

付 属 資 料

- I. Minutes of Meeting (Dec. 16, 1983)
- II. Memo of Discussion (Dec. 14, 1983)
- III. 事前調査団の質問及びMWWAの回答
- IV. Preliminary Project Proposal For Assistance (MWWA)
- V. MWWAの現行トレーニング内容
- VI. 実施調査団のためのR/D試案
- VII. 実 施 計 画
- VIII. 参 考 文 献

タイ水道技術訓練センター事前調査帰国報告

昭和58年12月19日

1. 調査目的・概要

タイ国では水道施設の行政、運営、保守、管理等に必要な人材が極端に不足しているため、MWWA 水道技術訓練センターに対し、設備の拡充、教育訓練計画の拡充、技術者の研修等に対する技術協力を我が国に要請越した。これを受け、プロジェクトの具体的内容及び我が国の協力事項等プロジェクト協力の可能性に必要な事項について調査協議を行ない、その結果をミニッツにとりまとめた。

2. 調査の日程

昭和58年12月6日(火)～同年12月20日(火)

3. 調査団の編成

- 1) 団 長 佐谷戸 安 好 (総括及び水質)
- 2) 団 員 岡 澤 和 好 (訓練計画)
- 3) " 北 原 健 次 (建物及びろう水)
- 4) " 坂 口 功 (機械及び電気機械)
- 5) " 松 永 龍 児 (協力企画及び業務調整)

4. 調査内容

- 1) MWWA 水道訓練センター設置計画に関し、その目的、意図、規模、必要性等を明らかにすること。
- 2) センター計画の実施に際しての問題点と解決の方途を明らかにすること。
- 3) MWWA 側の状況等を踏まえ、かつ、センタープロジェクトの趣旨に沿った、適切な協力計画を検討、作成すること。

5. 調査結果

(1) MWWA 水道訓練センター計画

MWWA は、現在、バンケン浄水場に隣接して、総務担当副総裁の直轄機関として設けられた訓練センター(T.C.)を有している。このT.C.には、床面積200㎡で2階建の訓練所と160㎡の平屋ワークショップが設置されており、所長以下29名の職員が勤務している。センター内部の訓練職員は所長のほか5名であり、随時内部、外部に講師を求めて訓

練を行っている。ここでは、毎年、60クラス程度の研修を行っており、年間の訓練生は2,000～3,000名に達するが、ほとんどのクラスは3～5日間程度である。

MWWAのT.C.計画では、将来、クラスを段階別に設定し、中上級クラスは期間も長くとして、訓練内容を充実させたいと考えているが、必要なスタッフと訓練用機材が絶対的に不足しており、この分野における日本の協力を求めている。

(2) センター計画の問題点と対応策

- MWWA職員の業務分野は非常に細分化されており、それぞれの職務に応じた訓練計画を設定するとすれば、コースの数が非常に多くなり、講師の業務が繁雑となるおそれがある。そのため、初級レベルの研修（短期）は、タイ側スタッフが担当し、日本側スタッフは、中上級コースの研修を担当するよう業務分担を図り、また、それらの研修コースでは、ある程度の巾をもった訓練内容を取込む必要がある。

なお、特殊な課題については、コースの間を利用して短期のセミナーを行うことも有効と考えられる。

- 訓練計画の実施に当たっては、現施設では規模が小さすぎ、少なくとも現研修施設の2倍程度の施設を設置する必要がある。MWWAでは、これに努力する意向であるが、Budgetingに不安がある。なお、土地については十分な土地が確保されていて、問題はない。
- タイ国においては、PWWAが地方水道を所管しており、このT.C.において、PWWA等他の機関の研修生を受入れることが望ましい。

(3) 協力計画

- 日本人専門家の協力する分野としては次の4分野とする。

水道計画

水処理・衛生

管路維持管理

電気機械設備管理

- タイ側では、日本人専門家に対してカウンターパートほかの協力態勢を整備する。
- MWWAにおいて、必要な建築物の新設を行う。

6. 別 添

ミニッツ

3h classroom Lecture

3h field

6hs/day × 5 days = 1 week

Appendix I

MINUTES OF MEETING
BETWEEN THE JAPANESE PRELIMINARY SURVEY TEAM
AND THE AUTHORITIES CONCERNED OF THE KINGDOM
OF THAILAND ON THE JAPANESE TECHNICAL COOPERATION
FOR THE WATER TECHNOLOGY DEVELOPMENT CENTER

The Japanese Preliminary Survey Team (hereinafter referred to as "the Team") organized by the Japan International Cooperation Agency (hereinafter referred to as "JICA") and headed by Dr. Y. SAYATO (Annex I) visited the Kingdom of Thailand from the 6th December to the 20th December 1983 for the purpose of preliminary survey for the Water Technology Development Center.

During its stay in the Kingdom of Thailand, the Team exchanged views and had a series of discussions with the authorities concerned of the Kingdom of Thailand (Annex II).

As a result of the discussions, the main agreements of both parties were as follows:

1. Main Trainees of this project are engineers, technicians and officials concerned of Metropolitan Water Works Authority (MWWA).
2. Thai side will allocate the budget for the building, facilities, and running costs of Water Technology Development Center.
3. Both Thai and Japanese side agreed to establish four courses in the Center. (Annex III).
 1. Planning
 2. Water Purification and Sanitation
 3. Pipeline Installation and Maintenance
 4. Mechanical and Electrical Installations
4. Thai side will allocate the counterpart personnels (at least one (1) counterpart personnel for each course).

5. Japanese experts will be assigned to transfer technology mainly to MWWA personnels in the Center.

16th December 1983

Bangkok, Thailand

佐藤 安好

Dr. Yasuyoshi SAYATO
Leader
The Preliminary Survey Team
Japan International Cooperation Agency
JICA

Pracha Tansiri

Mr. Pracha TANSIRI
General Manager
The Metropolitan Water
Works Authority
MWWA

(Annex I)

THE PRELIMINARY SURVEY TEAM

1. Team Leader Dr. Yasuyoshi SAYATO
2. Team Member Mr. Kazuyoshi OKAZAWA
3. " Mr. Kenji KITAHARA
4. " Mr. Isao SAKAGUCHI
5. " Mr. Ryuji MATSUNAGA

PROJECT PREPARATION COMMITTEE

Advisor	MR. Tien Katapan
Chairman	Mr. Klahan Voraputhapor
Member	Mr. Suthep Sungpetch
"	Mr Nopahdon Potiyanon
"	Mr. Wisit Tranfong
Member & Secretary	Mr. Sathit Chumjinda

TRAINING PLAN (PROPOSAL)

1. Courses to be established in the Center.

<u>Courses and Sub-courses</u>	<u>Duration</u>	<u>No. of Trainee</u>
A. Planning	24 wks	15-20
A-1 Basic Planning	(8)	
A-2 Facility Planning	(8)	
A-3 Distribution Planning	(8)	
B. Water Purification and Sanitation	24 wks	15-20
B-1 Water Purification Technique	(8)	
B-2 Water Quality Analysis	(8)	
B-3 Water Quality Control	(8)	
C. Pipeline Installation and Maintenance	12 wks	20
C-1 Piping	(4)	
C-2 Pipeline Maintenance	(4)	
C-3 Leakage Inspection	(4)	
D. Mechanical and Electrical Installation	12 wks	20
D-1 Mechanical Installations	(4)	
D-2 Electrical Installations	(4)	
D-3 Instrumentation	(4)	

Note: (i) Respective training course is consisted of 3 sub-courses, and trainee may choose to join a through course or a sub-course.
(ii) A and B course are to be held twice a year, and C and D course are to be held three times a year.

2. Seminars.

Respective training Course would have seminars on special subjects for 30 or 40 engineers, technician or officials concerned. These seminars are to be held with duration in accordance with the necessities.

3. Targets of Training

(1) Planning Course

To cultivate experts who have adequate knowledge and practical abilities to:

- A-1 make a master plan for water supply and basic facility plan including decision of types, structures, capacities and other fundamentals of watersupply facilities,
- A-2 make a detail plan and supervise designing work of water supply facilities, and
- A-3 plan and design a distribution system and its operation.

(2) Water Purification and Sanitation Course

To cultivate experts who have adequate knowledges and practical ability to:

- B-1 direct operations for water purification in conformity to raw water quality,
- B-2 investigate and examine water quality of raw and supplied water, and
- B-3 form a judgement on water safety and sanitation and also set up a water quality control system.

(3) Pipeline Maintenance Course

To cultivate skilled technicians who have adequate knowledges and practical ability to:

- C-1 lay water supply pipes including jointing and valve installations,
- C-2 maintain and repair water pipelines, and
- C-3 practice leakage inspection.

(4) Mechanical and Electrical Installations

To cultivate skilled personnels who have adequate knowledges and practical ability to:

- D-1 understand structures and functions of mechanical equipment for water supply systems, operate and maintain them properly in conformity to supply conditions,
- D-2 understand structures and functions of electrical equipment for water supply systems, operate and maintain them properly in conformity to supply conditions, and
- D-3 understand concepts of instrumentation and make a preliminary design of instrumentation.

4. Curriculum

(1) Planning Course

A-1 Basic Planning

(a) Lectures (Including Audio-Visual Instructions) 120 hrs.

- Introduction of water technology
- Water supply and public health
- Water works management system
- Maintenance and operation system
- Water demand estimate
- Water resources planning
- Lay-out planning
- Structures of water supply facilities
- Safety Considerations for water supply facilities

(b) Practices and Demonstrations 120 hrs.

A-2 Facility Planning

(a) Lectures (Including Audio-Visual Instructions) 120 hrs.

- Basic hydraulics
- Intake and storage facilities planning
- Water purification techniques
- Structural analysis
- Soil Dynamics
- Lay-out of pipelines
- Basic land survey
- Drawing techniques

(b) Practices and Demonstrations 120 hrs.

A-3 Distribution Planning

(a) Lectures (Including Audio-Visual Instructions) 120 hrs.

- Hydraulics in pipe
- Planning for distribution pipelines
- Water pipes and valves
- Piping design
- Pipe laying techniques
- Land survey techniques
- Distribution control
- Design using computer

(b) Practices and Demonstrations 120 hrs.

- (2) Water Purification and Sanitation
- B-1 Water Purification and Sanitation
- (a) Lectures (Including Audio-Visual Instructions) 120 hrs.
- Introduction of water technology
 - Water quality engineering
 - Water chemistry
 - Coagulation control
 - Sedimentation control
 - Filtration control
 - Disinfection
- (b) Laboratory Study 120 hrs.
- B-2 Water Quality Analysis
- (a) Lectures (Including Audio-Visual Instructions) 120 hrs.
- Water quality investigation plan
 - Monitoring methods
 - Analytical instruments
 - Physical and Chemical analysis
 - Biological examination
- (b) Practices and Demonstrations 120 hrs.
- B-3 Water Quality Control
- (a) Lectures (Including Audio-Visual Instructions) 60 hrs.
- Environmental Health
 - Water pollution control
 - Maintenance and operation system
 - Toxicology and epidemiology
 - Water Quality evaluation
 - Water purification for quality improvement
- (b) Practices and Demonstrations 180 hrs.
- (3) Pipeline Installation and maintenance course
- C-1 Piping
- (a) Lectures (Including Audio-Visual Instructions) 60 hrs.
- Basic hydraulics in pipe
 - Soil conditions and excavation technique
 - Piping planning and design
 - Pipe joint works
 - Valves operation
- (b) Demonstrations and On-Job Training 60 hrs.

C-2 Pipeline Maintenance

- (a) Lectures (Including Audio-Visual Instructions) 60 hrs.
 - Structures of pipes
 - Pipe protection and conservation
 - Pipe inspection techniques
 - Maintenance program
- (b) Demonstrations and On-Job Training 60 hrs.

C-3 Leakage Inspection

- (a) Lectures (Including Audio-Visual Instructions) 60 hrs.
 - Reasons of leakage
 - Hydraulics of leakage
 - Leakage inspection techniques
 - Leakage control measures

(4) Mechanical and Electrical Installation

D-1 Mechanical equipments

- (a) Lectures (Including Audio-Visual Instructions) 60 hrs.
 - Outline of water supply mechanical installations
 - Mechanical installations for water purification
 - Mechanical installation for flow control
 - Pump operation
 - Maintenance and Inspection for mechanical installations
- (b) Demonstrations and On-Job Training 60 hrs.

D-2 Electrical equipments

- (a) Lectures (Including Audio-Visual Instructions) 60 hrs.
 - Outline of water supply electrical installations
 - Power receiving system
 - Power distribution system
 - Motor operation
 - Maintenance and inspection for mechanical installations
- (b) Demonstrations and On-Job Training 60 hrs.

D-3 Instrumentation

- (a) Lectures (Including Audio-Visual Instructions) 60 hrs.
 - Concept of Instrumentation
 - Measurement systems
 - Flow control instrumentation
 - Quality control instrumentation
 - Instrumentation technique
- (b) Demonstrations and On-Job Training

Appendix II

Memo of Discussion (dec. 14, 83) Sam Sen Water Treatment Plant

Attendants

A. Japanese Team

Team Leader : Dr. Y. Sayato
Team Members : 1. Mr. K. Okazawa
2. Mr. K. Kitahara
3. Mr. I. Sakaguchi
4. Mr. R. Matsunaga

B. Thai Team

Advisor : Mr. K. Tien
Committee : Mr. V. Klahan
Chairman
Committee : 1. Mr. S. Suthep
2. Mr. C. Sathit
Participants : 1. Mr. H. Virat
2. Miss R. Namthip
3. Mr. B. Preecha
4. Mr. S. Vikrom

C. JICA Experts

1. Mr. T. Kubota
2. Mr. Y. Ono

Discussed and agreed items:

1. Space Requirement in the Building
 - 3 classrooms
 - 5 compartments for experts and leader
 - 1 laboratory room
 - 1 audio visual room
 - store room
2. Space for installation of Plant Models
 - 1 Water Treatment Training Plant
 - 1 Water Control Training Plant
 - 1 Pressure Control Model
 - 1 Water Level Control Model

- 1 Leakage Prevention Training System
- 1 Field Workshop

3. Training Courses

To be under responsibility of Japanese experts

- 3.1 Water Supply Planning two courses/year and course duration 6 months
- 3.2 Water Purification and Sanitation two course/year and course duration 6 months
- 3.3 Pipeline Installation and Maintenance three courses per year and course duration 12 weeks
- 3.4 Mechanical and Electrical Installation 3 courses per year and course duration 12 weeks

4. No. of experts who will be in charge of the courses

- 1 expert for (3.1)
- 1 expert for (3.2)
- 1 expert for (3.3)
- 1 expert for (3.4)
- (1 leader included)

5. Counterparts

- a) one or two counterparts for each course
- b) some counterparts will be trained in Japan yearly

6. Special trainings will be carried out by seminars for short period

佐藤 安好

Dr. Yasuyoshi SAYATO
Japanese Team Leader

K. Voraputhaporn

Mr. Klahan Voraputhaporn
Thai Team Leader

Appendix III

QUESTIONNAIRE (A)

1. SOCIAL AND ECONOMIC BACKGROUND FOR THE ESTABLISHMENT OF THE CENTER
 - (a) Economic development plant in Thailand.
 - (b) Economic and social background of the proposed request for Japanese cooperation for the center.
 - (c) Details of substance, executive situation and investment plan for the government's water works.

2. GOVERNMENT ADMINISTRATION AND BUDGET
 - (a) Organization and Budget of government (present chart including number of staff).
 - (b) Organization and Budget of MWWA (present chart including number of staff).
 - (c) Annual budget for the last 5 years
 - (d) Statistical table concerning Waterworks training (number, kind, other on an annual basis).

3. TRAINING CENTER
 - (a) Location
 - (b) Geological and geographical feature map
 - (c) Land ownership
 - (d) Supply conditions of Water, electricity, gas
 - (e) Objective and character of establishment
 - (f) Organization and Budget of center (present chart including number of staff, organization chart).
 - (g) Course, training, period and number of trainees
 - (h) Curriculum of present course
 - (i) Curriculum of each course (present curriculum and future programme, lecture hours per week and year, practical-theoretical ratio, textbook and teaching materials.)
 - (j) Number of staff (administration, teaching staff)
 - (k) Qualification and number of Lecturers and instructors
 - (l) Training programme under the third country's aid (including international organization)
 - (m) The situation of training in other similar training center (place, course, number, term)

4. PROPOSED TRAINING CENTER IN BANGKOK

- (a) Authority or organization responsible for the management of the center (The ministry itself or an independent organization, organization chart)
- (b) Proposed period of cooperation by the Japanese Government with reference to the Thai Government schedule
- (c) Budgetary step concerning establishment and operation of the new center (the cost of construction and running expenceses)
- (d) Number of Japanese expert necessary for the center (including chief advisor, team leader and coordinator)
- (e) Relation between director of the center and Japanese team leader
- (f) New center (building, facilities)
 - (1) Location
 - (2) Structure
 - (3) Draft of layout (floor plan)
 - (4) Construction schedule
 - (5) Budget for construction
 - (6) Japanese expert's room

5. TRAINING

- (a) Methods of training (language, relation of Trainee's job)
- (b) Training course priority and curriculums
- (c) Training Targets
- (d) Training term
- (e) Number of trainees
- (f) Total and per capital training expences
- (g) Trainees
 - (1) Qualification of applicant (academic career, and limit of age)
 - (2) Methods of recruitment
 - (3) Methods of screening
 - (4) Certificate of graduation
- (h) Project plan for on the job training

6. TRAINING MACHINERY AND EQUIPMENT

- (a) Standard of measurement (foot, metric or the mesurement)
- (b) List of machinery and equipment necessary for training

7. THE PRIVILEGES, EXEMPTIONS AND BENEFITS FOR THE JAPANESE EXPERTS

- (a) Provisions of residence
- (b) Medical services for the Japanese experts and their families
- (c) Annual leave (for 1 year)
- (d) Expences for official trip in Thailand
- (e) Exemption from taxation (e. g. incometax, residence tax)
- (f) Exemption from import and export tax
 - (1) The range so called furniture and personal effects
 - (2) The duration of exemption
- (f) Provision of transportation on official errand

8. OTHERS

- (a) Tentative name of the new center
- (b) Educational system in Thailand (School, college, university including of Number)
- (c) Lecture's content of university in Thailand
- (e) Preventive measure against job-hopping of counterparts personal

Dr. Yasuyoshi SAYATO
Head of Japanese Preliminary
Survey Team for Water Works
Training Center in Thailand

QUESTIONNAIRE (B)

- I. Understanding of the purpose of the Project (Waterworks Training Centre)
1. Studying Development Plans: National Development Plan, Metropolitan Development Plan, Water resources development Plan, etc.
 2. Relationship between the project and the relevant development plan
 3. Studying the Master Plan (M/P) written out by Camp Dresser & McKee and revised in corporation with the Japanese experts
 - population growth in the Metropolitan area (Bangkok City)
 - growth rate and its future needs of water distribution in the Metropolitan area in total and sectors
 - Is the m/p meeting the dynamics of the city/industrialization
 4. Training Centre
 - Relationship between Ministry of Interior and MWWA concerning management of the training centre
 - Relationship between MWWA and PWWA
 - the importance and the location of the training centre as the bureaucratic apparatus in the governmental organizations
 - Does she has some committee or similar organization ?
- II. Understanding of the present situation of the Project
1. Educational level of the staff & engineer of the MWWA
 - Educational system and the percentage of school attendance in Thailand
 - Classification of educational level of the staff & engineer of the MWWA
 - Composition of the staff in each water treatment plant
 - Table of the majored department of university graduates of MWWA

2. Details of the training presently implemented at the Training Centre
 - Name of the courses should be listed up by yearly basis
 - Number of participants of each course
 - Contents & syllabus of the courses
 - teaching materials used
 - screening method of participants and level of the participants
 - Duration of training
 - Number of teaching staff and their specialization, post and their level
 - Number of staff working for course management
 - Treatment of the participants who finished the course
3. How does the present training be appraised by MWMA?
 - Any points that you think it insufficient or being improved
 - Effects of the present training
 - Appraisal from participants' side
4. Training plan
 - Goal of the training centre
 - Which fields should be given higher priority to
 - What kind of the group of the people (higher class, middle and lower class) should be an object of training course ?
 - With regard to a training schedule, do you have an idea of short/long term training schedule ?
 - Can you provide necessary teaching staff from your office (MWMA) ? If not, how do you cope with this problem.
 - Necessity of Japanese experts in the field of planning and management of training plan
 - What are you expecting experts to do ? Number of counter part and their level

- Utilization of the trained staff Are you expecting a spread effect through those trained staff in the form of technical extension worker like ?

- Re-training scheme of technicians who is in charge of water quality test at water treatment plant

5. Management plan of training facilities

- Annual budget, source of budget, administrative staff, administrative system of facilities

- Management plan in case that the training including PWMA officer is to be held

- Physical capacity such as class rooms, accommodation and so on, when other people from other organizations is to be trained

6. Leakage control

- Present condition of the control of water distribution; drawings (how many, where,), a way of checking the amount of distribution, amount of leakage (absorute number and ratio) and the way of grasping, measurement of water pressure (at the point of an outlet of pump station and at the point of the end of the stream)

- Improvement/replacement plan of old facilities as pipe, buildings and etc

- The quality of the material of distribution pipe and distribution service pipe

- The contents of the works of leakage control presently done by the authority; contents and variety of works, number of person working for it and the necessary budget, tools and machines used for leakage control

- Future plan for leakage control

8. Improvement plan of training facilities of MWWA

- General plan and the progress made so far, future plan with regard to an expansion of buildings and facilities

- Annual budget for the improvement plan of the training facilities

9. Training counterpart in Japan

- Subject and training period

- What is the real purpose of the request of giving two-years scholarship ? At what kind of educational facilities are you thinking to put candidates in ? Language ability of the participants who get two-year fellowship.

Answer Questionnaire (A)

1. Social and Economic Background for Establishment of the Center
 - a. None
 - b. See in "Preliminary Project Proposal for Assistance" page 2-6
 - c. None

2. Government Administration and Budget
 - a. None
 - b.
 - c.
 - d. See in "Preliminary Project Proposal for Assistance" page 6

3. Training Center
 - a. Exactly, with in the area of Bangkhen Water Treatment Plant
 - b. See in page 53
 - c. MWWA
 - d. MWWA
 - e. See in "Preliminary Project Proposal for Assistance" page 5
 - f. See in page 5a-6
 - g. See in page 30-50 (By average = 30 Trainees per course and 3-5 days except main course 1-3 months)
 - h. See in page 30-50
 - i. See in page 30-50
 - j. Administration and Service Staff = 23 and teaching Staff = 6
 - k. At least Bachelor Degree (Staff + Outside = 15)
 - l. None
 - m. None

4. Proposed Training Center in Bangkok
 - a. None
 - b. Long term project 5 years
 - c. MWWA + proposal source of assistance
 - d. 3-5 persons.
 - e. Deputy General Manager for Finance and Administration
 - f. New Center (building, facilities)
 1. Exactly, within the area of Bangkhen Water Treatment
 2. Reinforced Concrete Building, 3 floors.
 3. See in "Preliminary Project Proposal for Assistance" page 53-57

4. See in page 51
 5. None (for the new Building)
 6. Use the room of the existing building
5. Training
- a. Thai and English language
 - b. See in page 7-9 and depend on the policy of MWWA for each year.
 - c. See in page 7-9
 - d. 1200 trainees per year.
 - e. See in page 6
 - g. Trainees
 1. Divided into 3 level and operator level; (and age are not morthan 55 years old.)
 2. Selection by division of the trainees
 3. Interview, aptitude test, and examination for main course.
 4. Only the main course (about 10 says and oner)
 - h. About 1-3 months
6. Training Machinery and Equipment
- a. Metric System
 - b. See in page 12-29
 - c.
7. The Privileges, Exemptions and Benefits for the Japanese Experts.
- a.
 - b.
 - c.
 - d. The same as JICA experts who are working with in MWWA
 - e.
 - f.
 - g.
8. Others
- a. Water Technology Development Center.
 - b. 6-3-3-4 years.
 - c. None
 - d. None
 - e. Contract 3-5 times period of trained.

Answer Questionnaire (B) on Development of Waterworks Training
Center (Thailand.)

I. Understanding of the purpose of the Project (Waterworks Training
Center.)

1. Metropolitan Development Plan (see in "Preliminary project proposal for Assistance" page 2-4
2. -
3. NSC.
4. Directly
5. Join-together in the future
6. Extremely
7. Yes and to be extended to cover people from PWWA and others.

II. Understanding of the present Situation of the Project.

1. Education level of the Staff & engineere of MWWA
 - Ph.D = 1, Master Degree = 105, Bachelor Degree 641
 - Technician = 1302
2. Details of the training presently implemented at the Training Center
 - See in "Preliminary Project Proposal for Assistance" page 30-43
 - 30 persons by average
 - See in page 30-43
 - Teaching documents of the instructors
 - Selection by the division of Trainees, and the trainess are divided into 3 level: high level, middle level and operator level
 - 3-5 days, except the main Courses are about 1-3 months.
 - 6 persons (at least Bachelor Degree)
 - 29 persons (See in page 5 a.)
 - Follow up 3-6 months period
3. How does the present Training be appraized by MWWA ?
 - Teaching materials, equipments, Methodology, Building
 - Almost of the training courses don't have any practice
 - Yes

4. Training Plan
 - See in page 7-11
 - Technical field - Water leakage, Water Production and distribution, Water quality Control and Computer etc.
 - 3 levels
 - Depend on each course
 - Some
 - Yes
 - Yes
 - Yes
 - Yes
5. Management plan of training facilities
 - Yes
 - No answer
6. Leakage Control
 - According to Mr. Kubota reports
7. Improvement plan of Training facilities of MWWA
 - None
8. Counterparts Training in Japan
 - 10 subjects 4-6-12 months
 - Master Degree level: English

III. Others

1. Yes
2. No
3. No
4. Lecture only

3. Targets of Trainings

A. Planning Course

To cultivate well-trained engineers and technicians who have adequate knowledge and practical ability for water supply planning and water supply facilities planning and design.

A-1 Basic Planning Sub-Course

To give ability to make a master plan for water supply and basic facility plan, including decision of types, structures, capacities and other fundamentals of water supply facilities.

A-2 Facility Planning Sub-Course

To give ability to make a detail plan and supervise designing work of water supply facilities.

A-3 Distribution Planning Sub-Course

To give ability to make a plan of distribution system and its operation.

B. Water Purification and Sanitation Course

B-1 Water Purification Technique Sub-Course

To give ability to

PRELIMINARY PROJECT PROPOSAL FOR ASSISTANCE

Title : Water Technology Development Center

Requesting Organization : Metropolitan Water Works

Authority (M W W A)

Ministry of Interior

Proposed Source of Assistance : The Government of Japan.

Dec. 5, 1983

Appendix VIII. 参 考 文 献

1. Metropolitan Water Works Authority Annual Report 1982
2. Panphlet of Bang Khen Water Treatment Plant
3. Preliminary Project Proposal For Assistance, MWWA (Dec. 5, 1983)
4. Consulting Services on Review of 1970 Master Plan and Present System and Preparation of Detailed Design of Stage II Water Improvement Program, Nihon Suido Consultants Co., LTD (Dec. 1983)
5. Training Courses Offered at the MWWA's Training Center (1982, 1983, 1984)
6. 現トレーニングセンター機材の活用, 整備状況, MWWA (Dec. 1983)

Appendix IV Preliminary Project Proposal For Assistance (MWWA)

Preface

This report of the Water Technology Development Center Project is prepared by collecting needs from all departments of MWWA. Needs collection was done by sending questionnaires to all departments with clear explanation of the objective of the project. The Preparation Committee received favorable response that provided adequate information for the project report to be completed.

Realization of this project will not be only beneficial to MWWA but also to the people of Thailand as a whole and the Japanese people.

Preamble

Time has already come that MWWA must be rational for survival and growth. To survive means that MWWA has to cut down production costs by all means and at the same time quality of personnel, water and work of all functions have to be up-graded. Only while cost is cut down and quality of all functions is elevated more revenue associated with trust, reputation and public contribution can be conceived.

To attain such aims and objectives many input gradients are needed such as:

- (1) Creative labor management
 - (2) Education and training
 - (3) Waste elimination and prevention
 - (4) Technology up-grading
 - (5) Full capacity operation
 - (6) Motivational activity programmes
- etc.

The above mentioned items are part of the input of rationalization. In other words to be rational, improvement of input is very essential otherwise aims and objectives of the authority cannot be met.

That is the reason why Water Technology Development Center (WTDC) establishment project is prepared. Realization of this project shall benefit not only MWWA but also PWWA and all water supply authorities and sectors.

CONTENTS

History of MWWA119

MWWA's Training Center121

Objective and Requirements of the Project124

Program Goal126

Project Requirements126

The Proposed Budget128

Table No. 1135

Table No. 2137

Table No. 3139

Table No. 4141

Table No. 5142

Course Description143

Schedule of MWWA Training Center158

MWWA's Organization Chart159

Sketch planning of MWWA's Training Center164

History of MWWA

The first piped water supply in Thailand was constructed in Lopburi province about 300 years ago. At that time it only served the royal palace. The Bangkok water supply system originated in 1897 with the establishment of a Sanitary Department by King Rama V. The primary objective of such establishment was to offer the Bangkok people hygienic way of living without being threatened and endangered by epidemics possible be occurred by consuming the natural water from rivers and canals of unqualified quality used for various domestic purposes. Meanwhile, water borne diseases were mostly spread during the dry season when water levels in the rivers and the canals were low. Despite the encroachment of sea water the quality of water even became worse and worse due to the rapid growth of the community as well as the increase of the population and those that might easily caused various water borne diseases.

The Department hired a French engineer to design and recommend a system which basically has been followed to this day. The recommendations were adopted in a royal proclamation in 1908. The following year digging began on the present raw water canal from Sam Lae (raw water pumping station) to Samgen Water Treatment Plant. Construction of the treatment plant, pipelines and elevated storage reservoirs followed soon thereafter, and the Bangkok's first piped water supply system went into operation in 1914. The cost of this first system was a little over 3 million bahts.

A second and larger treatment plant was added 16 years later. Another expansion program waited the execution for 22 years. However since 1952, improvement expansion work in the form of new treatment plants and deep wells has been almost continuous.

In 1967 the government decided to combine 4 water supply systems of Bangkok, Thonburi, Nonthaburi, and Samut Prakarn by the enactment of "METROPOLITAN WATER WORKS AUTHORITY ACT B.E. 2510" to form the "Metropolitan Water Works Authority" in order to undertake the activities concerning with water supply service for the population of Bangkok metropolis (formerly it was separately administered as Bangkok and Thonburi, province of Samut Prakarn).

All the activities to achieve objectives and goals have been the responsibility of the "General Manager" since the foundation. Policies as well as other necessary supervision are to be set and guided by the "Board of Directors" so designated by the cabinet.

In practice, MWWA can served only 460 square kilometers in the area of populated zones. In other areas of Thailand water supply systems had been developed gradually until 1979. When the government combined all those of municipalities; towns and rural communities across the country, except Bangkok Metropolitan area by the enactment of Provincial Water Works Authority (PWWA).

Master Plan

In 1966, as a result of the deficiencies in water supply, the government appointed a committee to study what were the real problems encountered. The committee was also instructed to determine the extent of the studies and recommendations which should be made. A contract for prearing a Master Plan for water supply and distribution was signed on December 18, 1968. The Master Plan presents estimation of population and water requirements up to the designed year 2000. The water supply, treatment and distribution facilities necessary to meet the expected water requirements are described and estimated cost of these facilities are also presented. The Master Plan also presents recommendations for the operation, maintenance, administration and financing of the proposed facilities.

The Master Plan above mentioned is the long range program which is designed to be stageous improvement to end in the year 2000. MWWA is now implementing the Stage I Project which has been subdivided into two phases i.e Phase I, phase II.

In order to satisfy projected maximum day demands for the central system to the year 2000, it is necessary that the Bangkhen Water Treatment Plant has an ultimate capacity of 3,800,000 CMD. In Stage II the plant capacity at Bangkhen is proposed to be expanded by 1,200,000 CMD to the total of 2,800,000 CMD together with Stage I plant capacity.

Presently, MWWA has many improvement projects and at the same time has to expand the service areas for the increasing amount of customers. On the contrary MWWA has to face with some major problems as the followings:

- 1) Personnel freezing policy: The Ministry of Interior had appointed a working group in March 31, 1982 to investigate the suitable size of manpower of MWWA. This leads to the result that the freezing manpower policy is set up to make MWWA firstly maintain the exact amount of manpower of 6,069 persons and then decrease to 5,680 persons as soon as possible, The rest of 389 persons shall be trained to improve or change their talent; knowledge and skill to

meet the partly demand of the future. This policy in effect leads MWWA into serious trouble even now and when consider more works to be added by the construction of Master Plan Stage II Project.

- 2) One of the most important problems experienced by MWWA since its establishment is the efficiency and qualification of manpower. At the time of establishment in 1967 MWWA had transfered all of personnel from the previous organizations mentioned without any selection method using the merit system. Since 1974 MWWA established the Department of Personnel and Administration and started to use the modern personnel management and administration techniques. In tackling the personnel problems for the past 9 yeats MWWA has left 2 major problems for debate;
 - 1) Efficiency of manpower (as claimed by the working group nominated by the Deputy Prime Minister in 1980)
 - 2) Qualification of technical and managerial skill of manpower fleet.

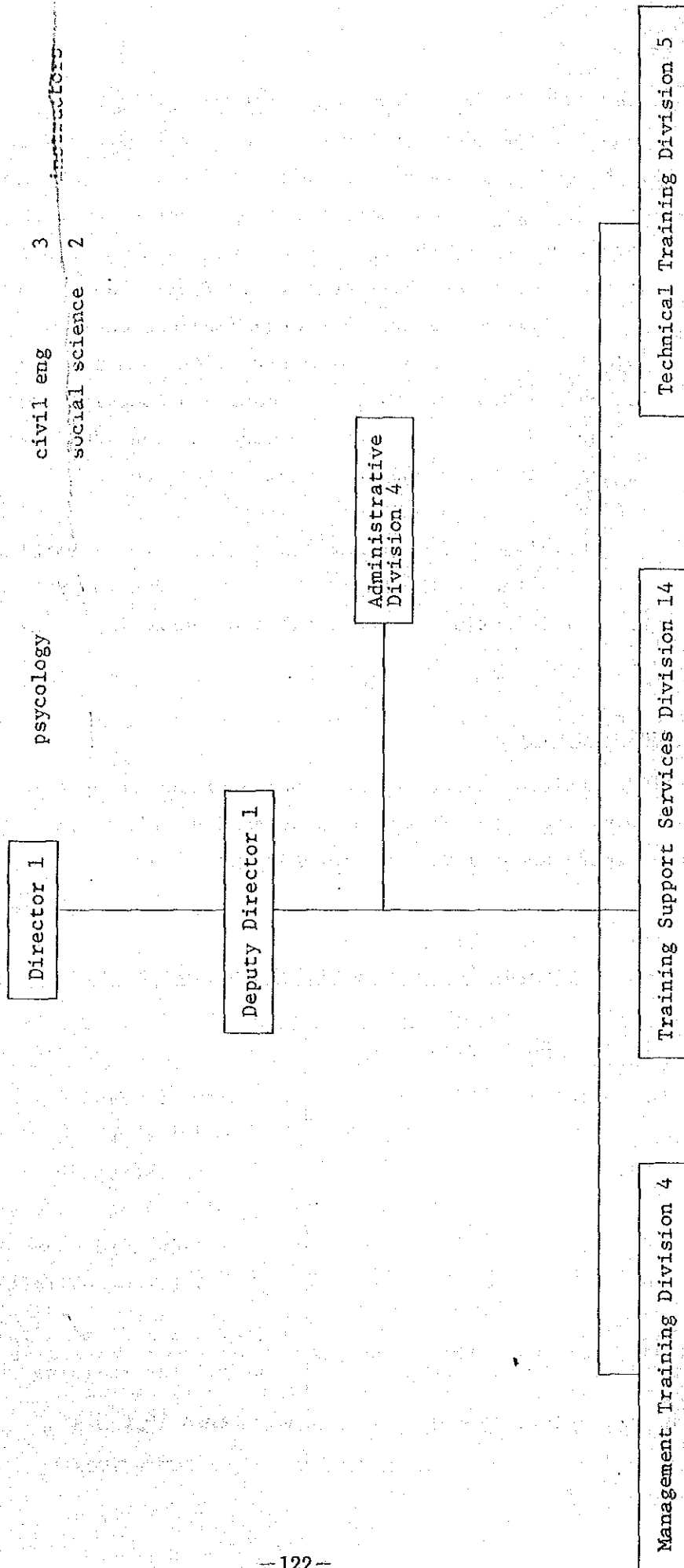
MWWA's Training Center

In 1974 Training Center of MWWA had a status of a section in the Personnel Division. Now it has been up-graded as a special division directly under the Deputy General Manager for Administration

Present Properties of MWWA's Training Center

No.	Description	Detail
1	One building	2 storey building 8 x 22 m ² - 1 st storey used as the office of the Center - 2 nd storey divided into 1-lecture room 8 x 14 m ² 1-discusion room 6 x 8 m ²
2	One Workshop	1 storey 8 x 20 m ² with no facilities at all for training
3	Reserved land space	more than 16,000 m ²

Present Organization Chart of MWWA's Training Center



Manpower - 29 persons

Present problems of MWWA's Training Center

- (1) No definite guidelines for long term manpower development.
- (2) Lack of assistant sources to develop its capability to meet the requirement of technology upgrading of MWWA.
- (3) Lack of modern facilities, tools and specialists to manage the training system and to transfer new technology to MWWA's personnel.

Activities of MWWA's Training Center for the past 4 fiscal years

Fiscal Year	No. of Personnel of MWWA	No. of Personnel Trained	%	Budget Spent (Baht)	Average Cost per Trainee (Baht)
1980	6,085	2,627	43.17	285,579.12	108.71
1981	6,085	1 653	27.16	491,405.10	297.28
1982	6,099	2,035	33.37		
1983	6,004	3,132	52.17	698,876.15	223.14

As can be seen from the above table that the average cost per trainee in Baht is very low when considered in parallel with the training course description (see Page 30). The figure implies that the training of personnel has been done by lecture and plant visiting that has very little effect specifically in the technical aspect. One of many reasons can be given here is that the training courses were not sufficiently equipped with experimental tools and equipment.

At present training courses of MWWA's Training Center are divided into 2 categories.

- Technical training which has inadequacy by the reason mentioned above.
- Management training which is also lack of suitable training models for each field.

Objectives and Requirements of the Project

By the birth of MWWA's proposed training center the training course should be divided into as the following:

- 1. Water treatment plant
 - System design
 - Process design
 - Plant design
 - Plant operation and maintenance
 - etc.
2. Pipe lines
 - Network design
 - Pipe lines design
 - Construction control
 - etc.
3. Quality control
 - Standardization of water quality control
 - Laboratory techniques
 - Work methods
 - Inspection and test standards
4. Electrical & mechanical technology
 - Basic and advanced technologies
 - System design and equipment design
 - Selection of proper equipment
 - Productive maintenance
 - Maintenance standards
 - Job standardization
 - Computerization
 - etc.
5. Instrumentation and telemetry
 - System design
 - Selection of suitable instrumentation
 - Basic and advanced instrumentation technologies
 - Check and inspection standards
 - Proper handling and maintenance
 - etc.
6. Customer service
 - Service psychology

- Billing & collecting techniques
 - Public and human relations
 - Metering
 - Jointing and water conservation
 - Application procedures
 - etc.
7. Leakage detection techniques and counter measures
- Leakage detection of distribution mains
 - Leakage detection of service lines
 - Metering technologies
 - Counter measures
 - etc.
8. Project planning
- Modern theories of project planning and practices
 - Project control
 - Life cycle costing
 - Forecasting techniques
 - etc.
9. Rationalization
- Energy conservation
 - Economical system operations
 - System efficiency
 - Value engineering
 - etc.
10. Management system
- General management theories and practices
 - Management information system
 - Database system
 - Medium and long range projections
 - etc.

From the above mentioned urgency may be arise that the MWWA's training center must rearrange and adjust priority of courses to meet the objective of the center in the future. Budget limitation can effect the implementation of these course.

Program goal

To organize training courses of satisfactory quality for at least 1,200 persons annually within the next 5 years from the existing 5,680 employees. Knowledge, should be as advanced and developed as MWWA production system and transportation system. MWWA is determining to gear the annual planning toward the goal of providing safe tap water supply for 100% of the residents in service areas.

Conditions after the completion of project are expected to be well equipped with highly qualified training staff, training aids and equipment. All of the training courses will be classified into 3 levels as follow:

- 1) High level
- 2) Medium level
- 3) Basic level

Computer training

As microcomputer technology has been advancing very rapidly in the last ten years. The price of it and auxiliaries varies inversely with technology invention. As the result, work improvement and modernization by applying computer technology can be achieved at low cost, for instance:

1. Economic operation and maintenance of the system
2. Office automation
3. Management information system
4. Energy conservation
5. Customer service
6. Other rationalization activities

MWWA has noticed these significant trends and want to have computer training in as many fields as possible. This can be realized by having training courses directly concern with the above mentioned subjects.

Project requirements

MWWA's requirements are as follows:

- a) Construction of a training center of suitable size having rooms, workshops and auxiliary equipment (see the table below)
- b) Training of MWWA's staff and personnel by experts from overseas and local
- c) Training overseas in developed countries ie, Japan.

Starting time of the project:

Fiscal year 1984 Project site: Bangkok Water Treatment Plant

Sources of information related to the project:

- Training Center project (MWWA)
- MWWA's annual reports
- JICA survey report of MWWA's Training Center

Related project activities

Previous assistance received in field related to the project.

Japan International Co-operation Agency missions here visited MWWA in 1981. This mission recommended that the employees for delivering training within MWWA should be developed on the high priority bases. The outlined in this proposal will strengthen MWWA efforts to meet its commitments to improve performance in water operations, maintenance, water quality control, design and management.

The Proposed Budget Request for Modernization of the Training Center

No.	Item	Description	Quan. (Unit)	Estimated Value per Unit (Baht)	Estimated Value (Baht)
1	Main building	3 storeys 60x12 m with corridor 1. 20 m. Total area 2,160 m ² . The main building should consist of 1 Library room 1 Computer train- ing room 5 Lecture rooms 1 Instrumentation lab 1 Meeting room 1 Standard cali- bration meter room 1 Laboratory 2 Trainers rooms 1 Printing room 1 Seminar room 1 Living room 3 Lounges	1	10,000,000	10,000,000 (This value includes air conditioning, decoration furni- ture, and other facilities)
2	Mechanical workshop	1 storey 240 m ² equiped with machanical shop machines and test equipments	1	1,400,000	1,400,000
3	Electrical workshop	1 storey 240 m ² equiped with elec- trical shop ma- chines and test equipments	1	1,400,000	1,400,000

No.	Item	Description	Quan. (Unit)	Estimated Value per Unit (Baht)	Estimated Value (Baht)
4	Landscape improvement	Improvement of surrounding area of the building (see sketch plan- ning of MWWA Training Center)			400,000
5	Construction management & supervision cost	To supervise and administrate the building contruc- tion works			300,000
6	Parking area	Concrete floor for car parking with lighting system about 480 m ² (see sketch planning of MWWA Training Center)			1,000,000
7	Fence	Screen fence around the MWWA training center (see sketch plan- ning of MWWA Training Center)			500,000
8	Service road	Concrete road 6 m wide for 2 way- traffic with drainage; pave- ment and lighting (see sketch plan- ning of MWWA Training Center)			3,000,000

No.	Item	Description	Quan. (Unit)	Estimated Value per Unit (Baht)	Estimated Value (Baht)
9	Computers	To be used for training such as: system analysis simulation for mathematical and managerial model problem solving; general specification - Desktop portable microcomputer - use at least 1 standard operating system - can expand to use other no. of CPU. - 2-5-1/4" Floppy disk drives - 1 monitor - 1 printer - other accessories	12	200,000	2,400,000
10	Process instrument training	Laboratory desk installed with the electronic and pneumatic circuits to perform and support instrument lab exercises	12	50,000	600,000

No.	Item	Description	Quan. (Unit)	Estimated Value per Unit (Baht)	Estimated Value (Baht)
11	Instrumentation model	For demonstration and analysis the behavior of fluid theories for better understanding of the trainees	2	250,000	500,000
12	Standard	For use to calibrate electric meters, flow meters and recorders equipment and other instrument the accuracy of measuring instrument of MWWA	1	3,500,000	3,500,000
13	Field pipe network workshop	For demonstration and practice dealing with pipe installation, leakage and repair techniques	1	1,000,000	1,000,000
14	Electrical shop equipment	Includes various meters; test equipment; shop machines for training (see table no.2)	1 lot	2,000,000	2,000,000
15	Mechanical shop equipment	Various mechanical shop machines for training (see table no.1)	1 lot	2,000,000	2,000,000

No.	Item	Description	Quan. (Unit)	Estimated Value per Unit (Baht)	Estimated Value (Baht)
16	Laboratory equipment	General instru- ments and equip- ments for train- ing from primary to advance level in accordance with WHO. stand- ards (see table no.3)	1 lot	3,000,000	3,000,000
17	Treatment plant model	Small scale waterworks unit completely equiped as actual water treatment plant to show and demonstrate the water treatment process to be used as visual aid in realizing theories during the training		2,000,000	2,000,000
18	Leakage de- tection equipment	To be used as training tools to familiarize the trainees in order that they can use to decrease the amount of unac- count for water in actual job (see table no.4)	1 lot	2,000,000	2,000,000

No.	Item	Description	Quan. (Unit)	Estimated Value per Unit (Baht)	Estimated Value (Baht)
19	Audio-video equipment	A complete set of audio and video vision system include 72" pro- jector and other accessories			
		- video system	2	350,000	700,000
		- audio system	1	300,000	300,000
20	Vehicles	16 seats micro- bus 1600 cc car	2	700,000	
		2200 cc pick-up		250,000	1,600,000
				200,000	
21	Text books (for Advanc- ed Training)	Text books as training material, various kinds of new management and technology text and refer- ence books	1 lot	200,000	200,000
22	Printing equipment	To reproduce handout sheets; leaflets documen- tation consisting of - 1 offset pri- ting m/c - 1 photostat - 1 copy m/c and other acces- sories office com- munication and sound system	1	1,000,000	1,000,000
23	Telephone & accessories system	Office communica- tion and sound system	1 set	1,000,000	1,000,000

No.	Item	Description	Quan. (Unit)	Estimated value per Unit (Baht)	Estimated Value (Baht)
24	Contingency sum 10% of overall			4,180,000	4,180,000
Total sum				45,980,000	45,980,000

Table No. 1 List of Mechanical Equipments

No.	Name	Quan.
1	<u>Measuring tools</u> - steel rule - caliper - micrometer caliper - vernier caliper - gauge block - dial indicator	1 lot
2	<u>Bench works</u> - hand tools (hammer, screwdriver, wrenches, hacksaw, vise, - avil, chisel, file, file cleaner, center punch, etc)	1 lot
3	<u>Layout work</u> - surface plate - height gauge - surface gauge - square - scriber	1 lot
4	<u>Drill press</u> - bench type drill press - floor type drill press - radial type drill press - portable electric drill press - accessories (straight and taper shank drill, reamer, borer, etc.)	1 1 1 1 1 lot
5	<u>Lathe work</u> - precision lathe - turret lathe - copy lathe - lathe work attachments	2 2 2 2
6	<u>Pipe threading machine</u>	2
7	<u>Shaper work</u> - universal table shaper - vertical shaper	1 1

No.	Name	Quan.
8	<u>Milling machine</u> - universal milling machine - plain milling machine - vertical milling machine - milling work attachment (dividing head and tail stock, slotting attachment, rotary attachment etc.)	1 1 1 1 lot
9	<u>Grinding machine</u> - universal grinding machine - plain grinding machine - portable grinding machine - double grinding machine	1 1 1 1
10	<u>Sawing machine</u>	1
11	<u>Hydraulic press tool work</u> - hydraulic press	3 1
12	<u>Welding shop</u> - oxy-acetylene gas welding machine - inert gas arc welding machine - AC-DC arc welding machine - automatic gas cutting machine - foot shearing machine - portable shearing machine - hydraulic pipe bending machine - rolling machine - folding machine	3 2 3 1 1 1 1 1 1

Table No. 2 List of Electrical Equipments

No.	Name	Quan.
1	Oscilloscope	2
2	Portable standard voltmeter (AC., DC.)	1
3	Portable standard ammeter (AC., DC.)	1
4	Portable standard wattmeter	1
5	Portable power factor meter	2
6	Portable frequency meter	2
7	Portable high - frequency voltmeter	2
8	Portable high - frequency milliampmeter	2
9	Voltage standard meter (AC., DC.)	1
10	Current standard meter (AC., DC.)	1
11	Winding machine	2
12	Balance tester	1
13	Vacuum cleaner	1
14	Portable recorder	1
15	Battery testing voltmeter	1
16	Wheatstone bridge	3
17	Galvanometer	3
18	Shunts, multipliers, transformers	3
19	D.C. potentiometer	3
20	Decade resistance boxes	3
21	Transistor checker	1
22	Insulation tester	1
23	Relay tester	1
24	Earth tester	1
25	Universal leakage current tester	1
26	Portable luxmeter	1
27	Circuit tester	1
28	Photo tachometer	2
29	Mechanical tachometer	2
30	Clip-on A.C. power meter	3
31	Frequency counter	2
32	Digital AC. meter	3
33	Voltage detector	1
34	Motor characteristic test instrument	3

No.	Name	Quan.
35	Pump characteristic test instrument	3
36	Digital electronic experiment set	3
37	Single board microcomputer training set	3
38	Static relay test set	2
39	Power line stabilizer/conditioner	1
40	Transmitter & receiver training set	3
41	Electrical equipments & accessories	1 lot
42	Shock pulse meter	1
43	Eddy current bearing puller	1
44	Computerized alignment system	1

Table No. 3 List of Equipment in Laboratory

1) Physical and chemical analysis section

No.	Name	Quan.
1	UV-Vis spectrophotometer (Fe, Mn, NH ₃)	1
2	Digital PH meter	1
3	Turbidity meter	1
4	Conductivity meter	1
5	Analytical balance	1
6	Magnetic stirrer with hot plate	2
7	Hot plate	1
8	Color meter	1
9	Dessicator	1
10	Dry oven	1
11	Volatge stabilizer	1
12	Lab wagon	1
13	Water bath	1
14	Refrigerator	1
15	Water still	1
16	Muffle furnance	1
17	Vacuum and pressure air pump	1
18	Stop watch with alarm	2
19	Chemicals	1 lot
20	Glasses; pipette; tripod; and accessories of laboratory usage	1 lot

2) Bacteria and Bio - chemical analysis section

No.	Name	Quan.
1	Incubator 10 cu.ft (temp range-10 to 50°C)	2
2	Incubator 6 cu.ft. (temp range-10 to 50°C)	2
3	Autoclave	1
4	Oven	1
5	Top loading balance	1
6	Colony counter	1
7	Microscope	1
8	Vacuum pressure pump	2
9	Stainless steel vacuum holder	2
10	Suction flask	2
11	Hot plate with magnetic stirrer	2
12	Test tube basket	2
13	Supporter-(test tube)	2
14	Box, petri, dish, sterilizing, stainless steel	1 lot
15	Box, pipette, sterlizing	1 lot
16	Distillation and digertion apparatus	1
17	Distillation apparatus	1
18	Spectrophotometer	1
19	Balance analytical	1
20	Chemicals	1 lot
21	Glasses and other accessories	1 lot

Table No. 4 List of Equipment for Water Leakage Protection Training

No.	Name	Quan.
1	Portable ultrasonic flow meter	2
2	Water leakage detector	2
3	Iron pipe & live cable locator	2
4	Non iron pipe locator	2
5	Box locator	2
6	Branch pipe locator	2
7	Leak noise correlator	2
8	Cold water meter compound type	2
9	Pitometer	2
10	Water pressure recorder	2

Table No. 5 List of Instrumentation Equipments

No.	Name	Quan.
	<u>Flow measuring equipment</u>	
1	Rotameter 0 ~ 50 l/min	2
2	D/P cell (electronic) 0 ~ 6,000 mm. E ₂ O	2
3	Two-pen recorder (electronic)	2
4	Square root extractor (electronic)	2
5	Totalizer	2
6	Electromagnetic flow meter 2.54 cm	2
7	Simulator flow and level cascade control (electronic)	1
8	Standard voltage and current source	2
9	Control valve with electropneumatic positioner 1"	2
10	Recorder with controller (electronic)	2
11	V/I converter	4
	<u>Pressure measuring equipment</u>	
12	Dead weight tester (0 ~ 50 kg/cm ²)	2
13	Hg. column (0 ~ 1.5 kg/cm ²)	2
14	Standard pressure gauge (0 ~ 5 kg/cm ²)	2
15	Differential pressure gauge	2
16	Air filter regulator	4
17	PP/I transmitter (0 ~ 5 kg/cm ²) (electronic)	2
18	Vacuum tester	2
19	Purge set (0 ~ 10 m H ₂ O)	4
	<u>Temperature measuring equipment</u>	
20	Oil bath temperature (0 ~ 150°C)	2
21	Thermo couple (0 ~ 100°C)	4
22	Resistance bulb	2
23	MV/I converter	2

Outline of Course Description

Course Title	Purpose	Subjects of Training	Trainees
<p>General knowledge of waterworks "Upgrade technical level 1"</p>	<p>For skill-workmen to be incharge of higher responsibility and positions</p>	<ul style="list-style-type: none"> - General knowledge in organization; water production; water distribution; - Public and human relation 	<p>skill-workmen</p>
<p>Basic knowledge of water works</p>	<p>The basic skills and knowledge required in water service pipe and plumbing works</p>	<ul style="list-style-type: none"> - Basic arithmetic and surveys - Water pipe laying and jointing - The installation of plumbings - Care and routine maintenance of tools and equipments - Public relation 	<p>skill-workmen whom passed course "Upgrade technical level 1"</p>
<p>Water treatment and filtration operations</p>	<p>To give instruction in the operation of water treatment and filtration techniques</p>	<ul style="list-style-type: none"> - Basic chemical treatment - Operation of sedimentation plant - Sludge disposal - Safty and emergency action - Record and testing 	<p>Operators engaged on filtration and treatment work</p>

Course Title	Purpose	Subjects of Training	Trainees
Introduction to water quality control	Increasing awareness of the need for quality control, how it is organized and the practical techniques used	<ul style="list-style-type: none"> - The concept of quality control - The need for control and regular monitoring - Sampling theory and practice - General hygiene and sterile techniques - Bacteriological examination of waters - Interpretation of results 	Engineers; technicians and supervisors
Water chemistry for non-specialist	General introduction to water treatment and various techniques of examination and analysis	<ul style="list-style-type: none"> - Standard of water quality - Water treatment process - Chemical, biological and other contaminants - Pump & pumping - Animals & algae problems - Laboratory work 	Senior administrative; professional and technical staff
Supervisory functions for office supervisors general principles	Increase awareness of the factors effecting office operations with emphasis planning and control of work, relationships and	<ul style="list-style-type: none"> - Role of the office supervisor - Human relation-motivation and job enrichment 	Supervisors of office personnel employed either in administrative or in technical department

Course	Purpose	Subjects of Training	Trainees
	productivity	<ul style="list-style-type: none"> - Personal relations, leadership - Communication-sytematic communication, principle of organization, effective communication - Manpower planning, staff development - Management techniques, operation research, job evaluation, statistic and financial control 	
Surveying practice	Basic skills for used of surveying instruments and application of site surveyings	<ul style="list-style-type: none"> - Principles of surveying - Use of surveying instruments - Basic surveying technique 	Technicians and supervisors
Excavation methods and practice	Safety in trenching, theoretical aspects of soil stability, methods of back filling and reinstatement	<ul style="list-style-type: none"> - Types and properties of soil - Properties and strength of materials - Care and maintenance of tools/equipments 	Supervisors or technicians

Course Title	Purpose	Subjects of Training	Trainees
		<ul style="list-style-type: none"> - Back filling and rein-statement - Statutory safety regulations 	Supervisors or technicians
The maintenance of pipe work systems	Corrosion and deposition, the disinfection of distribution pipe and outline what is required in planning organization and control of remedial work	<ul style="list-style-type: none"> - Identification of the problems - Problem solving method - Methods available for various corrosion and infestation control. 	Engineers, technicians engaged in water distribution
Leakage water inspection (house inspection duties)	Basic skill and knowledge required in house inspection for leakage detection	<ul style="list-style-type: none"> - Need of leakage prevention - Cause of leakage within domestic premises - House inspection - Principles of fluid mechanics - Public relations - Care and routine maintenance of tools and equipments 	New entrant who will take the duty of leakage control
Leakage water inspection (leakage water metering)	Basic skill and knowledge required in leakage water	<ul style="list-style-type: none"> - Cause of underground leakage 	employees whom passed course in "house

Course Title	Purpose	Subjects of Training	Trainees
	watering and operation of waste water districts	<ul style="list-style-type: none"> - Leakage water meters, district - Valves and valves operation - Leakage detection and record - Public relations 	inspection duties"
Leakage water inspection (distribution, recording and measuring equipment)	Basic skill and knowledge in use and operation of water distribution, recording and measuring equipments and the flushing and foam swabbing of mains	<ul style="list-style-type: none"> - Water pressure and flow record - Equipments for tracing buried pipes - Flushing and formaing swabbing of distribution pipe - Customer compliants - Water meters and meter reading - Buried pipe leakage detection 	Employees whom passed course in "Leakage water metering"
Water pipe laying and jointing (Trench operation) Level 1	Basic skills and knowledge in preparation and reinstatement of trenches for water pipe laying and handling	<ul style="list-style-type: none"> - Safety function - Trench excavations and simple timbering 	New entrant who will take the duty of water pipe laying and jointing (branch office)

Course Title	Purpose	Subjects of Training	Trainees
	operation; outing and preparation of water pipe jointing (up to 6" diameter)	<ul style="list-style-type: none"> - Trench back filling and reinstatement - Handling and stacking of pipe - Pipe cutting & jointing 	
Water pipe laying and jointing (Pipe laying and jointing) Level 2	Basic skills and knowledge required in laying and jointing of water pipes (up to 6" diameter)	<ul style="list-style-type: none"> - Jointing of various kinds of pipe - Laying of pipes - Safety practices in pipe laying operation 	Employees whom passed course in level 1
Water pipe laying and jointing (Pipe repair and modifications) level 3	Basic skills and knowledge required in repair and modifications to existing water pipe	<ul style="list-style-type: none"> - Work planning and job records - Water pipe branch connections - Installation and maintenance of valves, hydrants, meter - Water pipe repairs - Safety practices in repairs and modifications to existing water pipes 	Employees whom passed course in level 2

Course Title	Purpose	Subjects of Training	Trainees
Orientation	To introduce the participants with general knowledge of organization	<ul style="list-style-type: none"> - General knowledge of MWVA - Human & labour relation - Team work building - Principle of personnel management 	New employees, both in administrative and technical working (Occativnaly)
Job relation	To enhance knowledge for the supervisors and technical role and team building	<ul style="list-style-type: none"> - Role and responsibilities of supervisors - Establishment of working relation - Psychology at work and motivation - Self development - Safety at work - Labour relation - Avoidance of work conflicts 	Supervisors, both in the administrative and technical working
Team development	Knowledge required in team development	<ul style="list-style-type: none"> - Job improvement - Self analysis and self adaptation - Team development - Group discussion 	Junior officers

Course	Purpose	Subjects of Training	Trainees
Feasibility study	To promote an appreciation of trainees with knowledge required in project planning	<ul style="list-style-type: none"> - Project cycle - Plan and project relation - Project analysis - Benefit/cost analysis - Cost effectiveness analysis 	Junior officers both in the administrative and technical knowledge
Customer service	To equip the participants with fully understanding of customer service works and how to service the customers	<ul style="list-style-type: none"> - Role and responsibility of customer service - Water production and distribution - Basic billing system - Art of communications - Introduction to water meter - Introduction to MWWA's computer 	The in-experienced officers and operators, including the new entrant who will take the duty of customer service
Strategy to clear unpaid water debts and illegal water problems	The knowledge required in strategy to clear unpaid water debts and illegal water problems	<ul style="list-style-type: none"> - Causes and problem of unpaid water debts and illegal water service - Water meter reading - Water unpaid debts clearance technique 	The new entrant who will take the duty of customer service works

Course Title	Purpose	Subjects of Training	Trainees
General business and documentary works	To enhance knowledge, skill and good attitude required in general business and documentary works	<ul style="list-style-type: none"> - Basic law knowledge - Team working - General ideas of general business and documentary works - Office writing - Filing system - Team development - Function psychology - Office automation - Computer approach 	Supervisors in business fields
Secretarial working system	To promote an appreciation of the trainees with knowledge and skill required in secretarial works	<ul style="list-style-type: none"> - Secretary's role and responsibility - Filing and record operation - Self analysis and adaptation - Art of reception and communication - Computer approach - office automation 	Secretarial officers

Course Title	Purpose	Subjects of Training	Trainees
Functional psychology	Knowledge of psychology and how to apply psychology at works	<ul style="list-style-type: none"> - Self analysis and self adaptation - Communication with transaction analysis - Team building 	Engineers, lawyer, accountant and other professional employees
Management workshop	To increase awareness of the trainees with the factors effecting in personnel management; and to promote an appreciation of skill and knowledge required in personnel management by human behaviour	<ul style="list-style-type: none"> - Factors effecting in personnel management - Human behaviour - Communication 	Executives, senior officers, both in administrative works and technical works
Introduction to computer	To familiarize the trainees with the basic concepts of computer and its applications	<ul style="list-style-type: none"> - History of computers - Basic concepts of computers - Artificial intelligence - General procedures and precautions - Classification of languages 	Technicians, supervisors both in administrative and technical fields

Course	Purpose	Subjects of Training	Trainees
Electrical workshop practice I	To train semi-skill labour in using electrical tools and equipments with safety rules	<ul style="list-style-type: none"> - Electrical hazards - Basic handle of various tools - Care and maintenance - Safety rule and equipments - First aid 	Semi-skill labour in electrical works
Electrical workshop	Basic knowledge of electrical workshop and basic electronics experiments	<ul style="list-style-type: none"> - Electronic theories - Basic experiments - Various meter using - Electrical theories - Application of micro processors 	Technicians or semi-skill labour who already passed course level I
Mechanical workshop practice I	To train semi-skill labour in using mechanical tools and equipments	<ul style="list-style-type: none"> - Basic handle of various tools - Care and maintenance - Classification of materials - Safety rule and equipments 	Semi-skill labour in mechanical works
Mechanical workshop practice II	Basic knowledge of mechanical workshop with precision and equipments usage	<ul style="list-style-type: none"> - Tolerance and fitness - Semi or automatic machines - Precision tools and measurement - Blue print reading 	Technicians or semi-skill labour who already passed course level I

Course Title	Purpose	Subjects of Training	Trainees
Computer applications	To understand and use computer as a tool in problem solving	<ul style="list-style-type: none"> - Database management - System analysis - Structure programming - Software package 	Engineers and middle level management
Computer in management	To customerize the executives in using computer to solve the management or technical problems	<ul style="list-style-type: none"> - Computer concepts - Software package applications - Modeling theory - Decision making - Theory of game - Statistics applications 	The executive level both in administrative and technical field
Digital electronics	To upgrade the knowledge of the technicians for maintainance the digital equipments	<ul style="list-style-type: none"> - Microprocessor concepts - History of electronics - Theory of microprocessors - Applications of various gates 	Technicians who dealing with electronics maintenance
Pneumatic process instrumentation	To customerize the trainees with the knowledge and technique of pneumatic instruments	<ul style="list-style-type: none"> - Basic principles of pneumatic transmitters - Process dynamic characteristics - Pneumatic controllers - Pneumatic analog computing analysis 	Engineers and technicians who dealing with pneumatic instruments

Course Title	Purpose	Subjects of Training	Trainees
Process instrumentation theory & practice I (measurement)	To customize the trainees with the technique of measuring instrumentation	<ul style="list-style-type: none"> - Control valves and valve positioners - Introduction to process instrumentation and principle of measurement - Temperature measurement with demonstration and practice - Pressure, differential pressure and vacuum pressure measurement - Pressure calibration practice - Flow measurement - Level measurement & practice - D/P cell adjustment and practice - Automatic control system - Analytical & other measurements 	Engineers and technicians who dealing with process instrumentation (measurement)

Course Title	Purpose	Subjects of Training	Trainees
Process instrumentation theory & practice II (control)	To customize the trainees with the technique of controlling instrumentation	<ul style="list-style-type: none"> - Principle of automatic control system and process characteristics - Controller and control actions - Electronic receiver & controller - Receiver calibration and study of controller characteristic - Pneumatic receivers & controller - Receiver calibration and study of controller characteristic - Optimum turning theory - Process characteristic study in practice optimum turning practice - Final control element - Control valve & position calibration - Combination control system and conclusion 	Engineers and technicians who dealing with the process instrumentation (control)

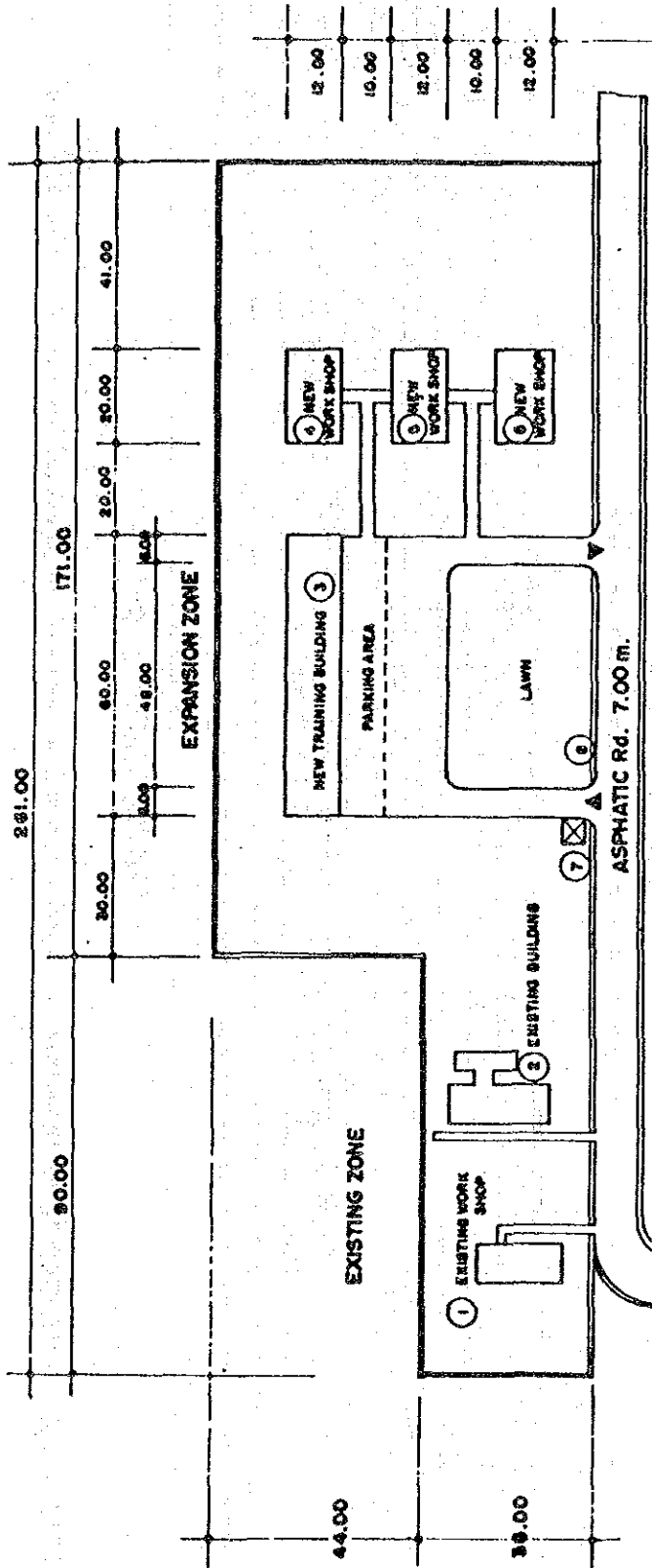
Course Title	Purpose	Subjects of Training	Trainees
Measurement & control in water and waste water treatment process	To train in knowledge of measurement and control in waterworks process	<ul style="list-style-type: none"> - Fundamentals in water & waste water treatment process - Instrumentation & control in water & waste water treatment plants - Organic measurement - Instrumental quality control 	The trainees dealing with water treatment process

Schedule of MWA Training Center

Description	1983			1984			1985			1986			1987			1988			1989			
	9	12	3	6	9	12	3	6	9	12	3	6	9	12	3	6	9	12	3	6	9	12
Preparation study																						
Feasibility study of MWA problems																						
Sending the require report	□																					
Visiting of the mission team from Japan			□																			
Survey and detail designs																						
Construction of the new building																						
Provision of equipments																						
First term of training																						
Training by experts from overseas																						
Training by Thai experts																						
Second term of training																						
Training by experts from overseas																						
Training by Thai experts																						
Third term of training																						
Training by experts from overseas																						
Training by Thai experts																						
Fourth term of training																						
Training by Thai experts																						
Overseas advisors																						
Training in Japan																						

Arrangement & grant aids

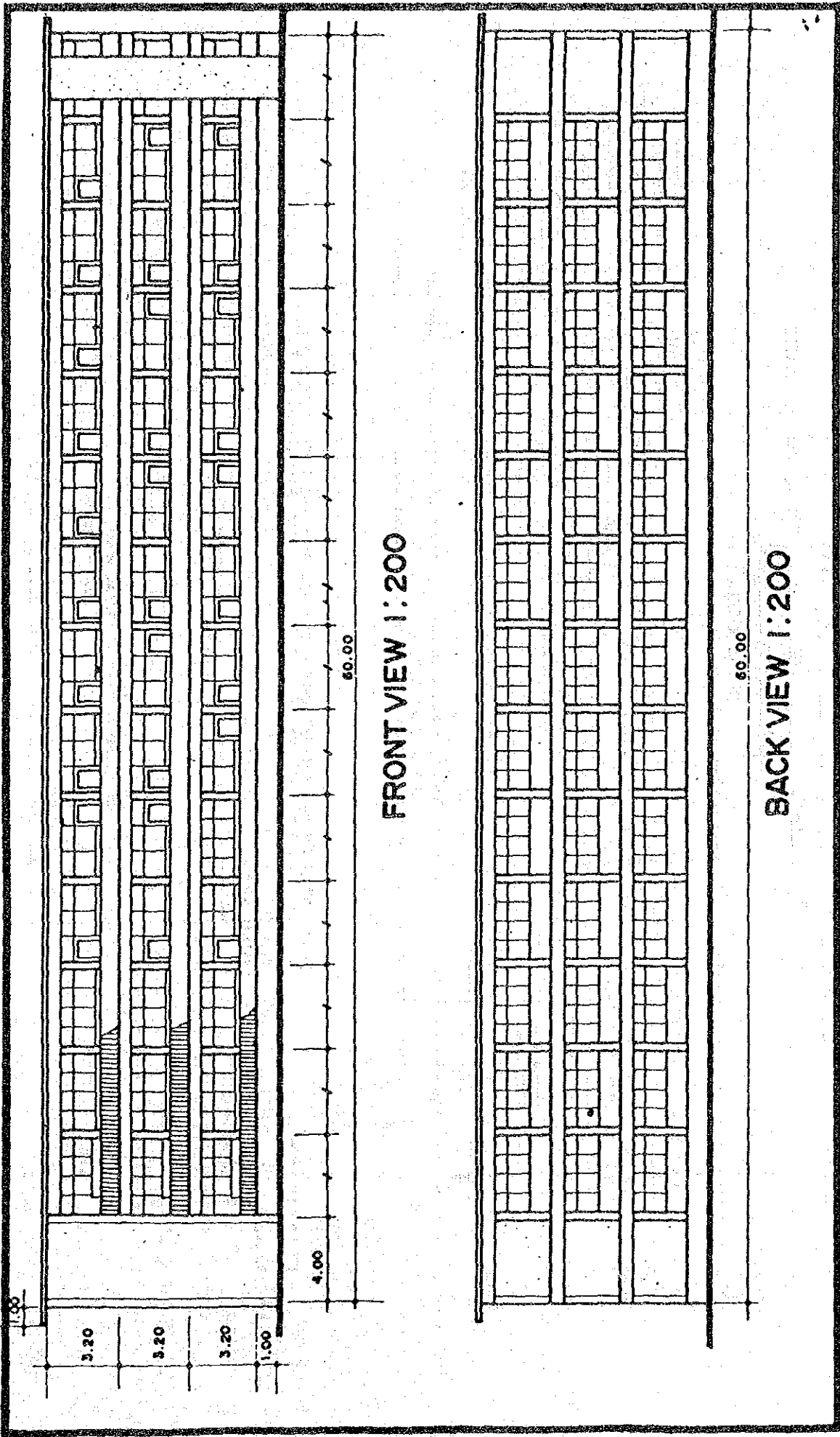
Technical co-operation

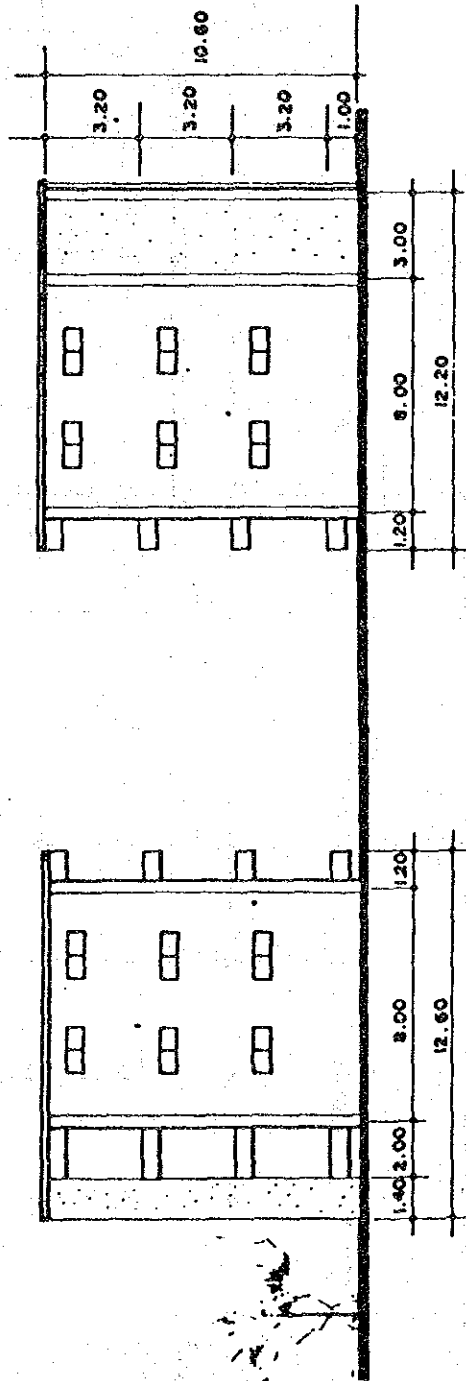


SKETCH PLANNING OF MMWA. TRAINING CENTER.

SCALE 1 : 1000
 TOTAL AREA 16,920 m²

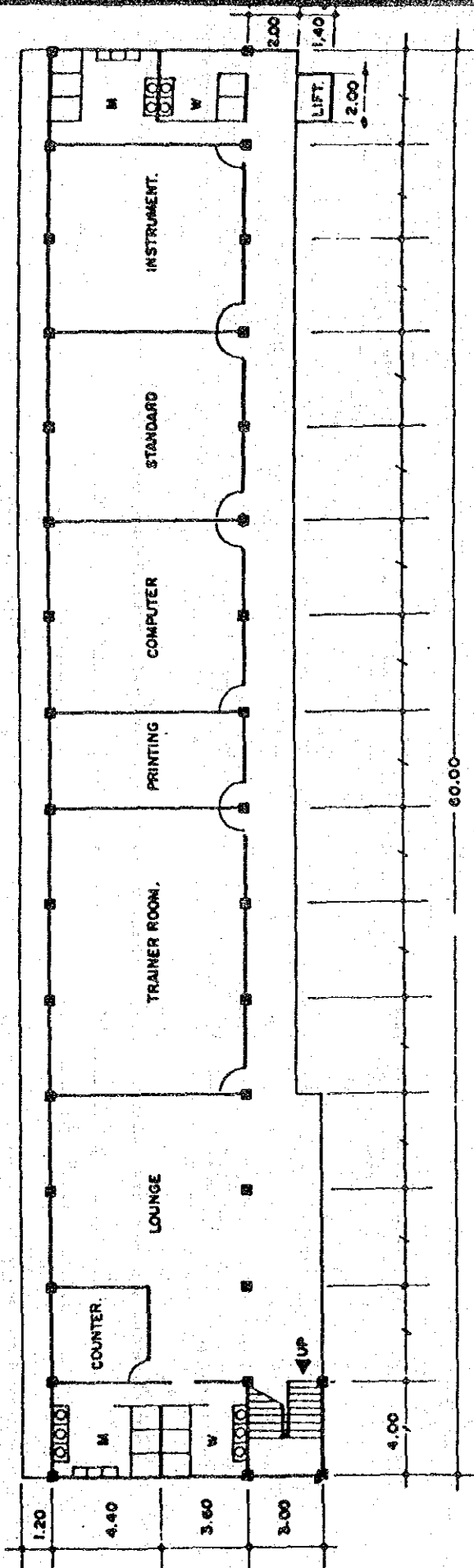
NO	DESCRIPTION
1.	EXISTING WORKSHOP 8.00 m x 19.00 m.
2.	EXISTING BUILDING (OFFICE) 8.00 m x 22.00 m.
3.	NEW TRAINING BUILDING 12.00 m x 60.00 m.
4, 5, 6	NEW WORKSHOP (EE - ME, FIELD PIPE NET WORK)
7.	GUARD 12.00 m x 20.00 m.
8.	SCREEN FENCE 2.00 m x 2.30 m.



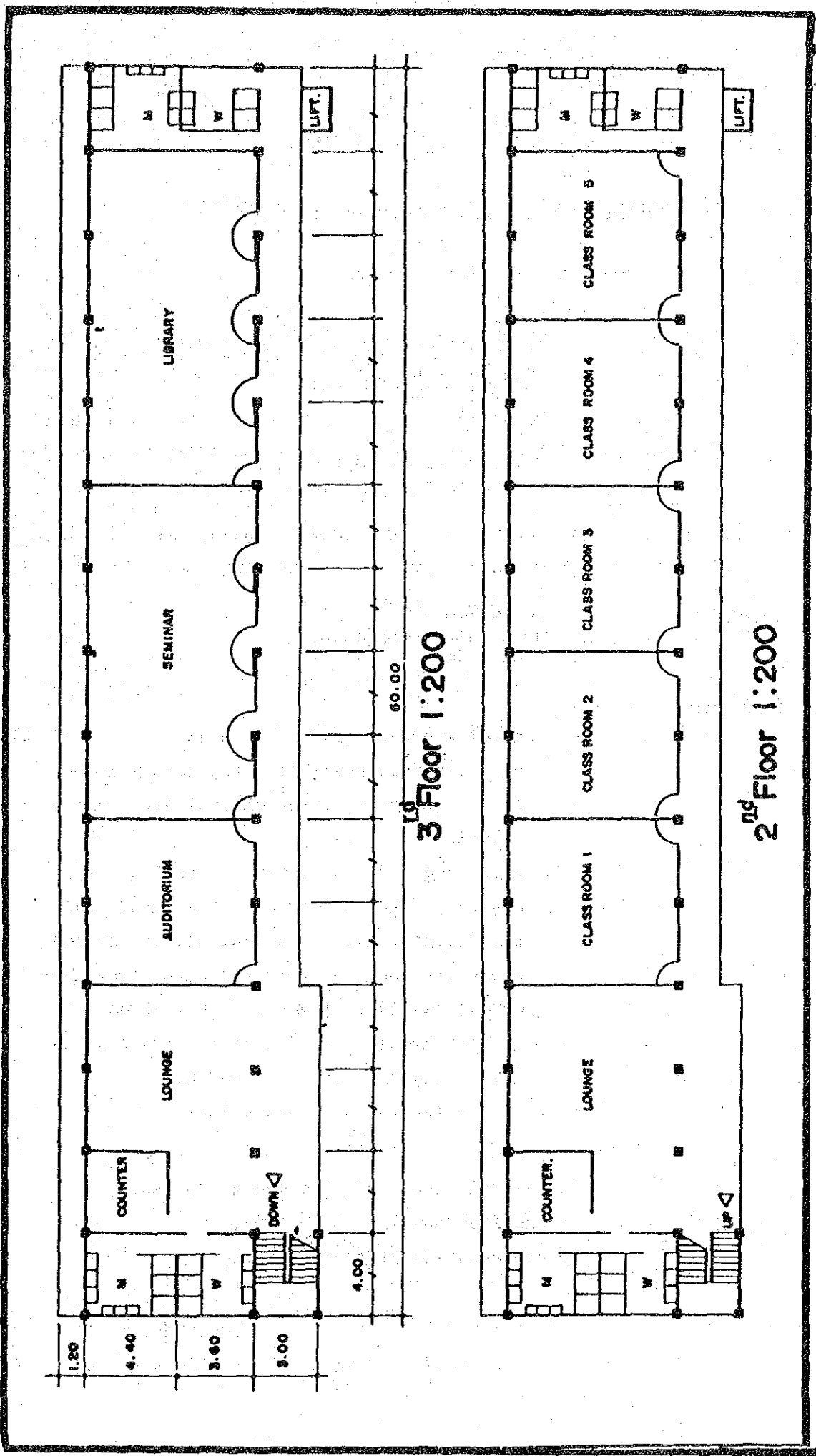


RIGHT VIEW 1:200

LEFT VIEW 1:200



PLAN 1: 200
1st Floor



Appendix V Current Training Courses in MWWA

METROPOLITAN WATER WORKS AUTHORITY, THAILAND

Training Center

<u>Course Title</u>	:	T ₁ General Knowledge or Water Works (Upgrade Course I)
<u>Aim</u>	:	To prepare the skill workman to be incharge of higher responsibility and position by providing them with the general knowledge of water works.
<u>Selection</u>	:	The skill-workman who has been worked in the technical field of water works more than 3 years.
<u>No. of Trainees</u>	:	30 persons
<u>Duration</u>	:	9 full days.
<u>Outline Syllabus</u>	:	<ul style="list-style-type: none">- General knowledge in organization<ul style="list-style-type: none">- Duties and responsibilities, organization charts, present situation, welfare and labour relation- General knowledge of water production<ul style="list-style-type: none">- Raw water process of water treatment, and quality control; mechanical electrical and measuring tools used in the water treatment plant- General knowledge of water distribution<ul style="list-style-type: none">- Distribution works, customer service works, water leakage, safety at works.- Public relation and human relation
<u>Methodology</u>	:	<ul style="list-style-type: none">- Pretest- Lecture, demonstration and study tour- Examination- Presentation of the certificate

Remarks This course serve the policy of MWWA in Manpower Planning
Program.

METROPOLITAN WATER WORKS AUTHORITY, THAILAND

Training Center

- Course Title : T₂ Basic Knowledge of Water Works
(Upgrade Course II)
- Aim : To prepare the skill-workman to be incharge of higher responsibilities and positions, by providing them with the basic skills and knowledge required in water service pipe and plumbing works
- Selection : The skill-workman who has been worked in the technical field of water works more than 3 years and already entered the course T₁ General knowledge of Water Works (Upgrade Course I)
- No. of Trainees : 30 persons.
- Durations : 30 full days (180 hours)
- Outline Syllabus :
- Basic of arithmetic
 - Basic surveys
 - Tape/chains, plane table, leveling and profile; mapping reading; estimation cost.
 - Water pipe laying and jointing
 - The need of water leakage detection, types of service pipes, pipe joints and fitting, jointing of pipe and fitting of similar and dissimilar materials, pressure test, safety at works.
 - The installation of plumbinge
 - Types of plumbing and accessory; installation of plumbing, vent pipes and soul pipes
 - Care and routine maintenance of tools and equipment used.
 - Public relation
 - Health and exercise
 - Self adaption in social life

Methodology

- :
- Examination for entrance
 - Lecture, Practice, and study tour.
 - Examination for the presentation of certificate
-

Remarks

This course serves the policy of MWA in Manpower Planning Program.

METROPOLITAN WATER WORKS AUTHORITY, THAILAND

Training Center

- Course Title : T₃ Water Treatment and Filtration Operations.
(Rapid Gravity Centers)
- Aim : To give instruction in the operation and use
of rapid gravity center
- Selection : A basic course for all operators engaged on
filtration and treatment work of the rapid
gravity type
- No. of Trainees : 30 persons
- Duration : 5 full day
- Outline Syllabus :
- Basic chemical of water treatment
 - Purpose and description of rapid gravity filters.
 - Operation of sedimentation plant
 - Sludge disposal
 - Emergency action
 - Safety practice
 - Fault analysis
 - Records and testing
- Methodology - Lecture, demonstration and practice
-

METROPOLITAN WATER WORKS AUTHORITY, THAILAND

Training Center

- Course Title : T₁ Introduction to Water Quality Control
- Aim : The course aims at increasing the trainee's awareness of the need for quality control, how it is organized and the practical techniques used.
- Selection : Engineers, technicians and supervisors
- No. of Trainees : 30 persons
- Duration : 5 full days
- Outline Syllabus :
- The concept of quality control
 - The need for control and regular monitoring
 - Sampling-theory and practice
 - General hygiene and sterile techniques
 - Bacteriological examination of waters
 - Interpretation of results
- Methodology - Lecture, demonstration, and practice
-

METROPOLITAN WATER WORKS AUTHORITY, THAILAND

Training Center

- Course Title : T₅ Water Chemistry for Non-Specialist.
- Aim : To provide a general introduction to water treatment and to give instruction in various techniques of examination and analysis.
- Selection : Senior administrative, professional and technical staff
- No. of Trainees : 30 persons
- Duration : 5 full days
- Outline Syllabus :
- The need for water treatment
 - Water treatment process
 - Chemical, biological and other contaminants
 - Standard of water quality
 - Pumps and pumping
 - Classical methods of analysis in the process of water quality control
 - Problems arising from algae
 - Animals
 - Laboratory practice work
 - General discussion
- Methodology : Lecture, demonstration and study tour.
-

METROPOLITAN WATER WORKS AUTHORITY, THAILAND

Training Center

- Course Title : T₆ Supervisory Functions for Office Supervisors
General principles
- Aim : To increase awareness of the factor affecting office operations, with emphasis on planning and control of work, relationships and productivity.
- Selection : Supervisors of office personnel employed either in administrative or in technical department.
- No. of Trainees : 30 persons
- Duration : 5 full days
- Outline Syllabus :
- Roles of the office supervisor
 - Human relations motivation and job enrichment, interpersonal relations, relation with the public, leadership style.
 - Communication-systematic communication, principle of organization, effective communication, barriers to communication
 - Personnel functions-man power planning and staff development, recruitment and selection, induction training, performance appraisal, counselling and staff welfare, industrial relations.
 - Management techniques, organization and methods, method study and work measurement, operational research, job evaluation, statistic and financial control.
 - The work situation-legal aspect, environmental factors, safety and security.
- Methodology : Lecture, and exercise
-

METROPOLITAN WATER WORK AUTHORITY, THAILAND

Training Center

- Course Title : T7 Surveying Practice
- Aim : The courses aims is to equip the trainee with the basic skills required for use of conventional surveying instruments and the application of techniques for the purpose of sits surveying.
- Selection : Technicians and supervisors
- No. of Trainees : 30 persons.
- Duration : 10 full days.
- Outline Syllabus :
- Introduction to the principles of surveying
 - Use of surveying instruments
 - Tape/chain
 - Levels
 - Theodolite
 - Introduction to the principles of
 - Chain servey
 - Plane table
 - Traverse
- Methodology : Lecture and practice.
-

METROPOLITAN WATER WORKS AUTHORITY, THAILAND

Training Center

- Course Title : T8 Excavation Methods and Practice
- Aim : This course aims to develop the trainees skill related to safety in trenching, to introduce the trainees to theoretical aspects of soil stability and to give a working knowledge of efficient and effective methods of back filling and reinstatement.
- Selection : Supervisor of technician
- No. of Trainees : 30 persons.
- Duration : 10 full days.
- Outline Syllabus :
- Types of soil and their properties
 - General safety requirements
 - Interpretation of visual evidence
 - Type of support available
 - Setting and with drawal of timbers
 - Moderately firm ground
 - Loose ground
 - Setting and with-drawal of steel trench sheets
 - Lowering of pipes in timber trenches.
 - Care and maintenance of tools/equipment
 - Back filling and reinstatement
 - Statutory safety regulations and summary of safety practices
- Methodology : Lecture, demonstration, and study tour.
-

METROPOLITAN WATER WORKS AUTHORITY, THAILAND

Training Center

- Course Title : T₉ The Maintenance of Pipe work Systems.
- Aim : The course aims to introduce the trainee to the problem of waste control, corrosion and deposition the disinfection of distribution pipe and to outline wheet is required in the planning organization and control of remedial work.
- Selection : Engineers, technicians engaged in water distribution work.
- No. of Trainee : 30 persons
- Duration : 5 full days.
- Outline Syllabus :
- Identification of the problems
 - Causes of the problems
 - Methods available for control:
 - Waste
 - Corrosion and deposition
 - Infestation
- Methodology : Lecture, practice, excercise.
-

METROPOLITAN WATER WORKS AUTHORITY, THAILAND

Training Center

Course Title : T10 Waste Water Inspection "A"
(House Inspection Duties)

Aim : To provide basic training in the skill and knowledge required in house inspection for the detection of waste water.

Selection : The operators, including new entrant who will take the duty of waste water inspection.

No. of Trainees : 30 persons

Durations : 5 full days.

Outline Syllabus :

- The need for waste water prevention
- Cause of waste of water within domestic premises.
- Statutory powers to prevent waste of water
- House inspection-for the detection of waste of water.
- Rewashing domestic water fittings and emergency repairs
- Principles of simple hydraulics.
- Safety precautions
- Public relations
- Care and routine maintenance of tools and equipment used.

Methodology : Lecture, demonstration, and practice

Remarks This course serves the policy of MWWA in the program of the Detection of Waste of Water Planning.

METROPOLITAN WATER WORKS AUTHORITY, THAILAND

Training Center

Course Title : T₁₁ Waste Water Inspection "B".
(Waste Water Metering)

Aim : To provide basic training in the skills and knowledge required in waste water metering and operation of waste water districts.

Selection : The operators, including the new entrant, who will take the duty of waste water inspection. And the one who have already entered the course T₁₀ Waste Water Inspection "A"

No. of Trainees : 30 persons

Durations : 5 full days

Outline Syllabus :

- Cause of underground waste water
- Waste water meters
- Valves and valves operations
- Sounding for waste water
- Waste water reports and records
- Summary of safety practices
- Public relations
- Care and routine maintenance of tools and equipment used.

Methodology : Lecture, demonstration, and practice

Remarks : This course serves the policy of MWWA in the program of the Detection of Waste of Water Planning.

METROPOLITAN WATER WORKS AUTHORITY, THAILAND

Training Center

- Course Title : T₁₂ Waste Water Inspection "C"
(Distribution, recording and measuring equipment)
- Aim : To provide basic training in the skills and knowledge required in the use and operation of water distribution, recording and measuring equipment and flushing and from swabbing of mains.
- Selection : The operators, including the new entrant, who will take the duty of waste water inspection. And the one who have already entered the course T₁₀ and T₁₁ Waste Water Inspection "A" and "B"
- No. of Trainees : 30 persons
- Duration : 5 full days.
- Outline Syllabus :
- Water pressure and flow records
 - Co-ordination of pressure and flow testing of water distribution systems.
 - Equipment for the detection of water leakage, from buried pipes.
 - Flushing and foam swabbing of distribution pipe
 - Consumer complaints.
 - Water sampling-distribution and service pipes
 - Water meters and meter reading
 - Summary of safety practice
 - Care and routine maintenance of tools and equipment used.
- Methodology : Lecture, demonstration, and practice
-

Remarks This course serves the policy of MWWA in the program of the Detection of Waste of Water Planning.

METROPOLITAN WATER WORKS AUTHORITY, THAILAND

Training Center

- Course Title : T₁₃ Water pipe laying and jointing "A"
(Trench Operations)
- Aim : To provide basic training in the skills and knowledge required in the preparation and reinstatement of trenches for water pipe laying and the handling examination; cutting and preparation of water pipe jointing (Up to 6" diameter)
- Selection : The operators, including the new entrant who will take the duty of water pipe laying and jointing.
- No. of Trainees : 30 persons.
- Duration : 5 full days.
- Outline Syllabus :
- Safety practices in trench operations
 - Safety code during road works.
 - Setting out a trench
 - Trench excavations and simple timbering
 - Portable pumps for the removal of water from trenches.
 - Trench back filling and reinstatement.
 - Examination of pipes and specials.
 - Pipe cutting
 - Preparation of pipes for jointing
 - Care and routine maintenance of tools and equipment used
- Methodology : Lecture, demonstration, and study tour.
-

METROPOLITAN WATER WORKS AUTHORITY, THAILAND

Training Center

- Course Title : T₁₄ Water Pipe Laying and Jointing "B"
(Pipe Laying and Jointing)
- Aim : To provide basic training in the skills and knowledge required in the laying and jointing of water pipes (upto 6" diameter)
- Selection : The operators, including the new entrant who will take the duty of water pipe laying. And the one who are already entered the course T₁₃ Water Pipe Laying and jointing "A".
- No. of Trainees : 30 persons.
- Duration : 5 full days.
- Outline Syllabus :
- Jointing of grey iron (coated) pipes
 - Jointing of asbestos cement pipes
 - Jointing of galvanized steel pipes.
 - Jointing of P.B, P.E, and P.V.C. pipes.
 - Laying of pipes and specials.
 - Safety practices in pipe laying operation
 - Care and routine maintenance of tools and equipment used.
- Methodology : Lecture, demonstration, and study tour.
-

METROPOLITAN WATER WORKS AUTHORITY, THAILAND

Training Center

- Course Title : T₁₅ Water Pipe Laying and Jointing "C"
(Pipe Repair and Modifications)
- Aim : To provide basic training in the skills and knowledge required in the repair and modifications to existing water pipe (upto 6" diameter)
- Selection : The operators, including the new entrant who will take the duty of water pipe laying and jointing. And the one who are already entered the course T₁₃ and T₁₄ Water Pipe Laying and Jointing "A" and "B"
- No of Trainees : 30 persons
- Duration : 5 full days.
- Outline Syllabus :
- Work planning and job records.
 - Water pipe branch connections
 - Installation of valves, hydrants, meters.
 - Water pipe repairs
 - Maintenance of sluice valve and hydrants
 - Safety practices in repairs and modifications to existing water pipes.
 - Care and routine maintenance of tools and equipment used.
- Methodology : Lecture, demonstrate, and study tour.
-

METROPOLITAN WATER WORK AUTHORITY, THAILAND

Training Center

Course Title : A₁ Orientation

Aim : To introduction the participants with general knowledge of organization

Selection : Near employees, both in administrative and Technical working

No. of Trainees : 35 persons

Duration : 5 full days

Outline syllabus :

- General knowledge of MWWA.
- Human relation
- Labour relation
- Team work building
- Public relation
- Water treatment plant observation
- Principle of personnel management

Methodology : Instruction, study tour

Records : Attendance and evaluation

METROPOLITAN WATER WORKS AUTHORITY, THAILAND

Training Center

- Course Title : A₂ Job Relations
- Aim : To enhance knowledge for the supervisors required role and team building.
- Selection : Supervisors, both in the administrative and technical working
- No. of Trainees : 35 persons
- Duration : 4 full days
- Outline Syllabus :
- Role and responsibilities of supervisors
 - Establishment of working relation
 - Avoidance of work conflicts.
 - Psychology at work and motivation
 - Safety at work
 - Self development
 - Labour relations
- Methodology : Instruction, discussion, games, group dynamics.
- Records : Attendance and evaluation.

METROPOLITAN WATER WORKS AUTHORITY, THAILAND

Training Center

Course Title : A3 Team development

Aim : To provide the trainees with knowledge required
in team development

Selection : Junior officers

No. of trainees : 35 persons

Duration : 3 full days

Outline syllabus :

- Job improvement
- Self analysis and self adaptation
- Team development
- Group discussion

Methodology : Instruction, discussion, group dynamics

Records : Attendance and evaluation

METROPOLITAN WATER WORKS AUTHORITY, THAILAND

Training Center

- Course Title : A₄ Feasibility Study
- Aim : To promote an appreciation of trainees with knowledge required in project planning
- Selection : Junior officers, both in the administrative and technical working.
- No. of trainees : 35 persons.
- Duration : 1 full days.
- Outline Syllabus :
- Project cycle
 - Plan and project relation
 - Project analysis
 - Benefit cost analysis
 - Cost effectiveness analysis
- Methodology : Instruction, discussion, practice
- Records : Attendance and evaluation

METROPOLITAN WATER WORKS AUTHORITY, THAILAND

Training Center

<u>Course Title</u>	:	A ₅ Customer service
<u>Aim</u>	:	To equip the participants with fully understanding of customer service works and how to service the customers
<u>Selection</u>	:	The in-experienced officers and operators, including the new entrant who will take the duty of customer service
<u>No. of Trainees</u>	:	35 persons
<u>Duration</u>	:	10 full days
<u>Ourline Syllabus</u>	:	<ul style="list-style-type: none">- Role and responsibilities of customer service- Introduction to water production and distribution- How to solve conflicts.- Basic of billing system.- Introduction to MWWA'S computer- Art of talking and telephoning- Introduction to water meter use
<u>Methodology</u>	:	Instruction, discussion and study tour
<u>Records</u>	:	Attendance and evaluation

METROPOLITAN WATER WORKS AUTHORITY, THAILAND

Training Center

Course Title : A₆ Strategy to clear Unpaid Water Debts and Illegal Water Problems.

Aim : To provide the trainees with knowledge required in strategy to clear unpaid water debts and illegal water problems.

Selection : The in-experienced officers and operators including the new entrant who will take the duty of customer service works.

No. of Trainees : 35 persons

Duration : 4 full days

Outline Syllabus :

- Causes and problems of unpaid water debts.
- Causes and problems of illegal water service
- Water meter reading
- Water unpaid debts clearance technique
- Need of law to deal with unpaid water debts and illegal water service
- Team Working

Methodology : Instruction, discussion and group dynamics

Records : Attendance and evaluation

Remarks : This course serves the policy of MWWA in the program of the Detection of Waste of Water Planning required in increasing of income.

METROPOLITAN WATER WORKS AUTHORITY, THAILAND

Training Center

- Course Title : A7 General Business and Documentary Works.
- Aim : To chance knowledge, skill and good attitude of the trainees required in general business and documentary Works.
- Selection : Supervisors who response to general business
- No. of trainees : 35 persons
- Duration : 5 full days
- Outline Syllabus :
- General ideas of general business and documentary Works.
 - Office writing
 - Filing system
 - Team development
 - Function psychology.
- Methodology : Instruction, discussion, study tour.
- Records : Attendance and evaluation.

METROPOLITAN WATER WORKS AUTHORITY, THAILAND

Training Center

Course Title : Ag Secretarial Working System.

Aim : To promote an appreciation of the trainees with knowledge and skill required in secretarial works.

Selection : Secretarial officers.

No. of Trainees : 3 full days.

Outline Syllabus :

- Secretary's role and responsibility.
- Filing and record operation.
- Preparing the meeting
- Self analysis and self adaptation
- Arts of reception and communication

Methodology : Instruction, discussion, games

Records : Attendance and evaluation

METROPOLITAN WATER WORKS AUTHORITY, THAILAND

Training Center

- Course Title : A9 Functional Psychology
- Aim : To promote an appreciation of the trainees with knowledge of psychology and how to apply psychology at works
- Selection : Engineers, lawyers, accountant and other professional employees.
- No. of Trainees : 35 persons
- Duration : 2 full days.
- Outline Syllabus :
- Self analysis and self adaptation
 - Communication with transactional analysis
 - Team building
- Methodology : Instruction, discussion, games, and group dynamics
- Records : Attendance and evaluation

METROPOLITAN WATER WORKS AUTHORITY, THAILAND

Training Center

- Course Title : A₁₀ Management Workshop
- Aim : To increase awareness of the trainees with the factors effecting in personnel management; and to promote an appreciation of skill and knowledge required in personnel management by human behaviour.
- Selection : Executives, senior officers; both in administrative works and technical works.
- No. of Trainees : 35 persons
- Duration : 5 full days.
- Outline Syllabus :
- Factors effecting in personal management.
 - Human behaviour.
 - UNO principle
 - Individual format
 - Management by human behaviour
 - Motivation
 - Punishments and rewards.
 - Counseling techniques
 - Communication
 - Speaking skill
 - Listening skill
 - Presentation skill
- Methodology : Lecture, case study, role play, and seminar.
- Records : Attendance, and evaluation.

Appendix V. 実施調査団のためのR/D試案

THE RECORD OF DISCUSSIONS BETWEEN THE
JAPANESE IMPLEMENTATION SURVEY TEAM
AND THE AUTHORITIES CONCERNED OF THE
GOVERNMENT OF THE KINGDOM OF THAILAND
ON THE JAPANESE TECHNICAL COOPERATION
FOR THE THAILAND-JAPAN WATER TECHNOLOGY
DEVELOPMENT CENTER (DRAFT)

The Japanese Implementation Survey Team (hereinafter referred to as "the Team") organized by the Japan International Cooperation Agency (hereinafter referred to as JICA) and headed by _____ visited the Kingdom of Thailand from _____ to _____ for the purpose of working out the details of the technical cooperation program concerning the Thailand-Japan Water Technological Development Center of the Metropolitan Water Works Authority (hereinafter referred to as "MWWA") in the Kingdom of Thailand.

During its stay in the Kingdom of Thailand, the Team exchanged views and had a series of discussions with the Thai authorities concerned in respect of the desirable measures to be taken by both Governments for the successful implementation of the Center.

As the results of the discussions, the Team and the Thai authorities concerned agreed to recommend to their respective Governments the matters referred to in the document attached here to.

Bangkok, Thailand

Dr. Yasuyoshi Sayato
Leader
The Implementation Survey Team
Japan International Cooperation Agency
JICA

Dr. Pracha Tansiri
General Manager
The Metropolitan Water
Works Authority
MWWA

I. COOPERATION BETWEEN BOTH GOVERNMENTS

1. The Government of Japan and the Government of the Kingdom of Thailand will cooperate with each other in implementing the Thai-Japan Water Technology Development Center Project (hereinafter referred to as "the Project") for the purpose of cultivating well-trained middle-class skilled manpower, thereby contributing to the water supply development of the Kingdom of Thailand.
2. The Project will be implemented in accordance with the Master Plan which is given in Annex 1.

II. DISPATCH OF JAPANESE EXPERTS AND PRIVILEGES, EXEMPTIONS AND BENEFITS

1. In accordance with the laws and regulations in force in Japan, the Government of Japan will take necessary measures through JICA to provide at its own expense services of the Japanese experts as listed in Annex II through the normal procedures under the Technical Cooperation Scheme of the Government of Japan.
2. The privileges, exemptions and benefits to be granted by the Government of the Kingdom of Thailand to the Japanese experts and their families in the Kingdom of Thailand will be no less favourable than those granted to experts of third countries or of international organizations such as United Nations performing similar missions in the Kingdom of Thailand, and

include the followings:

- 1) Exemptions from income tax and charges of any kind imposed on or in connection with the living allowances remitted from abroad.
- 2) Exemptions from import and export duties and any other charges imposed in respect of personnels and household effects including one motor vehicle per each expert which may be brought into from abroad or taken out of the Kingdom of Thailand.
- 3) Exemptions from import tax, import sales tax, and other taxes and charges of any kind imposed on or in connection with the purchase in the Kingdom of Thailand by the Japanese experts of one motor vehicle per each expert.
- 4) Free local medical services and facilities to the Japanese experts and their families.
- 5) Issue of Identification cards to the Japanese experts, to secure the cooperation of the authorities concerned of the Kingdom of Thailand, necessary for the performance of the duties of the Japanese experts and their families.

III.

PROVISION OF INSTALLATIONS AND EQUIPMENTS

1. In accordance with the laws and regulations in force in Japan, the Government of Japan will take necessary measures through JICA to provide at its own expense such installations and equipments and other materials necessary for the implementation of the Project as listed in Annex III, through the normal procedures under the Technical Cooperation Scheme of the Government of Japan.

2. The articles referred to in 1. above will become the property of the MWWA of the Kingdom of Thailand upon being delivered c.i.f. to the Thai authorities concerned at the ports and/or airports of disembarkation, and will be utilized exclusively for the implementation of the Project in consultation with Japanese experts referred to in Annex II.

IV. TRAINING THAI PERSONNEL IN JAPAN

1. In accordance with the laws and regulations in force in Japan, the Government of Japan will take necessary measures through JICA to receive at its own expense the MWWA personnels connected with the Project for technical training in Japan through the normal procedures under the Technical Cooperation Scheme of the Government of Japan.

2. The Government of the Kingdom of Thailand will take necessary measures to ensure that the knowledge and experiences acquired by the MWWA personnels from technical training in Japan will be utilized effectively for the implementation of the Project.

V. SERVICES OF THAI COUNTERPART PERSONNEL AND ADMINISTRATIVE PERSONNEL

1. In accordance with the laws and regulations in force in Thailand, MWWA of the Kingdom of Thailand

will take necessary measures to secure at its own expense necessary services of personnels as listed in Annex IV.

2. As to the Thai counterpart personnels, MWWA of the Kingdom of Thailand will endeavor to allocate the necessary number of suitably qualified personnels corresponding to each Japanese expert to be dispatched by the Government of Japan as specified in Annex II, to fulfill the effective and successful transfer of technology under the Project.

VI. MEASURES TO BE TAKEN BY THE GOVERNMENT OF THE KINGDOM OF THAILAND

1. In accordance with the laws and regulations in force in the Kingdom of Thailand, MWWA of the Kingdom of Thailand will take necessary measures to provide at its own expense:

- 1) Land, building and facilities as listed in Annex V.
- 2) Supply or replacement of installations, equipments, instruments, vehicles, tools, spare parts and any other materials necessary for the implementation of the Project other than those provided through JICA under III above.
- 3) Transportation facilities and travel allowance for the Japanese experts for the official travel within the Kingdom of Thailand.
- 4) Suitably furnished accommodations for the Japanese experts and their families.

2. In accordance with the laws and regulations in force in the Kingdom of Thailand, MWWA of the Kingdom of Thailand will take necessary measures to meet:

1) Expenses necessary for transportation within the Kingdom of Thailand of the articles referred to in III above as well as for the installation, operation and maintenance thereof.

2) Customs duties, internal taxes and any other charges, imposed in the Kingdom of Thailand on the articles referred to in III above.

3) All running expenses necessary for the implementation of the Project.

VII.

ADMINISTRATION OF THE PROJECT

1. Deputy General Manager of MWWA concerned with the Center will bear overall responsibility for the implementation of the Project, and General Manager of MWWA will be responsible for the administrative and managerial matters of the implementation of the Project.

2. The Japanese experts will provide technical guidance and advice for the implementation of the Project.

3. For the effective and successful implementation of the Project, there will be close consultation between the Japanese experts and the officials concerned of the Government of the Kingdom of Thailand. For the purpose, a Joint Committee will be established as specified in Annex VI.

VIII. CLAIMS AGAINST JAPANESE EXPERTS

The Government of the Kingdom of Thailand undertakes to bear claims, if any arises, against the Japanese experts engaged in the Project resulting from, occurring in the course of, or otherwise connected with the discharge of their official functions in the Kingdom of Thailand except for those arising from the willful misconduct or gross negligence of the Japanese experts.

IX. MUTUAL CONSULTATION

There will be mutual consultation between the two Governments on any major issues from, or in connection with this Attached Documents.

X. TEAM OF COOPERATION

The duration of the technical cooperation for the Project under this Attached Documents will be basically five (5) years from _____ . However, there will be a general review by the Japanese Evaluation Team together with the Joint Committee to be held in Bangkok on the progress of the cooperation taking account of measures to be taken by two Governments in order to decide if the cooperation should be continued for two (2) more years.

ANNEX I MASTER PLAN

1. Objectives of the Project

(1) Considering the situation that supply of well-trained manpower is one of the most urgent problems for development of public water supply, especially for ensurement of clean and ample water supply in Thailand, the training for middle-class water supply engineers and other personnels should be implemented in the Water Technology Development Center provided by the Metropolitan Water Works Authority of Thailand.

(2) The Center has for its object to improve training method and its level through technical cooperation by the Government of Japan and introducing characteristics of training method for water supply engineers in Japan, thereby contributing improvement of training system for water supply engineers and other personnels of Thailand.

2. Training Courses to be Established in the Center, Duration of Training, Number of Trainee

Courses	Sub-Courses	Duration	No. of Trainee
A.Planning		24 wks	15-20
	A-1 Basic Planning	(8)	
	A-2 Facility Planning	(8)	
	A-3 Distribution Planning	(8)	
B.Water Purification and Sanitation		24 wks	15-20
	B-1 Water Purification Technique	(8)	
	B-2 Water Quality Analysis	(8)	
	B-3 Water Quality Control	(8)	
C.Pipeline Installation and Maintenance		12 wks	20
	C-1 Pipng	(4)	
	C-2 Pipeline Maintenance	(4)	
	C-3 Leakage Inspection	(4)	
D.Mechanical and Electrical Installation		12 wks	20
	D-1 Mechanical Installation	(4)	
	D-2 Electrical Installation	(4)	
	D-3 Instrumentation	(4)	

Notes: (1) Number of trainees may change in accordance with the necessity of Thai side and the capacity of lecture rooms to be provided by MWWA.

(2) A and B training courses are to be held twice a year, and C and D training courses three times a year.

(3) Besides above-mentioned regular training courses, seminars on special subjects may be held for 30 or 40 personnels with duration in accordance with the necessity .

3. Targets of Training Courses

A. Planning Course

To cultivate well-trained engineers and technicians who have adequate knowledge and practical ability for water supply and water supply facility planning.

A-1 Basic Planning Sub-Course

To give ability to make a master plan for water supply and basic facility plan, including decision of types, structures, capacities and other fundamentals of water supply facilities.

A-2 Facility Planning Sub-Course

To give ability to make a detail plan and supervise designing work of water supply facilities.

A-3 Distribution Planning Sub-Course

To give ability to make a plan on distribution pipelines and its operation.

B. Water Purification and Sanitation

To cultivate well-trained engineers, scientists and technicians who have adequate knowledge of water purification and sanitation and practical ability for water purification operation and water quality control.

B-1 Water Purification Technique Sub-Course

To give ability to direct operations for water purification in conformity to raw water quality.

B-2 Water quality Analysis Sub-Course

To give ability to investigate and examine water quality of raw and supplied water.

B-3 Water Quality Control Sub-Course

To give ability to form a judgement on water safety and sanitation and also set up water quality control system.

C. Pipeline Maintenance Course

To cultivate well-trained technicians and other skilled workers who have adequate knowledge of distribution system and water pipes and practical ability for maintenance of water pipelines.

C-1 Piping Sub-Course

To give ability to lay water supply pipes including jointing and valve installations.

C-2 Pipeline Maintenance Sub-Course

To give ability to maintain and repair water pipeline

C-3 Leakage Inspection Sub-Course

To give ability to practise leakage inspection.

D. Mechanical and Electrical Installations Course

To cultivate well-trained engineers, technicians, and other skilled workers who have adequate knowledge of mechanical, electrical and instrumentation equipments and practical ability for basic planning, operations and maintenance of those installations.

D-1 Mechanical Installations Sub-Course

To give ability to understand structures and functions of mechanical equipment for water supply systems and operate and maintain them properly in conformity to supply conditions.

D-2 Electrical Installations Sub-Course

To give ability to understand structures and functions of electrical equipment for water supply systems and operate and maintain them properly in conformity to supply conditions.

D-3 Instrumentation Sub-Course

To give ability to understand concepts of instrumentation and make a preliminary design of water supply instrumentation.

ANNEX II JAPANESE EXPERTS

Category	Field
1-Team Leader	
4-Experts	Water Supply Planning Sanitary Engineering Civil Engineering Mechanical and Electrical Engineering
1-Liaison Officer	

Note: (1) One of the experts to be dispatched as listed above will be designated as a Team Leader.

(2) Short-term experts may be dispatched, if necessity arises, for the installation of demonstration models and equipment provided by the Government of Japan and for other training purposes.

ANNEX III LIST OF ARTICLES

The articles to be provided by the Government of Japan are such installations, equipment, tools and other materials necessary for the implementation of training mentioned by ANNEX I.

ANNEX IV LIST OF MWWA STAFF

1. Director

Deputy Director

2. Instructors

a) Full-Time Instructors in the Following Fields

-Planning

-Water Purification

-Water Sanitation

-Piping and Pipeline Maintenance

-Mechanical Installations

-Electrical Installations

b) Part-Time Instructors to support Full-Time Instructors

3. Administrative Personnels

a) Executive Officers

b) Clerks

c) Secretaries / Typist

d) Store Keepers

e) Demonstration Plant Operaters

f) Drivers

g) Others

ANNEX V LIST OF LAND, BUILDINGS AND FACILITIES

1. Land

2. Administration Buildings

Director Room

Administrative Office

Team Leader Room

Experts Rooms

Meeting Rooms

Other Necessary Rooms

3. Class Rooms / Audio-Visual Education Room

4. Laboratory

5. Workshops for Trainings

6. Libraly

7. Other Necessary Buildings and Facilities

ANNEX VI THE JOINT COMMITTEE

1. Functions

The Joint Committee composed of those members as listed below will meet at least once a year and whenever necessity arises, and work:

- 1) To review the overall progress of Tentative Implementation Schedule in line with the Master Plan of the Project.
- 2) To review those measures taken by the Government of Japan:
 - (1) Dispatch of Japanese experts.
 - (2) Acceptance of Thai counterpart personnels in Japan for training.
 - (3) Provision of installations and equipments.
- 3) To review those measures taken by MWWA of the Government of Thailand:
 - (1) Allocation of necessary budget (including local cost expenditure)
 - (2) Allocation of necessary counterpart personnels.
 - (3) Utilization of installations and equipments provides by the Government of Japan.
- 4) To formulate the Annual Operational Plan of the Project
- 5) And, to recommend to the two Governments particularly on:
 - (1) Budgetary matters.
 - (2) Recruitment and appointments of the Thai counterpart personnels.
 - (3) Selection and effective utilization of installations and equipments.
 - (4) Appropriate dispatch of Japanese experts.
 - (5) Acceptance of Thai counterpart personnels in Japan for training
 - (6) Others.

2. Composition

1) Chairman

General-Manager, MWWA

2) Thai Side

3) Japanese Side

(1) Team Leader

(2) Experts designated by the Team Leader

(3) Liaison Officer

(4) Representatives of JICA, Bangkok

Note; Officials of the Embassy of Japan may attend the Joint Committee as observers.

		1					2					3					4					5					6								
ITEMS		2	4	6	8	10	12	2	4	6	8	10	12	2	4	6	8	10	12	2	4	6	8	10	12	2	4	6	8	10	12	2	4	6	8
R/D		←-----																																	
EXPERT		←-----																																	
CP		←-----																																	
CP TRAINING		← 3名					← 3名					← 3名					← 3名					← 3名													
TEXTBOOK		← 教科書・教材 →																																	
TRAINING COUSE																																			
EQUIPMENT		←-----																																	
REPORT																																			
OTHERS																																			

(2) 協力実施計画

ITEMS	1				2				3				4				5				6						
	2	4	6	8	10	12	2	4	6	8	10	12	2	4	6	8	10	12	2	4	6	8	10	12	2	4	6
R/D	*-----*																										
[日本側計画]																											
1. 長期専門家派遣																											
①水道計画 (T・L)																											
②水処理衛生																											
③管路維持管理																											
④電気・機械設備																											
⑤調整員																											
2. 短期専門家派遣																											
①機材据付け																											
②短期セミナー																											
3. 機材供与																											
4. 調査団																											
5. カウンターパート受入れ																											
[タイ側計画]																											
1. 建物等整備																											
2. カウンターパート																											
①研修所長																											
②水道計画 (1~2名)																											
③水処理・衛生 (")																											
④管路維持管理 (")																											
⑤電気機械設備 (")																											
3. 研修助手, オペレータ																											
4. ローカル・コスト																											

JICA