4-5-2 Data Processing Methods (Indication, Recording, and Storing)

1) Data Process Flow

Data transmitted from monitoring stations through TOT lines will be received by the telemetering panel at the Flood Control Center and then processed with the present indication pattern program of the main computer. The standard process flows of data are shown in the following Tables:

- Table 4.4 Rainfall Data Processing Flow
- Table 4.5 Water Level Data Processing Flow
- Table 4.6 Water Quality Data Processing Flow
- Table 4.7 Pump Operation and Gate Opening Data Processing Flow

2) Picture (VDU Picture Data) and Print Form Types

Picture and print form types are shown in Table 4.8.

The number of format patterns are as follows:

Data Type	Picture		Print Form	
Rainfall	9 types:	84 patterns	8 types:	11 patterns
Water Level	5 types:	101 patterns	3 types:	12 patterns
Water Quality	5 types:	5 patterns	2 types:	2 patterns
Pump & Gate	1 types:	9 patterns	2 types:	20 patterns
TOTAL	20 types:	199 patterns	15 types:	45 patterns

3) Contents of Pictures and Print Forms

Contents of pictures and print forms are shown in the following Tables:

- Table 4.9 Contents of Rainfall Data Pictures
- Table 4.10 Contents of Water Level Data Pictures
- Table 4.11 Contents of Pump and Gate Operations and Water quality Data Pictures
- Table 4.12 Contents of Rainfall Data Print Forms
- Table 4.13 Contents of Water Level Data Print Forms
- Table 4.14 Contents of Pump and Gate Operations and Water Quality Data Print Forms

Table 4.4 Rainfall Data Processing, Indicating, Recording, and Storing Flow

DATA FLOW	Process Intervals						Basic Unit of Data					Medium of Picture Process, Recording and Storing					
	At any time	15 minutes	1 hour	24 hours (1 day)	1 month	1 year	Real time data	15 min. data	1 hour data	24 hour data	1 month data	SR	HD	MMC	VDU	PRT	MT
Rain Gauge Stations (21 Stations)																	
↓																	
Raw Data							○					○					
↓																	
Master Station								○					○ 6 Mos.				
↓ Main Computer																	
Real Time Data Process	△	○						○						○			○
Hourly Rainfall Distribution Map at Each Location	△		○				△	○							●		
Accumulated Rainfall Distribution Map at Each Location	△			○			△	○							●		
↓																	
Hourly Data Process			○						○								
Hourly Rainfall Picture at Each Station				○					○						●		
Hourly Rainfall Picture in Each Area				○					○						●		
Hourly Rainfall Change Picture at Each Station				5 Days					○						●		
Hourly Rainfall Change Picture in Each Area				5 Days					○						●		
↓																	
Daily Data Process				○						○							
Daily Rainfall Distribution Map at Each Location				○						○					●		
Daily Rainfall Change Picture at Each Station					120 days				○						●		
Daily Rainfall Change Picture in Each Area					120 days				○						●		
Hourly Rainfall Table at Each Station				○					○							●	
Hourly Rainfall Table in Each Area				○					○							●	
↓																	
Monthly Data Process					○					○							
Daily Rainfall Table at Each Station	△				○					○						○	
Daily Rainfall Table in Each Area	△				○					○						○	
↓																	
Yearly Data Process						○					○						
Monthly Rainfall Table at Each Station	△					○					○					○	
Monthly Rainfall Table in Each Area	△					○					○					○	
Table of Max. Hourly Rainfall in Each Day at Each Station	△					○		○	○	○						○	
Table of Max. Hourly Rainfall in Each Day in Each Area	△					○		○	○	○						○	

SR: Self-recorder on paper
HD: Hard disk
MMC: Mimic panel
VDU: VDU picture, hard copy, and 70-inch projector
PRT: Printer
MT: Magnetic tape

○ : Applicable Item
△ : Supplemental Function

○ : Temporary
● : Permanent (if required)
○ : Permanent (all data)

Table 4.5 Water Level Data Processing, Indicating, Recording, and Storing Flow

DATA FLOW.	Process Intervals: At any time	15 minutes	1 hour	24 hours (1 day)	1 month	1 year	Basic Unit of Data: Real time data	15 min. data	1 hour data	24 hour data	1 month data	Medium of Picture Process, Recording and Storing: SR	HD	MMC	VDU	PRT	MT
Water Level Gauge Station's (24 stations, 41 gauges)																	
↓ Raw Data							○					○					
↓ Master Station								○					○ 6 Nos.				
↓ Main Computer																	
Real Time Data Process	△	○						○						○			○
Water Level Cross Section Picture	○							○							●		
↓ Water Level Change Picture at Each Station				30 hrs				○							●		
Hourly Data Process			○						○								
Water Level Change Table at Each Station				○					○						●		
↓ Water Level Change Picture at Each Station				5 days					○						●		
Daily Data Process				○						○							
Water Level Change Picture at Each Station				120 days						○					●		
↓ Hourly Water Level Table at Each Station				○					○							○	
Monthly Data Process					○					○							
Average Daily Water Level Table at Each	△				○					○						○	
↓ Station																	
Yearly Data Process						○					○						
Average Monthly Water Level Table at	△					○					○					○	
Each Station																	

SR: Self-recorder on paper
HD: Hard disk
MMC: Mimic panel
VDU: VDU picture, hard copy, and 70-inch projector
PRT: Printer
MT: Magnetic tape

○ : Applicable Item
△ : Supplemental Function

○ : Temporary
● : Permanent (if required)
○ : Permanent (all data)

Table 4.6 Water Quality Data Process, Indication, Recording, and Storing Flow

DATA FLOW	Process Intervals						Basic Unit of Data					Medium of Picture Process, Recording and Storing					
	At any time	15 minutes	1 hour	24 hours (1 day)	1 month	1 year	Real time data	15 min. data	1 hour data	24 hour data	1 month data	SR	HD	MMC	VDU	PRT	MT
Water Quality Meter Stations (2 stations)																	
Raw Data							○										
Master Station								○					○ 6 Nos.				
Main Computer																	
Real Time Data Process																	○
Water Quality Data Table at Each Station	○							○							●		
Water Quality Change Picture at Each Station				30 hrs.				○							●		
Hourly Data Process				○					○								
Water Quality Data Table at Each Station				○					○						●		
Water Quality Change Picture at Each Station				5 days					○						●		
Daily Data Process				○						○							
Water Quality Change Picture at Each Station				120 days						○					●		
Monthly Data Process					○					○							
Average Daily Water Quality Table at Each Station	△				○					○						○	
Yearly Data Process																	
Average Monthly Water Quality Table at Each Station	△					○					○					○	

SR: Self-recorder on paper
HD: Hard disk
MMC: Mimic panel
VDU: VDU picture, hard copy, and 70-inch projector
PRT: Printer
MT: Magnetic tape

○ : Applicable Item
△ : Supplemental Function

○ : Temporary
● : Permanent (if required)
○ : Permanent (all data)

Table 4.7 Pump Operation and Gate Opening Data Process, Indication, Recording, and Storing Flow

DATA FLOW	Process Intervals						Basic Unit of Data				Medium of Picture Process, Recording and Storing					
	At any time	15 minutes	1 hour	24 hours (1 day)	1 month	1 year	Real time data	15 min. data	1 hour data	24 hour data	1 month data	SR	HD	MMC	VDU	PRT	MT
Pumping Stations (12 stations, 118 pumps)																	
Gates (16 locations, 30 gates)																	
Total: 18 Monitoring Station																	
Raw Data							○										
Master Station								○					○ 6 Mos.				
Main Computer																	
Real Time Data Process								○						○		○	
Pump Operation and Gate Opening Picture at Each Station	○							○							●		
Hourly Data Process																	
Daily Data Process																	
Monthly Data Process																	
Summary Table of Daily Pump Operated Hours at Each Station			○						○							○	
Yearly Data Process																	
Summary Table of Monthly Pump Operated Hours at Each Station				○						○						○	

SR: Self-recorder on paper
HD: Hard disk
MMC: Mimic panel
VDU: VDU picture, hard copy, and 70-inch projector
PRT: Printer
MT: Magnetic tape

○ : Applicable Item
● : Supplemental Function

○ : Temporary
○ : Permanent (if required)
○ : Permanent (all data)

Table 4.8 Picture and Print Form Types and the Number of Their Patterns

PICTURE IMAGE		
#	NAME	No. OF PICTURE
1	RAINFALL DISTRIBUTION	1
2	ACCUMULATED RAINFALL DISTRIBUTION	1
3	HOURLY RAINFALL BY MONITORING STATION (M.S.)	21
4	HOURLY RAINFALL BY REGION	6
5	ACCUMULATED HOURLY RAINFALL BY M.S.	21
6	ACCUMULATED HOURLY RAINFALL BY REGION	6
7	ACCUMULATED HOURLY RAINFALL DISTRIBUTION	1
8	ACCUMULATED DAILY RAINFALL BY M.S.	21
9	ACCUMULATED DAILY RAINFALL BY REGION	6
10	SELECTION OF WATER LEVEL PROFILE	1
11	WATER LEVEL PROFILE	4
12	WATER LEVEL TREND BY M.S.	24
13	HOURLY WATER LEVEL BY M.S.	24
14	HOURLY WATER LEVEL TREND BY M.S.	24
15	DAILY WATER LEVEL BY M.S.	24
16	WATER QUALITY	1
17	WATER QUALITY TREND	1
18	HOURLY WATER QUALITY	1
19	HOURLY WATER QUALITY TREND	1
20	DAILY WATER QUALITY TREND	1
21	PUMP OPERATION, GATE OPENING	9

PRINT FORMAT		
#	NAME	No. OF FORMAT
1	DAILY REPORT FOR RAINFALL BY MONITORING STATION	2
2	DAILY REPORT FOR RAINFALL BY REGION	1
3	MONTHLY REPORT FOR RAINFALL BY M.S.	2
4	MONTHLY REPORT FOR RAINFALL BY REGION	1
5	ANNUAL REPORT FOR RAINFALL BY M.S.	2
6	ANNUAL REPORT FOR RAINFALL BY REGION	1
7	MAXIMUM RAINFALL BY M.S.	1
8	MAXIMUM RAINFALL BY REGION	1
9	DAILY REPORT FOR WATER LEVEL	4
10	MONTHLY REPORT FOR WATER LEVEL	4
11	ANNUAL REPORT FOR WATER LEVEL	4
12	MONTHLY REPORT FOR WATER QUALITY	1
13	ANNUAL REPORT FOR WATER QUALITY	1
14	MONTHLY REPORT FOR RUNNING TIME OF PUMPS	10
15	ANNUAL REPORT FOR RUNNING TIME OF PUMPS	10

Table 4.9 Contents of Rainfall Data Pictures (1)

Name of Picture	Picture Renewal Time	Picture Indicating Zone	Type of Picture	Contents
Hourly Rainfall Distribution Map at Each Location	15 Minutes	Entire Area	Map	The monitoring area will be divided into 5 km square meshes. The rainfall area and 60 minute rainfall (15 minutes X 4 data) in each mesh will be displayed on a map. Rainfall in such a mesh area that does not have a rain gauge will be obtained by simply averaging the ones in the surrounding mesh areas. Real time rainfall conditions in the monitoring area will be clearly known by the use of this map.
Accumulated Rainfall Distribution Map at Each Location	15 minutes	Entire Area	Map	The monitoring area will be divided into 5 km square mesh. The accumulated rainfall during the monitoring day (from 0:00 AM to present time) in each mesh and rain area will be displayed. Rainfall in a mesh area that does not have a rain gauge will be obtained by simply averaging the rainfall in the surrounding mesh areas. Rainfall condition on the monitoring day in the monitoring area will be clearly understood through the use of this map.
Hourly Rainfall Picture at Each Station	1 hour	24 hours	Table, bar graph, and line graph	Each observation station's hourly rainfall and accumulated rainfall for the past 24 hours will be displayed on tables and graphs.
Hourly Rainfall Change Picture in Each Area	1 hour	24 hours	Table, bar graph, and line graph	Each area's (polder's) hourly rainfall and accumulated rainfall for the past 24 hours will be displayed on tables and graphs.
Hourly Rainfall Change Picture at Each Observation Station	1 hour	5 days	Bar graph, and line graph	Each observation station's hourly rainfall and accumulated rainfall during any continuous 5-day period within the previous six-month period will be displayed on graphs. The starting date and time of rainfall accumulation will be June 1, 0:00 AM.
Hourly Rainfall Change Picture in Each Area	1 hour	5 days	Bar graph, and line graph	Each area's (polder's) hourly rainfall and accumulated rainfall during any continuous 5-day period within the previous six-month period will be displayed on graphs. The starting date and time of rainfall accumulation will be June 1, 0:00 AM.

Table 4.9 Contents of Rainfall Data Pictures (2)

Name of Picture	Picture Renewal Time	Picture Indicating Zone	Type of Picture	Contents
Daily Rainfall Distribution Map at Each Location	1 day	Entire Area	Map	The monitoring area will be divided into 5 km square meshes. The daily rainfall area and the amount of any one day's rain during the previous six-day period in each mesh area will be displayed on a map. The day starts from 0:00 AM. Rainfall in a mesh area that does not have a rain gauge will be obtained by simply averaging the ones in the surrounding mesh areas.
Daily Rainfall Change Picture at Each Observation Station	1 day	120 days	Bar graph, and line graph	Each station's daily rainfall and accumulated rainfall during any continuous 5-day period within the previous six-month period will be displayed on graphs. The starting date and time of rainfall accumulation will be June 1, 0:00 AM.
Daily Rainfall Change Picture in Each Area	1 day	120 days	Bar graph, and line graph	Each area's (polder's) daily rainfall and accumulated rainfall during any continuous 5-day period within the previous six-month period will be displayed on graphs. The starting date and time of rainfall accumulation will be June 1, 0:00 AM.

Table 4.10 Contents of Water Level Data Pictures

Name of Picture	Picture Renewal Time	Picture Indicating Time	Type of Picture	Contents
Water Level Cross Section Picture	15 minutes	-	Topographical cross section figure	Water levels will be displayed on several pre-made topographical cross section figures.
Water Level Change Picture at Each Observation Station (real time data)	15 minutes	30 hours	Line graph	Each observation station's water level changes at every 15 minute interval during any continuous 30-hour period within the previous six-month period will be displayed on a line graph.
Water Level Change Picture at Each Observation Station (hourly data)	1 hour	5 dys	Line graph	Each observation station's average hourly water levels during any continuous 5-day period within the previous six-month period will be displayed on a line graph.
Water Level Change Picture at Each Observation Station	1 hour	24 hours	Table, bar graph, line graph, and map	Each observation station's hourly water levels, together with hourly rainfall, during the past 24 hour period will be displayed with pictures.
Water Level Change Picture at Each Observation Station	1 day	120 days	Line graph	Each observation station's average daily water levels during any continuous 120-day period within the previous six-month period will be displayed on a line graph.

Table 4.11 Contents of Pump and Gate Operations and Water Quality Data Pictures

Name of Picture	Picture Renewal Time	Picture Indicating Zone	Type of Picture	Contents
Pump Operation and Gate Opening Pictures	15 minutes	-	Map	Each pump's operating condition and each gate's opening or closed conditions at various observation stations will be displayed by picture.
Water Quality Data Table at Each Observation Station	1 hour (15 minutes)	24 hours	Table	Each observation station's hourly water quality (DO and EC) during a 24-hour period, including present time, will be displayed on a table.
Water Quality Change Picture at Each Observation Station	15 minutes	30 hours	Line graph	Each observation's 15 minute interval's water quality during any continuous 30-hour period within the previous six-month period will be displayed on a line graph.
Water Quality Change Picture at Each Observation Station	1 hour	5 days	Line graph	Each observation station's average hourly water quality during any continuous 5-day period within the previous six-month period will be displayed on a line graph.
Water Quality Change Picture at Each Observation Station	1 day	120 days	Line graph	Each observation station's average daily water quality during continuous 120-day period within the previous six-month period will be displayed on a line graph.

Table 4-12 Contents of Rainfall Data Print Forms (1)

Name of Form	Recording Data	Recording Method	Contents
Hourly Rainfall Table at Each Observation Station (Daily Record	Hourly Rainfall Maximum Hourly Rainfall Minimum Hourly Rainfall Average Hourly Rainfall Daily Rainfall Accumulated Rainfall	Table (12 observation stations on each sheet)	Each station's hourly rainfall for a 24-hour period will be tabulated and recorded in the printer. At the same time, each station's maximum, minimum, and average hourly rainfalls and daily rainfall, and accumulated rainfall (starting from June 1, 0:00 AM) will be recorded Output to the printer will be selected by a preset program.
Hourly Rainfall Table in Each Area (Daily Data)	Hourly Rainfall Maximum Hourly Rainfall Minimum Hourly Rainfall Average Hourly Rainfall Daily Rainfall Accumulated Rainfall	Table (12 observation stations on each sheet)	Each area's hourly rainfall for a 24-hour period will be tabulated and recorded in the printer. At the same time, each area's maximum, minimum, and average hourly rainfalls, daily rainfall, and accumulated rainfall (starting from June 1, 0:00 AM) will be recorded Output to the printer will be selected by a preset program.
Daily Rainfall Table at Each Observation Station (Monthly Data)	Daily Rainfall Maximum Daily Rainfall Minimum Daily Rainfall Average Daily Rainfall Monthly Rainfall Accumulated Rainfall	Table (12 observation stations on each sheet)	Each observation station's daily rainfall for a one-month period will be tabulated and recorded in the printer. Output to the printer will be automatically carried out.
Daily Rainfall Table in Each Area (Monthly Data)	Daily Rainfall Maximum Daily Rainfall Minimum Daily Rainfall Average Daily Rainfall Monthly Rainfall Accumulated Rainfall	Table (12 observation stations on each sheet)	Each area's daily rainfall for a one-month period will be tabulated and recorded in the printer Output to the printer will be automatically carried out.
Monthly Rainfall Table at Each Observation Station (Yearly Data)	Monthly Rainfall Maximum Monthly Rainfall Minimum Monthly Rainfall Average Monthly Rainfall Yearly Rainfall	Table (12 observation stations on each sheet)	Each observation station's monthly rainfall for a one-year period (from June 1 to May 31) will be tabulated and recorded in the printer. Output to the printer will be automatically carried out.

Table 4-12 Contents of Rainfall Data Print Forms(2)

Name of Form	Recording Data	Recording Method	Contents
Monthly Rainfall Table in Each Area (Yearly Data)	Monthly Rainfall Maximum Monthly Rainfall Minimum Monthly Rainfall Average Monthly Rainfall Yearly Rainfall	Table (12 observation stations on each sheet)	Each area's monthly rainfall for a one-year period (from June 1 to May 31) will be tabulated and recorded in the printer. Output to the printer will be automatically carried out.
Daily Table of Maximum Unit Time Rainfall at Each Observation Station (Yearly Data)	Maximum rainfalls of 15-minute, 30-minute, 45-minute, 1-hour, 2-hour, 3 hour, 4-hour, 6 hour, 12-hour, 18-hour, and 24-hour periods in each year	Table (24 observation stations on each sheet)	Each observation station's maximum unit time rainfalls together with their occurrence days during a one-year period will be automatically tabulated and recorded.
Daily Table of Maximum Unit Time Rainfall in Each Area	Maximum rainfalls of 15-minute, 30-minute, 45-minute, 1-hour, 2-hour, 3-hour, 4-hour, 6-hour, 12-hour, 18-hour, and 24-hour periods in each year	Table (24 observation stations on each sheet)	Each area's maximum unit time rainfalls together with their occurrence days during a one-year period will be automatically tabulated and recorded.

Table 4-13 Contents of Water Level Data Print Forms

Name of Form	Recording Data	Recording Method	Contents
Fixed Time Water Level Table at Each Observation Station (Daily Data)	Fixed time Water Levels (inner and outer water). Highest Daily Water Levels (inner and outer water). Lowest Daily Water Levels (inner and outer water). Average Daily Water Levels (inner and outer water).	Table (6 observation stations on each sheet)	Each observation station's inner and outer water levels at fixed times during a 24-hour period will be tabulated and recorded in the printer. Output to the printer will be selected by a pre-set program.
Daily Average Water Level Table at Each Observation Station (Monthly Data)	Daily Average Water Levels (inner and outer water). Maximum Average Daily Water Levels (inner and outer water). Minimum Average Daily Water Levels (inner and outer water). Average Daily Highest Water Levels (inner and outer water). Average Daily Lowest Water Levels (inner and outer water). Average Monthly Water Levels (inner and outer water).	Table (6 observation stations on each sheet)	Each observation station's daily average inner and outer water levels for a one-month period will be automatically tabulated and recorded.
Average Monthly Water Level Table at Each Observation Station (Yearly Data)	Average Monthly Water Levels (inner and outer water). Maximum Average Monthly Water Levels (inner and outer water). Minimum Average Monthly Water Levels (inner and outer water). Average Monthly Highest Water Levels (inner and outer water). Average Monthly Lowest Water Levels (inner and outer water). Average Yearly Water Levels (inner and outer water).	Table (6 observation stations on each sheet)	Each observation station's average monthly inner and outer water levels for a 1-year period will be automatically tabulated and recorded

Table 4-14 Contents of Pump Operation and Water Quality Data Print Forms

Name of Form	Recording Data	Recording Method	Contents
Daily Pump Operation Hours Table (Monthly Data)	Daily Pump Operation Hours Average Daily Pump Operation Hours Monthly Pump Operation Hours Yearly Accumulated Pump Operation Hours	Table (12 pumps on each sheet)	Each pump's daily operation hours for a one-month period will be automatically tabulated and recorded.
Monthly Pump Operation Hours Table (Yearly Data)	Monthly Pump Operation Hours Average Daily Pump Operation Hours Yearly Accumulated Pump Operation Hours	Table (12 pumps on each sheet)	Each pump's monthly operation hours for a one-year period will be automatically tabulated and recorded.
Average Daily Water Quality Table at Each Station (Monthly Data)	Average Daily Water Quality DATA (EC & DO) Average Monthly Water Quality Data	Table	Average daily water quality data (EC & DO) for a one-month period will be automatically tabulated and recorded
Average Daily Water Quality Table at Each Station (Yearly Data)	Average Monthly Water Quality Data Average Yearly Water Quality Data	Table	Average monthly water quality data (EC & DO) for a one-year period will be automatically tabulated and recorded.

4-6 Flood Control Center's Equipment Arrangement Plan

The arrangement of the Flood Control Center's equipment and offices on the sixth floor of the new BMA building was decided upon from the following viewpoints:

1) Free Access Floor

Each piece of equipment in the computer room and the monitoring room has to be connected with many cables. It was decided upon to install free access floors in these rooms to enable efficient cable installation work, easy cable route changes in the event of possible future equipment relocation, and simple cable maintenance.

Judging from the equipment and room height, the top of the free access floor shall be no higher than 250 mm above the room floor.

2) Air conditioner

In order to maintain room temperature and humidity levels suitable for the various pieces of electronic equipment, such as computer, console, telemetering panel, etc., it is necessary to install an air conditioner.

3) Electronic Equipment Arrangement

The following requirements must be satisfied for the electronic equipment arrangement:

a. To allow daily work and maintenance to be carried out simply and efficiently.
b. For efficient equipment operation, the distances operators need to travel from one piece of equipment to another must be made as short as possible.
c. To allow functional equipment operation, no two pieces of equipment must interfere with each other.
d. To install proper measures to prevent equipment from overheating or causing disturbing sounds.
e. To secure sufficient equipment maintenance space.

4) Cables to be Used

As the cables for connecting Project equipment will be

installed in rooms having comparatively good conditions, the following ordinary cables shall be used:

a. Control power cable: 600V XLPE, insulated cable

b. (D-1) Specifications: JIS C-3605, IEC Pub. 502

5) Room Arrangement

The Flood Control Center shall be divided into the following rooms for functional purposes:

a. Computer Room:

A main computer, telemetering panel, system console, and an air conditioner will be installed in the computer room. The room shall have a free access floor.

b. Monitoring Room:

A mimic panel, control desk, hard copier, printer, 70-inch projector, and an uninterruptible power supply unit will be installed in the monitoring room. The room shall have a free access floor. The following operations will be conducted daily in this room: monitoring; image display; data processing; data transmission; etc.

c. Radio Control Room

DDS's present radio equipment will be installed in the radio room for the purpose of issuing urgent flood fighting activity orders and other related communications.

d. Analysis and Management Room:

This room will be used for analyzing collected data, flood forecasting research, and for studying the system improvement plan.

An engineering work station will be arranged in the room for the purpose of engineering analyses, and for preparing various publicity material.

e. Library:

Books and publicity material related to the Flood Control Center will be kept in the library. The library will also be utilized as a meeting place.

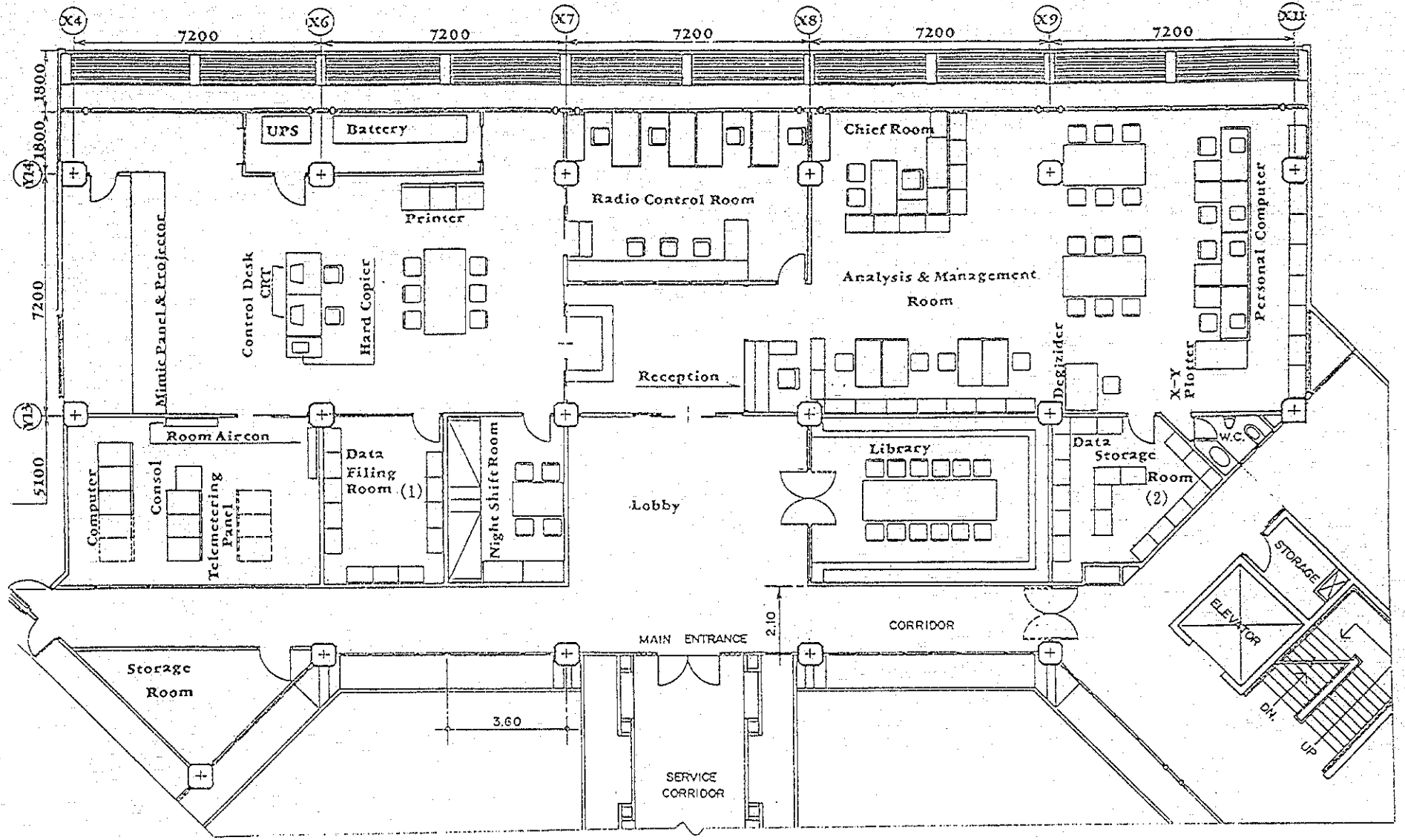
f. Data Filing Room (1) and Data Storage Room (2):
Magnetic tapes, floppy disks, electronic equipment operation manual will be kept in the Data Filing Room (1). Print files of yearly data, monthly data, etc., and office supplies will be kept in the Data Storage Room (2).

g. Night Shift Room:
The Center will be operated on a three shift basis; two people to a shift. Beds will be installed to accommodate night shift personnel.

h. Others:
The entrance doors to the computer room and the monitoring room shall be electrically operated.

The room arrangement plan for the Flood Control Center is shown in Fig. 4.6.

Fig. 4.6 Flood Control Center's Equipment and Room Arrangement Plan



4-7 Specifications of the Project Equipment

1 MASTER STATION

1.1 Main Computer

1.1.1 Minicomputer and Memory 1set

(1) Minicomputer
Word length : 16bit ; General register : 16 ; Interrupt level : 4

(2) Memory (3 Mega Byte)
MOS dynamic RAM with ECC(error correcting code)

(3) Multi Watch Dog Timer(WDT)
Time out detector ; DI 8/DO 8

(4) Floating Point Processor

(5) CPU expansion box

1.1.2 System console 1set

(1) Visual display unit terminal
12 inch monochrome ; Display : 80character×24line

(2) Printer
Speed : 120char./sec. ; ;80char./line

(3) Desk and chair

1.1.3 Hard Disk 1set

(1) Hard disk drive with controller
Capacity : 134MB ; Average access time : 33.5ms.

1.1.4 Floppy Disk 1set

(1) Floppy disk drive with controller
Capacity : 1MB ; Average access time : 195ms.

1.1.5 Tape Storage 1set

(1) Magnetic tape drive with controller
Capacity : 32MB/reel ; Bit dencity : 1600BPI

1.1.6 Calendar Clock

(1) Calendar clock with controller
Year, Month, Day, Hour, Minute; Serial / BCD output 1ch each

1.1.7 Other Interface 1set

(1) Data Link
Printer Link : 3CH ; VDU Link 2CH

(2) Telemetering I/F

(3) Modem for Data Link

1.1.8 Computer cabinet and Accessary 1set

Computer Cabinet : H1,900 X W700 X D1,000 (mm) : 3 units ; Channel base ; Fan unit ; Equipment operating condition display unit ; Electric power distribution unit

1.2 Man Machine Interface

1.2.1 Mimic Panel 1set

Mosaic panel : Mimic panel frame ; Controller ; Clock display ; Pump & Gate indicater(LED) ; Rainfall & Water level display(7-segment)

1.2.2 70inch Projector 1set

Screen dimension : 70 inch (H1.0m x W1.4m) ; Horizontal resolution : 1000TV line(center screen) ; Synchronization frequency : 24 to 65KHz (Horizontal), 50 to 120Hz(Vertical) ; Digital scan converter ; source selecter

1.2.3 Operator Console and Color Graphic Display 1set

Desk, Chair, Key board, Light pen, and 20 inch Color VDU(7-color display, 90 character x 50line)

1.2.4 Color Hard Copier 1set

Color Hard Copier(Heat print, 7 color, A4 size) ; Desk ; 2ch input to 1 changeover unit

1.2.5 Printer 3sets

Printer (Speed : 132 character/sec, Character 136 char./line) ; Desk (with noise shield cover)

1.2.6 VTR and Video Camera(Commercially available) 1set

1.2.7 Modem(for MD) 2units

Synchronous Modem ; 2,400 baud ; CCITT interface

1.2.8 Facsimile(for RID) 2units

Heat print ; Send up to A3 size

1.3 Telemetering Equipment

1.3.1 Telemetering Panel No.1(16-OTU) 1set

Panel and Accessary ; OTU monitoring panel ; OTU Master : 40bitCDT ; Modem : 200baud ; Line protection arrester ; Power supply unit

1.3.2 Telemetering Panel No.2(10-OTU) 1set

Panel and Accessary ; OTU monitoring panel ; OTU Master : 40bitCDT ; Modem : 200baud ; Line protection arrester ; Power supply unit

1.3.3 Telemetering Panel No.3(Main unit) 1set

(1) Panel and Accessary ; Power supply unit ; No.1 controller ; No.2 controller

1.4 Uninterruptible Power Supply Unit

1.4.1 CVCF : 10KVA ; Input voltage : AC230V3Φ 1set

1.4.2 Battery (Lead paste ; 60 minute back up main CPU only) 1set

1.4.3 By pass circuit(Transformer, Non-interrupt changeover) 1set

1.4.4 Output distribution panel 1set

1.5 Package Type Air Conditioner

1.6 Free Access Floor

1.6.1 Assemble Floor (500mm×500mm×34mm) 760pcs

1.6.2 Pedestal 930pcs

1.6.3 Accessary 1set

1.6.4 Miscellaneous Materials 1set

1.7 Cables

1.7.1 Control Power Source Cable 1set

1.7.2 Accessary 1set

1.8 System and Application Software

1.8.1 Application Software 1set

(1) System Management

(2) Communication function

(3) Rainfall data process task

(4) Water level data process task

(5) Water quality data process task

(6) Pump operation data process task

(7) Gate opening data process task

(8) VDU back ground picture data process task

(9) Logging data process task

(10) Historical data storage task

(11) Line and Bar graphic generation task

(12) Accumulated data process task

(13) VDU picture edit task

(14) Set point value data modification task

(15) Utilities

1.8.2 System software 1set

(1) System software installation

(2) Operating System

(3) Language license

1.8.3 Data Base 1set

(1) VDU picture data base
84-Rainfall, 101-Water level, 5-Water quality, 9-Pump operation & Gate opening

(2) Logging data base
11-Rainfall, 12-Water level,2-Water quality, 20-Pump operation & Gate opening

1.9 Architectural Works(350m²)

1.9.1 Wall Fitting and Installation 1set

1.9.2 Door & Window and Installation 1set

1.9.3 Automatic Door Closer and Installation 4sets

1.9.4 Partition Wall & Furniture and Installation 1set

1.10 Master Station Installation 1set

2 MONITORING STATIONS

2.1 Rain gauge

2.1.1 Rain gauge 21sets

(1) Type Tipping backet

(2) Inlet diameter 200mm

(3) Resolution 1mm

(4) Output Normal Open contact

2.1.2 Recorder 21sets

(1) Input N.O. contact

(2) Recording Pulse count ; Cartridge pen(circular chart)

(3) Chart speed 10mm/h

2.2 Water level gauge

2.2.1 Water level gauge 41sets

(1) Type	Float
(2) Range	0－5m
(3) Accuracy	±1cm
(4) Recording	2pen linear recording
(5) Chart speed	6mm/h or 18mm/h(selectable)
(6) Output	Shaft encoder BCD 3-digit

2.3 Water quality

2.3.1 Electric conductivity 1set

(1) Measuring	AC 2-pole(thermistor)
(2) Range	0～1000μs/cm
(3) Accuracy	within ±5% at F/S(full scale)

2.3.2 DO meter 1set

(1) Measuring	Polar electrode
(2) Range	0～20ppm
(3) Accuracy	within ±1% at F/S

2.3.3 Capsule 1set

(1) Water pressure resist.	not less than 1kg/cm²
(2) Operating temperature	－10°C～＋50°C
(3) Wiper	

2.3.4 Controller 1set

(1) Input
Conductivity : 4～20mA 1CH ; DO: 4～20mA 1CH

(2) Output
Conductivity : 0～1000μs/cm : 4～20mA ; DO : 0～20ppm : 4～20mA

(3) Wiper set point value
1～24hour selectable

2.3.5 Recorder 1set

(1) Recording	2pen
(2) Paper width	150mm

2.4 Gate Opening Gauge

2.4.1 Gate Opening Gauge(30-gate) 1set

(1) Converter output	10digit/revolution
(2) Oscillator	Shaft encoder
(3) Output	BCD 3-digit

2.5 Modification of Existing Panel

2.5.1 Parts(118pump panel) 1set
Relay, terminal block, cable

2.6 Foundation Works for Gauging Station & OTU House

2.6.1 Rainfall Gauge Station (Type－RA)	7sets
2.6.2 Rainfall Gauge Station (Type－RB)	14sets
2.6.3 Water Level Gauge Station (Type－WA)	34sets
2.6.4 Water Level Gauge Station (Type－WB)	1set
2.6.5 Water Level Gauge Station (Type－WC)	6sets
2.6.6 OTU House (Type－OA)	11sets
2.6.7 OTU House (Type－OB)	8sets
2.6.8 OTU House (Type－OC)	6sets
2.6.9 OTU House (at Flood Control Center)	1set

2.7 OTU & Cabinet

2.7.1 OTU Panel 26sets

(1) Data transmission	Cyclic digital telemeter(CDT) 40 bit/word
(2) Speed	200 baud
(3) Coding	NRZ fixed length coded
(4) Synchronization	Frame synchronize
(5) Modulation	Frequency shift
(6) Modulating frequency	800＋(n－1)×400±100Hz(n＝1～6)
(7) Transmitting level	Sending : 0～－30dBm ; Receiving : 0～－30dBm
(8) Power supply	DC12V or AC100V

2.7.2 Line Arrestor		26sets
(1) Range	DC~2MHz	
(2) Line	2-Wire	
2.7.3 Protective device		26sets
(1) Line voltage	DC0~+18V	
(2) Line current	maximumDC100mA	
(3) Resintance between I&O	approximately10Ω	
(4) Input crest value	Output voltage shall be less than 60 V when (1×40usec)10KV input applied.	
2.8 DC Power Supply		
2.8.1 Isolation Transformer		26sets
(1) Output capacity	2KVA ; Input voltage : AC220V1Φ Output voltage : DC100V1Φ	
(2) Voltage regulation	not greater than 3.5%	
(3) Output vol. deviation	±2% at full load	
(4) Surge inductivity	not greater than −40dB at balance not greater than −20dB at inbalance	
(5) Insulation class	B	
(6) Discharge capacity	10KA at 4×10μs	
2.8.2 Charger		26sets
(1) Input	AC100V1Φ	
(2) Rectifier output	within 15A	
(3) Constant vol. accuracy	within±2%	
(4) Floating charge volt.	13.7V~15.3V	
(5) Constant charge volt.	15V~16.5V	
2.8.3 Alkaline Storage Battery		26sets
2.9 OTU House		
2.9.1 House Body		18sets
2.9.2 Shieling & Painting Material		18sets
2.9.3 Miscellaneous Material		18sets
2.10 Cables		
2.10.1 Signal Cable		1set
2.10.1 Control Cable		1set
2.10.1 Control Power Source Cable		1set
2.10.1 Conduit Tube		1set
2.10.1 Earthing Material		1set
2.10.1 Miscellaneous Materials		1set
2.11 Equipment Installation		1set
3 OTHER		
3.1 Site Testing		
3.1.1 Computer H/W		1set
3.1.2 Computer S/W		1set
3.1.3 Telemetering		1set
3.1.4 UPS		1set
3.1.5 OTU		2sets
3.1.6 Rain gauge		3sets
3.1.7 Water level gauge		1set
3.2 Spare Parts		
3.2.1 Computer related (1 of each module)		1set
3.2.2 Man / Machine related (1 of each module)		1set
3.2.3 Telemetering related (1 of each module)		1set
3.2.4 UPS related (1 of each module)		1set
3.2.5 Other equipment related (paper、Ribon)		1unit
3.2.6 Rain gauge		3units
3.2.6 Water level gauge		1unit
3.2.8 OTU House		1unit
3.2.9 OTU & Cabinet		1unit
3.2.10 Power Supply Unit		1set
3.3 TOT Line Installation and Electric Distribution Line		
3.3.1 TOT Line		1set
3.3.2 MEA Line		1set

3.4. 4WD Car

3.4.1. Land cruiser type	2units
Engine : 4.000cc ; Person : 4~6 ; Air conditioner ; Tool set	

3.5 Copy Machine

3.5.1 Copy Machine	1set
Size : A3~A4 ; Zoom65%~155%	
3.5.2 Sorter (20-bin)	1unit
3.5.3 Automatic feeder	1unit

3.6 Engineering Work Station

3.6.1 CPU and Memory 4MB RAM	1set
3.6.2 16 inch color CRT	1set
3.6.3 Key board with mouse	1set
3.6.4 Hard disk	1unit
3.6.5 Magnetic tape (1600BPI)	1unit
3.6.6 Cassette MT	1unit
3.6.7 Printer	1unit
3.6.8 Floppy Disc	1unit
3.7.9 A1 size X-Yplotter	1unit
3.6.10 Digitizer with 4 button cursor	1set
3.6.12 Operating system software	1set
C-compiler、Fortran compiler、Graphic library	

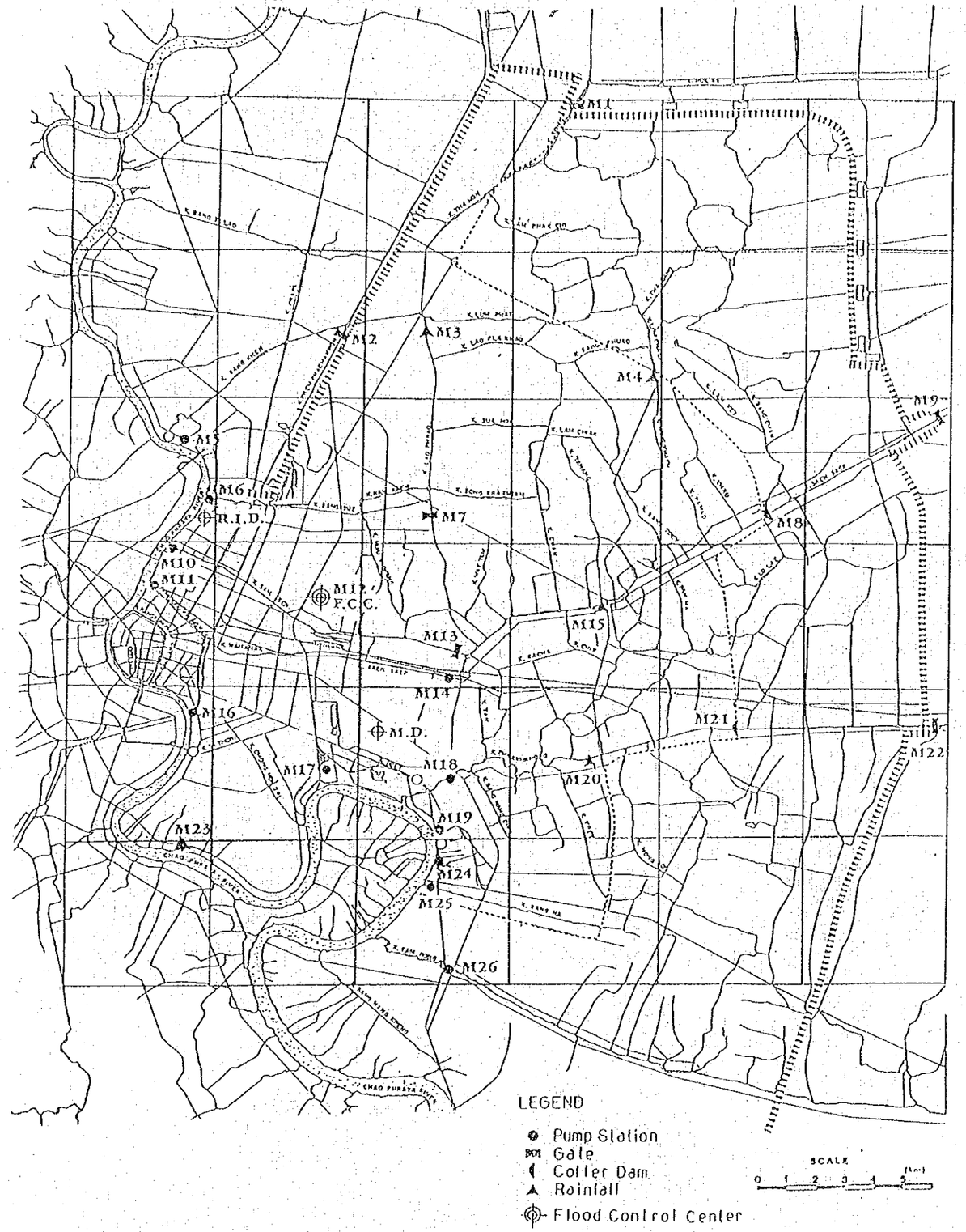
3.7 Test Equipment

3.7.1 Level Meter	2sets
3.7.2 40bit CDT Tester	1set
3.7.3 Digital Multi-meter	2units
3.7.4 Synchroscope	1set
3.7.5 Frequency Counter	1set
3.7.6 ROM Programmer	1set
3.7.7 ROM Eraser	1set
3.7.8 DC voltage/current generator	1unit
3.7.9 Main computer console	1set
3.7.10 Portable CPU	1set
3.7.11 Module Extender	1set
3.7.12 Tool kit	3sets
3.7.13 Attenuator	2sets
3.7.14 Data transmission error tester	1unit

3.8 Documentation	1set

4-8 Drawings of Basic Design

Drawing No.	Title
01	Location Map of Monitoring Station
02	Layout of Telecommunication System
03	Installation Type of Gauge Station & OTU House
04	Standard Water Level Gauge Station
05	Standard Installation of OTU
06	Rain Gauge & Recorder
07	Water Level Gauge
08	Standard Block Diagram of Monitoring Station
09	TOT Leased Line Network
10	Layout of Flood Control Center
11	Master Station Equipment Configuration
12	Mimic Penal Indication
13	Rainfall Picture Image (Typical Sample-1)
14	Rainfall Picture Image (Typical Sample-2)
15	Water Level Picture Image (Typical Sample-1)
16	Water Level Picture Image (Typical Sample-2)



Monitoring Index of Each Station

No. of Monitoring Station	Location of Monitoring Station		Monitoring Index						
			Rainfall	Water Level		Gate Opening	Pump Operation	Water Quality	
				Inside	Outside			D. O	Conductivity
M 1	K. Song (Don Muang)	W. G	○	○	○	1			
M 2	K. Prem Prachakorn	W. G	○	○	○	1			
M 3	K. Lat Phrao		○	○					
M 4	K. Lam Charat		○	○					
M 5	K. Bang Khen (South)	P. S	○	○	○	1	4		
M 6	K. Bang Sue	P. S		○		2	12		
M 7	K. Lat Phrao	W. G	○	○	○	1			
M 8	K. Saen Saep (Rat Banphen Tai)	C. D	○	○	○				
M 9	K. Saen Saep (Klinbuli)	W. G	○	○	○	1			
M10	K. Sam Sen	P. S		○	○	2	10		
M11	K. Krung Kasem	W. G	○	○	○		5		
M12	Flood Control Center		○						
M13	K. Sam Sen	W. G		○	○	2			
M14	K. Saen Saep	P. S	○	○	○	2	5	○	○
M15	K. Saen Saep (Bang Kapi)		○	○					
M16	K. Krung Kasem	P. S	○	○	○	1	5	○	○
M17	Rama IV	P. S	○				4		
M18	K. Phrakanong	P. S	○	○	○	5	35		
M19	K. Bang Jek	P. S		○	○	2	2		
M20	K. Phrakanong (Hat Kachon Siri)		○	○					
M21	K. Phrakanong (Hat Krathuk Sua Pra)	C. D	○	○	○				
M22	K. Phrakanong (Lat Krajang)	W. G	○	○	○	1			
M23	K. Wat Sai	C. D	○		○				
M24	K. Bang Oa	P. S	○	○		2	6		
M25	K. Bang Na	P. S		○	○	2	5		
M26	K. Sam Rong	P. S	○	○	○	3	25		
	M. D								
	R. I. D								
	TOTAL		21	41	30	118	2	2	

NOTE THE MARK(○) IS THE EQUIPMENT TO BE APPLIED FOR MONITORING SYSTEM

THE KINGDOM OF THAILAND
BANGKOK METROPOLITAN ADMINISTRATION

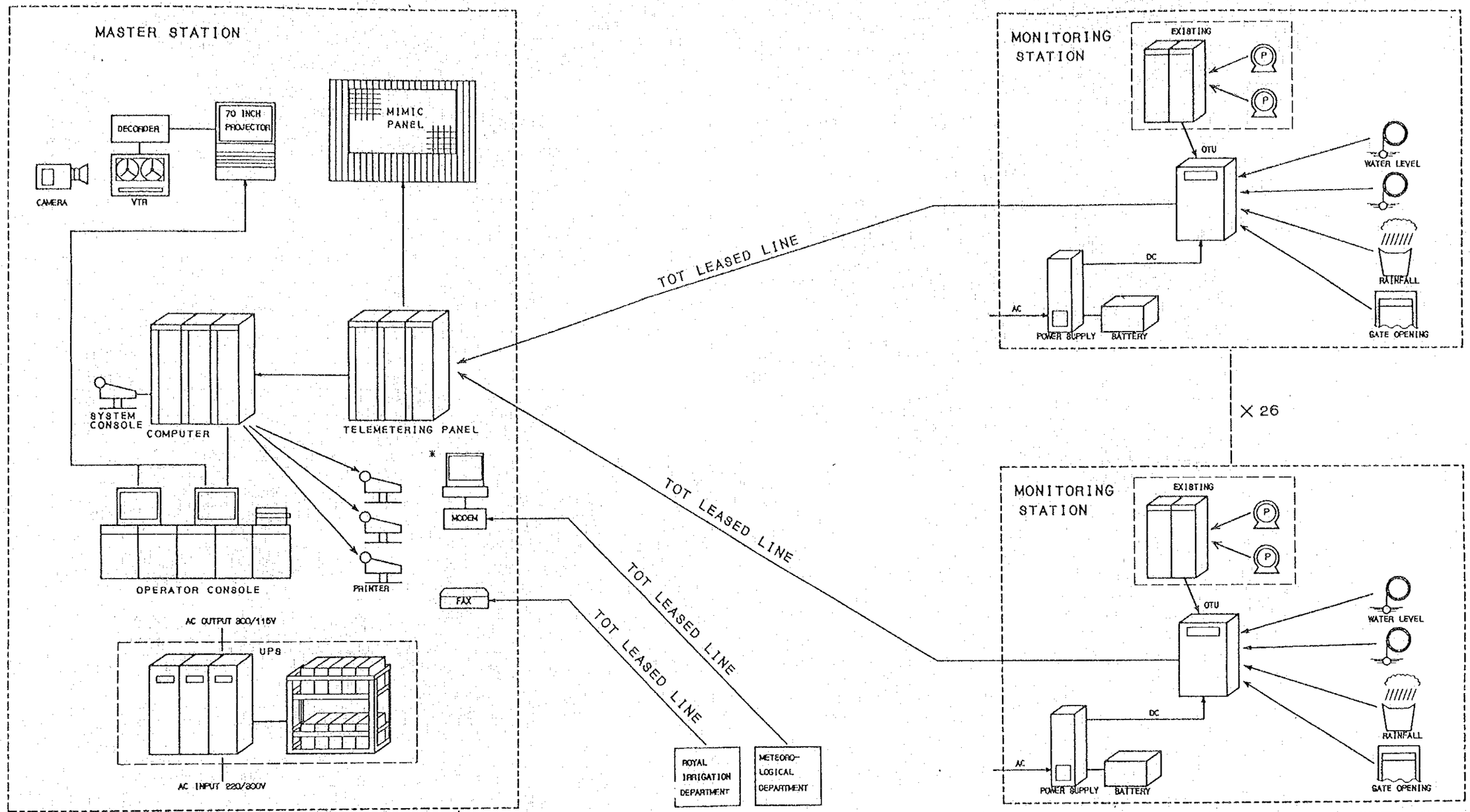
THE PROJECT FOR THE PROCUREMENT OF EQUIPMENT FOR FLOOD CONTROL CENTER IN BANGKOK AND ITS VICINITY

TITLE

Location Map of Monitoring Station

DATE	SCALE	DWG.NO.
		01

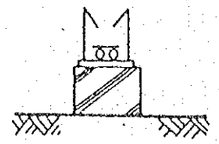
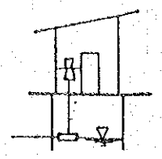
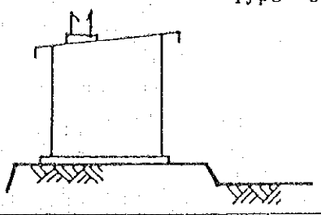
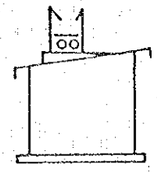
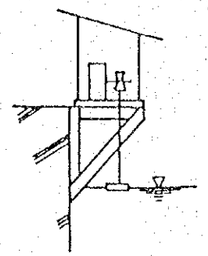
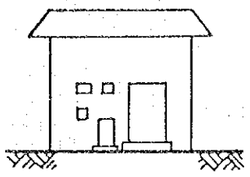
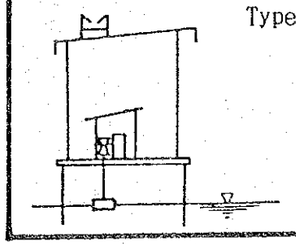
JICA JAPAN INTERNATIONAL COOPERATION AGENCY



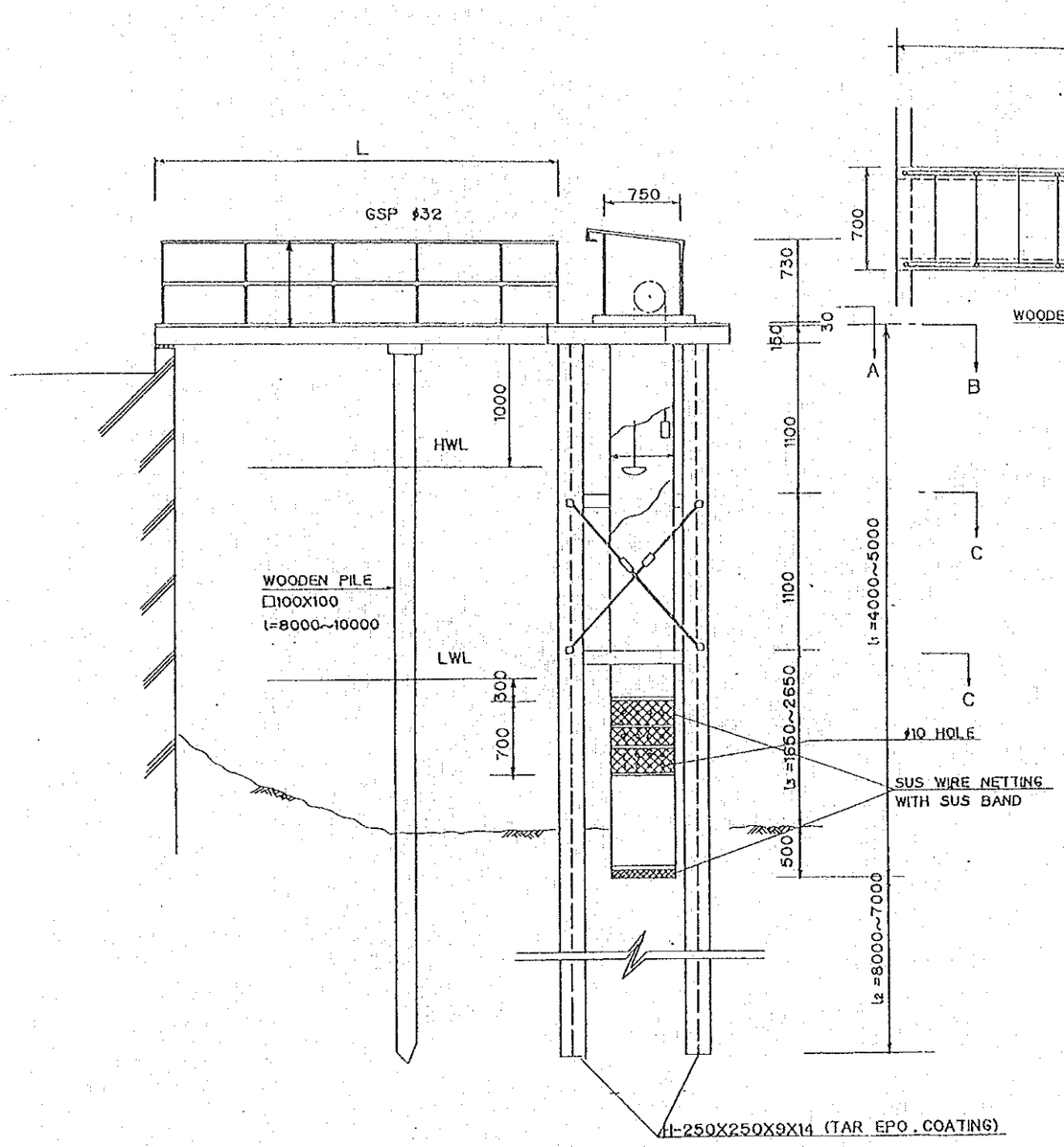
* : IS NOT INCLUDED.
TO BE APPLIED EXISTING
DOS OWNED PC.

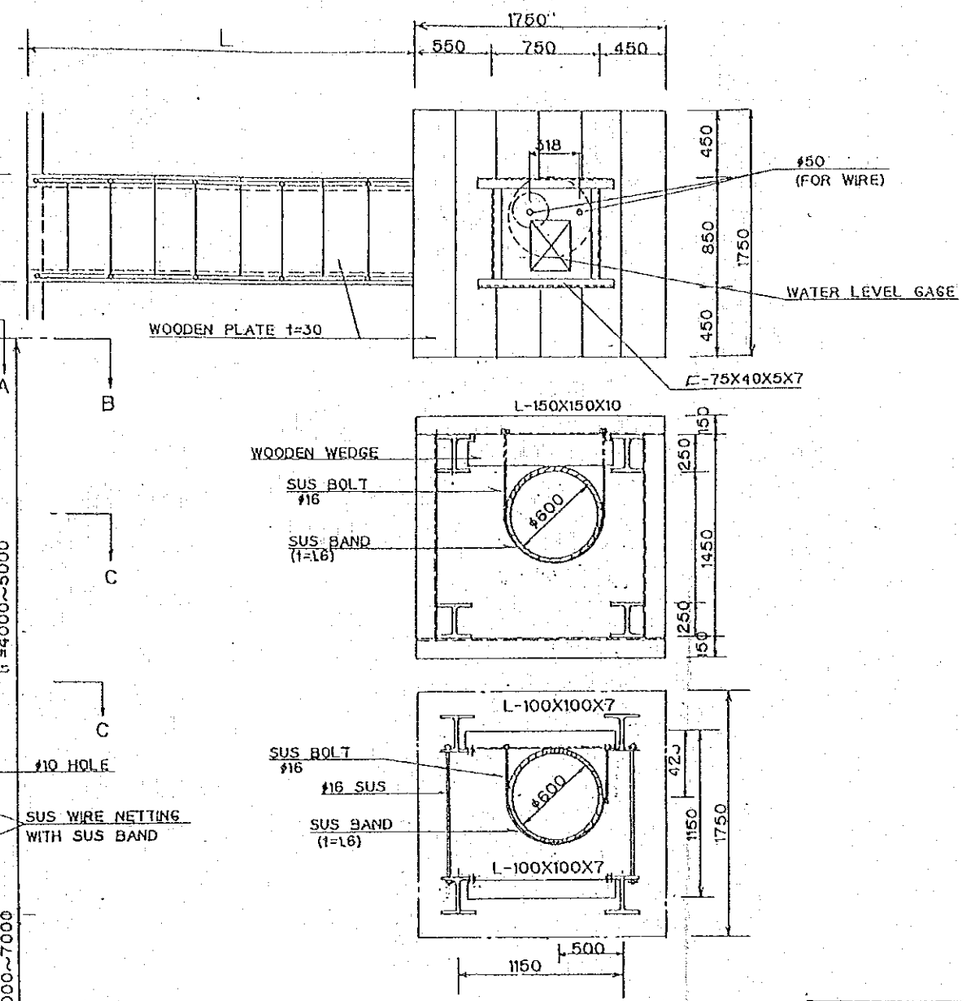
THE KINGDOM OF THAILAND BANGKOK METROPOLITAN ADMINISTRATION		
THE PROJECT FOR THE PROCUREMENT OF EQUIPMENT FOR FLOOD CONTROL CENTER IN BANGKOK AND ITS VICINITY		
TITLE Layout of Telecommunication System		
DATE	SCALE	DWG.NO. 02
JICA JAPAN INTERNATIONAL COOPERATION AGENCY		

No. of Monitoring Station	Location Of Monitoring Station		Type of Gauging Station & OTU House							
			Rain Gauge	Water Level Gauge: Inside	Water Level Gauge: Outside	Gate Opening Gauge	Pump Operation Indicator	D.O. Meter	Conductance Meter	OTU & Data Recorder
M 1	K.Song (Don Muang)	W.D.	RA	WA	WA	○				OB
M 2	K.Prem Prachakorn	W.G.	RB	WA	WA	○				OA
M 3	K.Lat Phrao		RB	WA						OC
M 4	K.Lam Charat		RB	WA						OC
M 5	K.Bang Khen (South)	P.S.	RA	WA	WA	○	○			OB
M 6	K.Bang Sue	P.S.		WA		○	○			OB
M 7	K.Lat Phrao	W.G.	RB	WA	WA	○				OA
M 8	K.Saen Saep (Wat Banphen Tai)	C.D.	RB	WA	WA					OA
M 9	K.Saen Saep (Minburi)	W.G.	RA	WA	WA	○				OB
M10	K.Sam Sen	P.S.		WA	WA	○	○			OB
M11	K.Krung Kasem	W.G.	RB	WA	WA		○			OA
M12	Flood Control Center		RA							OA
M13	K.Sam Sen	W.G.		WA	WA	○				OA
M14	K.Saen Saep	P.S.	RA	WA	WA	○	○	○	○	OB
M15	K.Saen Saep (Bang Kapi)		RB	WA						OC
M16	K.Krung Kasem	P.S.	RB	WA	WA	○	○	○	○	OA
M17	Rama IV	P.S.	RB				○			OA
M18	K.Phrakanong	P.S.	RB	WA	WA	○	○			OA
M19	K.Bang Jek	P.S.		WA	WA	○	○			OA
M20	K.Phrakanong (Wat Khachon Siri)		RB	WA						OC
M21	K.Phrakanong (Wat Krathum Sua Pra)	C.D.	RB	WA	WA					OC
M22	K.Phrakanong (Lat Krabang)	W.G.	RA	WA	WA	○				OB
M23	K.Wat Sai	C.D.	RB		WA					OC
M24	K.Bang Oa	P.S.	RB	WA		○	○			OA
M25	K.Bang Na	P.S.		WA	WB	○	○			OA
M26	K.Saw Rong	P.S.	RA	WA	WA	○	○			OB

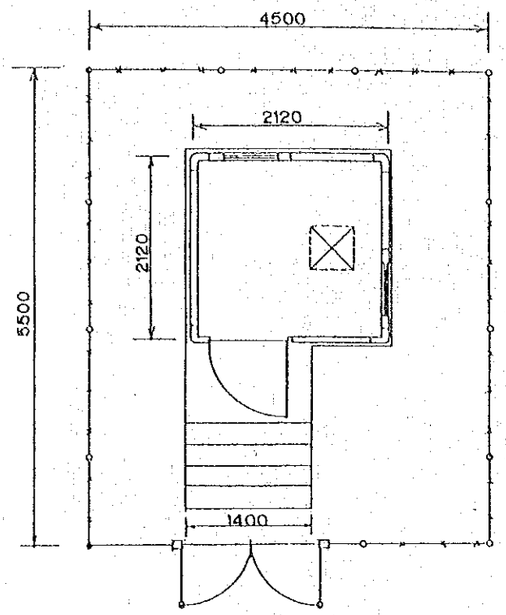
Rain Gauging Station	Water Level Gauging Station	OTU & Data Recorder House
Type RA 	Type WA 	Type OA 
Type RB 	Type WB 	Type OB 
		Type OC 

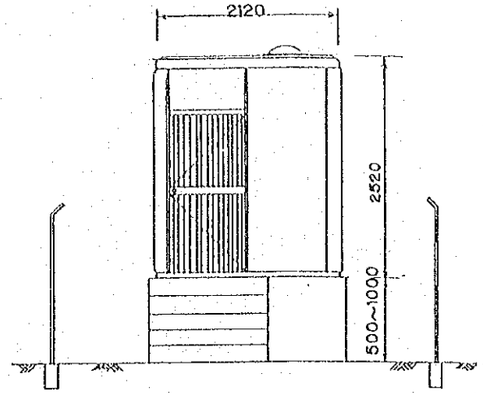
THE KINGDOM OF THAILAND BANGKOK METROPOLITAN ADMINISTRATION		
THE PROJECT FOR THE PROCUREMENT OF EQUIPMENT FOR FLOOD CONTROL CENTER IN BANGKOK AND ITS VICINITY		
TITLE Installation Type of Gauge Station & OTU house		
DATE	SCALE	DWG.NO. 03
JICA JAPAN INTERNATIONAL COOPERATION AGENCY		

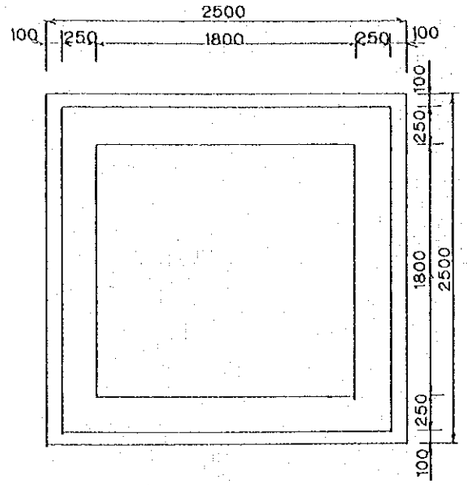


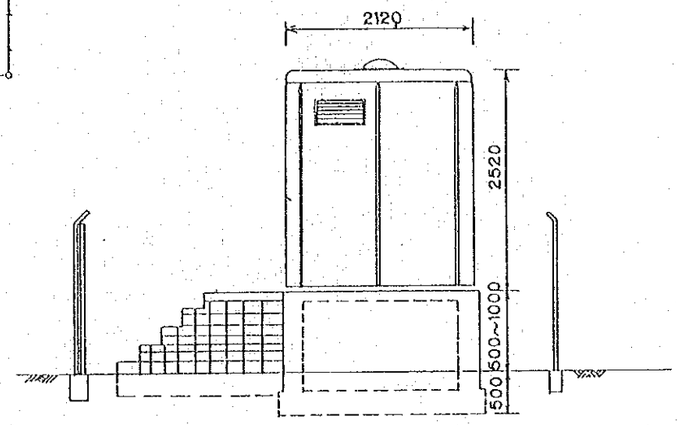


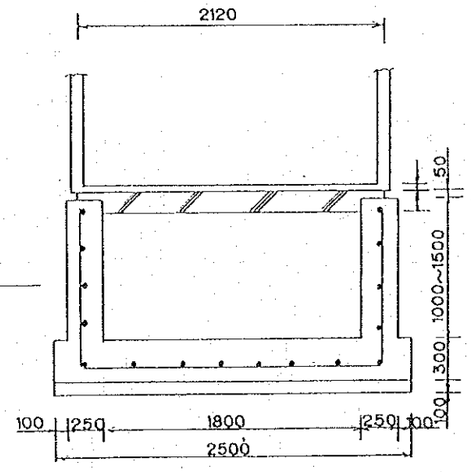
THE KINGDOM OF THAILAND BANGKOK METROPOLITAN ADMINISTRATION		
THE PROJECT FOR THE PROCUREMENT OF EQUIPMENT FOR FLOOD CONTROL CENTER IN BANGKOK AND ITS VICINITY		
TITLE Standard Water Level Gauge Station (Type-WA)		
DATE	SCALE	DWG.NO. 04
JICA JAPAN INTERNATIONAL COOPERATION AGENCY		



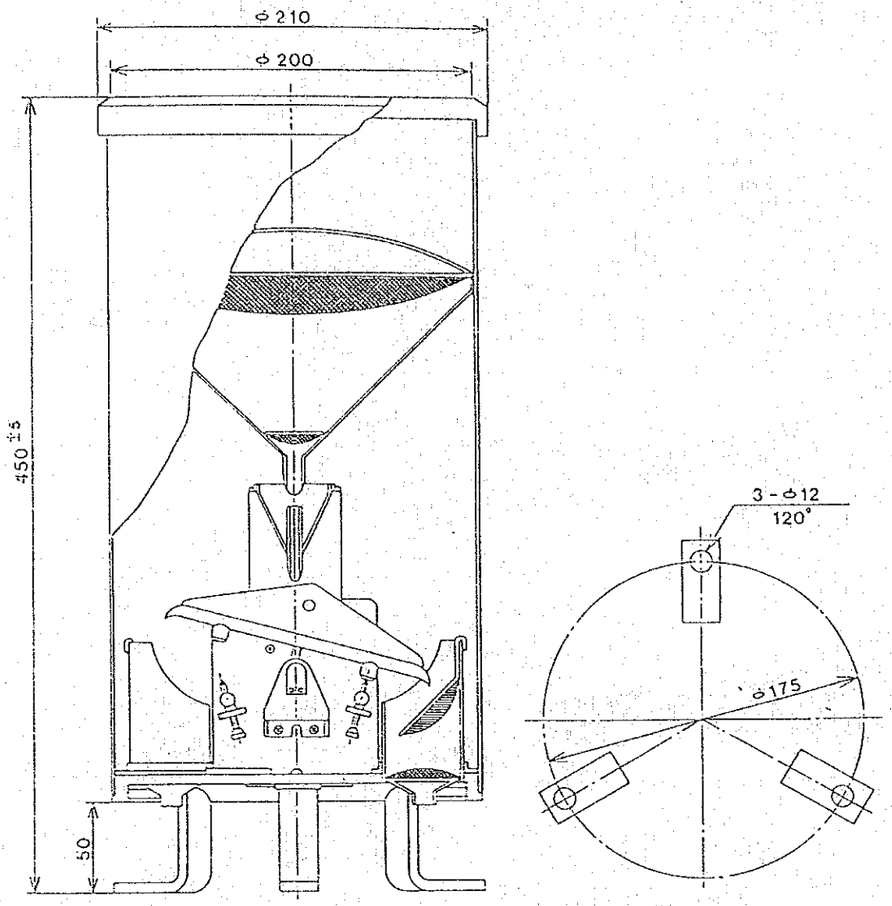




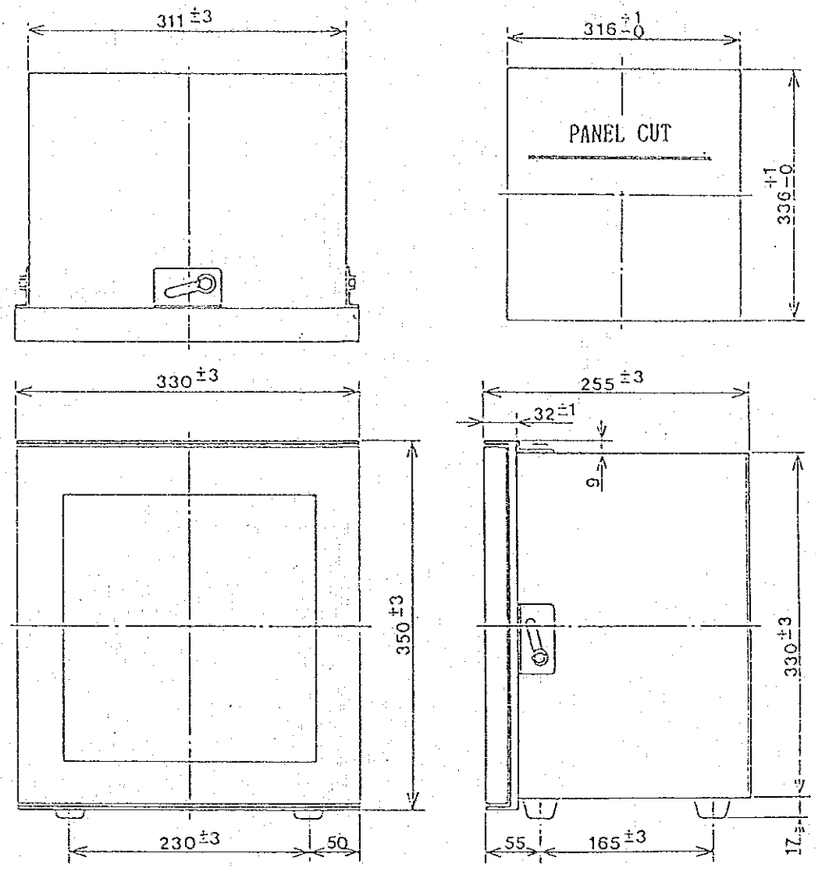




THE KINGDOM OF THAILAND BANGKOK METROPOLITAN ADMINISTRATION		
THE PROJECT FOR THE PROCUREMENT OF EQUIPMENT FOR FLOOD CONTROL CENTER IN BANGKOK AND ITS VICINITY		
TITLE Standard Installation of OTU (Type-OA)		
DATE	SCALE	DWG.NO. 05
JICA JAPAN INTERNATIONAL COOPERATION AGENCY		



RAIN GAUGE

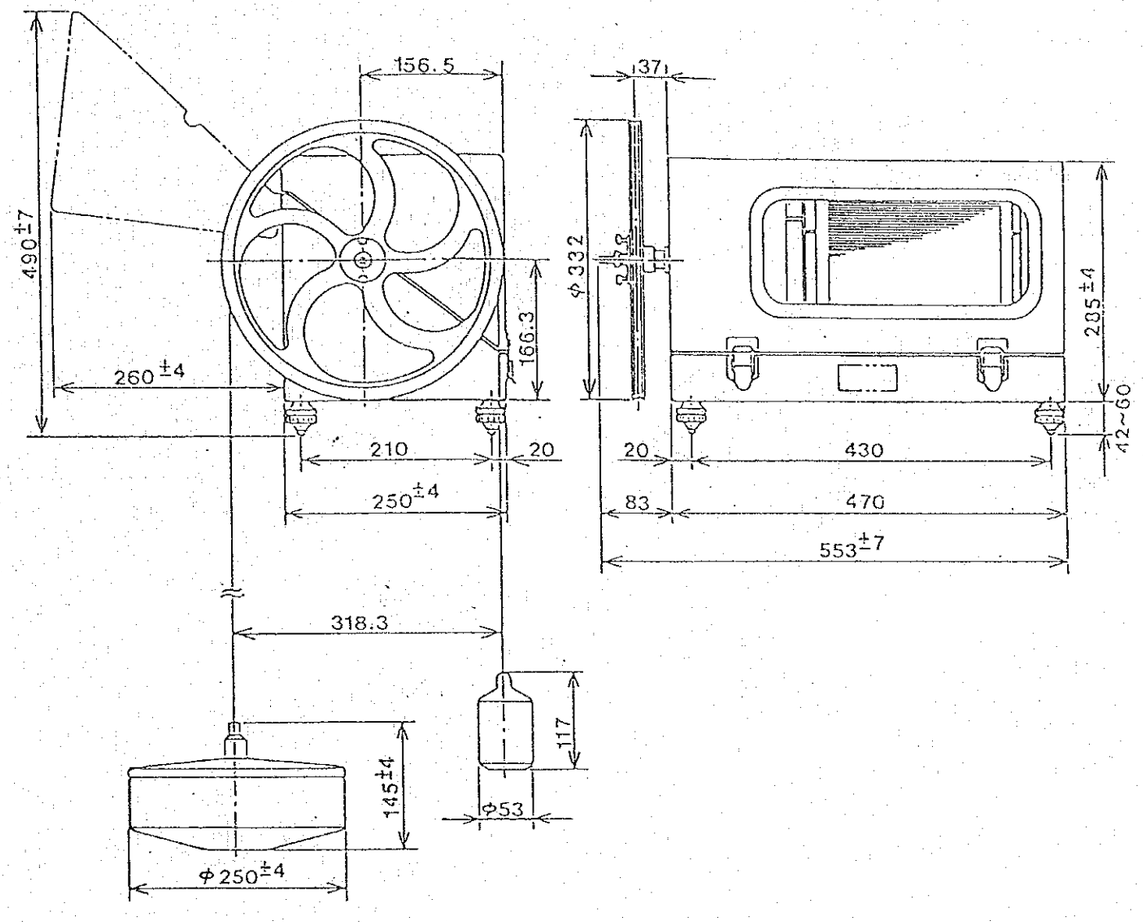


FRONT VIEW

SIDE VIEW

RECORDER

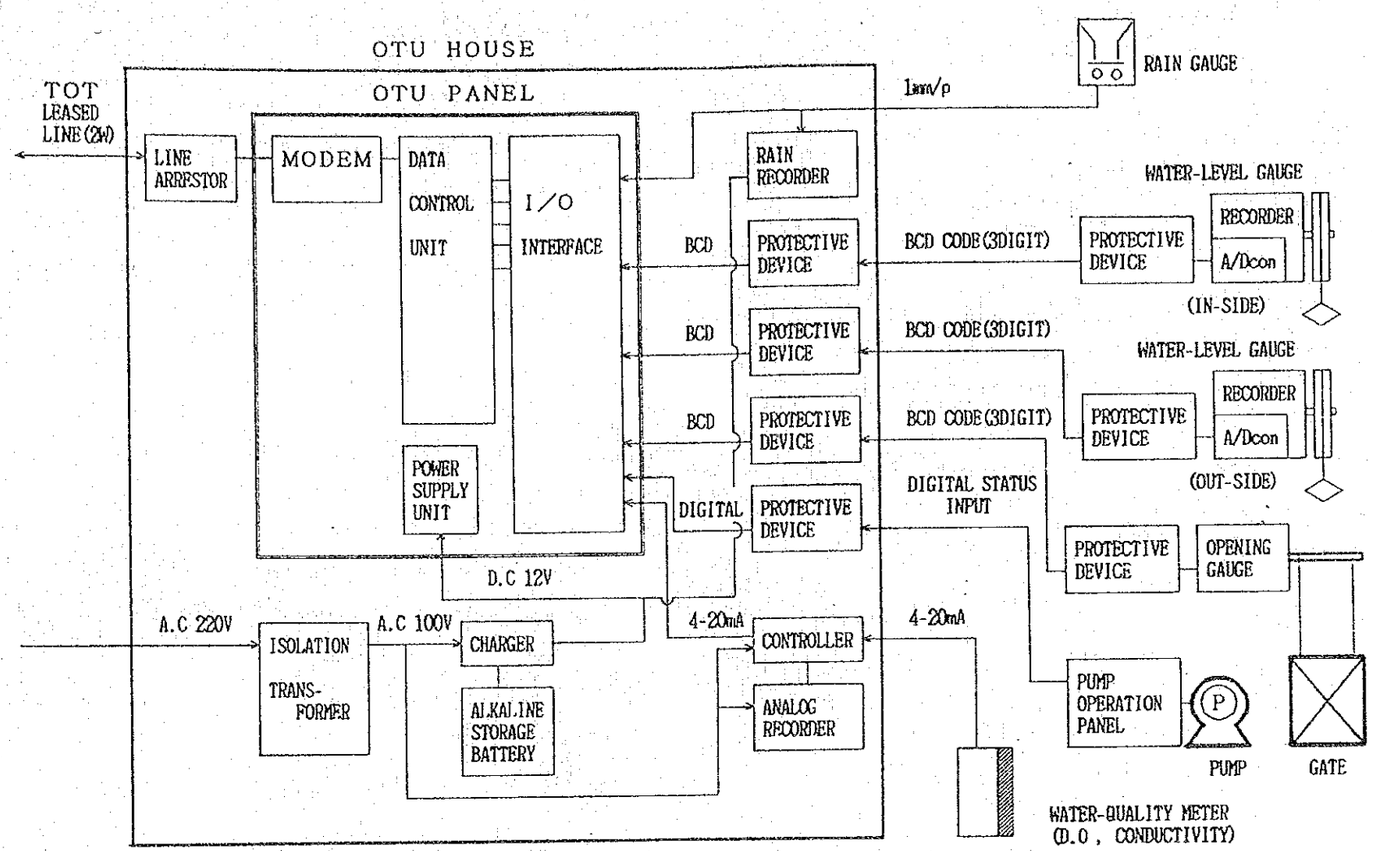
THE KINGDOM OF THAILAND BANGKOK METROPOLITAN ADMINISTRATION		
THE PROJECT FOR THE PROCUREMENT OF EQUIPMENT FOR FLOOD CONTROL CENTER IN BANGKOK AND ITS VICINITY		
TITLE Rain Gauge & Recorder		
DATE	SCALE	DWG.NO. 06
JICA JAPAN INTERNATIONAL COOPERATION AGENCY		



THE KINGDOM OF THAILAND BANGKOK METROPOLITAN ADMINISTRATION		
THE PROJECT FOR THE PROCUREMENT OF EQUIPMENT FOR FLOOD CONTROL CENTER IN BANGKOK AND ITS VICINITY		
TITLE Water Level Gauge		
DATE	SCALE	DWG.NO. 07
JICA JAPAN INTERNATIONAL COOPERATION AGENCY		

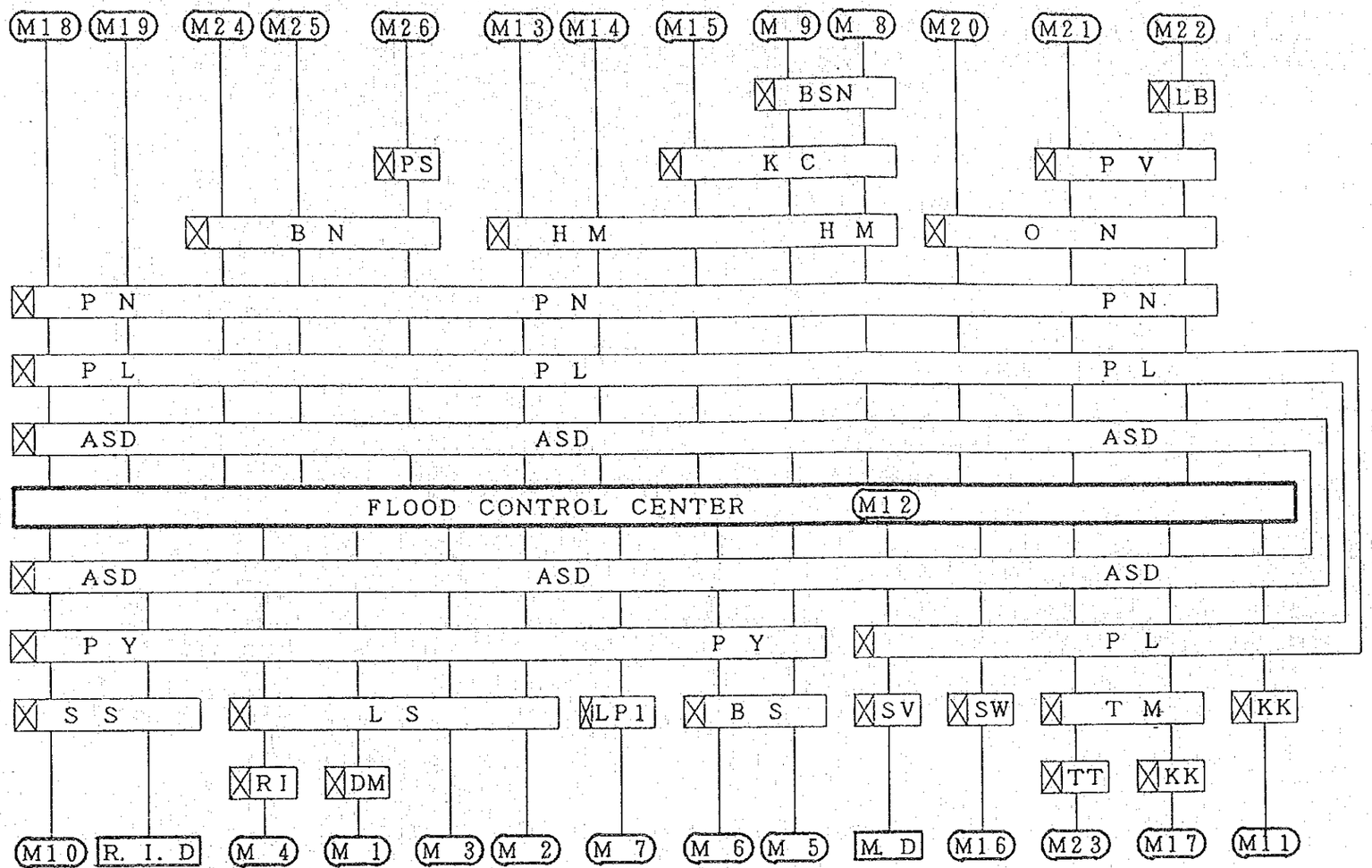
Monitoring Index of Each Station

No. of Monitoring Station	Location of Monitoring Station		Monitoring Index: Rainfall	Water Level: Inside	Water Level: Outside	Gate Opening	Pump Operation	Water Quality: D.O	Water Quality: Conductivity
M 1	K. Song (Don Muang)	W. G	○	○	○	1			
M 2	K. Prem Prachakorn	W. G	○	○	○	1			
M 3	K. Lat Phrao		○	○					
M 4	K. Lam Charat		○	○					
M 5	K. Bang Khen (South)	P. S	○	○	○	1	4		
M 6	K. Bang Sue	P. S		○		2	12		
M 7	K. Lat Phrao	W. G	○	○	○	1			
M 8	K. Saen Saep (Wat Banphen Tai)	C. D	○	○	○				
M 9	K. Saen Saep (Minburi)	W. G	○	○	○	1			
M10	K. Sam Sen	P. S		○	○	2	10		
M11	K. Krung Kasem	W. G	○	○	○		5		
M12	Flood Control Center		○						
M13	K. Sam Sen	W. G		○	○	2			
M14	K. Saen Saep	P. S	○	○	○	2	5	○	○
M15	K. Saen Saep (Bang Kapi)		○	○					
M16	K. Krung Kasem	P. S	○	○	○	1	5	○	○
M17	Rama IV	P. S	○				4		
M18	K. Phrakanong	P. S	○	○	○	6	35		
M19	K. Bang Jek	P. S		○	○	2	2		
M20	K. Phrakanong (Wat Kachon Siri)		○	○					
M21	K. Phrakanong (Wat Krathum Sua Pra)	C. D	○	○	○				
M22	K. Phrakanong (Lat Krajang)	W. G	○	○	○	1			
M23	K. Wat Sai	C. D	○		○				
M24	K. Bang Oa	P. S	○	○		2	6		
M25	K. Bang Na	P. S		○	○	2	5		
M26	K. Sam Rong	P. S	○	○	○	3	25		
	M. D								
	R. I. D								
	TOTAL		21	41		30	118	2	2



STANDARD BLOCK DIAGRAM

THE KINGDOM OF THAILAND BANGKOK METROPOLITAN ADMINISTRATION		
THE PROJECT FOR THE PROCUREMENT OF EQUIPMENT FOR FLOOD CONTROL CENTER IN BANGKOK AND ITS VICINITY		
TITLE Standard Block Diagram of Monitoring Station		
DATE	SCALE	DWG.NO. 08
JICA JAPAN INTERNATIONAL COOPERATION AGENCY		



ABBREVIATION OF TOT LINE EXCHANGE STATION

ASD	ASOK DIN-DAENG
BN	BANG NA
BS	BANG SUE
BSN	BANG CHAN
DM	DON MUANG
HM	HUA MAK
KC	KHLONG CHAN
KK	KRUNG KASEM
KT	KHLONG TOEI
LB	LAT KRABANG
LP1	LAT PHRAO 1
LS	LAK SI
TM	THUNG MAHAMEK
ON	ON NUT
PL	PHLOEN CHIT
PN	PHRA KHANONG
PS	PU CHAO SAMING PHRAI
PV	PRAWET
PY	PHANONYOTHIN
RI	RAM INTHRA
SS	SAMSEN
SV	SUKHUMWIT
SW	SURAWONG
TT	THANOM TOK

-LEGEND-

(M 1) MONITORING STATION
[R. I. D] ROYAL IRRIGATION DEPARTMENT
[M. D] METEOROLOGICAL DEPARTMENT
[RI] TOT EXCHANGE STATION
——— TOT LEASED LINE (2W)

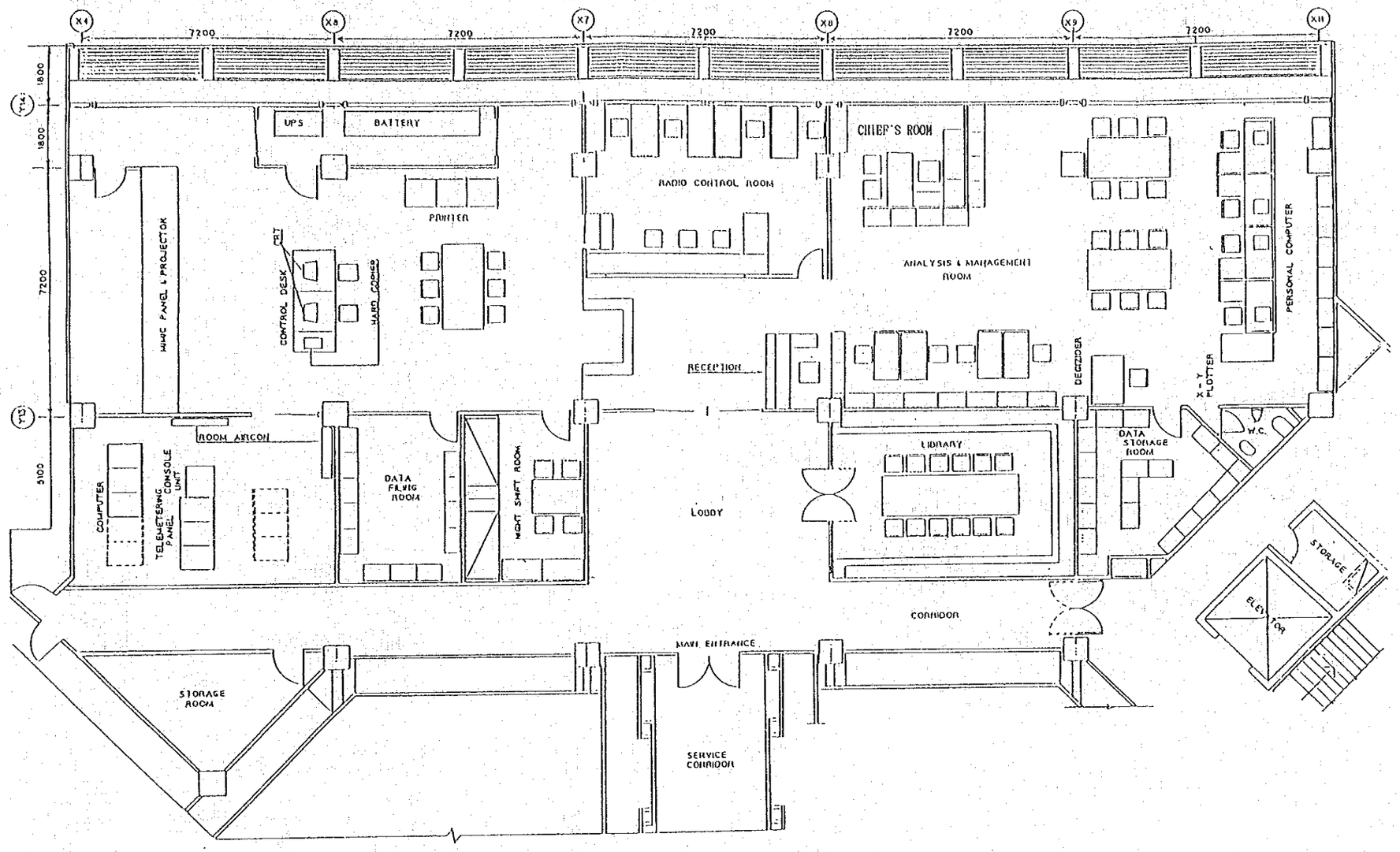
THE KINGDOM OF THAILAND
BANGKOK METROPOLITAN ADMINISTRATION

THE PROJECT FOR THE PROCUREMENT OF EQUIPMENT FOR FLOOD CONTROL CENTER IN BANGKOK AND ITS VICINITY

TITLE: TOT Leased Line Network

DATE	SCALE	DWG.NO.
		09

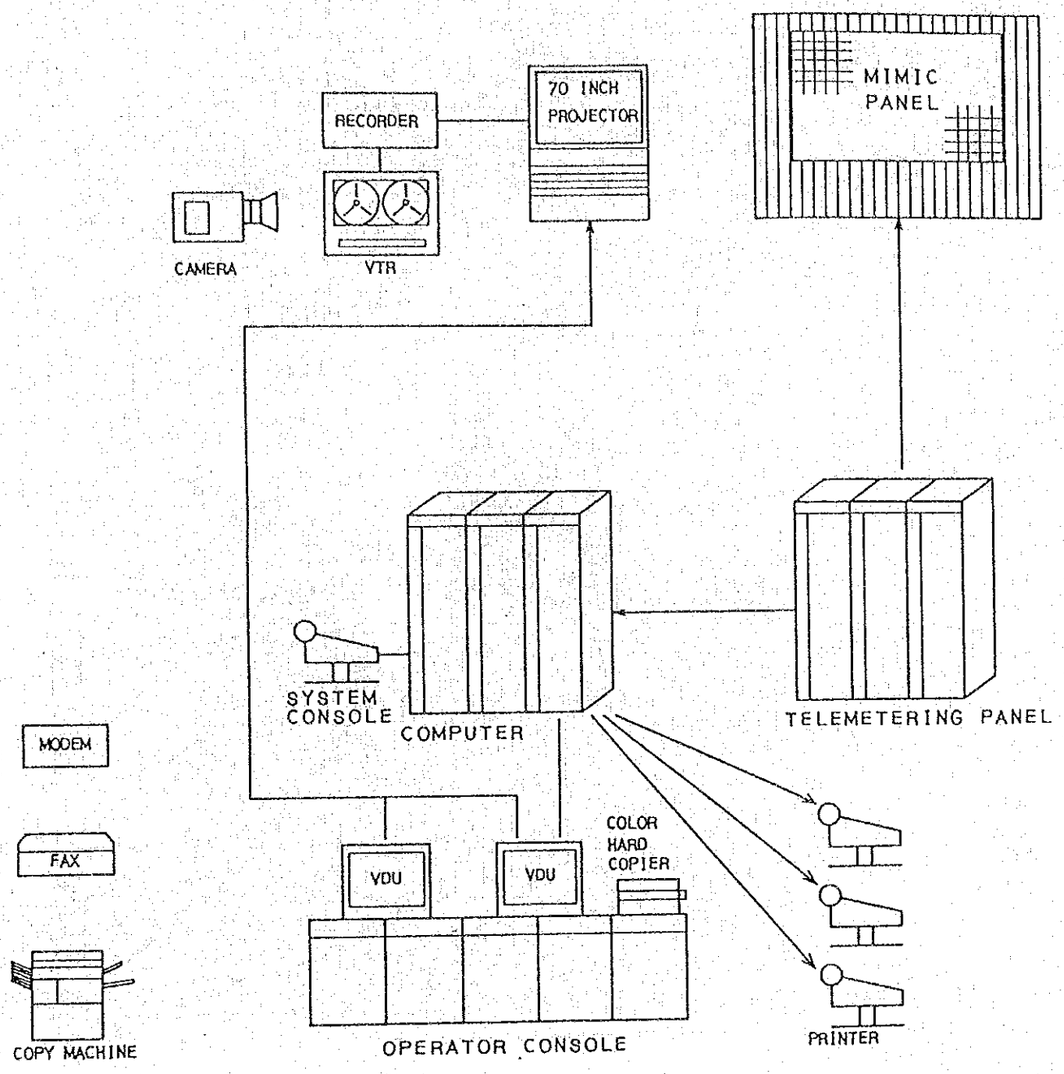
JICA JAPAN INTERNATIONAL COOPERATION AGENCY

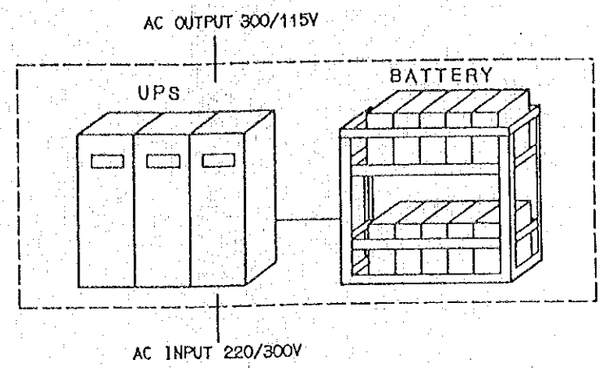


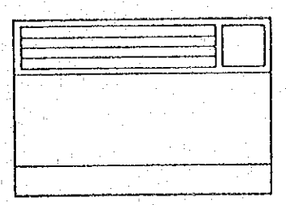
LAY OUT OF FLOOD CONTROL CENTER

THE KINGDOM OF THAILAND BANGKOK METROPOLITAN ADMINISTRATION		
THE PROJECT FOR THE PROCUREMENT OF EQUIPMENT FOR FLOOD CONTROL CENTER IN BANGKOK AND ITS VICINITY		
TITLE Layout of Flood Control Center		
DATE	SCALE	DWG.NO. 10
JICA JAPAN INTERNATIONAL COOPERATION AGENCY		

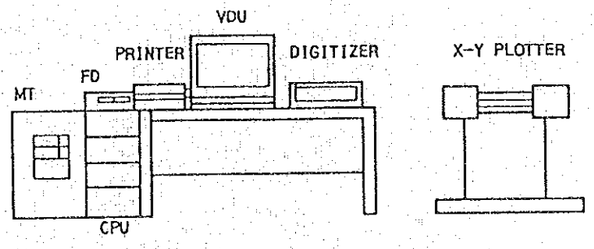
MASTER STATION EQUIPMENT CONFIGURATION





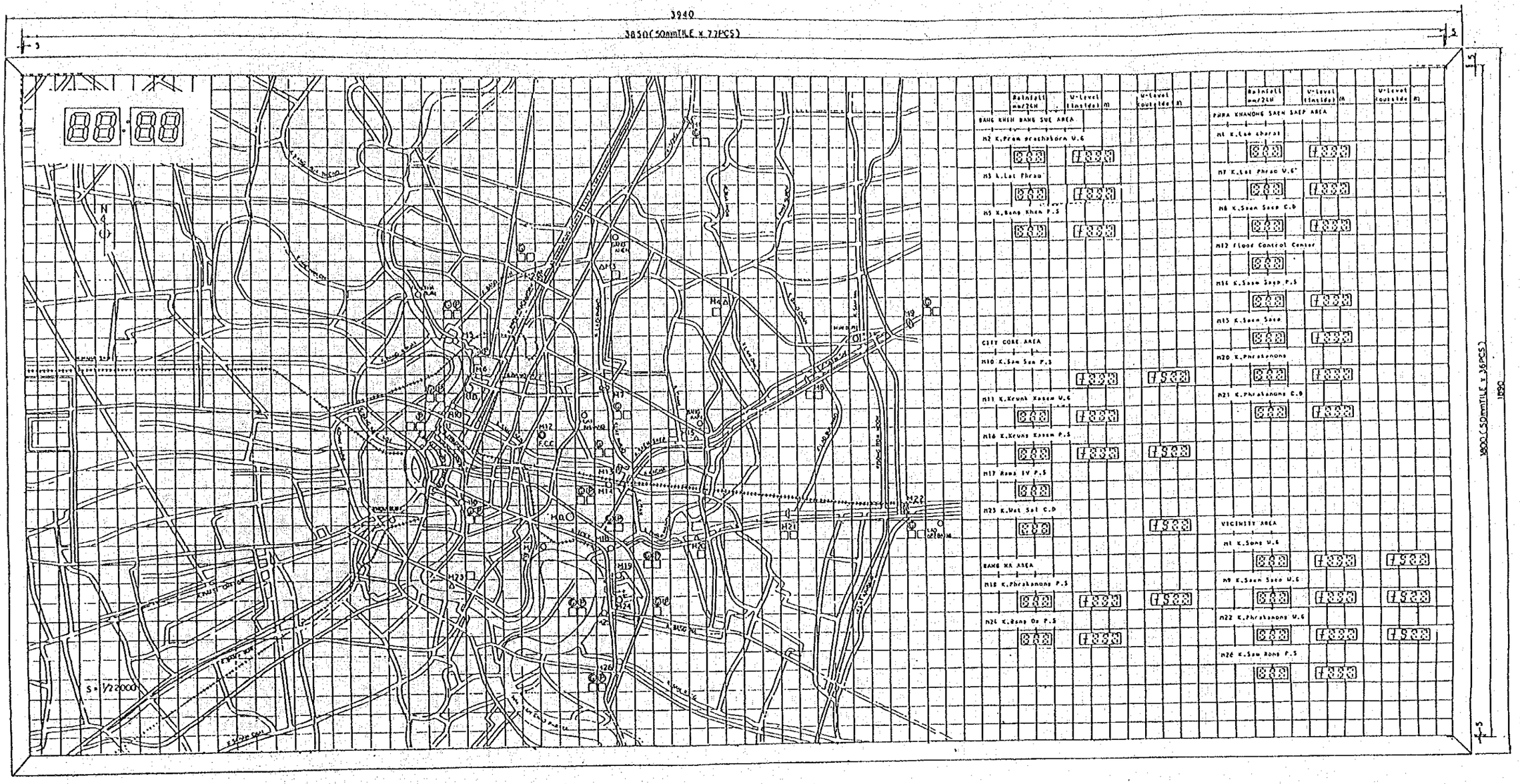


AIR CONDITIONER



ENGINEERING WORK STATION

THE KINGDOM OF THAILAND BANGKOK METROPOLITAN ADMINISTRATION		
THE PROJECT FOR THE PROCUREMENT OF EQUIPMENT FOR FLOOD CONTROL CENTER IN BANGKOK AND ITS VICINITY		
TITLE Master Station Equipment Configuration		
DATE	SCALE	DWG.NO. 11
JICA JAPAN INTERNATIONAL COOPERATION AGENCY		



1. MOSAIC TILE 50 x 50 mm
2. BEZEL AL. L5 WIDE 50 mm

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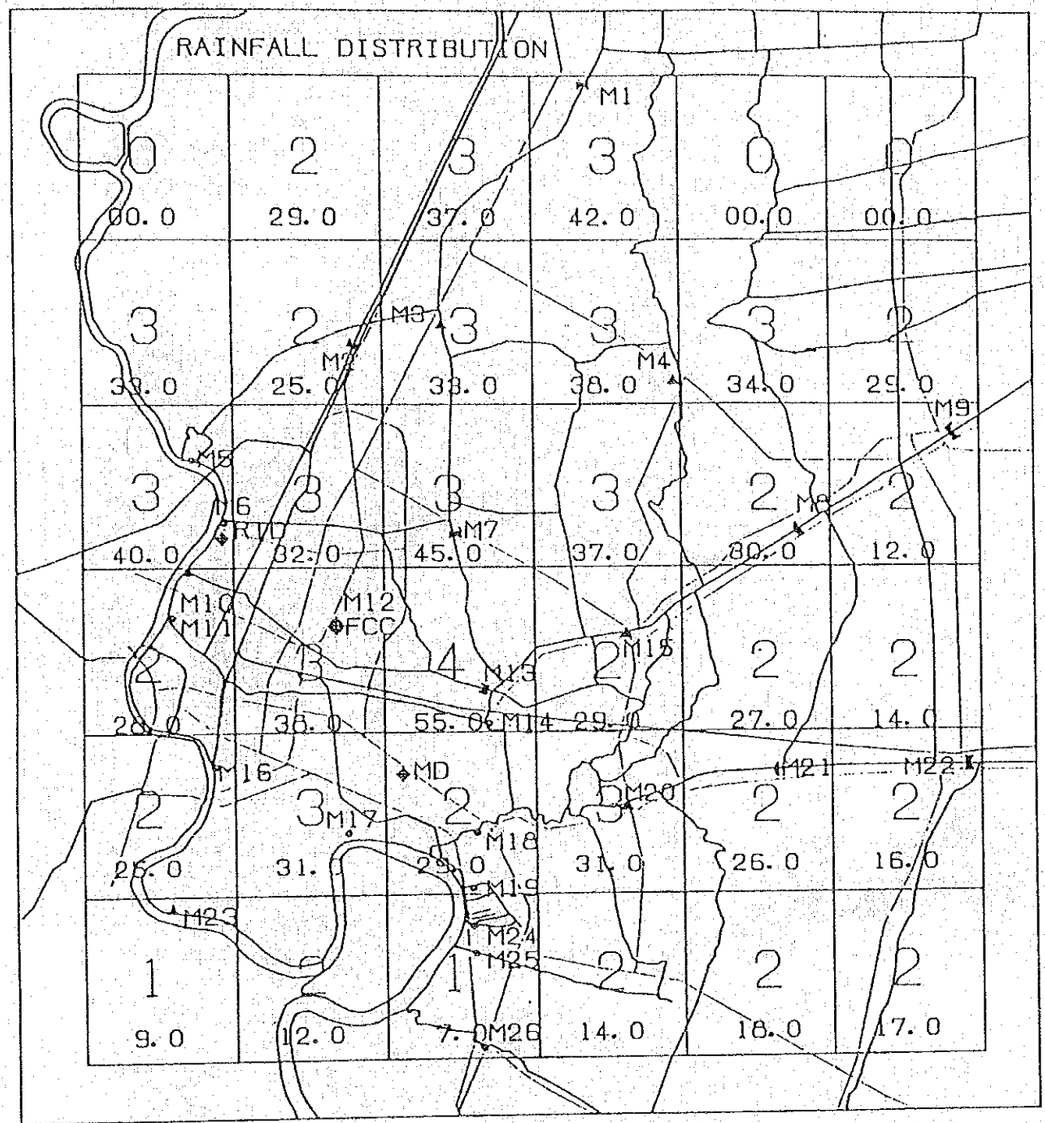
THE PROJECT FOR THE PROCUREMENT OF EQUIPMENT FOR FLOOD CONTROL CENTER IN BANGKOK AND ITS VICINITY		
TITLE Mimic Panel Indication		
DATE	SCALE	DWG.NO. 12
JICA JAPAN INTERNATIONAL COOPERATION AGENCY		

10-JUN-88 05:31



RAINFALL INTENSITY

0	:	0.0 – 0.0	mm/H
1	:	0.5 – 10.0	mm/H
2	:	10.5 – 30.0	mm/H
3	:	30.5 – 50.0	mm/H
4	:	50.0 –	mm/H

THE KINGDOM OF THAILAND
BANGKOK METROPOLITAN ADMINISTRATION

THE PROJECT FOR THE PROCUREMENT OF EQUIPMENT
FOR
FLOOD CONTROL CENTER IN BANGKOK AND ITS VICINITY

TITLE

Picture Image (Typical Sample) 1/11

DATE	SCALE	DWG.NO.
		13

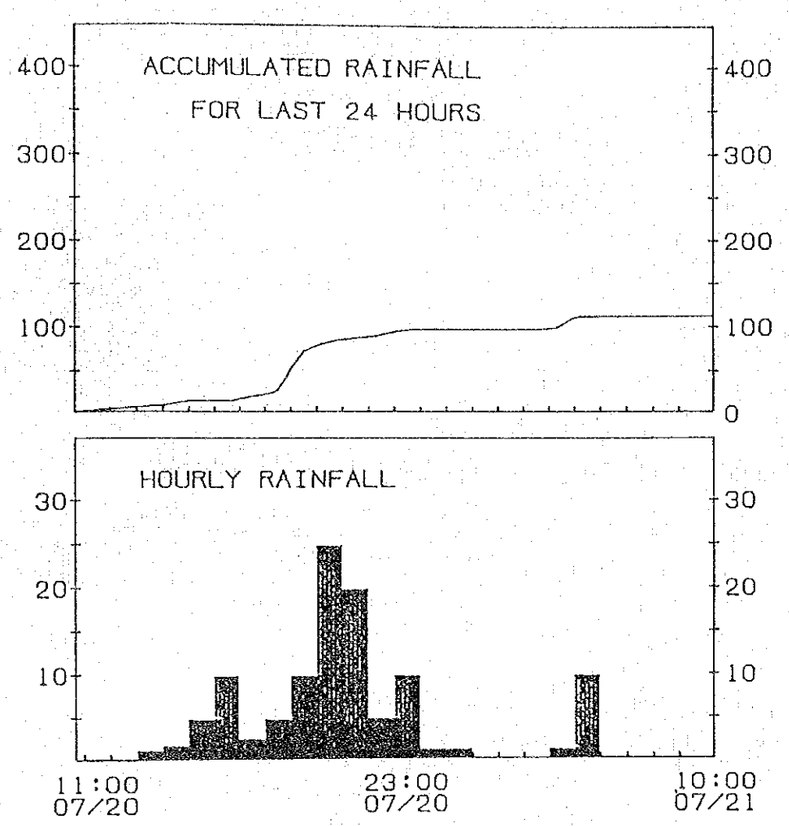
JICA JAPAN INTERNATIONAL COOPERATION AGENCY

HOURLY RAINFALL

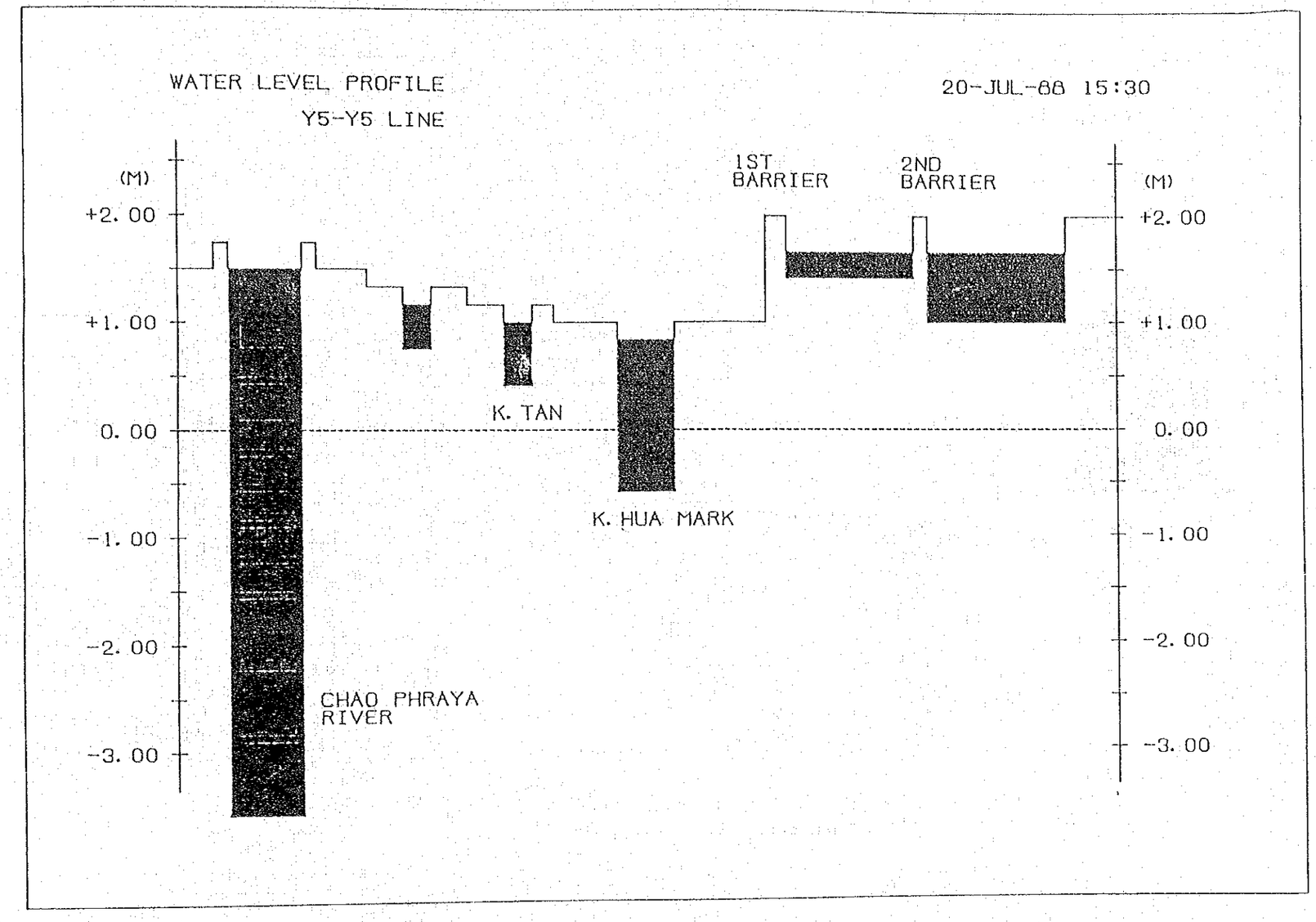
K. LAT PHRAO

21-JUL-88 10:10

TIME	HOURLY RAINFALL	ACCUMULATED RAINFALL
11:00	0	000
12:00	0	000
13:00	1	001
14:00	2	003
15:00	5	008
16:00	10	018
17:00	4	022
18:00	6	028
19:00	10	038
20:00	25	053
21:00	20	073
22:00	6	079
23:00	10	089
00:00	1	090
01:00	1	091
02:00	0	091
03:00	0	091
04:00	0	091
05:00	1	092
06:00	6	098
07:00	10	108
08:00	0	108
09:00	0	108
10:00	0	108



THE KINGDOM OF THAILAND BANGKOK METROPOLITAN ADMINISTRATION		
THE PROJECT FOR THE PROCUREMENT OF EQUIPMENT FOR FLOOD CONTROL CENTER IN BANGKOK AND ITS VICINITY		
TITLE Picture Image (Typical Sample) 2/11		
DATE	SCALE	DWG.NO. 14
JICA JAPAN INTERNATIONAL COOPERATION AGENCY		



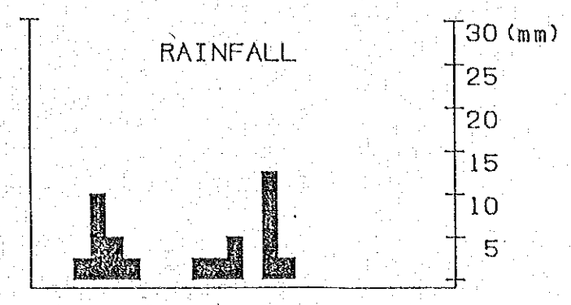
THE KINGDOM OF THAILAND BANGKOK METROPOLITAN ADMINISTRATION		
THE PROJECT FOR THE PROCUREMENT OF EQUIPMENT FOR FLOOD CONTROL CENTER IN BANGKOK AND ITS VICINITY		
TITLE Picture Image (Typical Sample) 6/11		
DATE	SCALE	DWG.NO. 15
JICA JAPAN INTERNATIONAL COOPERATION AGENCY		

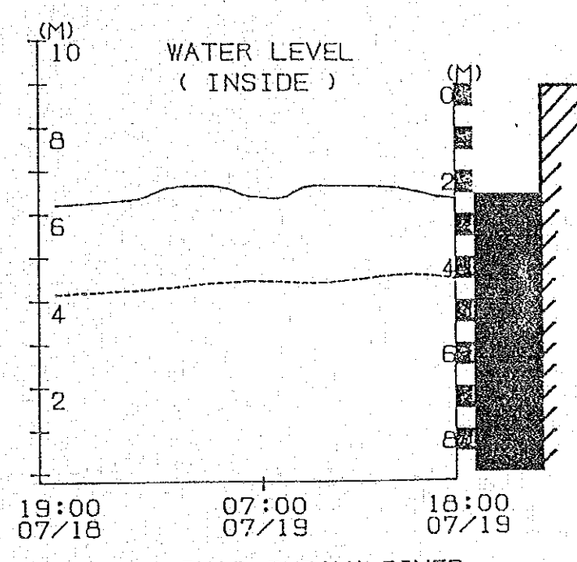
WATER LEVEL

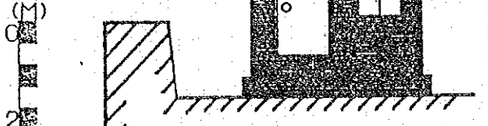
K. KRUNG KASEM

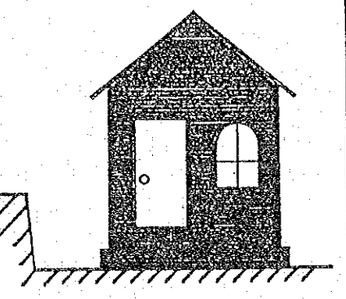
20-JUL-88 15:30

TIME	WATER LEVEL (cm) INSIDE	WATER LEVEL (cm) OUTSIDE	RAINFALL (mm/h)
19:00	6.32	6.24	0
20:00	6.34	6.29	0
21:00	6.36	6.20	3
22:00	6.38	6.32	10
23:00	6.44	6.49	5
00:00	6.45	6.58	3
01:00	6.55	6.66	0
02:00	6.62	6.70	0
03:00	6.67	6.74	0
04:00	6.69	6.82	3
05:00	6.59	6.84	3
06:00	6.42	6.88	5
07:00	6.43	6.87	0
08:00	6.47	6.91	13
09:00	6.56	7.05	3
10:00	6.67	7.18	0
11:00	6.73	7.24	0
12:00	6.73	7.30	0
13:00	6.74	7.25	0
14:00	6.62	7.25	0
15:00	6.51	7.09	0
16:00	6.58	6.92	0
17:00	6.44	6.81	0
18:00	6.36	6.81	0









---------- : CHAO PHRAYA RIVER

THE KINGDOM OF THAILAND BANGKOK METROPOLITAN ADMINISTRATION		
THE PROJECT FOR THE PROCUREMENT OF EQUIPMENT FOR FLOOD CONTROL CENTER IN BANGKOK AND ITS VICINITY		
TITLE Picture Image (Typical Sample) 7/11		
DATE	SCALE	DWG.NO. 16
JICA JAPAN INTERNATIONAL COOPERATION AGENCY		

CHAPTER 5 PROJECT IMPLEMENTATION PLAN

CHAPTER 5 PROJECT IMPLEMENTATION PLAN

5-1 Project Implementation Structure

5-1-1 Project Implementation Agency

The Project implementation agency will be the Bangkok Metropolitan Administration (BMA) of the Kingdom of Thailand. It is desirable, therefore, that Project facilities should be actually managed by the Department of Drainage and Sewerage of BMA.

It is believed that no problems will be encountered in organizing the operations, maintenance, and management groups utilizing DDS's present staff members.

5-1-2 Consultant

A Japanese consultant company will prepare the procurement plan for obtaining the equipment necessary for the telemetering system that will be borne by the Japanese side. The consultant company will design the facilities wherein Project equipment will be installed. They will also design the Project equipment and provide the management service for equipment manufacturing. Project construction supervision will be handled by the consultant company.

After the signing of the Exchange of Notes for the project, the Thailand side will make a contract agreement with a Japanese consultant company for the following services:

1) Preparation of detailed designs for Project equipment and facilities based on the basic design study report.
2) Preparation of tender documents for Project equipment procurement and facility construction.
3) Assisting in tendering, and in the examination and evaluation of tender documents.
4) Providing advice concerning the contract agreement between the Thailand side and a qualified Japanese contractor.

5) Witnessing and Inspecting equipment manufacturing and their condition upon being unloaded in Thailand.

6) Providing supervision for Project construction and equipment installation.

7) Witnessing the delivery of Project facilities to the Thailand side upon completion of construction.

Strict construction management will be required to carry out Project construction work under the rules of the Japanese grant aid cooperation system. Because BMA (DDS) has very little experience in project implementation under the Japanese grant aid cooperation system, a Japanese consultant company that is to undertake the Project's consulting service work must have adequate experience, knowledge and the staff members necessary to perform the task.

5-1-3 Contractor

Equipment supply and facility construction will be undertaken by a Japanese contractor. The Thailand side will make a contract agreement with a qualified Japanese contractor with the assistance of the above mentioned consultant.

The major work items of the Japanese contractor will be as follows:

1) Equipment Manufacturing, Shipping and Installation:
The contractor shall install the equipment at the Project sites by the day specified in the contract agreement. The contractor shall explain the equipment's assembling, installation, trial run, repair, inspection, and daily maintenance and management methods to the Thailand side. The contractor will also provide guidance manuals for the equipment.

2) Project Facility Construction Work
In order to complete Project equipment installation by the day specified in the contract agreement, the contractor will follow a tight construction management schedule.

The above construction work shall be performed either inside or in close proximity to the existing pumping stations and gates. This work should be carried out under a very tight construction schedule.

It will be a requirement for the contractor to have had previous experience in installing equipment similar to that which will be used in the Project in Thailand.

5-2 The Boundary of Responsibility for Project Construction

For Project implementation under the Japanese grant aid cooperation system, the boundary of responsibility for Project construction will be as follows, in accordance with discussions made with the Thailand side:

5-2-1 Undertakings by the Japanese Side

1) Design of telemetering system
2) Provision and installation of equipment necessary for the telemetering system
3) Facility construction necessary for installing monitoring station equipment
4) Room interior work for installing master station equipment
5) Partial modifications to the existing pumps' operations boards to pick up pump operation signals.
6) Shipping of Project equipment via sea and land to the Project sites.
7) Provision of consulting services for Project equipment procurement and facility construction.

5-2-2 Undertakings by the Thailand side

1) Acquisition of the required site for the installation of the Flood Control Center (master station).
2) Securing of sufficient space, prior to the commencement of the construction work, necessary for Project facility construction.
3) Securing of access roads necessary for transporting the construction materials and equipment.
4) Exemption of taxes and taking necessary measures for obtaining customs clearance, at the port of disembarkation, for the materials and equipment being brought into Thailand for Project use.

5) Conducting leveling surveys necessary for water level gauge installation.

6) Establishment of the maintenance and management structure for all Project facilities.

7) Taking appropriate measures necessary for smooth Project implementation.