QUESTIONNAIRE

Thank you very much for the excellent arrangement and the kind cooperation you granted us during our stay in Thailand for the Preliminary Study of TCSW Project.

The Japan International Cooperation Agency (JICA) plans to dispatch a team of four experts for the Pre-implementation Study of TCSW Project from February 22 to March 7,1995.

The study will be carried out for the purpose of compiling necessary data for formulating a detailed plan of operation. In this connection,it would be much appreciated if you could kindly provide us the information regarding the following items by February 17. Although you do not complete all our request, please provide us as much information as possible by February 17.

In reference to the contents of the questionnaire, necessary discussion in your side will be very helpful to enhance the effectiveness of our Study.

1. List of officials including BMA who will be assigned to the Study Team (NAME,BELONGING,POSITION,EDUCATIONAL BACKGROUND,etc.)
   - 1.1 Overall
   - 1.2 Implementation
   - 1.3 Training courses
   - 1.4 Equipment
   - 1.5 Responsible persons for each item in the above

2. List of counterparts including BMA who will be assigned to the Project (NAME,BELONGING,POSITION,EDUCATIONAL BACKGROUND,etc.)

3. Training courses

3.1 Monthly schedule of each training course for 5-years from 1995

3.2 Number of trainees divided by PWD/BMA/Local Government in each training course

3.3 Training courses relating to the sewage works which have done in Thailand in 1994

(1)Course name and Curriculum

(2)Course duration

(3)Number of participants

(4)Implemention authority and place

(5)Participants fee/person

(6)Lecturers information(e.g.,position,qualification,etc.)

(7)Trainees qualification

(8)Teaching materials

(9)Cost/course

3.4 Priorities among the each courses on TCSW Project

3.5 How to enhance the effectiveness of the training(if any ideas)

3.6 Water Quality Analysis course (TTI & BMA branch)

(1)Present construction stage and prospect

(2)available space

(3)Budget allocation for purchasing equipment

4.Actual water pollution data in some areas in comparison with the water quality standards

5.National policy for waste water after completion of the seventh Economic and Social Development Plan(1992-1996)

6.Relations with other donor countries and international organizations

7.Present construction stage in comparison with construction plan including utilities such as electricity ,water system.

8.List of main technical materials on sewage works such as 'GUIDELINE'/ 'MANUAL'/ 'STANDARDS' ,and how to use it

9.Priorities of items of equipment which will be provided by Japanese side

10.Arrangement for the Japanese experts

(1)Rooms

(2)Administrative staffs

(3)Secretaries

(4)Vehicles and Drivers

(5)Air-Conditioners

(6)Direct-line Telephones

(7)Facsimiles

Answer of the Questionnaire

1. **List of officials including BMA who will be assigned to the Study Team. (Name, Belonging, Position, Educational Background, etc.)**

   1.1 Overall
   1.2 Implementation
   1.3 Training Courses
   1.4 Equipment
   1.5 Responsible persons for each item in the above

Responsible persons of PWD who are taking care of data collection for setting up, organizing and co-ordination with BMA and other divisions such as SED and MRD TCSW are as follows:

1. Mr. Surapol Pongthaipat, Director of TCSW.
2. Mrs. Panee Ratanasampan, Deputy director of TTI.
3. Mr. Kamalas Phandee, TTI officer.
4. Director of Civil Enginnering Division (CED), PWD.
5. Director of Material and Research Division (MRD), PWD
6. Director of Sanitary Engineering Division (SED), PWD
7. Director of Electrical and Mechanical Engineering Division (EMD), PWD.
8. Mr. Tongchai Klankrong, DDS, BMA.
9. Ms. Aphinan Jaruchaiyakul, DDS, BMA.
10. Mr. Chanchai V. Panyakij, Technical Sub-division Chief, BMA.

2. **List of counterparts including BMA who will be assigned to the project. (Name, Belonging, Position, Educational Background, ect.)**

   For details of each person see Attachment I.

3. Training Courses

(1) Monthly schedule for 1997 and 1998

Note : FY 1996 (October 1996 - September 1997) no course will be planned
1996 Sanitary and Environment for Engineer and Technician will be done at TTI.

COURSE	FY 1997												FY 1998											
	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S
Planning and Design 1																		X						
Planning and Design 2																	X						X	
Planning and Design 3																								
Construction Supervision																			X				X	
Operation and Maintenance (Basic)		X				X				X				X				X				X		
Operation and Maintenance (Advanced)																								
Water Quality Analysis (Basic)			X					X							X					X				
Water Quality Analysis (Advanced)																	X							
Management of Sewage Works																						X		X
Water Quality Control	X				X				X				X				X				X			

(2) Monthly schedule for 1998 and 1999

COURSE	FY 1998												FY 1999											
	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S
Planning and Design 1						X												X						
Planning and Design 2					X						X						X						X	
Planning and Design 3																					X			
Construction Supervision							X				X								X				X	
Operation and Maintenance (Basic)		X				X				X				X				X				X		
Operation and Maintenance (Advanced)																			X		X		X	
Water Quality Analysis (Basic)			X					X							X					X				
Water Quality Analysis (Advanced)																								
Management of Sewage Works										X		X										X		X
Water Quality Control	X				X				X				X				X				X			

(3) Monthly schedule for 1999 and 2000

COURSE	FY 1999												FY 2000											
	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S
Planning and Design 1						X												X						
Planning and Design 2					X						X						X						X	
Planning and Design 3									X												X			
Construction Supervision							X				X								X				X	
Operation and Maintenance (Basic)		X				X				X				X				X				X		
Operation and Maintenance (Advanced)							X		X		X								X		X		X	
Water Quality Analysis (Basic)			X					X							X					X				
Water Quality Analysis (Advanced)					X												X							
Management of Sewage Works										X		X										X		X
Water Quality Control	X				X				X				X				X				X			

3.2 Number of trainees divided by PWD / BMA / Local Government in each training course.

	PWD	BMA	Local	Total
Planning and Design 1	40	20	-	60
Planning and Design 2	50	30	-	80
Planning and Design 3	40	20	-	60
Construction Supervision	80	40	-	120
Operations and Maintenance (Basic)	30	150	150	330
Operations and Maintenance (Advanced)	30	100	50	180
Water Quality Analysis (Basic)	10	20	50	80
Water Quality Analysis (Advanced)	5	20	5	30
Management of Sewage Works	20	20	50	90
Water Quality Control	20	500	150	670
Total	325	920	455	1700

3.3 Training course relating to the sewage works which have done in Thailand in 1994.

(1) Course name and Curriculum
(2) Course duration
(3) Number of participants
(4) Implementation authority and place
(5) Participant fee / person
(6) Lecturers information (e.g., position, qualification, etc.)
(7) Trainees qualification
(8) Teaching materials
(9) Cost / course

Detail of Training Courses relating to sewerage in TTI

"Sanitary and Environment Works" for Technician Course

Environmental problems are seriously concerned in every country in the world to keep them no more deterioration. Also both the Thai government and private sector see the importance of these problems. They are trying to motivate the people to think more about environmental problems and natural conditions.

The Public Works Department has created several projects to conserve the environment for many years, especially the projects of sanitary for people living condition both in suburban and urban area. However, the major roadblock for running these projects are the lack of expert or experienced personnel. The academic institutions, both of government and private, still can not enough produce the personnel in this fields.

Consequently, realizing such problem, the Technical Training Institute under the Ministry of Interior thus sets up the course entitled "Sanitary and Environmental Works" to improve the expertise of the personnel in this field, which would lead to the development of human resources and also organizations.

Objectives:

1. To increase knowledge and experiences in sanitary and environmental fields to the technicians, who are technical college graduates or equivalent.
2. To develop the ability of the technical personnel of the Ministry of Interior to make them able to assist the sanitary and environmental engineers.

Qualification of trainees:

1. Working as a Civil technician, drawing technician (draftsman), technical technician, mechanical technician, or a technical college graduated or equivalent.
2. At least 2 years of work as a government officer, but not more than 10 years, or one who receives the approval from the Director of Public Works Department.
3. Never attend any same course.
4. Able to attend the course continuously in the whole training period.

Curricula:

	TOPIC	Th	P/In	P/ou	Total
1	Basic sanitary work system	3	-	-	3
2.	Survey	6	-	-	6
3	Basic science for water and waste water	6	-	-	6
4	Hydrology	6	3	-	9
5	Hydrography	6	3	-	9
6	Plumbing	6	3	-	9
7	Drainage system	15	-	-	15
8	Weast water treatment	21	-	9	30
9	Sanitary system in building	9	3	-	12
10	Solid waste management	9	-	3	12
11	Cost estimation	6	-	-	6
12	Supplementary	13	-	-	13
13	Miscellaneous	2	-	-	2
	TOTAL	108	12	12	132

Total amount of trainees : 40 persons

Training period : April 18 - May 19 , 1995

Training methodology : Lecture, Seminar, Practice, Site survey, Question answering.

Lecturer :

Internal lecturer : Sanitary Engineering Division, Water Supply Development Division, Public Works Department.

External lecturer : Department of Drainage and sewerage, BMA. Depend on appropriateness.

Place :

* Technician Training Institute, Pratunam Pra-in, Ayudhaya province.
* Meeting room #5, Public Works Department, Samsen.
* Environmental Engineering, Faculty of Engineering, Chulalongkorn University.
* Research and experimental division, Irrigation Department.

Evaluation :

* Examination document
* Course evaluation form
* Observation evaluation by TTI officer.

Certification :	The trainee will receive a certificate from Public Works Department under the following conditions: - Attend course not less than 90% - Total score not less than 70% - Behavior score not less than 70%
Project Consultant :	the Director-General of Public Works Department.
Project Responsibility :	the Director of Technical Training Institute.
Project Management :	TTI Officer.

"Sanitary and Environment Works" for Engineer Course

Environmental problems are seriously concerned in every country in the world to keep them no more deterioration. Also both the Thai government and private sector see the importance of these problems. They are trying to motivate the people to think more about environmental problems and natural conditions.

The Public Works Department has created several projects to conserve the environment for many years, especially the projects of sanitary for people living condition both in suburban and urban area. However, the major roadblock for running these projects are the lack of expert or experienced personnel. The academic institutions, both of government and private, still can not enough produce the personnel in this fields.

Consequently, realizing such problem, the Technical Training Institute under the Ministry of Interior thus sets up the course entitled "Sanitary and Environmental Works" to improve the expertise of the personnel in this field, which would lead to the development of human resources and also organizations.

Objectives:

1. To increase knowledge and experiences in sanitary and environmental fields to the technicians, who are technical college graduates or equivalent.
2. To develop the ability of the engineer of the Ministry of Interior
3. To make them able to advice and suggest about sanitary and environment feild.

Qualification of trainees:

1. Government employee, Engineer or Architect Level 4 or more
2. Never attend any same course.
3. Able to attend the course continuously in the whole training period.

Curricula:

	TOPIC	Th	P/In	P/ou	Total
1	Basic sanitary work system	1	-	-	1
2.	Survey	2	-	-	2
3	Basic science for water and waste water	3	-	-	3
4	Hydrology	3	-	-	3
5	Hydrography	3	-	-	3
6	Plumbing	6	-	-	6
7	Drainage system	6	-	-	6
8	Weast water treatment	6	-	-	6
9	Sanitary system in building	6	-	-	6
10	Solid waste management	3	-	-	3
11	Air and Noice pollution	3			
12	Cost estimation	6	-	-	6
13	Morality and Disciplinary	12	-	-	12
	TOTAL	60	-	-	60

Feild trip : Domestic 3 days
- Solid waste management
- Waste water treatment

: International (Australia) 6 days
- Solid waste management
- Waste water treatment
- City planning
- Air and noise pollution

Total **9 days**

Total amount of trainees : 40 persons

Training period : March 14th - April 11th, 1995 (20 days)

Training methodology : Lecture, Seminar, Practice, Site survey, Question answering.

Lecturer :

Internal lecturer : Sanitary Engineering Division, Water Supply Division, Public Works Department.
Material and Reserch Division, Public Works Department

External lecturer : Department of Drainage and Sewerage of BMA
Depend on appropriateness.

Place :	*	Technician Training Institute, Pratunam Pra-in, Ayudhaya province.
Evaluation :	*	Examination document
	*	Course evaluation form
	*	Observation evaluation by TTI officer.
Certification :		The trainee will receive a certificate from Public Works Department under the following conditions: - Attend course not less than 90% - Accepted report of field trip
Project Consultant :		the Director-General of Public Works Department. the Deputy Director-General of Public Works Department Chief Engineer Chief Architect
Project Responsibility :		the Director of Technical Training Institute. the Deputy Director of TTI (Institution) the Deputy Director of TTI (Administration) the Deputy Director of TTI (Management and Training)
Project Management :		TTI Officer.

Examples of former training courses

1. Sanitary and Environment for Engineer
   Course period: August 15th - September 6th, 1994.(20 days)
   Budget: 334,462.71 Baht. (8,361,568 Yen)
   Number of trainees: 40 persons

2. Sanitary and Environment for Technician
   Course period: April 18th - May 16th, 1994.(30 days)
   Budget: 190,174.12 Baht. (4,754,353 Yen)
   Number of trainees: 40 persons

3.4 Priorities among the each courses on TCSW project

1. Operations and Maintenance
2. Water Quality Control
3. Water Quality Analysis
4. Planning and Design
5. Construction Supervision
6. Management of Sewage Works

3.5 How to enhance the effectiveness of the training (if any ideas)

At present, we have created some draft ideas but still need some more information and suggestion from the committee and also assistance from JICA. Right now TTI has only buildings and some facilities for TCSW, but still has inadequate laboratory equipment and accessories, text books, experts and trainers. We hope that with the assistance from JICA we can best enhance the effectiveness of the training.

3.6 Water Quality Analysis course (TTI & BMA branch)

(1) Present construction stage and prospect

See answer at the answer of question 7.

(2) Available space

Academic Building

Floor	Name of Room	Area (Sq.m)	Number of Rooms
1 st FL	Laboratory	1,425	
2 nd FL	Meeting Room	416	1
	Lecture Room	64	4
	Seminar Room	32	2
	Lecture's Room	64	1
	Rest Room	23	2
	Others	579	
	Sub-total	1,425	
3 rd FL	Lecture Room	64	4
	Seminar Room	32	2
	Lecturer's Room	64	1
	Rest Room	23	2
	Others	258	
	Sub-total	688	
TOTAL		3,538	19

Administration Building

Floor	Name of Room	Area (Sq.m.)	Number of Room
1 st FL	Office space	72	1
	Printingt and Copy	96	1
	Living room	12	2
	Meeting room	48	1
	Computer room	48	1
	First Aid unit	48	1
	Sub-total	336	7
2 nd FL	Offied space	96	1
	Meeting room	96	1
	Lecture room	12	2
	Library	48	1
	Lobby louge	48	1
	Sub-total	300	6
TOTAL		636	13

(3) **Budget allocation for purchasing equipment**

Now, we don't have any idea to allocatate for purchasing equipment, because, we waiting for the completion of curiula. we hope that with the assistance from JICA we can design it.

4. **Actual water pollution data in some areas in comparison with the water quality standards.**

See Attachment II.

5. **National policy for waste water after completion of the Seventh National Economica and Social Development Plan. (1992-1996)**

Regarding the Seventh National Economics and Social Development Plan (NESDP), the master plan for waste water treatment system and garbage disposal facilities emphasizes on the following issues:

1. Determination of pattern of capital mobilization and joint ventures with the private sector.

2. Supervise and seriously enforce punitive measures for those causing environmental destruction.

3. Collection of fees for waste water treatment and garbage disposal services should cover costs of investment and maintenance of the services, and local public agencies should be given supervisory responsibilities.

6. **Relations with other donor countries and international organizations.**

At present PWD, technical office for cities development (TOCD) and Department of Local Administration (DOLA), gets donation and assistance from Australian International Development Assistant Bereau (AIDAB) for solid waste management.

7. **Present construction stage in comparison with construction plan including utilities such as electricity, water system.**

See Attachment III.

8. **List of main technical materials on sewerage works such as "GUIDELINE" / "MANUAL" / "STANDARDS", and how to use it.**

Actually, we don't have GUIDLINE / MANUAL / STANDARD of main technical materials on sewerage works. Normally,we set its up for the particular project and use it as a GUIDELINE / MANUAL / STANDARD.

9. **Tentation equipment for the first year.**

NECESSARY EQUIPMENT FOR TCSW				**Gross Total**	**49,584** (x 1000)
1. EQUIPMENT FOR WATER QUALITY ANALYSIS				**Total**	**33,500**
1) **LABORATORY FURNITURE & FACILITIES** (TTI have to provide for laboratory furniture of this sub-item and its have to install before march 1996)				**Sub-Total**	**17,600**
*Center Tables	5	4	9	1000	9000
*Side Table	1	1	2	200	400
*Balance Table	1	1	2	300	600
*Sink	-	-	-	300	-
*Hume Hood (With exhaust gas washer)	1	1	2	1500	3000
*Exhaust Gas Washer	-	-	-	5000	0
*Storage Cabinet	2	2	4	400	1600
*Bottle Cabinet	1	1	2	300	600
*Drying Shelf	2	2	4	500	2000
*Laboratory Chair	10	10	20	20	400
*Others (Case, Work Table, etc.)			-	1000	-

2)	**LABORATORY INSTRUMENT**			**Sub-Total**		**15,900**
*	Ultrasonic Cleaner	-	-	-	1800	-
*	Refrigerator (L)	1	1	2	300	600
*	Refrigerator (M)	1	1	2	100	200
*	Water Purifier	1	1	2	1500	3000
*	Drying Oven	1	1	2	400	800
*	Low Temp. Incubator	1	1	2	1000	2000
*	Incubator	1	1	2	500	1000
*	Drying Sterilizer	1	1	2	400	800
*	Autoclave	1	1	2	500	1000
*	Water Bath	1	1	2	400	800
*	Muffle Furnace	1	1	2	700	1400
*	Distillation Equipment	1	1	2	600	1200
*	Vacuum Pump	1	1	2	150	300
*	Hot Plate	1	1	2	150	300
*	Centrifuge	1	1	2	500	1000
*	Shaker	-	-	-	300	-
*	Evaporator	-	-	-	200	-
*	Disiccator	1	1	2	300	600
*	COD Analyzer	1	1	2	200	400
*	Portable COD analyzer	-	1	1	500	500
2.	**ANALYTIC EQUIPMENT**			**Sub-Total**		**6,800**
*	pH Meter	1	1	2	200	400
*	DO. Meter	1	1	2	600	1200
*	Spectrophotometer	1	1	2	2000	4000
*	A.A. Photometer	-	-	-	10000	-
*	Analytical Balance	1	1	2	300	600
*	Balance	1	1	2	200	400
*	Moisture Balance	-	-	-	250	-
*	Microscope (with VTR)	-	-	-	3500	-
*	Ion Chromatography	-	-	-	4000	-
*	Gas Chromotography	-	-	-	3000	-
*	Recorder	-	-	-	600	-
*	Water Sampler	-	2	2	100	200
3.	**VEHICLES**				**Total**	**3,048**
1)	Mini Bus	(25 seats)	1	-	1	6800	6800
2)	Micro Bus	(12 seats)	1	-	1	2448	2448
					Total	**49,548**

10. Arrangement for the Japanese experts.

(1) Rooms
(2) Administrative staffs
(3) Secretaries
(4) Vehicles and Drivers
(5) Air-conditioners
(6) Direct-line Telephones
(7) Facsimiles

- For rooms, see floor plan in Attachment IV.
- For admistrative staff, co-ordinator will be provided by TTI.
- For secretaries, they should be provided or hired by JICA according to the regulations of the department of technical and economic co-operation (DTEC). However, if any trouble to find secretaries who are fluent in spoken and written English, TTI will assist in finding good secretaries for JICA experts.
- For vehicles and drivers, there is a pool of vehicles and drivers shared within TTI but they are still inadequate. We're afraid that there will be problem in the future due to the increasing demand from TCSW. Therefore we let you consider for this item.
- For air-conditioners, they are already provided.
- For direct-line telephones and facsimiles, they are already provided and more lines are on requesting process. However, TTI cannot pay for the cost of international phone call. JICA experts are requested to pay for that.

Attachment I (cont.)
List of Counterparts (BMA)

Name	Present Organization	Position	Education	Age
Mr.Thawachai Spaptham	Department of Drainage and Sewerage, BMA	Engineer 6, Chief of Sipraya WasteWater Treatment Plant	B.Eng. (Civil) King Mongkut's Institute of Technology, Thonburi	-
Mr.Chanin Vichayanon	Department of Drainage and Sewerage, BMA	Engineer 5, Chief of Bangna Waste Water Treatment Plant	B.Eng (Industrial Technology) King Mongkut's Institute of Technology, North Bangkok	-
Mr.Supis Kraimark	Department of Drainage and Sewerage, BMA	Mechanical Technician 5, Sipraya Waste Water Treatment Plant	Dip.in Mechanical Technology Bachelor in Education (English) Institute of Technology & Vocational	-
Mr.O-pha Seangtongprakai	Department of Drainage and Sewerage, BMA	Sanitary Scientist 4, Sipraya WasteWater Treatment Plant	B.Sc. (Sanitation) Mahidol University	-
Mr.Prachote Krabkran	Department of Drainage and Sewerage, BMA	Sanitary Scientist 4, Sipraya WasteWater Treatment Plant	B.Sc. (Sanitation) Mahidol University	-
Mr. Pracha Keawprang	Department of Drainage and Sewerage, BMA	Sanitary Scientist3, Huaykwang WasteWater Treatment Plant	B.Sc. (Sanitation) Mahidol University	-
Mr. Charoen Veeraachakul	Department of Drainage and Sewerage, BMA	Chief of WQI	B. Sc. (Sanitation) Mahidol University	
Ms. Semsuk Pakkattang	Department of Drainage and Sewerage, BMA	Sanitary Scientist 3	B. Sc. (Sanitation) Mahidol University	

Attachment I
List of Counterparts (PWD)

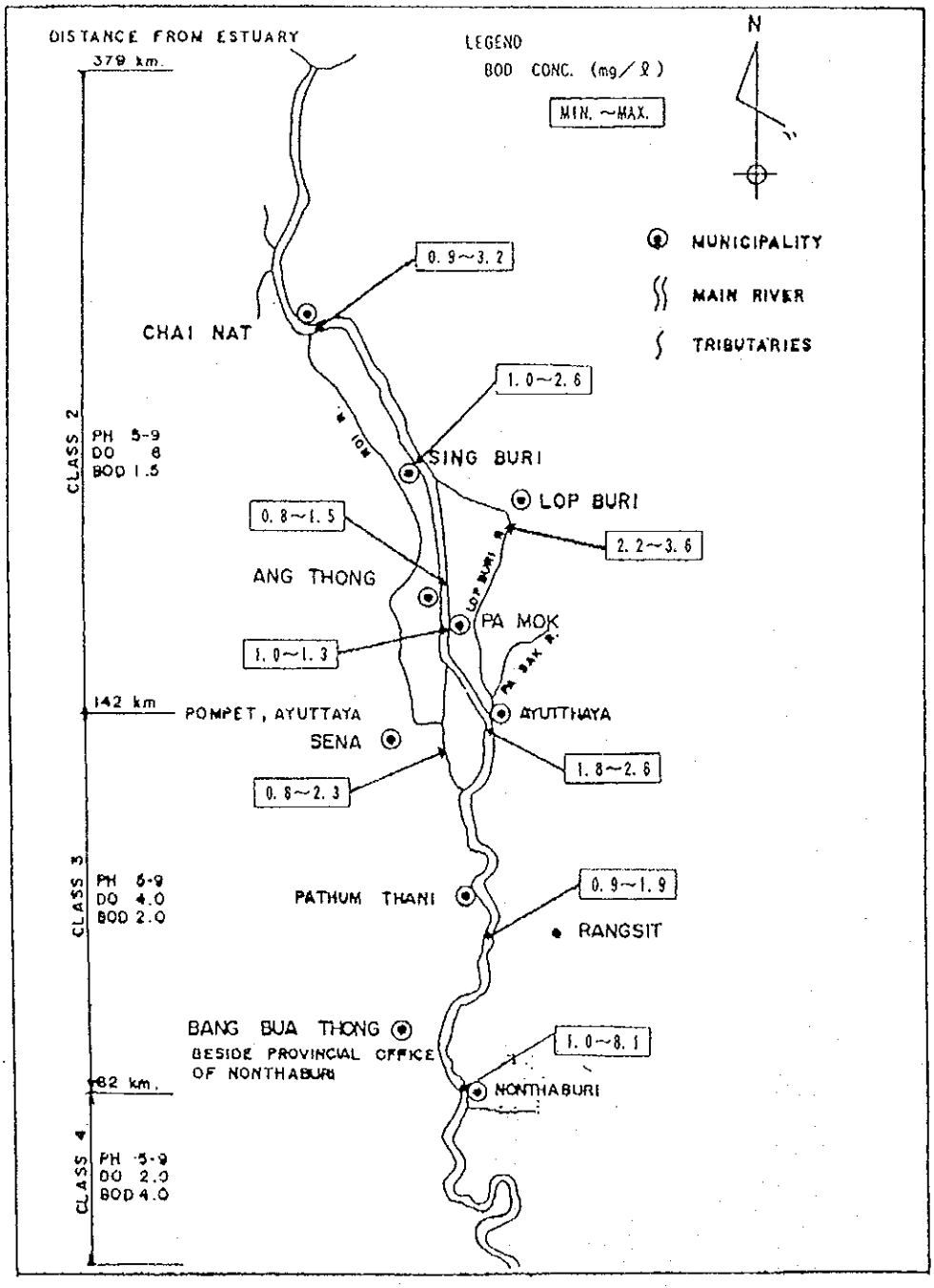
Name	Present Organization	Position	Education	Age
Mr.Surapol Pongthaiput (Director of TCSW)	Director of TCSW Deputy Director of TTI	Civil Engineer 8	B.Eng. (Civil) Chulalongkorn University B. of Law Ramkamhaeng University	47
Mr.Vijit Santipatanakij	Samutsongkram Provincial Public works office	Civil Engineer 6	B.Eng (Civil) Chiangmai University	37
Mr.Suriya Thanawatdej	Deepwell Drilling and Development Division	Mechanical Engineer 6	B.M.E. (Environmental Management) Vocational Institute of Technology	40
Mr.Pomput Nutthee	Lopburi Provincial Public Works office	Civil Engineer 5	B.Eng. (Agriculture engineer) Kasetsart University	36
Mr.Amorn Chansakul	Phuket Provincial Public Works office	Civil Engineer 4	B.E.(Civil) Prince Songkhla M.E.(Transportation) The City College of New York	35
Miss A-roon-ni Kasem	Materials and Research Division	Scientist 3	B.Sc. (Biology) Ramkamhaeng University	29

List of Specialist Field Assistance
for Working Group of TCSW Project

NAME	DIVISION
1. Dr. Kreetha Soykheeree	Sanitary Engineering Division (SED)
2. Mr. Nop Rojanawanij	Civil Engineering Division (CED)
3. Mr. Chatchawal Khunkhamchu	Electrical and Mechanical Engineering Division (EMD)
4. Mr. Peerapong Ratapana	Electrical and Mechanical Engineering Division (EMD)
5. Mrs. Vanida Banopas	Material and Research Division (MRD)
6. Mr. Pornsakdi Jevasuwon	Material and Research Division (MRD)

Attachment II

Present Water Pollution Status



Sourc :Study of Master Plan for the Sewerage Development Project for Lower Chao Praya River

Attachment III

The progressive work of TTI building for TCSW project

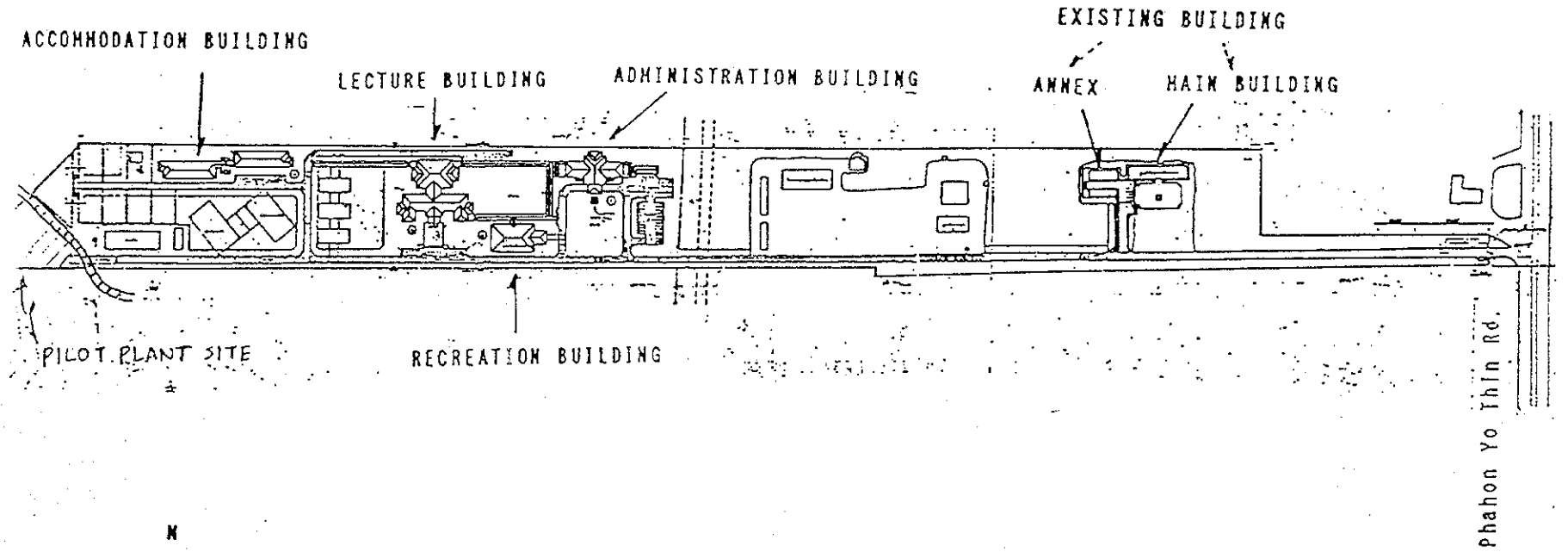
The previous work of the whole project

No	Detail	Ratio %	Monthly %	%	Total %
1.	Academic Building	29.628	2.000	44.000	13.036
2.	Dormitory Building	26.936	5.205	37.000	9.966
3.	Administration Building	8.787	0.650	81.032	7.120
4.	Entertainment Building	5.487	0.689	84.000	4.610
5.	Staff House	0.556	9.307	29.000	0.160
6.	Other Building	28.605	0.800	52.590	15.045
	6.1 Land-fill	14.656	0	100	14.656
	6.2 Flag Pole	0.114	5	5	0.005
	6.3 Clean Water System	0.942	4	21	0.197
	6.4 Waste Water Treatment	1.399	7	7	0.097
	6.5 Drainage System	3.182	3	3	0.090
	6.6 Road and Parking	6.691	0	0	0
	6.7 Electricity System	0.376	0	0	0
	6.8 Bar bed Fence	0.909	0	0	0
	6.9 Guard House and Main Gate	0.336	0	0	0
	Total	100			50.000

Attachment IV

FIG. 2-4 LAYOUT OF TTI

(Attachment IV)



TOTAL AREA : 68 RAI (10.88 ha)

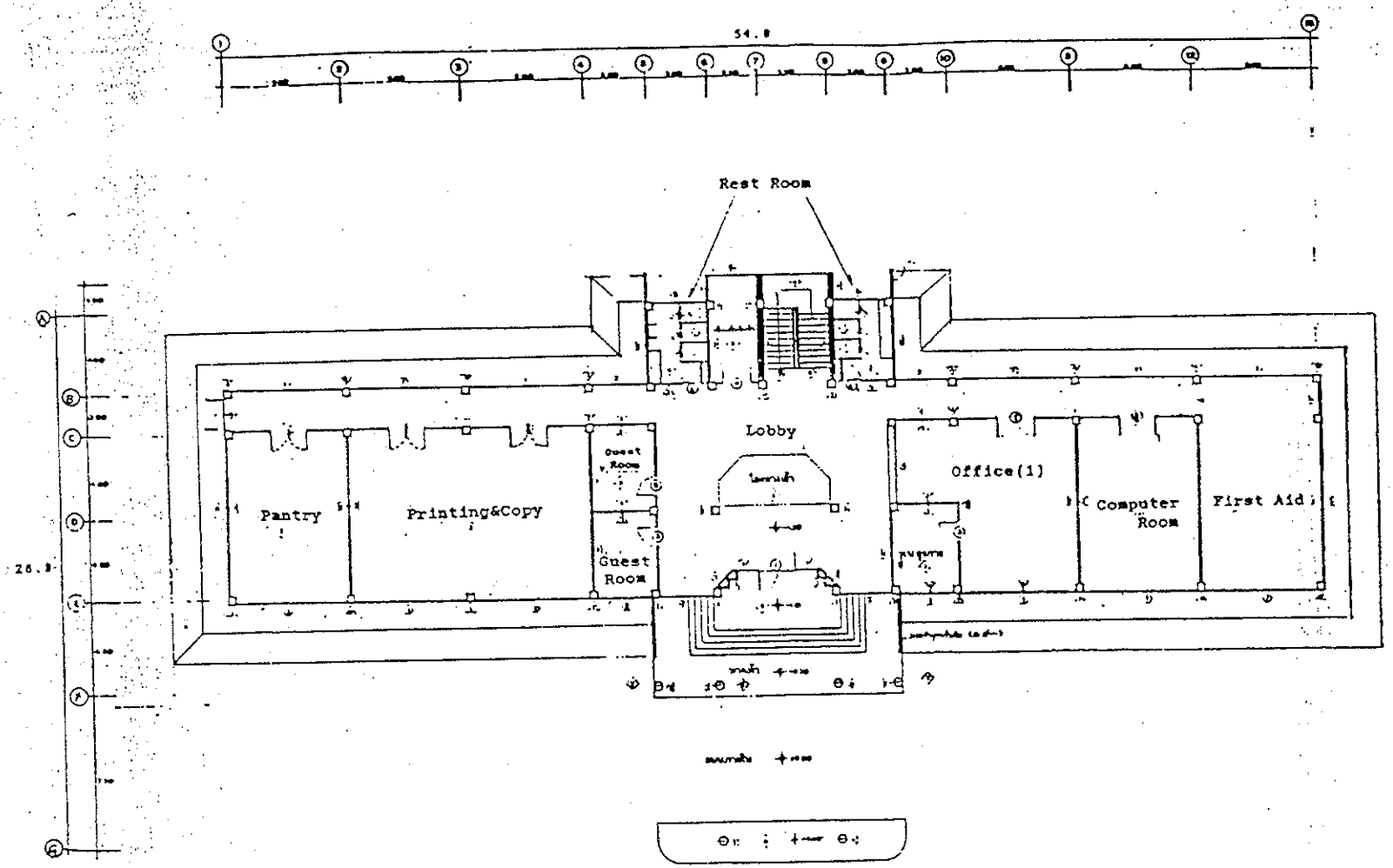


FIG. 2-5 ADMINISTRATION BUILDING

PLAN (1st Floor)

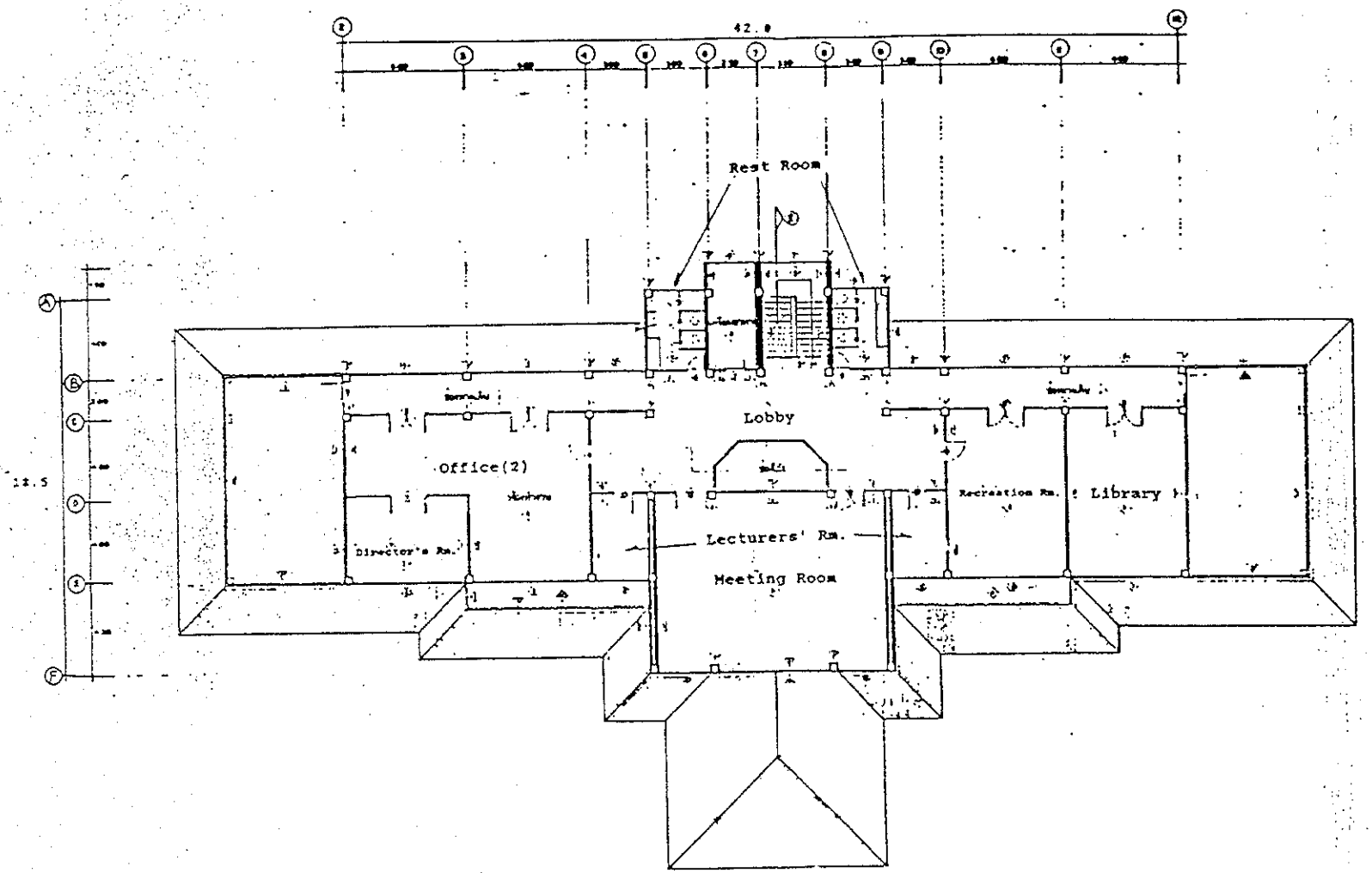


FIG. 2-6 ADMINISTRATION BUILDING

PLAN (2nd Floor)

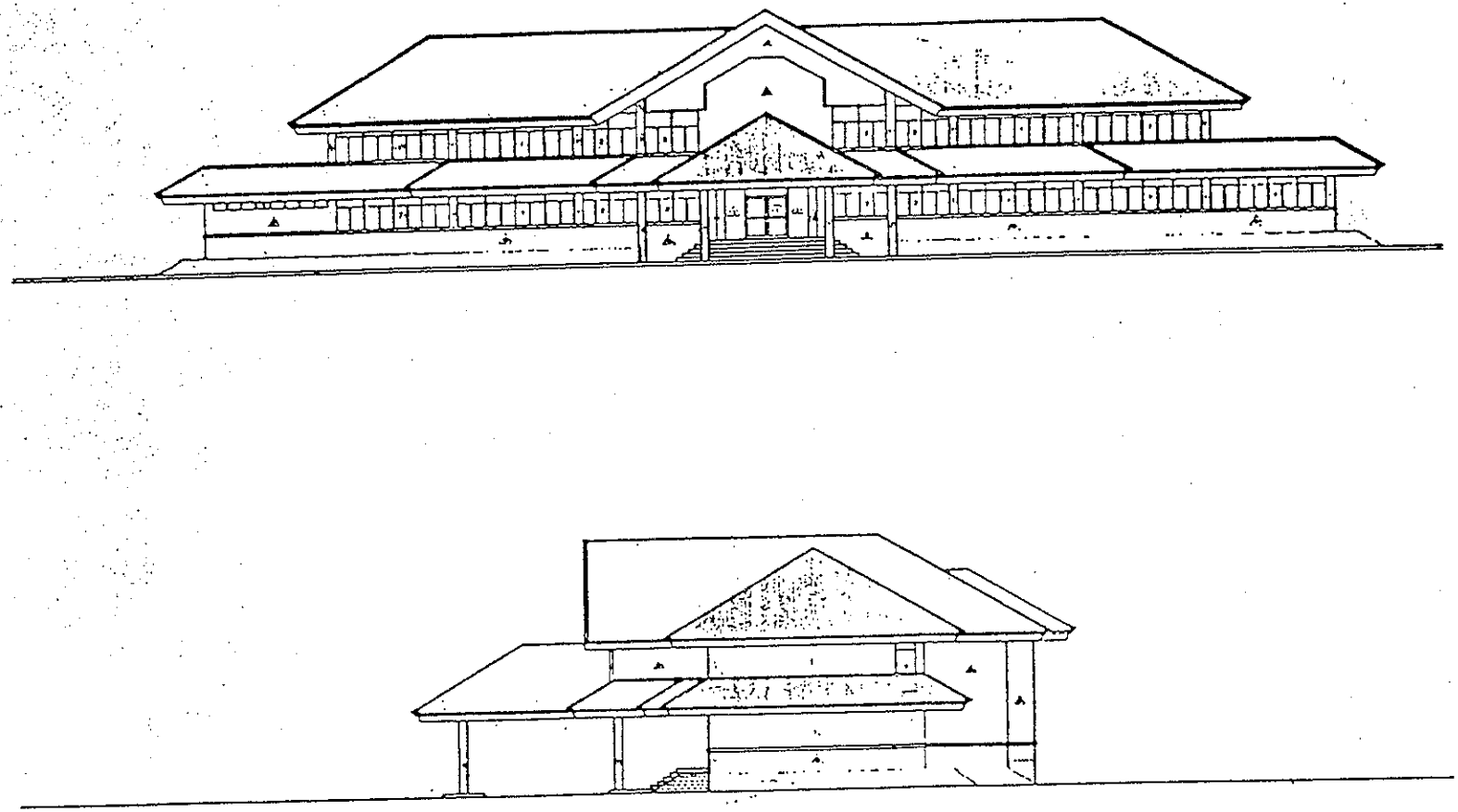


FIG. 2-7 ADMINISTRATION BUILDING

ELEVATION

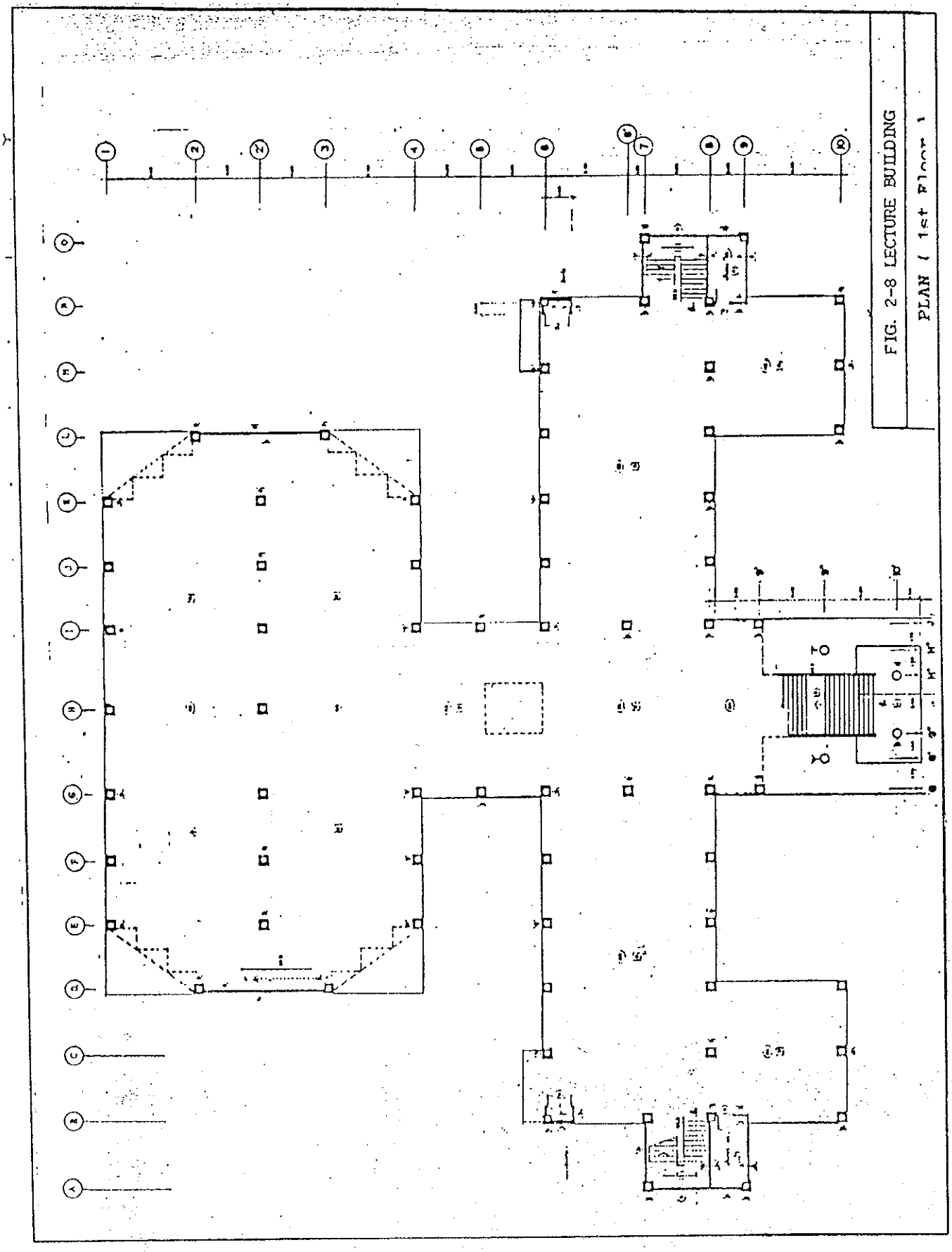


FIG. 2-8 LECTURE BUILDING
PLAN (1st Floor)

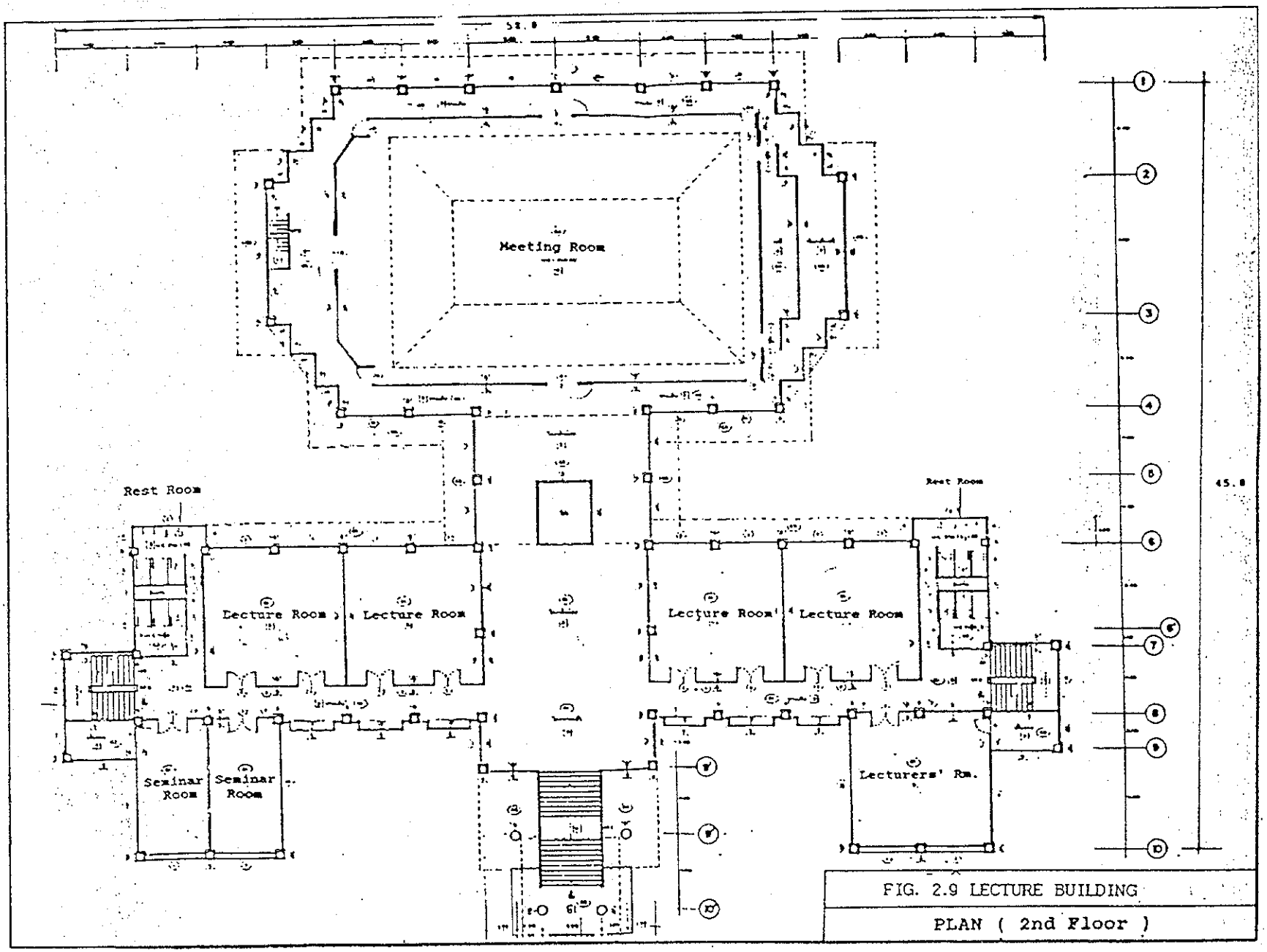


FIG. 2.9 LECTURE BUILDING

PLAN (2nd Floor)

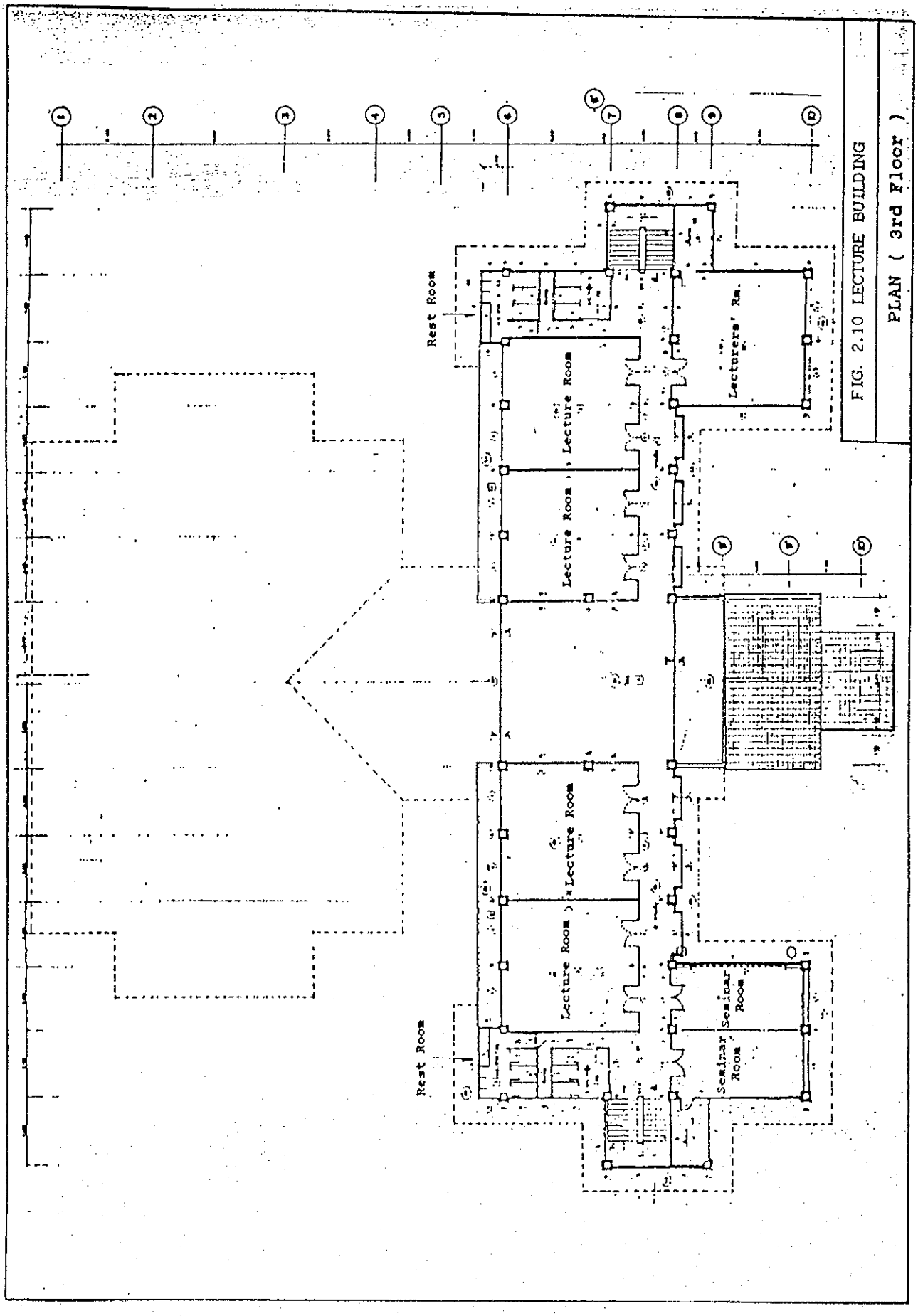


FIG. 2.10 LECTURE BUILDING
PLAN (3rd Floor)

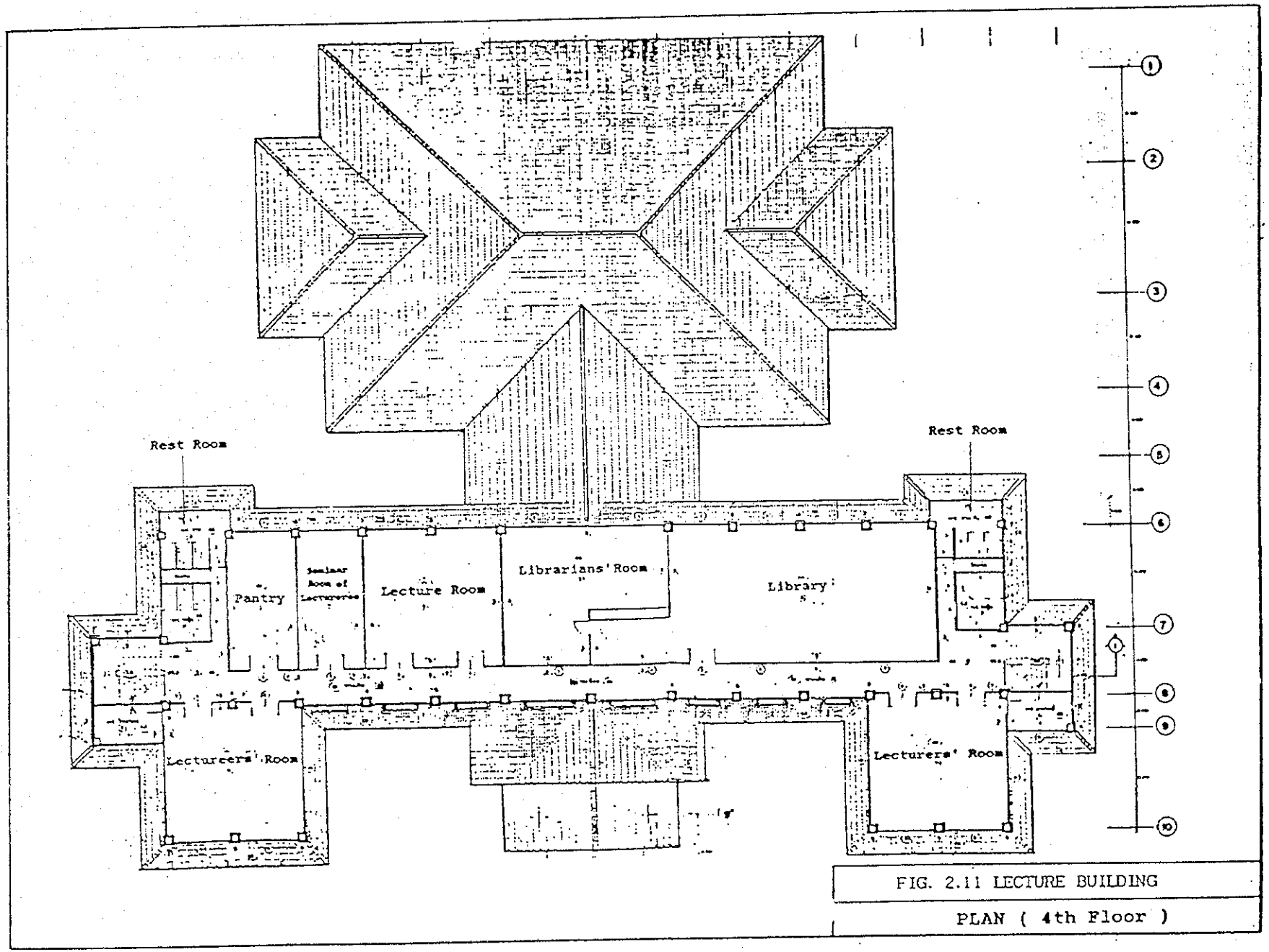
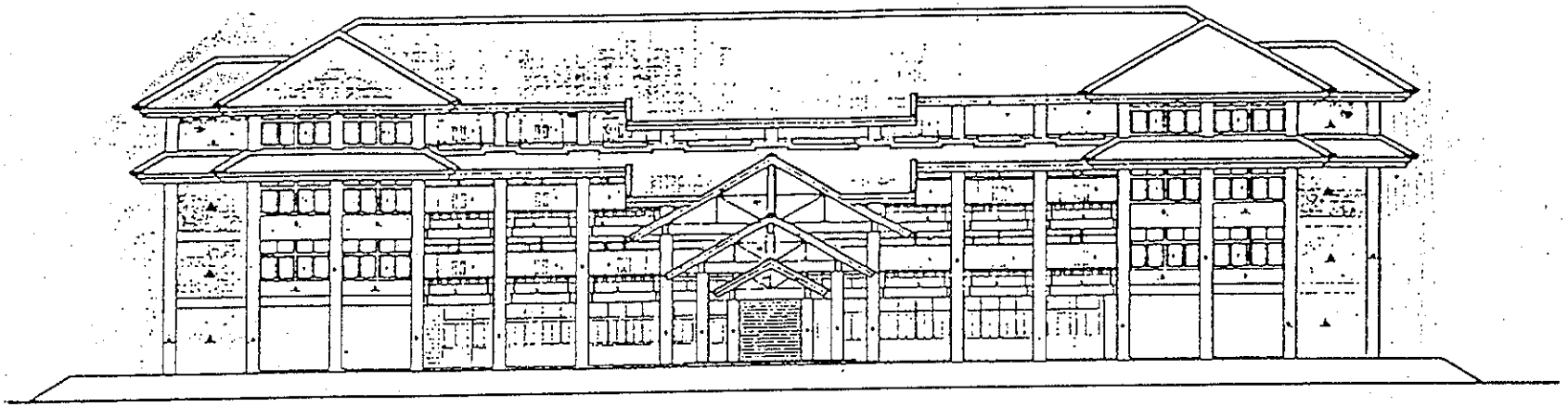
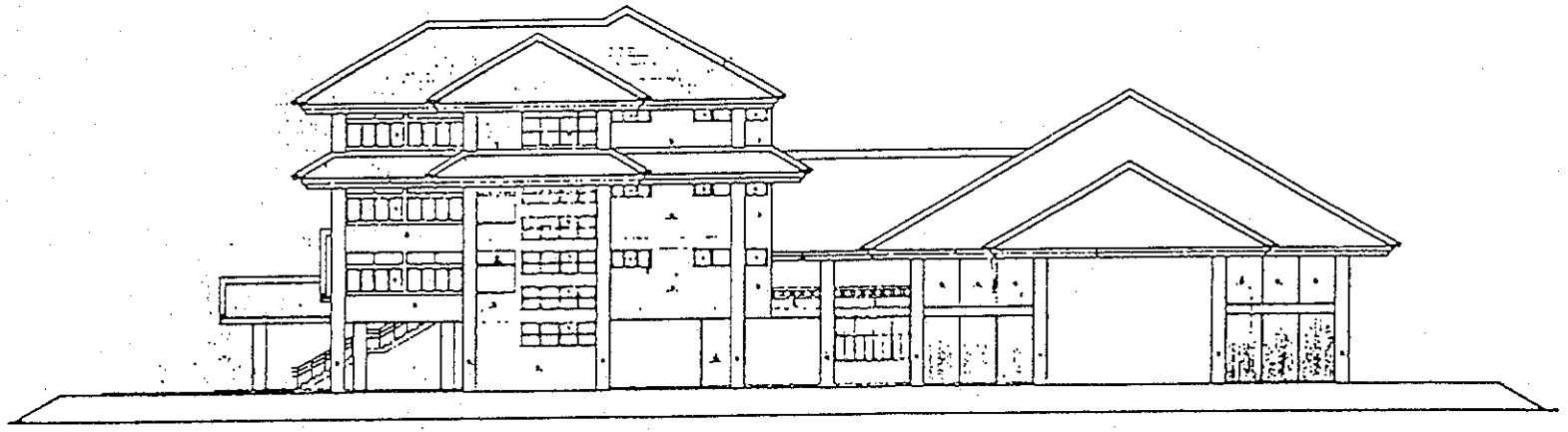


FIG. 2.11 LECTURE BUILDING

PLAN (4th Floor)



รูปด้าน (ก) 1: 100



รูปด้าน (ข) 1: 100

FIG. 2-12 LECTURE BUILDING

ELEVATION

TABLE 2-4 ADMINISTRATION BUILDING

	Name of Room	Area (sq.m)	Number of Rooms
1st FL.	Lobby	120	1
	Office (1)	72	1
	Guest Room	12	2
	Computer Room	40	1
	Printing & Copy	96	1
	First Aid	48	1
	Pantry	48	1
	Rest Room	12	2
	Others	179	
	Sub-total	651	
2nd FL.	* Lobby	72	1
	Director's Room	24	1
	* Office (2)	72	1
	* Lecturers' Room	12	2
	* Meeting Room	114	1
	* Recreation Room	48	1
	* Library	48	1
	* Rest room	12	2
	* Others	105	
	* Sub-total	531	
TOTAL		1,182	

(TCSW 507)

* provided to TCSW

TABLE 2-5 RECREATION BUILDING

	Name of Room	Area (sq.m)	Number of Rooms
1st FL.	Hall	294	1
	Kitchen	18	2
	Storage	12	1
	Rest Room	15	1
	Maintenance	12	1
	Others	463	
TOTAL		832	

TABLE 2-6 LECTURE BUILDING

	Name of Room	Area (sq.m)	Number of Rooms
* 1st FL.		1,425	
2nd FL.	Meeting Room	416	1
	Lecture Room	64	4
	Seminar Room	32	2
	Lecturers' Room	64	1
	Rest Room	23	2
	Others	579	
	Sub-total	1,425	
* 3rd FL.	Lecture Room	64	4
	Seminar Room	32	2
	Lecturers' Room	64	1
	Rest Room	23	2
	Others	258	
	Sub-total	688	
4th FL.	Lecture Room	64	1
	Library	143	1
	Librarians'Room	65	1
	Lecturers' Room	64	2
	Seminar Room of Lectureres	32	1
	Pantry	32	1
	Rest Room	23	2
	Others	178	
	Sub-total	688	
TOTAL		4,226	

(TCSW 2.113)

* Provided to TCSW

TABLE 2-7 ACCOMMODATION BUILDING

	Name of Room	Area (sq.m)	Number of Rooms
1st Fl.	Lobby	105	1
	Recreation Room	149	1
	Laundry	119	1
	Rest Room	25	1
	Others	814	
	Sub-total	1,212	
2nd FL.	Dormitory *1	60	9
	Lecturer's Dormitory *2	30	6
	Storage Room	20	1
	Others	472	
	Sub-total	1,212	
3rd FL.	Dormitory *1	60	12
	Storage Room	20	1
	Others	472	
	Sub-total	1,212	
4th FL.	Dormitory *1	60	12
	Stroage Room	20	1
	Others	472	
	Sub-total	1,212	
TOTAL		4,848	

cf. *1.....4 persons/room, *2.....2 persoms/room

Tentative Minimum Comments

on

Answer of the Questionaire (TTI)

by

JICA Pre-Implementation Study Team for TCSW

(Mar.6 1995)

A3, Detail of the training courses will be discussed further.

A9, Gross total of equipment is beyond Japanese budget for this project.

MEASURES TO BE TAKEN BY THE THAI SIDE

1. Measures to be taken by May 1995 (before dispatching the Project Implementation Survey Team)

(1) to nominate qualified counterpart personnels (experience in sewage technology)

(2) to nominate counterpart personnels for Chief advisor and Coordinator from BMA

(3) to establish the Technical Committee for TCSW which consists from PWD and BMA

(4) to establish the Technical Committee for BMA Branch

(5) to make an A-1 Form (draft) for long/short term experts

(6) to make an A-2・3 Form (draft) for training in Japan for 1995 Japanese fiscal year

(7) to make an A-4 Form (draft) for machinery and equipment for 1995 Japanese fiscal year

(8) to allocate the necessary budget for setting up the Water Quality Analysis Room at TTI

(9) to revise the Draft of the Basic Plan which will be titled the Draft of the Tentative Basic Plan

2. Measures to be taken by July 1995 (before dispatching the Japanese experts)

(1) Arrangement for the Project implemntation at TTI

・Enough rooms with water/electric supply/drainage system
・4 Candidates for Secretary (will be selected by Japanese experts)
・Administrative staff
・Desk
・Chair
・Sofa
・Shelf
・Meeting table
・Direct-line telephone
・Air-Conditioner
・Facsimile

WATER CLASSIFICATION CRITERIA

Classifications	Objectives, Conditions and Beneficial Usages
Class 1	Extra clean fresh surface water resources used for: (1) consumption (not necessary to pass through water treatment processes, require only ordinary process for pathogenic destruction) (2) ecosystem conservation, where basic living organisms can breed naturally
Class 2	Very clean fresh surface water resources used for : (1) consumption (require ordinary water treatment process before use) (2) aquatic organism conservation (3) fishery (4) recreation
Class 3	Medium clean fresh surface water resources used for: (1) consumption (need to pass through an ordinary treatment process before use) (2) agriculture
Class 4	Fairly clean fresh surface water resources used for: (1) consumption (require special water treatment process before use) (2) industry (3) other activities
Class 5	The resources which are not classified in class 1-4 and used for: (1) navigation

Source : Notification of the Ministry of Science, Technology and Energy (B.E 2528 (1985)), published in the Royal Government Gazette, Vol. 103, Part 60, dated April 15, B.E 2529 (1986).

SURFACE WATER QUALITY STANDARDS

Parameter	Unit	Statistic	Standard values for class ***				
			1	2	3	4	5
1. Temperature	°C	-	n	n'	n'	n'	
2. pH Value	-	-	n	5-9	5-9	5-9	-
3. Dissolved oxygen	mg/l	P20	n	6	4.0	2.0	-
4. BOD (5 days, 20°C)	mg/l	P80	n	1.5	2.0	4.0	-
5. Coliform bacteria							-
- total coliform	MPN/100ml	P80		5,000	20,000	-	-
- Fecal coliform	MPN/100ml	P80		1,000	4,000	-	-
6. NO_3-N	mg/l	Max. allowance	n	5.0	5.0	5.0	-
7. NH_3-N	mg/l	Max. allowance	n	:	0.5	:	-
8. Phenols	mg/l	Max. allowance	n	:	0.005	:	-
9. Cu	mg/l	Max. allowance	n	:	0.1	:	-
10. Ni	mg/l	Max. allowance	n	:	0.1	:	-
11. Mn	mg/l	Max. allowance	n	:	1.0	:	-
12. Zn	mg/l	Max. allowance	n	:	1.0	:	-
13. Cd	mg/l	Max. allowance	n	:	0.005*, 0.05**	:	-
14. Cr (hexavalent)	mg/l	Max. allowance	n	:	0.05	:	-
15. Pb	mg/l	Max. allowance	n	:	0.05	:	-
16 Hg (total)	mg/l	Max. allowance	n	:	0.002	:	-
17 As	mg/l	Max. allowance	n	:	0.01	:	-
18 CN	mg/l	Max. allowance			0.005		-
19 Radioactivity							-
- Gross α	Bq./l	Max. allowance	n	:	0.1	:	-
- Gross β	Bq./l	Max. allowance	n	:	1.0	:	-
20. Pesticides (total)	mg/l	Max. allowance	n	:	0.05	:	-
- DDT	µg/l	Max. allowance	n	:	1.0	:	-
- β BHC	µg/l	Max. allowance	n	:	0.02	:	-
- Dieldrin	µg/l	Max. allowance	n	:	0.1	:	-
- Aldrin	µg/l	Max. allowance	n	:	0.1	:	-
- Heptachlor & Heptachlor epoxide	µg/l	Max. allowance	n	:	0.2	:	-
- Endrin	µg/l	Max. allowance	n	:	None	:	-

Note :

P = Percentile value
n = natural
n' = natural, but changing not more than 3°C
* = when water hardness not more than 100 mg/l as $CaCO_3$
** = when water hardness more than 100 mg/l as $CaCO_3$
*** = Water Classification

Source: Notification of the Ministry of Science, Technology and Energy (B.E 2528) (1985)

INDUSTRIAL EFFLUENT STANDARDS

Items	Units	Standard values	Remarks	
BOD (5 days, at 20°C)	mg/l	20-60	Fishery canning	Max. 100
			Starch industry	
			Centrifugal	Max. 60
			Sedimentation	Max. 100
			Noodle industry	Max. 100
			Tanning industry	Max. 100
			Pulp industry	Max. 100
			Frozen food industry	Max. 100
Suspended solids (SS)	mg/l	Depend on dilution ratios of wastewater and receiving water	Ratio	
			1/8 to 1/150	Max. 30
			1/151 to 1/300	Max. 60
			1/301 to 1/500	Max. 150
Dissolved solids (DS)	mg/l	Max. 2,000 or under office's consideration but not more than 5,000	If salinity of receiving water is higher than 2,000 mg/l, DS in the effluent should not be higher than 5,000 mg/l of the DS in the receiving water	
pH	-	5-9		
Permanganate value	mg/l	Max. 60		
Sulfide as H_2S	mg/l	Max. 1.0		
Cyanide as HCN	mg/l	Max. 0.2		
Tar	mg/l	none		
Oil & Grease	mg/l	Max. 5.0	Refinery & Lubricant oil industry Max. 15.0	
Formaldehyde	mg/l	Max. 1.0		
Phenol & Cresol	mg/l	Max. 1.0		
Free Chlorine	mg/l	Max. 1.0		
Insecticides	mg/l	none		
Radioactivity	Bq./l	none		
Heavy metals				
Zinc (Zn)	mg/l	Max. 5.0	Zinc industry	Max. 3.0
Chromium (Cr)	mg/l	Max. 0.5	Zinc industry	Max. 0.2
Arsenic (As)	mg/l	Max. 0.25		
Copper (Cu)	mg/l	Max. 1.0		
Mercury (Hg)	mg/l	Max. 0.005	Zinc industry	Max. 0.002
Cadmium (Cd)	mg/l	Max. 0.03	Zinc industry	Max. 0.1
Barium (Ba)	mg/l	Max. 1.0		
Selenium (Se)	mg/l	Max. 0.02		
Lead (Pb)	mg/l	Max. 0.2		
Nickel (Ni)	mg/l	Max. 0.2	Zinc industry	Max. 0.2
Manganese (Mn)	mg/l	Max. 5.0		
Silver (Ag)	mg/l	-	Zinc industry	Max. 0.02

Penalty: A license for operation a factory who does not comply with this notification shall be punished by fine not exceeding ten thousand Baht.

Source: (1) Notification of the Ministry of Industry No. 12 B.E 2525 (1982) issued under the Factory Act B.E. 2521 (1978) published in the Royal Government Gazette, Vol. 99, Part 33, dated March 5, B.E. 2525 (1982)

(2) Notification of the Ministry of Industry No. 10 B.E 2521 (1978) issued under the Factory Act B.E. 2521 (1978) published in the Royal Government Gazette, Vol. 95, Part 132, dated November 28, B.E. 2521 (1978)

DOMESTIC EFFLUENT GUIDELINES

Parameters	Units	Domestic Effluent Classification for Community Group (persons)			
		A(>2500)	B(501-2500)	C(101-500)	D(<1010)
1. BOD (20°C at 5 days)*	mg/dm^3	20	30	60	90
2. Solids					
2.1 SS	mg/dm^3	30	40	50	60
2.2 Settleable S.	mg/dm^3	0.5	0.5	0.5	0.5
2.3 TDS ***	mg/dm^3	+500	+500	+500	+500
3. Sulfide	mg/dm^3	1.0	1.0	3.0	4.0
4. Free residual Chlorine ****	mg/dm^3	0.5	0.5	-	-
5. Nitrogen					
5.1 TKN	mg/dm^3	-	-	40	40
5.2 ORG-N	mg/dm^3	10	10	15	15
5.3 NH_3-N	mg/dm^3	-	-	25	25
5.4 NO_3-N	mg/dm^3	-	-	-	-
6. pH	mg/dm^3	5-9	5-9	5-9	5-9
7. Oil & Grease	mg/dm^3	20	20	20	20
8. Fecal coliform	MPN/$100cm^3$	-	-	-	-
9. Phosphate	mg/dm^3	-	-	-	-

Remarks: A,B,C,D size of community with more than 2500, between 501-2500, between 101-500 and less than 1010 persons respectively.

* Settled BOD (30 min)

** more than TDS of used water

*** Maximum allowance under epidemic condition only

Source: Proposed by the Sub-Committee on Domestic Effluent under the Environmental Committee on Water (May 27 BE 2527 (1984)) and approved by the National Environment Board (Jan. 31 BE 2528 (1985))

Strandards for Controlling Building's Effluent
Announcement January 10,1994 by Minister of Science, Technology and Environment

(1) Classification

TPYE OF BUILDING	SIZE	CLASS
1. Condominium	> 500 rooms	A
	100-500 rooms	B
	< 100 rooms	C
2. Hotel	> 200 rooms	A
	60-200 rooms	B
	< 60 rooms	C
3. Dormitory	> 250 rooms	B
	50-250 rooms	C
	10-50 rooms	D
4. Massage Parlor	> 5000 m^2	B
Disco/coffee Shop	1000-5000 m^2	C
5. Hospitals	> 30 beds	A
	10-30 beds	B
6. School/University	> 25,000 m^2	A
	5000-25,000 m^2	B
7. Government/Authority/	> 55,000 m^2	A
International Organization	10,000-55,000 m^2	B
Office Building	5,000-10,000 m^2	C
8. Shopping Center/	> 25,000 m^2	A
Department Store	5,000-25,000 m^2	B
9. Market	>2500 m^2	A
	1500-2500 m^2	B
	1000-1500 m^2	C
	500-1000 m^2	D
10. Restaurant	>2,500 m^2	A
	500-2500 m^2	B
	250-500 m^2	C
	100-250 m^2	D
	< 100 m^2	E

(2) Effluent Standards

	Units	Effluent Standards				
		A	B	C	D	E
1. pH	-	5-9	5-9	5-9	5-9	5-9
2. BOD	mg/l	< 20	< 30	< 40	< 50	< 200
3. SS	mg/l	< 30	< 40	< 50	< 50	< 60
4. Sulfide	mg/l	< 1	< 1	< 3	< 4	-
5. TDS	mg/l	< 500	< 500	< 500	< 500	-
6. Settleable Solids	mg/l	< 0.5	< 0.5	< 0.5	< 0.5	-
7. Fat Oil and Grease	mg/l	< 20	< 20	< 20	< 20	< 100
8. TKN	mg/l	< 35	< 35	< 40	< 40	-

(3) Methord for Water Quality Analysis

	Methods
1. pH	pH mether
2. BOD	Azide Modification Method
3. SS	Glass fiber Filter
4. Sulfide	Titration
5. TDS	Evaporation (103-105°C,1hr)
6. Settleable Solids	Imhoff Cone (1000 ml,1hr)
7. Fat Oil and Grease	Soxhlet Extraction Method
8. TKN	Kjeldahl Method

MANUAL FOR OPERATION AND MAINTENANCE OF SEWAGE WORKS

October 1994

Public Works Department

Japan International Cooperation Agency

OPERATION & MAINTENANCE MANUAL

OF

THE WASTEWATER TREATMENT PLANT

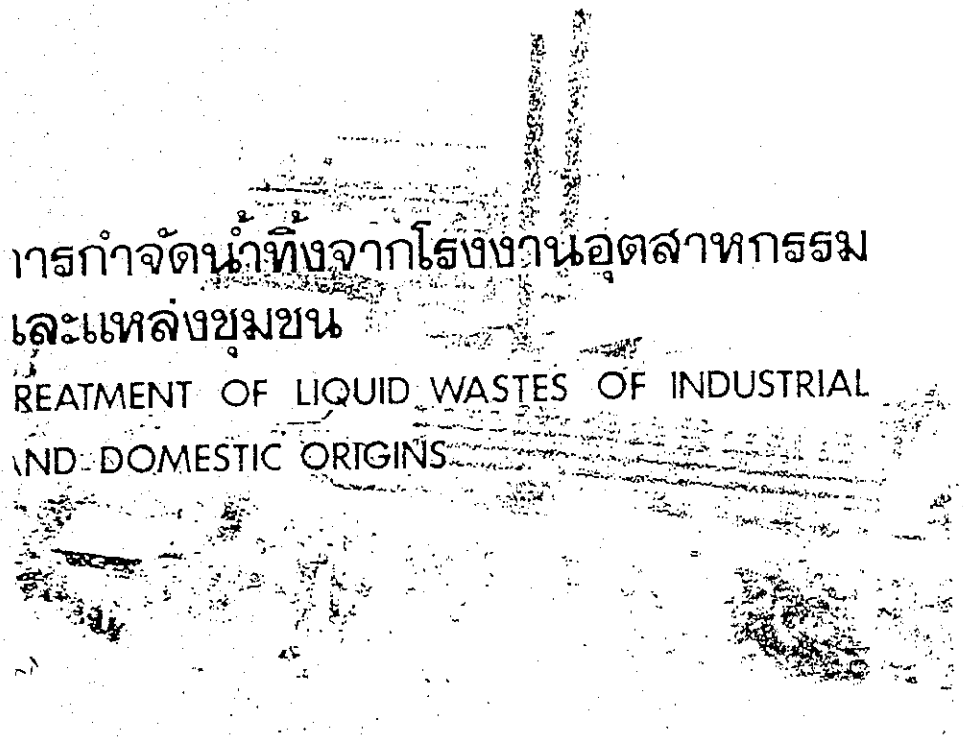
DDS, BMA

MARCH, 1993

JICA

การกำจัดน้ำทิ้งจากโรงงานอุตสาหกรรมและแหล่งชุมชน

"Treatment of Liquid Wastes of Industrial and Domestic Origins"



โดย
เสริมพล รัตสุข
ไชยยุทธ กลิ่นสุคนธ์

สถาบันวิจัยวิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย

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Dip. in Ecosystem Management (Dresden GDR)
สถาบันวิจัยวิทยาศาสตร์และเทคโนโลยีแห่งประเทศไทย

Operation and Maintenance of Wastewater treatment System

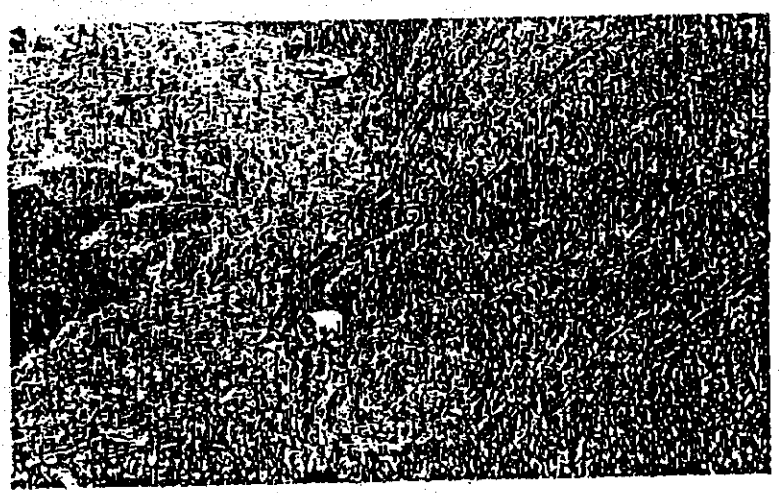
การควบคุมดูแลระบบบำบัดน้ำเสีย

Faculty of Environment Engineering
คณาจารย์ภาควิชาวิศวกรรมสิ่งแวดล้อม

จุฬาลงกรณ์มหาวิทยาลัย 2537
Chulalongkorn University 1994

MANUAL VOLUME I
for
Building Owner/Restaurant
and Install Contractor

On-site treatment plants



Pollution Control Department

Faculty of Engineering
Chulalongkorn University

King Mongkut's Institute of Technology Thonburi

MANUAL VOLUME II
for
Designer and Producer

On-site treatment plants

Pollution Control Department

Faculty of Engineering
Chulalongkorn University

King Mongkut's Institute of Technology Thonburi

MANUAL VOLUME IV

for

Wastewater Inspector Service

Pollution Control Department

Faculty of Engineering
Chulalongkorn University

MANUAL VOLUME III
for

Wastewater Control Operation
by Government Sector, Provincial Administration
Municipality and Sanitation

Pollution Control Department

Faculty of Engineering
Chulalongkorn University

King Mongkut's Institute of Technology Thonburi

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１３）中本至、東アジア諸国への下水道技術協力、月刊下水道、Vol.11,No.1
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