Table 4(2)-19 : Outline of Welfare Building

No	TYPE OF ROOM	NO. OF ROOM	SIZE OF ROOM (PERSON)	REMARKS
1	Cafeteria	1	100	-for dinning and drinking of trainees, researchers and staffs
2	Common room	2	20	-for refreshment and entertainment of trainees, researchers and staffs. with necessary devices

Table 4(2)-20 Outline of Dormitory

No	TYPE OF ROOM	NO. OF ROOM	SIZE OF ROOM (PERSON)	REMARKS
1	Trainee room	16	4	-for accommodation of trainee. 4 persons per room
2	Guest room	8	1	-for accommodation of invited lectures, invited researchers and guests. 1 person per room

Table 4(2)-21 List of Equipments used for Training Program

No.	1. COMMON ANALYTICAL INSTRUMENT TRAINING	Q'ty	
C-5-1	UV/Vis SPM Shimadsu UV-250	5	
C-8-1	AA SPM(Flame) HITACHI 180-30/AMA-180	5	
C-8-2	AA SPM (Graphite) PERKIN-ELMER/ SHIMADSU AA670G	1	
C-8-3	Hollow cathorde lamp HAMAMATSU-PHOTONICS	10	
C-9-1	ECD Gaschromato Graph SHIMADSU GC-12A ECD(No FID)	4	
C-9-2	FID/FPD Gaschromato Graph SHIMADSU GC-12A FPD+FID	2	
C-9-3	TCD/FID Gaschromato Graph SHIMADSU GC-12A TCD+FID	1	
C-9-4	FID/FID Gaschromato Graph SHIMADSU GC-12A FID/FID	1	
C-10-1	Capillary GC SHIMADSU GC-9APF/ECD	1	
C-11	HPLC SIMPLE LC6Ax5, SPD-6Ax5, FLD6Ax3, ECD6Ax2 7125X5	5	
C-14	Hg Analyzer HIRANUMA Mercury Analyzer HG-1	3	
C-17	TLC DEVELOPING "HANGING-PLATE" TANK	10	
C-20-1	pH Meter Hand Type (field use)	5	
C-20-2	pH Meter Loboratory Use HORIBA M-8s	5	
C-21	Ion Selective Electrodes F-, NH3, NO3-	3	
C-23	Microscope NIKON LABOPHOTO	5	
C-24-1	RECORDER EYELA TR250-1P 1mv-1V multi range, 1 pen 220V	10	
C-24-2	RECORDER EYELA TR250-2P 1mv-1V multi range, 2 pen 220V	5	

No.	2. GENERAL LABORATORY EQUIPMENT (1) <TRAINING>		
G-1-2	MICRO BALANCE Mettler M3 1microG-150mg /TOYO WTD-90 table	1	
G-2-1	Top-Pan Analytical Balance Mettler PE6000	2	
G-2-2	Top-Pan Analytical Balance Mettler PE3600	4	
G-2-3	Top-Pan Balance Mettler PE1600	4	
G-3-1	Weighting Scale (Platform) SHIBATA 100kg Automatic Spring	1	
G-3-2	SHIBATA 150Kg STANDARD SCALES	1	

No.	2. GENERAL LABORATORY EQUIPMENT (2) <TRAINING>		
G-4-1	Centrifuge >20000 rpm, 1000ml, Refgirator/KOKUSAN H-117-203	1	
G-4-2	Centrifuge >5000 rpm, 250ml*4,	3	
G-4-3	Centrifuge >8000 rpm, Table top 100ml*4-6/KOKUSAN H103NF	1	
G-4-4	Centrifuge >1500 rpm, 30mlx24 KOKUSAN H195C	1	
G-5	Muffle Furnace TOYO OPERUSER 3.0kW OFM-42D 50HZ/220V 1φ	1	
G-6	Electric Furnace TOYO ESF-3 3.2kW 50HZ/220V 1φ	1	
G-8-1	OVEN DRYING OVEN TOYO FS-62D 3111560 220V 1φ	2	
G-8-2	MEDIUM TEMP OVEN TOYO KCM-22 50HZ/220V 1φ	2	
G-8-3	HIGH TEMP OVEN TOYO FH-35 50HZ/220V 1φ	1	
G-9	Glass oven TOYO KCP-30 Pipettes and Labo Glassware Dryer	1	
G-10	Autoclave TOYO SVM-30H 220V 1φ	2	
G-12-1	Incubator TOYO FT-60T /EYELA SLI1000D 220V 1φ	1	
G-12-2	Incubator TOYO IS3000H /EYELA LTI1000D 220V 1φ	4	
G-14	Rotary Evaporator EYELA N-4 220V	10	
G-17-2	Shaker EYELA SS-81P 220V 1φ Cat.No 147303	2	
G-17-3	Shaker TAIYO R-D II 220V 1φ	2	
G-17-4	Shaker Tube Vibrator(Voltex type) 220V	4	
G-18	Mixer HITACHI Jucer/Mixer 220V Glass Pot type	4	
G-19	Homogenizer KINEMATIKA	2	
G-20-1	Heater:EYELA DRY BLOCK BATH MG-2 220V	5	
G-20-2	Heater:Gerhardt Bonn KI-25 4 in line Heater for kjeldahle	10	
G-20-3	Labconco Heater with water circulation system for NH3	5	
G-21	HOT PLATE HITACHI 220V 1.2KW TEFLON coarted	10	
G-22-1	Magnetic Stirrer EYELA RC-2 Cat.No 127602 200V	5	
G-22-2	Magnetic Stirrer TOYO HS-8 with Heater	5	
G-22-3	Magnetic Stirrer TOYO B-2	5	
G-23	THERMO REGULATOR EYELA T-80/TOYO LH500+LH20S	2	

No.	2. GENERAL LABORATORY EQUIPMENT (3) <TRAINING>	Q'ty	
G-24-1	Vacuum Pump HANDY DIAFRAM AIR PUMP	5	
G-24-2	Vacuum Pump ROTARY OIL PUMP	2	
G-25	Roller Pump EYELA Model RP-5, RP-10, RP-30, RP-60, RP-32 220	10	
G-26	Water Pump TOYO PM 2(3082880) 220V 50Hz 1φ	5	
G-27	Water Bath TOYO WB 26S, 21OS, 16S 220V 50Hz 1φ	7	
G-28	Ultrasonic Bath SHARP UC-6100 600W, UT-1203R+UI-1203R 1200W	2	
G-29	Pipette Washer SIBATA S4-6302	10	
G-30-1	Water Distillation Unit Solar cell distilled Water system	2	
G-30-2	TOYO GSU-910 Deionized Water 90L/h	2	
G-30-3	EYELA All glass Compact Water Still NST-15 220V 1.2L/h	1	
G-30-4	TOYO GS-50 3-41451 200v 1φ 5L/h	1	
G-32	Clean Bench VC-1600-F Down flow air	2	
G-33	Draft Chamber LFD-180 gas wash type	1	
G-34	Draft Chamber/HOOD DALTON DN-8P (TYLE type)	12	
G-35	Cold Storage TOYO NTS-30(walk in type)	1	
G-36	Refrigerater HITACHI 220L type 220V	10	
G-37	Freezer WOORPROOF "DEEP" EV-15HBXR 220V 1φ	5	
G-38	Ice Maker HOSHIZAKI 100kg/day F-120 300W 220V	2	
G-39	Glass Blower SHIBATA Btype (Liquid Propane)	2	
G-40	Bunsen Burner SHIBATA S-48403 LPG with Cock	40	
G-41	Stop watch 1/100sec digital Citizen, Seiko, Casio	5	
G-42-1	Laboratory Desk TOYO PFC-300	2	
G-42-2	TOYO PDF-420	2	
G-42-3	TOYO PFM-420	8	
G-42-4	TOYO PFO-420	4	
G-42-5	TOYO PFP-420	4	
G-43	Emergency Shower TOP PAN SHOWER+EYE WASHER	4	

No.	3. Water Pollution <TRAINING>		Q'ty	
W-1	TOC Analyzer	SHIMADSU TOC-500	1	
W-3-1	DO Meter	Field USE SHIBATA DO3	6	
W-3-2	DO Meter	LABO USE YSI Model 54	2	
W-6	Tintometer	Lovibond AF702	1	
W-7	Turbidity Meter	HACH Model 2100A	2	
W-8-1	Conductivity Meter	Portable OSK-6602/HANNA HI-8033	1	
W-8-2	Conductivity Meter	LABO SUNTEX SC17A/TOA(OSK 6603)	1	
W-9	Salinity Meter	TOA SAT-1	2	
W-10	Water Sampler	** SHIBATA 8053 1L	4	
W-11	Automatic Water Sampler	Central KAGAKU Model 600	1	
W-12	Grab Sampler	Eckman Burge Grab Sampler	4	
W-13	Core Sampler	NAUMAN Core Sampler Cat. No. 5166	2	
W-14	Plankton Net	NYLON	5	
W-15	Velocity Meter	Electric Current Meter CM-2 0.08m-3m/se	4	
W-16	Echo Sounder	FISHING SOUNNER **	1	
W-17	Jar Tester	ISUZU(SHIBATA SI-3702) JR12 200V 1φ	2	
W-20	Pipette washer with Ultrasonic bath		1	
W-21	Manipulator		1	
W-22	Microscope NIKON Labophoto 10x x5, x10, x20, x30, x50, x100		1	
W-23	UV LIGHT 254nm x1, 360nm x1, Room light type (20W)x5		7	
W-24	Pressure Pan 6L		3	
W-25	Gas Stove (Table Type) For LPG		3	
W-27	Dish Washer(for Glass ware washing)		2	

No.	4. Airr Pollution TRAINING	Q'ty	
A 1	SOx Monitor DKK IS 12024	1	
A-2	NOx Monitor DKK GUN 8B	1	
A-3	CO Monitor DKK GIA-72	1	
A-4	Ox Monitor DKK GLX-31	1	
A 5	HC Monitor DKK GHC-75M	1	
A-6	Dust Monitor Aloka β-RAY Methord	1	
A-7	Hi-Vol Air Sampler HVC-1000A 200V	2	
A-8	Low Vol Air Sampler SHINTAKU-	4	
A-9	Anderson Sampler SHIBATA AN 200	1	
A 10	DUST Jar SHIBATA Deposit Gauge Type 8008 01	1	
A-11	Wind Speed,Direction Meter OGASAWARA KEIKI	1	
A-12	Temperature,Humidity Meter OGASAWARA KEIKI	1	
A 13	Rainfall Meter OGASAWARA KEIKI	1	
A 11	Ultraviolet Meter OGASAWARA KEIKI	1	
A 15	NOx Monitor for Automobile ***	1	
A-16	CO Monitor for Automobile *** CREX 311	1	
A-17	HC monitor for Automobile ***	1	
A-18	Black Smoke Monitor *** ST100	1	
A 19	Orsat Analyzer SHIBATA	1	
A-20	Gas Impinger SHIBATA 8003 05	1	
A-23	Gas Phase Calibrator	1	
A-24	Stack Sampler	1	
A-25	GAS PUMP SHINAGAWA SEIKI	4	
A-26	GAS Meter	4	
A-27	Rotameter	2	
A-28	Mass Flow Meter	1	
A-31	Datalogger TEAC DR-F1	2	
A-32	Digital Multimeter IWATSU VOAC707A, VOAC767	1	

No.	5. Noise and Vibration <TRAINING>	Q'ty	
N-1	Sound Meter RION NL-01	7	
N-2	Extention Code EC-04B 10mx2, EC-04C 30mx2	4	
N-3	Lebel Recorder RION LR-04	7	
N-4	Tape Recorder SONY CASSETE DENSUKE TC D-5M/Metal Tape	7	
N-5-1	Precision Sound Meter NL-10A	1	
N-5-2	" NL-11	1	
N-6	Traffic counter Numberx3 , Numberx5	10	
N-7	All Weather Screen VIDEO CAMERA Stand + Wind Screen	5	
N-9	Tachometer Non Contact type Model 3632	2	
N-10	Data Processing Unit RION CF-01 set	2	
N-11	Vibration Meter VM-14B Vibration Pollution Meter	3	
N-15	Turnble Band Pass filter VM-61 + VP-28A + CP-02 +1F01A	1	
N-16	Accelerometer Calibrator	1	
N-17	Anemometer AM-10 0.05m/sec-25m	1	

No.	6. Solid waste <TRAINING>	Q'ty	
S-1-1	Weighting Scale Platform Spring Scale 100kg	1	
S-1-2	" Spring Scale 10kg	2	
S-1-3	" Top pan Electric Scale Mettler PE-12 11kg, 1g	1	
S-5	Calorie Meter YOSHIDA 1013	3	
S-6	Muffle Furnace TOYO OPM-60D	1	
S-8	KjeDahl Digestion Unit (Lab. Conco)	2	
S-9	Distillation unit with water circulation system	2	
S-10	Set of Solid Waste sampling/Mixing/Separating Tools set	1	

No.	7. Toxic substances <TRAINING>	Q'ty	
T-1	Rotary Evaporator EYELA N-4/SB-35/AS-2 220V set	4	
T-2-1	Shaker EYELA SS-81P 220V 1φ Cat.No 147303	1	
T-2-2	Shaker TAIYO SR- D 220V 1φ	3	
T-3	Fraction Collector TOYO SF-100 220V 1φ	1	
T-4	Block Heate EYELA DRY BLOCK BATH MG-2 220V	3	
T-5	Homogenizer SIBATA 51-4311 TP-18 Cutter set	1	
T-6	Blender HITACHI JUICER/MIXER Glass Cup type 200V	2	
T-7	Centrifuge KOKUSAN H-103NF	2	
T-10	Bottle Cabinet(TOXIC SAFE) NAGANO BCB-5	1	
T-11	All Glass solvent Rifine Set with Heating Mantle 5L	2	
T-12	Soxhlet Set(4 in line) with Heating Mantle	2	

No.	8. OTHERS <TRAINING>	Q'ty	
0-2-1	Computer IBM-AT compati, THAI/ENG , 1M RAM, 1.2M FDD, printer	15	
0-3	Audio Visual Unit	1	
0-4	VTR SET	2	
0-5	Conference Unit	1	
0-6	Class Room Unit	7	
0-7	OHP	5	
0 8	Slide Projector	5	
0-9	Film Projector 16mm	1	
0-13	Photo Copy MITA with SORTER	2	
0-14	Electric Typewriter THAI/ENG , Parallel interface	5	
0-15	Printing Machine +Binder Geshtetzner	1	
0-19	Grass Cutter YANMER YF-19-DX	1	
0-20	Plowing Machine KUBOTA	1	
0 21	Floor Cleaner JV-25H	2	
0-22	Washing Machine	6	

Necessary Chemicals and Glasswares

Apart from the equipments mentioned above, there are still some necessary chemical reagents,glasswares for the training and research program as shown in Table 4(2)-22 and 4(2)-23

Table 4(2)-22

No.	Name(A)	No.	Name(A)
1.	Ammonium Alum	2.	Aluminium potassium sulfate
3.	Aluminium nitrate	4.	Alumina
5.	Aluminium peroxidesulfate	6.	Ammonium ferrous sulfate
7.	Ammonium Tetramethylene dithiocarbamate	8.	Ammonium sulfate
9.	Ammonium oxalate	10.	di-Ammonium hydrogen citrate
11.	Ammonium chloride	12.	Ammonium heptamolybdate
13.	4- Amino-antipyrin	14.	1-Amino-2-Naphthol-4-sulfonic acid
15.	Tris (hydroxymethyl) aminomethane	16.	Amylose from potato starch
17.	L(-)Ascorbic acid	18.	L(+)Ascorbic acid
19.	ammonium acetate	20.	4-amino-3-hydrazino-5-mercapto-1,2,4-triazol

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No.	Name(A,B)	No.	Name(A,B)
21.	Amberlite	22.	Acetone
23.	Acetonitrile	24.	Ammonia solution
25.	Acetic acid	26.	Acetyl acetone
27.	Ammonium amidosulfonate	28	di-Ammonium hydrogen orthophosphate
29.	Ammonium metavanadate	30.	Ammonium persulfate
31.	Ammonium potassium tartrate	32.	Arsenic trioxide
33.	Bacto-peptone	34.	Bacto oxgall
35.	Barium chloride	36.	Barbituric acid
37.	Boric acid	38.	Bromphenol blue
39.	Brilliant green	40.	Bromthymol blue
41.	Bromcresol purple	42.	Brilliant yellow
43.	Brucine sulfate	44.	Brucine dihydate
45.	Brilliant green bile lactose broth for micro	46.	n-Butyl alcohol
47.	Iso-Butyl alcohol	48.	Benzene
49.	Boric acid	50.	Barium chloride

No.	Name(B,C)	No.	Name(B,C)
51.	Brucine sulfate	52.	Barbituric acid
53.	Bromocresol purple	54.	Bromocresol green
55.	Bromphenol blue	56.	Benzol
57.	Buffer solution 4,7,10	58.	n-Butyl alcohol
59.	Cacodylic acid	60.	Calcium chloride 2 hydrate
61.	Calcium chloride dehydrated	62.	Calcium carbonate anhydrous
63.	Calcium carbonate	64.	Calcium nitrate
65.	Cadmium sulfate	66.	Cadmium, Mossy
67.	Cadmium, Coated with copper in water	68.	Calcium sulfate 2 hydrate
69.	Charcoal activated	70.	Calcium nitrate tetrahydate
71.	Congo red	72.	Cuprous chloride
73.	Cupric chloride anhydrous	74.	Cupric oxide
75.	1,2 Cyclohexanediamine-N,N,N',N',-tetraacetic acid	76.	L-Cysteine monohydrochloride
77.	4-Chloro-o-phenylenediamine	78.	β - chlorousphtalene

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No.	Name(C,D)	No.	Name(C,D)
79.	Camphor	80.	Cupferron
81.	Cobalt sulfate	82.	Cobalt sulfate 7 hydrate
83.	Citric acid	84.	Carbon tatrachloride
85.	p-Cresol	86.	Carbon disulfide
87.	Chloroform	88.	Calcium carbonate
89.	Cadmium carbonate	90.	Calcium hydroxide
91.	Charcoal	92.	Calcium chloride
93.	∝-Chloro-p-nitrotoluene	94.	Cedar wood oil
95.	p-Dimethylamino benzylidenerhodanine	96.	NN-Dimethyl-p-phenylene diamine dihydrochloride
97.	1,5 Diphenylcarbazone RG	98.	1,5 Diphenylcarbazide
99.	5-(4-Dimethylamino benzylidenerhodamine	100.	4-Dimethylamino benzaldehyde
101.	Dimethylglyoxime(2,3 Butenediondioxime)	102.	2,9-Dimethyl-1,10-phenanthrolene
103.	Dithizone	104.	5-Diphenylcarbazone
105.	2,6 Dibromoquinone -4-chloroimide	106.	Dextrin

No.	Name (D,E,F,G,H)	No.	Name (D,E,F,G,H)
107.	Desoxychlolate Lactose Agar (dehydated)	108.	Diatomacious silica
109.	2,3-Diaminonaphthalene	110.	3,3'-Diaminobenzidine
111.	3,3'-Diaminobenzidine, tetrahydrochloride	112.	N,N dimethyl p- phenylene diamine oxalate
113.	Dichloromethane	114.	Diethyl ether
115.	1,2 Dichloroethane	116.	Dichloromethane
117.	1,5 Diphenylcarbazide	118.	Diphenylcarbazone
119.	N,N-Dimethyl formamide	120.	m-Endo broth (dehydrated)
121.	Eriochrome black T	122.	Ethylene diamine tetraacetic acid
123.	Ethylene tetraacetic acid	124.	Ethylene glycol
125.	Ethyl ether	126.	Ethanol absolute GR
127.	Ferric chloride 6 hydrate	128.	Ferrous sulfate 7 hydrate
129.	Florisil	130.	Fluorescein sodium powder
131.	Formaldehyde	132.	D(+) Glucose
133.	D,L Glutamic acid	134.	Glutathione,reduced form
135	Glycerol	136.	Heavy Oil

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No.	Name (H,I,K,L,M)	No.	Name (H,I,K,L,M)
137	Humic acid	138.	Hydrazine sulfate
139	Hydroquinone	140.	Hydroxylammomium chloride
141.	Hydroxylammomium sulfate	142.	Hexamine
143.	Hydrazine hydrate	144.	Hexamethylene tetramine
145.	n-Hexane	146.	Hydrogen peroxide
148.	Hydrochloric acid	149.	Hypophosphorous acid
150.	Ion-exchange resin	151.	Iso-octane
152	Kancort-A-Intra-articular intradermol	153.	Lactose broth for micro
154.	Lactose (monohydrate)	155.	Lauryl sulfate broth
156.	Lead(II) acetate trihydate	157.	Lanthanium oxide
158.	Ligninesulfonic acid sodium salt	159.	Lead nitrate
160.	Lithiumsulfate monohydrate	161.	Magnesium 7 hydrate
162.	Magnesium sulfate 1 hydrate	163.	Magnesium sulfate 4 hydrate
164.	Mercuric oxide red	165.	Mercury(II) chloride
166.	Mercury(II) iodide red	167.	Mercury sulfate

No.	Name (M,N,O,P)	No.	Name (M,N,O,P)
168.	Methyl orange indicator	169.	Methylene blue
170.	Mercuric(II) nitrate, 1-hydrated	171.	Mercury(II) nitrate, 1/2 hydrated
172.	3-Methyl-1-phenyl-2-pyrazol-ine-5-one	173.	Meroxide Standard Fluka
174.	4-Methyl-2-pentanon	175.	Methanol
176.	Manganese dioxide	177.	Manganese sulfate 4 hydrate
178.	Manganese sulfate 1 hydrate	179.	Manganese sulfate 7 hydrate
180.	Magnesium oxide	181.	Mercuric sulfate
182.	Magnesium chloride	183.	Molybdatophosphoric acid
184.	N,Naphthylethylene-diamine dihydrochloride	185.	Nikel nitrate
186.	Nitric acid	187.	Nickel(II) chloride
188.	Oxalic acid dihydrate	189.	iso-octane
190.	Pararosalin	191.	1,10 Phenanthroline monohydrate
192.	Phenol red-D-indicator	193.	Phenolphthalein indicator
194.	Phenyl hydrazine hydrochloride	195.	Potassium antimony(III) oxide tartrate

No.	Name(P)	No.	Name(P)
196.	Potassium bromide	197.	Potassium chloride
198.	Potassium dichromate	199.	Potassium fericyanide
200.	di-Potassium hydrogen phosphate	201.	Potassium antimony oxide
202.	Potassium dihydrogen phosphate	203.	Potassium hydrogen di-iodate
204.	Phenyl hydrazine p-sulfonic acid	205.	Phenylhydrazine-4-sulfonic hemihydrate
206.	bis-Pyrazolone	208.	Pumice stone
209.	Potassium sulfate	210.	Potassium (meta) periodate
211.	o-Phosphoric acid	212.	Petroleum ether
213.	Pyrrolidine	214.	Pyridine
215.	Potassium per sulfate	216.	Potassium per manganate
217.	Potassium iodate	218.	Potassium peroxodisulfate
219.	Potassium nitrate	220.	Potassium hydroxide
221.	Potassium hydrogen phthalate	222.	Potassium cyanide
223.	Potassium chromate	224.	bis(1-phenyl-1-3 methyl-5-pyrazone)

No.	Name (P,R,S)	No.	Name (P,R,S)
225.	1,10 Phenanthroline	226.	Phenol
227.	Rosso metile	228.	Rhodamin B
229.	Rhodamin 6 G	230.	Rosolic acid
231.	Silica gel with moisture indicator	232.	Silica gel for PCBs
233.	Silver nitrate	234.	Silver sulfate
235.	Silver diethyldithyocarbamate	236.	Sodium sulfate anhydrous granulated
237.	Sodium acetate 3 hydrate	238.	Sodium azide
239.	Sodium benzoate	240.	Sodium cobaltinitrate
241.	Sodium dihydrogen phosphate 1 hydrate	242.	Sodium dihydrogen phosphate 2 hydrate
243.	Sodium dihydrogen phosphate 7 hydrate	244.	di-Sodium hydrogen phosphate 2 hydrate
245.	di-Sodium hydrogen phosphate anhydrous	246.	Sodium N,N'-Diethyl-dithiocarbamate trihydrate
247.	Sodium,p-toluenesulfonchloroanide trihydrate	248.	Sodium nitroprusside
249.	Sodium iodide	250.	Sodium metabisulfite

No.	Name(S)	No.	Name(S)
251.	Sodium nitrite	252.	Sodium borohydride
253.	Sodium sulfate anhydrous	254.	Sodium thiosulfate
255.	di-Sodium tetraborate	256.	Solochrom dark blue
257.	Starch soluble	258.	Sodium hydrogen sulfate 1 hydrate
258.	Sodium hydrogen carbamate	259.	Sodium carbamate anhydrous
260.	Sodium diethyldithiocarbamate trihydate	261.	Sodium fluoride
262.	Sodium peroxide	263.	Sodium laurylsulfate
264.	Stannous chloride	265.	Stannous sulfate
266.	Sulphamic acid	267.	Sulphanilamide
268.	Sodium hydroxide	269.	Sodium oxalate
270.	Sodium metasilicate	271.	Sodium arsenate hydrated
272.	Sodium boron hydrate	273.	Sodium dioctyl sulfosuccinate
274.	Sulfuric acid	275.	Silver sulfate
276.	Sulphanilic acid	277.	sulphamic acid
278.	Strontium chloride	279.	Starch soluble
280.	Sodium acetate	281.	Sodium tungstate

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No.	Name (S,T,U,X,Y,Z)	No.	Name (S,T,U,X,Y,Z)
282.	di-Sodium tetraborate 10 hydrate	283.	Sodium D(+) tartrate
284.	Sodium nitrite	285.	Sodium molybdate dihydrate
286.	Sodium metabisulfite	287.	Salicylic acid
288.	tri-Sodium citrate	289.	Thymol blue
290.	Toluene	291.	o-Toluidine
292.	Trioctyl methyl ammonium chloride	293.	Thomas lubriseal
294.	Tannic acid powder pure	295.	Tannic acid
296.	Thionalide	298.	Tetrahydrofuran
299.	1,1,2 Trichlorotrifluoroethane	300.	Uranyl acetate
301.	Uranine	302.	Xylene cyanol FF
303.	Yeast	304.	Zinc acetate
305.	Zinc metal	306.	Zinc sulfate

Table 4(2)-23 Glassware

No	NAME OF GLASSWARE	FOR TRAINING USE							FOR RESEARCH USE							GRAND TOTAL
		C	W	A	N	S	T	ST	C	W	A	N	S	T	ST	
1.	Erlenmeyer															
	1,000ml		5				5	10		5				5	10	20
	500ml		20	10		10	20	60		20	10		10	20	60	120
	250ml		20	10		10	20	60		20	10		10	20	60	120
	100ml		10	5		5	10	30		10	5		5	10	30	60
	50ml		10	5		5	10	30		10	5		5	10	30	60
	10ml		5	5		5	5	20		5	5		5	5	20	40
2.	Round bottom flask															
	1,000ml		5	5		5	5	20		5	5		5	5	20	40
	500ml		5	5		5	5	20		5	5		5	5	20	40
	250ml		5	5		5	5	20		5	5		5	5	20	40
	100ml		5	5		5	5	20		5	5		5	5	20	40
	50ml		5	5		5	5	20		5	5		5	5	20	40
	10ml		5	5		5	5	20		5	5		5	5	20	40
3.	Kjedahl flask															
	1,000ml		10	5		5	10	30		10	5		5	10	30	60
	800ml		30	15		15	30	90		30	15		15	30	90	180
	500ml		10	5		5	10	30		10	5		5	10	30	60

Table 4(2)-2 Glasswares (continued)

No	NAME OF GLASSWARE	FOR TRAINING USE							FOR RESEARCH USE							GRAND TOTAL
		C	W	A	N	S	T	ST	C	W	A	N	S	T	ST	
	4. Volumetric flask															
	1,000ml		5	5		5	5	20		5	5		5	5	20	40
	500ml		10	5		5	5	25		10	5		5	5	25	50
	100ml		30	15		15	20	80		30	15		15	20	80	160
	50ml		30	15		15	20	80		30	15		15	20	80	160
	25ml		10	5		5	5	25		10	5		5	5	25	50
	10ml		30	15		15	20	80		30	15		15	20	80	160
	5. Beaker															
	1,000ml		10	5		5	10	30		10	5		5	10	30	60
	500ml		10	5		5	10	30		10	5		5	10	30	60
	250ml		10	5		5	10	30		10	5		5	10	30	60
	100ml		50	15		15	30	110		50	15		15	30	110	220
	50ml		10	5		5	10	30		10	5		5	10	30	60
	10ml		10	5		5	10	30		10	5		5	10	30	60
	6. Conical beaker															
	1,000ml		5	5		5	5	20		5	5		5	5	20	40
	500ml		10	5		5	10	30		10	5		5	10	30	60
	100ml		10	5		5	10	30		10	5		5	10	30	60
	50ml		10	5		5	10	30		10	5		5	10	30	60

4(2)-A3

Table : Glassware (continued)

No NAME OF GLASSWARE	FOR TRAINING USE							FOR RESEARCH USE							GRAND TOTAL
	C	W	A	N	S	T	ST	C	W	A	N	S	T	ST	
7. Tall beaker															
1,000ml		10	5		5	5	25		10	5		5	5	25	50
500ml		10	5		5	5	25		10	5		5	5	25	50
100ml		10	5		5	5	25		10	5		5	5	25	50
8. Nessler tube		20	10		10	20	60		20	10		10	20	60	120
9. Volumetric pipette															
100ml		10	5		5	10	30		10	5		5	10	30	60
50ml		10	5		5	10	30		10	5		5	10	30	60
25ml		20	10		10	20	60		20	10		10	20	60	120
10ml		30	15		15	30	90		30	15		15	30	90	180
5ml		20	10		10	20	60		20	10		10	20	60	120
4ml		20	10		10	20	60		20	10		10	20	60	120
3ml		20	10		10	20	60		20	10		10	20	60	120
2ml		20	10		10	20	60		20	10		10	20	60	120
1ml		20	10		10	20	60		20	10		10	20	60	120
0.5ml		10	5		5	10	30		10	5		5	10	30	60
0.3ml		10	5		5	10	30		10	5		5	10	30	60
0.1ml		10	5		5	10	30		10	5		5	10	30	60

Table 4(2)-23 : Glasswares (continued)

No	NAME OF GLASSWARE	FOR TRAINING USE							FOR RESEARCH USE							GRAND TOTAL
		C	W	A	N	S	T	ST	C	W	A	N	S	T	ST	
10.	Measuring pipette															
	10ml		30	15		15	30	90		30	15		15	30	90	180
	5ml		50	10		10	20	90		50	10		10	20	90	180
	1ml		50	10		10	20	90		50	10		10	20	90	180
11.	Autometric burette															
	50ml		5	5		5	5	20		5	5		5	5	20	40
	25ml		5	5		5	5	20		5	5		5	5	20	40
	10ml		5	5		5	5	20		5	5		5	5	20	40
12.	Test tube															
	50ml		10	5		5	10	30		10	5		5	10	30	60
	25ml		50	5		5	10	70		50	5		5	10	70	140
	15ml		50	15		15	30	110		50	15		15	30	110	220
	10ml		20	10		10	20	60		20	10		10	20	60	120
	5ml		10	5		5	10	30		10	5		5	10	30	60
13.	Separating funnel															
	2,000ml		5	5		5	5	20		5	5		5	5	20	40
	1,000ml		10	5		5	10	30		10	5		5	10	30	60
	500ml		20	10		10	20	60		20	10		10	20	60	120
	250ml		20	10		10	20	60		20	10		10	20	60	120
	100ml		10	5		5	10	30		10	5		5	10	30	60

Table 4(f)-23 : Glassware (continued)

No	NAME OF GLASSWARE	FOR TRAINING USE							FOR RESEARCH USE							GRAND TOTAL
		C	W	A	N	S	T	ST	C	W	A	N	S	T	ST	
	50ml		10	5		5	10	30		10	5		5	10	30	60
14.	Measuring cylinder															
	2,000ml		10	5		5	10	30		10	5		5	10	30	60
	1,000ml		20	10		10	20	60		20	10		10	20	60	120
	500ml		10	5		5	10	30		10	5		5	10	30	60
	100ml		10	5		5	10	30		10	5		5	10	30	60
15.	Impinger															
	200ml		5	20		5	5	35		5	20		5	5	35	70
	100ml		5	30		5	5	45		5	30		5	5	45	90
	50ml		5	20		5	5	35		5	20		5	5	35	70
16.	U shape tube		10	20		10	10	50		10	20		10	10	50	100
17.	Dessicator		5	5		3	3	16		5	5		3	3	16	32
18.	KD condenser		2	1		1	2	6		2	1		1	2	6	12
19.	Buchner funnel		15	3		5	5	28		10	3		5	5	23	51
20.	Glass filter		5	3		3	3	14		5	3		3	3	14	28
21.	Vacuum bottle			20				20			20				20	40
22.	Funnel		20	10		10	20	60		20	10		10	20	60	120
23.	Cylinder		10	5		5	10	30		10	5		5	10	30	60
24.	Weighing bottle		10	5		5	10	30		10	5		5	10	30	60
25.	Mortar		5	3		3	3	14		5	3		3	3	14	28

Table 4(ク)-43: Glasswares (continued)

No	NAME OF GLASSWARE	FOR TRAINING USE							FOR RESEARCH USE							GRAND TOTAL
		C	W	A	N	S	T	ST	C	W	A	N	S	T	ST	
26.	Crucible		10	5		5	10	30		10	5		5	10	30	60
27.	Watch glass		10	5		5	10	30		10	5		5	10	30	60
28.	Petri dish		10	5		5	10	30		10	5		5	10	30	60
29.	Gas burner		10	5		5	5	25		10	5		5	5	25	50
30.	Pipette washer		2	1		1	1	5		2	1		1	1	5	10
31.	Crucible		5	3		5	5	18		5	3		5	5	18	36

(Note) Symbols in Table means as follows; C:common use, W:water pollution, A:air pollution, N:noise pollution, S:solid waste, T:toxic substance, ST:sub-total

(3) Implementation of training courses

a. Methods to recruit and screen applicants

The applicants will be screened by the ERTC and the host office. The priority of the selected applicants should be from their related responsibilities to the present job. Training is supported to fulfill their deficiencies as efficiently and effectively as possible.

b. Development of educational materials

The educational materials such as textbooks will be carried out by the trainers under the guidance of JICA experts.

c. Trainer's training

According to the counterpart training system based on the project. Type Technical Cooperation programme, the training and research staffs of ERTC should be further trained in Japan in order to upgrade the curriculum and improve new techniques. It is expected that they will undertake intensive training courses in Japan and take study tours with emphasis on specialized fields of environmental science and administration. such intensive courses and/or educational tours should take approximately 3-6 months. It is anticipated that these fellows will help improve the research and training activities in ERTC upon their return to Thailand. Table shows the necessary fields and number of fellowship.

4(3)-1

Table : Counterpart Training in Japan

No.	FIELD	NUMBER OF TRAINEE	TERM (man-month)	TOTAL (m)
1	Water Pollution	3	6	18
2	Air Pollution	3	6	18
3	Noise and Vibration	2	6	12
4	Solid Waste	2	6	12
5	Toxic Substance	3	6	18
6	Audio Visual	2	3	6
7	Instrument	2	3	6
	TOTAL	17	36	90

d. Recruitment of Trainers from ONEB, other Thailand Institutions and Foreign Institutions

To realize the technological transfer for the environmental pollution control and management to Thailand, a term of Japanese experts should be dispatched to ERTC based on the Project-Type Technical Cooperation Programme. Seven long-term experts and twelve short-term experts are very necessary to assist staff members of ERTC to carry out the Training and research programme. The detail of Japanese experts is shown in Table 4(3)-2 and Table 4(3)-3. The role of Japanese experts are as follows:

(i) to train staffs in charge of training to be self-motivated trainers,

(ii) to develop training materials such as textbooks in cooperation of staff members of ERTC,

(iii) to run the training courses together with staff members of ERTC,

(iv) to gulde and advise the research staffs,

(v) to transfer the administrative and technological experiences of Japan in the field of environmental protection through the activities mentioned above.

Inviting qualified trainers or lectures from international institutes are also very necessary for the ERTC trainers.

e. Estimated cost of each training courses

The cost of each training courses will be relied on number of inviting lecturers, the chemicals used and time consumed of each course. For the training courses related to the experimental analysis, the cost of each courses are shown in Table 4(3)-4

f. Budgetary sources of each training course

Budgetary sources of each training course will mainly come from ERTC and the other budget will come from the trainee's office.

(4) Expected Counterpart Training in Japan

a. Fields

The counterpart training in Japan is divided into 7 categories as mentioned in Table 4(3)-1.

Table : 4(3)-2 Short-Term JICA Experts

NO.	FIELD	NUMBER OF EXPERT	TERM (man-month)	REMARKS
1	Water Pollution Management and Administration	1	3-6	-To teach and advise the knowhow of water pollution control management and administration.
2	Air Pollution Management and Administration	1	3-6	-To teach and advise the knowhow of air pollution control management and administration.
3	Noise Pollution and Administration	1	3-6	-To teach and advise the knowhow of noise pollution control management and administration.
4	Solid Waste Management and Administration	1	3-6	-To teach and advise the knowhow of solid waste management and administration.
5	Toxic Substance Management and Administration	1	3-6	-To teach and advise the knowhow of toxic substance pollution control management and administration.
6	Impact Assessment	1	6-9	-To teach the knowhow of compiling and evaluation of IEE and EIS.
7	Meteorology	1	3-6	-To teach the air pollution meteorology.
8	Data Handling	1	3-6	-To teach the knowhow to handle the environment data
9	Computer Analysis	1	3-6	-To teach the knowhow of environmental data analysis by personal computer.

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Table : 4(3)-2 Short-Term JICA Experts(continued)

NO.	FIELD	NUMBER OF EXPERT	TERM (man-month)	REMARKS
10	Mathematical Modeling	1	3-6	-To teach the knowhow of mathematical modeling for water and air quality prediction.
11	Health Effect	1	3-6	-To advise the health effect research by environmental pollution.
12	Ecological Effect	1	3-6	-To advise the ecological effect research by environmental pollution.
	TOTAL	12	39-75	

Table : 4(3)-3 Long-Term JICA Experts

NO.	FIELD	NUMBER OF EXPERT	TERM (man-month)	REMARKS
1	Project Leader	1	60	-To supervise the whole project as a leader of JICA experts team. -To have wide knowledge and long-term experience in environmental protection, especially in environmental management.
2	Project Coordinator	1	60	-To do administrative work for the project such as negotiation correspondence and coordination. -To have some experience in environmental issues.
3	Water Pollution	1	60	-To train, teach and advise staff in the field of water pollution control technology. -To be preferable an expert on water pollution analysis and surveillance be in the first half and that on waste water treatment in the last half.
4	Air Pollution	1	60	-To train, teach and advise staff in the field of air pollution control technology. -To be preferable an expert on air pollution analysis and surveillance be in the first half and that on exhausted gas treatment technology in the last half.
5	Noise Pollution	1	60	-To train, teach and advise staff in the field of noise pollution control technology. -To be an expert on noise pollution monitoring and surveillance.

Table : 4(3)-3 Long-Term JICA Experts(continued)

NO.	FIELD	NUMBER OF EXPERT	TERM (man-month)	REMARKS
6	Solid Waste	1	60	-To train, teach and advise staff in the field of solid waste management. -To be preferable an expert on solid waste analysis be in the first half and that on solid waste management technique in the last half.
7	Toxic Substance	1	60	-To train, teach and advise staff in the field of toxic substance pollution control technology. -To be an expert on toxic substance pollution analysis and surveillance.
	TOTAL	7	420	

b. Number

The number of counterpart training should be at least 15 trainees within total 102 man-month.

c. Duration

Duration ranges from 3 to 6 months depend on the details of each course.

d. Priority

The training of counterpart in each field should be done in parallel for all fields as shown in Table 4(3)-1

e. Estimated Cost of each Training Course

The estimated cost of each training course is depend on the duration and the type of course. For the courses which are related to laboratory works will range from 90,000 to 160,000 baht, the cost of ordinary lecture course will range from 28,000 to 90,000 baht and the total cost of the whole training program of each year will be 1,532,000 baht.

4(3)-4

Table Estimated cost of each training course

Training Cost	No. of trainees	Duration	Time/year	Estimated Cost
1. Water Pollution I	40	8 weeks	4	160,000
2. Water Pollution II	20	8 weeks	2	40,000
3. Water Pollution III	45	4 weeks	3	135,000
4. Air Pollution I	40	8 weeks	4	176,000
5. Air Pollution II	40	8 weeks	4	176,000
6. Air Pollution III	45	4 weeks	3	148,500
7. Noise Pollution	20	4 weeks	2	28,000
8. Solid Waste I	20	4 weeks	2	28,000
9. Solid Waste II	45	6 weeks	3	94,500
10. Toxic Substance I	30	8 weeks	3	108,000
11. Toxic Substance II	30	8 weeks	3	108,000
12. Environmental Administration I	60	4 weeks	3	90,000

Training Cost	No. of trainees	Duration	Time/year	Estimated Cost
13. Environmental Administration II	60	2 weeks	3	90,000
14. Environmental Impact Assessment	30	4 weeks	2	30,000
15. Environmental Data Processing	30	2 weeks	2	30,000
16. Environmental Education	60	1 weeks	3	90,000
			Total	1,532,000

(4) Expected Counterpart Training of trainer in Japan

a. Fields b. Number and c. Duration

The expected counterpart Training of Trainer in Japan is divided into 7 fields such as Organization, Administration and Operation of ERTC, Environmental Administration and Management, Water Pollution, Air Pollution, Solid Waste, Toxic substance and Computer. Number of trainee of each course ranges from 2 to 5 and average man-month ranges from 3 to 6 months. Total man-month is 102 as shown in Table 4(4)-1 :

Table 4(4)-1 Expected Counterpart Training of Trainer in Japan

No.	Field	No. of Trainees	Term (m/m)	Total (m)
1.	Organization, Administration and Operation of ERTC	5	3	15
2.	Environmental Administration and Management	5	3	15
3.	Water Pollution	2	6	12
4.	Air Pollution	2	6	12
5.	Solid Waste	2	6	12
6.	Toxic Substance	2	6	12
7.	Computer	2	6	12
	Total	15	36	102

d. Priority

The training of trainer program in Japan should be done in parallel for all fields.

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SESSION 5 : EXPECTED RESEARCH PROGRAMS OF THE ERTC PROJECT

5. Expected Research Programs of the ERTC Project

(1) Justification of Environmental Research

a. Demand from ONEB and other Related Agencies

One of the major ONEB objectives under the Environmental Act (1975) is to study and analyse the environmental conditions and quality to be used for planning and determining the standard of the national environmental quality as well as to recommend the methods to be used for checking environmental quality of water, air, solid waste and toxic substance. Although ONEB has already put up the environmental quality standard, there has yet not all fired reference of Analytical standard Method for each parameters. In other words different laboratories in governmental and non-governmental agencies in Thailand follow their own method of analysis, hence, data collected from these laboratories are difficult to compare. It is therefore, imperative for ONEB to develop such National Standard Method of Analysis.

Research activities in environmental field are minimal in Thailand. There is need for research on health aspects, specific to the conditions of the region. Although much researches have been done in the west, the data and information gathered are not necessarily applicable in this part of the world. Hence, indigenous researches need to be carried out. For example, research on standard analytical methods of environmental samples with focus on economical and practical methods.

At the same time, the quality assurance of analysis should be promoted by developing the standard samples and distributing them to the other laboratories concerned.

While most countries have established their monitoring program , the management of the data has not been extensively developed. It may take years before the data are properly collated, analysed and presented to decision maker or to the public. Considering the time log between implementation of corrective measures and the lowering of pollutant concentrations in the environment, timely presentation of the data to decision maker is important. The ONEB, Thailand, currently in the process

of developing such programs and computer capabilities. However, its application and utility could be enhanced if the other offices will work hard hand in hand. Besides this, ONEB is expected to be a leading environmental research center in Thailand, which can help support the environmental policies and measures by means of providing necessary and reliable data and information.

b. Field of Research

The research should divided into 5 programs such as water, air, noise, solid waste and toxic substance.

c. Five Years Research Program

I Research on Water Pollution

(1) Table 5(1)-1 shows the outline of the research programs for water pollution. As the monitoring of water pollution has been carried out for a longer time compared with other environmental fields, the knowledge and experiences are accumulated to some degree. However, even in this field, the standard analytical methods for the environmental quality standards are still not available, which sometimes makes it impossible to compare data among the laboratories concerned. Therefore in Phase One, the emphasis should be put on the development or improvement of Thai standard analytical methods for water and waste water, which should match the climatic condition, the availability of analytical instruments and reagents, etc. Phase Two is supposed to start the substantial surveillance of water pollution in degrading water areas in order to help formulate appropriate policies and measures for water pollution control, identifying the pollution sources and their loads, the mechanism of pollution, and the health and ecological effects of pollution. The water pollution control technologies should be studies in Phase Three. In particular, paying much attention to the natural, social and economic conditions in Thailand, for example high temperature all the year round and fairly cheaper land price, the best economically practical waste water treatment technologies are expected to be developed such as oxidation ponds, aerated lagoons or oxidation ditches even if they have less treatment efficiency compared with those available in advanced countries.

II Research on Air Pollution

(2) Table 5(1)-2 shows the outline of the research programs for air pollution. As the research on air pollution has never been conducted in the existing research institutes including universities, the research activity in ERTC substantially means the first step in this field. The foundation for research works should be laid in Phase One, focusing on the development or improvement of Thai standard analytical methods (including simplified methods) for ambient air and industrial and automobile exhausted gas as well as the development of maintenance methods of automatic air quality monitoring instruments. In Phase Two, the substantial surveillance of air pollution in urban and industrial areas should be fulfilled to help formulate appropriate policies and measures for air pollution control, identifying the pollution sources and their loads, the mechanism of pollution, and health and ecological effects of pollution. In addition, the effects of air pollution on Thai plants and vegetables will be studies in the research farm of ERTC. The emphasis will be, in Phase Three, placed on the study and development of the best practical and feasible technologies to reduce the emission of air pollutants. As for the exhausted gas treatment technologies, it seldom be available the intermediate technology which means the technology with a little lower efficiency and far cheaper cost. Therefore, the soft-technologies such as the industrial location and urban planning should also be studied to pursue the appropriate answer to combat air pollution.

III Research on Noise Pollution

(3) Table 5(1)-3 shows the outline of the research programs for noise pollution. As the research on noise pollution has rarely been done until now, the emphasis should be, in Phase One, put on the development or improvement of standard measuring methods for noise to lay foundation for research works. The substantial surveillance in urban areas will be started in Phase Two to help formulate appropriate policies and measures for noise pollution control, identifying the sources, characteristics and effects of noise pollution. In Phase Three, the best practical technologies to reduce noise pollution are expected to be researched and developed including the comparison study of city planning in terms of noise reduction.

IV Research on Solid Wastes

(4) Table 5(1)-4 shows the outline of research programs for solid wastes. Phase One focuses on the development or improvement of standard classification or analytical methods for domestic and industrial solid wastes in order to help provide the reliable data for the formation of solid waste management plans. In Phase Two, the study on per capita loads and characteristics of domestic solid wastes in municipalities should be carried out to help municipalities formulate appropriate domestic solid waste management plans. Also the quality and quantity of industrial solid wastes will be surveyed to help promote industrial solid waste control. In Phase Three, the best practical treatment and disposal technologies for domestic solid wastes will be researched and developed. The emphasis is supposed to be placed on the alternative way of predominant open dumping methods. In addition, the industrial toxic solid wastes should be intensively studied to find out the appropriate technologies for separation, non-toxicization and final disposal of them.

V Research on Toxic Substances

(5) Table 5(1)-5 shows the outline of the research programs for toxic substances. Laying foundation in Phase One, the focus should be placed on the development or improvement of standard analytical methods for agricultural products, soil, fish, food, environmental samples etc. to ensure the reliability of data. In addition, promoting the quality assurance of environmental analysis, different kinds of standard environmental samples should be developed and distributed to not only relevant sections of ERTC but also environmental-related laboratories in Thailand in order to check and improve the analytical ability of environmental samples. In Phase Two, the substantial surveillance of toxic substances pollution should be promoted to help formulate appropriate policies and measures for toxic substances pollution control, identifying the quality, quantity, type of use, environmental levels and fate of toxic substances used in Thailand as well as the health and ecological effects of toxic substances. It is expected in Phase Three that best practical technologies for toxic substances pollution control should be studies including the preparation of manuals or handbooks to promote a proper used of toxic substances.

5 (1)-1

Table . : Research Program (Water Pollution)

PHASE	RESEARCH TARGET	RESEARCH THEME
I	-to develop human resources of researchers -to develop analytical methods for water pollutants to get reliable data -to help promote the use of water quality monitoring data in water pollution control	-development or improvement of standard analytical method for water and waste water -development of the system to analyze and evaluate water quality monitoring data -water quality monitoring in major water area
II	-to promote the surveillance of water pollution in each water area and clarify the cause and effect of the pollution -to help form an appropriate policy and measure for water pollution control	-study on water pollution loads (industrial, domestic and agricultural) -study on the cause of water pollution -study on the health and ecological effect of water pollut -water quality monitoring in major water areas
III	-to develop an appropriate waste water treatment technology for Thailand and help promote the reduction of waste discharge -to develop a water quality simulation model suitable in Thailand so as to upgrade the reliability of water pollution impact assessment	-development of appropriate waste water treatment technology (septic tank, oxidation pond etc.) -study and improvement on the existing waste water treatment facility (pollutants removed, removal rate, cost, trouble, etc.) -development of simulation model for water quality prediction (self purification rate, dispersion factor, dispersion equation, etc.) -water quality monitoring in major water areas

B(1)-2

Table : Research Program (Air Pollution)

PHASE	RESEARCH TARGET	RESEARCH THEME
I	-to develop human resources of researchers -to develop analytical and monitoring methods to get reliable data -to help promote the use of air quality monitoring data in air pollution control	-development or improvement of standard analytical method for ambient air, industrial emission gas and automobile exhausted gas -development of maintenance method of automatic air quality monitoring instrument -development of the system to analyze and evaluate air quality monitoring data -air quality monitoring in major areas
II	-to promote the surveillance of air pollution in each air basin and clarify the cause and effect of the pollution -to help form an appropriate policy and measure for air pollution control	-study on air pollution loads (industrial, automobile and domestic) -study on traffic mode to control automobile air pollution -study on the cause of air pollution -study on the health and ecological effect of air pollution -air quality monitoring in major areas
III	-to develop an appropriate air pollution control technology for Thailand and help promote the reduction of air pollutants discharge -to develop an air quality simulation model suitable in Thailand so as to upgrade the reliability of air pollution impact assessment	-study and improvement of existing exhausted gas treatment facility (pollutants removed, removal rate, cost, trouble, etc.) -study on the appropriate air pollution control technology (fuel, stack, burning system, treatment facility, automobile device, etc.) -air quality monitoring in major areas

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5(1)-3

Table : Research Program (Noise Pollution)

PHASE	RESEARCH TARGET	RESEARCH THEME
I	-to develop human resources of researchers -to develop monitoring methods for noise to get reliable data -to help promote the use of noise pollution monitoring data in noise pollution control	-development or improvement of standard measuring method for noise -development of the system to analyze and evaluate noise monitoring data -noise monitoring in major areas
II	-to promote the surveillance of noise pollution in each area and clarify the cause and effect of the pollution -to help form an appropriate policy and measure for noise pollution control	-study on the noise affected zone by the type of sources -study on the health effect of noise pollution -noise monitoring in major areas
III	-to develop an appropriate noise pollution control technology and noise prevented city planning method for Thailand and help promote the prevention of noise pollution -to develop a noise level simulation model suitable in Thailand so as to upgrade the reliability of noise pollution impact assessment	-study and improvement existing noise prevention facility (prevention rate, cost, trouble, etc.) -study on the effect of city or regional planning in terms of noise reduction by setting up miniature model in noise-free room -noise monitoring in major areas

5(1)-4

Table : Research Program (Solid Waste)

PHASE	RESEARCH TARGET	RESEARCH THEME
I	-to develop human resources of researchers -to develop classification and analytical methods for wastes to get reliable data -to help promote the use of solid wastes contents data in solid waste management	-development or improvement of standard classification method for domestic solid waste -development or improvement of standard analytical method for industrial solid waste -analysis of solid waste samples
II	-to promote the surveillance of domestic solid waste in each community and help form an appropriate domestic solid waste management plan -to promote the surveillance of industrial solid waste in each industry and help form an appropriate policy and measure for industrial solid waste control	-study on per capita loads and characteristics of domestic solid waste -study on the quality and quantity of industrial solid waste -study on the environmental effect caused by the collection and transportation of solid waste -analysis of solid waste samples
III	-to develop an appropriate solid waste disposal method to replace open dumping -to develop an appropriate technology for the treatment and disposal of toxic industrial solid waste	-study on the environmental effect of existing solid waste disposal sites (leachate, ground water pollution, offensive odor, sanitation, etc.) -feasibility study on sanitary landfill -study on the appropriate treatment and disposal method of industrial solid waste by types of industry -analysis of solid waste samples

5(1)-5

Table : Research Program (Toxic Substances)

PHASE	RESEARCH TARGET	RESEARCH THEME
I	-to develop human resources of researchers -to develop analytical methods for toxic substances to get reliable data -to promote quality assurance of analysis -to help promote the use of toxic substances monitoring data in toxic substance pollution control	-development or improvement of standard analytical method for agricultural products, soil, fish, food, environmental samples etc. -development of standard environmental samples and distribution to environment-related laboratories -development of the system to analyze and evaluate toxic substance monitoring data -toxic substance monitoring
II	-to promote the surveillance of toxic substance pollution and clarify the cause and effect of the pollution -to help form an appropriate policy and measure for toxic substance pollution control	-preparation of inventory of toxic substances used in Thailand on their quality, quantity, type of use, environmental level, fate, etc. -study on the health and ecological effect of toxic substance -preparation of inventory on toxicity -toxic substance monitoring
III	-to develop an appropriate toxic substance pollution control method for Thailand -to prepare a manual or handbook to promote a proper use of toxic substances	-study on the residue of toxic substance in environment -feasibility study for alternative substance -study on the degradation of toxic substance in environment -toxic substance monitoring

d. Priority of Research Programs

The research program as mentioned in c. should be done in parallel for all 5 fields as follows:

1.1 Water Pollution

(i) Preparation , analysis and certification of water , sediment standard reference material.

(ii) Studies on the effect of organic wastes on the soil ecosystem

(iii) Comprehensive studies on the eutrophication of fresh-water areas. Geomorphological and hydro-meteorological characteristics of Songkhla Lake Watershed as related to the lake environment.

(iv) Studies on the methods for long term water pollution monitoring

(v) Study on optimal allocation of water quality points.

(vi) Studies on the environmental effects of the application of sewage sludge to soil.

(vii) Studies on the establishment of standard procedures for the water and wastewater.

(viii) Studies on the appropriate technology for on-site treatment system.

1.2 Air Pollution

(i) Studies on evaluation amelioration of air pollution by plants.

(ii) Studies on the biological effects of single and combined exposure of air pollutants.

(iii) Studies on effect of air pollutant mixture on plants.

(iv) Smog chamber studies on photochemical reactions of hydrocabon-nitrogen oxides system.

(v) Meteorological characteristics and atmospheric diffusion phenomena in the coastal region.

(vi) Actual condition of environmental pollution by Auto-Exhaust Gas.

(vii) Studies on the method for long term air pollution monitoring.

(viii) Studies on the establishment of standard procedure for air.

(ix) Studies on the appropriate technology for air pollution control.

1.3 Noise and Vibration

(i) Comprehensive evaluation of noise and vibration impacts of road and traffic.

(ii) Vertical distribution of floor impact sound in a multiple dwelling.

(iii) Studies on the noise barriers on expressway.

(iv) Studies on the noise barriers on airport boundaries.

(v) Studies on the factory noises and vibrations.

1.4 Solid Waste

(i) Studies on the establishment of standard procedures for solid waste.

(ii) Studies on the appropriate technology for the solid waste treatment.

(iii) Studies on utilization of food waste material.

(iv) Studies on the characteristic of solid waste in different major cities.

(v) Studies on the harzardous waste treatment.

(vi) The emissions of heavy metals caused by refuse incineration.

1.5 Toxic Substances

(i) Effect of toxic substances on aquatic ecosystems.

(ii) Studies on unfavourable effects on human body regarding to several toxic substances in the environment, using epidermiological and analytical techniques.

(iii) Establishment of standard procedures for toxic substance analysis.

(iv) Fundamental study on monitoring of mutagenicity in river sediments.

(v) Survey of organic chemical substances contained in Mussel (Mytilus edulis L.) in coastal area.

1.6 Others

(i) Study on supporting technology for systems analysis of environmental policy.

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(2) Expected Research Projects

a) Expected research projects are divided into 5 activities

ACTIVITY 1 : RESEARCH ON WATER POLLUTION

1) Development and Improvement of Analytical Standard Method

2) Substantial Surveillance of Water Pollution in degrading water areas

3) Water Pollution - Control Technology

ACTIVITY 2 : RESEARCH ON AIR POLLUTION

1) Development and Improvement of Analytical Standard Method

2) Substantial Surveillance of Air Pollution in Urban and Industrial areas

3) Air Pollution - Control Technology

ACTIVITY 3 : RESEARCH ON NOISE AND VIBRATION

1) Development and Improvement of Standard Measuring Methods

2) Substantial Surveillance of Noise and Vibration in Urban and Industrial areas

3) Noise and Vibration - Control Technology

ACTIVITY 4 : RESEARCH ON SOLID WASTE

1) Development and Improvement of Standard Measuring Method

2) Substantial Surveillance of Solid Waste

3) Solid Waste - Control Technology

ACTIVITY 5 : RESEARCH ON TOXIC SUBSTANCE

1) Development and Improvement of Standard Measuring Method

2) Substantial Surveillance of Toxic substance

3) Toxic substance - Control Technology

b) Objectives

i) The research targets should be set up on three phases in order to correspond with the ability of researchers. The first phase should emphasize on the establishment of standard analytical methods of environmental samples as a basis of practical research works. Quality assurance of analysis should be promoted in this phase.

ii) Based on the result of Phase One, the comprehensive surveillance of environment should be started in Phase Two in order to support to formulate appropriate policies and measures for the environmental protection, investigating and identifying the state, causes and effects of the environmental pollution.

iii) In Phase Three, the best practicable pollution control technologies will be researched and developed so as to promote the implementation of the policies and measures for environmental protection, being well considered the climatic, social and economic conditions of Thailand.

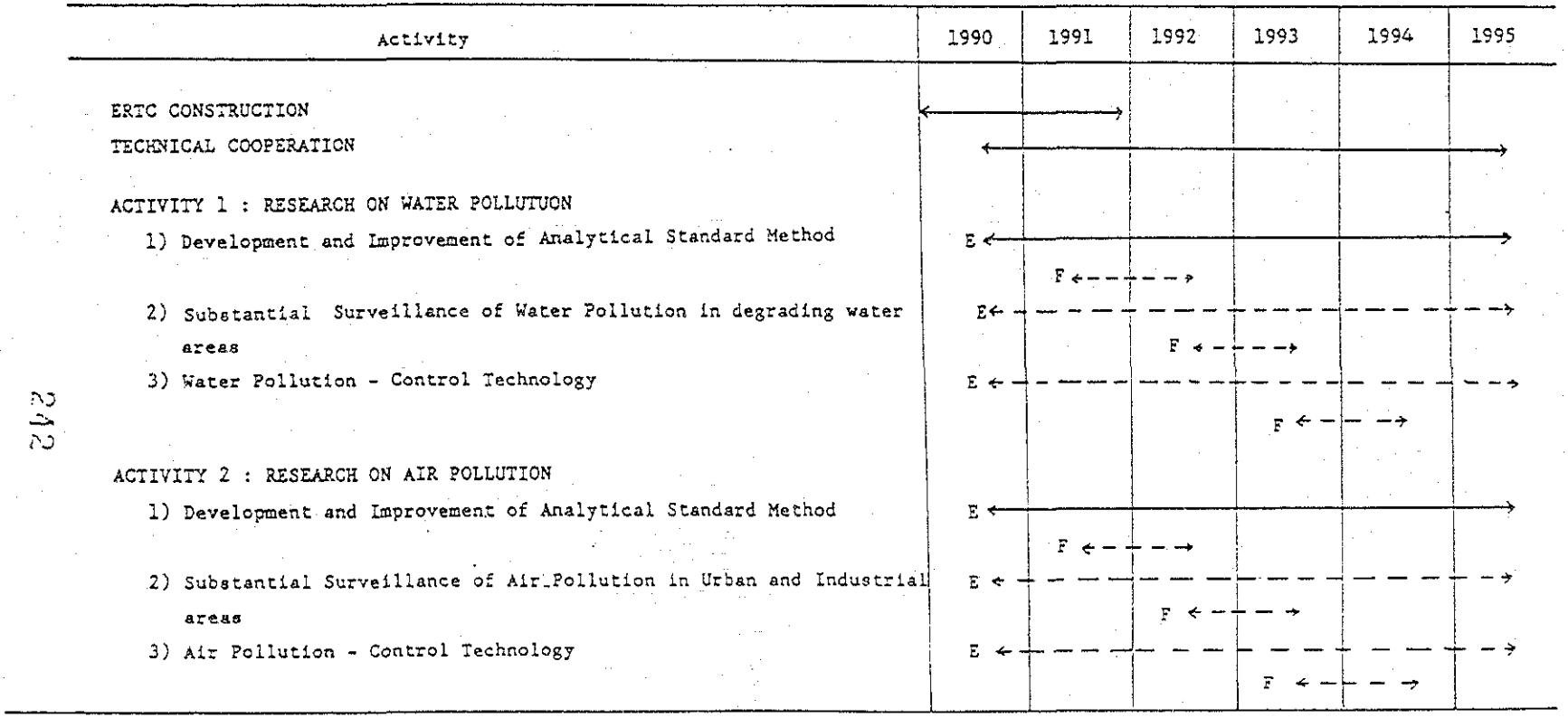
c) Qualification of researchers involved

The qualification of researchers involved should be ERTC researchers who graduated from the Thai Universities or aboard. Their background of the educations should be at least bachelor degree in science or engineer. Master and Ph.D. degree are also required.

d,e) Workplan and Duration

Workplan for the five years research activities are shown in table 5(2)-1

Table 5(2)-1 TENTATIVE ANNUAL SCHEDULE OF IMPLEMENTATION FOR THE RESEARCH PROMOTION PROJECT IN ERTC



Note :- The Government of Thailand is requested to assign the personnel trained in Japan to the Project until the completion of the project.

E ——— Japanese Expert F ——— Followship ---------- Time and duration will be fixed late

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Activity	1990	1991	1992	1993	1994	1995
ACTIVITY 3 : RESEARCH ON NOISE AND VIBRATION						
1) Development and Improvement of Standard Measuring Methods	E ←					→
		F ←			→	
2) Substantial Surveillance of Noise and Vibration in Urban and Industrial areas	E ←					→
3) Noise and Vibration - Control Technology	E ←					→
				F ←	→	
ACTIVITY 4 :RESEARCH ON SOLID WASTE						
1) Delopment and Improvement of Standard Measuring Method	E ←					→
		F ←			→	
2) Substantial Surveillance of Solid Waste	E ←					→
				F ←	→	
3) Solid Waste - Control Technology	E ←					→
ACTIVITY 5 : RESEARCH ON TOXIC SUBSTANCE						
1) Development and Improvement of Standard Measuring Method	E ←					→
		F ←			→	
2) Substantial Surveillance of Toxic substance	E ←					→
			F ←		→	
3) Toxic Substance - Control Technology	E ←					→
				F ←	→	

f. Necessary Facilities and Equipments

1) Necessary Facilities for Research Program

1) Table 5(2)-2 shows the outline of Research Building, estimated to be more than 3,000 square meters, is where research activities and routine analysis of environmental samples will be fulfilled, consisting of "Water Pollution Research Laboratory", "Air Pollution Research Laboratory", "Noise Pollution Research Laboratory", "Solid Wastes Research laboratory", "Toxic Substances Research Laboratory", "Common Analytical Instruments Room", "Fixed Temperature Room", "Clean Room", "Electron Microscope Room", "Computer Room ", "Meeting Room", "Research Division Director Room", and "Guest Room".

2) Workshop is the place to install research and experiment units. It is estimated that the workshop of ERTC should be more than 600 square meters. It is necessary that the workshop will have machineries and equipments to cope with the great variety of demands generated by research activities.

3) Apart from the facilities inside the Training and Research buildings, the following large scale experimental facilities must be prepared for the time being in order to fulfill the planned Environmental Training and Research Programmes; Waste Water Treatment Model Plant, Air Pollution Monitoring station, Automobile Exhausted Gas Research Facilities, Air Pollution Treatment Model Plant, Solid Waste Treatment Model Plant, Research Farm and Waste Treatment Facility. The outline of these facilities is shown in Table 5(2)-3

4) "Waste Water Treatment Model Plant" is used for the research and training activity of waste water treatment technologies such as oxidation ditch and activated sludge as well as the treatment of domestic waste water from ERTC. The hydraulic research facility and workshop are also set up together in order to study the mechanism of water pollution in rivers, lakes and coastal areas, and carry out the bench-scale experiments of waste water treatment respectively.

5) "Air Pollution Monitoring Station" is a model station for the

research and training of air pollution monitoring including the operation, calibration and maintenance of automatic air pollution monitoring instruments. It is equipped with meteorological devices as well as air pollution monitors such as SO_x, NO_x, CO, HC, O_x and Dust.

6) "Automobile Exhausted Gas Research Facility" is for the research and training to investigate per capita amount of air pollutants exhausted from an automobile in various running modes. It is equipped with a chassis dynamometer and exhausted gas monitors.

7) "Air Pollution Treatment Model Plant" is the model plant for the research and training of exhausted gas and dust treatment technologies such as filter, cyclone, electrostatic precipitator and desulfurization.

8) "Solid Waste Treatment Model Plant" is the model plant for the research and training of solid waste treatment technologies both for domestic and industrial solid wastes. It is equipped with an incinerator and composting plant for domestic solid wastes and a non-hazardization and stabilization of hazardous industrial solid wastes. The workshop for the use of small scale experiments and solid waste classification is also established together.

9) "Research Farm" is where the research on the effects of environmental pollution on plants and vegetations in Thailand is conducted.

10) "Waste Treatment Facility" is the facility for the treatment of toxic waste water, exhausted gas and solid wastes generated in ERTC.

11) In addition to the facilities mentioned above, the following facilities are expected to be prepared in future; Radio Isotope Laboratory, Ecosystem Research Facility, Hydraulic Laboratory and Hydrology Laboratory.

Table 5(2)-2 : Outline of Research Building

No	TYPE OF ROOM	NO. OF ROOM	REMARKS
1	Water pollution research laboratory	4	-researcher's room(1), chemical analysis room(1), biological laboratory(1) and waste water treatment research room(1)
2	Air pollution research laboratory	2	-researcher's room(1) and air pollution analysis room(1)
3	Noise pollution research laboratory	3	-researcher's room(1), noise laboratory(1) and noise-free room(1)
4	Solid waste research laboratory	2	-researcher's room(1) and solid waste analysis room(1)
5	Toxic substance research laboratory	3	-researcher's room(1), toxic substance analysis room(1) and poisonous research laboratory(1)
6	Common analytical instruments room	3	-gas chromatography room(1), atomic absorption spectrophotometer room(1) and other analytical instruments room(1)
7	Fixed temperature room	2	-analytical balance room(1) and cold storage room(1)
8	Clean room	1	-for development and preparation of standard environmental samples
9	Electron microscope room	1	
10	Computer room	1	-with middle scale computer for data processing or numerical simulation
11	Workshop	1	
12	Meeting room	2	-for 20 persons each
13	Research Division Director room	1	
14	Guest room	1	-for 10 persons

Table 5(2)-3 : Experimental Facilities

No	TYPE OF FACILITY	REMARKS
1	Waste water treatment model plant	-model plant for research and training of waste water treatment technology such as oxidation ditch and activated sludge together with hydraulic research facility and workshop
2	Air pollution monitoring station	-model station for research and training of air pollution monitoring equipped with automatic air pollution monitors and meteorological devices
3	Automobile exhausted gas research facility	-chassis dynamometer and exhausted gas monitors for research of the amount of exhausted pollutants from automobiles
4	Air pollution treatment model plant	-model plant for research and training for exhausted gas and dust treatment technology such as filter, cyclone, EP, desulfurization
5	Solid waste treatment model plant	-model plant for research and training of solid waste treatment technology such as furnace and compost
6	Research farm	-farm for research of the effect of environmental pollution on plants and vegetations
7	Waste treatment facility	-treatment facility for the toxic waste water and gas generated in the Center

Table ｽｷｬﾝ-4 List of Equipment used for Research Program

No.	1. COMMON ANALYTICAL INSTRUMENT(1) <RESEARCH>	Q'ty	
C-1-1	GC-MS Double Foucus GC-MS	1	
C-1-2	GC-QMS Shimadsu QP1000A/HP5988A GC/CAP-MS	1	
C-2	Emission Plasma SPM Shimadsu ICPS-500	1	
C-3	Xray Fluorescence SPM Shimadsu VF-320A	1	
C-4	Infrared GC/FTIR system HP4660 FT-IR/MS/GC	1	
C-5-1	UV/Vis SPM Shimadsu UV-250+AUTO SAMPLER	1	
C-5-2	UV/VIS SPM Shimadsu UV-2100	2	
C-6	Fluoro SPM HITACHI F-4010	1	
C-7	same as No.2 ..NILL		
C-8-1	AA SPM(Flame) HITACHI Z-6100/SHIMADSU AA-670	1	
C-8-2	AA SPM (Graphite) PERKIN-ELMER/ SHIMADSU AA670G	1	
C-8-3	Hollow cathorde lamp HAMAMATSU-PHOTONICS	40	
C-9-1	ECD Gaschromato Graph SHIMADSU GC-15A ECD(No FID)	4	
C-9-2	FID/FPD Gaschromato Graph SHIMADSU GC-15A FPD+FID	2	
C-9-3	TCD/FID Gaschromato Graph SHIMADSU GC-15A TCD+FID	1	
C-9-4	FID/FID Gaschromato Graph SHIMADSU GC-12A FID/FID	1	
C-10-1	Capillary GC SHIMADSU GC-9APF/ECD	1	
C-10-2	Capillary gc SHIMADSU GC-9APF/FPD/FID	1	
C-11	HPLC SHIMADSU GRADIENT LC SYSTEM	2	
C-12	Ion Chromatograph SHIMADSU HIC-6A/HITACHI L3700	1	
C-13-1	TECHNICON Auto Analyzer 6 channel	1	
C-13-2	Flow Injection Type Auto Analyzer 3 channel	1	
C-14	Hg Analyzer HIRANUMA Mercury Analyzer HG-1	2	
C-15	CHON Analyzer**	1	
C-16	THERMAL ANALYZER** SHIMADSU 40	1	
C-17	Thin Layer Chromato Scanner CS-930	1	
C-18	GM counter	1	
C-19	Na-I-Ta Scintillation Counter Aloka TCS-131	1	

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No.	1. COMMON ANALYTICAL INSTRUMENT(2) <RESEARCH>	Q'ty	
C-20-1	pH Meter Hand Type (field use)	5	
C-20-2	pH Meter Loboratory Use HORIBA M-8s	5	
C-21	Ion Selective Electrodes F-, NH3, NO3-, Cl, CN, SCN, Na	7	
C-22	Electron Microscope JEOL SCAN	1	
C-23	Microscope NIKON Optiphoto/35mm CAMERA, Teaching Unit, VTR	1	
C-24-1	RECORDER EYELA TR250-1P 1mv-1V multi range, 1 pen 220V	10	
C-24-2	RECORDER EYELA TR250-2P 1mv-1V multi range, 2 pen 220V	5	

No.	2. GENERAL LABORATORY EQUIPMENT (1) <RESEARCH>		
G-1-1	Analytical Balance Mettler AE163 0.01mg- 162g	1	
G-1-2	MICRO BALANCE Mettler M3 1microG-150mg /TOYO WTD-90 table	1	
G-2-1	Top-Pan Analytical Balance Mettler PE6000	2	
G-2-2	Top-Pan Analytical Balance Mettler PE3600	4	
G-2-3	Top-Pan Balance Mettler PE1600	4	
G-3-1	Weighting Scale (Platform) SHIBATA 100kg Automatic Spring	1	
G-3-2	SHIBATA 150Kg STANDARD SCALES	1	
G-4-1	Centrifuge >20000 rpm, 1000ml, Refgirator/KOKUSAN H-117-203	1	
G-4-2	Centrifuge >5000 rpm, 250ml*4,	3	
G-4-3	Centrifuge >8000 rpm, Table top 100ml*4-6/KOKUSAN H103NF	1	
G-4-4	Centrifuge >1500 rpm, 30mlx24 KOKUSAN H195C	1	
G-5	Muffle Furnace TOYO OPERUSER 3.0kW OPM-42D 50HZ/220V 1ϕ	1	
G-6	Electric Furnace TOYO ESF-3 3.2kW 50HZ/220V 1ϕ	1	
G-7	Vacuum oven(Furnace) TOYO V-30 / EYELA VOS-300 220V	1	
G-8-1	OVEN DRYING OVEN TOYO FS-62D 3111560 220V 1ϕ	2	
G-8-2	MEDIUM TEMP OVEN TOYO KCM-22 50HZ/220V 1ϕ	2	
G-8-3	HIGH TEMP OVEN TOYO FH-35 50HZ/220V 1ϕ	1	
G-9	Glass oven TOYO KCP-30 Pipettes and Labo Glassware Dryer	1	
G-10	Autoclave TOYO SVM-30H 220V 1ϕ	2	

No.	2. GENERAL LABORATORY EQUIPMENT (2)	Q'ty	
G-11	Asher **		
G-12-1	Incubator TOYO FT-60T /EYELA SLI1000D 220V 1ϕ	1	
G-12-2	Incubator TOYO IS3000H /EYELA LTI1000D 220V 1ϕ	4	
G-13	Lyophillizer EYELA FREEZE DRYER Model FD-1 217801 220V	1	
G-14	Rotary Evaporator EYELA N-4 220V	10	
G-15	Test Tube Evaporator EYELA S-10 Cat. No 117501 220V	4	
G-16	Fraction Collector TOYO SF-100 220V 1ϕ	2	
G-17-1	Shaker EYELA DC-40 220V 1ϕ Cat. No 417506	2	
G-17-2	Shaker EYELA SS-81P 220V 1ϕ Cat. No 147303	2	
G-17-3	Shaker TAIYO R-D II 220V 1ϕ	2	
G-17-4	Shaker Tube Vibrator(Voltex type) 220V	4	
G-18	Mixer HITACHI Juicer/Mixer 220V Glass Pot type	4	
G-19	Homogenizer KINEMATIKA	2	
G-20-1	Heater:EYELA DRY BLOCK BATH MG-2 220V	5	
G-20-2	Heater:Gerhardt Bonn KI-25 4 in line Heater for kjeeldahle	10	
G-20-3	Labconco Heater with water circulation system for MB	5	
G-20-4	Mantol Heater 5L, 2L, 1L, 500ml, 250ML, 100ML	12	
G-21	HOT PLATE HITACHI 220V 1.2KW TEFLON coarted	10	
G-22-1	Magnetic Stirrer EYELA RC-2 Cat. No 127602 200V	5	
G-22-2	Magnetic Stirrer TOYO HS-8 with Heater	5	
G-22-3	Magnetic Stirrer TOYO B-2	5	
G-23	THERMO REGULATOR EYELA T-80/TOYO LH800+LH20S	2	
G-24-1	Vacuum Pump HANDY DIAFRAM AIR PUMP	5	
G-24-2	Vacuum Pump ROTARY OIL PUMP	2	
G-25	Roller Pump EYELA Model RP-5, RP-10, RP-30, RP-60, RP-32 220	10	
G-26	Water Pump TOYO PW-2(3082880) 220V 50Hz 1ϕ	5	
G-27	Water Bath TOYO WB 26S, 21OS, 16S 220V 50Hz 1ϕ	7	
G-28	Ultrasonic Bath SHARP UC-6100 600W, UT-1203R+UI-1203R 1200W	2	

No.	2. GENERAL LABORATORY EQUIPMENT (3) :RESEARCH	Q'ty	
G-29	Pipette Washer SIBATA S4-6302	10	
G-30-1	Water Distillation Unit Solar cell distilled Water system	2	
G-30-2	TOYO GSU-910 Deionized Water 90L/h	2	
G-30-3	EYELA All glass Compact Water Still WST-15 220V 1.2L/h	1	
G-30-4	TOYO GS-50 3-41451 200v 1ϕ 5L/h	1	
G-31 *			
G-32	Clean Bench VC-1600-F Down flow air	2	
G-33	Draft Chamber LFD-180 gas wash type	3	
G-34	Draft Chamber/HOOD DALTON DN-8P (TYLE type)	12	
G-35	Cold Storage TOYO NTS-30(walk in type)	1	
G-36	Refrigerater HITACHI 220L type 220V	10	
G-37	Freezer WOORPROOF "DEEP" EV-15HKXR 220V 1ϕ	5	
G-38	Ice Maker HOSHIZAKI 100kg/day F-120 300W 220V	2	
G-39	Glass Blower SHIBATA Btype (Liquid Propane)	2	
G-40	Bunsen Burner SHIBATA S-48403 LPG with Cock	40	
G-41	Stop watch 1/100sec digital Citizen, Seiko, Casio	5	
G-42-1	Laboratory Desk TOYO PFC-300	2	
G-42-2	TOYO PDF-420	2	
G-42-3	TOYO PFM-420	8	
G-42-4	TOYO PFO-420	4	
G-42-5	TOYO PFP-420	4	
G-43	Emergency Shower TOP PAN SHOWER+EYE WASHER	4	

No.	3. Water Pollution RESEARCH	Q'ty	
W-1	TOC Analyzer SHIMADSU TOC-500	1	
W-2	COD " DKK COD 31N	1	
W-3-1	DO Meter Field USE SHIBATA DO3	2	
W-3-2	DO Meter LABO USE YSI Model 54	2	
W-4	T-N Analyzer DKK TNW-10	1	
W-5	T-P " DKK TPW-10	1	
W-6	Tintometer Lovibond AF702	1	
W-7	Turbidity Meter HACH Model 2100A	1	
W-8-1	Conductivity Meter Portable OSK-6602/HANNA HI-8033	1	
W-8-2	Conductivity Meter LABO SUNTEX SC17A/TOA(OSK 6603)	1	
W-9	Salinity Meter TOA SAT-1	1	
W-10	Water Sampler ** SHIBATA 8053 1L	3	
W-11	Automatic Water Sampler Central KAGAKU Model 600	1	
W-12	Grab Sampler Eckman Burge Grab Sampler	3	
W-13	Core Sampler NAUMAN Core Sampler Cat. No. 5166	2	
W-14	Plankton Net NYLON	5	
W-15	Velocity Meter Electric Current Meter CM-2 0.08m-3m/se	3	
W-16	Echo Sounder FISHING SOUNNER **	1	
W-17	Jar Tester ISUZU(SHIBATA SI-3702) JR12 200V 1ϕ	2	
W-18	Automatic Dispensor	1	
W-19	Colony Counter	1	
W-20	Pipette washer with Ultrasonic bath	1	
W-21	Manipulator	1	
W-22	Microscope NIKON Labophoto 10x x5, x10, x20, x30, x50, x100	1	
W-23	UV LIGHT 254nm x1, 360nm x1, Room light type (20W)x5	7	
W-24	Pressure Pan 6L	3	
W-25	Gas Stove (Table Type) For LPG	3	
W-27	Dish Washer(for Glass ware washing)	2	

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No.	4. Airr Pollution (1) <RESEARCH>	Q'ty	
A-1	SOx Monitor DKK BS-12024	1	
A-2	NOx Monitor DKK GUN-8B	1	
A-3	CO Monitor DKK GIA-72	1	
A-4	Ox Monitor DKK GLX-31	1	
A-5	HC Monitor DKK GHC-75M	1	
A-6	Dust Monitor Aloka β-RAY Methord	1	
A-7	Hi-Vol Air Sampler HVC-1000A 200V	2	
A-8	Low Vol Air Sampler SHINTAKU-	4	
A-9	Anderson Sampler SHIBATA AN-200	1	
A-10	DUST Jar SHIBATA Deposit Gauge Type 8008-01	1	
A-11	Wind Speed/Direction Meter OGASAWARA KEIKI	1	
A-12	Temperature/Humidity Meter OGASAWARA KEIKI	1	
A-13	Rainfall Meter OGASAWARA KEIKI	1	
A-14	Ultraviolet Meter OGASAWARA KEIKI	1	
A-15	NOx Monitor for Automobile ***	1	
A-16	CO Monitor for Automobile *** UREX-311	1	
A-17	HC monitor for Automobile ***	1	
A-18	Black Smoke Monitor *** ST100	1	
A-19	Orsat Analyzer SHIBATA	1	
A-20	Gas Impinger SHIBATA 8003-05	1	
A-21	Gas Detector(TEST TUBE) KITAGAWA AP-1	1	
A-22	Zero Air Generator HORIBA SGPU-22	1	
A-23	Gas Phase Calibrator	1	
A-24	Stack Sample	~~1~~ 2	
A-25	GAS PUMP SHINAGAWA SEIKI	3	
A-26	GAS Meter	3	
A-27	Rotameter	2	
A-28	Mass Flow Meter	1	

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No.	4. Airr Pollution (2) <RESEARCH>	Q'ty	
A-29	Air Purifier	1	
A-30	Dehumidifier Chamber AUTO DRY SHIBATA Oltype I-05G-02	3	
A-31	Datalogger TEAC DR-F1	2	
A-32	Digital Multimeter IWATSU VOAC707A, VOAC767	1	
A-33	Digital Storage OSC IWATSU SS-5802	1	
A-34	Acid Rain Monitor	1	

No.	5. Noise and Vibration <RESEARCH>	Q'ty	
N-1	Sound Meter RION NL-01	7	
N-2	Extention Code EC-04B 10mx5, EC-04C 30mx5	10	
N-3	Lebel Recorder RION LR-04	7	
N-4	Tape Recorder SONY CASSETE DENSUKE TC D-5M/Metal Tape	7	
N-5-1	Precision Sound Meter NL-10A	1	
N-5-2	" NL-11	1	
N-6	Traffic counter Numberx3 , Numberx5	10	
N-7	All Weather Screen VIDEO CAMERA Stand + Wind Screen	5	
N-8	Pistonphone RION NC-72	3	
N-9	Tachometer Non Contact type Model 3632	2	
N-10	Data Processing Unit RION CF-01 set	3	
N-11	Real-Time WAVE Analyzer IWATSU SM-2100B	1	
N-12	Noise Monitoring Unit station set	3	
N-13	Microphone/Analyzer Unit SC-73 /SC-71	1	
N-14	Vibration Meter VM-14B Vibration Pollution Meter	3	
N-15	Turnble Band Pass filter VM-61 + VP-28A + CP-02 +1F01A	1	
N-16	Accelerometer Calibrator	1	
N-17	Anemometer AM-10 0.05m/sec-25m	1	

No.	6. Solid waste <RESEARCH>	Q'ty	
S-1-1	Weighting Scale Platform Spring Scale 100kg	1	
S-1-2	" Spring Scale 10kg	2	
S-1-3	" Top pan Electric Scale Mettler PE-12 11kg, 1g	1	
S-2	Milling Machine YOSHIDA 1029C	1	
S-3	Mechanical screen NAKAMURA LS-15N+Shaker set	1	
S-4	Hot Air Oven TOYO KCV-10ST with waste Tray	1	
S-5	Calorie Meter YOSHIDA 1013H	2	
S-6	Muffle Furnace TOYO OPM-60D	1	
S-7	C, H Analyser TOYO(Vol 43) Cat. P. 309 JIS M8813	1	
S-8	KjeDahl Digestion Unit (Lab. Conco)	1	
S-9	Distillation unit with water circulation system	1	
S-10	Set of Solid Waste sampling/Mixing/Separating Tools set	1	

No.	7. Toxic sabstances <RESEARCH>	Q'ty	
T-1	Rotary Evaporator EYELA N-4/SB-35/AS-2 220V set	4	
T-2-1	Shaker EYELA SS-81P 220V 1ϕ Cat. No 147303	1	
T-2-2	Shaker TAIYO SR- D 220V 1ϕ	3	
T-3	Fraction Collector TOYO SF-100 220V 1ϕ	2	
T-4	Block Heate EYELA DRY BLOCK BATH MG-2 220V	3	
T-5	Homogenizer SIBATA 51-4311 TP-18 Cutter set	1	
T-6	Blender HITACHI JUICER/MIXER Glass Cup type 200V	2	
T-7	Centrifuge KOKUSAN H-103NF	2	
T-8	----		
T-9	----		
T-10	Bottle Cabinet(TOXIC SAFE) NAGANO BCB-5	1	
T-11	All Glass solvent Rifine Set with Heating Mantle 5L	2	
T-12	Soxhlet Set(4 in line) with Heating Mantle	2	

No.	8. OTHERS <RESEARCH>	Q'ty	
0-1	Computer 32 bit office computer set 10MB MAIN memory, 130MB HD, 8'2Dx2, 5'2HDx2 FDD, Graphic CARD 20' Fine pich Color CRT, A1 size Degitizer+Plotter, 11'PRNr VIDEO Color Printer, console, Interigent Terminalx 2	1	
0-2-1	Computer IBM-AT compati, THAI/ENG , 1M RAM, 1.2M FDD, printer	5	
0-2-2	" IBM-AT Compattible, Japan/ENG TOSHIBA J-3100GT PRN	5	
0-4	VTR SET	1	
0-7	OHP	3	
0-8	Slide Projector	3	
0-9	Film Projector 16mm	1	
0-10	Microfilm projector***		
0-11	Slide Producer KODAK	1	
0-12	Camera:Medical NIKKOR, NIKONOS-V, NIKON FGx2, ZOOM 35-200	4	
0-13	Photo Copy MITA with SORTER	2	
0-14	Electric Typewriter THAI/ENG , Parallel interface	5	
0-15	Printing Machine Geshteztner	1	
0-16	Binder Geshteztner	1	
0-17-1	AUTOMOBILE Micro Bus (19)	1	
0-17-2	Stationwagon	2	
0-17-3	Landcruiser	1	
0-18	Motor Boat FRP 75 HPx2	1	
0-19	Grass Cutter YANMER YF-19-DX	1	
0-20	Plowing Machine KUBOTA	1	
0-21	Floor Cleaner JV-25H	2	
0-22	Washing Machine	1	
0-23	Equipment for Dark Room (B & W, Colour Lab) set	1	
0-24	Equipment for Dark Room (Electron Microscope) set	1	

No.	9. Workshop Instruments	<RESEARCH>		Q'ty	
WK-1	Lathe	TAKIZAWA TSL	20' 950kg	1	
WK-2	Milling Machine	INOUE IV-1	1030kg	1	
WK-3	Grinding Mashine	HITACHI SGP2T	33kg	1	
WK-4	SHAPING MAchine	UCHIDA SUD-550	1600kg	1	
WK-5	Ark Welding	DAIDEN-D-300		1	
WK-6	SHARING MACHINE	TAKAGI S-312	1.5kw	1	
WK-7	Leaf Machine	HOTTA HM-3	400kg	1	
WK-8	Roller Machine	IM-3-11	100kg	1	
WK-9	Bending Machine	NOGUCHI-U-440	100kg	1	
WK-10	Drilling Machine	HITACHI-B-23	145kg	1	
WK-11	Power Hack Saw	MURAHASHI KILSER 200	270kg	1	
WK-12	BAND SAW (WOOD)	HITACHI CB-75F	140kg	1	
WK-13	HAND PRESS	NOGUCHI KH-25+FPH-80		1	
WK-14	Circuler Saw	HITACHI PU-100F	262kg	1	
WK-15	/Plane				
WK-16	Screw Cutter	ASADA PISET 4S-B	130kg	1	
WK-17	Hand Drille	HITACHI D-10C+PR-25B		1	
WK-18	Disk Grinder	HITACHI PD-150A		1	
Wk-19	High Speed Cut-off Machine	HITACHI CC-14SA	17kg	1	

(3) Implementation of Research Project

a. Ways and Mean to obtain Researchers

Environmental Research and Training Center will have its own core group of researchers. To implement this in-house group, there is a need for the Center to collaborate with other research institutes in Thailand, especially academic institutes. Students or faculties research, for example, can be undertaken using the facilities of the Center with the cost of the student researches and his research supervisor from the academic institute free-of-charge.

b) Ways and Means to Develop Manpower for Research Projects

ERTC's researchers will be learning new knowledge and research technique as they participate in various projects. Development of manpower will mainly be done in-house or in term of co-operation research with other institutes within and without Thailand.

c) Collaboration with other Research Institutes

Collaboration will have to be mull-partite among ERTC academic, industrial and other government research institutes. ERTC will take a leading role in all types of research and training collaborations which can include exchange of research personnel.

d) Estimated Cost of Each Research Project

The cost of each research project will be estimated case by case.

e) Budgetary Sources of Research Project

The main budget source will come from the Thai Government budget and other bilateral project with various governments.

(4). Expected Counterpart Training for Research in Japan

No.	Field	No.of trainee	Term (m/m)	Total(m/m)
1.	Research on Water Pollution Control and Analysis	4	6	24
2.	Research on Air Pollution Control and Analysis	4	6	24
3.	Research on Noise Pollution Control and Analysis	2	4	8
4.	Research on Solid Waste	4	4	16
5.	Research on Toxic Substance Analysis	4	6	24
6.	Research on Ecology	1	6	6
7.	Research on Vibrations	1	6	6
	Total	20	38	108

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SESSION 6: OTHERS

6. Others

(1) Topographical Map (1/10,000) and Geographical Land Map

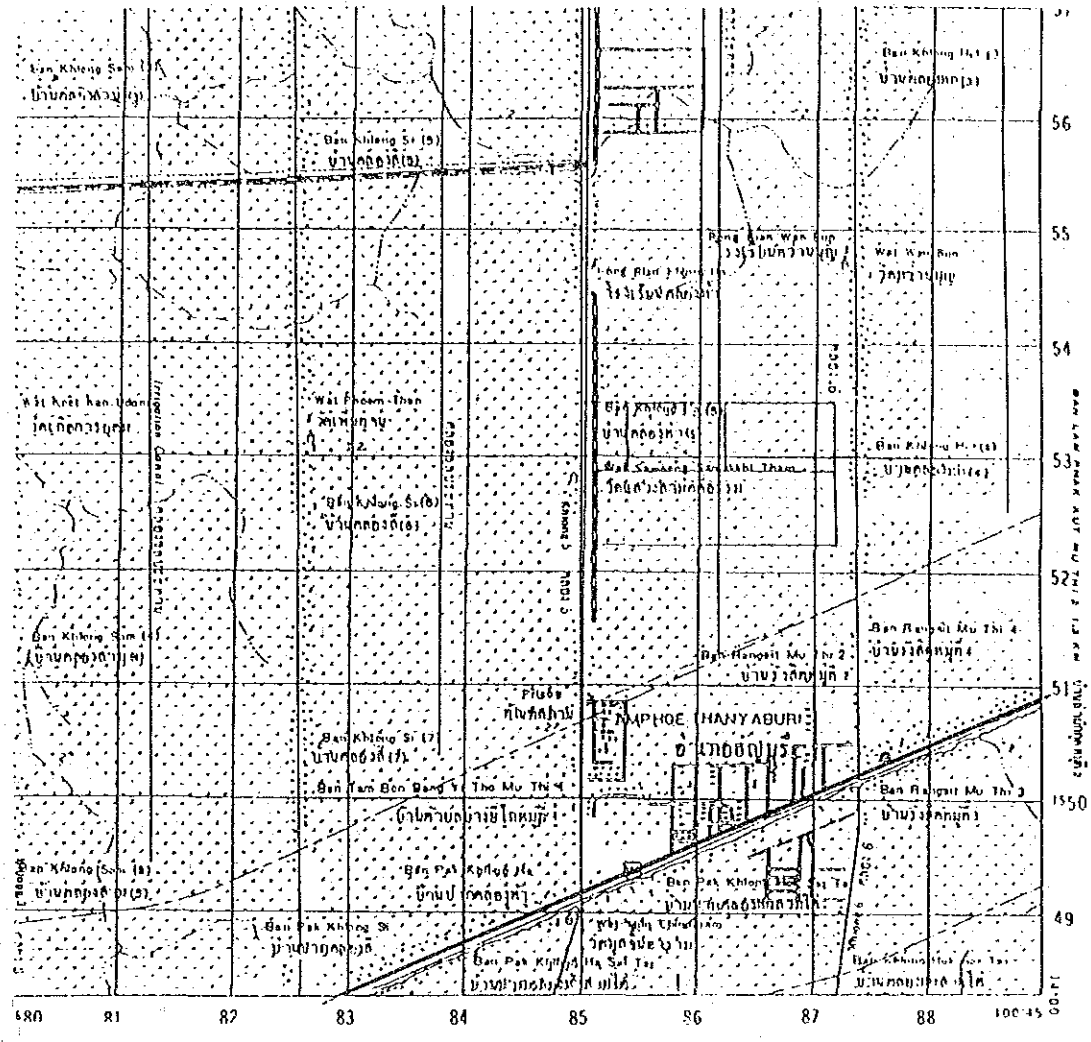

Fig. 1 : Tropographical map (1/50,000) of the location of The Environmental Research-Training Center
Amphoe Khlong Luang,
Changwat Pathum Thani.

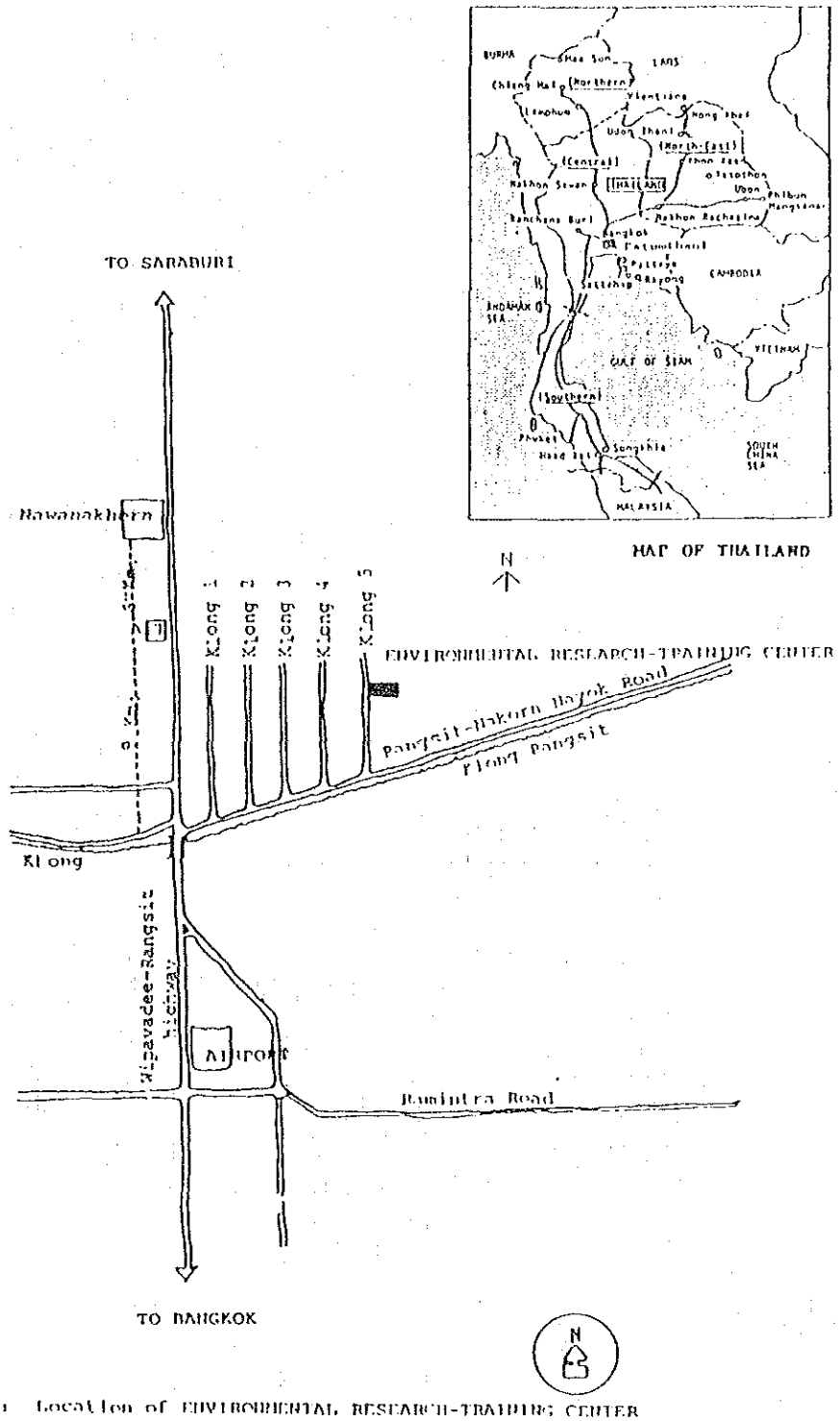

Fig 2 : Location of ENVIRONMENTAL RESEARCH-TRAINING CENTER

(2) Present and Future Plan of Infrastructure of ERTC and Chulabhorn Science Complex

a) Present and Future Plan of Infrastructure of ERTC

Item	Topic	Size	Total Budget (baht)
1	Land Development (1 phase)-1987	30 rai	1,000,000
2	Land Development (2 phase)-1988	43 rai	1,250,000
3	Bridge across the dike	W 31 m x L 51 m	1,750,000
4	Fence	H 1.5 m x L 1,600 m	1,000,000
5	Internal Road-1989	11,346 m^2	2,269,200
6	Electrical System		
	6.1 Transformer	500 KVA	246,336
	6.2 Capacity	0.4 KV	30,076
	6.3 Electric post (main post)	5 post	75,000
	6.4 Electric post with wire and lamp	30 set	354,048
	6.5 Photoelectric Control	1 set	1,900
	6.6 Testing Fee		15,000
	6.7 Connecting Fee		20,000
7	Plate Name	W 4 m x H 1 m	35,000
8	Flood Control System		
	8.1 Water Pump	2 pump	240,000
	8.2 Pumping Station	2 Station	34,000
	8.3 Pipe Line	50 m^2	9,250
	8.4 Installation Fee		10,000
9	Drainage System		
	9.1 Sewer Line	1,400 m^2	1,447,600
	9.2 Construction Cost		50,000
10	Telephone	direct line 10 number	50,000
	Total Budget (1987-1989)		9,887,410

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b) Present and Future Plan of Infrastructure of Chulabhorn Science Complex

Since ERTC-site is with Chulabhorn Science Complex. The infrastructure of Chulabhorn Science Complex can also be utilized by ERTC. The infrastructure of Chulabhorn Science Complex is as follow.

Item	Topic	Size	Total Budget (baht)
1.	Road (1988)	W 11 m x L 320 m	999,750
2.	Drainage System	-	485,250
3.	Water Supply	-	700,000
4.	Telephone Net Work	-	1,140,000
5.	Sewerage System (1989)	-	15,000,000
	Total Budget		18,325,000

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(3) Outline of the Chulabhorn Science Complex

Chulabhorn Science Complex is under the umbrella of Ministry of Science, Technology energy and located at Amphoe Klong Laung, Pathumthanee Province, about 30 Km. north of central Bangkok. The total land area is about 24.68 hectare as shown in Fig. 2

Chulabhorn Science Complex is utilized by 6 departments as follows :

i) Office of Secretary of Ministry of Science Technology and Energy

ii) Office of National Environment Board

iii) Office of Atomic Energy for Peace

iv) Thailand Research Institute of Technology

v) The National Energy Administration

vi) Department of Science and Service

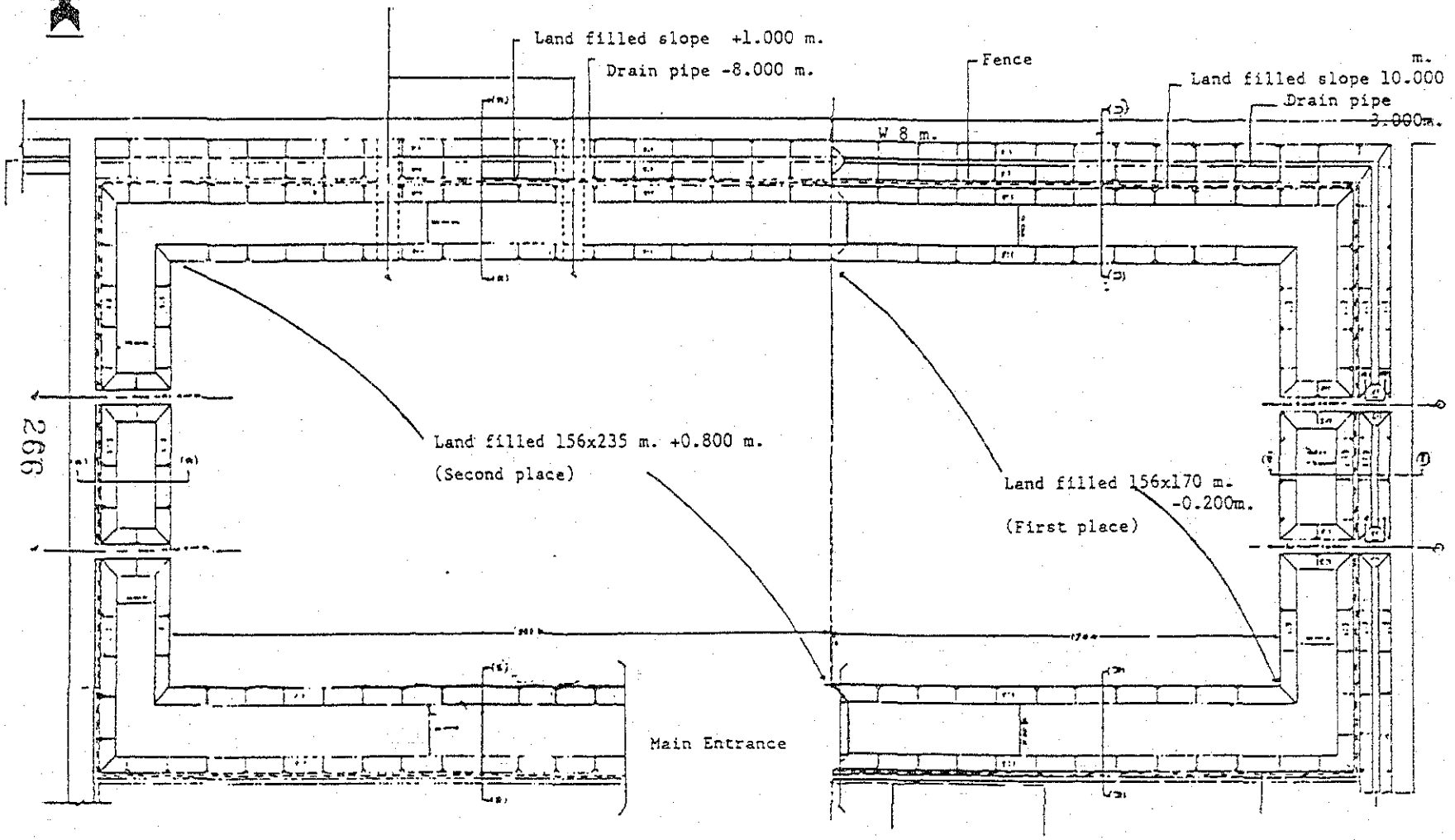
(4) Draft design of the ERTC building

At present, there are 2 draft designs. One is the ONEB design and the other one is designed by Mr. Chudchai Theerawongpairole, Bachelor degree student of architecture at the King Mongkut Institute, Ladkrabang.

Mr. Chudchai got the first award of best design for the ERTC building from the Thai Architecture Association. He received the award from the prime Ministry Prem Tinsulanondh on April 21,1988.

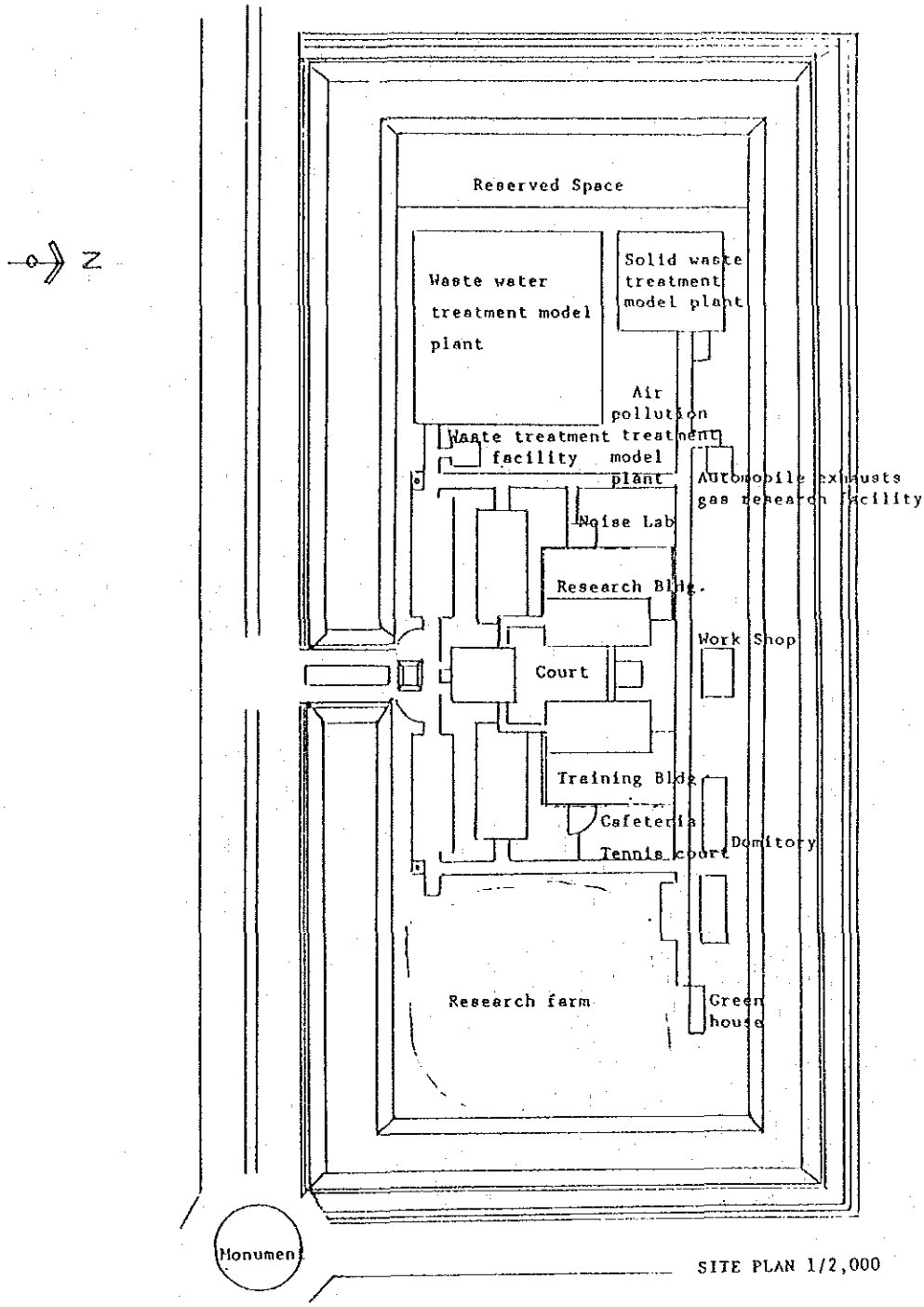
Chulabhorn Science Complex
Klong 5, Amphur Klong Luang, Pathumthanee
Science Museum
2.25 hc
Department of Science Service
7.38 hc
The National Energy Administration
7.28 hc
Min. of Sc.
TRIT
1.6 hc
1.63 hc.
Office of the National Environment Board
11.71 hc
Office of Atomic Energy for Peace
10.73 hc
Thailand Research Institute of Technology
12.19 hc
Automobile Technology Center
3.87 hc
Model Building
Factory
6.59
Government official Resident
5.12 hc
Road
150
240
260
150
350
150
1150
Scale 1:400
Total area of TRIT = 24.68 hc
Lay out of Chulabhorn Science Complex

LAND DEVELOPMENT OF ERTC



Scale 1:750

Environmental Research and Training Center (Alternative A)



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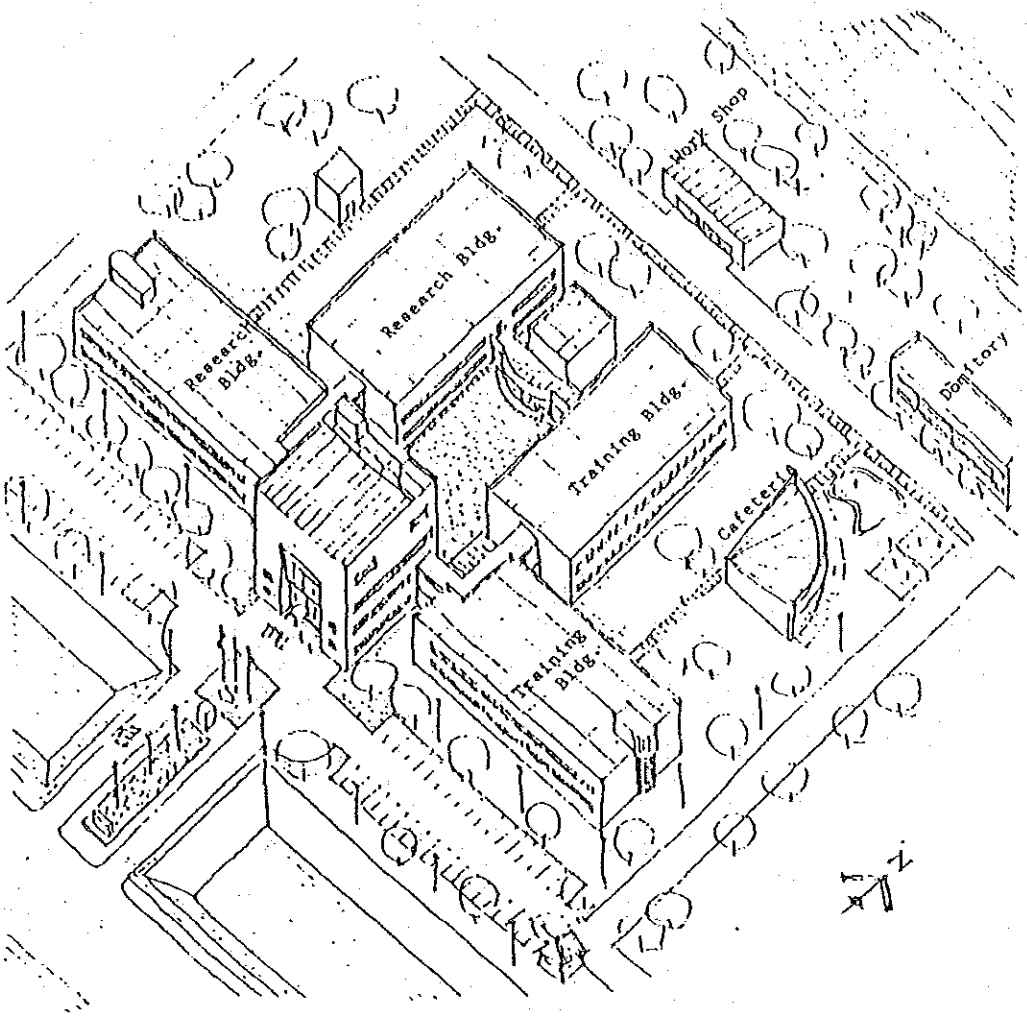

Environmental Research & Training Center

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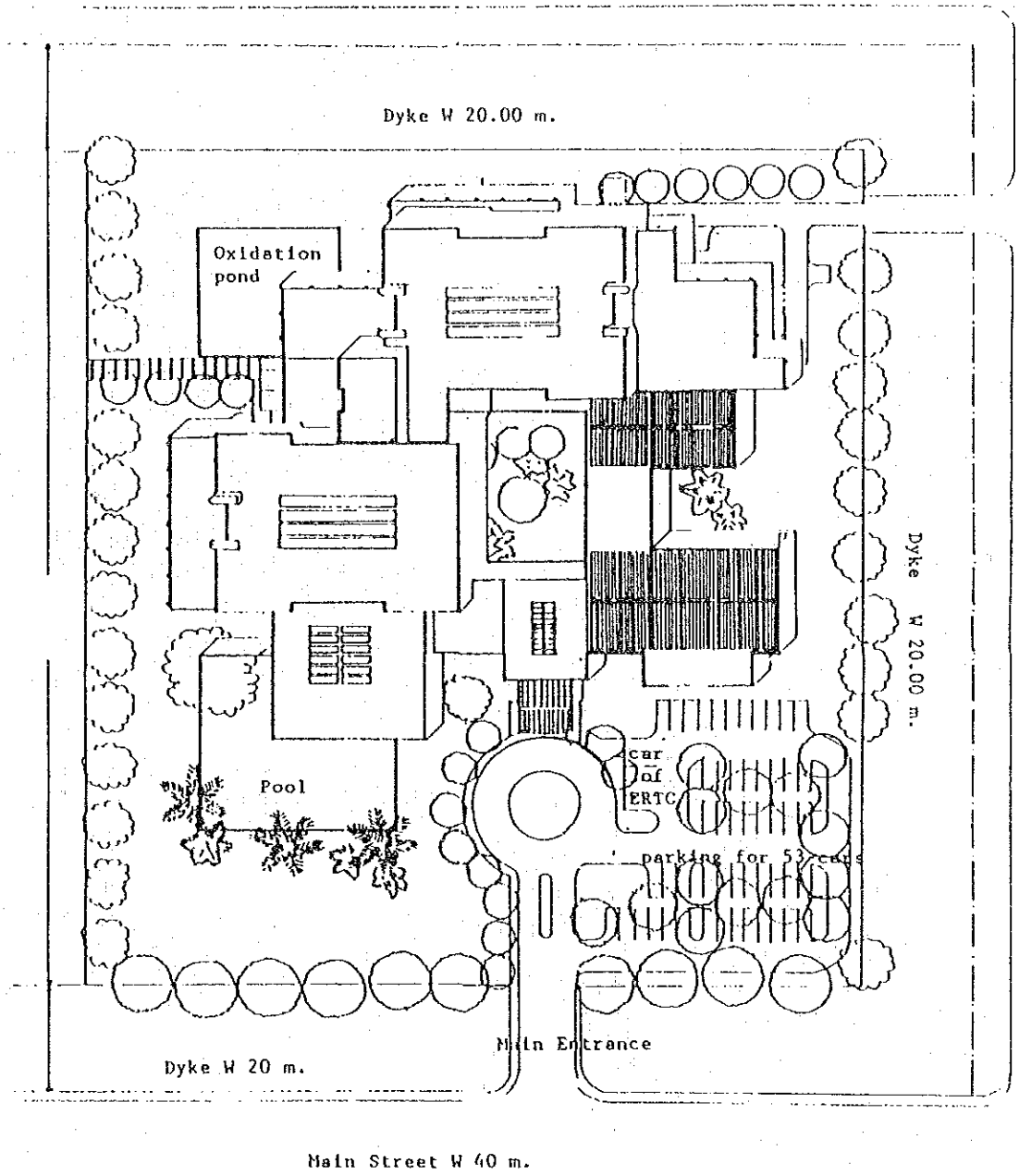
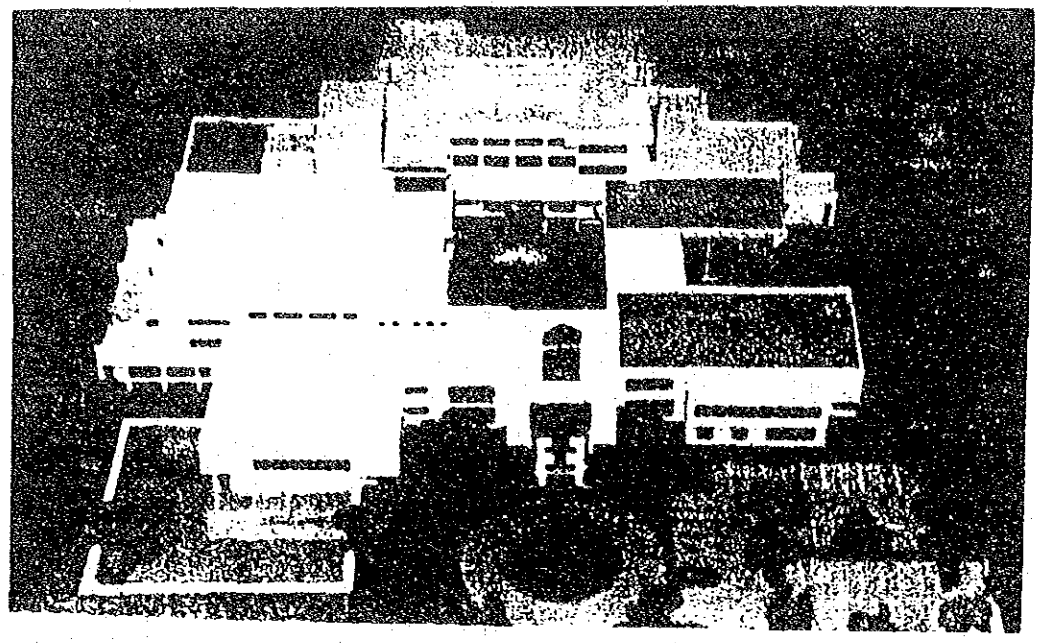
Environmental Research and Training Center (Alternative B)





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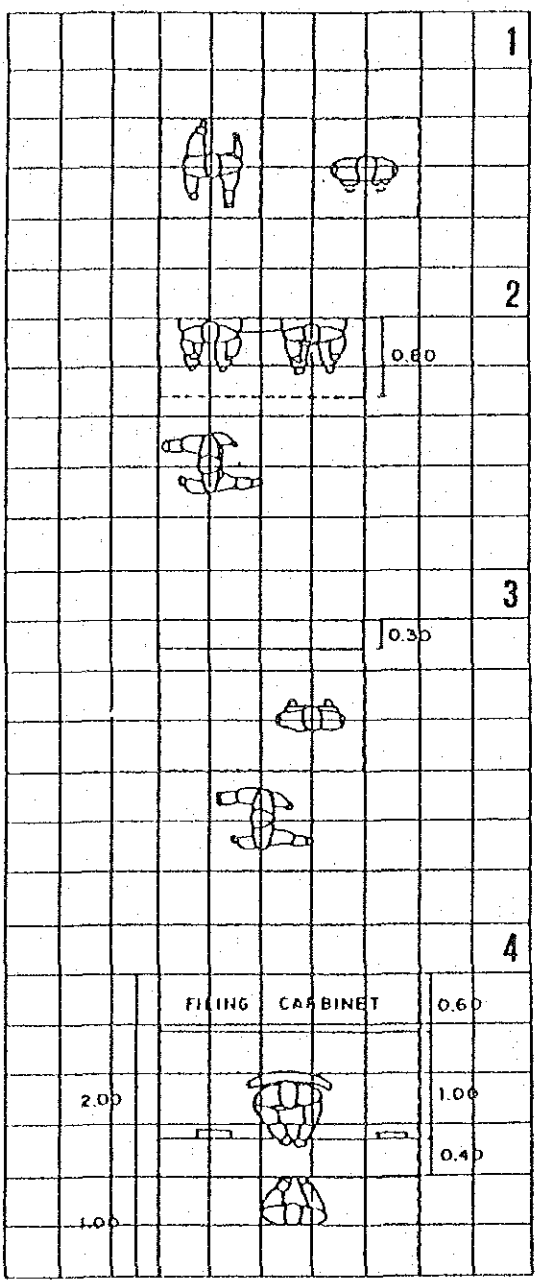
AREA ANALYSIS

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ANALYZE

FUNCTION & AREA REQUIREMENT



Administration

Walking or Standing space

Circulati

approximate = 1.00+1.00

= 1.00 m^2

(usedfor lobby, hall and circulation)

Sitting and Waiting Area

approximate = 0.80+1.00

= 0.80 m^2

(used for waiting area, lobby, hall

Looking at board

board = 1.00+0.30

Standing area = 1.00+1.20

= 1.00+1.50

= 1.50 m^2

(usedfor hall, office, library)

Senging and Information

filling cabinet = 0.60+2.50

counter = 0.40+2.50

working area = 1.00+2.00

visitor area = 1.00+2.00

total = 7.50 m^2

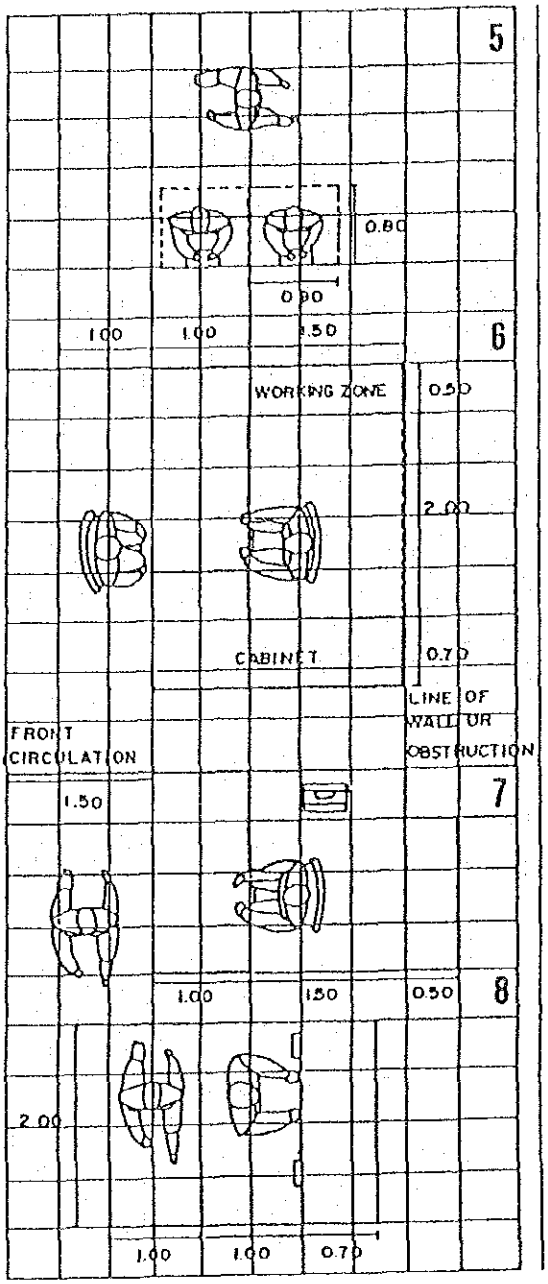
(used for office, hall)

AREA ANALYSIS

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ANALYZE

FUNCTION & AREA REQUIREMENT



Telephone Booth

approximate = 0.90+0.80

= 0.72 m^2

(used for hall)

Interviewing area

visitor area = 1.00+2.50

staff area = 2.50+3.20

total area = 12.25 m^2

(used for secretary)

Office Staff Working area

front circulation = 1.50+2.00

working table = 1.00+2.00

working area = 2.00+2.00

total area = 9.00 m^2

Filing area

back circulation = 1.00+2.00

working area = 1.00+2.00

cabinet = 0.70+2.00

total area = 5.4 m^2

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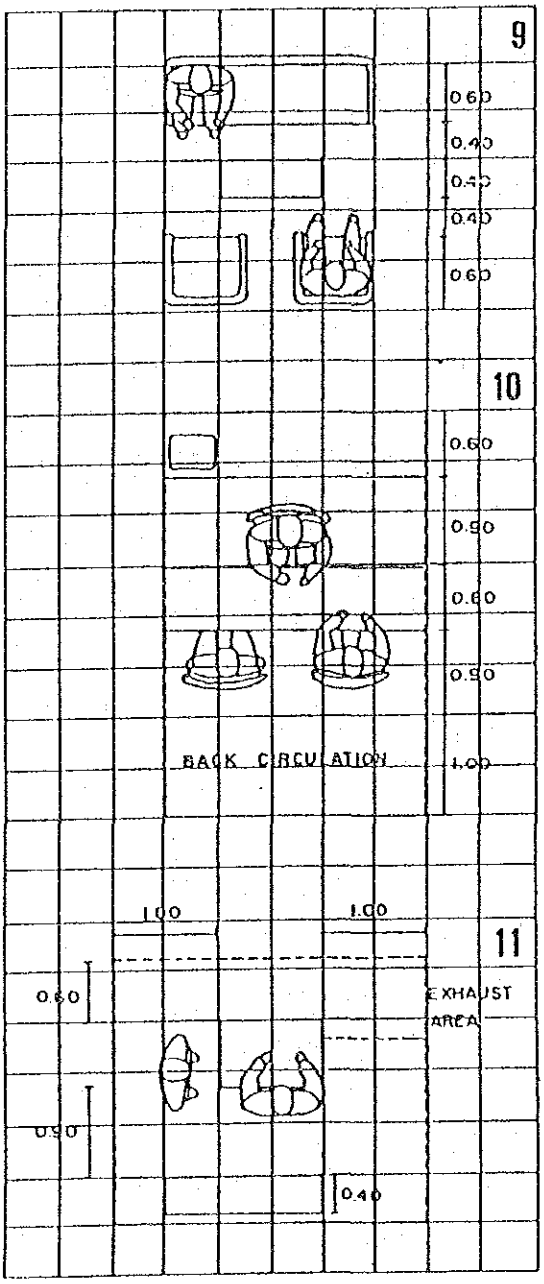
AREA ANALYSIS

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ANALYZE :

FUNCTION & AREA REQUIREMENT



Guest Area

sitting area	=	2.50+2.00
circulation area	=	1.00+1.00
(2 side)	=	3.50+1.00
total area	=	10.5 m^2

(used for head Rm., waiting)

Supervisor Working

working zone	=	1.50+2.50
working table	=	0.60+2.50
visitor area	=	0.90+2.50
back circulation	=	1.00+2.50
total area	=	10.00 m^2

(used for hand Rm., Head assistant Rm., secetary)

Xerox Area

approx.	=	3.00+2.65
	=	7.95 m^2
	=	8.00 m^2

Note

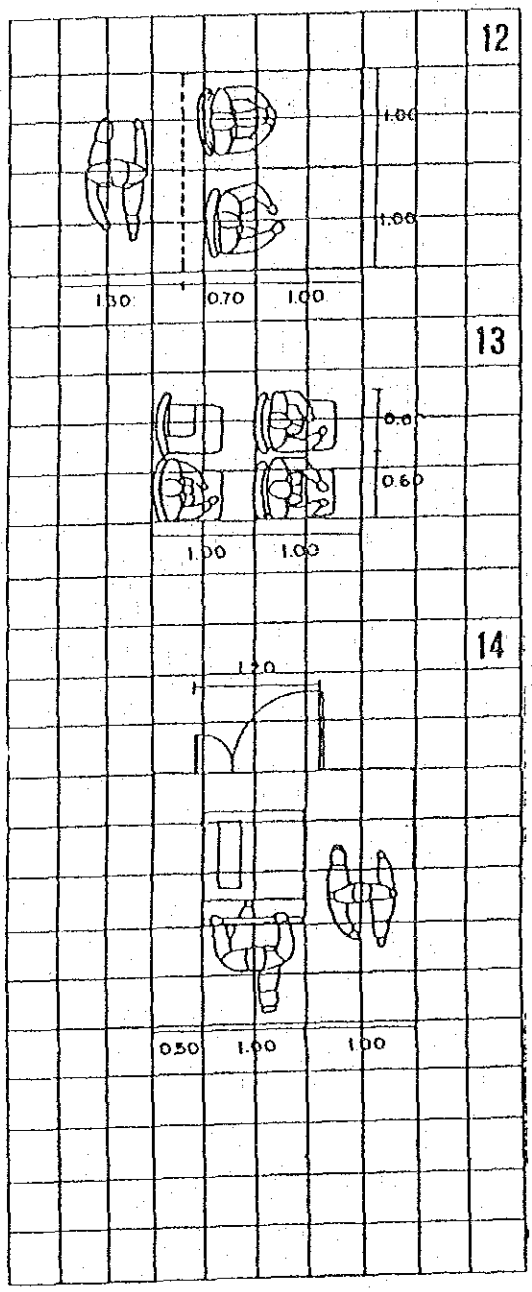
1. Area varies according to size of xerox equipment
2. Area can be comparatirely used with other printing equipment

AREA ANALYSIS

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ANALYZE :

FUNCTION & AREA REQUIREMENT



Conference Area

table area	= 1.00+1.00/unit
working area	= 0.70+1.00/unit
back circulation	= 1.30+1.00/unit
total area	= 3.30 m^2/unit

Lecture Rm.

approximate	= 0.60+1.00/unit
	= 0.60 m^2

Cart or Trolling Working

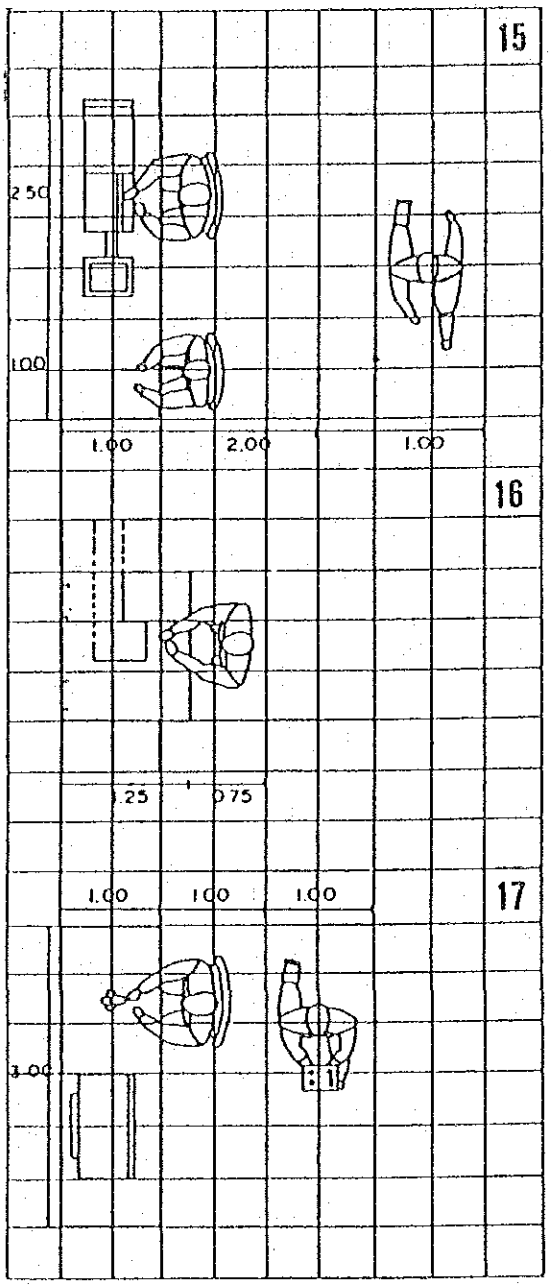
working area	= 1.00+2.50
circulation area	= 1.50+2.50
total area	= 6.50 m^2

AREA ANALYSIS

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ANALYZE :

FUNCTION & AREA REQUIREMENT



Laboratory

Instrument Working

working area = 1.00+(1.00+V)

(V = Dimension of Instrument max= 2.55 m)

= 1.00+3.55m^2

back working = 2.00+3.55

circulation = 1.00+3.55

total area = 14.20 m^2

Hood Working

working area = 0.75+1.50

hood = 1.50+1.25

total area = 3.00 m^2

Bench Working

working area = 3.00+2.00

back circulation = 3.00+1.00

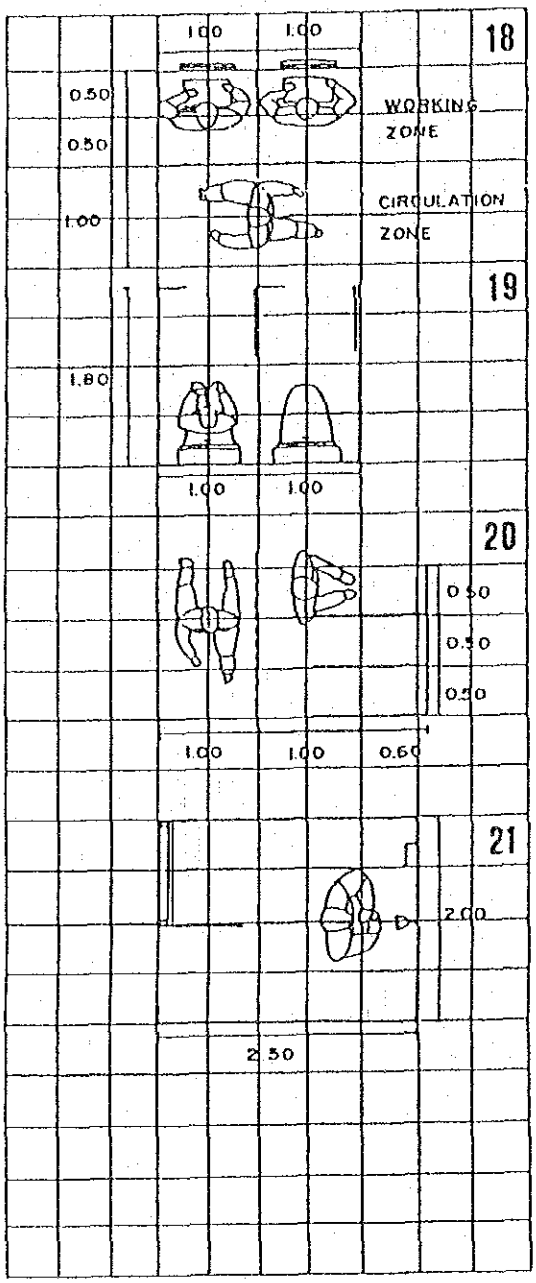
total = 9.00 m^2

AREA ANALYSIS

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ANALYZE :

FUNCTION & AREA REQUIREMENT



Toilet area

Lavator

approximate = 1.00+1.00/unit

back circulation = 1.00+(1.00/unit

total = 2.00 m^2/unit

(used for Lavatory, Urinal)

Water Closet

approximate = 1.00+1.80/unit

total = 1.80 m^2/unit

Locker area

Locker set = 0.50+0.60/unit

working area = 0.50+1.00

back circulation = 1.00+(1.00/unit

total area = 2.30 m^2/unit

Shower Room

shower area = 0.90+0.90

circulation 80% = 4.19

total = 5.00 m^2/unit

ROOM REQUIREMENT

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ROOM :

6 C- MS

SECTION : CENTRAL RESEARCH USED
GENERAL USED

DIVISION : RESEARCH DIVISION

USER :

2-3 PERSON
-SCIENTIST
-RESEARCHER
-EXPERT

PRIMARY :

SAMPLE PREPARATION

ARCHITECTURE :

-HEAVY WT.
-HUMIDITY CONTROL
-GAS CYLINDER SPACE

SYSTEM :

-AIR CONDITIONAL
-HUMIDITY CONTROLLER

INSTRUMENT :

-6C-MS
-HUMIDITY CONTROLLER

FURNITURE :

-CHEMICAL CABINET
-ELECTRIC FAN

ELECTRIC :

10 A
25 KW

REMARK :

HUMIDITY 60 %

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ROOM REQUIREMENT

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ROOM :
ATOMIC ABSORPTION

SECTION :
CENTRAL RESEARCH USAD

DIVISION :
RESEARCH

USER :
2-3 PERSON
-SCIENTIST
-RESEARCHER
-EXPERT

PRIMARY :
ANALYSIS OF HEAVY METALS
BY USING AAS. TECHNIQUE

ARCHITECTRE :
-FLOOR MATERIAL
MADE OF ACID RESISTANCE
MATERIAL

SYSTEM :
-SPLIT TYPE AIR CONDITIONAL
-FUME HOOD WITH ACID
RESISTANCE MATERIAL AND
GOOD VENTILLATION

INSTRUMENT :
-AAS
-AUTO ANALYZER
-HOT AIR OVEN

FURNITURE :
-2 SINK
-PREPARATION
SAMPLE COUNTER
-CHEMICAL REAGENT
& GLASSWAER
CABINET
-ELECTRIC FAN
-BLOWER
-CHAIR

ELECTRIC :
10A

REMARK :
HUMIDITY
40%

277

ROOM REQUIREMENT

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ROOM :
PREPARATION RM.

SECTION : WATER POLLUTION

DIVISION : RESEARCH

USER :
4-5 PERSON
-SCIENTIST
-TECHNICIAN
-TRAINEE

PRIMARY :
PREPARATION OF MEDIUM FOR CULTURE

ARCHITECTRE :
-ACID RESISTANCE FLOOR
-VIBRATION PROTECTION

SYSTEM :
GOOD VENTILATION

INSTRUMENT :
-BALANCE
-ANALYTICAL BALANCE
-PH METER
-HOT PLATE
-REFRIGERATOR
-CART
-SILICA GEL
-BLENDER

FURNITURE :
-CABINET
-5 SINKS
-COUNTER
-ANALYTICAL BALANCE COUNTER
-CHAIR

ELECTRIC :
100 W, 1AMP
4 SMP

REMARK :
HUMIDITY 50 %

ROOM REQUIREMENT

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ROOM : PREPARATION RM. (2)

SECTION : AIR, TOXIC SUBSTANCE , SOLID WASTE

DIVISION : RESEARCH

USER :
2-3 PERSONS
-SCIENTIST
-RESEARCHER
-TECHNICIAN
-TRAINEE

PRIMARY :
PREPARATION OF SAMPLE BY USING HEAT

ARCHITECTURE :
-VIBRATION PROTECTION

SYSTEM :
-AIR VENTILATION
-AIR CONDITIONAL
-TEMPERATURE AND HUMIDITY CONTROL

INSTRUMENT :
-ANALYTICAL BALANCE
-SILICA GEL
-CART
-BLENDER

FURNITURE :
-COUNTER FOR ANALYTICAL BALANCE
-CHEMICAL CABINET
-CHAIR
-COUNTER FOR SAMPLE PREPARATION

ELECTRIC :
15 AMP

REMARK :

279

ROOM REQUIREMENT

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ROOM :
COLD ROOM

SECTION :
CENTRAL RESEARCH USED

DIVISION : RESEARCH &TRAINING

USER :
2-3 PERSONS
-SCIENTIST
-RESEARCHER
-TECHNICIAN

PRIMARY :
SAMPLE PRESERVATION

ARCHITECTRE :
-DOOR 8 INCH
-SPCIAL CEILING AND FLOOR
-INSULATION

SYSTEM :
-AIR CONDITIONAL
-AIR VENTILLATION

INSTRUMENT :
THERMOMETER

FURNITURE :
-COUNTER
-SINK
-CHEMICAL CABINET

ELECTRIC :
15 AMP

REMARK :
TEMP.CONTROL AT 10°

280

ROOM REQUIREMENT

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ROOM : GLASS WASHING ROOM

SECTION : CENTRAL TRAINING USED

DIVISION : TRAINING

USER :

3-5 PERSONS

PRIMARY :

TO CLEAN AND STERILE THE GLASSWARE

ARCHITECTURE :

EASY TO CLEAN

SYSTEM :

GOOD VENTILATION FOR CIRCULATING THE HOT AIR FROM AUTOCLAVE

INSTRUMENT :

-AUTOCLAVE
-HOT AIR OVEN
-DISTRILLED WATER EQUIPMENT
-CART

FURNITURE :

-COUNTER
-SINK
-CABINET FOR GLASSWARES AND CHEMICALS

ELECTRIC :

30 AMP
10 AMP

REMARK :

281

ROOM REQUIREMENT

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ROOM : HOT ROOM (1)

SECTION : WATER POLLUTION

DIVISION : RESEARCH & TRAINING

USER :
2-3 PERSON
-SCIENTIST
-RESEARCHER
-TECHNICIAN
-TRAINEE

PRIMARY :
SAMPLE PREPARATION
-EXTRACTION

ARCHITECTURE :

SYSTEM :
AIR VENTILATION

INSTRUMENT :
-WATER BATH
-PH METER
-HOOD
-EVAPORATION
-EXTRACTION
APPARATUS
-CENTRIFUGE
-INCUBATOR
-VACCUUM FURNACE
-TAP-PAN
ANALYTICAL BALANCE

FURNITURE :
-SINK
-CHEMICAL CABINET
-FAN
-CHAIR
-COUNTER

ELECTRIC :
15 AMP,
10 AMP,
15 AMP

REMARK :

ROOM REQUIREMENT

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ROOM : HOT RM.(2)

SECTION : AIR,TOXIC SUBSTANCE, SOLID WASTE

DIVISION : RESEARCH AND TRAINING

USER :
-SCIENTIST
-RESEARCHER
-TRAINEE

PRIMARY :
SAMPLE PREPARATION :
EXTRACTION

ARCHITECTURE :

SYSTEM :
AIR VENTILATION

INSTRUMENT :
-WATER BATH
-PH METER
-HOOD

FURNITURE :
-SINK
-CHEMICAL AND GLASS-WARE CABINET
-ELECTRIC FAN
-SAMPLE PREPARATION COUNTER
-CHAIR

ELECTRIC :
5 AMP, 10 AMP, 15 AMP

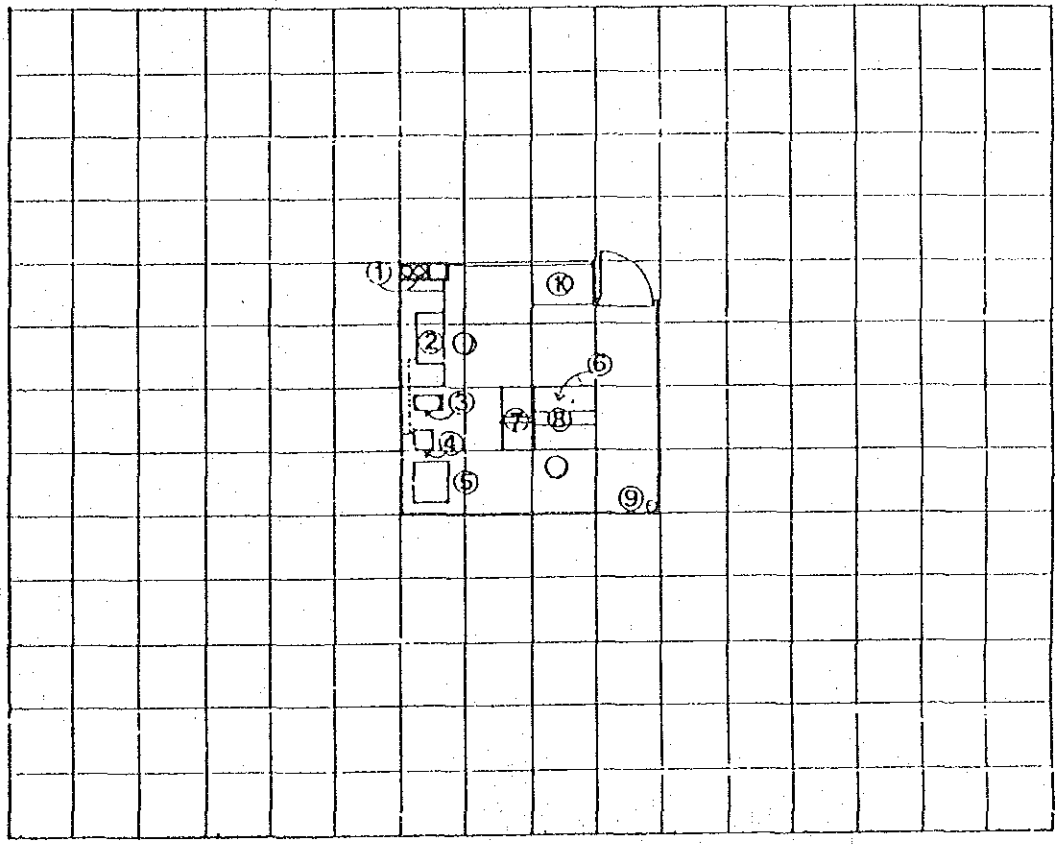
REMARK :

223

LABORATORY PLANNING

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ROOM TYPE :
ATOMIC ABSORPTION SPM.



KEYPLAN :

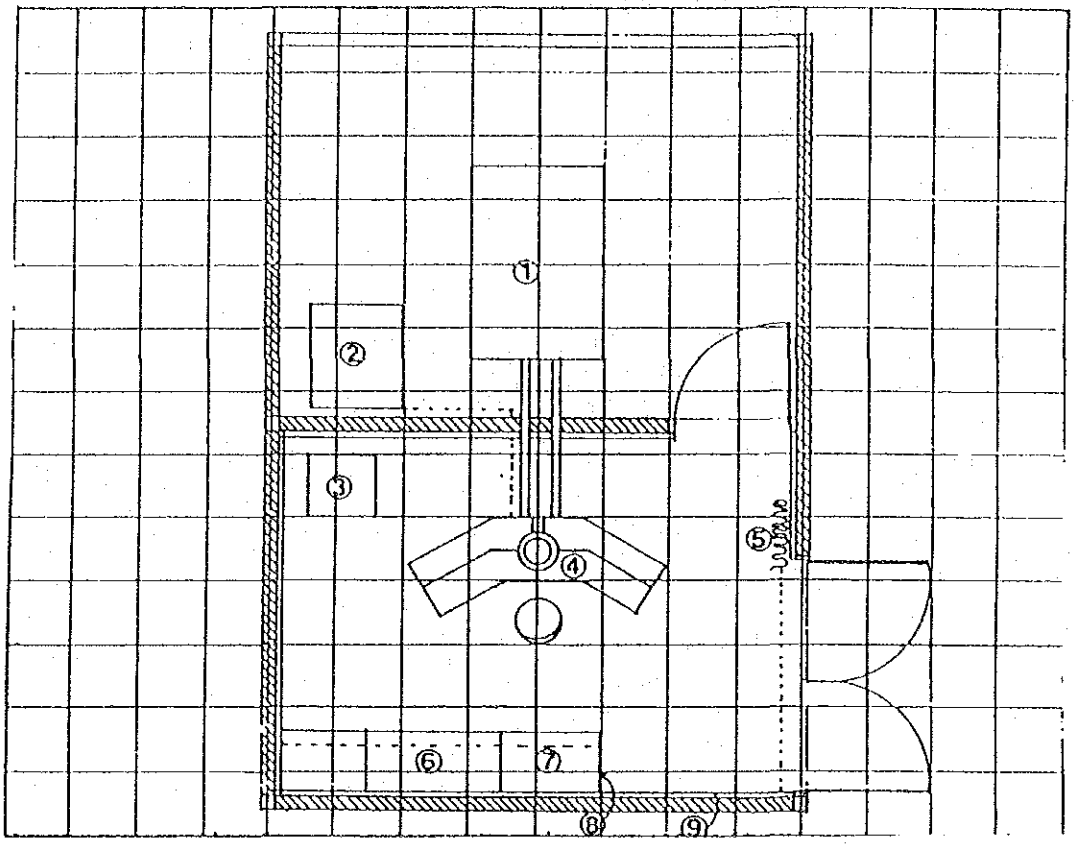
1. GAS CYLINDER
2. AAS
3. AIR PUMP
4. INTEGRATOR
5. HOT AIR OVEN
6. STIRRING HOT PLATE
7. SINK
8. LAB COUNTER
9. FIRE EXTINGUISHER
10. GLASSWARE CABINET

LABORATORY PLANNING

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ROOM TYPE :

ELECTRON MICROSCOPE



KEYPLAN

1. COOLING UNIT
2. POWER SUPPLY
3. HUMIDIFIER
4. TEM OR SEM
5. BLACK CURTAIN
6. WORKING SPACE
7. STEREO MICROSCOPE

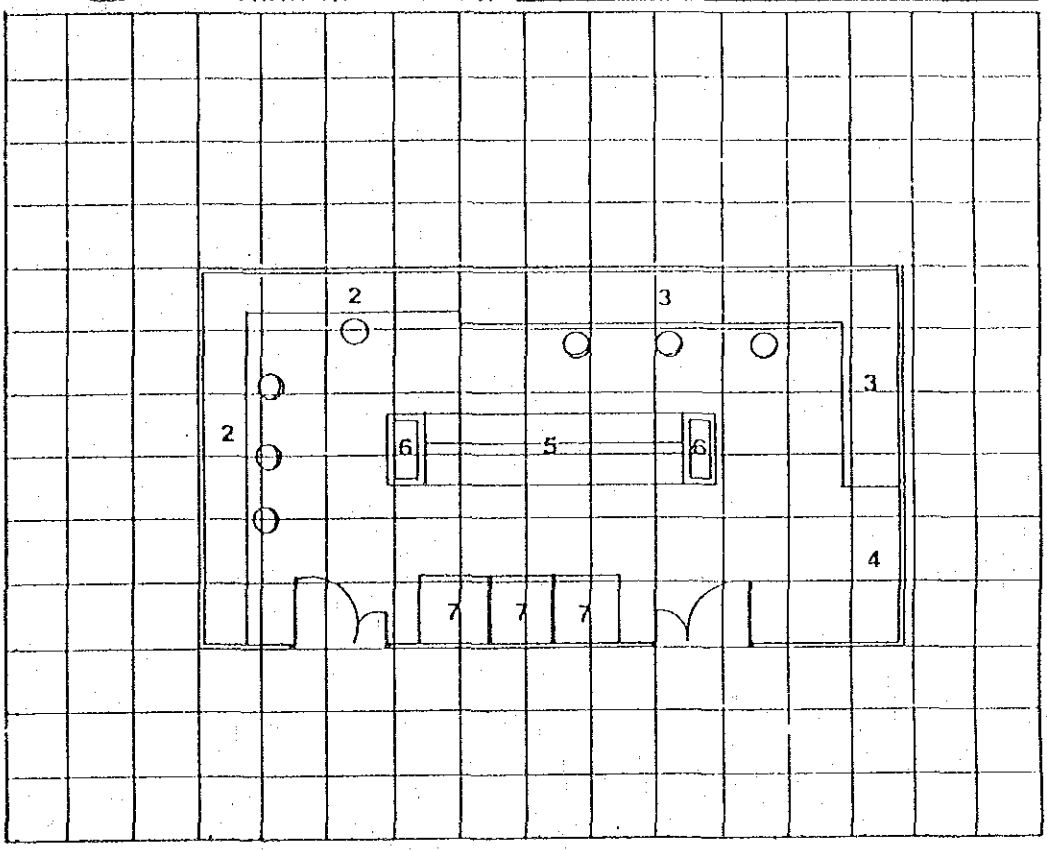
285

LABORATORY PLANNING

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ROOM TYPE :

INSTRUMENT ROOM



KEYPLAN :

1. HUMIDITY SENSOR
2. OFFICE COUNTER
3. COUNTER FOR ANALYTICAL BALANCE
4. CUPBOAED FOR CHEMICAL AND GLASSWARE
5. LAB COUNTER
6. SINK
7. EQUIPMENT SPACE

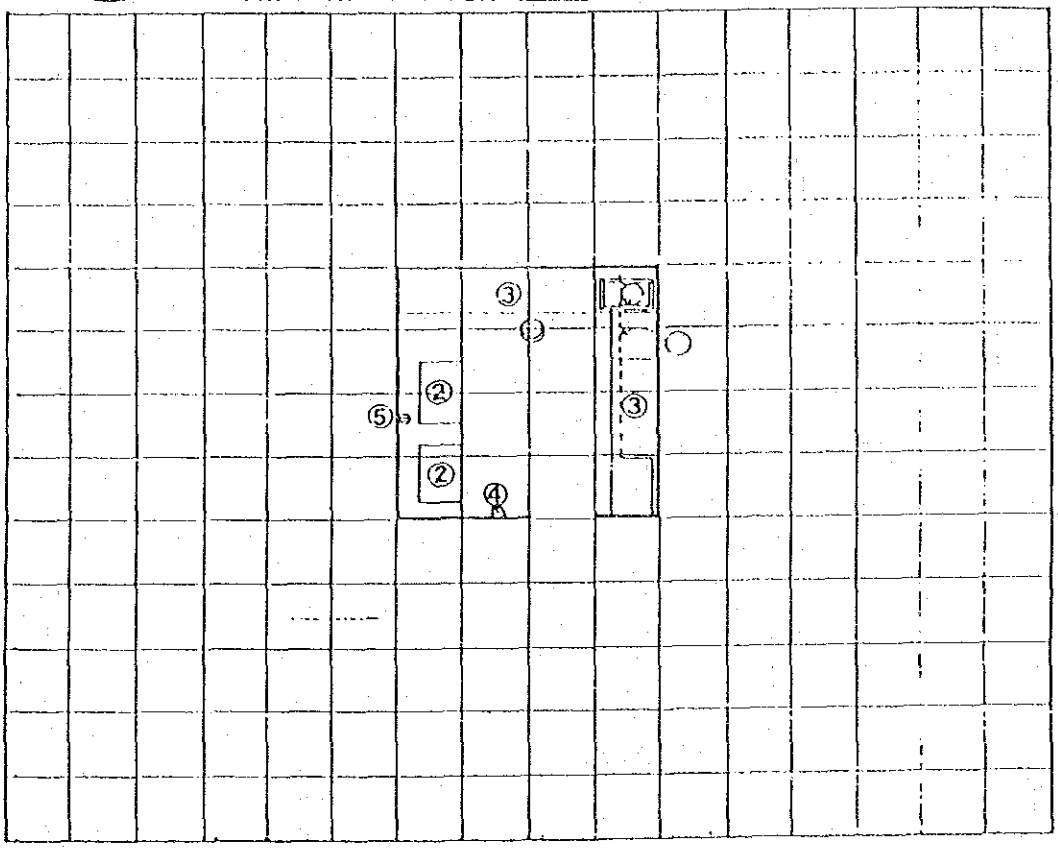
286

LABORATORY PLANNING

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ROOM TYPE :

EQUIPTMENT STOR.



KEYPLAN :

1. SINK
2. WORKING COUNTER
3. EQUIPMENT CABINET
4. FIRE EXTINGUISHER
5. PLUG
6. SIDE BOARD

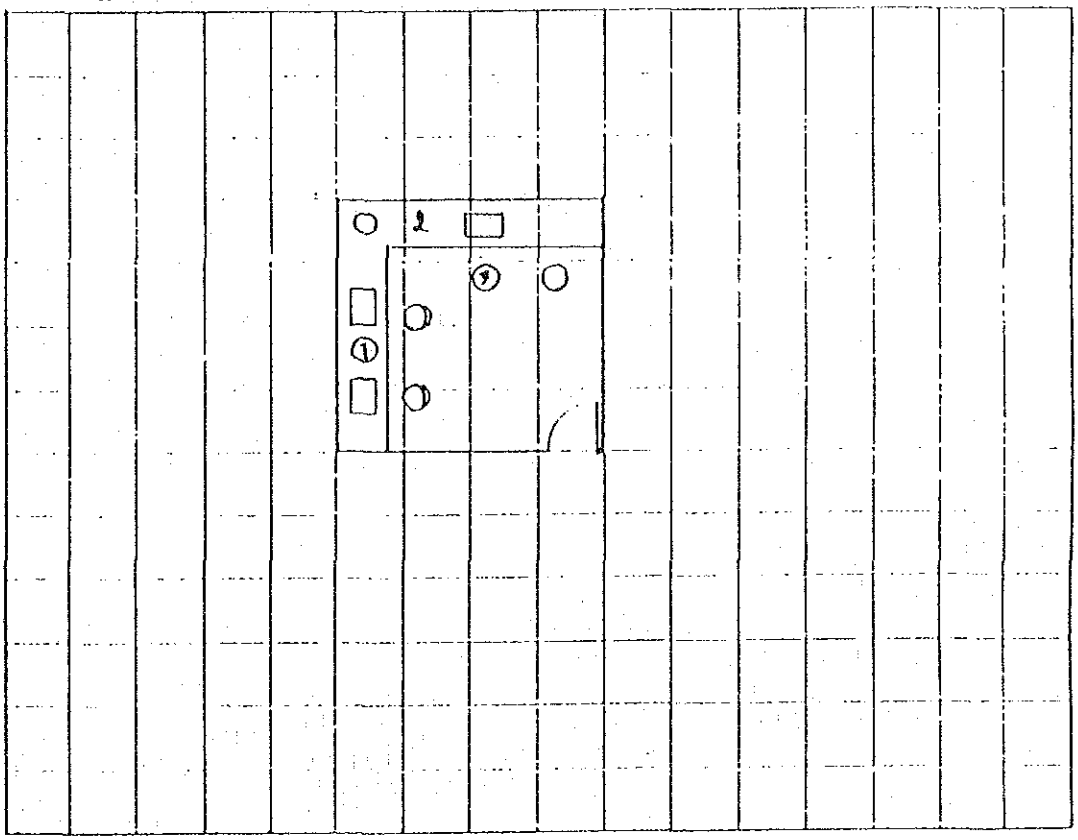
287

LABORATORY PLANNING

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ROOM TYPE :

PREPARATION RM.(2)



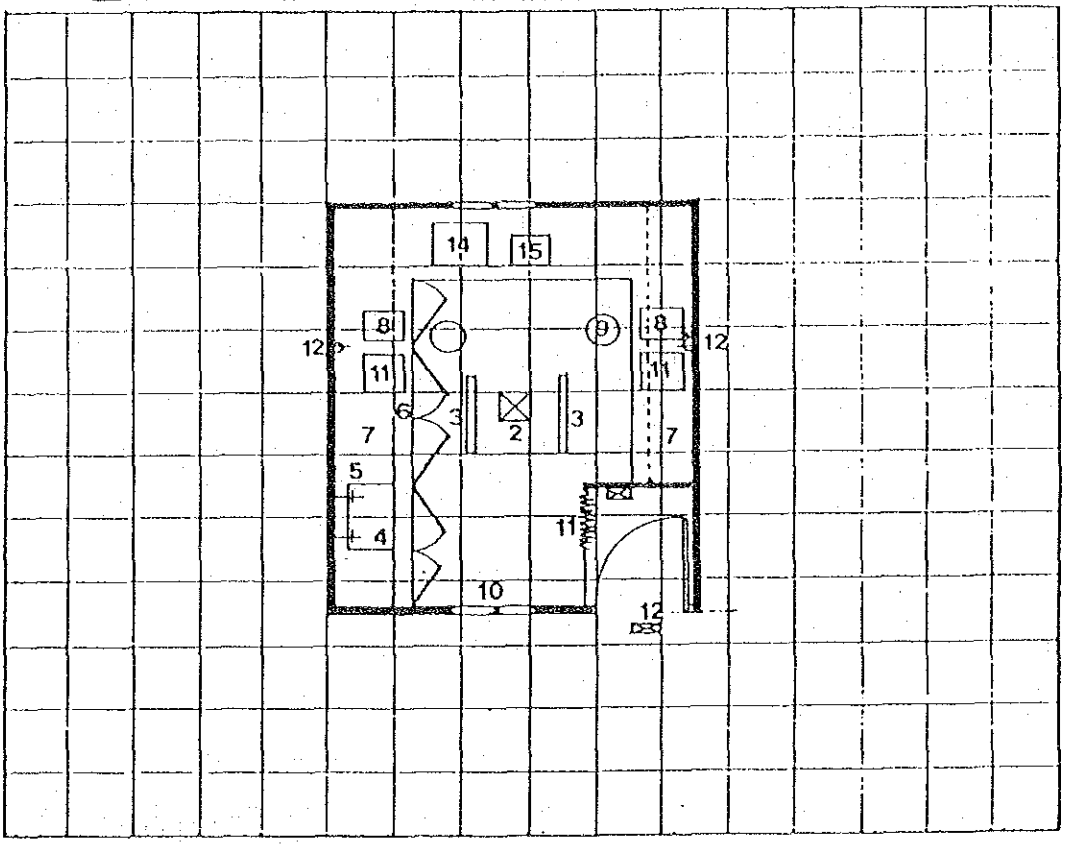
KEYPLAN

1. COUNTER
2. EQUIPMENT COUNTER
   - BLENDER
   - ANALYTICAL BALANCE
   - CELLGAR GEL
   - CART
3. CHAIR

LABORATORY PLANNING

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ROOM TYPE :



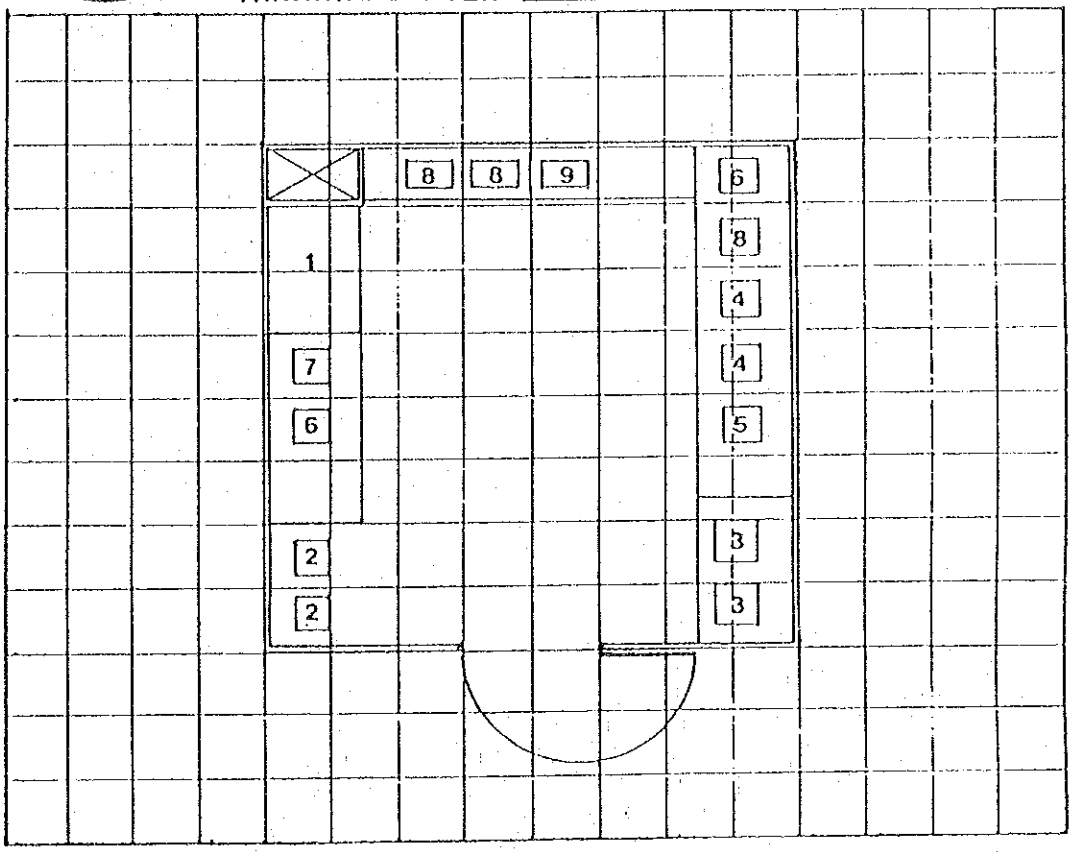
KEYPLAN :

LABORATORY PLANNING

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ROOM TYPE :

HEATING RM.



KEYPLAN :

1. FUME HOOD
   EQUIPMENT SPACE
2. INCUBATOR
3. CENTRIFUGE
   EQUIPMENT COUNTER
4. AUTOCLAVE
5. ELECTRIC FURNACE
6. ULTRASONIC BATH
7. WATER BATH
8. OVEN
9. EXTRACTION APPARATUS

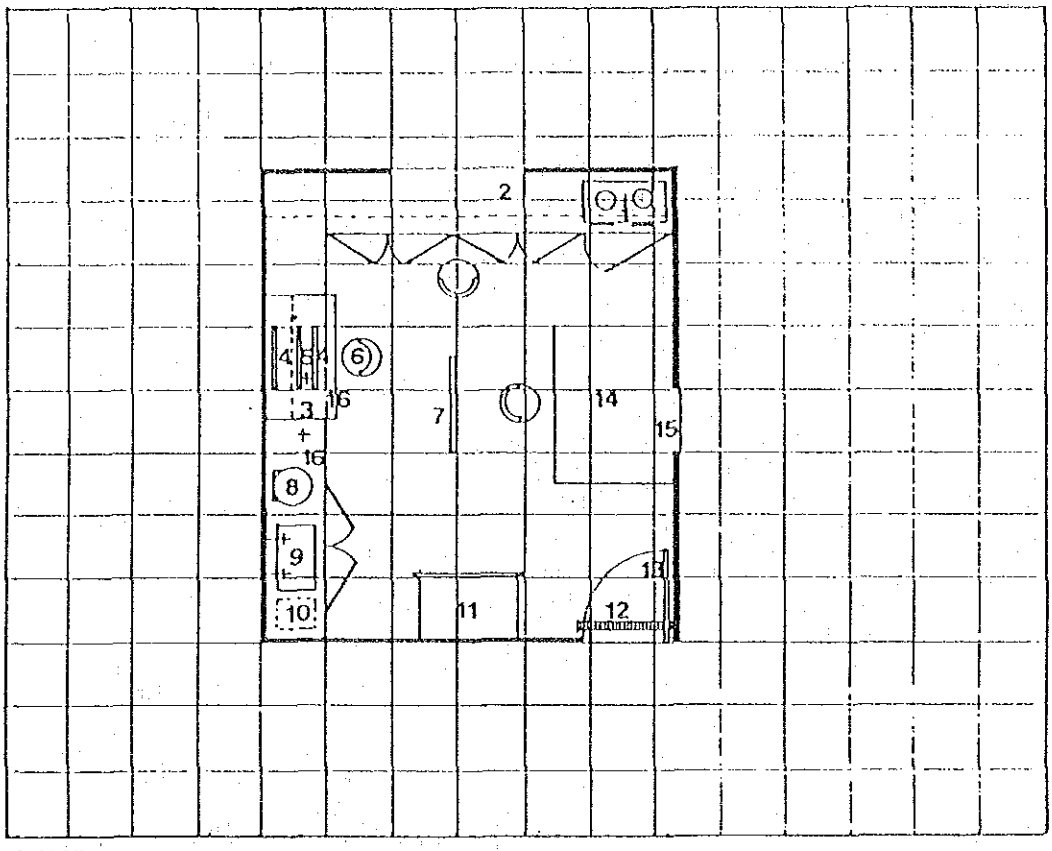
290

LABORATORY PLANNING

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ROOM TYPE :

PEPARATION RM. (1)



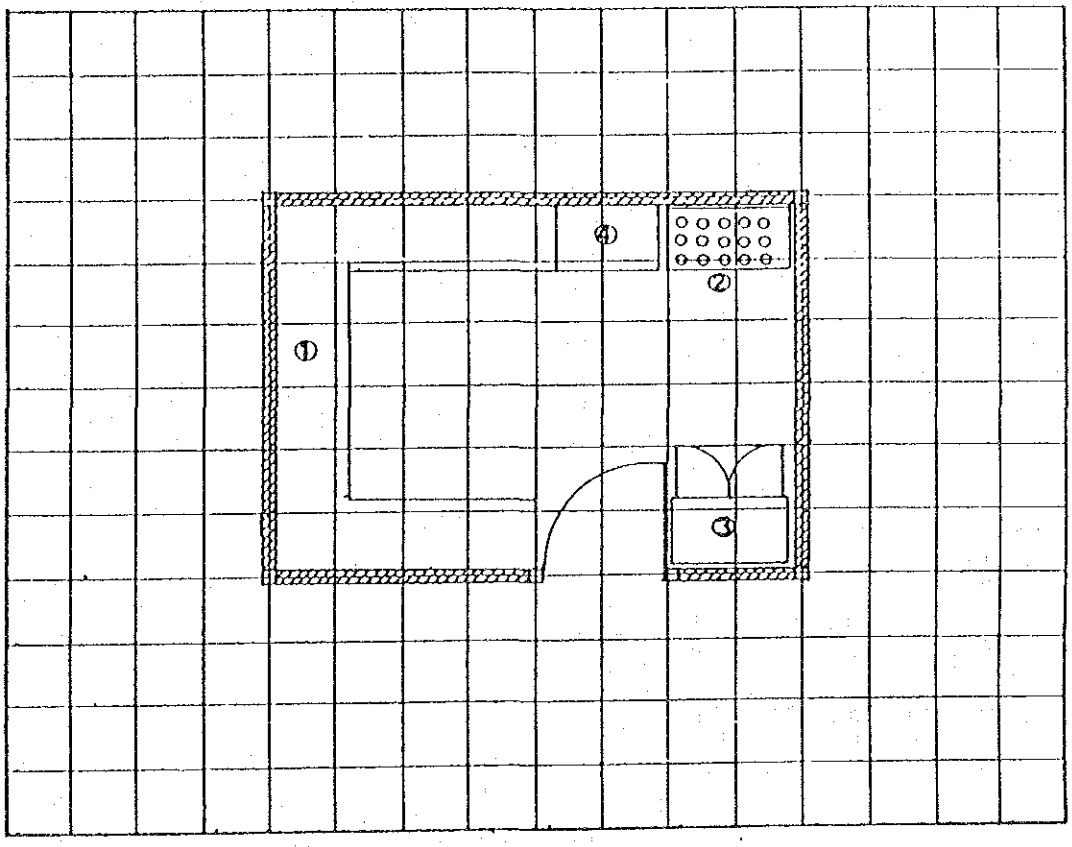
KEYPLAN :

LABORATORY PLANNING

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ROOM TYPE :

CULTURE ROOM



KEYPLAN

1. CABINET FOR CULTURE BOTTLE WITH TIMER AND FLUORESENCE LAMP
2. SHAKER
3. CABINET
4. CENTRIFUGE

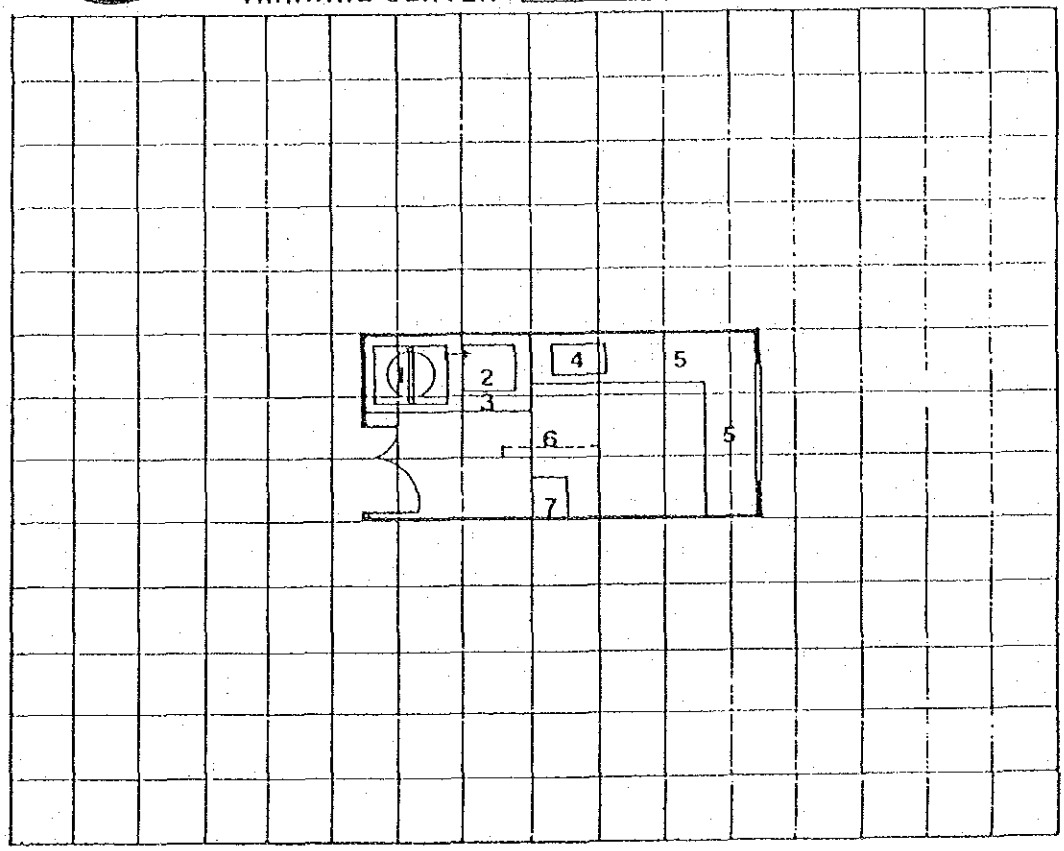
292

LABORATORY PLANNING

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ROOM TYPE :

HOT RM.
EXCEPT IN HOT RM. (2)



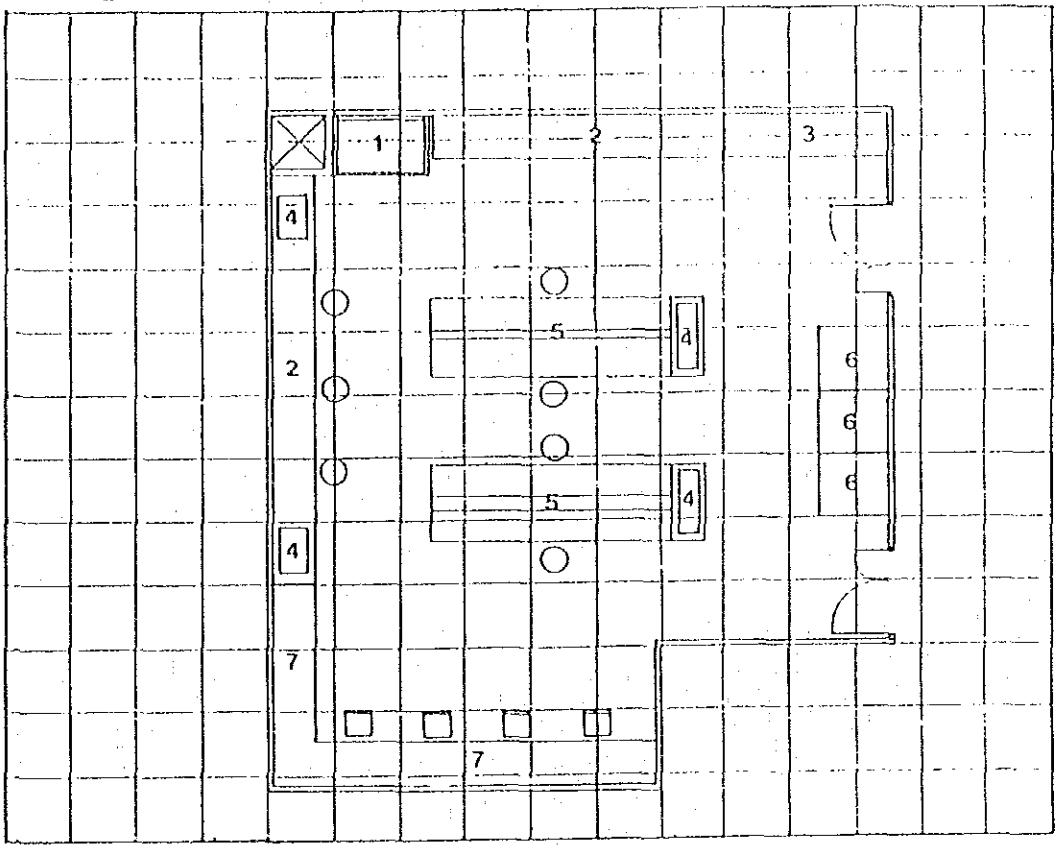
KEYPLAN :

1. WATER BATH
2. EVAPOLATOR
3. HOOD
4. pH METER
5. EXTRACTION APPARATUS
6. CENTRIFUGE
7. INCUBATOR

LABORATORY PLANNING

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ROOM TYPE :
DIAGNOSIC RESEARCH LABOLATORY
(PHYSICAL, CHEMICAL, BIOLOGICAL)



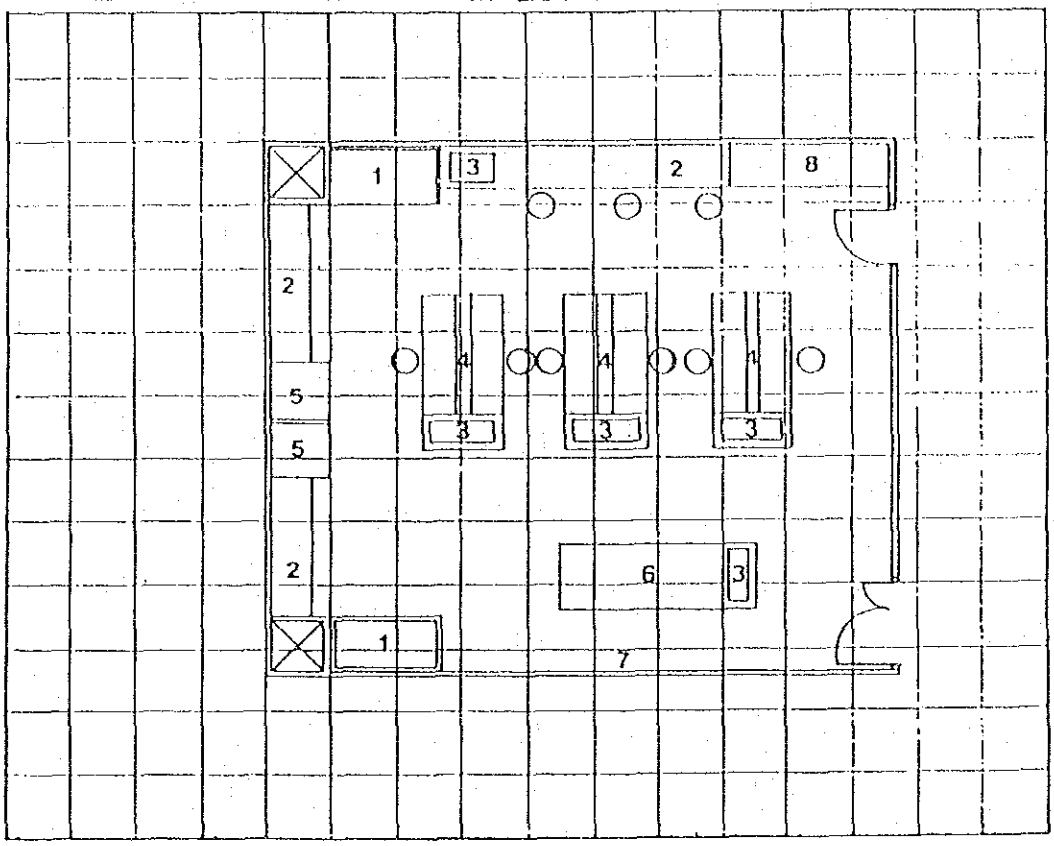
KEYPLAN :

1. FUME HOOD
2. EQUIPMENT COUNTER
3. CHEMICAL AND GLASSWARE CABINET
4. SINK
5. LAB COUNTER
6. EQUIPMENT SPACE
7. OFFICE COUNTER

LABORATORY PLANNING

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ROOM TYPE :
DIAGNOSIC TRAINING LABORATORY
(PHYSICAL , CHEMICAL, BIOLOGICAL)



KEYPLAN :

1. FUME HOOD
2. EQUIPMENT COUNTER
3. SINK
4. LAB COUNTER
5. EQUIPMENT SPACE
6. DEMONSTRATION COUNTER
7. BLACK BOARD
8. CHEMICAL AND GLASSWARE CABINET

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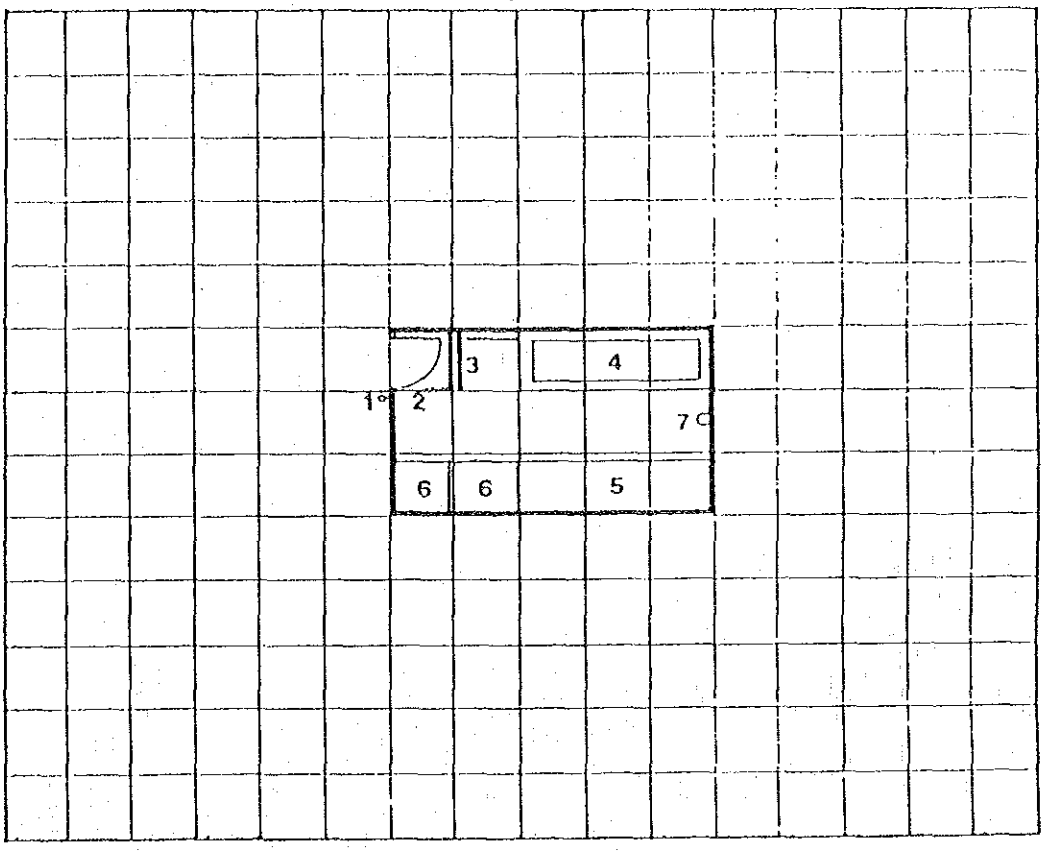
LABORATORY PLANNING

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ROOM TYPE :

DARK ROOM



KEYPLAN :

1. WORKING LIGHT
2. BLACK CURTAIN
3. PHOTO HANGER
4. SINK
5. WORKING COUNTER
6. CABINET
7. FIRE EXTINGUISHER

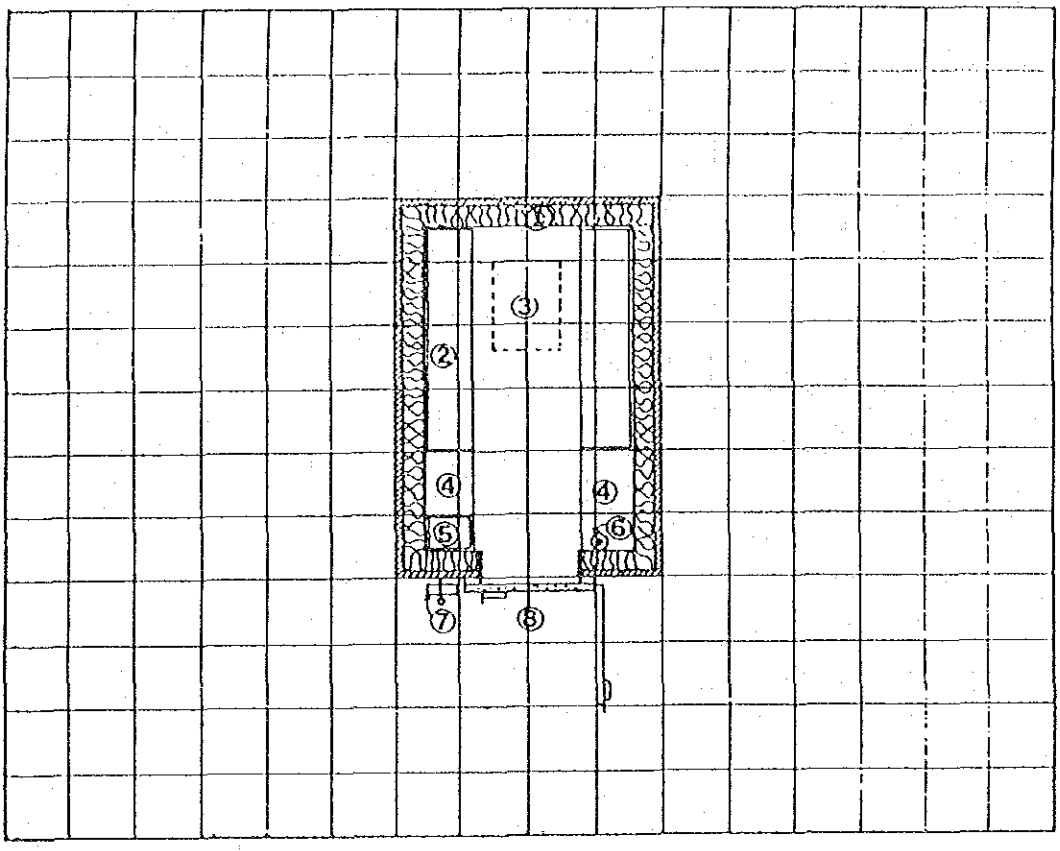
296

LABORATORY PLANNING

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ROOM TYPE :

COLD RM.



KEYPLAN :

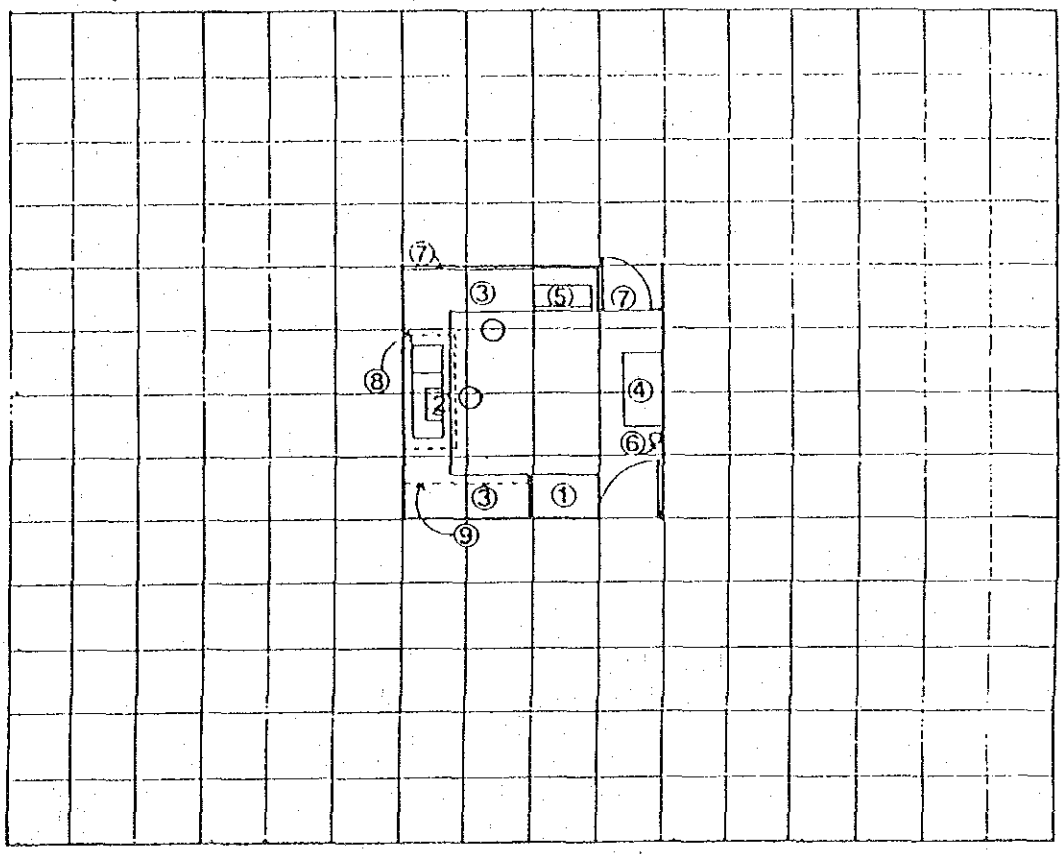
1. INSULATOR
2. CABINET
3. AIR CONDITIONER
4. LAB COUNTER
5. SINK
6. SMERGENCY SWITCH
7. ELECTRIC BOARD
8. DOOR

LABORATORY PLANNING

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ROOM TYPE :

GLASS WASHING AND STOR RM.



KEYPLAN :

1. SIDE BOARD
2. GLASSWARE CABINET
3. OFFICE COUNTER
4. OVEN
5. SINK
6. FIRE EXTINGUISHER
7. ELECTRIC FAN
8. GLASSWARE CABINET
9. LAB CABINET

AREA REQUIREMENT

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ADMINISTRATION DIVISION

AREA REQUIREMENT

ROOM/FUNCTION	USER		NO ROOM	AREA (M^2)		REFERENCE
	STAFF	VISITER		AREA/ UNIT	TOTAL	
ADMINISTRATIVE DIV.						
DIRECTOR RM.	1	4	1	30	30	AREA ANALYSIS
DEPUTY DIRECTOR RM.	1	4	1	30	30	"
JICA TEAM LEADER RM.	7	-	1	30	30	"
COMMON RM.	7	-	1	25	25	"
SECRETARY RM.	1	-	1	11.20	11.20	"
						"
WAITING RM.	-	6	1	16	16	"
OFFICE RM.						
- CHIEF OF ADMIN.	1	4	1	12	12	"
- STAFF RM.	17	-	1	6	102	"
- INFORMATION COUNTER	1	2-4	1	7.50	7.50	"
TOTAL AREA					121.5	
XEROX - PRINTING RM.	1	-	1	12	12	AREA REQUIREMENT
STORAGE	2	-	1	16	16	"
MEETING RM.	20	-	1	2	40	ARCHITECT DATA
- PREP. RM.	1-2	-	1	9	9	"
TOILET MAN	-	-	1	4	4	(1 UNIT = 1WC
WOMAN	-	-	1	4	4	OR 1UR +LAV)
SERVICE SECT.						
FIRST AID RM.	1	4	1	20	20	
CAFETERIA	143	40	1	330	330	
PARKING	49	12	1	25.30	1800	

299

AREA REQUIREMENT

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ADMINISTRATION DIVISION

AREA REQUIREMENT

ROOM/FUNCTION	USER		NO ROOM	AREA (M^2)		REFERENCE
	STAFF	VISITER		AREA/ UNIT	TOTAL	
WORK SHOP	3	-	1	30	90	WORKING REQUIREMENT
OFFICE'S TECHNICIAN	3	-	1	5	15	"
STORAGE	3	-	1	30%	30	"
ELECTRONIC WORK SHOP & ENGINEER OFFICE	2	-	1	30	60	"
ELECTRONIC STOR	2	-	1	9	9	"
REQUESTING RM. FOR CHEMICALS	3	-	1	30	30	"
STATIONARY STOR	2	-	9	25	25	"
CHEMICAL STOR	2	-	1	30	30	"
GAS STOR	2	-	1	30	30	"
ELECTRIC SERVICE RM.	-	-	1	40	40	"
MECHANICAL SERVICE RM.	-	-	1	80	80	"
WATER PUMP				25	25	"
LOCKER	25	-	25	1.35	37.75	"
BATH RM.	25	-	3	5	15	"
WC.	25	-	3	4	12	"
TOTAL					3031.45	
CIRCULATION 30%					909.45	
TOTAL AREA					3940.88	

300

AREA REQUIREMENT

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

INFORMATION AND DOCUMENTARY SERVICE DIVISION

ROOM/FUNCTION	USER		NO ROOM	AREA (M^2)		REFERENCE
	STAFF	VISITER		AREA/ UNIT	TOTAL	
SECT. CHIEF RM.	1	4	1	12	12	AREA REQUIREMENT
WAITING RM.	-	4	1	10	10	"
OFFICE RM.	1	2-4	1	7.5	7.5	"
MEETING RM.	10	-	1	2	20	"
LIBRARY						
- STAFF RM.	4	2-4	1	34.5	34.5	"
- STACK AREA	-	100	1	150pc./ m^2	41.33	"
- READING AREA	-	100	1	2.7	270	"
- MAINTENANCE-STORAGE	3	-	1	15%	17.25	"
- MEETING HALL	3	2-4	-	9	9	"
TOTAL AREA					480	
AUDIO VISUAL RM.						
- AUDIO VISUAL EQUIP.	-	50	1	2	100	"
- AUDIO VISUAL SERVICE	3	-	1	16	16	"
- STAFF RM.	3	-	1	20	20	"
COMPUTER RM.						
- SERVICE RM.	2	15	1	5	90	"
- DISK STORE RM.	2	-	1	4	4	"
- MEETING HALL	1	2-4	1	4	4	
STAFF RM.	2	-	1	19.5	19.5	"

AREA REQUIREMENT

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

INFORMATION AND DOCUMENTARY SERVICE DIVISION

ROOM/FUNCTION	USER		NO ROOM	AREA (M^2)		REFERENCE
	STAFF	VISITER		AREA/ UNIT	TOTAL	
WC. MAN	-	-	2	4	8	AREA REQUIREMENT
WOMAN	-	-	2	4	8	
TOTAL AREA					799	
CIRCULATION 30%					239.7	
TOTAL AREA FOR INFORMATION AND DOCUMENTARY SERVICE DIVISION					1038.7	

AREA REQUIREMENT

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

RESEARCH AND DEVELOPMENT DIVISION

ROOM/FUNCTION	USER		NO ROOM	AREA (M^2)		REFERENCE
	STAFF	VISITER		AREA/ UNIT	TOTAL	
ADMINISTRATION AREA						
DIRECTOR RM.	1	4	1	24	24	REQUIRED AREA
DEPUTY DIRECTOR RM.	1	4	1	24	24	"
EXPERT RM.	5	4	1	60	60	"
WAITING RM.	-	10	1	25	25	"
MEETING RM.	20	-	1	2/P	40	"
COMMON RM.	20	-	1	1.5/P	30	"
OFFICE RM.	1	2-4	1	7.5	7.5	"
WC. MAN	2	-	2	-	8	"
GENERAL SERVICE						
COMPUTER RM.	6-8	-	1	70	70	"
ELECTRON MICROSCOPE	2	-	2	35	70	"
GC-MS RM.	2-3	-	1	30	30	"
X-RAY FLVORESCENCE	2-3	-	1	30	30	"
ATOMIC ABSORPTION	2-3	-	1	30	30	"
CHROMATOGRAPH	6-8	-	1	64	64	"
INSTRUMENT RM. (2)	6-8	-	1	64	64	"
GAS SUPPLY RM.	1-2	-	1	16	16	"
HEATING RM. (1)	4-6	-	1	30	30	"
DISTRILLING WATER RM.	2-3	-	1	25	25	"
CLEAN RM.	2-3	-	1	40	40	"

203

AREA REQUIREMENT

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

RESEARCH AND DEVELOPMENT DIVISION

ROOM/FUNCTION	USER		NO ROOM	AREA (M^2)		REFERENCE
	STAFF	VISITER		AREA/ UNIT	TOTAL	
COLD STOR RM.	2-3	-	1	24	24	REQUIRED AREA
DARK RM. (1)	2-4	-	1	20	20	"
DARK RM. (2)	2-4	-	1	15	15	"
WATER POLLUTION LAB						
RESEARCH'S OFFICE	9	4	1	76	76	"
CHEMICAL ANALYSIS RM.	6-8	-	1	12/P	96	"
HOT RM.	2-4	-	1	20	20	"
BIOLOGICAL LABORATORY	6-8	-	1	12/P	96	"
CULTURED RM.	2-4	-	1	40	40	"
PREPARATION RM.	4-6	-	1	40	40	"
INSTRUMENT RM.(3)	4-6	-	1	64	64	"
GLASS WASHING STOR RM.	2-4	-	1	30	30	"
GLASS SUPPLY RM.	1-2	-	1	12	12	"
AIR POLLUTION LAB						
RESEARCH'S OFFICE	8	4	1	70	70	"
CHEMICAL ANALYSIS RM.	6-8	-	1	12/P	96	"
HOT RM.	2-4	-	1	18	20	"
PHYSIC LABORATORY	6-8	-	1	12/P	96	"
EQUIPMENT STOR	2-4	-	1	16	16	"
PREPARATION RM. (2)	4-6	-	1	16	16	"
GLASS WASHING & STOR RM.	2-4	-	1	30	30	"

AREA REQUIREMENT

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ROOM/FUNCTION	USER		NO ROOM	AREA (M^2)		REFERENCE
	STAFF	VISITER		AREA/ UNIT	TOTAL	
NOISE POLLUTION LAB						
RESE RCHER'S OFFICE	8	-	1	70	70	REQUIRED AREA
NOISE LABORATORY	8-10	-	1	12/P	120	"
NOISE EQUIPMENT RM.	2-4	-	1	20	20	"
NOISE MODEL LAB	6-8	-	1	100	100	"
TOXIC SUBSTANCE LAB						
RESEARCHER'S RM.	8	-	1	70	70	"
TOXIC SUBSTANCE ANALYSIS	6-8	-	1	12/P	96	"
POISONS RESEARCH LAB	6-8	-	1	12/P	96	"
PREPARATION RM. (2)	4-6	-	1	16	16	"
INSTRUMENT RM. (4)	2-4	-	1	36	36	"
HOT RM.	2-4	-	1	20	20	"
GLASS WASHING STOR RM.	2-4	-	1	30	30	"
GAS SUPPLY RM.	1-2	-	1	12	12	"
SOLID WASTE LAB						
RESEARCHER'S OFFICE	8	-	1	70	70	"
SOLID WASTE ANALYSIS RM.	8-10	-	1	12/P	96	"
HOT RM.	2-4	-	1	18	20	"
PREPARATION RM. (2)	4-6	-	1	16	16	"
GLASS WASHING & STOR RM.	2-4	-	1	30	30	"
LOCKER & BATH RM. + WC.	81	-	2	-	199.35	"
TOTAL					2681.85	

AREA REQUIREMENT

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ROOM/FUNCTION	USER		NO ROOM	AREA (M^2)		REFERENCE
	STAFF	VISITER		AREA/ UNIT	TOTAL	
CIRCULATION 30%					804.5	
TOTAL AREA FOR RESEARCH LAB					3486.4	

AREA REQUIREMENT

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ENVIRONMENTAL TECHNOLOGY

TRAINING DIVISION

ROOM/FUNCTION	USER		NO ROOM	AREA (M^2)		REFERENCE
	STAFF	VISITER		AREA/ UNIT	TOTAL	
ADMINISTRATION AREA						
DIRECTOR RM.	1	4	1	24	24	REQUIRED AREA
DEPUTY DIRECTOR RM.	1	4	1	24	24	"
JICA EXPERT RM.	1	4	1	24	24	"
COMMON RM.	20	-	1	30	30	"
WAITING RM.	-	10	1	25	25	"
MEETING RM.	20	-	1	20/P	40	"
STAFF RM.	1	2-4	1	7.5	7.5	"
WC.	3	-	2	4	8	"
TRAINING DIV.						
1. LECTURE AREA						
DIRECTOR RM.	1	4	1	12	12	"
SECTION RM.	17	-	1	6	102	"
SECTION CHIEF RM.	1	4	1	12	12	"
STAFF RM.	6	-	1	6	36	"
MEETING HALL	-	4	2	16	32	"
LECTURE RM.	2-4	25	4	60	240	"
MEETING RM.	2-4	25	3	63	189	"
STUDY RM.	2-4	25	2	60	120	"
WC. MAN	-	-	2	-	20	"
WOMAN	-	-	2	-	20	"

AREA REQUIREMENT

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ROOM/FUNCTION	USER		NO ROOM	AREA (M^2)		REFERENCE
	STAFF	VISITER		AREA/ UNIT	TOTAL	
2. LABORATORY TRAINING						
SECTION CHIEF RM.	1	4	1	12	12	REQUIRED AREA
STAFF RM.	17	-	1	6	102	"
MEETING RM.	-	4	1	16	16	"
INSTRUMENT RM.	2-4	8-10	1	64	64	"
HEATING RM.	2-4	8-10	1	40	40	"
PRACTICE RM.						
- CHEMICAL ANALYSIS RM.	2-4	8-10	1	10/P	100	"
- HOT RM.	2-4	4-6	1	20	20	"
- BIOLOGICAL LABORATORY	2-4	8-10	1	10/P	100	"
- EULTURED RM.	2-4	4-6	1	5/P	40	"
PRACTICE RM. B						
- CHEMICAL ANALYSIS RM.	2-4	8-10	1	10/P	100	"
- HOT RM.	2-4	4-6	1	20	20	"
- PHYSIC LABORATRY	2-4	8-10	1	10/P	100	"
- EQUIPTMENT STOR	2-4	4-6	1	20	20	"
PRACTICE RM. C						
- NOISE LABORATORY	2-4	10-15	1	10/P	150	"
- NOISE EQUIPTMENT STOR	-	4-6	1	20	20	"
PRACTICE RM. D						
- CHEMICAL ANALYSIS LAB	2-4	10-15	1	10/P	150	"
- HOT RM.	-	4-6	1	20	20	"

AREA REQUIREMENT

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

ROOM/FUNCTION	USER		NO ROOM	AREA (M^2)		REFERENCE
	STAFF	VISITER		AREA/ UNIT	TOTAL	
PRACTICE RM. E						
- SOLID WASTE ANALYSIS	2-4	15-18	1	10/P	180	REQUIRED AREA
- HOT RM.	-	4-6	1	20	20	"
STERILIZE RM.	2-4	-	1	25	25	"
GLASS WASHING RM.	6	-	1	25	25	"
GLASS WARE STOR	6	-	1	25	25	"
CLEAN RM.	4-6	-	1	40	40	"
CHEMICAL STOR	6-10	-	1	25	25	"
GAS SUPPLY RM.	1-2	-	1	16	16	"
PREPARATION RM.	-	6-8	1	40	40	"
LOCKER + BATH + WC	73	55	3	-	322.80	"
WC MAN	-	-	2	-	18	"
LADY	-	-	2	-	16	"
TOTAL					2792.3	
CIRCULATION 30%					837.69	
TOTAL AREA					3630	

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AREA REQUIREMENT

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

TOTAL AREA REQUIREMENT

TOTAL AREA REQUIREMENT FOR ENVIRONMENTAL RESEARCH AND TRAINING CENTER

MAIN ELEMENT	ELEMENT	AREA/M^2	TOTAL
ADMINISTRATIVE SECTION	ADMINISTRATION AREA	356.7	
	SERVICE AREA	544.75	
	CAFETERIA	330	
	PARKING AREA	1800	3031.45
INFORMATION AND DOCUMENTARY SERVICE DIVISION	LIBRARY + ADMINISTRATION AREA AND CENTRAL SERVICE	545.5	
	AUDIO VISUAL RM.	136	
	COMPUTER RM.	117.5	799
RESEARCH AND DEVELOPMENT DIVISION	ADMINISTRATION AREA AND CENTRAL SERVICE	746.5	
	WATER POLLUTION LAB	474	
	AIR POLLUTION LAB	344	
	NOISE POLLUTION LAB	310	
	TOXIC SUBSTANCE LAB	376	
	SOLID WASTE LAB	431.35	2681.85
ENVIRONMENTAL TECHNOLOGY TRAINING DIVISION	ADMINISTRATION AND CENTRAL LAB	838.3	
	THEORETICAL TRAINING	783	
	LAB TRAINING	1180	2801.3
TOTAL AREA			9313.6
TOTAL AREA + CIRCULATION 30%			12107.68

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USER ANALYSIS

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

Man Power

Organization	Degree	Diploma	Permanent Staff	Total
Administrative Division	11	19	32	62
-Administrative Section	5	4	6	15
-Finance and Supply Section	5	4	6	15
-Maintenance and Repairing Section	3	4	5	12
-Welfare Section	3	2	5	10
-Service Section	3	2	5	10
Information and Documentary Service	7	3	1	11
-Computer Section	1	1	-	2
-Information and Extention Section	5	1	1	7
-Intercalibration Section	1	1	-	2
Training Division	10	16	4	30
-Planning and Training Section	5	4	1	10
-Evaluation Section	2	7	1	10
-Technical and Scientific Equipment Section	3	5	2	10
Analytical Service Division	20	26	7	53
-Water Quality Analytical Section	4	9	2	15
-Air Quality Analytical Section	3	6	1	10
-Toxic Substance Analytical Section	4	4	2	10
-Solid Waste and Hazardous Waste Analytical Section	4	4	1	9
-Noise and Vibration Analytical Section	5	3	1	9
Research and Development Division	45	18	11	74
-Water Quality Research Section	10	5	3	18
-Air Quality Research Section	9	2	2	13
-Toxic Substance Research Section	10	5	3	18
-Solid Waste and Hazardous Waste Research Section	9	4	2	15
-Noise and Vibration Research Section	7	2	1	10
Total	88	48	94	230

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USER ANALYSIS

ENVIRONMENTAL RESEARCH AND TRAINING CENTER

Training Program

Item	Course	number		
		trainee	weeks	times/year
Water Pollution	Water Pollution I	40	8	4
	Water Pollution II	20	8	2
	Water Pollution III	45	4	3
Air Pollution	Air Pollution I	40	8	4
	Air Pollution II	40	8	4
	Air Pollution III	45	4	3
Noise Pollution	Noise Pollution	20	4	2
Solid Waste	Solid Waste I	20	4	2
	Solid Waste II	45	6	3
Toxic Substance	Toxic Substance I	30	8	3
	Toxic Substance II	30	8	3
Environmental Administration	Environmental I Administration	60	4	3
Environmental Administration	Environmental II Administration	60	2	3

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