As results of examination of requested equipment from Chemistry department, equipment will be planned to implement Chemistry subjects such as Classification, Excretion and homeostasis, Stimulus and response, Reproduction, Genetics and Nutrition. As basic experimental equipment and measuring equipment are generally used for training, they will

be included into planned equipment as well. Consumables, spare parts and duplicated equipment in the list, however, are deleted or reduced the quantity.

(4) Mathematics

Subjects of Mathematics are shown in the below table.

Table 2-44 Training Topics for Mathematics

Topic Code	Subject	Cycle of National INSET	Third Country Training (5 weeks)	Third Country Training (2 weeks)	Planned Equipment
M1	Probability	1,2	○	○	
M2	Statistics	1	○	○	
M3	Integers	1	○	○	
M4	Sequences and Series	1	○	○	
M5	Ratio/Proportion	2			
M6	Loci	2			
M7	Vectors	2,3			
M8	Transformation Geometry	2			
M9	Trigonometry	2,3	○	○	
M10	Compound proportion/Rates/Mixtures	2,3			
M11	Navigation	2			
M12	Graphical methods	2	○	○	
M13	Practical work in Mathematics	2,3			
M14	3-Dimensional Geometry	3			
M15	Linear programming	3			
M16	Algebra	1,2,3,4	○	○	
M17	Measurement	1,2,3,4	○	○	○
M18	Geometry	3	○	○	○
M19	Problem Solving	1,2,3,4	○	○	

As results of examination of requested equipment from Mathematics department, equipment will be planned to implement Mathematics subjects such as Measurement and Geometry. Consumables, spare parts and duplicated equipment in the list, however, are deleted or reduced the quantity.

(5) Primary education equipment

Pre-service INSET for Primary Teacher College is planned to be established as new INSET scheme. Originally wood processing machine etc was requested as primary education equipment, but main activities of this INSET are more focused on lecture and discussion about ASEI/PDSI than Hands on Activity which trainees use equipment. For this situation only Science and mathematics education kit which is used Kenyan elementary school will be planned.

(6) Lecture support equipment

Lecture support equipment is used during lecture and Peer teaching that is trial lessons and evaluation among trainees. Presently Peer teaching is executed among 25 trainees, and 4 trainees (for 1 subject) prepare lesson plan based on ASEI/PDSI, and have trial lesson and evaluate each other. CEMASTEA expansion plan makes number of trainee doubled, but they want to conduct Peer teaching by 25 trainees to keep effectiveness. It is considered to be important to provide CEMASTEA the condition which 2 groups (25 trainees each) can implement Peer teaching. Equipment will be planned to correspond with 2 groups Peer

teaching implementation.

(7) Computer room equipment

All departments use commonly Computer room. Main purposes of the Computer room are implementation of computer based lecture and preparation of lesson plan and education materials by trainees. Outputs of INSET training produced by trainees are listed below.

Table 2-45 Outputs of INSET Training Produced by Trainees

Output	Content	Remarks
①Lesson Plan	Lesson Plan is a lesson content which includes the purpose of a subject, contents of a lecture and a classroom exercise/activity for each subject. Or it is an actual lesson plan of a subject which is used for District INSET training.	Each trainee or groups of trainee will prepare for each subject. An lesson plan which is prepared by groups of trainee will be used for Peer teaching afterward. It will be generated during a session of program.
②Education materials based ASEI/PDSI(for each subject)	They include "Student Work Sheet" and/or "Experimental/Activity Guide" for each subject.	All of trainees will prepare during a session of program.
③Training manual	Trainer of CEMASTEA will prepare a format of the training manual. Trainees modify the format for the District INSET according to their local situation (condition of school, condition of district, materials which is easy to get in local area.) It will be an training manual of District INSET.	If there are several trainees from the same district, trainees share the subject and prepare training manuals for all subjects. Trainees have to start preparation of training manuals submit after training and submit them by the next day. Trainer will check them and give a suggestion or advice to trainees. As these training manuals will be used for District INSET, Trainers have to carefully check the contents of them to keep their quality. ** Preparation of Training manual is not compulsory for the trainees of SMASSE-WECSA.*
④Training report	This report is prepared by the trainees of SMASSE-WECSA.	

These output documents shown above table are stipulated in the curriculum of "Working Planning", "Peer Teaching", "Development of ASEI lesson Plans" and "Actual classroom teaching". At present, trainees compose documents by hand writing because Computers are not available for trainees. Trainers evaluate and type them during interval of session of the program and/or after training. In current situation, document evaluation and feedback of the result of evaluation are difficult for trainers because of unclearness of hand writing documents prepared by trainees. Once computer room set up, all trainees prepare documents by using computer and submit hardcopy or softcopy, and typed documents make trainer's works easier. So that training program implementation will be more efficient and effective. It is especially noted that lesson plans and education materials which trainees made are specific practices of teaching for the subject and they will be precious property for Math and Science education in Kenya. After expanded the scale of training program in CEMASTEA, estimated Computer room shared time is planned as below table.

Table 2-46 Plan for Computer Room Shared Time

INSET	(1)Total Time (hour)	(2) PC using Time (hour)	% (2)/(1)
National INSET Cycle 1			
Chemistry	80	12.5	15.6%
Biology	80	12.5	15.6%
Physics	80	12.5	15.6%
Math	80	12.5	15.6%
sub-total	**320**	**50**	**15.6%**
National INSET Cycle 2			
Chemistry	80	15	18.8%
Biology	80	15	18.8%
Physics	80	15	18.8%
Math	80	15	18.8%
sub-total	**320**	**60**	**18.8%**
National INSET Cycle 3	80		
Chemistry	80	15	18.8%
Biology	80	15	18.8%
Physics	80	15	18.8%
Math	80	15	18.8%
sub-total	**320**	**60**	**18.8%**
National INSET Cycle 4			
Chemistry	80	15	18.8%
Biology	80	15	18.8%
Physics	80	15	18.8%
Math	80	15	18.8%
sub-total	**320**	**60**	**18.8%**
Third country INSET（5W）			
Chemistry	200	25	12.5%
Biology	200	25	12.5%
Physics	200	25	12.5%
Math	200	25	12.5%
sub-total	**800**	**100**	**12.5%**
Third country INSET（2W）			
Chemistry	80	10	12.5%
Biology	80	10	12.5%
Physics	80	10	12.5%
Math	80	10	12.5%
sub-total	**320**	**40**	**12.5%**
TOTAL	**2400**	**370**	**15.4%**

As shown in the above table, Computer room shared time will be averagely 15.4% of total training time of INSET training. Also Computer room will be available for trainees to prepare documents from 18 to 20 o'clock after the training program.

As the results of examination of usage and using time of computer, it is considered to be relevant to procure computers under Japanese Grant Aid.

(8) Lecture hall equipment

Lecture hall will be used at the time of opening ceremony, closing ceremony, Principal's workshop, DEO's workshop and Stakeholder workshop. It is necessary to procure sound equipment and furniture such as chair and table corresponding to 300 persons (200 persons of trainee and 100 persons of lectures and guests).

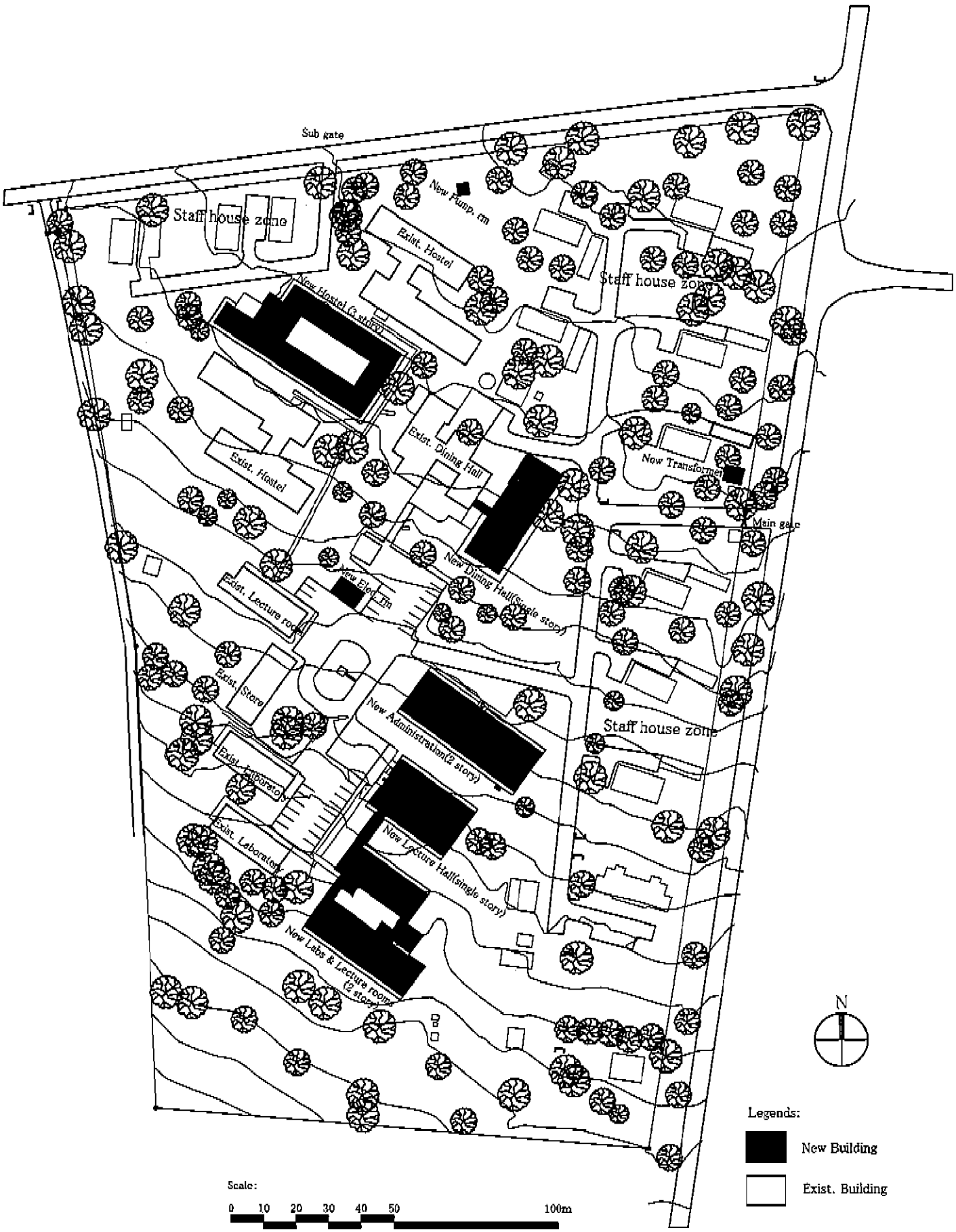
(9) Others (furniture)

Basically existing furniture shall be used continuously. However necessary furniture for new building such as lecture room, laboratory and dinning/kitchen will be included into planned equipment.

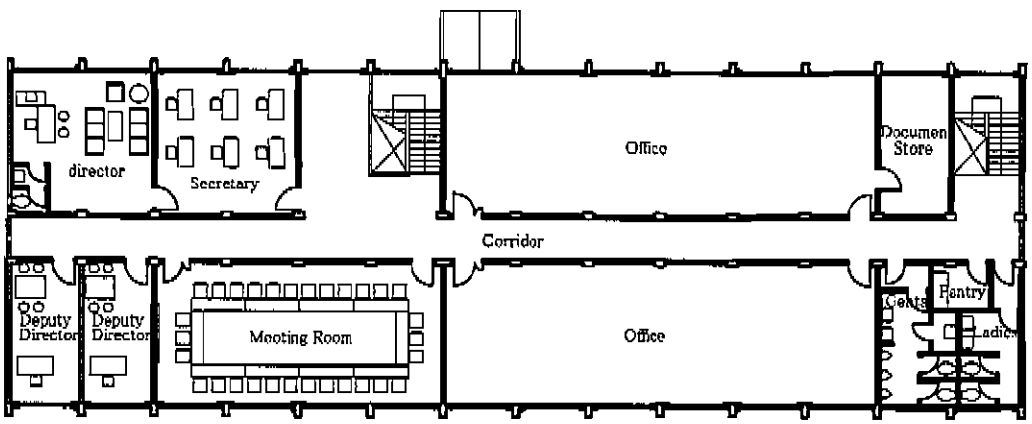
2.2.3 Basic Design Drawing

2.2.3.1 Facilities Drawing

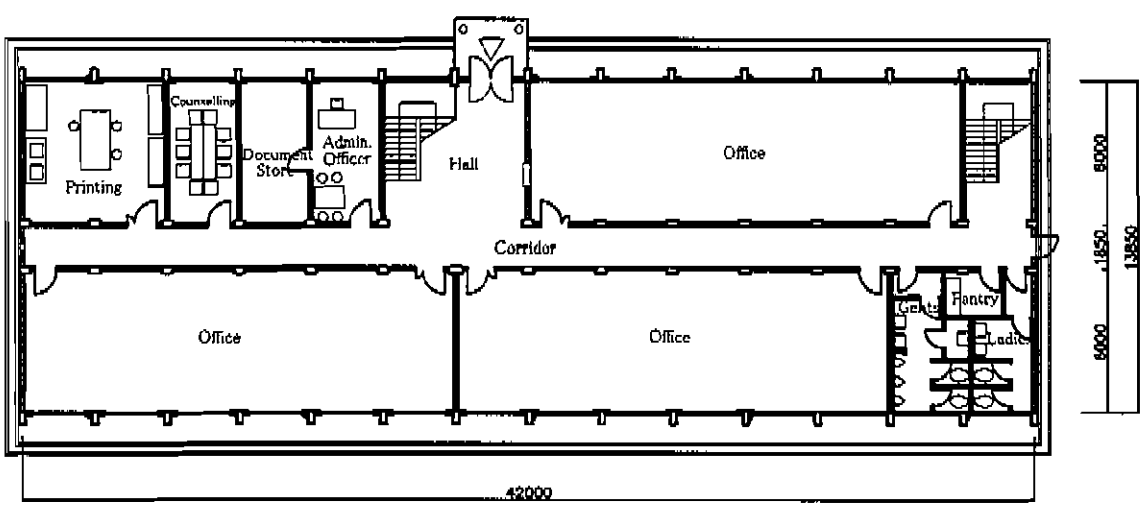
1. Layout Plan of Facility
2. New Administration Building Floor Plan
3. New Lecture Hall, Lecture Rooms, Laboratories Ground Floor Plan
4. New Lecture Hall, Lecture Rooms, Laboratories First Floor Plan
5. New Hostel Building Floor Plan
6. New Dining Hall Building Floor Plan
7. New Administration & Lecture Hall Building Elevation and Section
8. New Lecture Room & Laboratory Building Elevation and Section
9. New Hostel Building Elevation and Section
10. New Dining Hall Building Elevation and Section



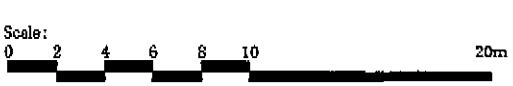
LAYOUT PLAN OF FACILITY 1/1500



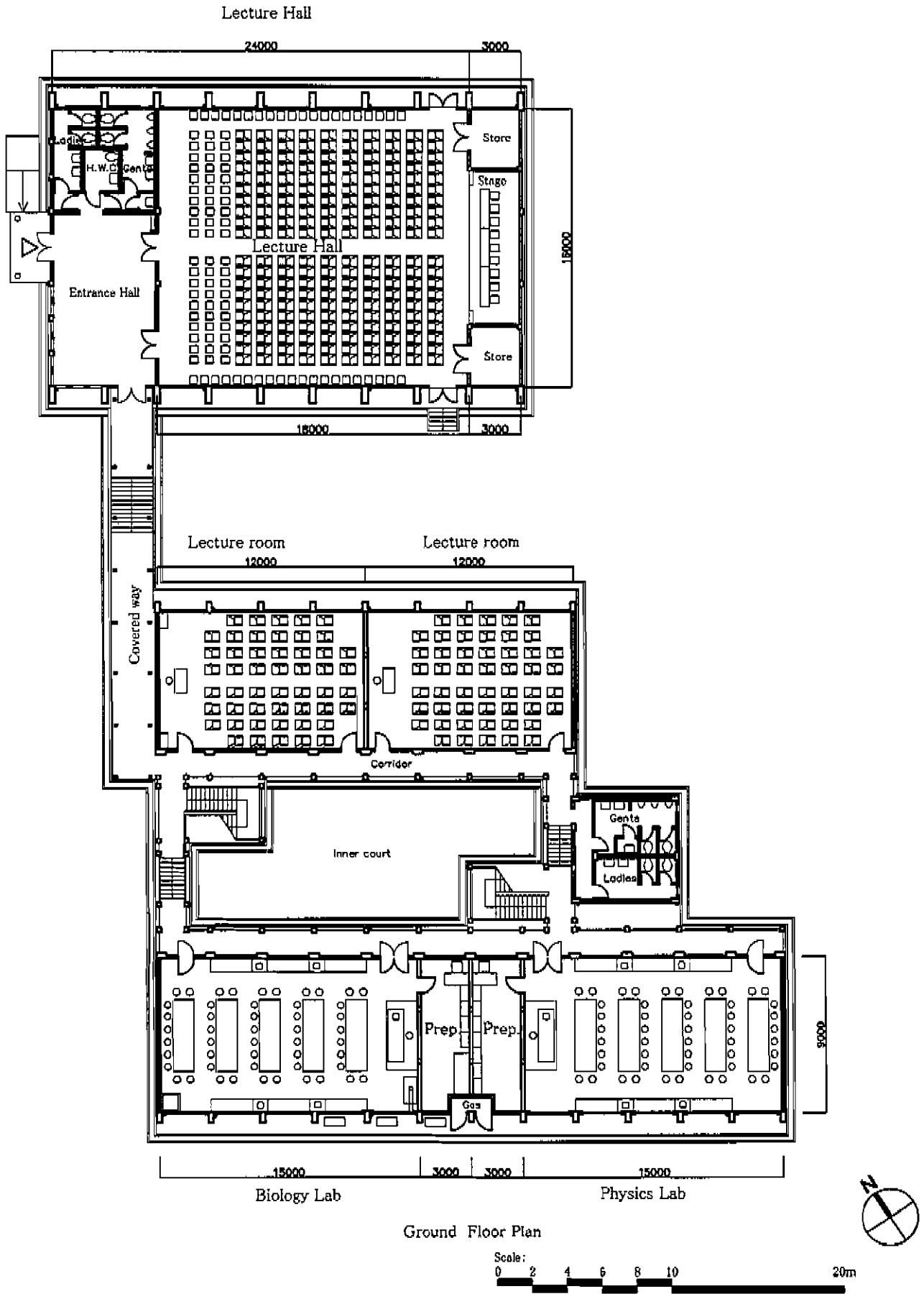
First Floor Plan



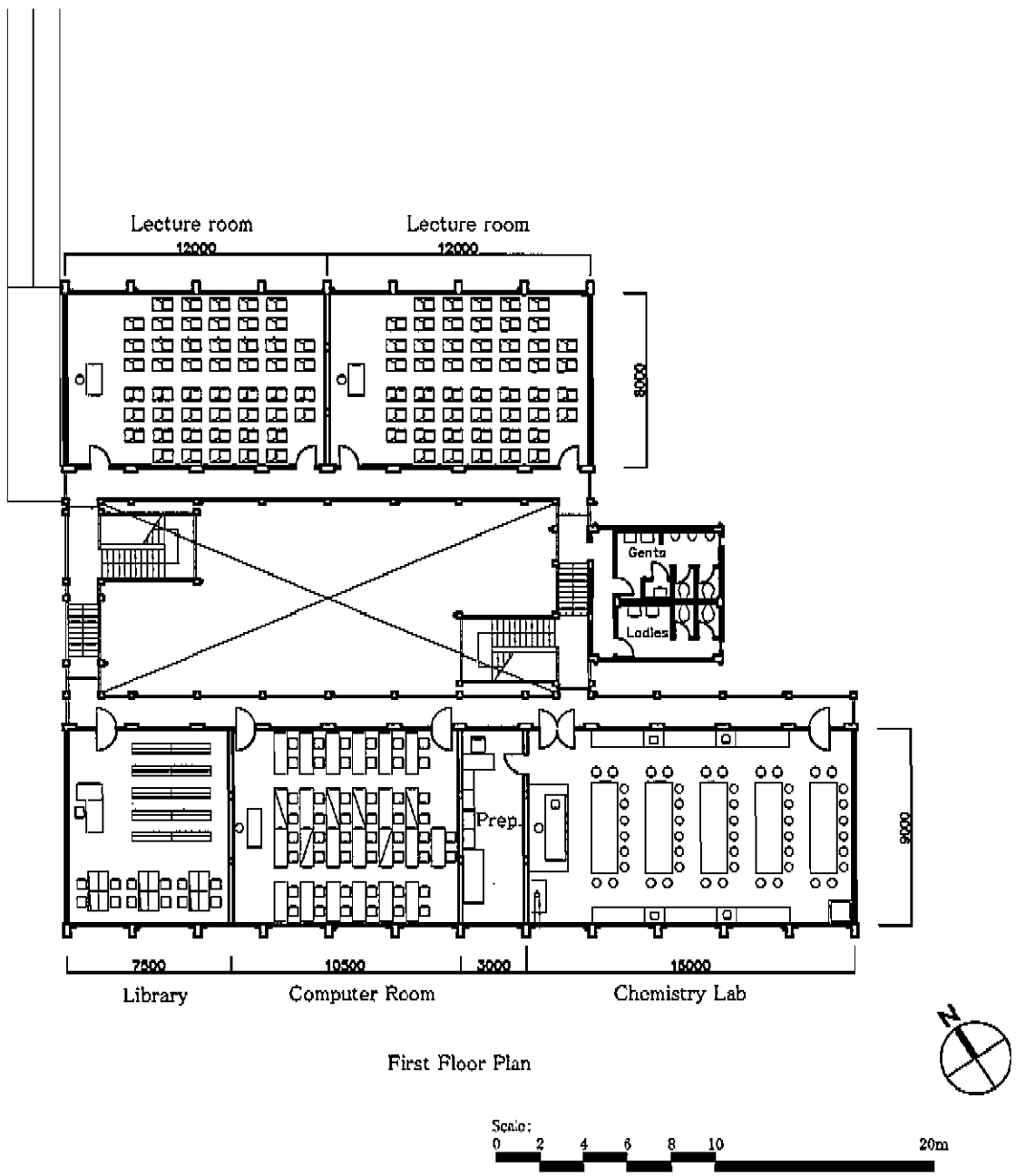
Ground Floor Plan



NEW ADMINISTRATION BUILDING FLOOR PLAN 1/300

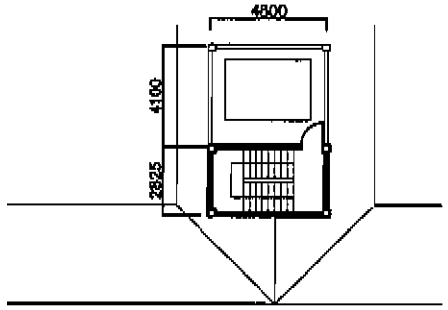


NEW LECTURE HALL, LECTURE ROOMS, LABORATORIES GROUND FLOOR PLAN 1/300



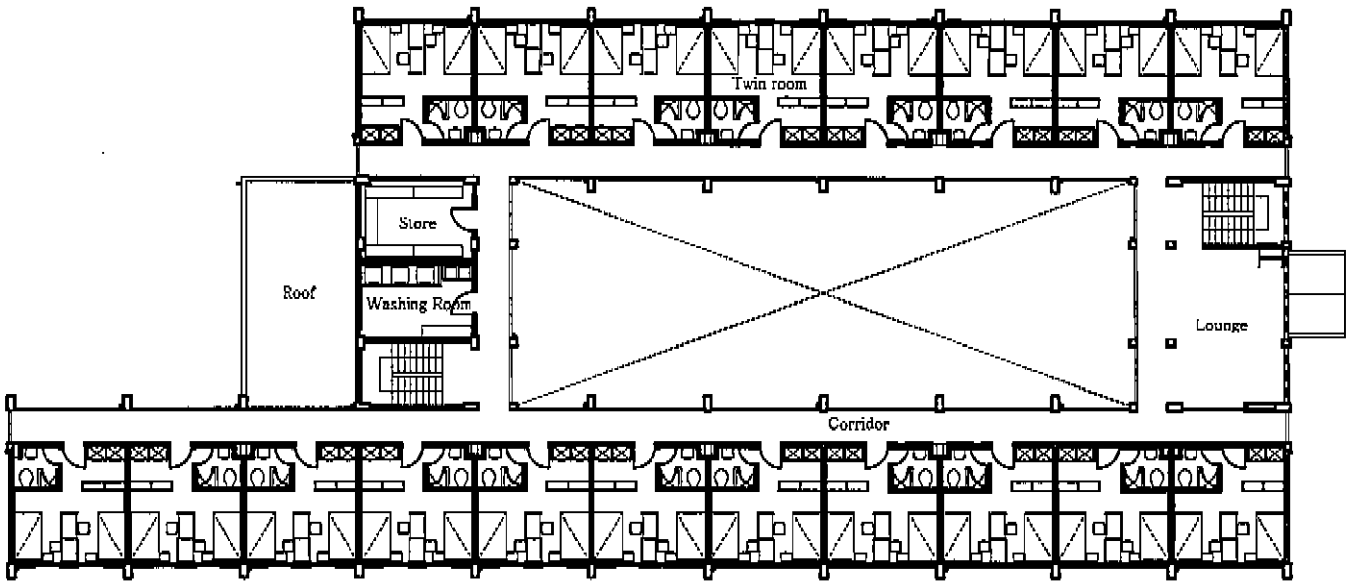
First Floor Plan

NEW LECTURE HALL, LECTURE ROOMS, LABORATORIES FIRST FLOOR PLAN 1/300



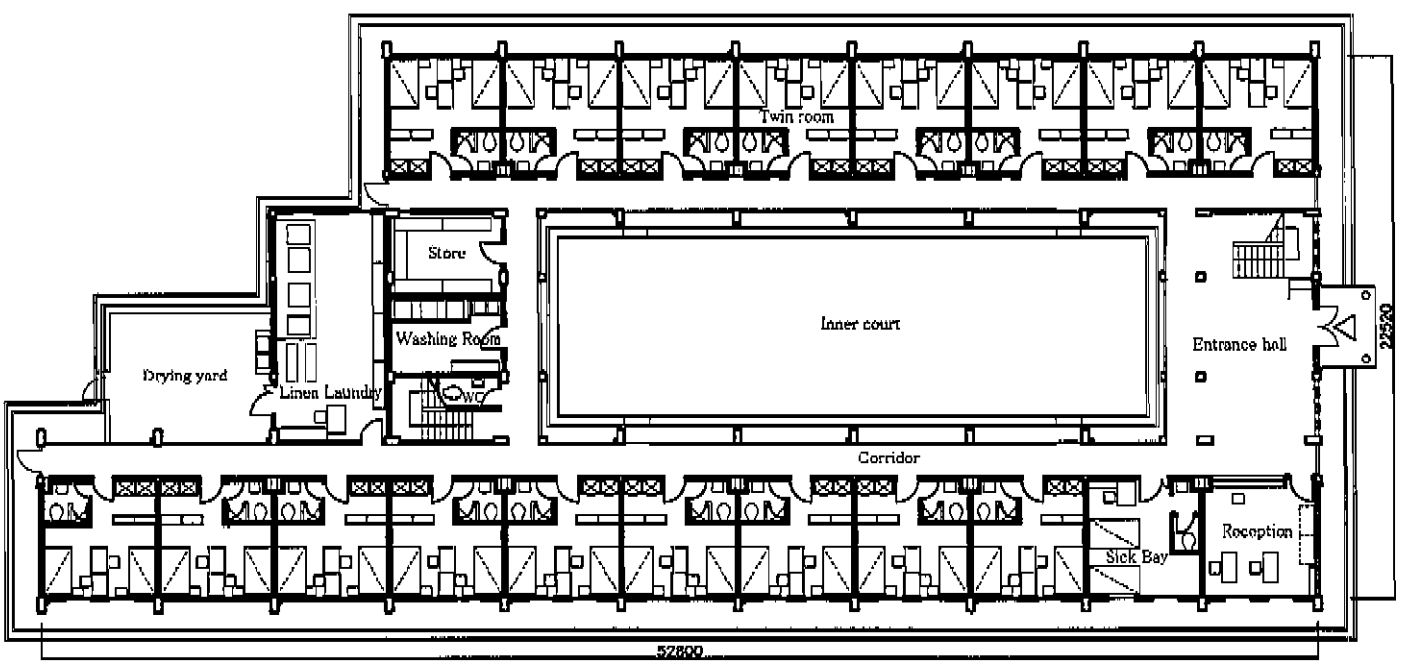
Roof Floor Plan

Twin rooms: 19 x 2= 38 rooms



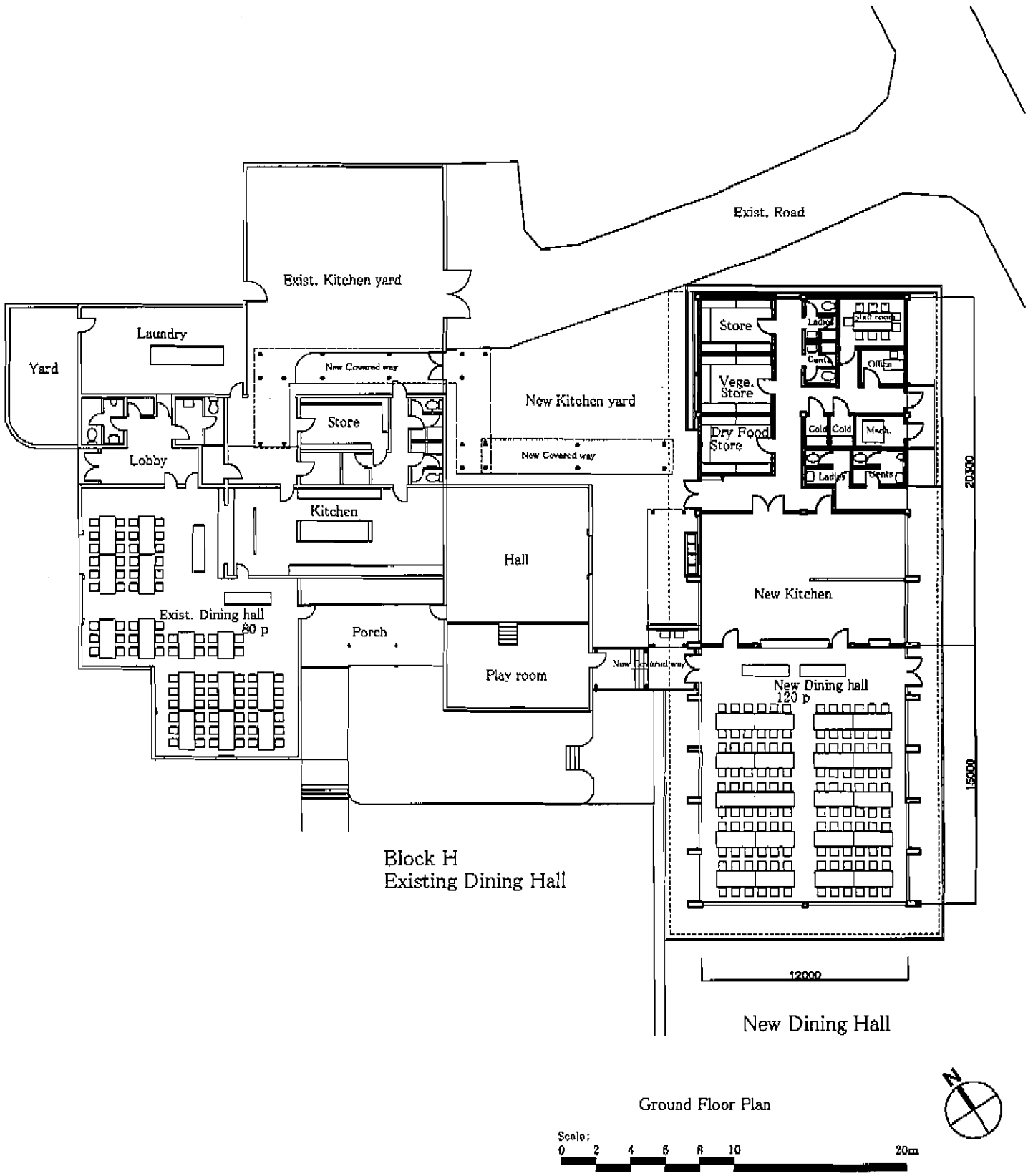
First & Second Floor Plan

Total ; 17+38=55 rooms
Twin rooms :17 rooms



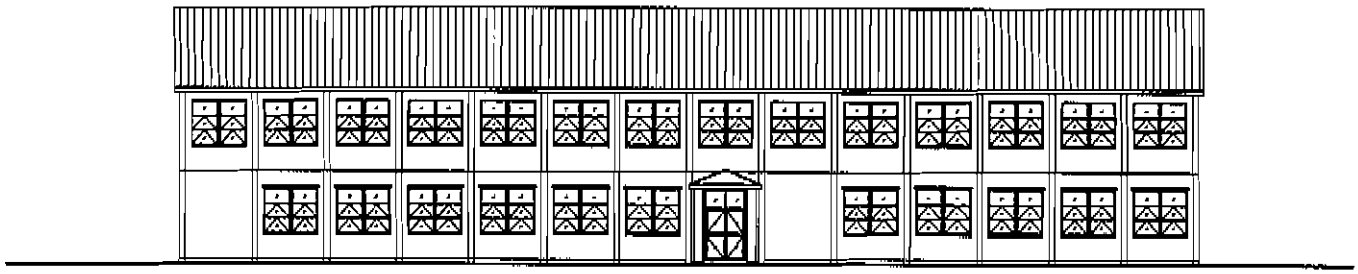
Ground Floor Plan

NEW HOSTEL BUILDING FLOOR PLAN 1/300

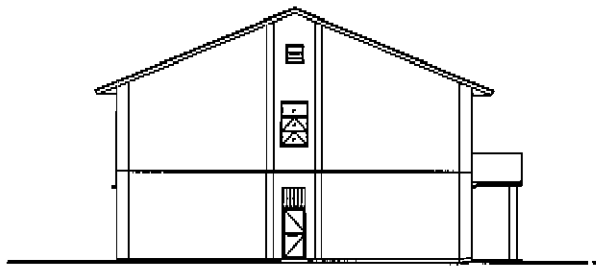


NEW DINING HALL BUILDING FLOOR PLAN 1/300

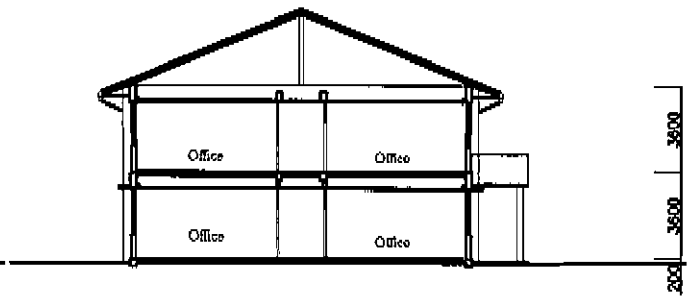
Elevation and Section of the New Administration Building



New Administration Building North Elevation

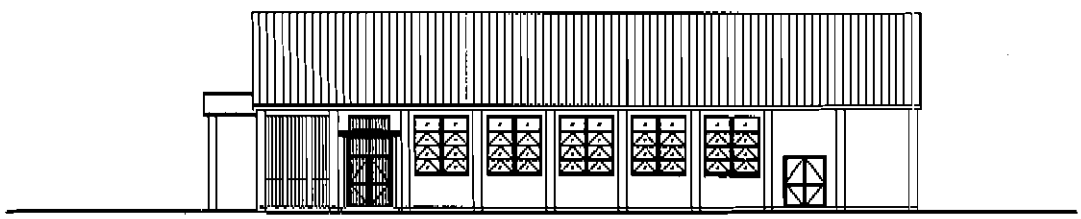


New Administration Building East Elevation

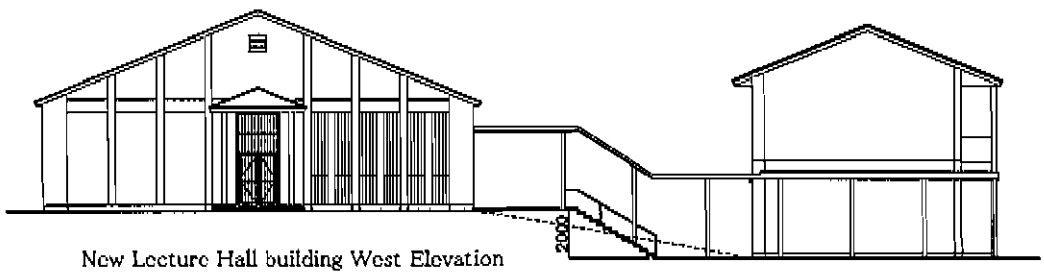


New Administration Building Section

Elevation and Section of the New Lecture Hall

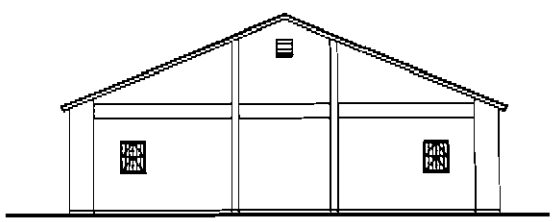


New Lecture Hall building South Elvation

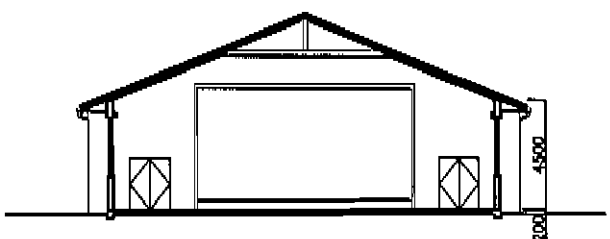


New Lecture Hall building West Elevation

New Lecture rooms West Elevation



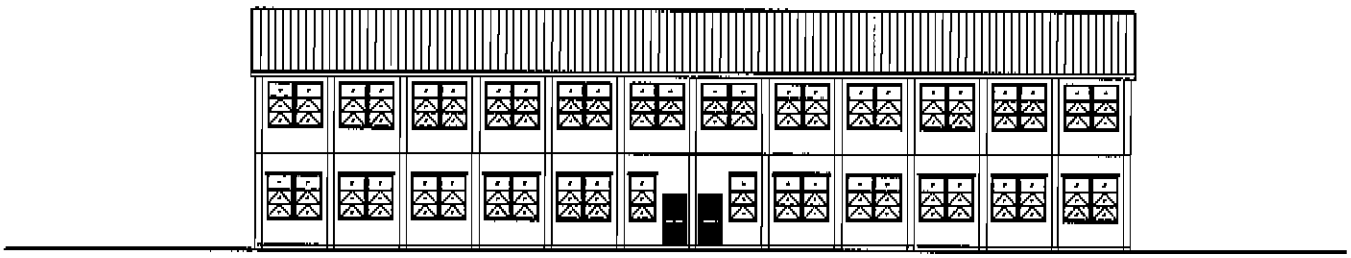
New Lecture Hall building East Elevation



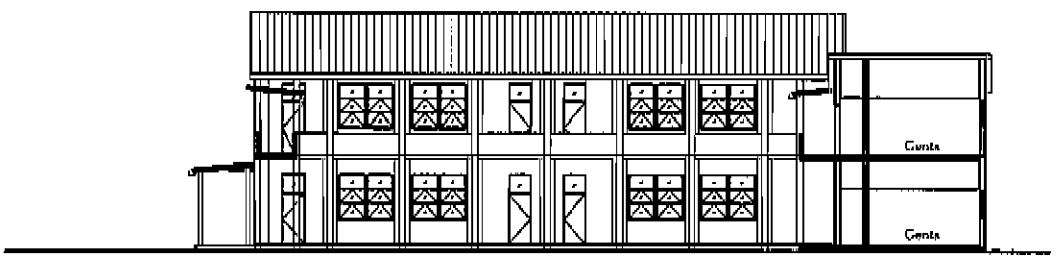
New Lecture Hall building Section

Scale:
0 2 4 6 8 10 20m

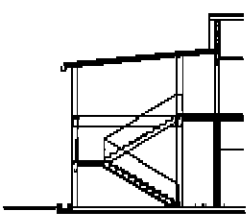
NEW ADMINISTRATION & LECTURE HALL BUILDING ELEVATION & SECTION 1/300



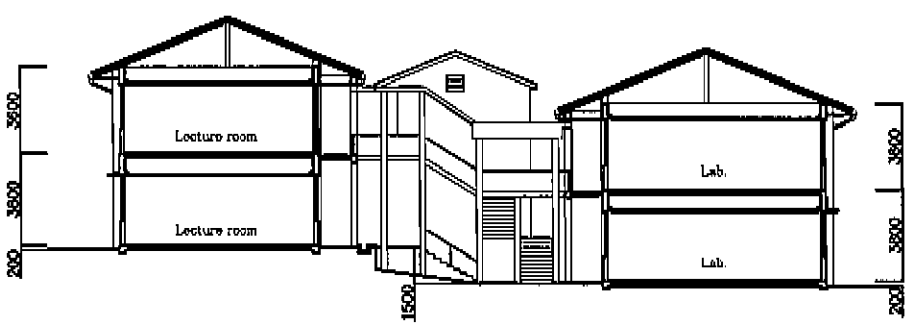
New Laboratories South Elevation



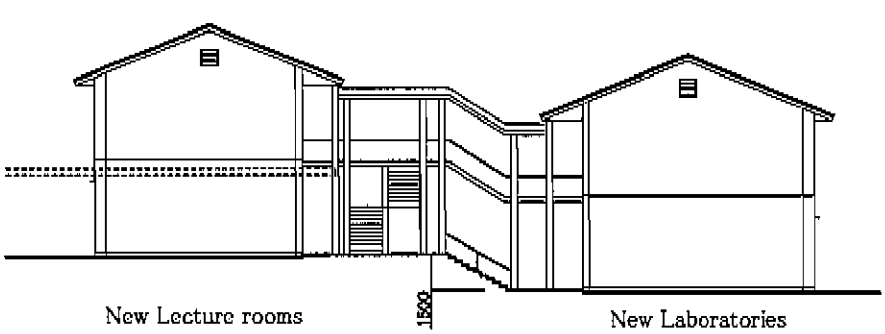
New Lecture rooms South Elevation



Stair Section



New Laboratories & Lecture rooms Section



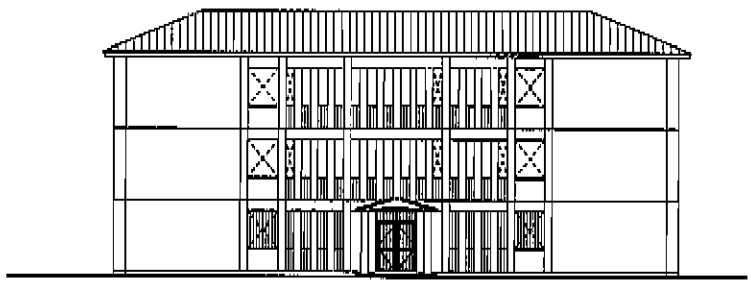
New Lecture rooms

New Laboratories

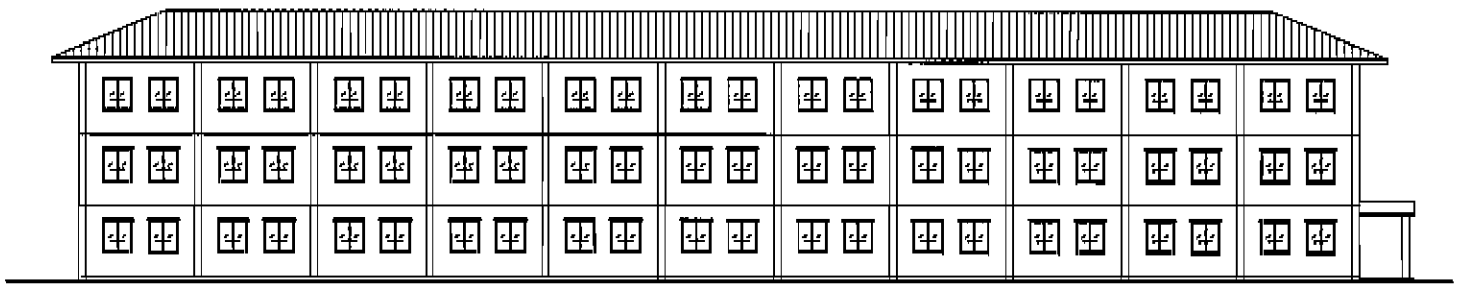
New Laboratories & Lecture rooms West Elevation

Scale:
0 2 4 6 8 10 20m

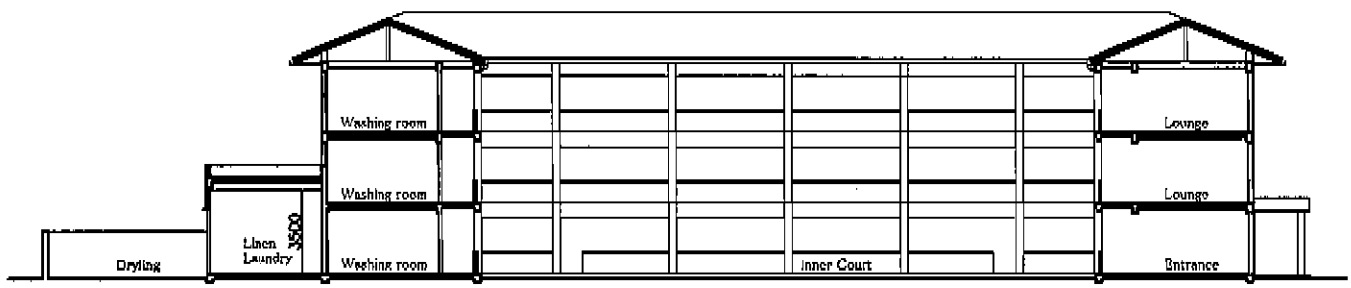
NEW LECTURE ROOM & LABORATORY BUILDING ELEVATION & SECTION 1/300



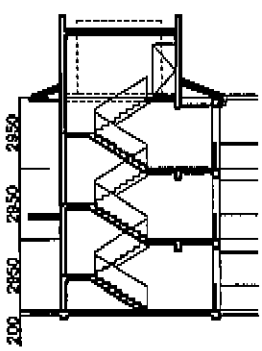
New Hostel Building East Elevation



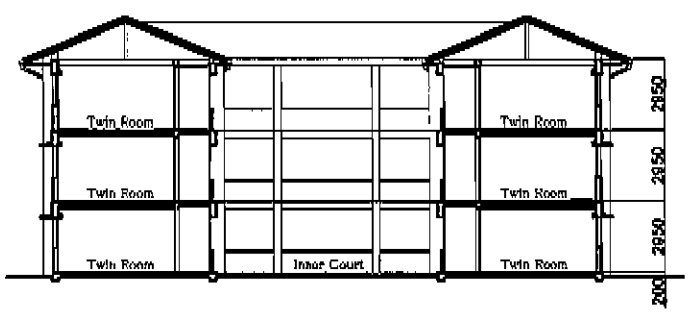
New Hostel Building South Elevation



New Hostel Building Section-1



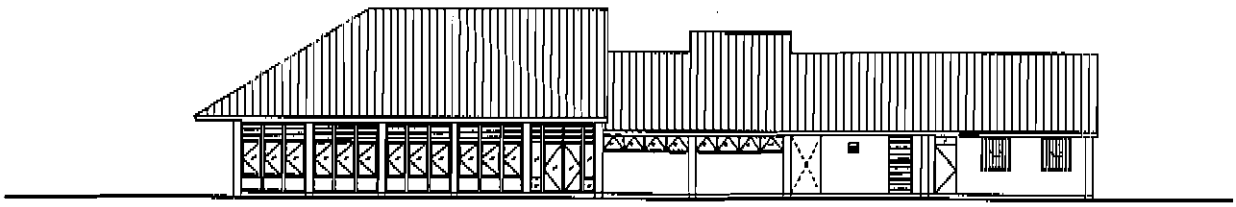
Staircase Section



New Hostel Building Section-2

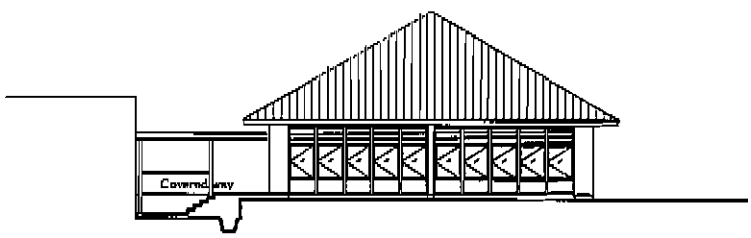
Scale:
0 2 4 6 8 10 20m

NEW HOSTEL BUILDING ELEVATION & SECTION 1/300

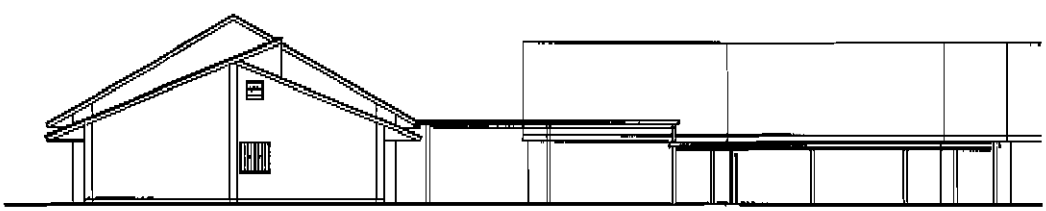


New Dining Hall New Kitchen

East Elevation

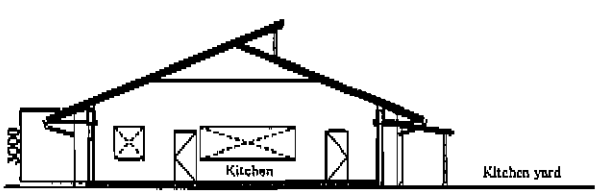


New Dining Hall South Elevation

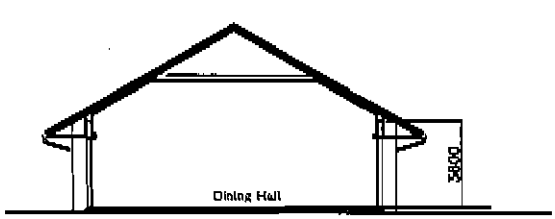


New Kitchen New Covered way

North Elevation



New Kitchen



New Dining Hall

Scale:
0 2 4 6 8 10 20m

NEW DINING HALL BUILDING ELEVATION & SECTION 1/300

2.2.3.2 Basic Design of Equipment

Planed Equipment List

No.	Equipment Name	Planned Q'ty
Physics		
PH-1	Electronic Precision Balance	5
PH-2	Free Fall Experimental Apparatus	5
PH-4	Table balance with weights	5
PH-5	Vernier callipers	10
PH-6	Micrometer	10
PH-8	Alarm stop clock	5
PH-9	Stroboscope	5
PH-10	Compact digital thermometer	10
PH-11	DC Voltmeter	7
PH-12	AC voltmeter	10
PH-13	DC Ammeter	10
PH-14	DC Ammeter (centre meter)	10
PH-15	AC Ammeter	10
PH-16	Micro ammeter	10
PH-17	Galvanometer	8
PH-18	Demonstration galvanometer	1
PH-19	Circuit tester	25
PH-20	Meter bridge	10
PH-21	Variable resistor	10
PH-22	Potable Wheatstone bridge	10
PH-23	Resistance box	10
PH-24	Signal generator	3
PH-26	Oscilloscope 20MHz	5
PH-27	Oscilloscope 100MHz	5
PH-28	Experimental lever	5
PH-29	Set of pulleys	10
PH-30	Wheel and axle	5
PH-31	Inclined plane	10
PH-32	Friction experimental apparatus	10
PH-33	Spring scales	10
PH-34	Experimental steel spring	1
PH-35	Equilibrium apparatus for demonstration	1
PH-36	Equilibrium apparatus	5
PH-37	Assorted weights for dynamics experiments	5
PH-38	Recording timers	5
PH-39	Cart acceleration apparatus	5
PH-40	Linear air track	5
PH-42	Ballistic cart apparatus	5
PH-43	Experimental vacuum drop tube	5
PH-45	Electric rotation platform	5
PH-46	Collision balls	5
PH-47	Gyroscope	5
PH-56	Rotary vacuum pump	1
PH-61	Thermal conduction apparatus	5
PH-62	Convection apparatus for demonstration	1
PH-63	Linear expansion tester	5
PH-64	Heat expansion ball and ring	5
PH-65	Dew point measurement device	5
PH-66	Brownian motion observation device	5
PH-67	Mechanical gas model apparatus	5
PH-93	Neodymium magnets	5

No.	Equipment Name	Planned Q'ty
PH-98	Electromagnet	1
PH-99	Dip needle	1
PH-129	Regulated D.C. power supply	5
PH-130	Power supply	5
PH-131	Hand centrifuge	1
PH-132	Stop watch	22
PH-135	Bunzen burner	10
Chemistry		
CH-1	Analytical Balance	5
CH-2	Drying Oven	2
CH-3	Mantle Heater	5
CH-4	Power Source	5
CH-7	Hot Plate	5
CH-8	Ultrasonic washer	2
CH-9	Test tube washer	2
CH-11	Mechanical Stirrer	5
CH-12	Magnetic Stirrer with hot plate	10
CH-13	Water Bath with Shaker	5
CH-14	Radiation detector	5
CH-15	Vacuum pump	2
CH-16	Ice maker	2
CH-17	Abbe refractometer	2
CH-19	Polarimeter	2
CH-20	Conductivity meter	10
CH-22	Joule meter	5
CH-23	Galvanometer	15
CH-24	High voltage power supply	5
CH-25	Digital Microscope	1
CH-26	Table Balance	10
CH-27	Molecular structure model	10
CH-28	Molecular structure model organic	10
CH-29	Battery and charger	10
CH-30	Retort stand set	50
CH-31	Bunsen burner	25
CH-32	Tripod stand set	25
CH-33	Alcohol lamp	25
CH-34	Laboratory gas burner for gas cartridge	10
CH-35	Centrifuge	2
CH-36	Voltaic cell	10
CH-38	DC voltmeter	25
CH-39	DC milivoltmeter	25
CH-40	DC ammeter	25
CH-41	DC miliammeter	25
CH-42	AC Ammeter	25
CH-43	AC Voltmeter	25
CH-44	PH bench meter	10
CH-45	Desiccator	10
CH-46	Glass tube cutter	10
CH-47	Glass cutter	10
CH-48	Digital stop watch	25
CH-49	Analogue stop watch	25
CH-51	Water distillation apparatus	4
CH-52	Suction bottle and funnel	25
CH-53	Hoffinann's voltameter	5
CH-54	Kipps apparatus	5
CH-55	Sample of ores	2
CH-56	Refrigerator	2

No.	Equipment Name	Planned Q'ty
CH-57	Graphic calculator	25
CH-58	Draft chamber	1
CH-59	Waste water apparatus	1
Biology		
BI-7	Thermostat Water Bath	5
BI-8	Desiccator	5
BI-9	Electric Balance	5
BI-10	Magnetic Stirrer with hot plate	5
BI-11	Stereo Microscope	25
BI-13	Incubator	2
BI-14	Shaker	1
BI-15	Draft chamber	1
BI-16	Homogenizer	5
BI-17	Adjustable Pipette	5
BI-19	Respirometer	10
BI-20	Autoclave	1
BI-21	Aquarium	5
BI-22	Microtone	5
BI-23	Centrifuge	5
BI-24	Prepared slide set	10
BI-28	Bilogical Microscope	26
BI-29	Digital Microscope	1
BI-31	Weight balance	2
BI-32	Bunsen burner	25
BI-33	Tripod stands for bunsen berner	25
BI-34	Model set	10
BI-35	Dissecting kit	30
BI-36	Refrigerator	1
BI-37	Scientific calculator	10
BI-38	Drying oven	1
BI-39	Skeleton	5
BI-40	Hot plate	4
BI-41	Stop watche	25
BI-42	Sand bath	10
BI-44	Spring balance	10
BI-45	Laboratory trolley	5
BI-46	Water distiller	1
BI-47	Deep freezer	1
BI-48	Cage for small animal	2
BI-49	Cage for rabbit	2
BI-50	Cage for insect	2
Mathematics		
MA-1	Programmable Calculator	51
MA-2	Bells	30
MA-3	Stop watch	20
MA-4	Vernier caliper	10
MA-5	Micrometre screw gauge	10
MA-6	Table balance	10
MA-8	Geometric model	10
MA-10	Clinometer	10
MA-11	Blackboard instrument	1
MA-12	Scietific calculator	10
MA-13	Ticker-tape timer	10
MA-14	Dynamic trolley set	10
MA-15	Trundle wheel	10
Lecture support equipment		
LS-1	OHP with screen	8
LS-2	Notebook computer	9

No.	Equipment Name	Planned Q'ty
LS-3	Scanner	5
LS-4	Projector	10
LS-5	Visual presenter	5
LS-6	VTR	5
LS-7	Video camera	5
LS-8	DVD/ VCD player	5
LS-9	TV set	5
LS-10	Digital camera	5
Computer room		
PC-1-1	Computer	51
PC-1-2	Network material	1
PC-2	Printer	1
PC-3	Computer table	25
PC-4	Chair	51
PC-5	Desk for lecturer	1
PC-6	Projector	1
PC-7	Screen	1
Primmary School Apparatus for INSET primary teacher colleges		
PS-1	Primary science kit	10
Lecture Hall		
LH-1	Sound equipment	1
LH-2	Projector with projector table	1
LH-3	Screen	1
LH-4	Lecture chair	200
LH-5	Chair	100
LH-6	Table	3
LH-7	Chair	9
LH-8	Lecturer table	1
Lecture Rooms (4 rooms)		
LR-1	Teacher's Desk	4
LR-2	Teacher's Chair	4
LR-3	Lecture chair	200
LR-4	White board portable	4
Laboratory furniture (3 rooms)		
LF-1	Laboratory central experimental table	15
LF-2	Laboratory table for Lecturer	3
LF-3	Experimental table for preparation room	2
LF-4-1	Side table	18
LF-4-2	Side table with sink	12
LF-5	Laboratory chair	153
LF-6	Shelf	17
LF-7	Desk	3
LF-8	Chair	3
Office Block		
OB-1	Shelf for Library	10
OB-2	Reading desk	3
OB-3	Reading chair	12
OB-4	Desk set for library staff	1
OB-5	Chair for library staff	1
OB-6	Bed for sick bay	2
OB-7	Desk for nurse	1
OB-8	Chair for nurse	1
OB-9	Shelf for medicine	1
Hostel Block		
HB-1	Washing machine	9
HB-2	Iron	9
HB-3	Iron table	9
HB-4	Desk for hostel staff	2

No.	Equipment Name	Planned Q'ty
HB-5	Chair for hostel staff	3
Kitchen and Dinning Hall		
KD-1	Desk for office	1
KD-2	Chair for office	1
KD-3	Table for kitchen staff	2
KD-4	Chair for kitchen staff	9
KD-5	Dinning table	20
KD-6	Dinning chair	120

2.2.4 Implementation Plan

2.2.4.1 Implementation Policy (Construction and Procurement)

The Project consists of (i) the construction of the planned facilities and (ii) the procurement and installation of equipment for CEMASTEA, and it will be implemented in accordance with the framework of the grant aid scheme of the Government of Japan after signing of the Exchange of Notes (E/N) by the Government of the Republic of Kenya (hereinafter referred to as "Kenya") following an approval by the Cabinet of the Government of Japan. After the signing of the E/N, the Government of Kenya will conclude a consultant services contract with a Japanese consultant to proceed with the detailed design works of the facilities and equipment. After completion of the detailed design drawings and tender documents, a Japanese contractor and a Japanese equipment supplier, both of which are selected by tenders, will conduct the construction work and the equipment procurement/installation respectively.

Each contract with the consultant, the contractor and the equipment supplier be verified by the Government of Japan to be eligible for the grant.

A construction supervision organisation will be established by a project implementation agency on the Kenyan side, the consultant, the contractor and the equipment supplier under the control of the project-related government organisations individually in Japan and in Kenya.

(1) Project Implementation Agency

The implementation agency of the Project on the Kenyan side will be the Ministry of Education (MOE). It is anticipated that the MOE will be a party for the project-related contracts. The CEMASTEA will be responsible as an agent for the general coordination of the work as required for implementation of the Project.

(2) Consultant

After signing the E/N, the project implementation agency will conclude a consultant services agreement for the detailed design and supervision with the Japanese Consultant in accordance with a set procedure of Japan's grant aid scheme and this contract must be verified by the Government of Japan. After verification of the contract, the Consultant will produce detailed design drawings and tender documents in accordance with the present Basic Design Study Report and in consultation with the CEMASTEA and will obtain approval by the Government of Kenya.

At the tender and during construction stage, the Consultant will conduct assistance for tender and supervisory service during construction stage based on the detailed design drawings and tender documents. The Consultant will also conduct supervisory service for procurement and installation of the equipment from equipment tender stage to installation, test running and handing over of the equipment.

1) Detailed Design

The detailed design means the decision-making on details of the facility plans and review of equipment plans based on the present Basic Design Study Report and the preparation of tender documents consisting of relevant design drawings, specifications,

general tender conditions and draft contracts for construction work and equipment procurement/installation respectively. It also includes estimation of the construction cost and equipment procurement/installation cost.

2) Assistance for Tender

"Assistance for Tender" means that the Consultant witnesses the selection of a contractor and an equipment supplier by the project implementation agency by means of tender and provides assistance for administrative procedures required for the concluding of contracts, reporting to the Government of Japan and other necessary works to proceed with the Project.

3) Supervision

"Supervision" means that the Consultant checks the compliance of the work by the contractor and the equipment supplier with the relevant contracts in order to confirm proper execution of the contracts. It also includes provision of advice and guidance for the project-related bodies and coordination between such bodies in a fair manner to facilitate the implementation of the Project. Expected major services of the Consultant in this regard are listed below.

a) Review and approval of the construction plan, shop drawings, equipment specifications and other documents submitted by the contractor and the equipment supplier
b) Pre-shipment inspection and approval of the quality and performance of the construction materials and equipment to be delivered to the site
c) Confirmation of delivery, installation and explanation of operation methods of building services equipment and other equipment
d) Assessment of and reporting on the construction progress
e) Witnessing of hand-over of the completed facilities and installed equipment.

In addition to the above services, the Consultant will report on the progress of the Project, payment procedure and hand-over on completion, etc. to the project-related government organisations in Japan.

(3) Contractor and Equipment Supplier

Contractor and Equipment Supplier for the Project will be selected from among Japanese companies with certain qualifications through an open tender. In principle, the tenderer who offers the lowest tender price will be designated as a successful tenderer and will conclude a construction (or equipment supply and installation) contract with the project implementation agency on the Kenyan side. Contractor and Equipment Supplier who are awarded with respective contract will conduct the construction of the facilities and the procurement, delivery and installation of the equipment in accordance with the respective contract. They will also provide technical training on the operation and maintenance of the relevant building materials, service systems and equipment. After hand-over of those materials, systems and equipment, the contractors will provide support together with the equipment manufacturers and local agents so that the Client, CEMASTEA, can receive a supply of spare parts and consumables for major equipment and technical training at cost.

(4) Japan International Cooperation Agency (JICA)

JICA will provide necessary actions to promote proper implementation of the Project in accordance with the grant aid scheme of the Government of Japan.

(5) Preparation of Construction Plan

The project implementation agency on the Kenyan side and the Consultant will discuss on construction plans during the detailed design stage. The demarcation of the scope of works by the Japan side and the Kenyan side needs to be clarified, and the time schedule and the method to conduct the work assigned to each side must be discussed and confirmed by both sides so that the works can be smoothly conducted in accordance with the implementation schedule specified in the Basic Design Study Report. Prior to the commencement of the construction work, the Kenyan side needs to complete demolition of existing office wing of Block-A on the site, to complete clearance of trees and levelling of ground over the area of building construction, and to obtain legal design approval from relevant authorities.

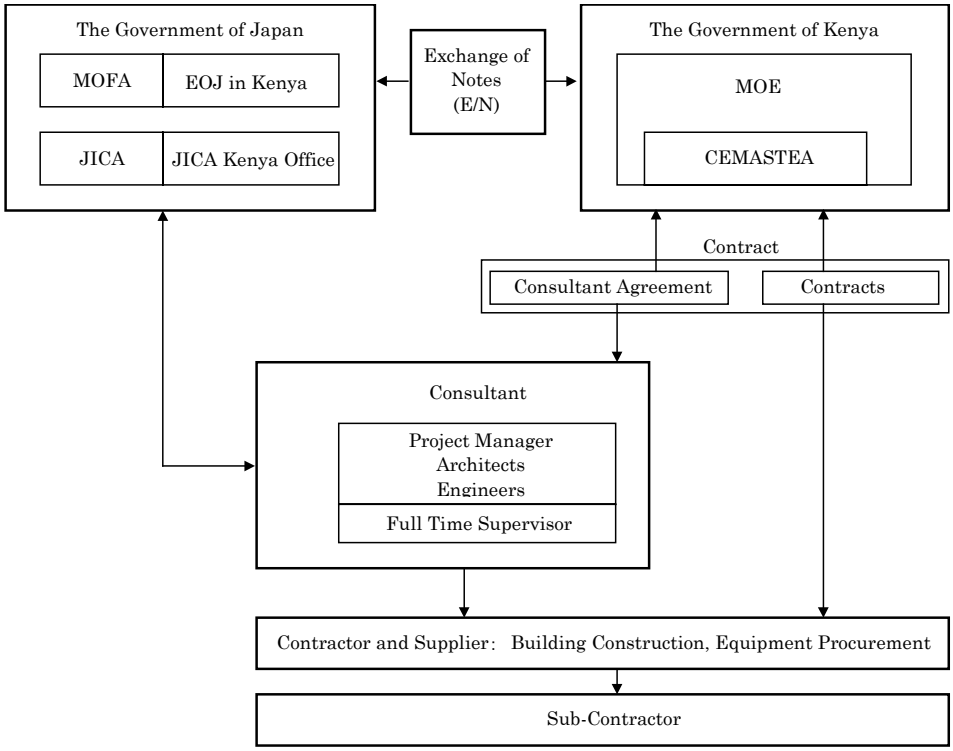


Figure 2-2 Construction Supervision Organisation

2.2.4.2 Implementation Conditions

(1) State of Local Construction Industry

The general state of local construction industry around Nairobi is outlined below.

a) Construction companies in Kenya have sufficient level of technology to serve for the domestic market.

b) Most construction materials are produced and available in Kenya, and imported materials can be also available and easily procured locally.
c) Taking into account the average work efficiency of joiners, plasterers, bar workers and finishing workers, the manpower requirements will be 2.5 to 4 times higher than those in Japan.
d) Skilled workers are available in all trades.
e) It is necessary to obtain a development permit at the basic design and a legal design approval at the detailed design stage. For the legal design approval application, it is necessary to submit a environment impact assessment approved by the National Environment Management Authority and detail design documents include part development plan, architectural drawings, including block (site) plan, plans, sections and elevations, structural drawings and structural calculations and so on. As this examination requires approximately 1 month by the Ministry of Roads & Public Works, application must be made immediately by MOE after completion of the detailed design documentation. This application and obtaining legal design approval are the works to be undertaken by the Kenyan side.

(2) Important Issues relating to Construction Work

1) Schedule Control

The heavy rainy season in Nairobi lasts from March to May, and a light rainy season lasts October to December. 25% of annual rainfall, i.e. 260mm, is concentrated in April. In order to complete the Project on schedule, it will be essential to ensure efficient drainage of rainwater from short but strong rain during the rainy season to prevent any delay of the construction work. Regular meetings on schedule control between the implementation body in Kenya, the Consultant and the Contractor for the Project will, therefore, become necessary.

2) Safety Control

The planned site is within the existing property of CEMASTEA, and located between existing buildings. As the construction needs to be undertaken during training period, means for safety control to protect trainees and staff will be necessary. The construction site needs to be surrounded by temporary fences to minimise interference to the training. Access route for construction vehicles and workers to the construction site will be separated from trainees and staff to ensure safety control. Prior to the start of the construction, coordination for safety control during the construction period will be necessary between the implementation agency of the Kenyan side, the Consultant and the Contractor(s).

(3) Important Issues Relating to Equipment Procurement

Some of the equipment to be delivered and installed at the planned facilities requires complicated installation arrangements during the construction period. Their procurement and installation schedule must, therefore, be properly arranged through close liaison between the Consultant and the Contractor. The equipment requiring such arrangements is listed below.

- Laboratory table, draft chamber, audio visual equipment, etc.

(4) Construction Management Engineers

In order to complete the construction of the facilities in time by complying with the design documents, the Contractor is expected to be capable of smoothly arranging the joint work with the local sub-contractor, providing appropriate technical guidance and controlling the schedule. The appointment of full-time engineers who are familiar with local conditions will be necessary to achieve facilities of high quality based on a proper understanding of the character of the planned facilities.

Given the contents and scale of the planned facilities, the following full-time on-site Japanese engineers are believed to be necessary.

- Site manager (1p) : general construction management
- Architectural engineer (1p) : guidance on building work, schedule control, quality control, guidance on shop drawing preparation
- Mechanical and electrical engineer (1p) : schedule control, quality control, equipment installation and test run, technical guidance
- Administrator (1p) : administrative work, personnel control, import procedures

(5) Equipment Procurement

- Installation, test run, confirmation of quantities of the supply items, explanation of operation and maintenance of each equipment together with manuals, technical training, must be provided.

- At the time of the hand over of the equipment, a list of parts and portions of major equipment, which tend to breakdown, must be listed and submitted to the Kenyan side.

2.2.4.3 Scope of Works

The Project will be implemented by cooperation by Japan and Kenya. In the case that the Project is implemented by a grant aid scheme provided by the Government of Japan, it is appropriate to demarcate the following scope of work for each side.

(1) Work to be undertaken by the Government of Japan

The Government of Japan will be responsible for the following works related to the consultant services for the Project, the construction of facilities and the procurement/installation of equipment.

1) Consultant Services

a) Preparation of detailed design documents and general conditions of tender for the planned facilities and equipment of the Project

b) Cooperation for selection of a Contractor and an Equipment Supplier (procurement and installation) for the Project, including cooperation for works related to establishment of contracts.
c) Supervision of the facility construction work and the delivery/installation/training of operation/training of maintenance of equipment

2) Construction of Facilities and Procurement/Installation of Equipment
a) Construction of the planned facilities for grant aid
b) Procurement and transportation/delivery of construction materials and equipment for the planned facilities for grant aid.
c) Training for installation and test operation/adjustment of the planned equipment for grant aid
d) Explanation and guidance on operation and maintenance methods for the planned equipment for grant aid

(2) Work to be undertaken by the Government of Kenya

At its own expense, the Government of Kenya will undertake demolition of office wing (Block-A) on the premises, clearance of tees in the construction area, clearance and levelling of ground for construction, planting vegetation within the premises, obtaining legal design approval, connection work of utility infrastructure, procurement of furniture and fixtures which are not included in the scope of the Japanese grant aid, and works related to tax exemption measures and others as described below.

1) Demolition of office wing on the premise, clearance of trees in the construction area, clearance and levelling of ground for construction

Prior to the start of construction, Office wing of Block-A needs to be demolished , trees over the area of building construction to be cleared, and the ground of construction area to be cleared and levelled.

2) Planting vegetation within the premises

Whole planting vegetation work within the premises to be undertaken

3) Obtaining Legal Design Approval

4) Connection of Utility Infrastructure
a) connection of electrical power supply
b) connection of telephone lines
c) connection of public water supply

5) Procurement

Procurement of general furniture and fixture excluded from the scope of the Japanese grant aid, including relocation of the existing general furniture and fixtures.

6) Tax Exemption

Exemption of Japanese nationals (persons and companies) from domestic taxes, including VAT, and financial levies imposed in Kenya for the procurement of goods and the provision of services based on the verified contracts for the Project

7) Customs Clearance, etc.

Provision of all conveniences for (i) the speedy customs clearance, (ii) exemption of import tax on equipment and materials imported from Japan and/or the third countries for the purpose of the Project based on the verified contracts, and (iii) the inland transportation of such equipment and materials

8) Visas, etc.
Provision of all conveniences necessary for the entry to and stay in Kenya of Japanese nationals who enter and stay in Kenya to conduct their assigned work for the implementation of the Project

9) Issue of Permits, etc.
Issue of various permits and authorisations which are required for the implementation of the Project

10) Payment
Payment of all necessary expenses that are not covered by the Japanese grant aid

11) Operation and Maintenance
Appropriate and effective utilization and maintenance of the facilities constructed and equipment procured by the grant aid

2.2.4.4 Consultant Supervision / Procurement Control

(1) Construction Supervision Policy

In accordance with the Japan's grant aid scheme, the Consultant will establish a project team, which will be consistently involved in the detailed design and construction supervision stages to ensure the smooth progress of the work, taking the purport of the basic design into consideration. The policy for the construction supervision for the Project is as per described below.

1) To aim at completing the construction of the facilities and the procurement and installation of the equipment without delay through close liaison with the personnel responsible for the Project in the two countries

2) To provide prompt and appropriate guidance and advice to the Contractor, Equipment Supplier and people related to them from an impartial standpoint

3) To complete the work, (i) to provide appropriate guidance and advice on the facilities and installation of equipment, and on the operation and management of the facilities as well as the installed equipment after the hand over, (ii) to witness the hand over of the facilities and equipment following confirmation of the completion of both the construction work and the equipment installation work meeting the contract conditions, (iii) to obtain acceptance of the handed-over facilities and equipment from the Kenyan side

(2) Supervision Plan

As the Project has many work items, one on-site full-time construction supervisor in charge of building work will be appointed, and following engineers will be dispatched and assigned in line with the progress of the construction.

- Project manager : general coordination and guidance on schedule and quality control
- Architect : confirmation of design intentions, shop drawings and material specifications
- Structural engineer : confirmation of soil bearing strength
- Mechanical engineer : interim and commissioning inspection of plumbing and air-conditioning system, etc.
- Electrical engineer : interim and commissioning inspection of conduit/wiring and power receiving equipment, etc.
- Equipment supervisor : guidance on equipment installation, coordination with building services work, witnessing quantity inspection and confirmation of appropriate explanation of equipment operation/maintenance , etc.

2.2.4.5 Quality Control Plan

Nairobi as the construction location has heavy rainy season from March to May, and light rainy season from October to December. Construction during the heavy rainy season of March to May requires sufficient quality control. According to past local meteorological data, due to the high altitude even under the Equator, the annual averaged monthly temperature fluctuate as little as 26.6°C max. in February to March and 10°C min. in July. It is expected to be easy to control the concrete temperature.

As there is no batcher plant within 50 to 60 minutes from the site, concrete needs to be mixed on site and the control of concrete quality, such as contents of salt in aggregates and the mixture of sand/aggregate/water etc. need to be undertaken on site.

If earth work is to be conducted during rainy season, a work plan describing the retaining work and dewatering work, etc. will be prepared as part of the quality control exercise.

The quality control plan for main works is described in the table below.

Table 2-47 Quality Control Plan

Work	Work Type	Control Item	Method	Remarks
Structural Work	Foundation work	Soil bearing capacity	Soil bearing test, soil layer confirm	
	Concrete work	Fresh concrete	Slump, air volume, temperature, chloride	
		Concrete strength	Compression strength test	Compression strength test at public test institution
	Reinforcing work	Reinforcing bar	Tensile test, mill sheet check	
		Arrangement	Bar arrangement check	
	Structural steel work	Steel material	Mill sheet, Tensile test	
		Processed	Factory inspection sheet check, Assembly check (location, bolt fastening)	

Finishing Work	Roof work	Workmanship, leakage	Water spray test	
	External tile work	Workmanship	Visual inspection	
	Plastering work	Workmanship	Visual inspection	
	Door & window work	Products	Factory inspection sheet check	
		Installation accuracy	Visual inspection, dimension check	
	Painting work	Workmanship	Visual inspection	
	Interior work	Products, workmanship	Visual inspection	
Electrical Work	Power Receiving	Performance, operation installation	Factory inspection sheet check, withstand voltage, megar, operation, visual inspection	
	Conduit Work	Bending, support pitch	Visual inspection, dimension check	
	Wiring and cable Work	Sheath damage, loose connection	Performance sheet check, cleaning before laying, marking after bolt fixing	
	Lightening Work	Resistance, conductor support pitch	Resistance measuring, visual inspection, dimension check	
	Lighting Work	Performance, operation, installation check	Performance sheet check, Illuminance measurement, visual inspection	
Mechanical Work	Water supply piping Work	Support pitch, leakage	Visual inspection, leakage, water pressure test	
	Drainage Piping	Grade, support pitch, leakage	Visual inspection, leakage, water flow test	
	Pump Installation	Performance, operation, installation	Performance sheet check, flow rate test	
	Water Tank	Leakage	Water filling test	
	Sanitary ware & fixture	Operation, installation, leakage	Visual inspection, water flow test	
	Kitchen Equipment	Operation, installation, leakage	Visual inspection, water flow test, performance	
	Air-conditioning	Operation, installation, leakage	Visual inspection, temperature measurement	
	Vent Work	Operation, installation	Visual inspection, air volume measurement	

2.2.4.6 Procurement Plan

(1) Construction Materials

1) Procurement Policy

As most of construction materials are available in Kenya, they will, in principle, be procured in Kenya. To make maintenance easier after completion of the construction, construction materials will be actively procured locally as a principle. Materials and equipment of which the procurement in Kenya is difficult and which are necessary to secure the intended functions of the planned facilities will be procured from Japan or third countries.

2) Procurement Plan

a) Structural Work

Main materials for the structural work, such as steel bar, concrete materials, steel form, etc., can be procured locally. Concrete block and brick for partitioning wall, etc., are produced and available locally.

b) Exterior and Interior Finishes

Aluminium sashes, timber, ceramic tiles, roof tiles, paint, glazing for both exterior and interior finishes can be procured locally.

c) Air-conditioning and Plumbing Work

Air-conditioning equipment, exhaust fans, pumps, various fixtures and sanitary-wares, fire hydrant including custom-order products, etc. can be procured locally. However, those products will be considered to import from Japan due to a difficulty on specifications and price of products in Kenya.

d) Electrical Work

Lighting fixtures, switches, lamps, electrical wires and cables, conduits, MDF, MDP, control panels etc. including custom-order products can be procured locally. However, those products will be considered to import from Japan or third country due to a difficulty on specifications and price of products in Kenya.

Table 2-48 Procurement Plan of Major Construction Materials
Architectural Work

Materials	Local Market		Procurement Plan		
	Condition (*)	Import	Kenya	Third Country	Japan
Portland cement	◎		○		
Sand, aggregate	◎		○		
Reinforcing bar	◎	SA, ASEAN, EU	○		
Structural steel	◎	SA, ASEAN, EU	○		
Form (steel)	◎		○		
Concrete block, Brick tile	◎		○		
Asphalt waterproof	△		○		
Wood	◎	ASEAN	○		
Aluminum window	△	ASEAN	○		
Steel door, Shutter	△	ASEAN	○		
Wooden door	◎	ASEAN	○		
Door handle, Lock	◎	ASEAN, EU	○		
Plane glass, Mirror	◎	ASEAN, EU	○		
Paint	◎		○		
Gypsum board, Cement board	◎	ASEAN, Japan	○		
Rock wool acoustic board (T-bar)	◎	ASEAN, Japan	○		
PVC tile	◎	ASEAN, EU	○		
Ceramic tile	◎	ASEAN, EU	○		

(*) ◎ Procure in Kenya market easily × Procure in Kenya market with difficulty ○ Procurement area and country
△ Procure in Kenya market particular spec. only SA: South Africa

Mechanical and Electrical Work

Work type	Materials	Local Market		Procurement Plan		
		Condition (*)	Import	Kenya	Third Country	Japan
Air-conditioning work	Air conditioner	△	Japan, EU			○
	Exhaust fan	△	Japan, EU			○
Plumbing work	Sanitary ware	◎	ASEAN, EU	○		○
	Fire extinguisher	◎	Japan, EU	○		
	Lifting pump	△	Japan, EU			○
	Water tank	◎	Japan, EU	○		
	Kitchen equipment	△	ASEAN, EU	○		○
Electrical work	Lighting fixture	◎	ASEAN, EU	○	○	○
	Panel (circuit)	△	ASEAN, EU		○	
	Wire, Cable	◎	ASEAN, EU	○		○
	Pipe (PVC)	◎	ASEAN, EU	○		○
	Telephone system	△	ASEAN, EU		○	○
	Fire alarm system	◎	ASEAN, EU	○	○	○
	Generator	△	ASEAN, EU		○	
	Lightning arrestor	◎	ASEAN, EU	○		

(*) ◎ Procure in Kenya market easily × Procure in Kenya market with difficulty ○ Procurement area and country
△ Procure in Kenya market particular spec. only SA: South Africa

(2) Equipment

1) Procurement policy

Comparing several equipment which is procured from Local, Third country and Japan, then equipment which price is lowest will be selected. Maintenance and after-sales-service (including spare parts and consumables) in Kenya will be taken into account to select equipment.

2) Procurement plan

a. Local procurement

Computer and peripherals are planned to be procured from local market because of importance of maintenance and after sales services. Furniture is also supposed to be procured in Kenya for its cost advantage.

b. Procurement from Japan

There are few manufacturers which produce experimental equipment in Kenya, so that almost experimental equipment will be procured from outside of Kenya. Comparing and examining Japanese and third countries' products, equipment will be selected from Japanese if there is cost advantage.

Regarding experimental table, there are several companies which produce the table in Kenya. But company guarantees heat-resistance and chemical-resistance of the table only for the products which table top is imported from outside of Kenya (mainly the United Kingdom) and assembled in Kenya. For the reason of that, comparing Japanese equipment and local assembled equipment which table top is imported, table will be procured from Japan if there is cost advantage.

c. Procurement from Third countries

Comparing and examining Japanese and third countries' equipment, equipment will be planned to be procured from third countries if there is cost advantage.

(3) Transportation Plan

In principle, transportation of the construction materials from Japan will use wooden crates or container shipment due to its small quantity, while the equipment will be transported in a container by sea. The main disembarkation point for maritime cargos to Kenya is Port Mombasa. There are frequent mixed consignment services from Japan to Port Mombasa. Customs clearance will be made at a bonded warehouse in Port Mombasa. Following customs clearance, they will be delivered to the site by a trailer. There are no obstruction for transportation between the port to the site, because road for a trailer is in good condition.

	Sea		Land	
Japan	→	Port Mombasa	→	Site

It will be necessary to allow about 1.5 months from shipping in Japan to the site including custom clearance. In principle, transportation of products from third countries will be made by containers by sea, and disembarked at Port Mombasa.

2.2.4.7 Implementation Schedule

In the case of the Project's implementation with the grant aid scheme provided by the Government of Japan, the following processes will be followed up to the commencement of the construction work.

a) Signing of the Exchange Notes (E/N) between the Government of Japan and the Government of Kenya
b) Recommendation of a Japanese consultant by JICA
c) Signing of the consultant services agreement by the Ministry of Education and the recommended Japanese consultant on the detailed design and supervisory of the planned facilities and equipment.
d) Preparation of the detailed design documents and tender documents, tender in Japan and signing contract for the construction and the equipment with (a) Japanese companies, leading to the commencement of the construction work.

After the signing of the E/N, the Ministry of Education will become an implementation agency on the Kenyan side.

(1) Detailed Design

The detailed design documents and tender documents will be prepared based on the basic design. These documents will consist of the detailed design drawings, specifications, calculation sheets, budget statement and terms of tender, etc. The Consultant will conduct detailed consultations with the project-related organizations of the Government of Kenya at the beginning and at end of the detailed design. The detailed design work by the Consultant will be completed when the final products submitted to the Government of Kenya are approved.

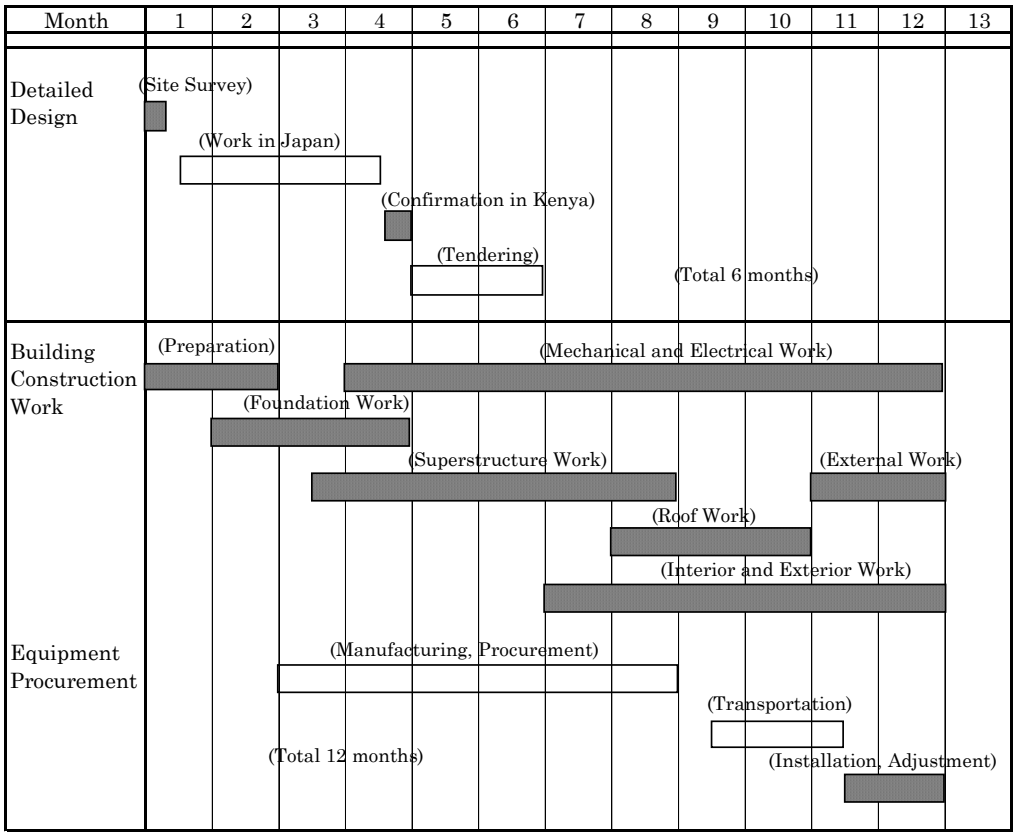
(2) Tender and Contract

Following the completion of the detailed design, a call for pre-qualification for the tender will be announced in Japan. Based on the evaluation result of the pre-qualification submission, the Ministry of Education, as the project implementation agency, will invite construction companies and equipment suppliers who have expressed of interest to participate in the tender. The tender will then be held and will be witnessed by the related parties. The tenderer(s) with the lowest tender price will be declared the successful tenderer provided that the contents of tender are judged to be appropriate. The successful tenderer will conclude a construction contract or an equipment supply contract with the Ministry of Education.

(3) Construction Work and Equipment Procurement

Following the signing of the contract and verification by the Government of Japan, the Contractor and the Equipment Supplier will commence their respective work. Judging from the scale of the planned facilities and the conditions of local construction workers, it is judged that the Project will take some 12 months to complete including equipment procurement and installation. The completion of the Project in this period assumes that procurement of the equipment and materials is made smoothly, that the clearance of the various procedures and reviews is made promptly by related organizations in Kenya and that implementation of the work to be undertaken by the Kenyan side is carried out smoothly.

Table 2-49 Implementation Schedule



2.3 Obligations of Recipient Country

2.3.1 Obligations of Recipient Country

It will be necessary for the Government of Kenya to undertake the following matters for the implementation of the Project with the grant aid provided by the Government of Japan.

(1) Matters Related to Construction Work

1) Demolition of office wing on the premise, clearance of trees in the construction area, clearance and levelling of ground for construction
2) Planting vegetation within the premises
3) Obtaining Legal Design Approval
4) Connection of Utility Infrastructure
   a. connection of electrical power supply
   b. connection of telephone lines
   c. connection of public water supply

(2) Matters Related to Operation and Maintenance

1) Procurement of general furniture and fixture excluded from the scope of the Japanese grant aid, including relocation of the existing general furniture and fixtures.
2) Arrangement of consumables and spare parts which will be required for the maintenance of the facilities and equipment
3) Appropriate as well as effective use and maintenance of the facilities and equipment provided under the grant aid

(3) Matters Related to Implementation Process

1) Making a banking arrangement and payment commission of contracts amount
2) Issue of authorisation to pays (A/P) and amendment of A/Ps and commission for the issue
3) Clearance of the procedure for the application of building permits and payment of various fees
4) Tax exemption and customs clearance of the equipment and materials imported under the grant aid and their swift inland transportation
5) Exemption of Japanese companies and Japanese persons working for the Project from customs duty, domestic taxes including VAT and any other financial levies imposed in Kenya
6) Provision of all conveniences for the entry to and stay in Kenya for Japanese persons for the execution of Project-related work
7) Issue of various permits and authorisation required for the implementation of the Project
8) Payment of all costs which are not included in the grant aid but which are necessary for the implementation of the Project

2.3.2 Cost Estimation

Cost to be borne by the Kenyan side

1) Cost related to building construction
   a) Demolition of office wing, clearance of trees and levelling of ground on site

1,719,200 Ksh

b) Plant vegetation on site

264,000 Ksh

c) Obtaining Legal Design Approval

95,920 Ksh

2) Connection of infrastructure

a) Incoming power supply

2,715,000 Ksh

b) Telephone lines

28,470 Ksh

c) City water supply

200,000 Ksh

3) Bank arrangement commission for contract sum (0.1% of contract value)

768,900 Ksh

4) Bank commission for issue of authorization of payment and amendments

39,800 Ksh

5) Procurement of general furniture and fixture (existing furniture and fixture are assumed to be relocated for use, and only procurement of shortages is allowed)

1,591,490 Ksh

Total of 1) to 5) 7,422,780 Ksh

2.3.3 Project Cost

The project cost for the planned facilities and equipment including consult services by the Government of Japan is estimates as per shown below, for the implementation of the Project with the Grant.

Preliminary Total Project Cost: approximately 1,161 million Yens

Facilities with total floor area of about 5,740 sqm.

Items		Project Cost (million Yens)	
Facilities	Administration, Training, Hostel, Dining Hall, External Works	929	1,054
Equipment	Laboratory, Lecture Room and Hall Equipment etc.	125	
Consultant Services Fee			107

This cost estimate is provisional and would be further examined by the Government of Japan for the approval of the Grant

Conditions of cost estimation

1) Date of cost estimation December 2005
2) Exchange rate 1 US$ = 75.15 Ksh = 113.53 Yens

2. 4 Project Operation Plan

2.4.1 Operation and Maintenance System

There is neither designated staff nor no staff allocation plan yet in CEMASTEA for maintenance of facilities and equipment. The maintenance work for the new facilities and equipment will be subcontracted in future to outside bodies in a same way as for the existing buildings currently undertaken.

Therefore the mechanical and electrical services for the facilities of the Project are designed introducing simple equipment that is easily procurable locally.

Similarly equipment are specified so that items requiring special maintenance can be procured and maintained by local agents, and that the maintenance problem is avoided.

2.4.2 Maintenance Plan

(1) Facilities

Maintenance of facilities is in two folds, i.e. a) daily cleaning, b) repair of wear/ breakdown/ deterioration.

Encourage of daily cleaning gives good influence to the use of the facilities, and it leads to careful handling of facilities and equipment. Furthermore, it is important to maintain the performance of equipment and materials. It also prolongs duration of the services equipment. Main repair works are repair and refurbish of interior/exterior finishes for protection of structural elements. Required refurbishment to maintain the function of the facilities is expected every 10 years in Japan.

Items of regular inspections and repairs that influences the durability of the facilities will be submitted as a part of Maintenance Manual by the contractor at the time of handover. Inspection methods and method of regular cleanings will be explained. The outlines of the Regular inspections are as follows;

Table 2-50 Outline of Regular Inspections

	Inspection items	Inspection frequency
Exterior	• Repair and paint of external wall	Repair: every 5 years Paint: every 3 years
	• Inspection and repair of roof	Inspection: every 3 years Repair: every 10 years
	• Regular cleaning of down pipe and drain	Every month
	• Inspection and repair of seal of furnishings on external wall	Every year
	• Regular inspection and cleaning of side ditches and manholes	Every year
Interior	• Change of interior finishes	As necessary
	• Repair and paint of partition walls	As necessary
	• Renew ceiling materials	As necessary
	• Adjustment of joiners, renew hardware	Every year As necessary

(2) Building Services

For building services, daily preventive maintenance is important as a mean to prevent repair of malfunctioning or replacement of parts. Life-spans of services equipment is influences by operation hours and they can be certainly prolonged by proper operation and daily inspection/lubrication/adjustment/cleaning/repair. These daily inspections can prevent

breakdown or accident and spread of accidents. Due to lack of maintenance staff in CEMASTEA, it is important to establish a maintenance formation to conduct periodic inspections for generator and pump, etc. once a year by subcontracting to outside contractors.

Expected life-spans of major equipments are as per shown in Table 2-45.

Table 2-51 Life-span of Building Services Equipment

	Type of Building Service Equipment	Life Expectancy
Electrical System	• Distribution panels • Fluorescent lamps • Incandescent lamps • Generator	20 – 30 years 5,000 – 10,000 hours 1,000 – 1,500 hours 30 years
Water Supply and Drainage Systems	• Pumps, pipes and valves • Tanks • Sanitary wares	15 years 20 years 25 – 30years
Air-Conditioning System	• Pipes • Exhaust fans • Air-conditioning units	15 years 20 years 10 year

(3) Equipment

It is necessary to conduct periodical inspections, maintenance and cleaning to make good use of the equipment. Also equipment shall be operated in accordance with its manual and avoided miss-use.

On purpose that CEMASTEA can receive after sales services such as procurement of spare parts and consumables, and repair of equipment which is procured from Japan and/or Third countries, it is considered as a tender condition that a tenderer which participates in the bidding of the equipment procurement shall have a liaison office in Kenya etc.

2.4.3 Operation and Maintenance Cost

The operation and maintenance cost is estimated for the full-scale operation (the annual utilization rate of the CEMASTEA is to be 81% for the entire facilities and 73% for the accommodation facilities (hostel)) of the planned new facilities following the completion of the Project. The operation and maintenance cost is divided into; 1. Travel and day allowance, 2. Meal cost for trainees, 3. Operation Cost for Facilities and Equipment ((1) Electricity Cost, (2) Power generator fuel Cost, (3) Telephone Cost, (4) LP Gas Cost, (5) City water cost, (6) Equipment Consumables) and 4. Maintenance Cost ((1) facilities, (2) utilities).

Table: 2-52 Estimated Operation and Maintenance Cost

Operation and Maintenance Cost	Ksh
1. Travel and day allowance	2,265,428
2. Meal cost for trainees	18,641,061
3. Operating Cost for Facilities and Equipment	7,116,441
(1) Electricity Cost	1,949,241
(2) Power generator fuel Cost	389,940
(3) Telephone Cost	470,000
(4) LP Gas Cost	3,294,260
(5) City water cost	700,000
((1)~(5) Total)	6,803,441
(6) Equipment Consumables	313,000
4. Maintenance Cost	640,000
(1) Facilities	308,000
(2) Utilities	332,000

5. Consumables	50,436
6. Miscellaneous	1,754,699
Total	30,468,065

- The inflation of prices is not taken into account.
  (Exchange rate: 1US$=75.15 Ksh = 113.53 Yen)

The operation and maintenance cost is estimated for the new facilities of 30,468,065 Ksh/year and the existing facilities of 4,625,000Ksh/year (consisting of operating cost for facilities and equipment, maintenance cost, consumables and miscellaneous), totalling the cost of approximately 35,125,000Ksh/year. The Ministry of Education's budget a the time of completion of the Project is approximately 45 million Ksh/year, there will be no problem to secure the operation and maintenance cost.

Breakdown of Cost Estimation

1. Travel and day allowances

Expenses of travel and day allowance for trainees in Kenya incurred in 2005 was 1,544,610Ksh. The number of academic was 60 persons in 2005, and it will be 88 persons when the Project is completed. The expense of travel and day allowances is expected to increase in proportion to the increase of the number of academic staff.

1,544,610Ksh / 60p x 80p = 2,265,428Ksh

2. Meal cost for trainees

The number of trainees in 2005 was 22,715p-day, and the meal cost was 7,935,228Ksh. The number of trainees is expected to be 53,361p-day. Assuming the quality and cost of meal remain same, the expected meal cost will be;

7,935,228Ksh / 22,715p-dayx 53,361p-day = 18,641,061Ksh

3. Operating Cost for Facilities and Equipment

(1) to (5) : Electricity, Power generator fuel, Telephone, Gas and City water cost

(1) Electricity Cost

1,949,241 Ksh/Year (referred to the attached sheet)

(2) Power generator fuel Cost

Year 2005: 129,980Ksh, Existing Generator capacity 250kVA → 250+258=508kVA

Oil 64.99Ksh /litter x 500 litter x 4 times/year = 129,980 Ksh - ①

New oil tank 1,000 litter x 64.99Ksh /litter x 4 times/year = 259,960 Ksh - ②

①＋② Total 389,940Ksh

(3) Telephone Cost

Year 2005: 312,000Ksh, Academic 60 persons in 2005 → 88 persons

Basic charge 500 Ksh x 5 lines x 12months = 30,000Ksh－ ①

Communication fee 300,000 Ksh/60 p x 88 p＝440,000Ksh－ ②

①＋② Total 470,000 Ksh

(4) LP Gas Cost

Year 2005: 1,402,320Ksh, use for cooking

1,402,320Ksh / 22,715p-dayx 53,361p-day = 3,294,260Ksh

(5) City water cost

700,000 Ksh/Year

(6) Equipment Major Consumables Cost

Major consumable price necessary for 1 year operation is estimated below table. It is possible for CEMASTEA to afford that price.

Table 2-53 Estimated major consumables, quantity and price

Equipment	Q'ty	Consumable/Spare parts	Unit	Unit Price (Yen)	Q'ty	Price (Yen)
Recording timer	5	Recording tape	56m/5set	5,500	10	55,000
Linear air track	5	Ink	bottle	1,000	20	20,000
Torricelli's law apparatus	5	Rubber tube	10 set	3,000	10	30,000
Brownian motion observation device	5	Bulb	10 set	3,000	10	30,000
Light source	1	Spare lamp	pc	3,000	5	15,000
Experimental lenses for refraction of light	5	Spare lamp	pc	3,000	15	45,000
Apparatus for coulomb's law	5	Spare lamp	pc	3,000	15	45,000
Digital microscope	2	Spare lamp	pc	3,000	4	12,000
Waste water apparatus	1	Filter	10 set	7,000	10	70,000
Binocular	25	Spare lamp	pc	3,000	50	150,000
Total						472,000

(approximately 313,000Ksh)

4. Maintenance Cost for Facilities

(1) Facilities Maintenance Cost

Even though the facilities maintenance cost changes considerably along the aging process, the necessity for major repair, etc. does not usually emerge for some 30 years after the completion of facilities. Actual examples of the maintenance cost for similar facilities suggest that the average annual repair cost is approximately 0.07% of the direct construction cost.

Direct Construction Cost 665,000,000 Yens × 0.07% = 465,500 Yens/year
(about 308,000 Ksh)

(2) Utilities Maintenance Cost

The amount of maintenance cost will remain small for some five years after completion but it will begin to increase thereafter because of the need for the replacement of parts and the replacement of equipment due to aging. The average annual repair cost over a 10-year span is estimated to be approximately 0.2% of the direct cost of utilities work.

Direct Cost 251,000,000Yens × 0.2% = 502,000 Yens/year
(about 332,000Ksh)

5. Consumables

Year 2005: 21,470Ksh, Trainees 22,715p-day→ 53,361p-day
21,470Ksh /22,715p x 53,361p = 50,436 Ksh

6. Miscellaneous

Year 2005: 746,950Ksh, Trainees 22,715p-day→ 53,361p-day
746,950Ksh /22,715p x 53,361p = 1,754,699 Ksh

2.4.4 Timing and Cost of Renewal

Building equipment, paint finish and equipment can perform their functions for a long period of time if daily maintenance is conducted. However, individual equipment has its own life span and its function deteriorates once it reaches the end of its expected life span, necessitating its renewal.

The renewal timing and cost of the main equipment planned under the Project are described below. It is necessary for the Kenyan side to secure the necessary budget to ensure the renewal of equipment in due course.

Renewal cost is estimated based on the following conditions;

- Renewal is limited to items with a life span less than 20 years.
- Excluding breakdowns due to inadequate use/operation
- Renewal cost is based on current price without escalation
- Exchange rate: 1 US$=113.64 Yen , 1 Ksh = 1.51 Yen

(1) Facilities

Table 2-54 Timing and Cost of renewal

Facilities: Building Work

Part	Work Item	Lifespan	Renewal Schedule	Unit	Renewal Cost
Exterior		(Year)		(㎡)	(Ksh)
Roof	Cement Tile	20～30	-	-	-
	Asphalt Waterproofing	10～15	15 yrs	125	163,000
	Metal Roofing	10	10 yrs	250	225,000
Ext. Wall	Brick tile	30	-	-	-
Exterior	Paint on Steel	3	Re-paint within 3 years	1,960	611,500
	Paint on Wall	5	Re-paint within 5 years	1,435	430,000
	Paint on Board	5	Re-paint within 5 years	1,545	433,000
	Aluminum Window	40	-	-	-
Interior		(Year)			
Floor	Ceramic Tile	30	-	-	-
	Parquet floor	15	15 years	310	1,355,000
	PVC Tile	20	-	-	-
Wall	Mortar Trowel＋EP Paint	5	Re-paint within 5 years	8,800	7,357,000
	Ceramic Tile	30	-	-	-
Ceiling	Rockwool Acoustic Board	20	-	-	-
	Gypsum Board + Paint	5	Re-paint within 5 years	1,114	1,114,000
	Silicate-Calcium Board VP paint	5	Re-paint within 5 years	1,225	1,286,000
Others		(Year)			
	Paint on Wooden Door	5	Re-paint within 5 years	1,675	569,500
	Paint on Steel Door	5	Re-paint within 5 years	100	30,000
	Paint on Steel	5	Re-paint within 5 years	400	128,000
	Wooden Door	20	-	-	-

Facilities: Mechanical and Electrical Services Work

		(Year)		(No.)	(Rp)
Part	Work Item	Lifespan	Renewal Schedule		Renewal Cost
Air-Conditioning.	Air-cooled package Air-Conditioner	10	Re-place within 10 years	2	1,180,817
	Exhaust Fan	20	-	-	-
Plumbing	Lifting Pump	15	Re-place within 15 years	2	411,496
	Fire Hydrant Pump	27	-	-	-
	Elevated Water Tank	20	-	-	-

	Fire Hydrant	20	-	-	-
	Sanitary ware	25～30	-	-	-
	Valve and fixtures	20	-	-	-
	Gas Range	8	Re-place between 8 years	3	413,204
Electrical	Panel	30	-	-	-
	Lighting Fixture	30	-	-	-
	Telephone System	15～20	Re-place between 15～20 years	1	1,796,000
	Fire Alarm	20	-	-	-
	Switch, Receptacle	20	-	-	-
	Generator	30	-	-	-

(2) Equipment

Manufacturers are required to supply equipment spare parts and consumables at least 5 years after handing over as warranty. And during warranty period, it is possible to repair the equipment as well. After warranty period expired, it may be difficult to purchase spare parts because of model change and/or discontinued line. As depreciation of equipment is depends on manufacturers, so it is difficult to specify the time of renewal.

Electricity Consumption Cost Estimation

Estimated Load
Lighting 13.5 VA/㎡
Receptacle 35 VA/㎡
Air-con 80 VA/㎡

① Load for Lighting and Air-conditioning

	ROOM NAME	Floor area (㎡)	Lighting (kVA)	Demand	Load (kVA) A	Receptacle (kVA)	Load	Total Load (kVA) B	Air-con (kVA)	Demand	Total Load (kVA) C	Total Load (kVA) A+B+C	Running hour per day	Running day per year	Running hour per year	Total Annual Load (kWh/year)
Administration Building	Office	540.00	7.29	100%	7.29	18.9	50%	9.45				16.74	8	185	1,480	24,775
	Director	36.00	0.486	100%	0.486	1.26	50%	0.63				1.116	8	185	1,480	1,652
	Deputy Director	36.00	0.486	100%	0.486	1.26	50%	0.63				1.116	8	185	1,480	1,652
	Administrative officer	18.00	0.243	100%	0.243	0.63	50%	0.315				0.558	8	185	1,480	826
	Secretary room	36.00	0.486	100%	0.486	1.26	50%	0.63				1.116	8	185	1,480	1,652
	Meeting	72.00	0.972	100%	0.972	2.52	50%	1.26				2.232	5	185	925	2,065
	Counseling room	18.00	0.243	100%	0.243	0.63	50%	0.315				0.558	3	185	555	310
	Printing room	36.00	0.486	100%	0.486	1.26	50%	0.63				1.116	5	185	925	1,032
	Hall/Corridor/ WC / Store and Pantry etc.	371.40	5.0139	30%	1.50417	12.999	10%	1.2999				2.80407	8	185	1,480	4,150
Dining Hall Kitchen	Dining hall	180.00	2.43	100%	2.43	6.3	20%	1.26				3.69	5	259	1,295	4,779
	Staff room	12.00	0.162	50%	0.081	0.42	20%	0.084				0.165	2	259	518	85
	Office	6.00	0.081	100%	0.081	0.21	50%	0.105				0.186	5	259	1,295	241
	Kitchen	80.00	1.08	100%	1.08	2.8	100%	2.8				3.88	4	259	1,036	4,020
	Store-1 (for Dry Food)	15.00	0.2025	30%	0.06075	0.525	5%	0.02625				0.087	0.5	259	130	11
	Store-2 (for Vegetable)	15.00	0.2025	30%	0.06075	0.525	5%	0.02625				0.087	0.5	259	130	11
	Cold room 1 (-5℃)	3.00	0.0405			0.105	5%	0.00525				0.00525	24	365	8,760	46
	Cold room 2 (+5℃)	3.00	0.0405			0.105	5%	0.00525				0.00525	24	365	8,760	46
	Corridor/ WC etc.	166.40	2.2464	30%	0.67392	5.824	5%	0.2912				0.96512	5	259	1,295	1,250
Laboratory and Lecture Building	Lecture Hall	315.00	4.2525	100%	4.2525	11.025	50%	5.5125				9.765	7	185	1,295	12,646
	Computer room	94.00	1.269	100%	1.269	3.29	80%	2.632	7.52	70%	5.264	9.165	5	185	925	8,478
	Library	67.00	0.9045	80%	0.7236	2.345	20%	0.469				1.1926	7	185	1,295	1,544
	Lecture room	384.00	5.184	100%	5.184	13.44	50%	6.72				11.904	7	185	1,295	15,416
	Laboratory (Physics)	135.00	1.8225	100%	1.8225	4.725	50%	2.3625				4.185	5	185	925	3,871
	Prep. ROOM	27.00	0.3645	100%	0.3645	0.945	50%	0.4725				0.837	2	185	370	310
	Laboratory (Chemistry)	135.00	1.8225	100%	1.8225	4.725	50%	2.3625				4.185	5	185	925	3,871
	Prep. ROOM	27.00	0.3645	100%	0.3645	0.945	50%	0.4725				0.837	2	185	370	310
	Laboratory (Biology)	135.00	1.8225	100%	1.8225	4.725	50%	2.3625				4.185	5	185	925	3,871
	Prep. ROOM	27.00	0.3645	100%	0.3645	0.945	50%	0.4725				0.837	2	185	370	310
	Hall/Corridor/Store and WC etc.	495.40	6.6879	30%	2.00637	17.339	5%	0.86695				2.87332	2	185	370	1,063
Hostel	Twin Bed room	1320.00	17.82	100%	17.82	46.2	50%	23.1				40.92	4	259	1,036	42,393
	Reception office	24.00	0.324	100%	0.324	0.84	50%	0.42				0.744	5	259	1,295	963
	Sick-Bay	24.00	0.324	100%	0.324	0.84	50%	0.42				0.744	5	259	1,295	963
	Washing room	48.00	0.648	80%	0.5184	1.68	50%	0.84				1.3584	1.5	259	389	528
	Linen laundry	47.00	0.6345	80%	0.5076	1.645	50%	0.8225				1.3301	1.5	259	389	517
	Entrance hall/ Store/ Lounge and corridor etc.	711.60	9.6066	30%	2.88198	24.906	5%	1.2453				4.12728	5	259	1,295	5,345
Others	Pump room	9.00	0.1215	10%	0.01215	0.315	5%	0.01575				0.0279	0.5	185	93	3
	Electrical room(Generator)	73.04	0.98604	10%	0.098604	2.5564	5%	0.12782				0.226424	0.5	185	93	21
	計				59.146794			71.45992			5.264	135.870714				**151,023**

Elec. Charge **9.88** (Ksh/kWh)

② Load for Plumbing Equipment

Pump capacity	Elec. Load (kW)	Demand 20%
Lift pump capacity (3.7kW+2.2kW) x 2 Nos.	11.8	2.36 kW
Septic tank pump capacity 1.5kW × 1no.	1.5	0.3 kW
	year	2.66 kW
		Demand 70%
③ Electric Shower Head capacity 4.4KW x 55 Nos.	242	169.4 kW

Annual running hour of Kitchen, toilet — Annual Consumption

900 h／year — **2,394** kWh/year
× **9.88** (Ksh/kWh)
= **23,653** Ksh/year - ②

Annual running hour of shower
259 h／year
(0.5h/day × 2person × 259day/year) — **43,875** kWh/year
× **9.88** (Ksh/kWh)
= **433,481** Ksh/year - ③

151,023 kWh/年 × **9.88** (Ksh/kWh)
= **1,492,107** Ksh/year - ①

Annual Consumption年 ①+②+③ = **1,949,241** Ksh/year

2.5 Improvement Points for Implementation of the Project

(1) Obtaining of Approval for Demolition of Existing Office Wing

The MOE is required to set up an investigating committee regarding the demolition of the existing office wing and to compile a request for demolition which will be made to the Kenyan Ministry of Finance for approval. The progress situation of this process must be regularly checked so that the demolition work is completed by January, 2007 when the construction work is scheduled to start.

(2) Environmental Impact Assessment and Obtaining of Legal Design Approval

To commence the construction work of the planned facilities under the Project, it will be necessary to obtain the legal design approval of the Ministry of Roads and Public Works. For application for this approval, an environmental impact assessment report will be required along with a letter of allotment and PDP (part development plan). The process of obtaining legal design approval consists of two stages, i.e. a development permit and legal design approval. The former is required at the time of completing the basic design while the latter is required at the time of completing the detailed design. As the legal design approval stage requires approximately one month to complete, the relevant application by the MOE should be made around October, 2006 after approval of the detailed design documents by the MOE. The progress situation of this process must be regularly checked so that the approval is obtained by the end of December, 2006 prior to the scheduled start of the construction work. The application for legal design approval must be accompanied by an environmental impact assessment report. The MOE is responsible for the preparation of this report and the application for its approval to the National Environment Management Authority. The progress situation of this process must also be regularly checked.

(3) Infrastructure Connection Work

The Kenyan side must complete the work to connect the power, telephone and municipal water to the relevant buildings by mid-November, 2007 when the electrical equipment and telephone equipment will be installed in these buildings. The progress situation of the work by the Kenyan side must be regularly checked.

CHAPTER 3 PROJECT EVALUATION AND RECOMMENDATIONS

Chapter 3 Project Evaluation and Recommendations

3.1 Project Effects

Current Situation and Problems	Improvement Measures Under the Project	Project Effects and Degree of Improvement
The Government of Kenya is facing a need to strengthen mathematics and science education in secondary education to achieve the national target of "shifting the country's economic foundation to industry by 2020". For this purpose, the retraining of mathematics and science teachers in secondary education has been conducted under the SMASSE Project, a technical cooperation project of Japan, since July, 1998. Following the positive effects of this project, the CEMASTEA has been established as a training base for the training of district trainers who will be required to expand the in-service training of teachers throughout Kenya and also for third country training for SMASSE-WECSA member countries in preparation for the SMASSE Phase 2 Project which was scheduled to commence in July, 2003. In subsequent years, the training need in Kenya and SMASSE-WECSA member countries has increased but has not been properly met because of the limited accommodation capacity of 92 trainees and the shortage of facilities, including a lecture hall, at the CEMASTEA which uses former vocational training facilities. It is, therefore, necessary to expand the CEMASTEA to an exclusive training facility which is capable of accommodating 200 trainees at a time.	The scale of the CEMASTEA will be expanded to accommodate 200 trainees from the present 92 trainees. Together with the provision of the necessary equipment, the CEMASTEA will be developed as a resource centre for mathematics and science education in secondary education in Kenya and SMASSE-WECSA member countries. To be more precise, a new administration building, laboratory and lecture building and dining hall building, etc. will be constructed and the required equipment for training will be provided.	The expansion of the CEMASTEA is expected to have the following effects. ① The number of trainees at a time will increase from 92 to 200. ② The annual number of trainees will increase from 1,476 in 2005 to 5,423 in 2008. ③The number of training courses to be held a year will increase from 7 in 2005 to 10 in 2008. Teaching on mathematics and science will improve not only in Kenya but also in the rest of Africa as the ex-trainees of the CEMASTEA will spread their newly acquired knowledge and skills in their respective countries. The understanding of mathematics and science among secondary school pupils in Kenya and the rest of Africa will improve.

Further details of the above direct effects are shown in Tables 3-1 and 3-2.

Table 3-1 Comparison of the Annual Number of Trainees Between in 2005 and in 2008

Year	Record in 2005		Plan in 2008	
Training Course	Training Plan	Trainees (person)	Training Plan	Trainees (person)
1. INSET Training in Kenya	(person) (week) (time/year)	1,381	(person) (week) (time/year)	5,273
(1) National INSET Training	90 x 2 x 12	1,017	200 x 2 x 8	1,600
(2) Principal Workshop	90 x 1 x 3	204	200 x 1 x 6	1,200

(3) DEO's Workshop	72 x 1 x 1	47	72 x 1 x 1	72
(4) Deputy DEO's Workshop	―	―	72 x 1 x 1	72
(5) QASO Workshop	90 x 1 x 1	60	200 x 1 x 3	600
(6) Stakeholder Workshop	600 x 1 x 1	Not Operated	200 x 1 x 3	600
(7) INSET for Secondary Teacher Colleges	90 x 1 x 1	53	93 x 1 x 1	93
(8) INSET for Primary Teacher Colleges	―	―	200 x 1 x 3	480
(9) INSET for TIVET Math. and Science	―	―	200 x 1 x 3	556
2. SMASSE-WECSA Third Country Training	92 x 5 x 1	95	150 x 5 x 1	150
Total		1,476		5,423

Table 3-2 Comparison of the Annual Number of Training Courses

Training Course	Record in 2005	Plan in 2008
INSET Training in Kenya	6 training course (National INSET Training, Principal Workshop, DEO's Workshop, QASO Workshop, Stakeholder Workshop, INSET for Secondary Teacher Colleges)	9 training course (National INSET Training, Principal Workshop, DEO's Workshop, Deputy DEO's Workshop, QASO Workshop, Stakeholder Workshop, INSET for Secondary Teacher Colleges, INSET for Primary Teacher Colleges, INSET for TIVET Math. and Science)
Third Country Training under SMASSE-WECSA	1 training course	1 training course

3.2 Pending Tasks and Recommendations

Although the effects described in 3.1 are expected to take place with the implementation of the Project, it will be necessary for the Kenyan side to undertake the following tasks to ensure the said effects.

(1) Assured funding to cover the management cost of the SMASSE-WECSA third country training

Five week long SMASSE-WECSA third country training was held with 85 participants from 15 countries in 2004 and 95 participants from 14 countries in 2005. The cost of participating in the training, including air fares, was also exclusively paid by Japan under the SMASSE Phase 2 Project, a technical cooperation project of the JICA. While the Kenyan side gives third country training high priority with the intention of further expanding the scale beyond that of the SMASSE Phase 2 Project, it faces the difficult task of securing funding for the training cost, including air fares, for the actual implementation of this training. The Kenyan side is hoping for the financial aid of Japan and other donors and, as the competent ministry, the MOE is required to promptly secure the necessary budget every year while examining the possibility of the said foreign aid.

(2) Assured appropriation of the operation and maintenance budget

For the actual implementation of the planned training, the operation and maintenance cost of the CEMASTEA must be funded. Any shortage of this funding may disrupt the training at the CEMASTEA.

The operation and maintenance cost of the CEMASTEA will be met by the MOE and this funding must be made without fail every year. The estimated operation and maintenance cost suggests that it can be met within the budget amount of which the appropriation is promised by the MOE.

(3) Establishment of the maintenance system

The CEMASTEA currently does not have maintenance staff for the facilities and equipment and trusts the maintenance work to local companies. As there is no plan to recruit any maintenance staff after the expansion of the facilities, the maintenance contracts with local companies are expected to continue. For this reason, the mechanical and electrical equipment and systems for the new facilities are planned based on such conditions as local procurement, simplicity and ease of maintenance as in the case of the existing facilities. However, as such equipment as the generator and pump, etc. require periodic inspection and maintenance, the conclusion of periodic maintenance contracts with local companies is necessary.

(4) Increase of the staff strength

In line with the expansion of the CEMASTEA, it is planned to increase the staff strength from the current 88 to 144. Although it is planned to recruit new academic staff and non-academic staff through the transfer of staff members of the MOE, the recruitment of new staff must be conducted as planned despite the restriction imposed by the Government of Kenya on an increase of civil servants due to the tight financial situation.

(5) Obtaining of the title deeds

In Kenya, it is common for government-owned land not to have any title deeds and it is possible to apply for and obtain a legal design approval based on a letter of allotment which has already been acquired without any title deeds. However, it is judged to be preferable to obtain the title deeds to prevent any future problems involving the land and efforts to obtain the title deeds for the land on which the new facilities will be constructed should continue.

APPENDICES

1. Member List of the Study Team
2. Study Schedule
3. List of Parties Concerned in the Recipient Country
4. Minutes of Discussions
   - 4.1 Basic Design Study
   - 4.2 Explanation on the Draft Final Report
5. Cost Estimation Borne by the Recipient Country

1. Member List of the Study Team

Appendix 1　Member List of the Study Team

1. Member List of Basic Design Study (November 30, 2005～December 25, 2005)

(1) Leader　Mr. Yoshiaki KANO
Resident Representative, JICA Kenya Office
Japan International Cooperation Agency (JICA)

(2) Planning Management　Mr. Narufumi TAKENAKA
Education and Vocational Training Team, Project Management Group Ⅱ,
Grand Aid Management Department, Japan International Cooperation Agency (JICA)

(3) Project Manager/Building Planning　Mr. Shigeru YASUMATSU
Kume Sekkei Co., Ltd.

(4) Building Design　Mr. Kiyoshi KANEKO
Kume Sekkei Co., Ltd.

(5) Mechanical and Electrical Planning　Mr. Akira HATANAKA
Kume Sekkei Co., Ltd.

(6) Construction Planning/Cost Estimation　Mr. Teruaki HIRAOKA
Kume Sekkei Co., Ltd.

(7) Equipment Planning　Mr. Takayuki KOJIMA
Intem Consulting, Inc.

2. Member List of Explanation on Draft Final Report (March 18, 2006～March 26, 2006)

(1) Leader　Mr. Hideaki HARADA
Group Director, Project Management Group Ⅱ, Grand Aid Management Department,
Japan International Cooperation Agency (JICA)

(2) Project Manager/Building Planning　Mr. Shigeru YASUMATSU
Kume Sekkei Co., Ltd.

(3) Building Design　Mr. Kiyoshi KANEKO
Kume Sekkei Co., Ltd.

(4) Equipment Planning　Mr. Takayuki KOJIMA
Intem Consulting, Inc.

2. Study Schedule

Appendix 2 Study Schedule

1. Itinerary of Basic Design Study (November 30～December 25, 2005)

No.	Date		Official		Consultants				
			Leader	Planning Management	Project Manager/ Building Planning	Building Design	Mechanical and Electrical Planning	Construction Planning/ Cost Estimation	Equipment Planning
			Yoshiaki KANO	Narufumi TAKENAKA	Shigeru YASUMATSU	Kiyoshi KANEKO	Akira HATANAKA	Teruaki HIRAOKA	Takayuki KOJIMA
1	11/30	Wed		Kansai (23:15) → (EK317)					Same as Project Manager
2	1	Thu	Courtesy Call to MOEST, JICA	→ Dubai (05:55) Dubai (08:10) → Nairobi (12:10) (EK719) Courtesy Call to MOEST, JICA					Same as Project Manager
3	2	Fri	Courtesy Call to Embassy of Japan, Visit to CEMASTEA, Explanation and Discussion of IR w/MOEST						Same as Project Manager
4	3	Sat	Analysis of Survey Details		Survey of CEMASTEA Facilities		Kansai (23:15) → (EK317)		Survey of CEMASTEA Equipment
5	4	Sun	Team Meeting				→ Dubai (05:55) Dubai (08:10) → Nairobi (12:10) (EK719) Team Meeting		Team Meeting
6	5	Mon	Discussion w/CEMASTEA		Same as Team Leader		Survey of CEMASTEA M/E Facilities	Survey of CEMASTEA Distribution of Cost Survey Sheet	Same as Project Manager
7	6	Tue	Discussion w/CEMASTEA Signing MD		Same as Team Leader	Order of Geotech.,Topo. Survey/same as Leader	Survey of CEMASTEA M/E Facilities	Survey of CEMASTEA, Local Contractor	Same as Project Manager
8	7	Wed	Report to JICA Lev. Nairobi (Planning Management)		Same as Team Leader, Discussion w/CEMASTEA	Order of Geotech.,Topo. Survey, Discu. w/CEMASTEA	Survey of M/E Contractor	Survey of Local Contractor	Discussion w/CEMASTEA
9	8	Thu		Arv, Kansai	Survey of Kiambu District INSET Centre, Kiambu TIVET, Nairobi District INSET Centre				
10	9	Fri			Survey of KSTC, Third Country Training, Discussion w/CEMASTEA			Survey of Construction Material・Unit Price, Similar Facilities	Discussion w/CEMASTEA
11	10	Sat			Survey of CEMASTEA Facilities			Survey of Construction Material・Unit Price	Survey of Equipment Agent
12	11	Sun			Survey Data Input Team Meeting				
13	12	Mon			Preparation of Draft Facility Plan				Preparation of Draft Equipment Plan
14	13	Tue			Discussion w/CEMASTEA, Water Company Survey	Preparation of Draft Facility Plan	Survey of M/E Material・Maintenance, Water Company Survey	Survey of Construction Material・Unit Price	Discussion w/CEMASTEA
15	14	Wed			Survey of Well Contractor, Preparation of Draft Facility Plan	Preparation of Draft Facility Plan	Survey of Well Contractor, M/E Material・Maintenance	Survey of Construction Material・Unit Price	Discussion w/CEMASTEA, Survey of Equipment Agent
16	15	Thu			Survey of JKUAT, AICAD				
17	16	Fri			Discussion w/CEMASTEA, Survey of TSC, JICA Report	Discussion w/CEMASTEA, JICA Report	Discussion w/CEMASTEA, JICA Report	Survey of Tax Exemption, Const. Material, JICA Report	Equipment Agent, Discu. w/ CEMASTEA, JICA Report
18	17	Sat			Preparation of Draft Facility Plan		Preparation of Draft M/E Plan	Survey of Construction Material・Unit Price	Supplementary Survey, Preparation of Draft Equipment Plan
19	18	Sun			Survey Data Input Team Meeting				
20	19	Mon			Discussion w/CEMASTEA		Survey of Electrical Corp.	Collection of Cost Survey Sheet Supplementary Survey	Supplementary Survey, Preparation of Draft Equipment Plan
21	20	Tue			Discussion w/CEMASTEA		Supplementary Survey and Discussion	Supplementary Survey and Discussion	Survey of Equipment Agent, Discussion w/CEMASTEA
22	21	Wed			Survey of City Council of Nairobi, Discussion w/CEMASTEA		Data Input, 、Discussion w/CEMASTEA Nairobi (18:20)→Dubai (00:15) (EK720)		Survey of Equipment Agent, Discussion w/CEMASTEA
23	22	Thu			CEMASTEA Site Survey, Data Input, Embassy Report		Dubai (02:30)→Kansai (17:00)(EK316)		Survey of Equipment Agent, Embassy Report
24	23	Fri			Signing Technical Note				Same as Project Manager
25	24	Sat			Supplementary Survey Nairobi (18:20)→Dubai (00:15) (EK724)				Same as Project Manager
26	25	Sun			Dubai (02:30)→Kansai (17:00)(EK316)				Same as Project Manager

2. Itinerary of Explanation on Draft Final Report (March 18～March 26, 2006)

No.	Date		Official	Consultants		
			Leader	Project Manager/ Building Planning	Building Design	Equipment Planning
			Hideaki HARADA	Shigeru YASUMATSU	Kiyoshi KANEKO	Takayuki KOJIMA
1	3/18	Sat	Narita (18:45) → Bangkok (23:45) (JL707)	Kansai (23:15) → (EK317)		
2	19	Sun	Bangkok (02:20)→ Dubai (6:00) (EK419) Dubai (08:10) → Nairobi (12:10) (EK719)	→ Dubai (05:55) Dubai (08:10) → Nairobi (12:10) (EK719)		
3	20	Mon	Call to JICA, Courtesy Call to MOE			
4	21	Tue	Discussion w/CEMASTEA, Survey of MOR&PW			Discussion w/CEMASTEA
5	22	Wed	Discussion w/CEMASTEA	Supplementary Survey, Discussion w/CEMASTEA		
6	23	Thu	Survey of AICAD, Discussion w/CEMASTEA		Supplementary Survey, Discussion w/CEMASTEA	
7	24	Fri	Discussion w/MOE, Signing MD, Courtesy Call and Report to Embassy, Report to JICA			
8	25	Sat	Nairobi (18:20) → Dubai (00:15) (EK724)			
9	26	Sun	Dubai (02:30) → Kansai (17:00) (EK316)			

3. List of Parties Concerned in the Recipient Country

Appendix 3 List of Parties Concerned in the Recipient Country

<Parties of the Kenyan side>

1. Ministry of Education

Prof. Karega Mutahi	Permanent Secretary
Prof. George I. Godia	Education Secretary
Mr. David K. Siele	Director of Higher Education
Mr. M. A. Saleh	Senior Deputy Secretary
Mr. Enos O. Oyaya	Director of Quality Assurance and Standard
Mr. A. A. Rateno	Director of Technical Education
Mrs. Margaret Odera	Senior Deputy Director of Education
Mr. Leah Rotich	Deputy Director of Basic Education
Mr. Orwa. M. Ondeto	Senior Assistant Director of Education
Mr. Robert M. Omosa	Education Officer-SMASSE
Mr. M.C. Opwora	Senior Technical Educational Officer

2. CEMASTEA (Strengthening of Mathematics and Science in Secondary Education Project, Phase II)

Mr. Obadial Maganga	Head
Mr. Michael M. Waititu	Subject Administrator – Physics
Mr. Peula Lelei	Subject Administrator – Biology
Mr. Patrick Kogolla	Subject Administrator – Chemistry
Mr. B. C. Chesire	Academic Head – Physics
Mr. Kithaka Njogu	Academic Head – Mathematics
Ms. L. G. Kisaka	Academic Head – Biology
Mr. Daniel Matiri	Academic Head – Chemistry
Mr. David Arimi	Subject Administrator – Biology
Mr. B. M. Njuguna	Former Head

3. Teachers Service Commission Kenya

Mr. Ibrahim M. Hussein	Commission Chaiman

4. Kenya Science Teacher College

Mr. Patrick. W. Kibui	Principal

5. Kiambu High School

Mr. G. M. Njorose	Principal

6. Kiambu Institute of Science & Technology

Mr. Simon. S. Iruwgu	Principal

7. Ministry of Roads and Public Works

Mr. Philip O. Sika	Chief Architect
Mr. M. N. Mugwanja	Principal Superintending Architect

8. City Council of Nairobi

Mr. Peter M. Kibinda	Registerd Planner

9. Nairobi Waterworks and Drainage Co., Ltd. Karen Branch

Mr. Peter Gukobu	Engineer

10. Agro Irrigation & Pump Services Limited

Mr. Dinesh Halai	Managing Director

11. Ngasi Consulting Engineers

Mr. Nathaniel O. Matalanga

12. TeljomKenya

Mr. James Achando	Manager for Nairobi South Area

13. Kenya Power and Lighting Co., Ltd.

Mr. Maritim	Manager for Karen Area

14. Nairobi Fire Department

Mr. Makira	Chief Fire Officer
Mr. Luvinzu	Fire Officer

＜Parties of the Japanese side＞

1. Embassy of Japan in Kenya

Mr. Satoru Miyamura	Ambassador
Mr. Tomohiro Ohishi	Secretary

2. JICA Kenya Office

Mr. Yoshiaki Kano	Resident Representative
Mr. Jiro Inamura	Deputy Resident Representative

Mr. Kazuhiko Tokuhashi	Deputy Resident Representative
Ms. Riko Saito	Assistant Resident Representative
Mr. Masaki Kurisu	Assistant Resident Representative
Mr. S. K. Kibe	Programme Officer (Education)
Ms. Naomi Assumani Owino	Advocate Administration Officer
Mr. Benson Gakere	Assistant Administration Officer
Mr. Elijah Kinyangi	Programme Officer

3. Strengthening of Mathematics and Science in Secondary Education Project, Phase II

Mr. Takahiko Sugiyama	Chief Advisor, JICA Expert
Mr. Keiichi Naganuma	Project Coordinator, JICA Expert
Prof. Dr. Shigekazu Takemura	JICA Expert in Physics
Mr. Tomoiso Tokuda	JICA Expert in Mathematics
Ms. Hazuki Uchiyama	JICA Expert in Physics
Mr. Hiromasa Hattori	JICA Expert in Evaluation

4. Africa Institute for Capacity Development (AICAD)

Prof. A. B. Gidamis	Executive Director
Dr. Josephat K. Z. Mwatelah	Deputy Executive Secretary
Ms. Margaret	Officer
Mr. Tomikazu Inagaki	Chief Advisor, JICA Expert
Mr. Atsutoshi Hirabayashi	Advisor, Administrative Management, JICA Expert

4. Minutes of Discussions

4.1 Basic Design Study

MINUTES OF DISCUSSIONS
ON THE BASIC DESIGN STUDY ON THE PROJECT
FOR THE EXPANSION OF THE CENTRE FOR MATHEMATICS, SCIENCE AND TECHNOLOGY EDUCATION IN AFRICA
IN THE REPUBLIC OF KENYA

Based on the results of the Preliminary Study, the Government of Japan decided to conduct a Basic Design Study on the Project for the Expansion of the Centre for Mathematics, Science and Technology Education in Africa (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to the Republic of Kenya (hereinafter referred to as "Kenya") the Basic Design Study Team (hereinafter referred to as "the Team"), headed by Mr. Yoshiaki Kano, Resident Representative, JICA Kenya Office, and which is scheduled to stay in the country from December 1st to 24th, 2005.

The Team held discussions with the officials concerned of the Government of Kenya and conducted a field survey at the study area. In the course of discussions and field survey, both parties confirmed the main items described in the attached sheets. The Team will proceed with further works and prepare the Basic Design Study Report.

Nairobi, December 6th, 2005

Mr. Yoshiaki Kano
Leader
Basic Design Study Team
Japan International Cooperation Agency

Prof. Karega Mutahi
Permanent Secretary
Ministry of Education,
Science and Technology
Republic of Kenya

ATTACHMENT

1. Objective of the Project

The objective of the Project is to strengthen the quality of mathematics and science education at basic level in Kenya and member countries of 'Strengthening of Mathematics and Science in Secondary Education–Western, Eastern, Central and Southern Africa' (SMASSE-WECSA) through the expansion of the Centre for Mathematics, Science and Technology Education in Africa (CEMASTEA).

2. Project site

The site of the Project located in Karen, Nairobi is shown in Annex-1-1. The layout of the existing facilities of CEMASTEA is shown in Annex-1-2.

The Kenyan side promised to secure the construction site within CEMASTEA, and will obtain the 'Title Deed' (certificate of land registration) and submit a copy to JICA by the end of February 2006.

3. Responsible and Implementing Organization

3-1. The responsible agency is the Ministry of Education, Science and Technology (MOEST). The organizational chart is attached as Annex-2-1.

3-2. The implementing agency is CEMASTEA, which has been registered as an educational institution under MOEST.

3-3. MOEST promised to gazette the Legal Order of CEMASTEA to make CEMASTEA a Semi-Autonomous Government Agency (SAGA) and implement the organizational structure as shown in Annex-2-2 by the end of February 2006.

4. Items requested by the Government of Kenya

After discussions with the Team, the items described in Annex-3 were finally requested by Kenyan side. The consultants will confirm further details of the items, and then JICA will assess the appropriateness of the request and will recommend to the Government of Japan for approval.

4-1. Construction of the Facilities

Requested items are listed in Annex-3-1

4-2. Procurement of the Equipment

Requested items are listed in Annex-3-2

5. Japan's Grant Aid Scheme

The Kenyan side understands Japan's Grant Aid Scheme and the necessary measures to be taken by the Government of Kenya as explained by the Team and described in Annex-4 and Annex-5.

6. Schedule of the Study

6-1. The consultants will continue with further studies in Kenya until December 24th, 2005.

6-2. JICA will then prepare the draft report in English and dispatch a mission in order to explain its contents in March 2006.

6-3. Upon acceptance of the report in principle by the Government of Kenya, JICA will complete the final report and send it to the Government of Kenya in June 2006.

7. Other relevant issues

7-1. The Future Training Plan at CEMASTEA

Both sides realized that success of the expanded CEMASTEA fully depended on the implementation of the national policy on In-Service Education and Training (INSET). The Kenyan side, therefore, assured the Team that it would make best efforts to implement INSET policy cited in the Sessional Paper No.1 of 2005 on a Policy Framework for Education, Training and Research in accordance with Kenya Education Sector Support Programme (KESSP) 2005-2010 even after the end of SMASSE project phase-2.

The Kenyan side also promised to make efforts to continuously elevate the status of CEMASTEA to be a centre of excellence involving other African governments or/and international organizations such as NEPAD by securing its sustainability.

The Kenyan side showed the future training plan after expansion of CEMASTEA as described in Annex-6. The consultants will confirm further details of the plan, and then JICA will assess the viability.

7-2. Operation and Maintenance Plan of CEMASTEA

The Kenyan side explained that it would provide the necessary budget and personnel for CEMASTEA after the expansion as described in Annex-7 and Annex-2-2, and also assured that immediately after gazetting the Legal Order; all posts for CEMASTEA staff will be filled in accordance with the organizational chart attached in Annex-2-2. The posts would be advertised and staff deployed to avoid disruption of operations.

7-3. Criteria for equipment selection

Both sides agreed on the criteria for equipment selection as described in Annex-8. Nevertheless, the contents covered by the Project will be finalized after further study in Japan.

7-4. Arrangement of the water resources

The Team will estimate the water consumption and recommend a plan for water supply system to support expanded CEMASTEA.

The Kenyan side agreed to facilitate the connection of city water line, renovation of the existing deep well or dig a new deep well by themselves if it is necessary for the expansion of CEMASTEA.

7-5. Procurement of computers

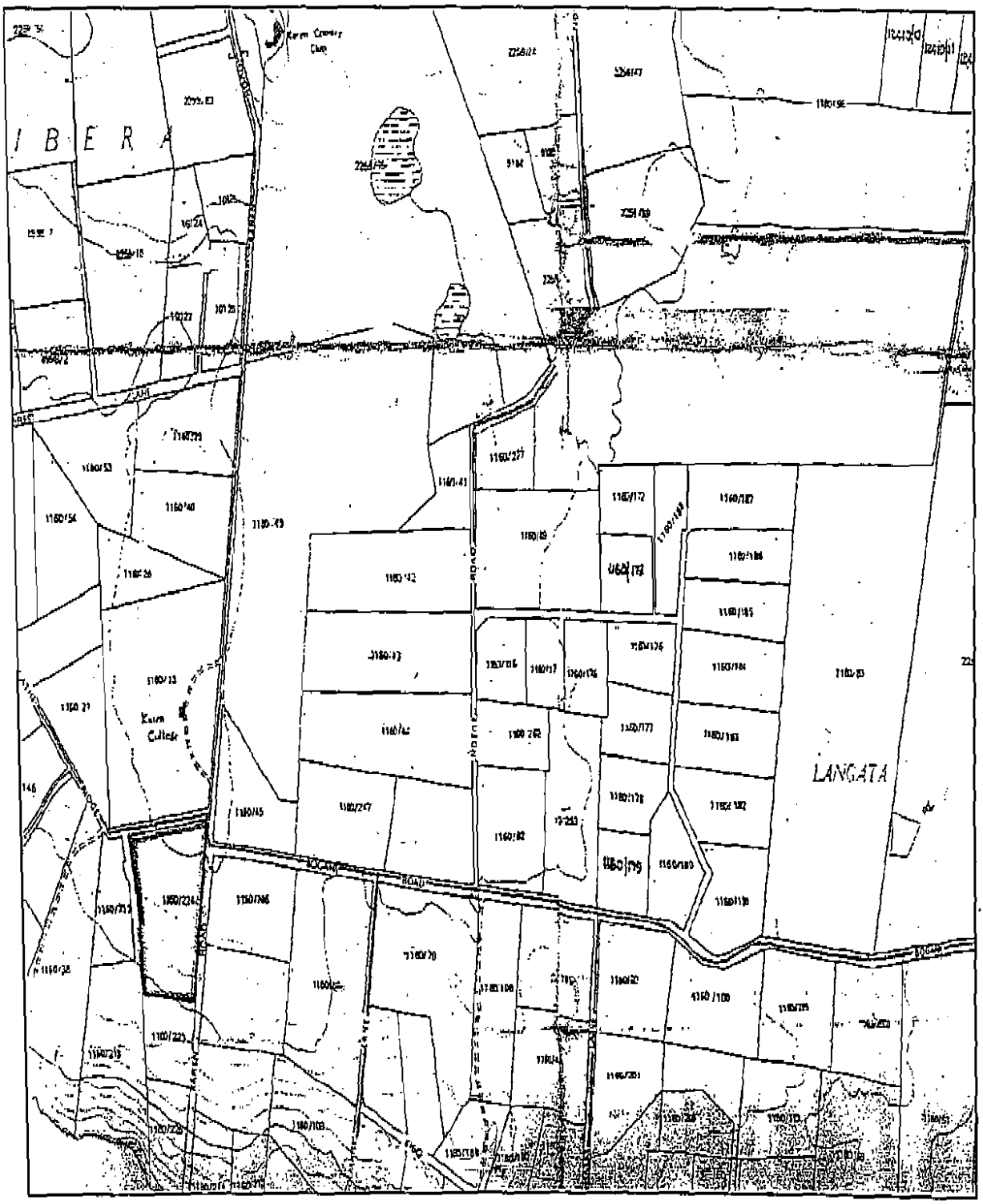
The Kenyan side presented a strong case for the procurement of the first batch of computers by the Japanese side, and also explained the use of the computers for long periods through refurbishing or

replacing some parts by themselves.

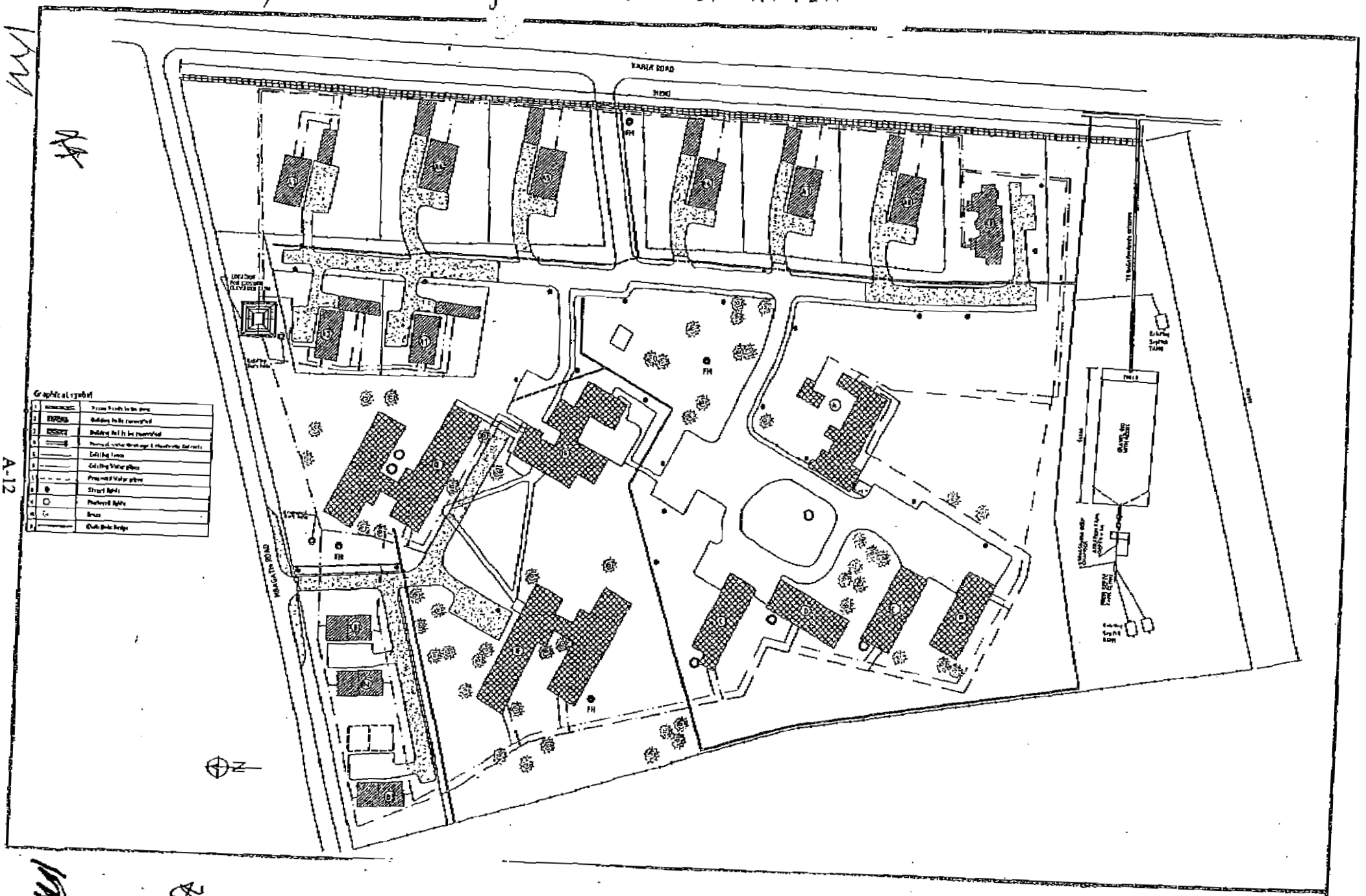
The Team promised to further consider this issue, and then to convey the request and situation to the Government of Japan.

Annex-1-1	Location map of CEMASTEA
Annex-1-2	Layout of the existing facilities of CEMASTEA
Annex-2-1	Organizational chart of MOEST
Annex-2-2	Organizational chart of CEMASTEA
Annex-3-1	List of the requested facilities
Annex-3-2	List of the requested equipment
Annex-4	The Japan's Grant Aid Scheme
Annex-5	Major undertakings to be taken by each government
Annex-6	Future training plan at CEMASTEA
Annex-7	Budget for CEMASTEA
Annex-8	Criteria for items selection

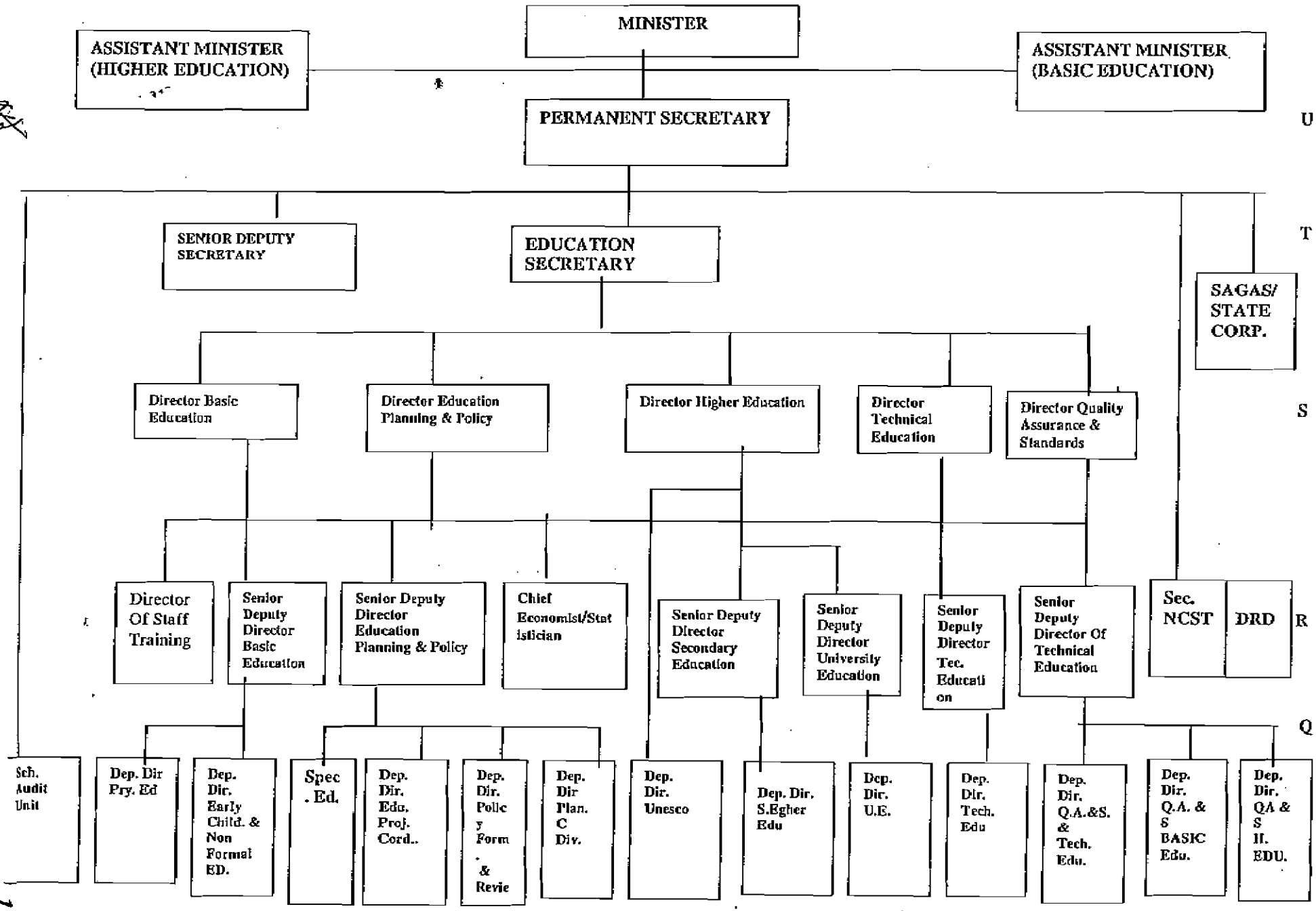
Annex-1-1: Location map of CEMASTEA



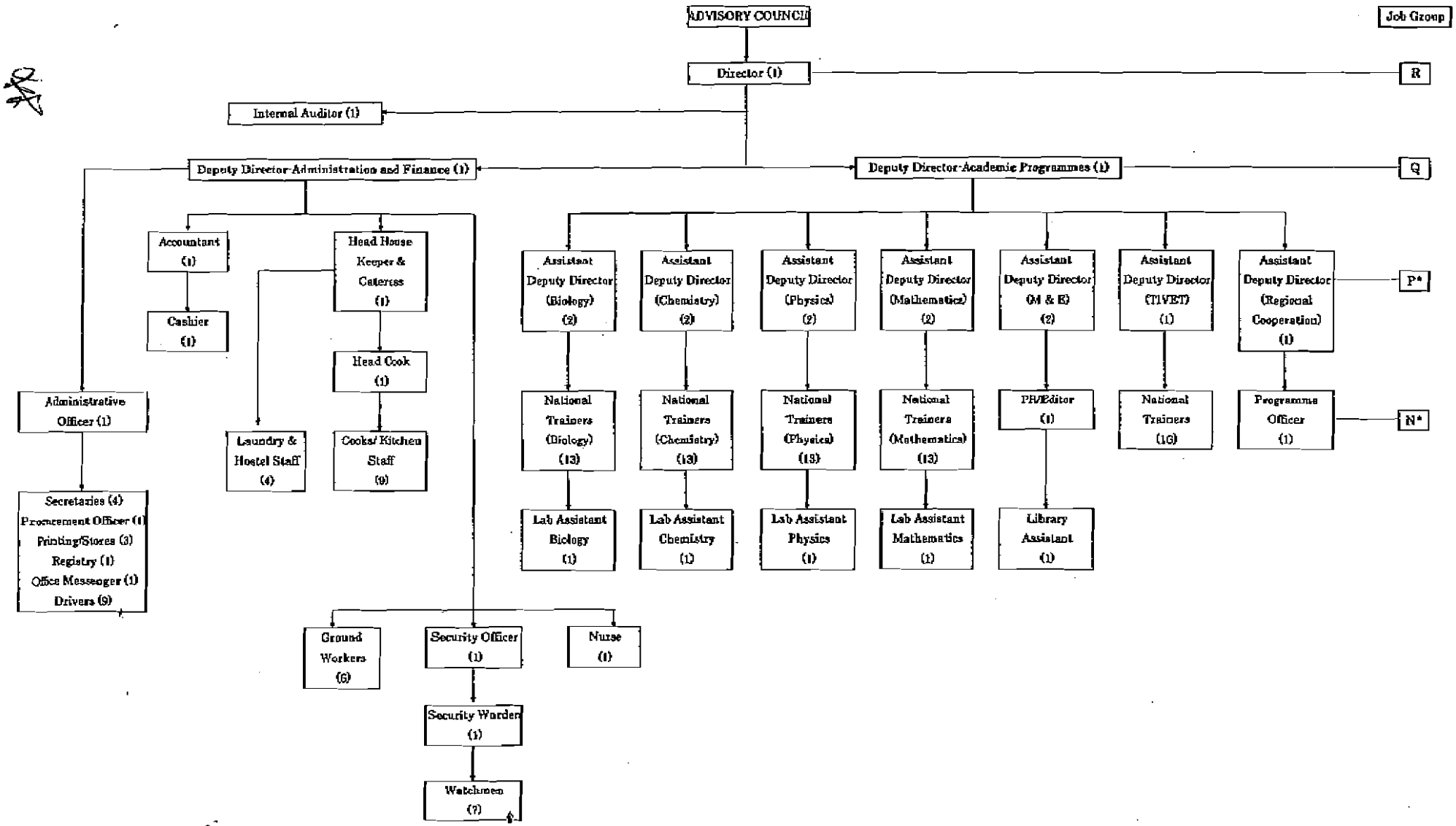
L.R. No. 1160/224 – Karen Road


A-12

Annex - 2-1 : Organizational chart of MOEST



Annex-2-2: Organizational chart of CEMASTEA



*: denotes District Trainers in the districts may be assigned to this Job Group. positions at P level will be reassessed to allow the promotion of tarainers.

Annex-3-1: List of the requested facilities

Requested Room		Capacity (Persons)	No. of room	Notes
A. LABORATORY BLOCK				
Physics		50	1	Preparation room, Dark room
Chemistry		50	2	Preparation room
Biology		50	2	Preparation room
B. LECTURE ROOM BLOCK				
Computer room		50	1	
Lecture Hall		300	1	
Mathematics/Lecture room		50	6	
C. OFFICE BLOCK				
Office		20	5	Physics, Chemistry, Biology, Mathematics, TIVET
Director		1	1	
Deputy Director		1	2	Administration & Finance, Academic Programme
Administrative Officer		1	1	
Chief Advisor		1	1	
Coordinator		1	1	
Secretary Room (Pool)		4	1	
Reception		-	1	
Meeting room		30	1	
Pantry		-	1	
Printing room		-	1	Printing/Stores×3
Library		-	1	Library Assistant
Sick Bay		-	1	1 Nurse
D. HOSTEL BLOCK				
Hostel	Twin Bedroom	2	55	Bath room
	Reception	-	1	Office: Head Housekeeper/Cateress, Hostel Staff
	Meeting room	-	1	
	Laundry room	-	1	Office: Laundry Staff
Dinning Hall	Dinning Hall	200	1	
	Kitchen	-	1	for 200 guest
E.. Toilet, Storage, corridor and etc. ; necessary for the above				
F. Power and Water supply	Generator	-	1	Sub station
	Deep well	-	1	Reservoir, Pump, Elevated Water Tank
G. Fundamental Furniture for above				

Annex-3-2 List of the Requested equipment

No.	Equipment Name	Requested Q'ty
	Physics	
PH-1	Air Table for Dynamics	5
PH-2	Dynamic Cart with Track	5
PH-3	Electric Turntable Set	5
PH-4	Electronic Precision Balance	5
PH-5	Experimental Apparatus of Second Law of Motion	5
PH-6	Experimental Apparatus for First Law of Motion	5
PH-7	Free Fall Experimental Apparatus	5
PH-8	Gyroscope with Stand Base	5
PH-9	Optical Bench Set	5
PH-10	Experimental Apparatus of Critical Angle of Liquid	5
PH-11	Faraday's Effect Apparatus	5
PH-12	Michelson Interferometer	5
PH-13	Power Source	5
PH-14	Water Calorimeter	5
PH-15	Amplifier	5
PH-16	Digital Circuit Tester	5
PH-17	Function Generator	5
PH-18	High Frequency Circuit Trainer	5
PH-19	LCR Bridge	5
PH-20	Logic Circuit Experimental Apparatus	5
PH-21	Low Frequency Oscillator	5
PH-22	Main Voltage Wave Observing Apparatus	5
PH-23	Oscillation Circuit Experimental Apparatus	5
PH-24	Oscilloscope	5
PH-25	Photoelectric Demonstrator	5
PH-26	Potentiometer	5
PH-27	Semiconductors Elemental Apparatus	5
PH-28	Spectrometer	5
PH-29	DC Voltmeter	10
PH-30	DC Ammeter	10
PH-31	Darkroom Equipment	1
PH-32	Overhead Projector with Screen	1
PH-33	Teacher's Desk	1
PH-34	Teacher's Chair	1
PH-35	Laboratory Table(for 10 Students)	5
PH-36	Student's Chair	50
	Chemistry	
CH-1	Analytical Balance	5
CH-2	Drying Oven	2
CH-3	Mantle Heater	5
CH-4	pH Meter	5
CH-5	Power Source	5
CH-6	Centrifuge	2
CH-7	Electrophoresis Apparatus	5
CH-8	Hot Plate	5
CH-9	Kjeldahl Set	5
CH-10	Melting Point Apparatus	5
CH-11	Mechanical Stirrer	5

No.	Equipment Name	Requested Q'ty
CH-12	BOD Meter	2
CH-13	COD Apparatus	5
CH-14	Autoclave/Sterilizer	2
CH-15	Magnetic Stirrer with hot plate	5
CH-16	Microscope	10
CH-17	Rotary Vacuum Evaporator	5
CH-18	Soxlet Extraction Apparatus	5
CH-19	Multi-shaker	5
CH-20	Refractometer	5
CH-21	Water Bath with Shaker	5
CH-22	Spectrometer	5
CH-23	Water Distillation	2
CH-24	Overhead Projector with Screen	1
CH-25	Teacher's Desk	1
CH-26	Teacher's Chair	1
CH-27	Laboratory Table(for 10 Students)	5
CH-28	Student's Chair	50
	Biology	
BI-1	Dissecting Set	50
BI-2	pH Meter	5
BI-3	Do Meter	5
BI-4	Hygrometer	5
BI-5	Salinity Conductivity Meter	5
BI-6	Refractometer	5
BI-7	Soil Analyzer Kit	5
BI-8	Thermostat Water Bath	5
BI-9	Centrifuge	2
BI-10	Oven Dryer	2
BI-11	Desiccator	5
BI-12	Analytical Balance	5
BI-13	Magnetic Stirrer with hot plate	5
BI-14	Autoclave	2
BI-15	Stereo Microscope	10
BI-16	Binocular Microscope	10
BI-17	Colony Counter	5
BI-18	Incubator	2
BI-19	Shaker	5
BI-20	Rotary Microtome	5
BI-21	Clean Bench	2
BI-22	Vortex Mixer	5
BI-23	Adjustable Pipette	5
BI-24	Reciprocating Bath Shaker	5
BI-25	Water Distillation	2
BI-26	Overhead Projector with Screen	1
BI-27	Teacher's Desk	1
BI-28	Teacher's Chair	1
BI-29	Laboratory Table(for 10 Students)	5
BI-30	Student's Chair	50
	Mathematics	
MA-1	Pesonal Compter	51
MA-2	UPS	26
MA-3	Programmable Calculator	51
MA-4	Overhead Projector with Screen	1
MA-5	Teacher's Desk	1
MA-6	Teacher's Chair	1
MA-7	Student's PC Desk(for 2 Students)	25
MA-8	Student's Chair	50

No.	Equipment Name	Requested Q'ty
	Lecture Rooms (5 rooms)	
LR-1	Overhead Projector with Screen	5
LR-2	Teacher's Desk	5
LR-3	Teacher's Chair	5
LR-4	Student's Lecture Desk(for 2 Students)	125
LR-5	Student's Chair	250
	Office Block	
OB-1	Furniture for Administrative Office(20 staff)	4
OB-2	Furniture for Office for Two Deputy Heads and Administrative Office	1
OB-3	Furniture for Pantry Room	1
OB-4	Furniture for Office Chief Advisor and Coordinator	1
OB-5	Furniture for Office for Head of Centre and Reception	1
OB-6	Furniture for Printing Room	1
OB-7	Furniture for Conference Room	1
OB-8	Furniture for Board Room	1
OB-9	Furniture for Library	1
OB-10	Furniture for Secretarial Pool	1
	Hostel Block	
HB-1	Furniture for Bed Room	110
HB-2	Furniture for Meeting Room	1
HB-3	Furniture for Ironing Room	1
HB-4	Furniture for Seminar Room	1
HB-5	Furniture for Stores	1
	TOTAL	
List of Equipment required in Kitchen, Laundlry, Dining Hall, Hostels, Lecture Hall, Administration, Lecture Rooms and Computer Room at CEMASTEA (Essential)		
1	Assorted cooking appliances and utensils, cold storage,	
2	Laundry machines, dryers, ironing etc.	
3	Basic furnitures	
4	Basic furnitures	
5	Basic furnitUres, Public address system, projector, screen	
6	PBA exchange set, basic furnitures	
7	Basic furnitures, projector, screen etc.	
8	Computers, printers, softwares, etc.	
PHYSICS REQUIREMENTS FOR THE NEW LABS AT CEMASTEA		
1	Table balance	2
2	Table balance weights	2 sets
3	Tape measure (Fine convex)	5
4	Tape measure	5
5	Vernier callipers	10
6	Micrometer	10
7	Digital plani-meter	3
8	Reading telescope	3
9	Optical louver	7
10	Spherometer	3
11	Alarm stop clock	3
12	Stroboscope	3
13	Compact digital thermometer	10
14	Electronic thermometer	3
15	Electronic thermometer	3

No.	Equipment Name	Requested Q'ty
16	DC Voltmeter	10
17	AC voltmeter	10
18	DC Ammeter	10
19	DC Ammeter (centre meter)	10
20	AC Ammeter	10
21	Micro ammeter	10
22	Galvanometer	10
23	Demonstration galvanometer	10
24	Circuit tester	5
25	Integrating wattmeter	3
26	Insulation resistance tester	2
27	Meter bridge	10
28	Variable resistor	5
29	Potable Wheatstone bridge	5
30	Resistance box	10
31	Signal generator	5
32	A.C circuit apparatus	5
33	CRT Oscilloscope (Single trace)	5
34	Synchroscope (Dual trace)	5
35	Experimental lever	5
36	Set of pulleys	10
37	Wheel and axle	5
38	Inclined plane	10
39	Friction experimental apparatus	10
40	Spring scales	10
41	Spring scale for Physics experiments	10
42	Force measuring apparatus	5
43	Experimental steel spring set	10
44	Equilibrium apparatus for demonstration	10
45	Equilibrium apparatus	10
46	Assorted weights for dynamics experiments	10
47	PH - 300 Series recording timers	10
48	Cart acceleration apparatus	2
49	Linear air track	2
50	Uniform circular motion apparatus	10
51	Ballistic cart apparatus	2
52	Experimental vacuum drop tube	2
53	Falling body accelerating apparatus	2
54	Electric rotation platform	2
55	Collision balls	2
56	Gyroscope	2
57	Density measurement set	5
58	Archimedes's principle demonstration device	10
59	Pascal's principle apparatus	10
60	Hydraulic pressure pump	2
61	Water pressure apparatus	2
62	Buoyancy measurement set	10
63	Water pressure apparatus	10
64	Simple vacuum apparatus	5
65	Vacuum gauge	2

No.	Equipment Name	Requested Q'ty
66	Magdeburg hemispheres	2
67	Torricelli's law apparatus	5
68	Vacuum bell	2
69	Mercury manometer	3
70	Rotary vacuum pump	2
71	Gas law experiment apparatus	2
72	Experiment Cylinder	10
73	Water calorimeter	10
74	Specific heat measurement set	10
75	Thermal conduction apparatus	5
76	Convection apparatus	5
77	Linear expansion tester	5
78	Bromine tubes	5
79	Heat expansion ball and ring	5
80	Dew point measurement device	2
81	Brownian motion observation device	2
82	Mechanical gas model apparatus	2
83	Light source apparatus	5
84	Light source apparatus (For instructors)	5
85	Light source box for group experiments	10
86	Light refraction device	10
87	Optical water tank	5
88	Optical bench	5
89	Optical disc	5
90	Convex lenses	10
91	Lens set	5
92	Achromatic lenses	10
93	Concave lenses	10
94	Lens and prism set	10
95	Water lens set	5
96	Right angled prisms	10
97	Achromatic prisms	15
98	Plane mirror	10
99	Convex mirror (with stand)	10
100	Concave mirror	10
101	Simple illumination meter	4
102	Solar battery equipment	5
103	Solar battery panels	5
104	Solar battery motor	5
105	HE -NE Gas laser	2
106	Laser experiment equipment set	2
107	Michelson interferometer	2
108	Light source for young's experiment	2
109	Slit set for young's experiment	2
110	Line spectrum light source	5
111	Spectroscope	5
112	Grating spectroscope	2
113	Sodium lamp	5
114	Newton's ring apparatus	5
115	Interference plates	10

No.	Equipment Name	Requested Q'ty
116	Diffraction grating production equipment	5
117	Newton's colour disc	2
118	Optical slit	2
119	Polarizing plate sheets	5
120	Sympathetic tuning forks	10
121	Standard tuning forks	5
122	Resonance drum (transparent type)	5
123	Sound experimentation kit	2
124	Cathode air resonance apparatus	2
125	Air column resonance apparatus	10
126	Doppler effect apparatus	5
127	Sonometer	2
128	Stethoscope	2
129	Rotary drum	2
130	Bar magnets	10
	Bar magnets	10
	Bar magnets	10
131	U Shaped magnets	10
	U Shaped magnets	10
	U Shaped magnets	10
	U Shaped magnets	10
	U Shaped magnets	10
132	Ring magnet repelling experiment kit	5
133	Ring magnets Set of ten	2
134	Ferrite magnet pieces	2
135	Neodymium magnets	5
136	Magnetised steel wire	10
137	Magnetised rubber bar	10
138	Magnetic pole detector	2
139	Magnetising apparatus	2
140	Magnetising coil	5
141	Magnetic field apparatus (for OHP)	2
142	High power electromagnet (B)	2
143	Electromagnet (A)	2
144	Iron sand collector	5
145	Magnetic compass	10
146	Magnetic needle	10
147	Dip needle	2
148	Magnetic shield box	5
149	Magnetic shield sheet	5
150	Rotary stand for friction rod	5
151	Friction rod	10
152	Electrophorus	5
153	Electrostatic pendulum	5
154	Apparatus for coulomb's law	5
155	Graduated electroscope	10
156	Electrostatic generator	5
157	Hamilton rotator	5

No.	Equipment Name	Requested Q'ty
158	Leyden jar	10
159	Discharge rod	5
160	Insulation platform	2
161	Capacitance apparatus	10
162	Condenser apparatus	10
163	Capacitive charge meter	4
164	Capacitor apparatus	2
166	Capacitor apparatus (Energy conversion experiment)	10
167	Hand generator	5
168	Electricity experiment board	10
169	Electrical experiment kit	10
170	Dry cell experimental equipment	10
171	Slide rheostat	10
172	Resistance comparison demonstrator	10
173	Rheostat paper	10
174	Potential demonstrator	2
175	Black box for electric circuitry	5
176	Fleming's law demonstrator	5
177	Fleming's law demonstrator	2
178	Magnetic field experiment equipment	10
179	Magnetic field experimentation equipment	5
180	One reel' motor	10
181	Magnets experimentation set	5
181	Primary and secondary coils	10
182	Electric bell	10
183	Electromagnetic strength measuring equipment	2
184	Induction coil	5
185	Vacuum discharge tube	5
186	OG Crooke's tube	5
187	Crooke's tube deflection effect	5
188	e/m Measuring apparatus	2
189	Milikan's elementary charge apparatus	2
190	Photoelectric effect apparatus	2
191	Frank Hertz apparatus	2
192	Diffusion cloud chamber	2
193	Radioactive test piece	2
	Radioactive test piece	2
	Radioactive test piece	2
194	Radiation detector	2
195	Softex X -ray apparatus	2
196	Regulated D.C. power supply (input 240V)	5
197	Vacuum tube power supply type B (input 240V)	5
198	Dry cell holder	10
199	Lead line with alligator clip attached	50
200	Lap top computers	2
201	LCD Projectors	2
202	OUP projectors	2
203	T.V SET	2
204	VHS Video players	2
205	DVD players	2

No.	Equipment Name	Requested Q'ty
206	Video camera	2
207	Slide projector	2
208	Centrifuge (Fixed type) In put voltage 240V	2
209	OSK 11280 Stop watch	20
210	Reflecting telescope	1
211	Refracting telescope	2
212	Wood and metal cylinder	10
213	Thermal conductivity metals apparatus	5
214	Franklin's motor	5
Primmary School Apparatus		
1	Ball bearings	20
2	Balloons	100
3	Beads	1000
4	Wooden Blocks	100
5	Blow pipe (flute)	100
6	Coloured marbles	100
7	Eureka cans	50
8	File	25
9	Filter papers	100
10	Funnels	25
11	Glass blocks	100
12	Glass rods	100
13	Hammer	25
14	Iron filings	20
15	Concave lens	100
16	Hand lens	100
17	Machine screws and nuts	100
18	Optical pins	100
19	Paper clips	100
20	Peg board stand (With lever)	25
21	Plasticine	50kg
22	Resistance Wire	25
23	Multiple slit	25
24	Rubber stoppers with holes	100
25	Sand paper	25
26	Scissors	50
27	Spiral springs with a pointer	100
28	Straws	50
29	Syringes	100
30	Fuse	50
31	Punch	15
32	Vice	15
33	Electric Drill	50
34	Surface plate	20
35	Anvil	25
36	Electric wood working tool	25
37	Circular saw	50
38	Twist drill	25

No.	Equipment Name	Requested Q'ty
	Tool Kit 3: Screw Drivers, Cutting Pliers, Monkey spanner, Round File, Knife, File for setting, Adhesive tape, Coil Covered with	4
SMASSE Proposed list of Equipment and apparatus for two new laboratories at CEMESTEA		
CATEGORYA-1st priority		
1	Infra-red spectrophotometer, with printer	2
2	UV/Visible spectrophotometer with printer	2
3	Vacuum pump	2
4	Magnetic stirrer	10
5	Ice maker	2
6	Gas chromatograph with printer	2
7	Abbe refractometer	2
8	Bomb calorimeter with its cylinder	25
9	Polarimeter	25
10	Conductance meter with the cells and temperature probe	25
11	Potentiometer	25
12	Joule meter	25
13	Galvanometer	50
14	High voltage power supply	
15	Beakers	100 each size
16	Beakers	
17	Beakers	
18	Beakers	
19	Round bottomed flask	
20	Flat bottom flask	
21	Erlenmeyer flask	
22	Erlenmeyer flask	
23	Kjedahl flask	50 each size
24	Kjedahl flask	
25	Distilling flask	10 each size
26	Distilling flask	"
27	Distilling flask	"
28	Distilling flask	"
29	Distilling flask	"
30	Distilling flask	"
31	Distilling flask	"
32	Distilling flask	"
33	Melting point flask	"
34	Melting point apparatus	2
35	Dishes	50each
36	Dishes	"
37	Dishes	"
38	Evaporating basin	"
39	Evaporating basin	"
40	crucibles	"
41	crucibles	"
42	Electronic balance	4
43	Advanced balances analytical	2
44	Ohaus balances	20
45	Spheres and balls	20packs

No.	Equipment Name	Requested Q'ty
46	Spheres and balls	20packs
47	Spheres and balls	10dozen
48	Diamond molymod(atomic model)	6kits
49	Graphite molymod	6kits
50	Sodium chloride-molymod	3kits
51	Battery connector clips	40
52	Battery connector clips	40
53	Stackable cell holders	10 pairs
54	Cell holders	50pieces
55	Mini bulb and fuse tester	10
56	Battery charger	5
57	Rechargeable battery	20
58	Pipette dropping bottle	50
59	Pipette dropping bottle	20
60	Reagent bottles	100 each
61	Reagent bottles	100 each
62	Wash bottle	50
63	Burette	50
64	Burette	50
65	Bases, retort stand	100
66	Clamp cork lined	100
67	Boss	100
68	Bunsen burner	50
69	Tripod stand	50
70	Pipe clay	100
71	Gauze	100
72	Burner	50
73	Laboratory gas burner	50
74	Centrifuge targa	2
75	Chromatography Jar	25
76	Laboratory spray gun	25
77	Chromatography column	25
78	Burette brush	50
79	Flask brush	50
80	Test tube brush	100
81	S-range colorimeter	4
82	Primo conductivity meters	25
83	Bulb holder M.E.S	100
84	Crocodile clips	25Packs
85	Plug Switch	25
86	Copper wire	5
87	Digital voltmeter	25
88	Digital milivoltmeter	25
89	Digital ammeter	25
90	Digital miliammeter	25
91	Moving coirmicro ammeter	25
92	Voltmeter, dual range	25
93	Thistle funnel	25

No.	Equipment Name	Requested Q'ty
94	Filter funnelsTunnels	1s
95	Separating funnel	25
96	Triple tap	25
97	Measuring cylinders	25 each size
98	Measuring cylinders	25 each
99	Graduated jugs	10each
100	PH bench meter	10
101	pipettes	50
102	dropping pipettes	50
103	pipettes	100
104	Pipette stand	50
105	Pipette filler	50each
106	gloves	100
107	Safety goggles	50
108	Gas masks	50
109	Scissors	50
110	Rod	10 m each
111	Mortar and pestle	50
112	stoppers	50 pieces
113	Cork	50 pieces
114	tongs	25
115	desiccators	10
116	Cork borers and its accessories	10 sets
117	Glass tube cutter	10
118	syringe	200
119	PH indicator paper dispenser	5m
120	Boiling tubes	1000 pieces
121	Test tubes	2000
122	Test tubes	2000
123	Test tube holders	50
124	Test tube stand	100
125	Thermometers	100
126	Thermometers	100
127	Thermometers	100
128	Thermometers	50
129	Stop watch	50
130	Stop watch	50
131	Tubing	20Packs of 0.5m
132	Tubing	20Packs of 0.5m
133	Tubing	20Packs of 0.5m
134	Water deionizer	3
135	Water still (distiller)	3
136	Lie beg condenser	25
137	Still head	25
138	Buchner filter flasks	25
139	Salt-bridge	50
140	U-tube	50
141	Copper foil electrodes	5 Packs of 10
142	Zinc plates	5packs
143	Nickel plates	5packs

No.	Equipment Name	Requested Q'ty
144	Lead plates	5packs
145	Hoffinann's voltammeter	10
146	Beehive shelf	25
147	Pneumatic troughs	25
148	Gas jar	50
149	Gas jar covers	10 Packs of 10
150	Kipps apparatus	4
151	Deflagrating spoon and cap	50
152	Absorption tubes	50
153	Absorption tower	50
154	Fractionating column	50
155	Sample of ores	2 for each category
156	Drying oven	2
157	Magnets	4 of each
158	Hot plate	10
159	Charts	10
160	Lab coats	60
161	Digital camera	1
162	Fridge	3
163	Power supply	10
164	Water bath	10
165	Heating mantle	10
166	CTX	2
167	Lap top	2
168	Scanner	1
169	TV set	2
170	VCR	2
CATEGORY B		
1	OHP	2
2	Scientific calculators	25
3	Mains extension lead	10
4	Dust bins	20
5	Soxhlet extraction apparatus and accessories	5 kits
6	Video camera	1
7	ICAM goose neck camera	1
	NB: Fpr furture query on specification refer to; I. Philip Harris Catalogue 2003 II. Ogawa Seiki(OSK)-Science and Education Catalogue, 4th ed.	
BIOLOGY LABORATORY REQUIREMENTS		
A : EQUIPMENTS-1ST PRIORITY - PERMANET STOCK		
1	Food calorimeter	10 pcs
2	Respirometer	10 pcs
3	Incubator	4 pcs
4	Autoclave	4 pcs
	Autoclave	4 pcs
5	Aquarium	10 pcs
6	Microtone	10 pcs
	Microtone	10 pcs
7	Centrifuge	10 pcs
8	Prepared slides	10 sets

No.	Equipment Name	Requested Q'ty
	Prepared slides	10 sets
	Prepared slides	10 pcs
	Prepared slides	10 pcs
	Prepared slides	10 pcs
	Prepared slides	10 pcs
	Prepared slides	10 pcs
	Prepared slides	10 pcs
	Prepared slides	10 pcs
	Prepared slides	10 pcs
	Prepared slides	10 pcs
	Prepared slides	10 pcs
	Prepared slides	10 pcs
	Prepared slides	10 pcs
	Prepared slides	10 pcs
8	Photometers	10 pcs
	Photometers	10 pcs
	Photometers	10 pcs
9	Stethoscopes	10 pcs
	Stethoscopes	10 pcs
	Stethoscopes	10 pcs
10	Clinostat	10 pcs
11	Microscopes	50 pcs
	Microscopes	2 pcs
12	Binoculars	10 pcs
13	Camera	10 pcs
14	Weight balance	10 pcs
15	Bunsen burners	50 pcs
16	Tripod stands	50 pcs
17	Models	10 pcs
	Models	10 pcs
	Models	10 pcs
	Models	10 pcs
	Models	10 pcs
	Models	10 pcs
	Models	10 pcs
	Models	10 pcs
	Models	10 pcs
	Models	10 pcs
	Models	10 pcs
	Models	10 pcs
	Models	10 pcs
	Models	10 pcs
	Models	10 pcs
	Models	10 pcs
	Models	10 pcs
	Models	10 pcs
	Models	10 pcs
	Models	10 pcs
	Models	4 pcs

No.	Equipment Name	Requested Q'ty
	Models	4 pcs
	Models	4 pcs
	Models	10 pcs
18	Dust bin with lid	10 pcs
19	Dissecting kits	50 pcs
20	Refrigerators	2 pcs
21	Calculators	20 pcs
22	Charts	10 pcs
	Charts	10 pcs
	Charts	10 pcs
	Charts	10 pcs
	Charts	10 pcs
	Charts	10 pcs
	Charts	10 pcs
	Charts	10 pcs
	Charts	10 pcs
23	Video recorder	2 pcs
24	Video camera	2 pcs
25	DVD/ VCD player	4 pcs
26	Over heard projector	4 pcs
27	Drying oven	4 pcs
28	Skeleton	4 pcs
29	Hot plate	4 pcs
30	Thermometers	50 pcs
31	Slide projector	4 pcs
32	Slide viewer	4 pcs
33	Electric balance	4 pcs
34	Stop watches	100 pcs
35	Sand bath	10 pcs
36	Preserved Marine organisms	20 pcs
	Preserved Marine organisms	20 pcs
	Preserved Marine organisms	20 pcs
	Preserved Marine organisms	20 pcs
	Preserved Marine organisms	20 pcs
	Preserved Marine organisms	20 pcs
	Preserved Marine organisms	20 pcs
	Preserved Marine organisms	20 pcs
	Preserved Marine organisms	20 pcs
	Preserved Marine organisms	20 pcs
	Preserved Marine organisms	20 pcs
	Preserved Marine organisms	20 pcs
	Preserved Marine organisms	20 pcs
	Preserved Marine organisms	20 pcs
37	Spring balances	10 pcs
38	Scale balances	10 pcs
39	Trolleys	10 pcs
40	Computer	4 pcs
41	Projector	4 pcs
42	Water distiller	4 pcs

No.	Equipment Name	Requested Q'ty
43	Deep .freezer	2 pcs
44	Animal cages- Vivaria	10 of each
45	Television	4 pcs
46	Stereomicroscope	10 pcs
	Stereomicroscope	10 pcs
47	Heater	4 pcs
B: APPARATUS- 2ND PRIORITY- EXPENDABLES		
1	Forceps	100 pcs
	Forceps	100 pcs
2	Test tube with corks	200 pcs
3	Test tube racks .	100 pcs
4	Test tube brushes	20 pcs
5	Petri dishes	100 pcs
6	Test tube holders	100 pcs
7	Reagent bottles	100 pcs
8	Beakers -Pyrex	50 pcs
	Beakers -Pyrex	50 pcs
	Beakers -Pyrex	50 pcs
	Beakers -Pyrex	50 ml
9	Gas tube	100 m
10	Flower pots	50 PCs
11	Towels	50 pcs
12	Bulb holders	50 PCs
13	Conical flask with stoppers	100 pairs
14	Boiling tubes with corks	100 pairs
15	Wire gauze	20 pcs
16	Killing jars	20 pcs
17	Dissecting trays	50 pcs
18	Dissecting pins	10 dozens
19	Hack saw blades	10 pkts
20	Hack saw	10 pcs
21	Y- tube	50 pcs
	Y- tube	50 pcs
22	Plastic baskets with covers	20 pcs
23	Syringes	50 pcs
	Syringes	50 pcs
24	Water bottles	50 pcs
25	Funnel	100 pcs
C : REAGENTS AND SOLUTION : 3RD PRIORITY : CONSUMABLES		
1	Chemical	20 litres
	Chemical	10 kg
	Chemical	1000 g
	Chemical	10 kg
	Chemical	1 litre
	Chemical	1 litre
	Chemical	10 litres
	Chemical	10 litres
	Chemical	10 kg
	Chemical	10 litres
	Chemical	10 litres

No.	Equipment Name	Requested Q'ty
	Chemical	10 kg
	Chemical	10 kg
	Chemical	10 kg
	Chemical	5 litres
	Chemical	5 litres
	Chemical	5 kg
	Chemical	1 litre
	Chemical	1 kg
	Chemical	1 kg
	Chemical	1 kg
	Chemical	10litres
	Chemical	5 kg
	Chemical	1 litre
	Chemical	1 kg
	Chemical	1 litre
2	Enzymes	1 kg
	Enzymes	1 kg
	Enzymes	1 kg
	Enzymes	1 kg
	Enzymes	1 kg
	Enzymes	1 kg
	Enzymes	1 kg
3	'Surgical' Gloves	50 pkts of 100 each
4	Gas cartridges	12 pcs
5	Delivery tubes	100 metres
ITEMS FOR MATHEMATICS ROOM		
1.	Manila	20 reams
2.	Knitting thread	ozens of each colour
	Knitting thread	
	Knitting thread	
	Knitting thread	
	Knitting thread	
	Knitting thread	
3.	Glue stick	10 dozens
4.	Wood glue	10 bottles
5.	Office glue	10 bottles
6.	Rubber bands	3 packets of each
	Rubber bands	
	Rubber bands	
	Rubber bands	
	Rubber bands	
7.	Tracing paper	10 rolls
8.	Match sticks	1 cartonon
9.	Straws	10 packets
10.	Blue tack	10 dozens
11.	Flip charts	10 dozens
12.	Felt pens	10 dozens/colours
13.	Dustless pieces of chalk	10 dozens
	Dustless pieces of chalk	5 dozens
14	Soma cubes	1 sack

No.	Equipment Name	Requested Q'ty
15	Beads of different colours	10 packets/colour
	Beads of different colours	
	Beads of different colours	
	Beads of different colours	
	Beads of different colours	
16	Mathematical tables	50 copies
	Mathematical tables	50 copies
17	Meter rules	20 pieces
	Meter rules	20 pieces
18	Blackboard rulers	20 pieces
	Blackboard rulers	20 pieces
19	A 50 metre tape measure	10 pieces
20	Spring balance	20 pieces
21	Measuring cylinder	20 pieces
22	Plane mirrors	20 pieces
23	Geometrical sets	20 pieces
24	Atlases	10 pieces
25	Pulley belts	10 sets
26	Playing cards	10 packets
27	Portable soft board	10 pieces
28	Pins	10 packets each
	Pins	
29	Copper wire	10 rolls
30	Magnetic buttons	10 packets
31	Magnetic sheet	10 dozens
32	Beakers: i) 50ml	10 pieces of each
	ii) 100ml	
	iii) 150ml	
	iv) 200ml	
	v) 250ml	
33	Bells	30 pieces
34	Stop watches	30 pieces
35	Vernier calipers	20 pieces
36	Micrometre screw gauge	10 pieces
37	Beam balance	20 pieces
38	Hydrometer	10 pieces
39	Overflow can (Eurekacan)	10 pieces
40	Wall clock	2 pieces
41	Geo boards -plastic or wooden	10 pieces
42	Peg boards - portable	10 pieces
43	Fixed grid board	1
44	Blackboard geometrical instruments	10 sets
45	Polygonal shapes - assorted	10 packets
46	Magnetic compass points	10 pieces
47	Clinometer	10 pieces
48	Wire models (assorted shapes including globe)	10 sets
49	Pair of scissors	2 dozens
50	Calculators	30 pieces
	Calculators	50 pieces
51	Ticker-tape timer	10 pieces

No.	Equipment Name	Requested Q'ty
52	Trolleys	10 pieces
53	Trundle wheel	10 pieces
54.	Pulleys of different diameters	10 sets
55.	Dice	A packet each
	Dice	
	Dice	
56.	Ludo	10 pieces
57.	Snakes and ladder	10 pieces
58.	Draught	10, packets
59.	Chess-board	10 packets
60.	Fixed screen - foldable	1
61	White board:	10 pieces
	(i) Portable	1 piece
	(ii) A wall board with one side having a grid for graphing	
62	Abacus	10 pieces

Annex -4: The Japan's Grant Aid Scheme

The Grant Aid Program provides a recipient country with non-reimbursable funds to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant laws and regulations of Japan. Grant Aid is not supplied through the donation of materials as such.

1. Grant Aid Procedure

1) Japan's Grant Aid Program is executed through the following procedures.

Application (Request made by a recipient country)
Study (Basic Design Study conducted by JICA)
Appraisal & Approval (Appraisal by the Government of Japan and Approval by Cabinet)
Determination of Implementation
(The Notes exchanged between the Governments of Japan and the recipient country)

2) Firstly, the application or request for a Grant Aid project submitted by a recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to determine whether or not it is eligible for Grant Aid. If the request is deemed appropriate, the Government of Japan assigns JICA to conduct a study on the request. If necessary, JICA sends a Preliminary Study Team to the recipient country to confirm the contents of the request.

Secondly, JICA conducts the study (Basic Design Study), using Japanese consulting firms.

Thirdly, the Government of Japan appraises the project to see whether or not it is suitable for Japan's Grant Aid Programme, based on the Basic Design Study report prepared by JICA, and the results are then submitted to the Cabinet for approval.

Fourthly, the project, once approved by the Cabinet, becomes official with the Exchange of Notes signed by the Governments of Japan and the recipient country.

Finally, for the implementation of the project, JICA assists the recipient country in such matters as preparing tenders, contracts and so on.

2. Basic Design Study

1) Contents of the Study

The aim of the Basic Design Study (hereinafter referred to as "the Study"), conducted by

JICA on a requested project (hereinafter referred to as "the Project"), is to provide a basic document necessary for the appraisal of the Project by the Government of Japan. The contents of the Study are as follows:

a) confirmation of the background, objectives and benefits of the Project and also institutional capacity of agencies concerned of the recipient country necessary for the Project's implementation;

b) evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from the technical, social and economic points of view;

c) confirmation of items agreed on by both parties concerning the basic concept of the Project;

d) preparation of a basic design of the Project; and

e) estimation of costs of the Project.

The contents of the original request are not necessarily approved in their initial form as the contents of the Grant Aid project. The Basic Design of the Project is confirmed considering the guidelines of Japan's Grant Aid Scheme.

The Government of Japan requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

2) Selection of Consultants

For the smooth implementation of the Study, JICA uses a consulting firm selected through its own procedure (competitive proposal). The selected firm participates the Study and prepares a report based upon the terms of reference set by JICA.

At the beginning of implementation after the Exchange of Notes, for the services of the Detailed Design and Construction Supervision of the Project, JICA recommends the same consulting firm which participated in the Study to the recipient country, in order to maintain the technical consistency between the Basic Design and Detailed Design as well as to avoid

any undue delay caused by the selection of a new consulting firm.

3. Japan's Grant Aid Scheme

1) Exchange of Notes (E/N)

Japan's Grant Aid is extended in accordance with the Notes exchanged by the two Governments concerned, in which the objectives of the project, period of execution, conditions and amount of the Grant Aid, etc., are confirmed.

2) "The period of the Grant" means the one fiscal year which the Cabinet approves the project for. Within the fiscal year, all procedure such as exchanging of the Notes, concluding contracts with consulting firms and contractors and final payment to them must be completed.

However, in case of delays in delivery, installation or construction due to unforeseen factors such as weather, the period of the Grant Aid can be further extended for a maximum of one fiscal year at most by mutual agreement between the two Governments.

3) Under the Grant, in principle, Japanese products and services including transport or those of the recipient country are to be purchased.

When the two Governments deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country.

However, the prime contractors, namely consulting, contracting and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

4) Necessity of "Verification"

The Government of the recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. This "Verification" is deemed necessary to secure accountability of Japanese taxpayers.

5) Undertakings required to the Government of the recipient country

a) to secure a lot of land necessary for the construction of the Project and to clear the site;

b) to provide facilities for distribution of electricity, water supply and drainage and other incidental facilities outside the site;

c) to ensure prompt unloading and customs clearance at ports of disembarkation in the recipient country and internal transportation therein of the products purchased under the Grant Aid;

d) to exempt Japanese nationals from customs duties, internal taxes and fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contracts;

e) to accord Japanese nationals whose services may be required in connection with the supply of the products and services under the verified contracts such as facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work;

f) to ensure that the facilities constructed and products purchased under the Grant Aid be maintained and used properly and effectively for the Project; and

g) to bear all the expenses, other than those covered by the Grant Aid, necessary for the Project.

6) "Proper Use"

The recipient country is required to maintain and use the facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign the necessary staff for operation and maintenance of them as well as to bear all the expenses other than those covered by the Grant Aid.

7) "Re-export"

The products purchased under the Grant Aid shall not be re-exported from the recipient country.

8) Banking Arrangement (B/A)

a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in an authorized foreign exchange bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the verified contracts.

b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an Authorization to Pay (A/P) issued by the Government of recipient country or its designated authority.

9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commission to the Bank.

Annex-5: Major undertakings to be taken by each government

No	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To secure land		●
2	To clear, level and reclaim the site when needed		●
3	To construct gates and fences in and around the site		●
4	To construct the parking lot	●	
5	To construct roads		
	1) Within the Site	●	
	2) Outside the site		●
6	To construct the buildings	●	
7	To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities		
	1) Electricity		
	a. The distributing line to the site		●
	b. The drop wiring and internal wiring within the site	●	
	c. The main circuit breaker and transformer	●	
	2) Water Supply		
	a. The city water distribution main to the site		●
	b. The supply system within the site (receiving and elevated tanks)	●	
	3) Drainage		
	a. The city drainage main (for storm, sewer and others) to the site		●
	b. The drainage system (for toilet sewer, ordinary waste, storm drainage and others) within the site	●	
	4) Gas Supply		
	a. The city gas main to the site		●
	b. The gas supply system within the site	●	
	5) Telephone System		
	a. The telephone trunk line to the main distribution frame/panel (MDF) of the building		●
	b. The MDF and the extension after the frame/panel	●	
	6) Furniture and Equipment		
	a. General furniture		●
	b. Project equipment	●	
8	To bear the following commissions to the Japanese bank for the banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
9	To ensure unloading and customs clearance at port of disembarkation in recipient country		
	1) Marine (Air) transportation of the products from Japan to the recipient country	●	

	2)	Tax exemption and custom clearance of the products at the port of disembarkation		●
	3)	Internal transportation from the port of disembarkation to the project site	●	
10		To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.		●
11		To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contracts.		●
12		To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant.		●
13		To bear all the expenses, other than those to be borne by the Grant, necessary for construction of the facilities as well as for the transportation and installation of the equipment.		●

Annex-6: Future training plan at CEMASTEA

Training Programme of CEMASTEA after SMASSE Phase-2

A. INSET Training in Kenya

Training Course	Target of Trainees	Qualification of Participants, If any	Record of Training in the Past	Training Programme After SMASSE-		
				Nos. of Participant	Duration	Times/year
1 National INSET Training (District Centre Trainers Training)	100 Centres×4 subject×4 persons=1,600 persons	M·Ed, B·Ed, Dip·Ed,AT4	1,017 persons in 2005(1-7), 90 persons×2 weeks×12 Group	200 persons	2 weeks	8 times
2 Educator Training						
(1) Principal Workshop	4,000 principal of secondary schools	M·Ed, B·Ed, Dip·Ed,AT4	253 persons in 2004, 204 persons in 2005, 1 week	200 persons	1 week	6 times
(2) DEO's Workshop	72 DEOs	M·Ed, B·Ed	72 persons in 2003, 47 persons in 2005, 1 week	72 persons	1 week	1 time
(3) Deputy DEO's Workshop	72 Deputy DEOs	M·Ed, B·Ed		72 persons	1 week	1 time
(4) QASO Workshop	1,800 persons QASO	M·Ed, B·Ed, Dip·Ed, AT4, P1	178 person in 2004, 60 in 2005, 1 week	200 persons	1 week	3 times
(5) Stakeholder Workshop	600	M·Ed, B·Ed, Dip·Ed,AT4	300 persons in 2004, 1 week	200 persons	1 week	3 times
3 Pre-service Tutors and the Other Training						
(6) INSET for Secondary Teacher Colleges	200 tutors	M·Ed, B·Ed HND, Dip·Ed	150 persons in 2005, 1 week	200 persons	1 week	1 time
(7) INSET for Primary Teacher Colleges	1,200 tutors	M·Ed, B·Ed		200 persons	1 week	6 times
(8) INSET for TIVET Math. and Science	600 tutors	M·Ed, B·Ed HND, Dip·Ed		200 persons	1 week	3 times
(9) JOCV Training	Depending on needs					
(10) Others if any	Depending on needs					

B.The Third Country Training under SMASSE-WECSA

Third Country Training			42 and 85 persons in 2004, 95 persons in 2005, 5 weeks	150 persons	5 weeks	1 time

Annex-7: Budget for CEMASTEA

(Unit: 1,000ksh)

Year	1998/99	1999/00	2000/01	2001/02	2002/03	2003/04	2004/05	2005/06	2006/07	2007/08	2008/09	2009/10	2010/11
MOEST	1,500	11,957	5,500	3,500	3,500	3,500	20,000	40,000	41,600	43,264	44,995	46,794	48,666
JICA	2,880	8,004	16,122	34,988	18,516	80,000	120,000	120,000	200,000	200,000			
Total	4,380	19,961	21,622	38,488	22,016	83,500	140,000	160,000	241,600	243,264	44,995	46,794	48,666

*: Budget and expenditure from year 1998/99 to 2007/08 are under SMASSE project.

Annex-8 Criteria for items selection

(1) Equipment which fulfills the following criteria is considered to be included in the Project

a. Equipment which is necessary to be replaced because the existing equipment is too old for work.
b. Equipment which is necessary to be added because quantity of the existing equipment is in short for experiment and training.
c. Equipment which is necessary for INSET training implementation
d. Equipment which can be operated by users' skill

(2) Equipment which fulfills the following criteria is considered to be excluded in the Project

a. Equipment which is used for high-grade experiments
b. Equipment which is difficult to be installed into building and difficult to be managed by user
c. Expensive equipment which is low frequency in use
d. Consumables, spare parts and reagent
e. Equipment which user is difficult to purchase its consumables and spare parts
f. Equipment which is required expensive cost for maintenance

4. Minutes of Discussions

4.2 Explanation on the Draft Final Report

MINUTES OF DISCUSSIONS
ON THE BASIC DESIGN STUDY ON THE PROJECT
FOR THE EXPANSION OF THE CENTRE FOR MATHEMATICS, SCIENCE AND TECHNOLOGY EDUCATION IN AFRICA
IN THE REPUBLIC OF KENYA
(EXPLANATION ON DRAFT REPORT)

In December 2005, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched a Basic Design Study Team on the Project for the Expansion of the Centre for Mathematics, Science and Technology Education in Africa (hereinafter referred to as "the Project") to the Republic of Kenya (hereinafter referred to as "Kenya"), and through discussion, field survey, and technical examination of the results in Japan, JICA prepared a draft report of the study.

In order to explain and to consult Kenyan authority concerned on the components of the draft report, JICA sent to Kenya the Draft Report Explanation Team (hereinafter referred to as "the Team"), which is headed by Mr. Hideaki Harada, Group Director, Project Management Group II, Grant Aid Management Department, JICA, from March 19 to March 25, 2006.

As a result of discussions, both parties confirmed the main items described on the attached sheets.

Nairobi, March 24, 2006

Mr. Hideaki Harada
Leader
Draft Report Explanation Team
Japan International Cooperation Agency

Prof. Karega Mutahi
Permanent Secretary
Ministry of Education,
Republic of Kenya

ATTACHIMENT

1. Components of the Draft Report

The Kenyan side agreed and accepted in principle the components of the draft report explained by the Team. After further discussions, the items of the equipment were revised as Annex1-2. Both sides confirmed the items covered by the Project would be as follows. JICA will recommend them to the Government of Japan for approval.

(1) The items of the facilities are listed in Annex-1-1.

(2) The items of the equipment are listed in Annex-1-2.

2. Japan's Grant Aid scheme

The Kenyan side understands the Japan's Grant Aid Scheme and the necessary measures to be taken by the Government of Kenya as explained by the Team and described in Annex-4 and Annex-5 of the Minutes of Discussions of the Basic Design Study signed by both parties on December 6, 2005.

3. Schedule of the Study

JICA will complete the final report in accordance with the confirmed items and send it to the Government of Kenya by June, 2006.

4. Other relevant issues

4-1. Legal Order and Title Deed

The Ministry of Education promised to obtain and gazette the 'Legal Order' of the Centre for Mathematics, Science and Technology Education in Africa (hereinafter referred to as " CEMASTEA ") to make CEMASTEA an institution under the Ministry of Education by the middle of April 2006. The Japanese side will re-consider the implementation of the Project in case the said Legal Order will not have been gazetted.

The Team confirmed through the discussion with the Ministry of Roads and Public Works that the 'Letter of Allotment' is the sufficient requirement for acquiring the Building Permit of the Project instead of obtaining the 'Title Deed' which is required for the private land owner. In this regard the Team confirmed the 'Letter of Allotment' for CEMASTEA has already been issued by the authority concerned. However the Team emphasized that CEMASTEA should obtain the 'Title Deed' for the security of the plot.

4-2. Environmental Impact Assessment

The Kenyan side promised to obtain the Environmental Impact Assessment as soon as possible which is one of the requirements for implementation of the Project.

4-3. To clear, level and reclaim the site

The Kenyan side agreed to complete the clearance of the existing administration building and trees in the construction area, and then level and reclaim the site prior to the commencement of construction.

4-4.Maintenance

The Kenyan side promised to secure enough budget and personnel for proper operation and maintenance of the facilities and equipment provided by the Project.

4-5. New organization chart of the Ministry of Education

The up-dated organization chart of the Ministry of Education is attached as Annex-2.

4-6. Confidentiality

Both sides agreed that the draft report shall be confidential, be dealt with carefully and not be disclosed to any other parties until tender opening.

Annex-1-1: Items covered by the Project (Facilities)

Annex-1-2: Items covered by the Project (Equipment)

Annex-2: Organization chart of the Ministry of Education

Annex-1-1 : Items Covered by the Project (Facilities)

Necessary Rooms	Scope of the Project		
	Accom. (person)	Room Number	Remarks
A. Administration Building			
1. Administration Building			
Office	18	5	For Physics, Chemistry, Biology, Mathematics, TIVET. Existing desks and chairs relocate
Director room	1	1	With toilet. Existing desk and chair relocate
Deputy Director Room	1	2	For Administration & Finance, and Academic Programme
Administrative Officer Room	1	1	With document store. Existing desk and chair relocate
Counselling Room	10	1	Existing tables and chairs relocate
Secretary Room	6	1	For 4 Secretaries, a registry and an office messenger. Existing desks and chairs relocate
Meeting Room	30	1	Existing tables and chairs relocate
Pantry	—	2	With sink counter
Printing Room	3	1	Existing copy machine, binding machine, tables and chairs relocate
B. Laboratory and Lecture Building			
2. Lecture Hall	300	1	With stage, stores, audio visual equipment, chairs
3. Lecture Room Building			
Lecture Room	50	4	With black board, chairs
4. Laboratory Building			
Physics Lab.	50	1	With dark curtain, preparation room. Laboratory equipment, tables, chairs
Chemistry Lab.	50	1	With preparation room. Laboratory equipment, tables, chairs
Biology Lab.	50	1	With preparation room. Laboratory equipment, tables, chairs
Computer Room	50	1	Computer, desks, chairs
Library	1	1	Open style shelves for 5,000 books, 12 reading desks, 1 library assistant
C. Hostel and Dining Hall			
5. Hostel			
Twin Room	2	55	With shower and toilet
Reception	4	1	With reception counter, desks and chairs
Sick Bay	1	1	2 beds, 1 nurse, shelf
Washing Room	—	3	For 200 persons, 3 washing machines and irons
Linen Laundry	—	1	Existing equipment relocate. 1 sheet iron machine add.
6. Dining Hall			
Dining Hall	200	1	80 seats at existing dining and 120 seats at new dining, totaling 200 seats
Kitchen	—	1	Meal for 200 persons, with preparation area and stores. Existing kitchen equipment relocate, and necessary equipment add.
D. Common space for the above such as toilet, store and corridor etc.			
E. Pavement, Drainage		Expansion	Pavement and drainage around new buildings. Septic tank and neutralization tank.
F. Power and Water Supply			
Generator Room		Expansion	Distribution panel, generator add
Water Supply System		Expansion	Water reservoir tank, pump, elevated water tank add
Total Floor Area	Approximately 5,735m²		

Annex-1-2 Items covered by the Project (Equipment)

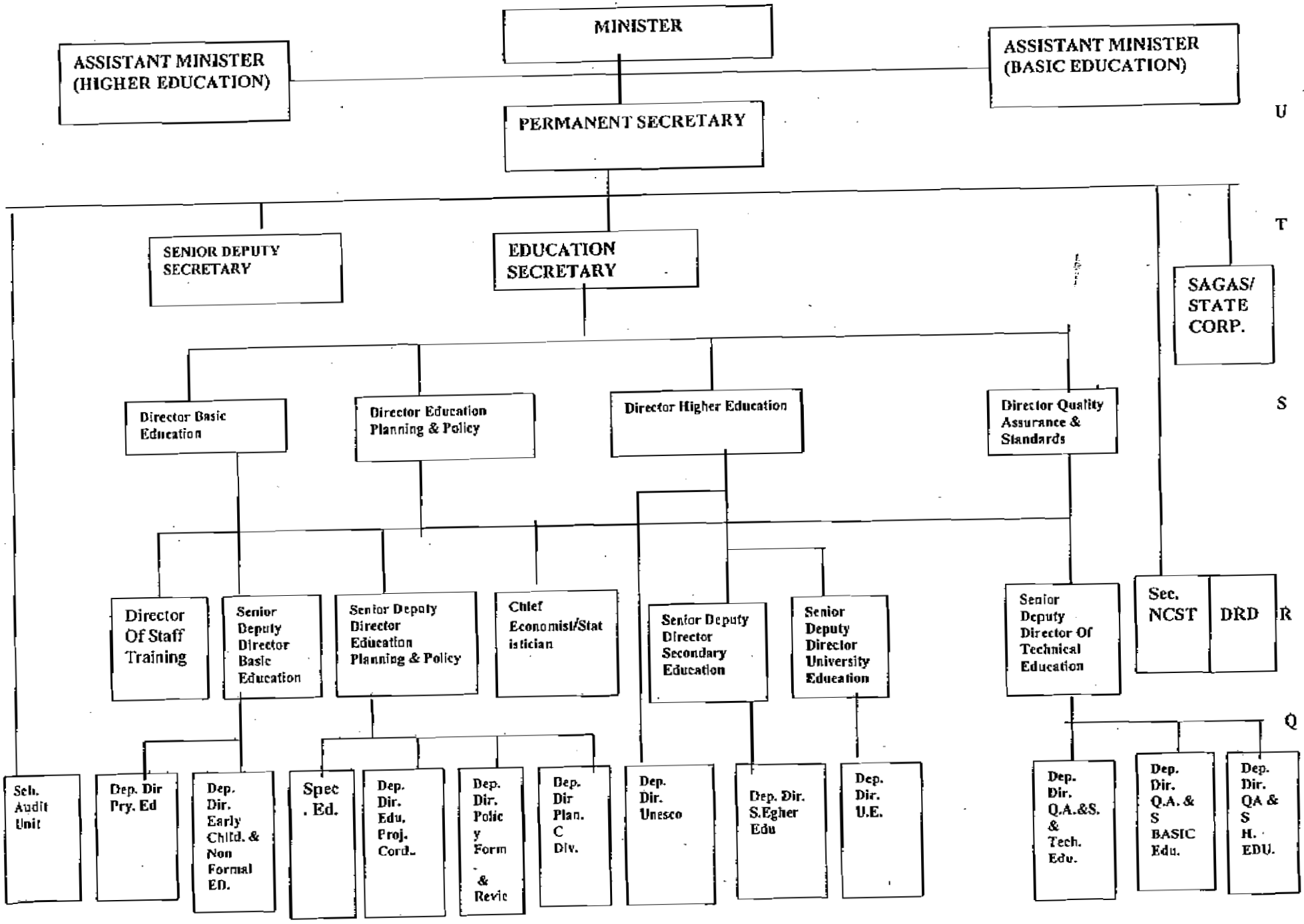
No	Code	Equipment Name	Planned Q'ty
	Physics		
1	PH-1	Electronic Precision Balance	5
2	PH-2	Free Fall Experimental Apparatus	5
3	PH-4	Table balance with weights	5
4	PH-5	Vernier callipers	10
5	PH-6	Micrometer	10
6	PH-8	Alarm stop clock	5
7	PH-9	Stroboscope	5
8	PH-10	Compact digital thermometer	10
9	PH-11	DC Voltmeter	7
10	PH-12	AC voltmeter	10
11	PH-13	DC Ammeter	10
12	PH-14	DC Ammeter (centre meter)	10
13	PH-15	AC Ammeter	10
14	PH-16	Micro ammeter	10
15	PH-17	Galvanometer	8
16	PH-18	Demonstration galvanometer	1
17	PH-19	Circuit tester	25
18	PH-20	Meter bridge	10
19	PH-21	Variable resistor	10
20	PH-22	Potable Wheatstone bridge	10
21	PH-23	Resistance box	10
22	PH-24	Signal generator	3
23	PH-26	Oscilloscope 20MHz	5
24	PH-27	Oscilloscope 100MHz	5
25	PH-28	Experimental lever	5
26	PH-29	Set of pulleys	10
27	PH-30	Wheel and axle	5
28	PH-31	Inclined plane	10
29	PH-32	Friction experimental apparatus	10
30	PH-33	Spring scales	10
31	PH-34	Experimental steel spring	1
32	PH-35	Equilibrium apparatus for demonstration	1
33	PH-36	Equilibrium apparatus	5
34	PH-37	Assorted weights for dynamics experiments	5
35	PH-38	Recording timers	5
36	PH-39	Cart acceleration apparatus	5
37	PH-40	Linear air track	5
38	PH-42	Ballistic cart apparatus	5
39	PH-43	Experimental vacuum drop tube	5
40	PH-45	Electric rotation platform	5
41	PH-46	Collision balls	5
42	PH-47	Gyroscope	5
43	PH-56	Rotary vacuum pump	1
44	PH-61	Thermal conduction apparatus	5
45	PH-62	Convection apparatus for demonstration	1
46	PH-63	Linear expansion tester	5
47	PH-64	Heat expansion ball and ring	5
48	PH-65	Dew point measurement device	5
49	PH-66	Brownian motion observation device	5
50	PH-67	Mechanical gas model apparatus	5
51	PH-93	Neodymium magnets	5

No	Code	Equipment Name	Planned Q'ty
52	PH-95	Magnetising apparatus	5
53	PH-97	Electromagnet high power	1
54	PH-98	Electromagnet	1
55	PH-99	Dip needle	1
56	PH-129	Regulated D.C. power supply	5
57	PH-130	Power supply	5
58	PH-131	Hand centrifuge	1
59	PH-132	Stop watch	22
60	PH-135	Bunsen burner	10
	Chemistry		
1	CH-1	Analytical Balance	5
2	CH-2	Drying Oven	2
3	CH-3	Mantle Heater	5
4	CH-4	Power Source	5
5	CH-7	Hot Plate	5
6	CH-8	Ultrasonic washer	2
7	CH-9	Test tube washer	2
8	CH-11	Mechanical Stirrer	5
9	CH-12	Magnetic Stirrer with hot plate	10
10	CH-13	Water Bath with Shaker	5
11	CH-14	Radiation detector	5
12	CH-15	Vacuum pump	2
13	CH-16	Ice maker	2
14	CH-17	Abbe refractometer	2
15	CH-19	Polarimeter	2
16	CH-20	Conductivity meter	10
17	CH-22	Joule meter	5
18	CH-23	Galvanometer	15
19	CH-24	High voltage power supply	5
20	CH-25	Digital Microscope	1
21	CH-26	Table Balance	10
22	CH-27	Molecular structure model	10
23	CH-28	Molecular structure model organic	10
24	CH-29	Battery and charger	10
25	CH-30	Retort stand set	50
26	CH-31	Bunsen burner	25
27	CH-32	Tripod stand set	25
28	CH-33	Alcohol lamp	25
29	CH-34	Laboratory gas burner for gas cartridge	10
30	CH-35	Centrifuge	2
31	CH-36	Voltaic cell	10
32	CH-38	DC voltmeter	25
33	CH-39	DC milivoltmeter	25
34	CH-40	DC ammeter	25
35	CH-41	DC miliammeter	25
36	CH-42	AC Ammeter	25
37	CH-43	AC Voltmeter	25
38	CH-44	PH bench meter	10
39	CH-45	Desiccator	10
40	CH-46	Glass tube cutter	10
41	CH-47	Glass cutter	10
42	CH-48	Digital stop watch	25
43	CH-49	Analogue stop watch	25

No	Code	Equipment Name	Planned Q'ty
44	CH-51	Water distillation apparatus	4
45	CH-52	Suction bottle and funnel	25
46	CH-53	Hoffinann's voltameter	5
47	CH-54	Kipps apparatus	5
48	CH-55	Sample of ores	2
49	CH-56	Refrigerator	2
50	CH-57	Graphic calculator	25
51	CH-58	Draft chamber	1
52	CH-59	Waste water apparatus	1
	Biology		
1	BI-7	Thermostat Water Bath	5
2	BI-8	Desiccator	5
3	BI-9	Electric Balance	5
4	BI-10	Magnetic Stirrer with hot plate	5
5	BI-11	Stereo Microscope	25
6	BI-13	Incubator	2
7	BI-14	Shaker	1
8	BI-15	Draft chamber	1
9	BI-16	Homogenizer	5
10	BI-17	Adjustable Pipette	5
11	BI-19	Respirometer	10
12	BI-20	Autoclave	1
13	BI-21	Aquarium	5
14	BI-22	Microtone	5
15	BI-23	Centrifuge	5
16	BI-24	Prepared slide set	10
17	BI-28	Bilogical Microscope	26
18	BI-29	Digital Microscope	1
19	BI-31	Weight balance	2
20	BI-32	Bunsen burner	25
21	BI-33	Tripod stands for bunsen berner	25
22	BI-34	Model set	10
23	BI-35	Dissecting kit	30
24	BI-36	Refrigerator	1
25	BI-37	Scientific calculator	10
26	BI-38	Drying oven	1
27	BI-39	Skeleton	5
28	BI-40	Hot plate	4
29	BI-41	Stop watche	25
30	BI-42	Sand bath	10
31	BI-44	Spring balance	10
32	BI-45	Laboratory trolley	5
33	BI-46	Water distiller	1
34	BI-47	Deep freezer	1
35	BI-48	Cage for small animal	2
36	BI-49	Cage for rabbit	2
37	BI-50	Cage for insect	2
	Mathematics		
1	MA-1	Programmable Calculator	51
2	MA-2	Bells	30
3	MA-3	Stop watch	20
4	MA-4	Vernier caliper	10
5	MA-5	Micrometre screw gauge	10

No	Code	Equipment Name	Planned Q'ty
6	MA-6	Table balance	10
7	MA-8	Geometric model	10
8	MA-10	Clinometer	10
9	MA-11	Blackboard instrument	1
10	MA-12	Scietific calculator	10
11	MA-13	Ticker-tape timer	10
12	MA-14	Dynamic trolley set	10
13	MA-15	Trundle wheel	10
	Lecture support equipment		
1	LS-1	OHP with screen	8
2	LS-2	Notebook computer	9
3	LS-3	Scanner	5
4	LS-4	Projector	10
5	LS-5	Visual presenter	5
6	LS-6	VTR	5
7	LS-7	Video camera	5
8	LS-8	DVD/ VCD player	5
9	LS-9	TV set	5
10	LS-10	Digital camera	5
	Computer room		
1	PC-1-1	Computer	51
2	PC-1-2	Network material	1
3	PC-2	Printer	1
4	PC-3	Computer table	25
5	PC-4	Chair	51
6	PC-5	Desk for lecturer	1
7	PC-6	Projector	1
8	PC-7	Screen	1
	Primmary School Apparatus for INSET primary teacher colleges		
1	PS-1	Primary science kit	10
	Lecture Hall		
1	LH-1	Sound equipment	1
2	LH-2	Projector with projector table	1
3	LH-3	Screen	1
4	LH-4	Lecture chair	200
5	LH-5	Chair	100
6	LH-6	Table	3
7	LH-7	Chair	9
8	LH-8	Lecturer table	1
	Lecture Rooms (4 rooms)		
1	LR-1	Teacher's Desk	4
2	LR-2	Teacher's Chair	4
3	LR-3	Lecture chair	200
4	LR-4	White board portable	4
	Laboratory furniture (3 rooms)		
1	LF-1	Laboratory central experimental table	15
2	LF-2	Laboratory table for Lecturer	3
3	LF-3	Experimental table for preparation room	2
4	LF-4-1	Side table	18
5	LF-4-2	Side table with sink	12
6	LF-5	Laboratory chair	153
7	LF-6	Shelf	17
8	LF-7	Desk	3

No	Code	Equipment Name	Planned Q'ty
9	LF-8	Chair	3
	Office Block		
1	OB-1	Shelf for Library	10
2	OB-2	Reading desk	3
3	OB-3	Reading chair	12
4	OB-4	Desk set for library staff	1
5	OB-5	Chair for library staff	1
6	OB-6	Bed for sick bay	2
7	OB-7	Desk for nurse	1
8	OB-8	Chair for nurse	1
9	OB-9	Shelf for medicine	1
	Hostel Block		
1	HB-1	Washing machine	9
2	HB-2	Iron	9
3	HB-3	Iron table	9
4	HB-4	Desk for hostel staff	2
5	HB-5	Chair for hostel staff	3
	Kitchen and Dinning Hall		
1	KD-1	Desk for office	1
2	KD-2	Chair for office	1
3	KD-3	Table for kitchen staff	2
4	KD-4	Chair for kitchen staff	9
5	KD-5	Dinning table	20
6	KD-6	Dinning chair	120


MINISTER
ASSISTANT MINISTER (HIGHER EDUCATION)
ASSISTANT MINISTER (BASIC EDUCATION)
PERMANENT SECRETARY
SENIOR DEPUTY SECRETARY
EDUCATION SECRETARY
SAGAS/ STATE CORP.
Director Basic Education
Director Education Planning & Policy
Director Higher Education
Director Quality Assurance & Standards
Director Of Staff Training
Senior Deputy Director Basic Education
Senior Deputy Director Education Planning & Policy
Chief Economist/Statistician
Senior Deputy Director Secondary Education
Senior Deputy Director University Education
Senior Deputy Director Of Technical Education
Sec. NCST
DRD
Sch. Audit Unit
Dep. Dir Pry. Ed
Dep. Dir. Early Chitd. & Non Formal ED.
Spec . Ed.
Dep. Dir. Edu. Proj. Cord.
Dep. Dir. Policy Form . & Revie
Dep. Dir Plan. C Div.
Dep. Dir. Unesco
Dep. Dir. S.Egher Edu
Dep. Dir. U.E.
Dep. Dir. Q.A.&S. & Tech. Edu.
Dep. Dir. Q.A. & S BASIC Edu.
Dep. Dir. QA & S H. EDU.

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Annex – 2

5. Cost Estimation Borne by the Recipient Country

Appendix-5 Cost Estimation Borne by the Recipient Country

（1US$ ＝ 75.15Ksh = 113.53J-Yen）

(1) Cost related to building construction

1) Demolition of office wing, clearance of trees and levelling of ground on site

a. Demolition of office wing : 530 sqm x 1,600 Ksh = 848,000 Ksh

b. Clearance of trees (including temporary area) : 60 trees x 4,500 Ksh = 270,000 Ksh

c. Levelling of ground : 3,600 sqm x 167 Ksh = 601,200 Ksh

Total: 1,719,200 Ksh

2) Plant vegetation on site

a. Lawn : 300 sqm x 300 Ksh = 90,000 Ksh

b. Seedling plant (1.5meter height) : 29 trees x 6,000 Ksh = 174,000 Ksh

Total: 264,000 Ksh

3) Obtaining building permits (for 5,740 sqm)

a. for architectural drawing: 59,980 Ksh

b. for structural drawing: 35,940 Ksh

Total: 95,920 Ksh

(2) Connection of infrastructure

1) Incoming power supply (419 kVA)

Total: 2,715,000 Ksh

2) Telephone lines (5 lines)

a. Connection work fee: 3,394 Ksh x 5 lines = 16,970 Ksh

b. Application fee: 2,300 Ksh x 5 lines = 11,500 Ksh

Total: 28,470 Ksh

3) City water supply: 200,000 Ksh

(3) Bank arrangement commission for contract sum (0.1% of contract value)

1,161,000,000 J-Yen x 0.1% = 1,161,000 J-Yen (approximately 768,900 Ksh)

(4) Bank commission for issue of Authorization of Payment and amendments

10,000 J-Yen x 6 times = 60,000 J-Yen (approximately 39,800 Ksh)

(5) Procurement of general furniture and fixture (existing furniture and fixture are assumed to be relocated for use, and only procurement of shortages is allowed)

1,591,490 Ksh

Total of (1) to (5)

7,422,780 Ksh