

(2) Basic Design Drawings

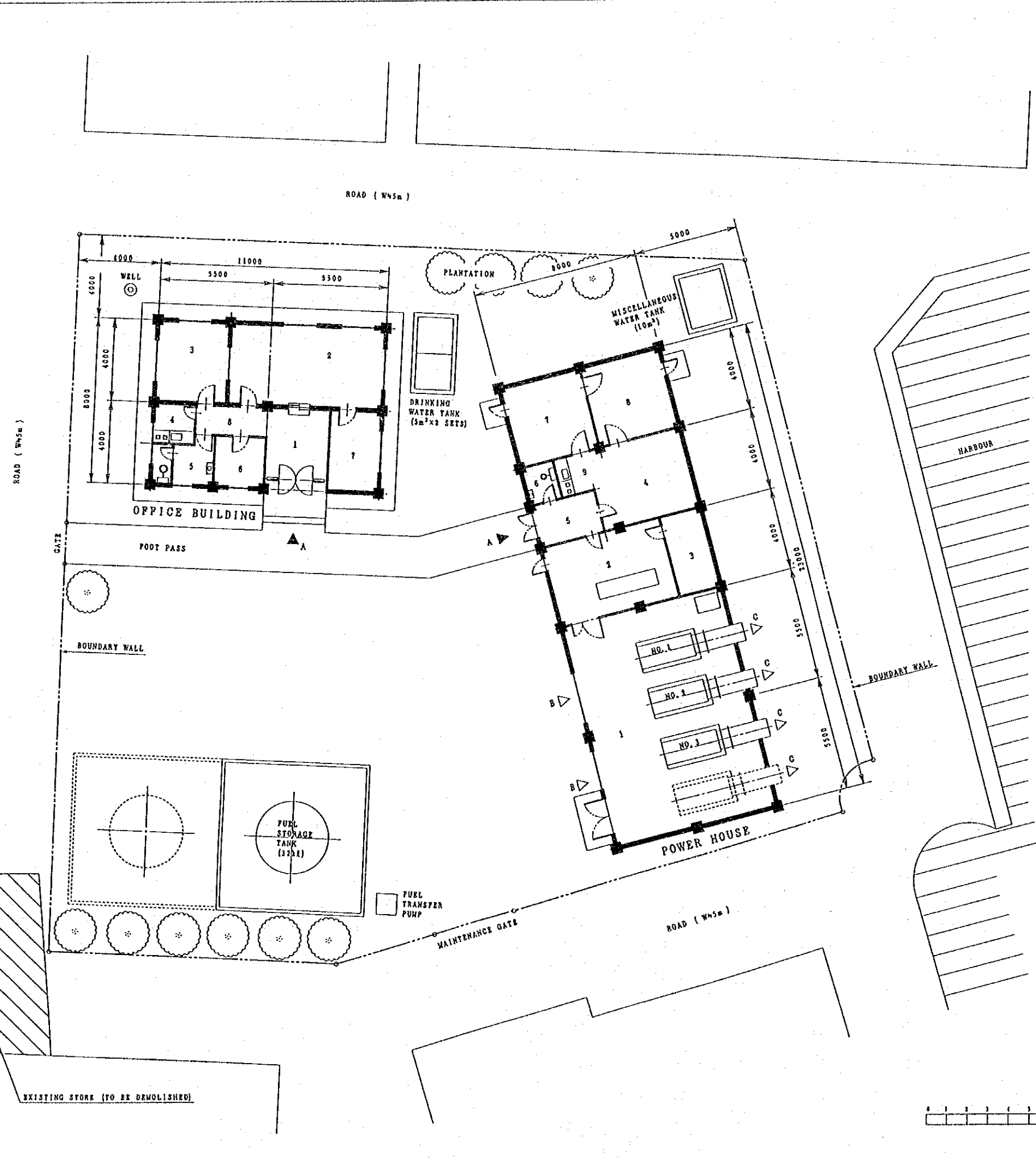
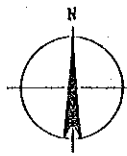
The drawings prepared for the basic design for the planned generating facilities are as follows.

Naifaru

MMN-G101	General Arrangement
MMN-G102	Single Line Diagram
MMN-G103	Fuel Oil System
MMN-G104	Cable Route & Location of Local D/B
MMN-G105	Water System

Eydhafushi

MME-G101	General Arrangement
MME-G102	Single Line Diagram
MME-G103	Fuel Oil System
MME-G104	Cable Route & Location of Local D/B
MME-G105	Water System



POWER HOUSE (TOTAL FLOOR , 184, 0m²)

1. ROOM		W(m)	D(m)	AREA(m ²)	NOTE
1	DEG ROOM	8,0	11,0	=88,0	VENTILATION
1	CONTROL ROOM	6,0	4,0	=24,0	AIR CONDITION
1	BATTERY ROOM	2,0	4,0	=8,0	VENTILATION
4	ENGINEER'S ROOM	5,0	4,0	=20,0	AIR CONDITION
5	ENTRANCE	3,0	2,0	=6,0	
6	TOILET	1,5	2,0	=3,0	VENTILATION
7	WAREHOUSE	4,0	4,0	=16,0	VENTILATION
8	WORK SHOP	4,0	4,0	=16,0	VENTILATION
9	KETTLE	1,5	2,0	=3,0	VENTILATION

2. STRUCTURE

- (1) FOUNDATION (INCLUDING EQUIPMENT FOUNDATION) ; REINFORCED CONCRETE
- (2) COLUMN, BEAM, SLAB (GROUND FLOOR) ; REINFORCED CONCRETE
- (3) WALL ; CONCRETE BLOCK (EXTERNAL WALL: t=200mm, INTERNAL WALL: t=100-150mm)
- (4) ROOF ; STEEL TRUSS + STEEL CORRUGATED SHEET WITH HEAT INSULATION

3. FINISHING

- (1) CEILING ; ACOUSTIC ROCKWOOL BOARD (ROOM NO. 2, 4, 5, 6, 9 ONLY)
- (2) WALL ; CEMENT MORTAR + E. P. (DEG ROOM ; SOUND PROOF MATERIAL)
- (3) FLOOR ; CEMENT MORTAR STEEL TROWEL (ENGINEER'S ROOM, CONTROL ROOM, ENTRANCE HALL ; PVC TILE)

4. FITTING ; ALUMINIUM OR WOOD.

OFFICE BUILDING (TOTAL FLOOR , 88, 0m²)

1. ROOM		W(m)	D(m)	AREA(m ²)	NOTE
1	ENTRANCE	3,0	4,0	=12,0	
2	ADMINISTRATION	7,5	4,0	=30,0	AIR CONDITION
3	MANAGER ROOM	3,5	4,0	=14,0	AIR CONDITION
4	KETTLE	2,0	2,0	=4,0	VENTILATION
5	TOILET	1,0x0,5+3,0	2,0	=6,5	VENTILATION
6	STORE	2,5	2,5	=6,25	VENTILATION
7	COMMUNICATION	2,5	4,0	=10,0	AIR CONDITION
8	CORRIDOR	3,5	1,5	=5,25	

2. STRUCTURE

- (1) FOUNDATION, SLAB (GROUND FLOOR), COLUMN ; REINFORCED CONCRETE
- (2) WALL ; CORAL BRICK (EXTERNAL ; t=200mm, INTERNAL ; t=100-150mm)
- (3) ROOF ; STEEL TRUSS + STEEL CORRUGATED SHEET WITH HEAT INSULATION

3. FINISHING

- (1) CEILING ; ACOUSTIC ROCKWOOL BOARD. (EXCEPT STORE)
- (2) WALL ; CEMENT MORTAR + E. P.
- (3) FLOOR ; MANAGER ROOM, COMMUNICATION, ADMINISTRATION, ENTRANCE HALL, CORRIDOR, TOILET ; PVC OR CERAMIC TILE, OTHERS ; CEMENT MORTAR STEEL TROWEL.

**4. FITTING ; EXTERIOR ; ALUMINIUM
INTERIOR ; WOOD**

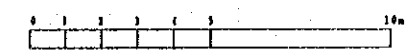
OTHERS

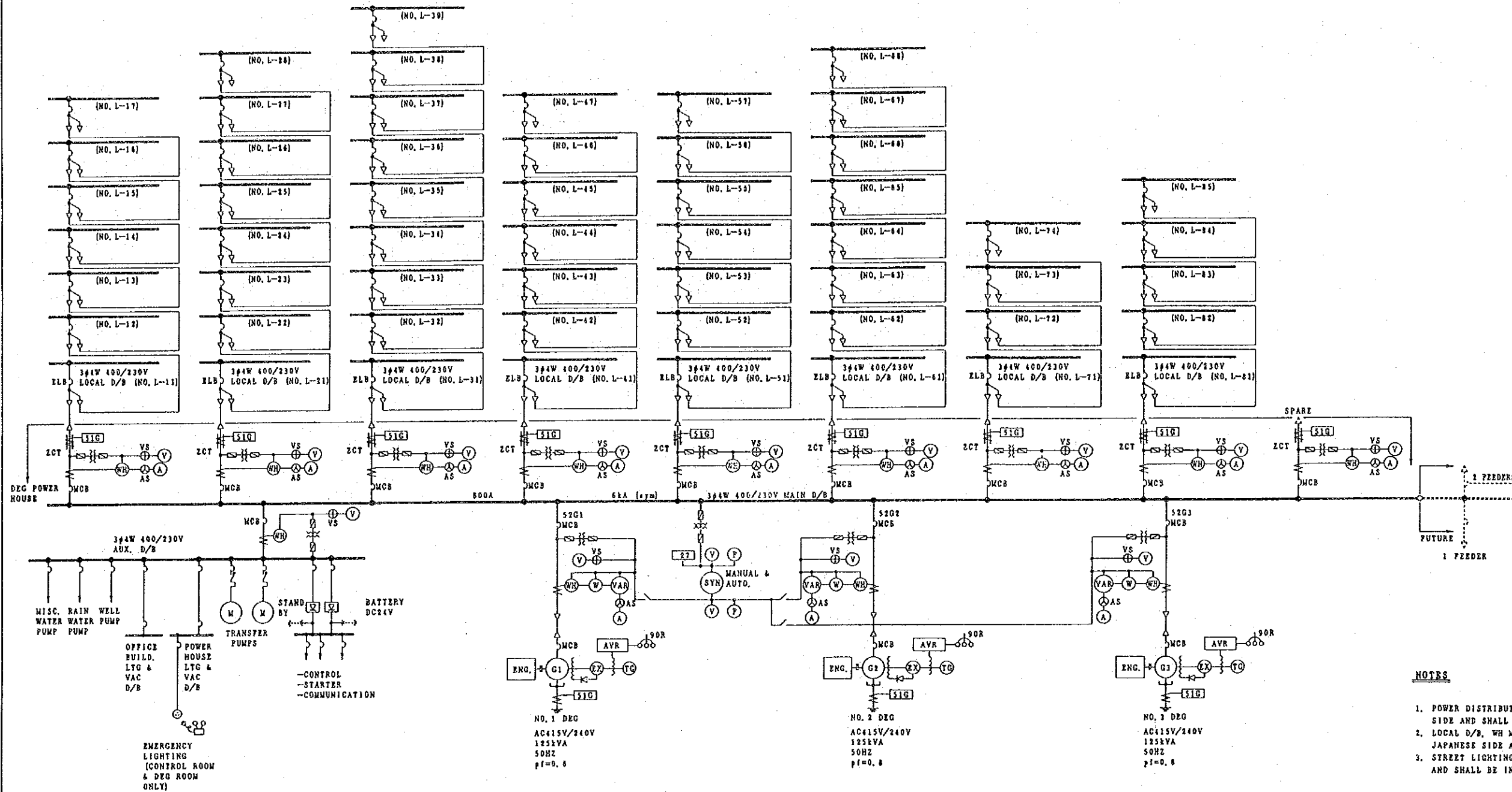
- 1. RAIN WATER COLLECTION SYSTEM AND TANK (5m²x2 SETS) FOR DRINKING AND COOKING WATER.
- 2. WELL WATER SYSTEM FOR TOILET INCLUDING ONE WELL PUMP.
- 3. RAIN WATER COLLECTION SYSTEM AND TANK (10m²) FOR MISCELLANEOUS.
- 4. BOUNDARY WALL WITH GATES SHALL BE CONSTRUCTED BY MALDIVES SIDE.

LEGEND

- A : MAIN ENTRANCE FOR EACH BUILDING
- B : AIR INLET FOR DEG SET
- C : EXHAUST FROM DEG SET

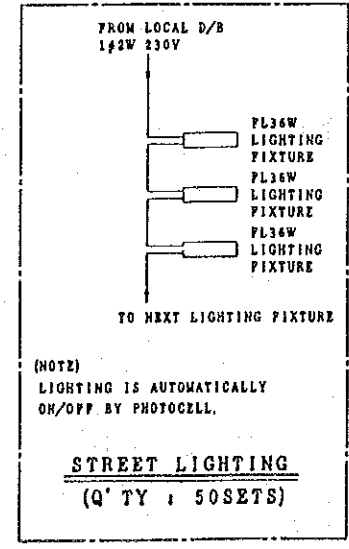
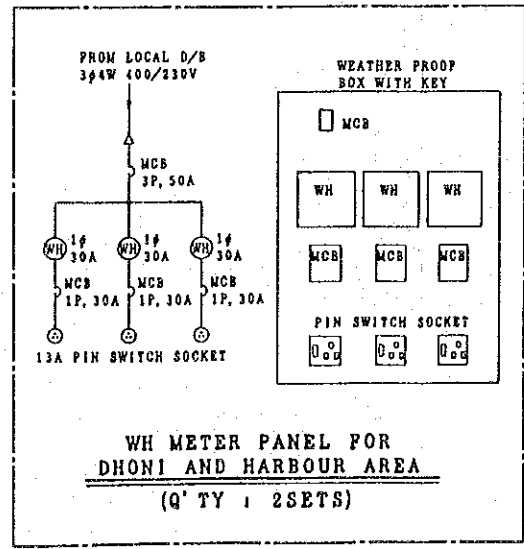
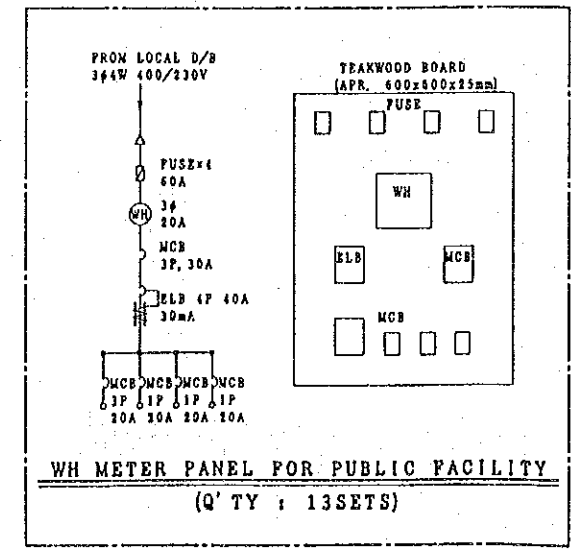
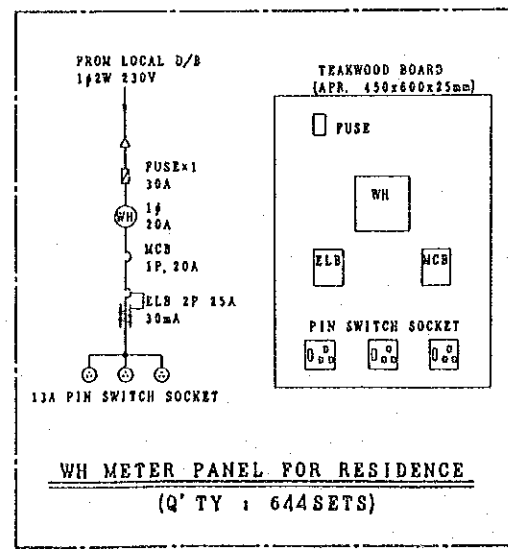
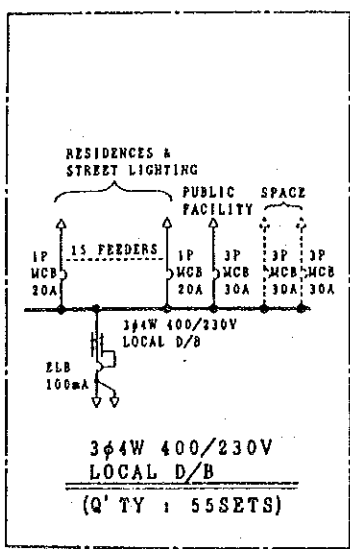
BASIC DESIGN STUDY ON ATOLL ISLAND ELECTRIFICATION PROJECT IN THE REPUBLIC OF MALDIVES					SCALE 1/100
GENERAL ARRANGEMENT OF NAIFARU POWER STATION					DWG. NO. MMN-G101
DATE	DESIGNED	CHECKED	APPROVED	REVISION	
7 Jan '94	K. Kianatun	M. Juma	V. Seta		
JAPAN INTERNATIONAL COOPERATION AGENCY					



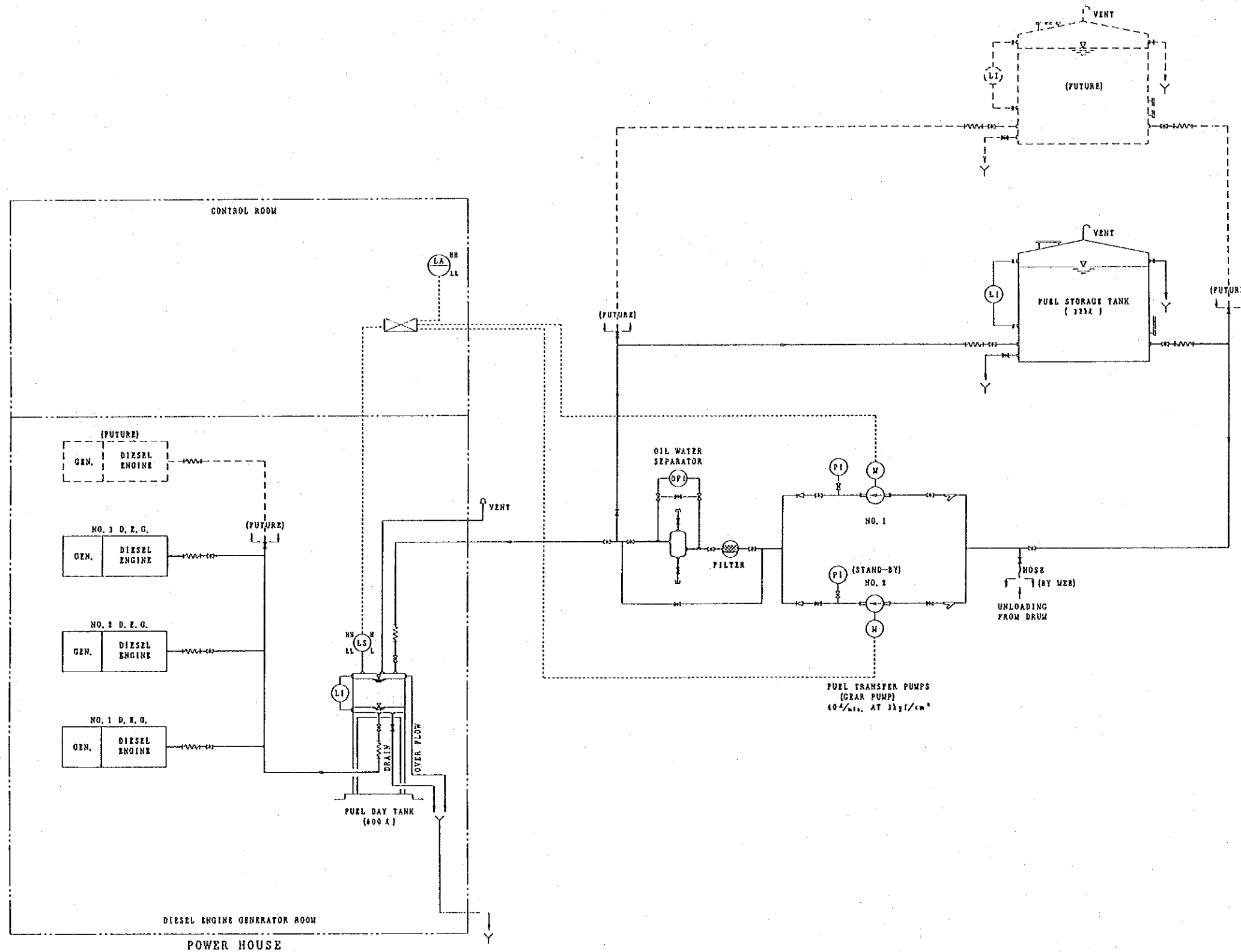


- SYMBOLS**
- MCB : MOLD CASE CIRCUIT BREAKER
 - ELB : EARTH LEAKAGE BREAKER
 - CT : CURRENT TRANSFORMER
 - ZCT : ZERO-PHASE CURRENT TRANSFORMER
 - PT : POTENTIAL TRANSFORMER
 - FUSE
 - SWITCH
 - CONTACTOR
 - THERMAL RELAY
 - GROUNDING
 - BATTERY
 - BATTERY CHARGER
 - THYRISTOR
 - CABLE TERMINATION
 - AMMETER
 - VOLTMETER
 - AMMETER SWITCH
 - VOLTMETER SWITCH
 - SYNCHRO METER
 - FREQUENCY METER
 - WATT METER
 - WATTHOUR METER
 - VAR METER
 - EARTH FAULT RELAY
 - UNDER VOLTAGE RELAY

- NOTES**
- POWER DISTRIBUTION CABLE SHALL BE SUPPLIED BY JAPANESE SIDE AND SHALL BE INSTALLED BY MALDIVES SIDE.
 - LOCAL D/B, WH METER PANELS, SHALL BE SUPPLIED BY JAPANESE SIDE AND SHALL BE INSTALLED BY MALDIVES SIDE.
 - STREET LIGHTING FIXTURE SHALL BE SUPPLIED BY JAPANESE SIDE AND SHALL BE INSTALLED BY MALDIVES SIDE.



BASIC DESIGN STUDY ON ATOLL ISLAND ELECTRIFICATION PROJECT IN THE REPUBLIC OF MALDIVES					STANDARD JIS
SINGLE LINE DIAGRAM OF NAIFARU POWER STATION					MMN-G102
DATE	DESIGNED	CHECKED	APPROVED	REVISION	
7 Jan '94	A. Minami	M. Yamai	H. Seto		
JAPAN INTERNATIONAL COOPERATION AGENCY					



LEGEND

LINE	
—	PIPING
- - -	FUTURE
· · · · ·	SIGNAL
VALVE	
⊞	GATE
⊞	CHECK
⊞	NORMAL CLOSE
⊞	NORMAL OPEN
ACCESSORY	
D	REDUCER
⊙	PUMP
⊞	Y-TYPE STRAINER
⊞	FLEXIBLE HOSE
Y	PIT
⊞	CONTROL PANEL
INSTRUMENT SYMBOL	
P	PRESSURE
L	LEVEL
D	DIFFERENTIAL
I	INDICATOR
S	SWITCH
L	LEVEL
A	ALARM
SUFFIX	
○	LOCAL MOUNTED
⊙	BOARD MOUNTED

BASIC DESIGN STUDY ON ATOLL ISLAND ELECTRIFICATION PROJECT IN THE REPUBLIC OF MALDIVES				SCALE NONE
FUEL OIL SYSTEM OF NAIRARU POWER STATION				DWG. NO. MMN-G103
DATE	DESIGNED	CHECKED	APPROVED	REVISION
1 Jan. 94	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	
JAPAN INTERNATIONAL COOPERATION AGENCY				

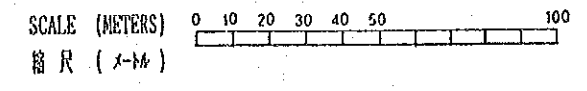


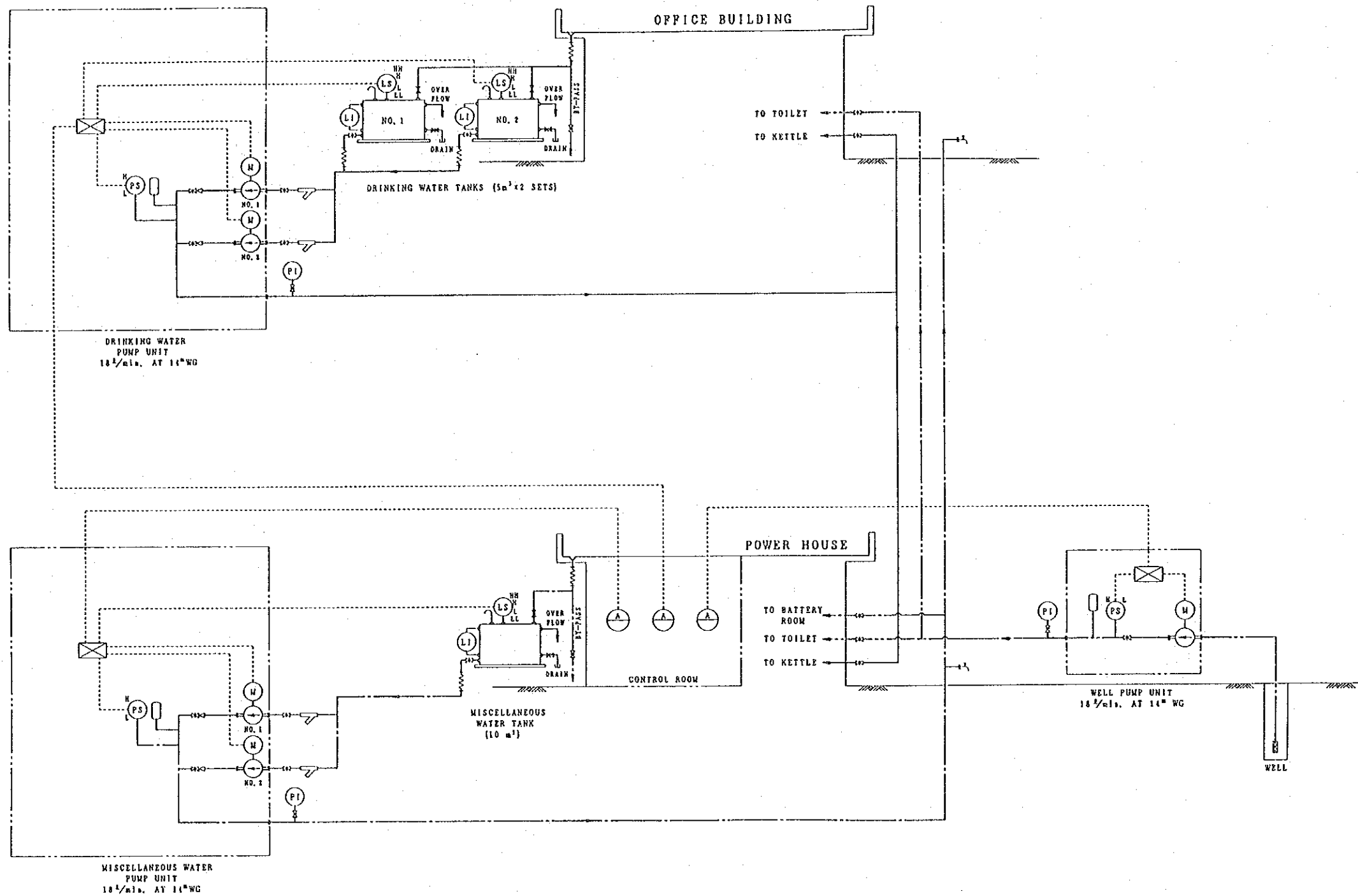
LEGEND

- | | |
|--------------------------------|-----------|
| A - BANK OF MALDIVES : | モルディブ銀行 |
| B - PLAYING GROUNDS : | 運動場 |
| C - MOSQUE : | イスラム教会 |
| D - CEMETERY : | 墓場 |
| E - ATOLL OFFICE : | 環礁事務所 |
| F - HEALTH CENTER : | ヘルスセンター |
| G - AREA FOR NEW POWER HOUSE : | 新発電所敷地 |
| H - STORES : | 倉庫 |
| I - WORKSHOP : | 工場 |
| J - SOCIAL CENTER : | 社会福祉センター |
| K - PREVIOUS POWER HOUSE : | 旧発電所 |
| L - BOAT REPAIRING AREA : | ボート修繕場 |
| M - SCHOOL : | 学校 |
| N - ISLAND OFFICE & COURT : | 島事務所及び裁判所 |

- - LOCAL D/B
- ^{H/D} - WH METER PANEL BOARD FOR HARBOUR AND DHONI AREA (H/D-1 AND H/D-2 ONLY)
- - WH METER PANEL
- - MAIN CABLE ROUTE
- - - - - DISTRIBUTING AREA COVERED BY A LOCAL D/B

BASIC DESIGN STUDY ON ATOLL ISLAND ELECTRIFICATION PROJECT IN THE REPUBLIC OF MALDIVES		SCALE AS SHOWN
CABLE ROUTE & LOCATION OF LOCAL D/B IN NAIFARU ISLAND		DWG. NO. MNV-G104
DATE	DESIGNED	CHECKED
7 Jan. '94	H. Khamati	M. Sami
		APPROVED
		A. Sob
REVISION		
JAPAN INTERNATIONAL COOPERATION AGENCY		

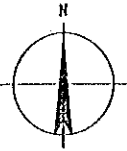




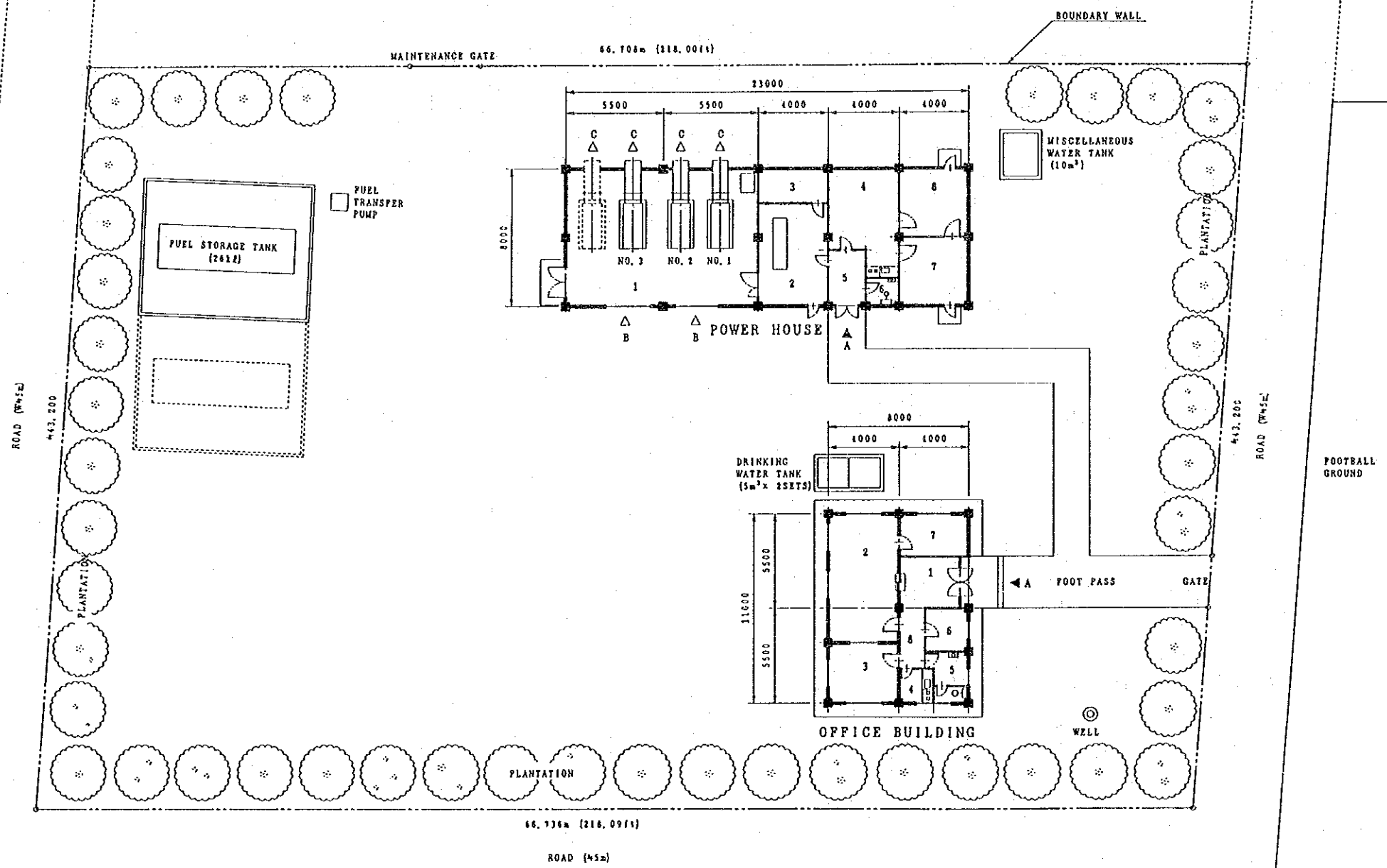
LEGEND

LINE	
—	DRINKING WATER PIPING
- - -	MISCELLANEOUS WATER PIPING
· · · · ·	WELL WATER PIPING
· · · · ·	SIGNAL
VALVE	
⊘	GATE
⊞	CHECK
⊞	NORMAL CLOSE
⊞	NORMAL OPEN
ACCESSORY	
⊞	REDUCER
⊞	PUMP
⊞	Y-TYPE STRAINER
⊞	FLEXIBLE HOSE
⊞	PIT
⊞	FLOW SWITCH
⊞	PRESSURE TANK
⊞	CONTROL PANEL
INSTRUMENT SYMBOL	
P	PRESSURE
L	LEVEL
I	INDICATOR
S	SWITCH
L	LEVEL
A	ALARM
SUFFIX	
○	LOCAL MOUNTED
⊞	BOARD MOUNTED

BASIC DESIGN STUDY ON ATOLL ISLAND ELECTRIFICATION PROJECT IN THE REPUBLIC OF MALDIVES					SCALE NONE
WATER SYSTEM OF NAIFARU POWER STATION					DWG. NO. MMN-G105
					DATE 7 Jan. '94
JAPAN INTERNATIONAL COOPERATION AGENCY					



SEA



POWER HOUSE (TOTAL FLOOR ; 184, 0m²)

1. ROOM No.	ROOM	W (m)	D (m)	AREA (m ²)	NOTE
1	DEG ROOM	8, 0	11, 0	=88, 0	VENTILATION
2	CONTROL ROOM	6, 0	4, 0	=24, 0	AIR CONDITION
3	BATTERY ROOM	2, 0	4, 0	= 8, 0	VENTILATION
4	ENGINEER'S ROOM	5, 0	4, 0	=20, 0	AIR CONDITION
5	ENTRANCE	3, 0	2, 0	= 6, 0	
6	TOILET	1, 5	2, 0	= 3, 0	VENTILATION
7	WAREHOUSE	4, 0	4, 0	=16, 0	VENTILATION
8	WORK SHOP	4, 0	4, 0	=16, 0	VENTILATION
9	KETTLE	1, 5	2, 0	= 3, 0	VENTILATION

2. STRUCTURE
 (1) FOUNDATION (INCLUDING EQUIPMENT FOUNDATION) ; REINFORCED CONCRETE
 (2) COLUMN, BEAM, SLAB (GROUND FLOOR) ; REINFORCED CONCRETE
 (3) WALL ; CONCRETE BLOCK (EXTERNAL WALL:t=200mm, INTERNAL WALL:t=100-150mm)
 (4) ROOF ; STEEL TRUSS + STEEL CORRUGATED SHEET WITH HEAT INSULATION

3. FINISHING
 (1) CEILING ; ACOUSTIC ROCKWOOL BOARD (ROOM NO. 2, 4, 5, 6, 9 ONLY)
 (2) WALL ; CEMENT MORTAR +Z, P (DEG ROOM ; SOUND PROOF MATERIAL)
 (3) FLOOR ; CEMENT MORTAR STEEL TROWEL (ENGINEER'S ROOM, CONTROL ROOM, ENTRANCE HALL ; PVC TILE)

4. FITTING ; ALUMINIUM OR WOOD.

OFFICE BUILDING (TOTAL FLOOR ; 86, 0m²)

1. ROOM No.	ROOM	W (m)	D (m)	AREA (m ²)	NOTE
1	ENTRANCE	3, 0	4, 0	=12, 0	
2	ADMINISTRATION	7, 5	4, 0	=30, 0	AIR CONDITION
3	MANAGER ROOM	3, 5	4, 0	=14, 0	AIR CONDITION
4	KETTLE	2, 0	2, 0	= 4, 0	VENTILATION
5	TOILET	1, 0x0, 5+3, 0	2, 0	= 6, 5	VENTILATION
6	STORE	2, 5	2, 5	= 6, 25	VENTILATION
7	COMMUNICATION	2, 5	4, 0	=10, 0	AIR CONDITION
8	CORRIDOR	1, 5	1, 5	= 2, 25	

2. STRUCTURE
 (1) FOUNDATION, SLAB (GROUND FLOOR), COLUMN ; REINFORCED CONCRETE
 (2) WALL ; CORAL BRICK (EXTERNAL ; t=200mm, INTERNAL ; t=100-150mm)
 (3) ROOF ; STEEL TRUSS + STEEL CORRUGATED SHEET WITH HEAT INSULATION

3. FINISHING
 (1) CEILING ; ACOUSTIC ROCKWOOL BOARD. (EXCEPT STORE)
 (2) WALL ; CEMENT MORTAR +Z, P.
 (3) FLOOR ; MANAGER ROOM, COMMUNICATION, ADMINISTRATION, ENTRANCE HALL, CORRIDOR, TOILET ; PVC OR CERAMIC TILE. OTHERS ; CEMENT MORTAR STEEL TROWEL.

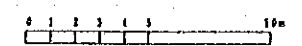
4. FITTING ; EXTERIOR ; ALUMINIUM
 INTERIOR ; WOOD

OTHERS

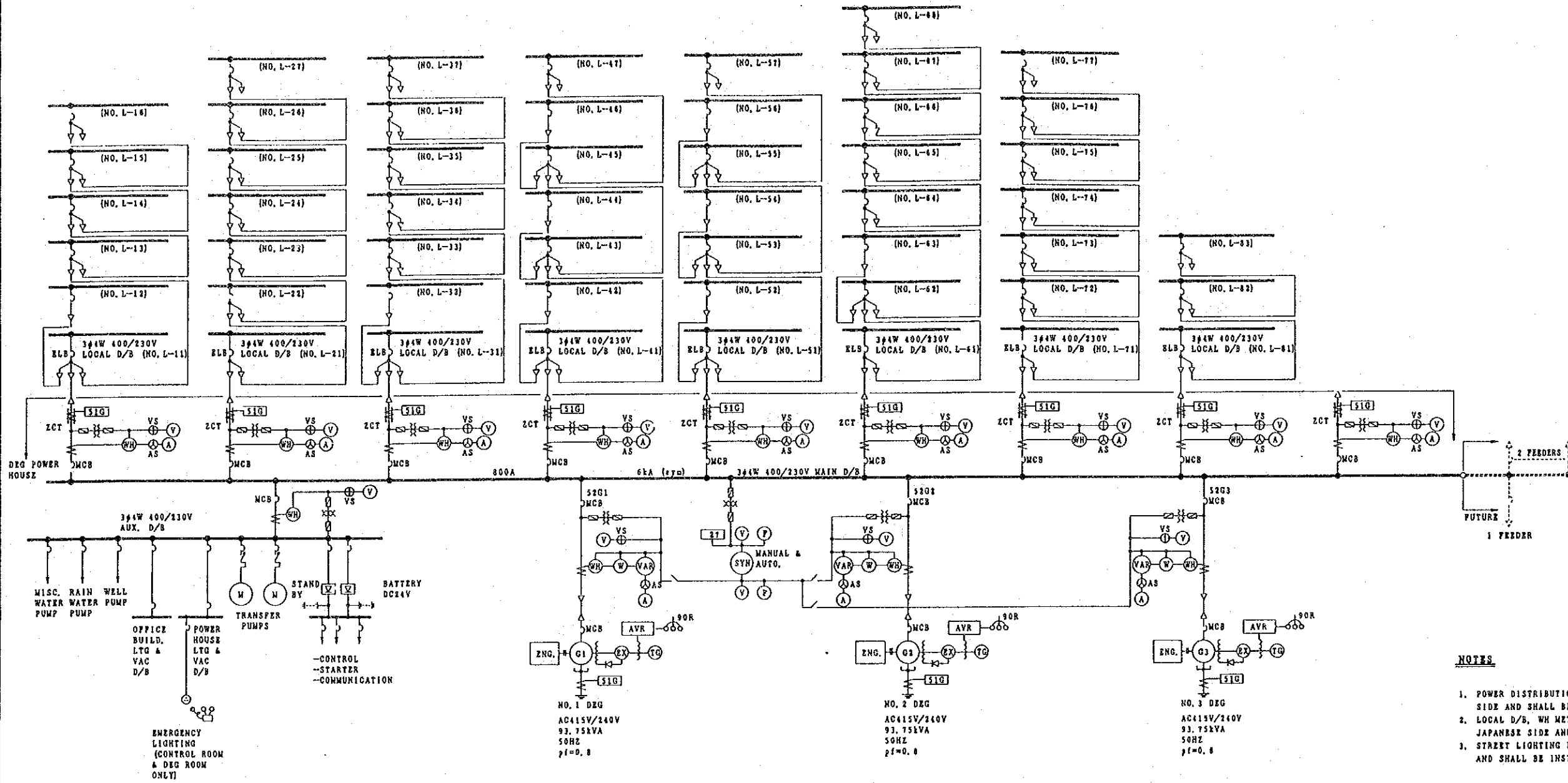
1. RAIN WATER COLLECTION SYSTEM AND TANK (5m²x2 SETS) FOR DRINKING AND COOKING WATER.
2. WELL WATER SYSTEM FOR TOILET INCLUDING ONE WELL PUMP.
3. RAIN WATER COLLECTION SYSTEM AND TANK (10m²) FOR MISCELLANEOUS.
4. BOUNDARY WALL WITH GATES SHALL BE CONSTRUCTED BY MALDIVES SIDE.

LEGEND

- A : MAIN ENTRANCE FOR EACH BUILDING
 B : AIR INLET FOR DEG SET
 C : EXHAUST FROM DEG SET

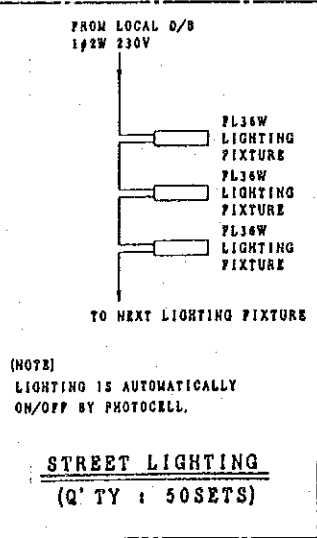
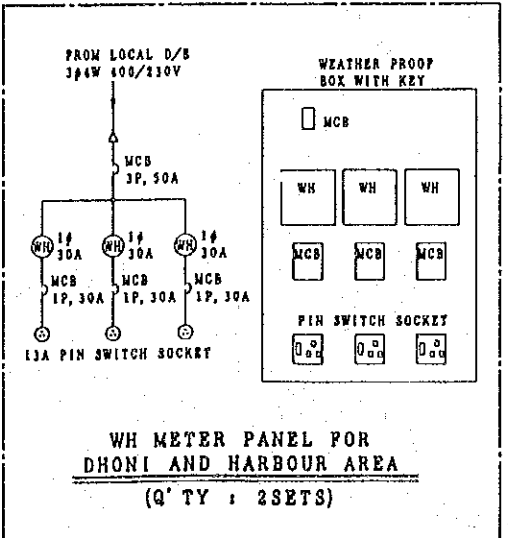
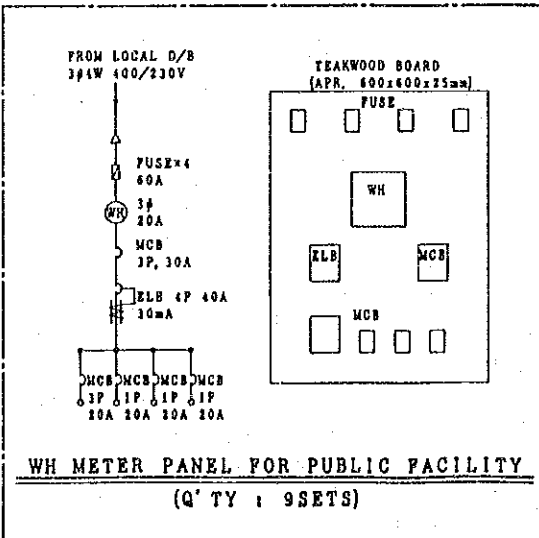
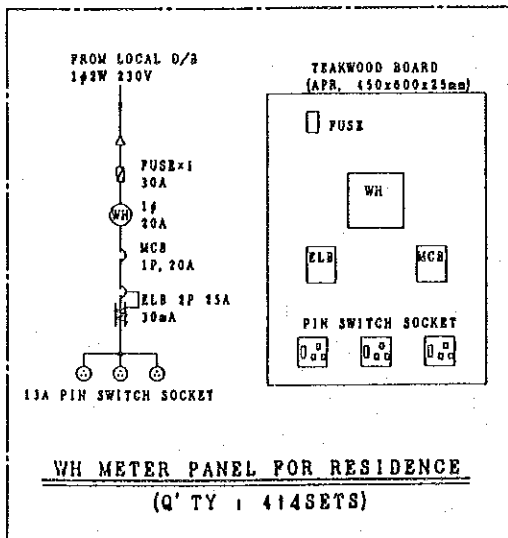
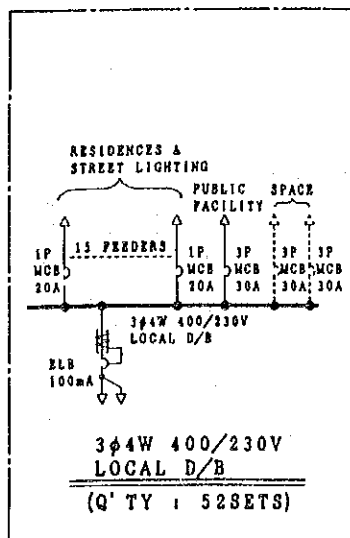


BASIC DESIGN STUDY ON ATOLL ISLAND ELECTRIFICATION PROJECT IN THE REPUBLIC OF MALDIVES		SCALE 1/150
GENERAL ARRANGEMENT OF EYDAPUSHI POWER STATION		DWG. NO. MME-G101
DATE	DESIGNED	CHECKED
7 Jan. '94	K. Xian	M. Sami
		APPROVED
		A. Seto
JAPAN INTERNATIONAL COOPERATION AGENCY		

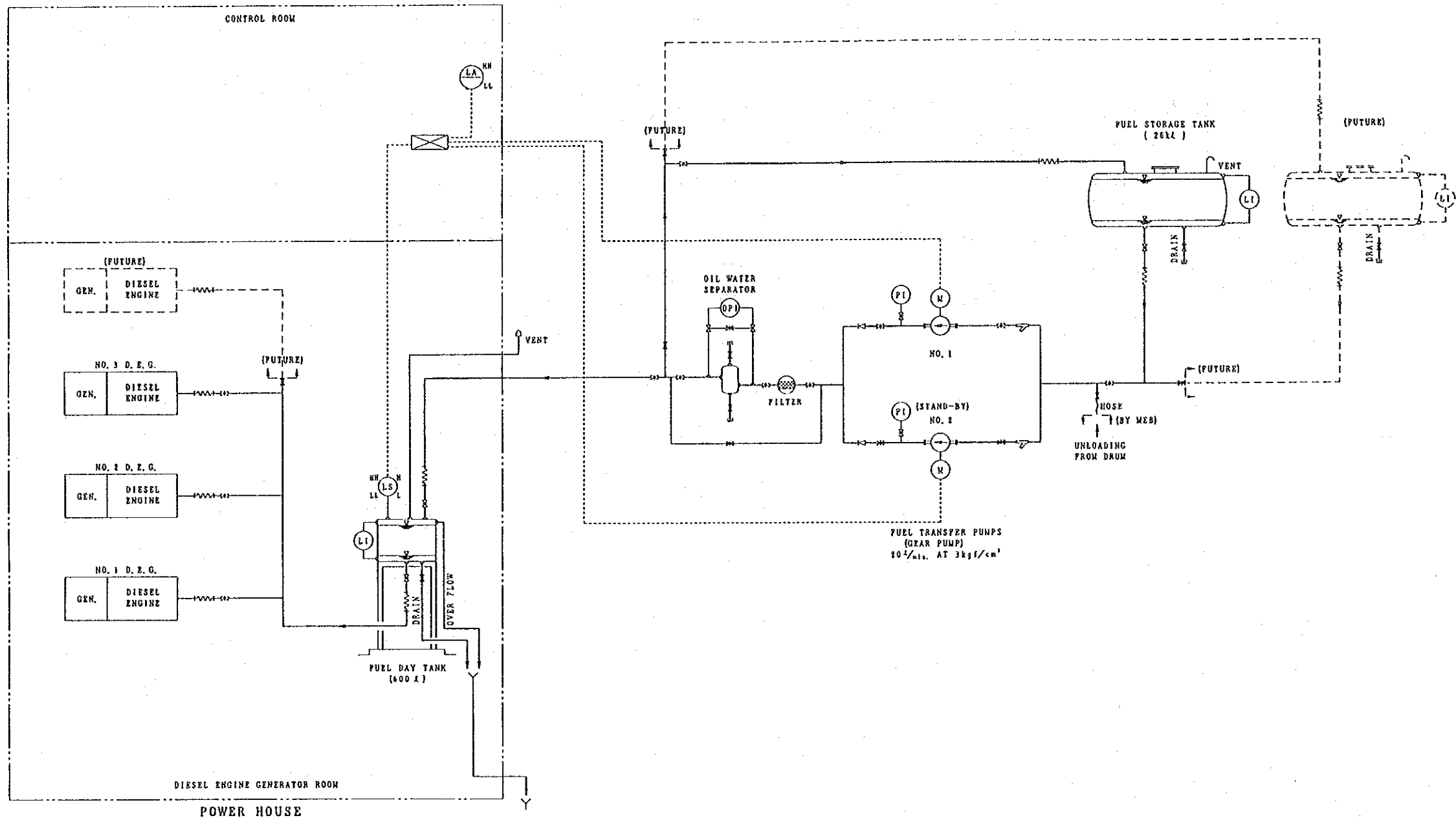


- SYMBOLS**
- MCB : MOLD CASE CIRCUIT BREAKER
 - ELB : EARTH LEAKAGE BREAKER
 - CT : CURRENT TRANSFORMER
 - ZCT : ZERO-PHASE CURRENT TRANSFORMER
 - PT : POTENTIAL TRANSFORMER
 - FUSE
 - SWITCH
 - CONTACTOR
 - THERMAL RELAY
 - GROUNDING
 - BATTERY
 - BATTERY CHARGER
 - THYRISTOR
 - CABLE TERMINATION
 - AMMETER
 - VOLTMETER
 - AMMETER SWITCH
 - VOLTMETER SWITCH
 - SYNCHRO METER
 - FREQUENCY METER
 - WATT METER
 - WATTHOUR METER
 - VAR METER
 - EARTH FAULT RELAY
 - UNDER VOLTAGE RELAY

- NOTES**
- POWER DISTRIBUTION CABLE SHALL BE SUPPLIED BY JAPANESE SIDE AND SHALL BE INSTALLED BY MALDIVES SIDE.
 - LOCAL D/B, WH METER PANELS, SHALL BE SUPPLIED BY JAPANESE SIDE AND SHALL BE INSTALLED BY MALDIVES SIDE.
 - STREET LIGHTING FIXTURE SHALL BE SUPPLIED BY JAPANESE SIDE AND SHALL BE INSTALLED BY MALDIVES SIDE.



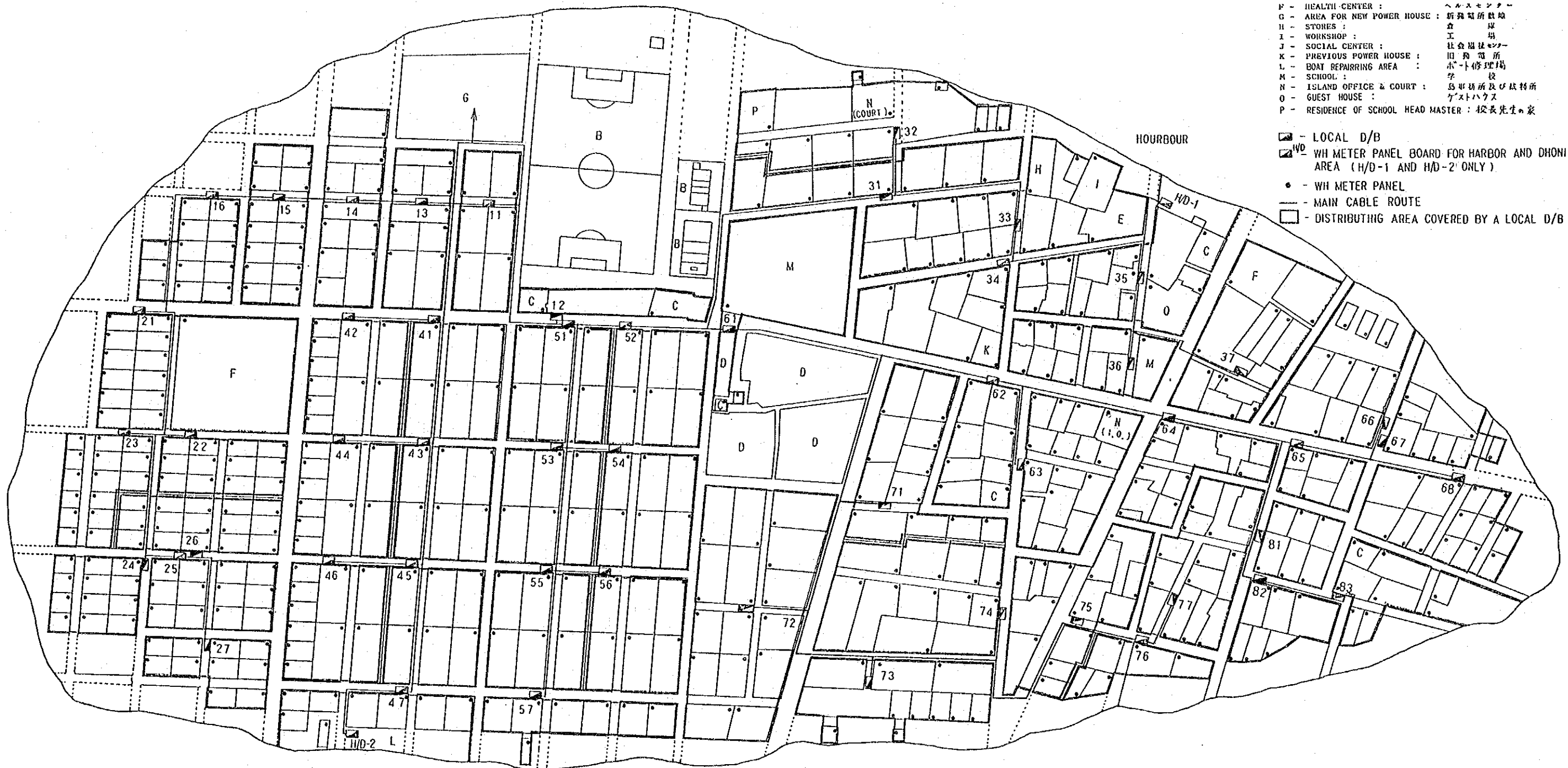
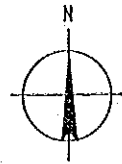
BASIC DESIGN STUDY ON ATOLL ISLAND ELECTRIFICATION PROJECT IN THE REPUBLIC OF MALDIVES					STANDARD JIS
SINGLE LINE DIAGRAM OF EYDAFUSHI POWER STATION					OWG. NO. MME-Q102
DATE	DESIGNED	CHECKED	APPROVED	REVISION	
7 Jan. '94	K. Nimmat	M. Suman	A. S. S.		
JAPAN INTERNATIONAL COOPERATION AGENCY					



LEGEND

LINE	
—	PIPING
---	FUTURE
---	SIGNAL
VALVE	
⊞	GATE
⊞	CHECK
⊞	NORMAL CLOSE
⊞	NORMAL OPEN
ACCESSORY	
D	REDUCER
⊞	PUMP
⊞	Y-TYPE STRAINER
⊞	FLEXIBLE HOSE
Y	PIT
⊞	CONTROL PANEL
INSTRUMENT SYMBOL	
P	PRESSURE
L	LEVEL
D	DIFFERENTIAL
I	INDICATOR
S	SWITCH
L	LEVEL
A	ALARM
SUFFIX	
⊞	LOCAL MOUNTED
⊞	BOARD MOUNTED

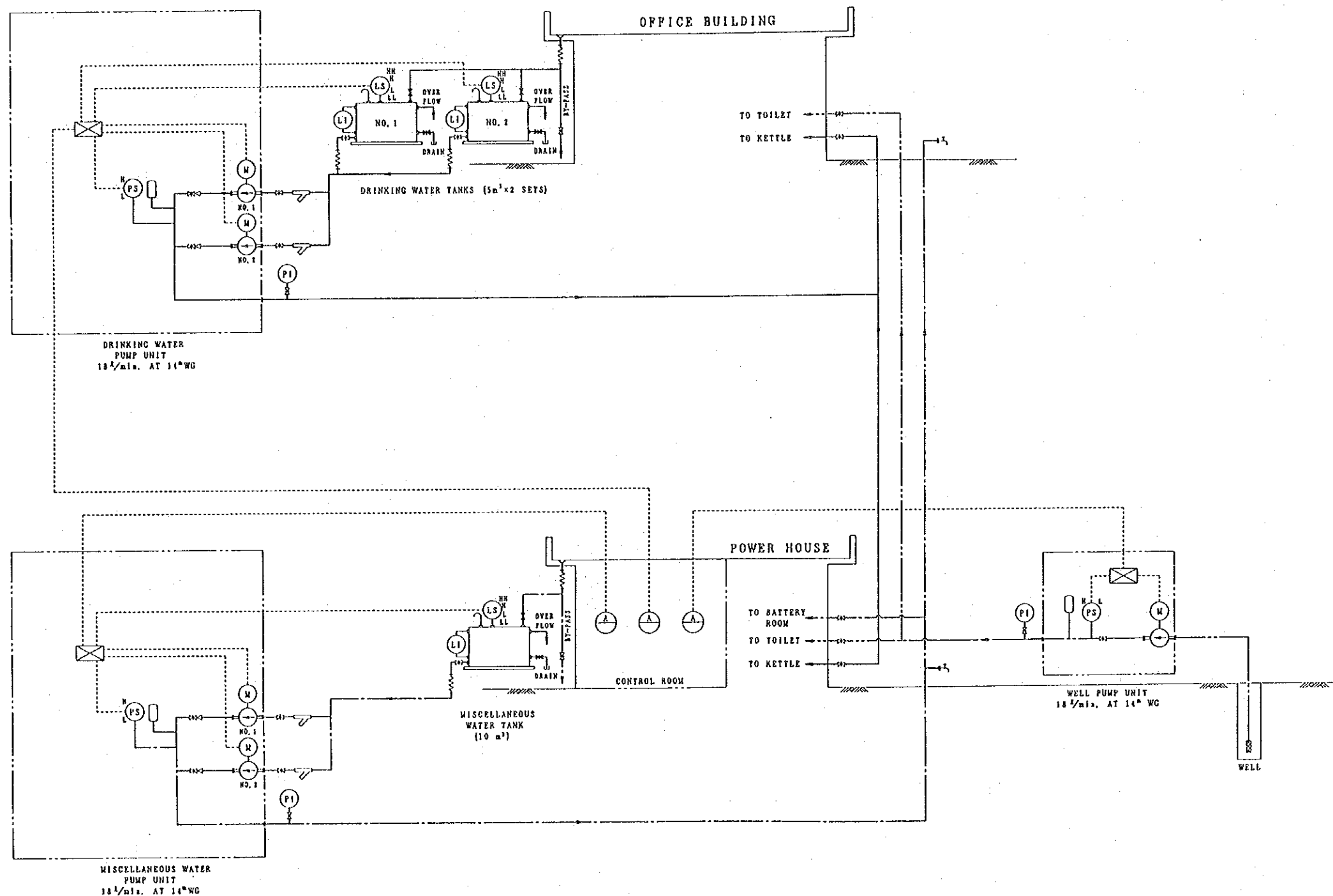
BASIC DESIGN STUDY ON ATOLL ISLAND ELECTRIFICATION PROJECT IN THE REPUBLIC OF MALDIVES				SCALE NONE
FUEL OIL SYSTEM OF EYDAPUSHI POWER STATION				DWG. NO. MME-G103
DATE	DESIGNED	CHECKED	APPROVED	REVISION
7 Jan '94	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>	
JAPAN INTERNATIONAL COOPERATION AGENCY				



- LEGEND**
- | | |
|---------------------------------------|-------------------|
| A - NOT USED : | 未 使 用 地 |
| B - PLAYING GROUNDS : | 遊 動 場 |
| C - MOSQUE : | イ ス ラ ム 教 堂 |
| D - CEMETERY : | 墓 場 |
| E - ATOLL OFFICE : | 環 礁 事 務 所 |
| F - HEALTH CENTER : | ヘル ス セ ン タ ー |
| G - AREA FOR NEW POWER HOUSE : | 新 機 関 所 敷 地 |
| H - STORES : | 倉 庫 |
| I - WORKSHOP : | 工 場 |
| J - SOCIAL CENTER : | 社 会 協 会 セ ン タ ー |
| K - PREVIOUS POWER HOUSE : | 旧 機 関 所 |
| L - BOAT REPAIRING AREA : | ボ ー ト 修 理 場 |
| M - SCHOOL : | 学 校 |
| N - ISLAND OFFICE & COURT : | 島 事 務 所 及 び 法 務 所 |
| O - GUEST HOUSE : | グ エ ス ト ハ ウ ス |
| P - RESIDENCE OF SCHOOL HEAD MASTER : | 校 長 先 生 の 家 |
-
- | | |
|--|---|
| | - LOCAL D/B |
| | - WH METER PANEL BOARD FOR HARBOR AND DHONI AREA (H/D-1 AND H/D-2 ONLY) |
| | - WH METER PANEL |
| | - MAIN CABLE ROUTE |
| | - DISTRIBUTING AREA COVERED BY A LOCAL D/B |

SCALE (METERS) 0 10 20 30 40 50 100
 縮 尺 (1 : 100)

BASIC DESIGN STUDY ON ATOLL ISLAND ELECTRIFICATION PROJECT IN THE REPUBLIC OF MALDIVES					SCALE AS SHOWN
CABLE ROUTE & LOCATION OF LOCAL D/B IN EYDAFUSHI ISLAND					DWG. NO. NME-G104
DATE	DESIGNED	CHECKED	APPROVED	REVISION	
7 Jan '89	K. Nishimura	M. Sawai	A. Sato		
JAPAN INTERNATIONAL COOPERATION AGENCY					



LEGEND

LINE	
—	DRINKING WATER PIPING
- - -	MISCELLANEOUS WATER PIPING
· · · · ·	WELL WATER PIPING
· · · · ·	SIGNAL
VALVE	
⊗	GATE
⊕	CHECK
⊗	NORMAL CLOSE
⊕	NORMAL OPEN
ACCESSORY	
D	REDUCER
⊖	PUMP
∇	Y-TYPE STRAINER
⊘	FLEXIBLE HOSE
Y	PIT
FS	FLOW SWITCH
⊖	PRESSURE TANK
⊗	CONTROL PANEL
INSTRUMENT SYMBOL	
P	PRESSURE
L	LEVEL
I	INDICATOR
S	SWITCH
L	LEVEL
A	ALARM
SUFFIX	
○	LOCAL MOUNTED
⊖	BOARD MOUNTED

BASIC DESIGN STUDY ON ATOLL ISLAND ELECTRIFICATION PROJECT IN THE REPUBLIC OF MALDIVES					SCALE NONE
WATER SYSTEM OF EYDAFUSHI POWER STATION					DWG. NO. MME-G105
DATE	DESIGNED	CHECKED	APPROVED	REVISION	
7 Jan. '94	<i>[Signature]</i>	<i>[Signature]</i>	<i>[Signature]</i>		
JAPAN INTERNATIONAL COOPERATION AGENCY					

5.3.4 Auxiliary Equipment Procurement Plan

(1) Plan Contents

The procurement of the following auxiliary equipment and tools is planned in accordance with the proposal made in 4.3.4.

- 1) Approx. 2 years supply of spare parts
- 2) Outdoor lighting equipment
- 3) Repair tools
- 4) VHF radio station
- 5) Maintenance tools
- 6) OJT-related materials

(2) Main Procurement Items

1) Spare Parts

- ① Diesel engine parts
- ② Auxiliary equipment for diesel engine and their parts
- ③ Generator parts
- ④ Electrical parts

2) Maintenance Tools

The tools to be procured will be those required for regular inspection, overhaul and replacement of spare parts for the generating and distribution facilities.

3) OJT-Related Materials

- ① Textbooks (in English): 20 copies
- ② Operation and maintenance manuals for generating facilities (in English): 20 copies

5.3.5 OJT Programme

(1) Programme Contents

The following OJT will be conducted in accordance with the proposal made in 4.3.4.

1) Period and Location

OJT on the operation and maintenance of the generating facilities will be conducted on-site during the construction period (approximately 3 months).

2) Trainees

The Maldivian engineers to undergo OJT will be those directly responsible for the maintenance of the generating facilities following the completion of the Project. The Government of the Maldives is expected to nominate the following engineers for OJT.

Senior Engineer : 1

Maintenance Engineers

- Mechanical Engineer : 1

- Electrical Engineer : 1

Maintenance Technicians

- Mechanical Technicians : 3

- Electrical Technician : 1

3) Training Contents

The following education and training will be conducted during the OJT period.

① Education on Basic Operation and Maintenance Techniques

- a) O & M schedule control (concept of preventive maintenance, analysis of various functions and preparation of an improvement plan for such functions, etc.)
- b) Control of spare parts and tools
- c) Control of O & M-related documents

- ② Practical Training on Operation and Maintenance of Generating Facilities
 - a) Cylinder head overhaul
 - b) Fuel valve overhaul
 - c) Grinding of air inlet and outlet valves
 - d) Piston overhaul
 - e) Crank pin inspection
 - f) Motor pump
 - g) Cleaning of air inlet filter and radiator, etc.
 - h) Start-up and stop method
 - i) Emergency stop method
 - j) Monitoring method

4) Teaching Materials

- ① The textbooks used for OJT should be capable of assisting actual operation and maintenance activities following the completion of OJT.
- ② Operation and maintenance manuals for the generating facilities concerned will be provided to assist OJT on maintenance and inspection work.

5.4 Construction Plan

5.4.1 Conditions of Local Construction Industry and Points to Note for Construction Work

(1) Local Construction Industry

- 1) Engineers and workers capable of conducting the building and foundation work, etc., are available. However, because of the small number of these engineers and workers, the appointment of a construction company from a third country may be necessary to ensure technical control and schedule control suitable for a project to be implemented under the Japanese grant aid system.
- 2) While some Maldivian engineers are capable of installing and adjusting the small generators to be procured under the Project, the dispatch of Japanese

engineers is planned to ensure proper schedule control, as in the case of the building and formulation work.

- 3) Apart from special machinery, such as certain types of cranes, trucks and welding machines, all types of construction machinery are available locally. Nevertheless, in view of the small number of construction machines as in the case of engineers, the import of construction machinery from a third country is planned.
- 4) As it will be difficult to secure the water and electricity required for the construction work, simple desalination devices and small generators will be provided at the construction sites.

(2) Points to Note

- 1) All imported equipment and materials must be unloaded at Port Male for customs clearance. Because of the absence of a deep berth at Port Male, vessels must anchor outside the reef for transportation of the cargo by tug boat. Consequently, an off-shore waiting period (approximately two weeks) must be included in the project schedule.
- 2) The marine transportation of the equipment and materials from Port Male to the project sites of some 150 km will be made by a 3 ton class barge which will land directly on the sandy beaches of the subject islands for unloading.
- 3) As difficulties in maritime transportation are experienced in the rainy season from May to October, particularly from May to July when the prevailing strong southwest wind causes rough seas, the project schedule should avoid the planning of maritime transportation during this period.
- 4) Installation of the generators and auxiliary equipment should commence immediately after the completion of the foundations. Mechanical and electrical installation work should also be concurrently conducted to shorten the project period as much as possible.

5.4.2 Construction Principles

The Project will be implemented within the framework of the grant aid cooperation system of the Government of Japan and will formally commence with the signing of

the E/N upon approval of the Project by the Governments of the Maldives and Japan. The Government of the Maldives will then select the Consultant (Japanese company) to conduct the detailed design work for the facilities and equipment. With the completion of the detailed design documents, the Contractor (Japanese company responsible for building construction and equipment supply) which is the successful bidder will conduct the assigned work. The basic principles and points to note in relation to the implementation of the Project are described below.

(1) Project Implementation Body

The body responsible for the implementation of the Project on the Maldivian side will be the MEB which is responsible for the management and operation of the electricity service in the Maldives (see 2.2.1). The Project will actually be controlled by the Outer Male Electricity Generation and Management Bureau of the MEB. It will be necessary for the Government of the Maldives to maintain close communication links with the Japanese Consultant and Contractor and to appoint a key person responsible for the implementation of the Project to ensure the Project's smooth progress. This responsible person must ensure that all staff members of the new power stations fully understand the contents of the Project, pay extra care to safety during the construction period, and provide all possible assistance for the smooth progress of the Project.

(2) Consultant

The Consultant, i.e., a Japanese company selected by the Government of the Maldives, will enter into a design and work supervision agreement with the Government of the Maldives to proceed to the building construction and equipment procurement stage of the Project. The Consultant will prepare the detailed design for the buildings and equipment to be constructed or procured with Japanese grant aid and will then supervise the actual on-site work. The Consultant will also prepare the tender documents and will conduct the tender process on behalf of the Government of the Maldives.

(3) Contractor

The Contractor, i.e. a Japanese company selected by open tender in accordance with the set procedure of Japan's grant aid system, will construct the buildings and procure and supply the equipment and other items. As the generating facilities will require the supply of spare parts and the provision of after-service in the case of breakdown following the completion of the Project, the Contractor should pay

close attention to the need to establish communication links between the power stations and the Contractor after the delivery of the facilities and equipment.

(4) Necessity to Dispatch Engineers

The successful construction of the planned generating facilities will require the presence of skilled engineers who are conversant with the configuration and functions of these facilities. While the recruitment of such engineers in the Maldives appears possible, it is more desirable for the manufacturers of these facilities to dispatch skilled engineers to the Maldives with a view to their supervising the installation work and conducting schedule control.

(5) Points to Note

Special attention should be paid to the following points as the construction work under the Project will be subject to many constraints associated with remote islands. The construction work must also meet various requirements of Japan's grant aid system.

- 1) The prospective restricted use of heavy machinery will make selection of the appropriate construction method and machinery important.
- 2) When work is being performed, care will be taken to preserve the environment of the surrounding residents with respect to noise, vibration, and water quality, and environmental protection measures will be taken, as required.
- 3) The timing and duration of the construction work, which will require removal of the existing facilities prior to its commencement, must be agreed upon with the MEB, and must be strictly observed.
- 4) Given the short installation period, it will be necessary to simultaneously conduct all installation work to meet the Project's deadline.

5.4.3 Work Supervision Plan

In accordance with Japan's grant aid system, the Consultant will organise a project team to conduct the detailed design and work supervision, taking all the basic design principles into consideration. At the work supervision stage, the Consultant will dispatch engineers to the Maldives for a short period of time when such dispatch is

deemed necessary in light of the Project's progress to supervise the work and to witness the inspection of the completed facilities. The Consultant will also dispatch an electrical engineer to the Maldives for a period of approximately two months prior to the completion of the Project to supervise the equipment installation work and to witness the inspection of the completed installations.

(1) Basic Principles for Work Supervision

The Consultant will conduct the work supervision based on the following principles to ensure work safety and the punctual completion of all the work involved in the Project.

1) Schedule Control

- ① The progress of equipment manufacture and delivery will be checked against the schedule to ensure the punctual implementation of the Project.
- ② The schedule for each type of work will be controlled on a daily, weekly and monthly basis to enable the Contractor to honour the agreed schedule.

2) Quality Control

- ① All equipment and materials will be checked against the relevant detailed design drawings and controlled accordingly.
- ② The Consultant will witness the inspections of work accuracy, methods and various performance tests in relation to on-site installation, plumbing, wiring and connection work.

3) Safety Control

- ① All workers involved in the Project will be made aware of the importance of accident prevention measures and the Contractor will be instructed to train local supervisors to foresee safety hazards.
- ② Constant inspection of the construction machinery will be emphasised to prevent accidents.
- ③ The drivers of vehicles and construction machinery will be constantly reminded to drive slowly on the site to avoid accidents to people and damage to the existing or new buildings and facilities.

(2) Relationships Between All Related Organizations at Work Supervision Stage

The relationships between all Project-related organizations at the work supervision stage are illustrated in Fig. 5-1.

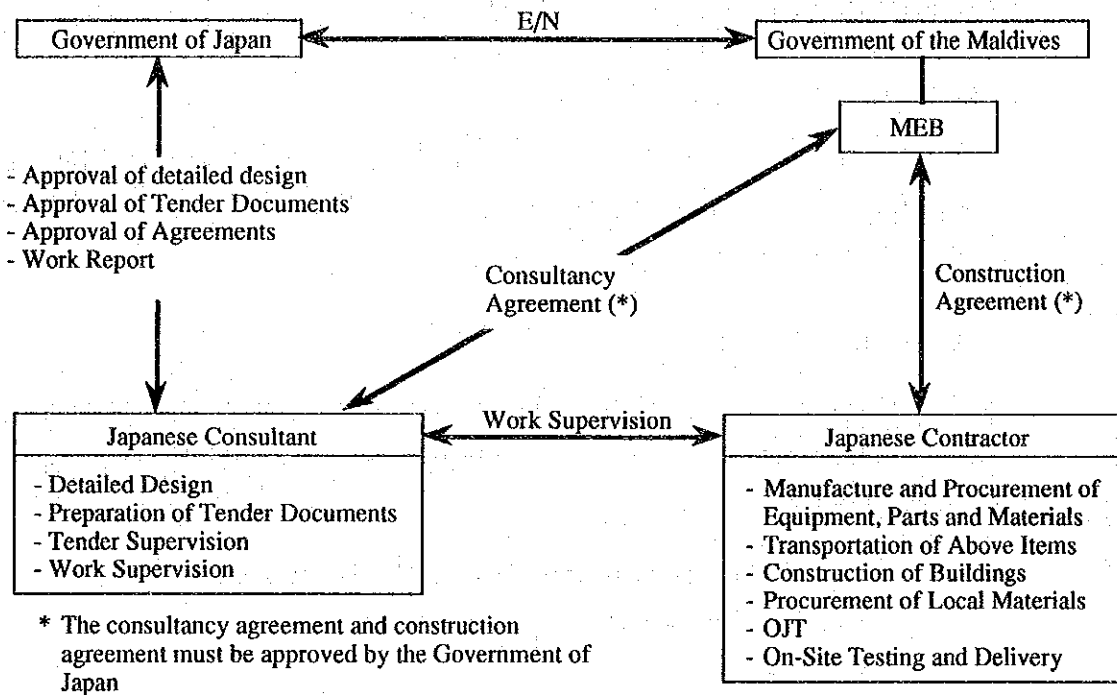


Fig. 5-1 Project Implementation System

(3) Work Supervisor

The Contractor must be capable of smoothly conducting the joint work with a sub-contracted construction company in the Maldives or a third country and of providing appropriate technical guidance for the sub-contractor in view of the construction, procurement and installation of the buildings and equipment specified in the detailed design documents on time. It will, therefore, be essential for the Contractor to appoint site supervisors with previous experience of similar projects to ensure quality work.

Given the scope and contents of the Project, the Contractor will be required to appoint the following full-time site supervisors.

- Site Manager (1) : general work supervision and OJT training
- Mechanical Site Engineer (1) : supervision of mechanical installation work and schedule control

In addition to the above full-time supervisors, testing and adjustment engineers, building and civil engineers, equipment installation supervisors, plumbing and welding technicians and cable laying technicians, etc., must be dispatched on a short-term basis in accordance with the progress of the work.

5.4.4 Equipment and Materials Procurement Plan

(1) Supply Sources

The construction equipment and materials to be used for the Project are not manufactured or produced in the Maldives. While some imported items are available, it will be difficult to ensure punctual supply or quality. Consequently, all equipment and materials, excepting coral blocks and diesel oil, will be imported from Japan or third countries. The supply sources shown in Table 5-5 have been decided, taking into consideration the required standards, specifications, quality, production volume, stable supply prospect, delivery time and prices.

Table 5-5 Supply Sources of Equipment and Materials

Source	Equipment/Materials	Remarks
Maldives	- Coral Blocks - Diesel Oil	
Third Country	Cement, Sand, Gravel, Structural Steel, Distribution Cables, Local Distribution Panels, Household Panel boards, Street Lamps	
Japan or Third Country	- Diesel Engine - Generator - 400V Main Distribution Panel Board - Auxiliary Equipment (Mechanical) - Auxiliary Equipment (Electrical) - Pipes and Valves - Electric Conduits and Cables - Paint - Special Maintenance Tools - Spare Parts	

(2) Transportation

As already described in 5.4.1, the use of a 3 ton class barge is necessary for the maritime transportation of equipment and materials over the some 150 km from Male Island to the project sites.

5.4.5 Implementation Schedule

In the case of the Project's implementation with grant aid provided by the Government of Japan, the actual construction and equipment installation will be conducted in three stages following the signing of the E/N, i.e., (1) preparation of detailed design documents, (2) tender process and signing of construction agreement, and (3) actual construction and installation.

(1) Basic Design

As soon as the E/N has been signed, the Japanese Consultant will conclude a consultancy agreement with the Maldives side and will commence the detailed design work. Based on the Basic Design Study findings and the Detailed Design Study findings, the tender documents (specifications and detailed design drawings) will be prepared. At the beginning and end of the detailed design stage, the Consultant will have thorough discussions with the Maldives side and will then proceed to the tender process upon approval of the documents by both governments. The detailed design work is expected to take three months.

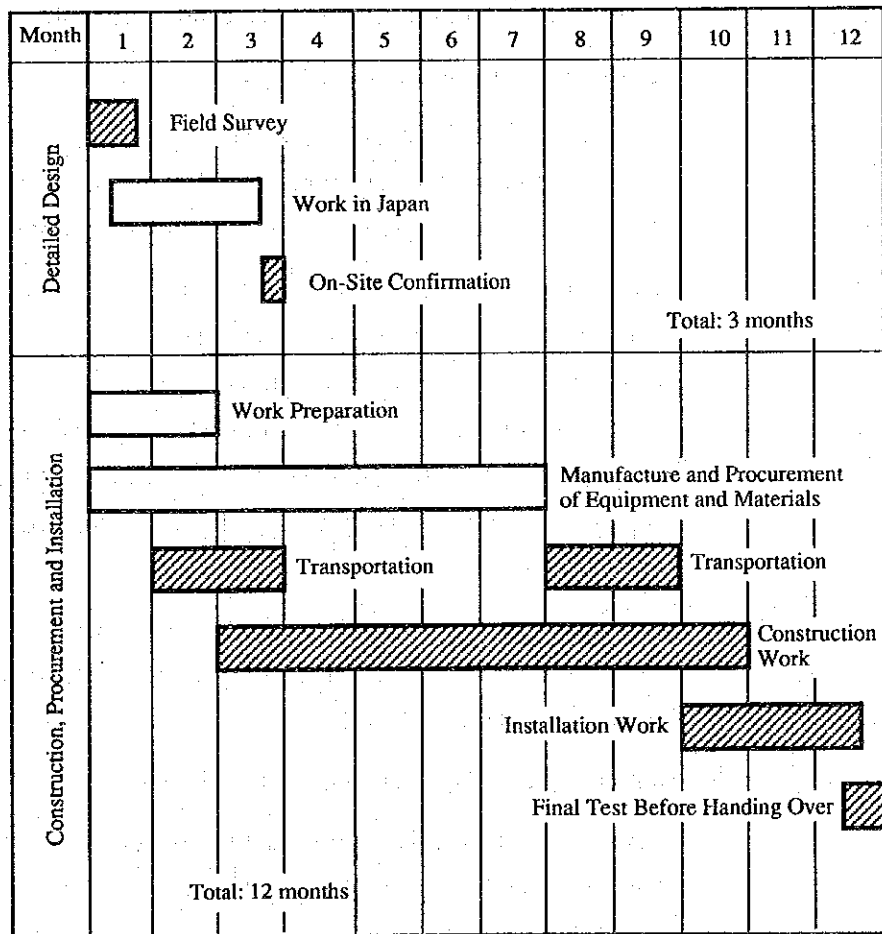
(2) Tender and Construction Agreement

The Consultant will announce the tender, accept preliminary tender applications, examine the applicant qualifications, hold a tender briefing and distribute the tender documents to the prospective bidders on behalf of the Government of the Maldives. Upon receipt of the bid prices and application documents, the Consultant will promptly examine them to facilitate a construction agreement between the Government of the Maldives and a Japanese contractor. The tender will be witnessed by all applicants and representatives of related organizations. If the contents of the bid with the lowest price are assessed as being appropriate, the bid will be accepted and the bidder will conclude a construction agreement with the Government of the Maldives. The process from the tender announcement to the signing of the construction agreement is expected to take two months.

(3) Building Work and Equipment Installation

Following the signing of the construction agreement, the Contractor will commence the equipment procurement and construction work on receipt of approval from the Government of Japan. In view of the scope and contents of the Project, the time required to complete the Project will be three months for the detailed design, seven months for equipment manufacture and 10 months for on-site construction provided that the procurement of construction materials and the work to be undertaken by the Maldivian side are smoothly conducted.

The Consultant will conduct the detailed arrangements prior to the commencement of construction work and supervise the Contractor in regard to the transportation of equipment and materials, construction methods and work schedule, etc., and will enforce schedule control and quality control to complete the entire work before the deadline stipulated in the E/N.



Notes Work in Japan Work in the Maldives

Fig. 5-2 Project Implementation Schedule

5.4.6 Scope of work

(1) Division of Work Responsibility

1) Scope of Work to be Undertaken by Government of Japan

- ① Construction of power stations with diesel generators
- ② Procurement and supply of distribution equipment and materials
- ③ Procurement and supply of auxiliary equipment and materials, including spare parts
- ④ Provision of OJT

2) Scope of Work to be Undertaken by Government of the Maldives

- ① Removal of all existing facilities on the project sites and subsequent land preparation
- ② Erection of fencing using coral blocks along site boundaries
- ③ Construction of distribution networks
- ④ Payment of cost of opening a project account at a Japanese government-approved foreign exchange bank and all costs which are essential but not included in the Japanese grant aid, including bank commissions.
- ⑤ Swift unloading and customs clearance of equipment and materials required for the Project, exemption of such equipment from import or re-export duties, exemption of registered Japanese companies and Japanese nationals from enterprise tax, customs clearance fees and other taxes and provision of all conveniences for, Sri Lankan, Japanese and other foreign nationals dispatched to the Maldives for Project-related purposes.
- ⑥ Smooth processing of any internal approval or certification requirements by the Government of the Maldives in connection with the implementation of the Project.
- ⑦ Appointment of engineers/technicians to undergo OJT.
- ⑧ Provision of sites to accommodate temporary offices, warehouses and material yards for the implementation of the Project and also disposal sites for waste oil and waste water produced during construction work.
- ⑨ Witnessing of construction work and confirmation of work completion.

- ⑩ Provision of appropriate maintenance system and relevant budget for the new power stations following completion of the Project.

(2) Cost to be Borne by Government of the Maldives

The Government of the Maldives is expected to bear the following construction cost.

- Removal of existing facilities on the project sites	:	US\$76,634
- Construction of distribution networks	:	US\$56,983
- Removable of generators at Eydnafushi	:	US\$300
		<hr/>
Total	:	US\$133,917

In addition, the following expenses must be paid by the Government of the Maldives.

- Bank commission (account arrangement)
- Issue fee of A/P

CHAPTER 6 PROJECT EFFECTS AND RECOMMENDATIONS

CHAPTER 6 PROJECT EFFECTS AND RECOMMENDATIONS

6.1 Effects

The direct effect of project implementation is a stable supply of electricity on Naifaru Island and Eydhafushi Island, both of which are the administrative seats of respective atolls. Indirect effects include an improved standard of living, better services by public welfare facilities and the reliable operation of such public facilities as the atoll administrative offices and fishing boat workshops, etc., all of which are essential for the life of the inhabitants of these atolls. Also, a stable supply of electricity will contribute to reducing the living standard gap between Male, the capital, and outlying atoll islands. Table 6-1 lists the expected benefits following the implementation of the Project.

Table 6-1 Present Situation of Electrification of Subject Islands and Expected Benefits of the Project

Island	Present Situation and Problems	Improvement Measures Under the Project	Degree of Improvement or Project Effects
Naifaru	<ol style="list-style-type: none"> 1. Electrification rate: 53% 2. Supply hours: 18:00-23:00 (5 hours/day) 3. Existing generators: 6 although old and unable to ensure a stable supply (2, 3, 7, 10, 12.5 and 40 kVA, totaling 74.5 kVA) 4. Generating capacity: some 50% of potential demand 5. Distribution network: totally confused due to unsynchronous operation; linkage between different networks is impossible 6. Rate: 3 Rf/kWH which is double MEB rate 7. Inefficient supply to not only domestic users but also to public welfare facilities, government offices and factories, etc. 8. 25 personally owned generators do not supply electricity for others (many are out of order) 	<ol style="list-style-type: none"> 1. Construction of power station capable of meeting estimated demand in 5 years time (three 100 kW generators, including one reserve); installation space for extra generator 2. Generators: capable of operating 24 hours/day 3. Construction of new distribution network 4. Provision of spare parts and other necessary items 	<ol style="list-style-type: none"> 1. Electricity demand in 5-8 years time will be met (electrification rate: 100%) 2. Extra generator to be installed by MEB will meet demand in 10 years time 3. 24 hour supply of electricity 4. Lower financial burden on islanders because the use of public electricity supply will save on the cost of kerosene for lighting 5. Improved standard of living and reliable operation of public welfare facilities and government offices, etc. due to stable supply of electricity 6. Reduction of living standard gap between Male and local atoll islands
Eydhafushi	<ol style="list-style-type: none"> 1. Electrification rate: 0% 2. Communal electrification planned but no fixed schedule 3. 33 personally owned generators unable to supply electricity for others (many are out of order) 4. Both atoll office and health center have their own generator 	<ol style="list-style-type: none"> 1. Construction of power station capable of meeting estimated demand in 5 years time (three 75 kW generators, including one reserve); installation space for extra generator 2. Generators: capable of operating 24 hours/day 3. Construction of new distribution network 4. Provision of spare parts and other necessary items 	Same as above

6.2 Conclusions

The public supply of electricity in the Maldives is currently limited to Male Island and nine outlying atoll islands of the 266 inhabited islands as explained in Chapter 3, prompting the unipolarisation of socioeconomic activities and population in Male, the capital. This unipolarisation has created a large gap in the standard of living between the people living on Male Island and those living on other atoll islands, and has also led to an undesirable situation in terms of civil life and industrial activities.

The Government of the Maldives and the MEB have promoted the Atoll Island Electrification Project through a series of national development plans since 1985, of which the Third Plan is currently in progress. However, the actual implementation of the Project has been delayed, even for those islands which are the administrative seats of respective atolls because of the financial situation of the Government of the Maldives.

The present Project intends the electrification of Naifaru Island and Eydhafushi Island which are the administrative seats of Lhaviyani Atoll and Baa Atoll respectively. The stable supply of electricity upon completion of the Project should improve the standard of living and vitalise social and economic activities on these islands, contributing to reducing the gap in the living standard between people living in Male and local islanders. The benefits of the Project will not be confined to the islands electrified, but will extend to all atolls where islands are located in terms of the vitalization of social and economic activities and improvement of the local standard of living. In short, some 17,400 islanders are expected to directly benefit from the Project.

The Project will also act as a model project for the Atoll Island Electrification Project promoted by the MEB. The technical training, transfer of technology, to MEB engineers by Japanese engineers who will be dispatched to the Maldives by the Japanese contractor during the construction period, will ensure that Maldives' engineers play a vital role in the further promotion of the electrification of other atoll islands.

Given these benefits, the Project's implementation as a grant aid project of the Government of Japan is deemed both highly significant and appropriate.

6.3 Recommendations

As the Project is part of the Atoll Island Electrification Project promoted by the Government of the Maldives and the MEB, the following requirements must be met by the Maldivian side to ensure the long-term proper functioning of the facilities and equipment to be provided under the Project.

- (1) Engineers in the Maldives need to acquire a proper understanding of the general functioning of the facilities and equipment to be provided under the Project, and must also prepare a sound operation and maintenance plan to ensure a constant, reliable supply of electricity.
- (2) The Maldivian side should appoint operation and maintenance engineers and have these engineers participate in on-the-job training (OJT) provided as part of the Project for the efficient and effective operation of the facilities and equipment to be provided under the Project to achieve the Project's objectives.
- (3) The Maldivian engineers undergoing said OJT will learn appropriate operation and maintenance technologies/techniques from the Japanese engineers, devote themselves to improving their technical expertise following completion of the Project, and consciously try to transfer such expertise to other engineers in order to assist the electrification of the remaining local atoll islands.
- (4) In the case of Maldivian engineers undergoing technical training in Japan to learn operation and maintenance technologies/techniques in relation to the equipment to be provided under the Project by the Government of Japan, these engineers must earnestly try to master such technologies/techniques and then try to educate and train other engineers in the Maldives following the commencement of operation of the new generating facilities.
- (5) The electricity rate to be introduced for the islands should be sufficient to recover operation, maintenance, and depreciation costs to maintain the self-reliant development prospect of the electricity service.
- (6) Work teams should be organized to install the distribution cable without any delay in accordance with the distribution network construction plan, the completion of which is timed to the completion of the Project.

- (7) The provision of a subsidy to cover part of the connection cost for each household must be considered to facilitate distribution to all households.
- (8) The introduction of a progressive rate system, whereby a higher unit rate is imposed for larger consumption, should be considered to provide low cost electricity for the poor and an energy-saving incentive for large users.

APPENDIX

- 1. List of Study Team Members**
- 2. Field Survey Schedule**
- 3. List of Counterparts and Related Persons in the Republic of the Maldives**
- 4. Minutes of Discussions**
- 5. Field Report**
- 6. Country Data**
- 7. Construction Cost to be Borne by Government of the Maldives**
- 8. Estimated Balance of Payments for Planned Generating Facilities**

APPENDIX 1

LIST OF STUDY TEAM MEMBERS

Members of Basic Design Study Team

Name	Assignment	Current Position/Company
Yuji Ogura	Team Leader	Grant Aid Division, Economic Cooperation Bureau, Ministry of Foreign Affairs
Mitsuhisa Nishikawa	Chief Supervisor (Generation Facilities)	Yachiyo Engineering
Hirohito Seto	Planning of Generator Facility	Yachiyo Engineering
Masayuki Tamai	Planning of Distribution Networks	Yachiyo Engineering

Members of Draft Final Report Explanatory Mission

Name	Assignment	Current Position/Company
Shinya Suzuki	Team Leader	Grant Aid Division, Economic Cooperation Bureau, Ministry of Foreign Affairs
Mitsuhisa Nishikawa	Chief Supervisor (Generation Facilities)	Yachiyo Engineering
Masayuki Tamai	Planning of Distribution Networks	Yachiyo Engineering

APPENDIX 2

FIELD SURVEY SCHEDULE

Basic Design Field Survey Schedule

Day	Date	Day of Week	Weather	Overnight	Movement	Activities
1	Aug. 19	Thurs.	cloudy	Colombo	Dep. Narita 12:00 (UL-457) Arrive Colombo 19:15	Departure from Tokyo
2	Aug. 20	Fri.	fair	Male	Dep. Colombo 20:05 (UL-101) Arrive Male 20:55	Visit to and meeting at JICA Office and Japanese Embassy in Sri Lanka
3	Aug. 21	Sat.	fair	Male		- Team meeting - Market survey on Male Island
4	Aug. 22	Sun	fair	Male		- Visit to and meeting at Ministry of Foreign Affairs (MFA) to explain survey objectives and outline - Visit to and meeting at Maldives Electricity Board (MEB) to explain Inception Report, Japan's grant aid program and questionnaire
5	Aug. 23	Mon.	fair	Male		- Visit to MEB for data collection - Visit to MFA to discuss priority issues
6	Aug. 24	Tues.	fair	Male		as above
7	Aug. 25	Wed.	fair	Male		- Visit to MEB for data collection - Visit to Ministry of Atoll Administration (MAA) to discuss priority issues
8	Aug. 26	Thurs.	fair	Male		- Visit to MEB for data collection - Visit to MFA to discuss priority issues
9	Aug. 27	Fri.	cloudy fair occasional rain	Felivaru	Dep. Male 08:00 (speedboat) Arrive Felivaru 18:30	Survey and data collection at Naifaru and Hinnavaru
10	Aug. 28	Sat.	cloudy	Male	Dep. Felivaru 07:00 (speedboat) Arrive Male 17:20	Survey and data collection at Kan'dholuhudoo and Eydhafushi
11	Aug. 29	Sun.	cloudy occasional rain	Male		Visit to MFA to report field survey findings and to discuss M/D
12	Aug. 30	Mon.	fair occasional rain	Male		Visit to MFA to sign M/D
13	Aug. 31	Tues.	fair	Male		- Visit to MEB to prepare field survey report - Mr. Ogura (Team Leader) left for Japan
14	Sept. 1	Wed.	cloudy occasional rain	Male		- Visit to MEB - Preparation of field survey report and data collection - Visit to Ministry of Trade and Industry for data collection (FPI and FISB)

15	Sept. 2	Thurs.	fair	Male		<ul style="list-style-type: none"> - Visit to MEB - Preparation of field survey report and data collection - Visit to JOCV for data collection on Kelaa Island agricultural development project
16	Sept. 3	Fri.	fair	Male		<ul style="list-style-type: none"> - Preparation of field survey report - Sorting and analysis of collected data
17	Sept. 4	Sat.	fair	Male		<ul style="list-style-type: none"> - Visit to MEB - Preparation of field survey report - Sorting and analysis of collected data - Survey on existing power station - Visit to MTCC for data collection on transportation and construction
18	Sept. 5	Sun.	fair	Gan	<p>Dep. Male 15:20 (small aircraft) Arrive Kadhdhoo 16:45 (car) Arrive Gan 17:00</p>	<ul style="list-style-type: none"> - Visit to MEB - Preparation of field survey report - Sorting and analysis of collected data
19	Sept. 6	Mon.	fair	Male	<p>Dep. Kadhdhoo 16:00 (small aircraft) Arrive Male 17:40</p>	<ul style="list-style-type: none"> - Field survey at Gan - Sorting and analysis of collected data
20	Sept. 7	Tues.	fair	Male		<ul style="list-style-type: none"> - Visit to MEB - Preparation of field survey report - Sorting and analysis of collected data - Visit to MFA - Acquisition of Naifaru Island map
21	Sept. 8	Wed.	fair	Male		<ul style="list-style-type: none"> - Visit to MEB - Preparation of field survey report - Sorting and analysis of collected data
22	Sept. 9	Thurs.	fair	Hanimaadhoo	<p>Dep. Male 12:30 (small aircraft) Arrive Hanimadhoo 13:15 (speedboat) Arrive Dhidhdhoo 16:45 Dep. Dhidhdhoo 17:50 (speedboat) Arrive Hanimaadhoo 18:20</p>	<ul style="list-style-type: none"> - Visit to MEB - Preparation of field survey report - Sorting and analysis of collected data - Study of new power station under construction on Dhidhdhoo and data collection
23	Sept. 10	Fri.	fair	Hanimaadhoo	<p>Dep. Hanimaadhoo 08:00 (speedboat) Arrive Kelaa 09:00</p>	<ul style="list-style-type: none"> - Field investigation on Kelaa and data collection - Study of existing power station on Kulhudhuffushi

					Dep. Kelaa 12:35 (speedboat) Arrive Khulhudhuffushi 16:00 Dep. Kulhudhuffushi 18:00 (speedboat) Arrive Hanimaadhoo 19:00	
24	Sept. 11	Sat.	fair	Male	Dep. Hanimaadhoo 14:50 (small aircraft) Arrive Male 16:35	Study on existing power station on Hanimaadhoo and data collection
25	Sept. 12	Sun.	fair	Male		- Visit to MEB - Preparation of field survey report - Sorting and analysis of collected data
26	Sept. 13	Mon.	fair occasional rain	Male		- Visit to MEB to explain field survey report - Sorting and analysis of collected data
27	Sept. 14	Tues.	fair	Male		- Visit to MEB to explain and submit field survey report - Sorting and analysis of collected data - Visit to MTCC for data collection
28	Sept. 15	Wed.	fair	Colombo	Dep. Male 14:20 (UL-102) Arrive Colombo 16:10	
29	Sept. 16	Thurs.	fair	Bangkok	Dep. Colombo 07:35 (UL-422) Arrive Bangkok 12:30	
30	Sept. 17	Fri.	fair	Arrive Narita	Dep. Bangkok 11:00 (TG-640) Arrive Narita 19:00	Arrival at Narita (Consultant)

Field Survey Schedule (Consultation of Draft Final Report)

Day	Date	Day of Week	Weather	Overnight	Movement	Activities
1	Nov. 1	Mon.	fair	Colombo	Dep. Narita 13:00 (UL-455) Arrive Colombo 19:30	Departure from Tokyo
2	Nov. 2	Tues.	cloudy	Male	Dep. Colombo 16:00 (UL-101) Arrive Male 16:55	Visit to and meeting at JICA Sri Lanka Office and Japanese Embassy in Sri Lanka
3	Nov. 3	Wed.	cloudy	Male		Visit to and meeting at Ministry of Foreign Affairs (MFA) to explain survey team schedule, outline of Draft Final Report, Project schedule and others
4	Nov. 4	Thurs.	heavy rain	Male		Visit to and meeting at Maldives Electricity Board (MEB) to explain detail of Draft Final Report and field survey schedule
5	Nov. 5	Fri.	cloudy occasional heavy rain	Male	Dep. Male 08:00 (helicopter) Arrive Naifaru 08:45 Dep. Naifaru 10:00 (helicopter) Arrive Eydhafushi 10:20 Dept. Eydhafushi 11:30 (helicopter) Arrive Male 12:00	- Field inspection of Naifaru - Field inspection of Eydhafushi - Team Meeting
6	Nov. 6	Sat.	heavy rain	Male		Team Meeting (cannot visit to Male because of heavy rain)
7	Nov. 7	Sun.	cloudy occasional rain	Male	Dep. Male 15:30 (Small aircraft) Arrive Kadhdhoo 16:30 Dep. Kadhdhoo 17:30 (Small aircraft) Arrive Male 18.30	- Visit to and meeting at MEB to explain detail of Draft Final Report - Visit to Kadhdhoo
8	Nov. 8	Mon.	cloudy occasional rain	Male		Visit to and meeting at MEB to explain detail of Draft Final Report and reconfirm technical contents
9	Nov. 9	Tues.	fair occasional cloudy	Male		Visit to MFA, Signing of M/D, Confirmation and signing of technical meeting M/D
10	Nov. 10	Wed.	fair occasional cloudy	in airplane	Dep. Male 10:40 (UL-102) Arrive Colombo 12:30	Visit to JICA Sri Lanka Office and Japanese Embassy in Sri Lanka to report field survey findings
					Team Leader Dep. Colombo 23:50 (SQ-123) Consultant Team Dep. Colombo 21:20 (UL-456)	
11	Nov. 11	Thurs.	cloudy occasional rain		Team Leader Arrive Singapore 06:10 Dep. Singapore 08:10 (UA-890) Arrive Narita 15:30 Consultant Team Arrive Narita 10:40 (UL-456)	Arrival at Narita

APPENDIX 3

**LIST OF COUNTERPARTS AND RELATED PERSONS
IN THE REPUBLIC OF THE MALDIVES**

List of People Interviewed

<u>Name and Ministry/Agency</u>	<u>Position</u>
Ministry of Foreign Affairs	
Mr. Mohamed Shihab	Director of External Resources
Mr. Mohamed Naseer	Assistant Undersecretary
Miss Aishath Azeema	Senior Secretary
Mr. Ibrahim Sujad	English Secretary
Ministry of Planning and Environment	
Hon. Ismail Shafeeu	Minister
Mr. Mohamed Hunaif	Assistant Director
Ministry of Public Works and Labor	
Hon. Abdulla Kamaldeen	Minister
Mr. Ahmed Ashraft	Assistant Undersecretary
Ministry of Atoll Administration	
Mr. Mohamed Latheef, Ph.D.	Deputy Minister
Mr. Mohamed Fardok	Undersecretary
Ministry of Trade and Industry	
Mr. Ahmed Hassem	Deputy Director of Foreign Investment Services Bureau (FISB)
Mr. Ibrahim Shakeer	Director of Fisheries Projects Implementation Department (FPID)
Mr. Adnan Ali	Technical Manager of FPID
Maldives Electricity Board	
Mr. Abdulla Kamaldeen	Chairman
Mr. Mohamed Saeed	Managing Director
Mr. Abdul Shakoor	Director
Mr. Abdul Fahthah	Deputy Director
Mr. Ibrahim Hassan	Deputy Director
Mr. Abdulla Wahid	Mechanical Engineer
Mr. Ibrahim Athif	Assistant Mechanical Engineer
Mr. Hassan Rasheed	Supervisor
Mr. Mohamed Qasim	Assistant Manager of Sn. Gan
Mr. Ahmed Nazim	Electromechanical Engineer
Mr. Noosa Ibrahim	Assistant Mechanical Engineer
Kan'Dholhudhoo Island in Raa Atoll	
Mr. Easa Moosa Kaleycgefaay	Senior Island Chief
Naifaru Island in Lhaviyani Atoll	
Mr. Ibrahim Rashaad	Chief of Atoll
Mr. Abdul Latheef Ibrahim	Chief of Island
Hinnavaru Island in Lhaviyani Atoll	

Mr. Mohamed Hussein Fulu Mr. Mohamed Ibrahim Mr. Mohamed Ahomed	Chief of Island General Manager of Fiyavahi Enterprises Owner of Generating Plant
Eydhafushi Island in Baa Atoll Mr. Mohamed Shareef Mr. Ali Waheed	Senior Undersecretary of Atoll Chief of Island
Fish Canning Factory Mr. Abdul Fathah Hussein	Manager
Gan Island in Laamu Atoll Mr. Ibrahim Zuhair	Chief of Atoll
Dhidhdhoo Island of Haa Alifu Atoll Mr. Adam Abdul Abdul Rahnan	Chief of Atoll
Kulhudhuffushi Island of Haa Dhall Atoll Mr. Ahmed Igbaal Mr. Ahmed Sameer Mr. Adam Mohamed	Chief of Island Chief of Atoll Eng. Chief of Power Station
Kelaa Island of Haa Alifu Atoll Mr. Abdul Waheed	Chief of Island
Embassy of Japan in Sri Lanka Mr. Hiroyuki Kinomoto	Second Secretary
JICA Office in Sri Lanka Mr. Yoshiaki Sakamaki Mr. Mitsuyoshi Kawasaki	Chief Staff Member
JOCV Maldives Office Miss Mutsuko Gonokami Mr. Tsutomu Kawahara	Coordinator JOCV Member for Kelaa Agricultural Development

APPENDIX 4

MINUTES OF DISCUSSIONS

MINUTES OF DISCUSSIONS
BASIC DESIGN STUDY
ON
ATOLL ISLAND ELECTRIFICATION PROJECT
IN
THE REPUBLIC OF MALDIVES

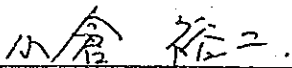
In response to a request from the Government of the Republic of Maldives, the Government of Japan decided to conduct a Basic Design Study on Atoll island electrification project in the Republic of Maldives (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Maldives a study team, which is headed by Mr. Yuji Ogura, Grant Aid Division, Economic Cooperation Bureau, Ministry of Foreign Affairs, and is scheduled to stay in the country from August 20 to September 15, 1993.


The team held discussions with the officials concerned of the Government of Maldives and conducted a field survey at the study area.

In the course of discussions and field survey, both parties have confirmed the main items described on the attached sheets. The team will proceed to further works and prepare the Basic Design Study report.

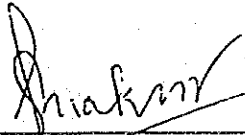
Male', August 30, 1993



Mr. Yuji Ogura
Leader
Basic Design Study Team
Japan International Cooperation
Agency (JICA)



Mr. Mohamed Shihab
Director of External Resources
Ministry of Foreign Affairs
The Republic of Maldives



Mr. Abdul Shakoor
Director
Maldives Electricity Board
(MEB)

ATTACHMENT

1. Title of the Project

The official title of the Project is Atoll island electrification project in the Republic of Maldives.

2. Objective

The objective of the Project are to supply and to install diesel engine generators including their auxiliaries and to construct power distribution networks at Naifaru island, Eydhafushi island and Gan island in order to enable households and buildings to receive public electricity.

3. Project Site

The Project sites are located in Naifaru island, Eydhafushi island and Gan island as shown in Annex-I.

4. Execution Agency

The Ministry of Foreign Affairs, the Republic of Maldives is responsible for execution of the Project of the Maldives side and Maldives Electricity Board (MEB) is implementation agency for the Project.

5. Items Requested by the Government of Maldives

JICA study team carried out field surveys of the following six(6) islands as the objects of the basic design study.

- Naifaru island at Lhaviyani atoll
- Hinnavaru island at Lhaviyani atoll
- Eydhafushi island at Baa atoll
- Gan island at Laamu atoll
- Kan'dholhudhoo island at Raa atoll
- Kelaa island at Haa Alifu atoll

After discussions with the Basic Design Study Team, the following items were finally requested by the Maldives side as the object islands of the Project.

(1) Equipment and Materials

- 1) Supply and installation of three(3) sets of diesel engine generators with output capacity 100 KW including necessary electrical equipment and auxiliaries for Naifaru island.
- 2) Supply and installation of three(3) sets of diesel engine

generators with output capacity 50 KW including necessary electrical equipment and auxiliaries for Eydhafushi island.

- 3) Supply and installation of three(3) sets of diesel engine generators with output capacity 50 KW including necessary electrical equipment and auxiliaries for Gan island.
- 4) Supply of equipment and materials for branch power distribution networks for Naifaru island, Eydhafushi island and Gan island.
- 5) Supply of spare parts and tools for diesel engine generators including their auxiliaries and distribution networks.
- 6) Operation and Maintenance manuals for diesel engine generators and their auxiliaries.

(2) Construction

- 1) Construction of a building(s) and equipment foundations necessary for the Project in Naifaru island.
- 2) Construction of a building(s) and equipment foundations necessary for the Project in Eydhafushi island.
- 3) Construction of a building(s) and equipment foundations necessary for the Project in Gan island.
- 4) Construction of main power distribution network for Naifaru island.
- 5) Construction of main power distribution network for Eydhafushi island.
- 6) Construction of main power distribution network for Gan island.

(3) On-The-Job training(OJT)

OJT for the installation, operation and maintenance techniques of the diesel power plants during construction period.

However, the final components of the Project will be decided after further studies consulted by the officials concerned in Japan.

6. Operation and maintenance of the equipment

- (1) The Maldives side shall allocate personals and the budget sufficient for installation of branch power distribution networks and for operation & maintenance of equipment and materials completed under the Project.
- (2) The Maldives side shall report to Japanese side the conditions and all aspects of the installation, operation and maintenance of the

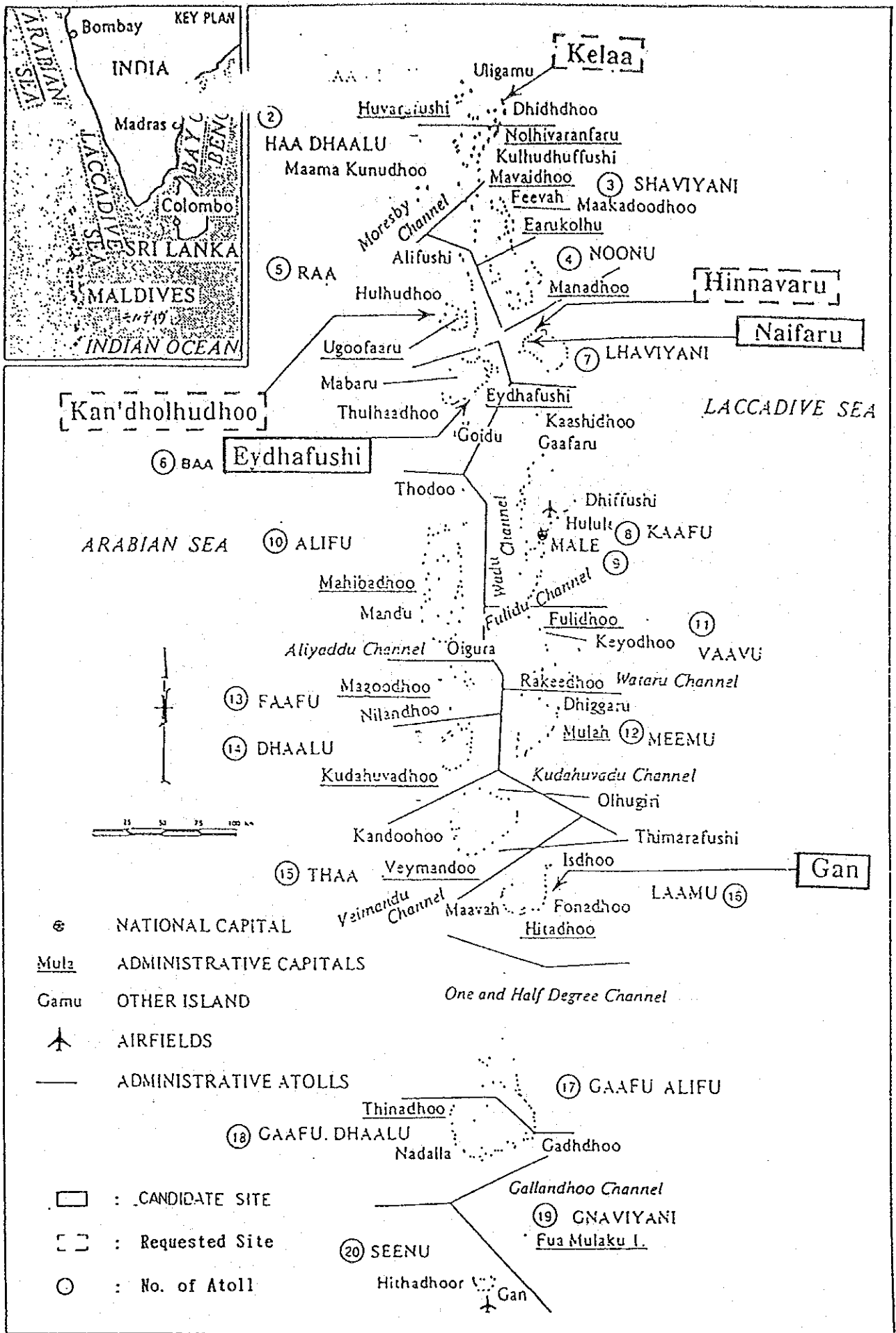
equipment and materials under the Project on every six(6) months from the commencement of the installation by the Maldives side.

7. Japan's Grant Aid System

- (1) The Government of Maldives has understood the system of Japan's Grant Aid explained by the team.
- (2) The Government of Maldives will take the necessary measures described in Annex II for smooth implementation of the Project, on condition that the Grant Aid assistance by the Government of Japan is extended to the Project.

8. Schedule of the Study

- (1) The consultants will proceed to further studies in Maldives until September 15, 1993.
- (2) Based on the Minutes of Discussions and technical examination of the study results, JICA will prepare a final draft report in English and dispatch a mission to Maldives in order to explain its contents by the middle of November, 1993.
- (3) In case that the contents of the report are accepted in principle by the Government of Maldives, JICA will complete a final report and send it to Maldives by the end of February, 1994.

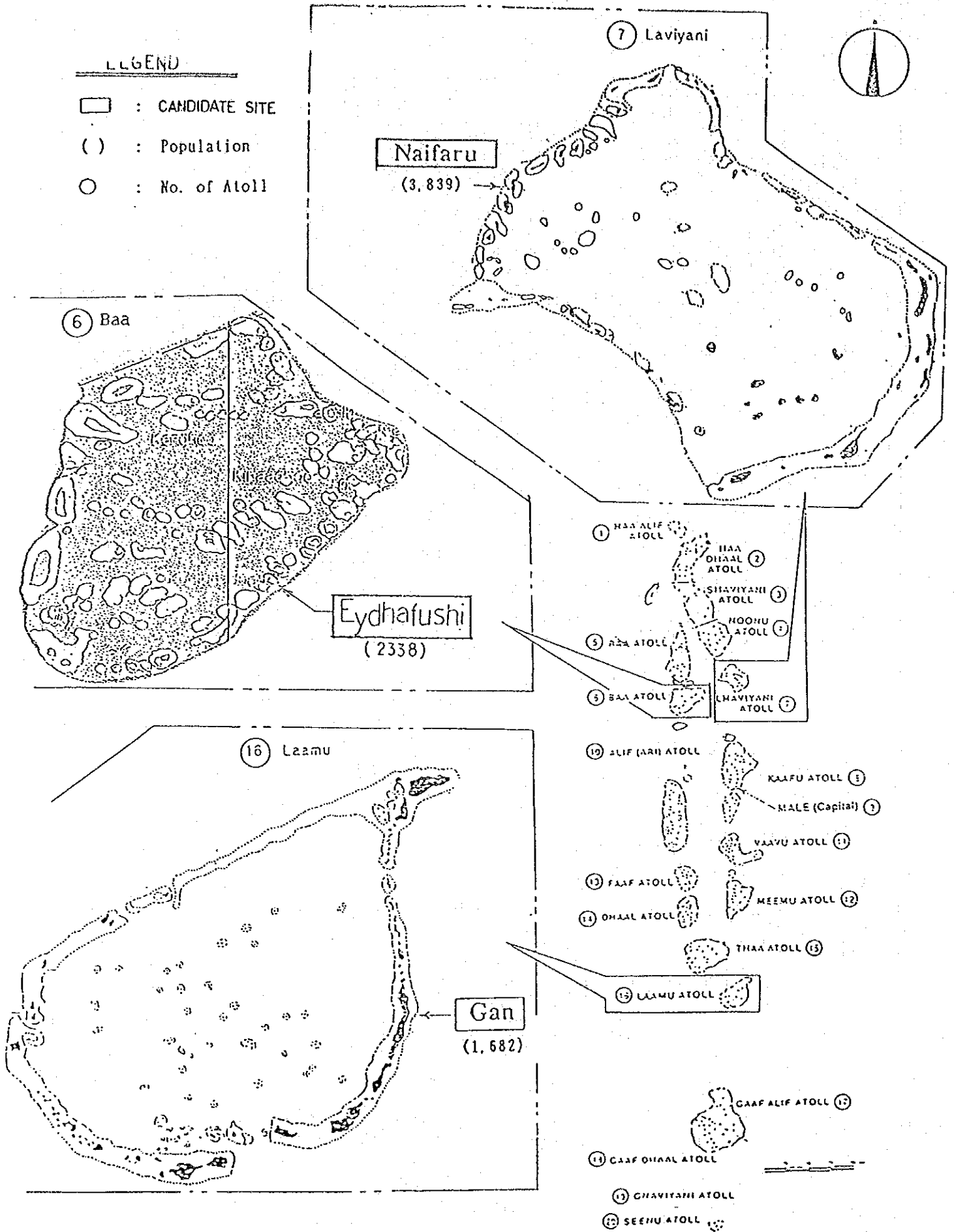


Map for Maldives

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Annex-I Location Map Project Site (2/2)



Map for Project Site

[Handwritten mark]

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ANNEX-II

UNDERTAKINGS BY THE GOVERNMENT
OF THE REPUBLIC OF MALDIVES

- a) To secure and provide cleared, embanked and leveled land as well as access road for the project sites prior to the commencement of the construction of the Japanese side.
- b) To provide proper arrangements for unloading and for inland transportation of the equipment and materials necessary for the Project.
- c) To construct boundary fences, gates and plantation for the power stations.
- d) To provide the land for temporary site offices, warehouses and stock yards in the project sites during the implementation period.
- e) To ensure speedy unloading, tax exemption, custom clearance of the goods for the Project at the port and/or airport of disembarkation.
- f) To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contracts such facilities as may be necessary for their entry into the Republic of Maldives and stay therein for the performance of their work.
- g) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the Republic of Maldives with respect to the supply of the products and services under the verified contracts.
- h) To bear commissions to a Japanese foreign exchange bank for the banking services based upon the Banking Arrangement.
- i) To bear all the expenses, other than those to be born by the Grant Aid necessary for the execution of the Project.
- j) To provide proper arrangements for the construction, such as water supply, drainage, etc., if necessary.
- k) To install the equipment and materials supplied by the Japan's Grant Aid for branch power distribution networks according to the proper plan.
- l) To relocate two(2) set of existing diesel engine generators and distribution facilities including cables installed at Eydhafushi island in order to utilize them for another island(s).
- m) To provide necessary arrangement to restrict of environmental pollution such as noise from the diesel engine generator, etc.
- n) To assign exclusive-counterpart engineers and technicians to the Project in order to transfer the operation and maintenance technique for the

Project and to witness and confirm construction when inspection are carried out.

- o) To provide a bench mark at the sites.
- p) To bear the cost for the fuel oil and the lubrication oil during commissioning.
- q) To provide necessary data and information for the detailed design of the Project.
- r) To provide topographical survey maps and if possible, soil investigation reports for the Project sites.
- s) To take necessary measures to expedite the approval for executions of the Project by the Government of Maldives, if necessary.
- t) To control traffic during the inland transportation of the facilities of the Project, if necessary.
- u) To provide the disposal places of the surplus soil during the construction period.
- v) To secure the approval for access to public and private land for the Project, if necessary.
- w) To secure the approval for protection works for the existing facilities, if necessary.

MINUTES OF DISCUSSIONS

BASIC DESIGN STUDY ON ATOLL ISLAND ELECTRIFICATION PROJECT

IN THE REPUBLIC OF MALDIVES

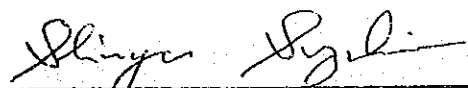
(CONSULTATION ON DRAFT REPORT)

In August 1993, the Japan International Cooperation Agency(JICA) dispatched a Basic Design Study Team on Atoll Island Electrification Project (hereinafter referred to as "the Project") to the Republic of Maldives, and through discussions, field survey, and technical examination of the study results in Japan, has prepared the draft report of the study.


In order to explain and to consult the Maldives side on the components of the draft report, JICA sent to Maldives a study team(hereinafter referred to as "the Team"), which was headed by Mr.Shinya Suzuki, Grant Aid Division, Economic Cooperation Bureau, Ministry of Foreign Affairs, and was scheduled to stay in the country from November 2 to 9, 1993.

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

Male. November 9, 1993



Mr. Shinya Suzuki
Leader
Draft Report Explanation Team
Japan International Cooperation
Agency(JICA)



Mr. Mohamed Shihab
Director of External Resources
Ministry of Foreign Affairs
The Republic of Maldives



Mr. Mohamed Saeed
Managing Director
Maldives Electricity Board(MEB)

ATTACHMENT

1. Components of the Draft Report

The Government of Maldives has agreed and accepted in principle the components of the Draft Report proposed by the Team.

2. Japan's Grant Aid system

- (1) The Government of Maldives has understood the system of Japanese Grant Aid explained by the Team.
- (2) The Government of Maldives will take the necessary measures described in Annex-I for smooth implementation of the Project on condition that the Grant Aid assistance by the Government of Japan is extended to the Project.

3. Further schedule

The Team will make the Final Report in accordance with the confirmed items, and send it to the Government of Maldives by the end of February 1994.

4. Installation, operation and maintenance of the equipment

- (1) The Maldives side shall allocate the personals and budget sufficient for installation of power distribution networks, workshop equipment, etc, and for operation & maintenance of equipment and materials supplied and constructed under the Project.
- (2) The maldives side shall report, monthly, to Japanese side the conditions and all situations related to the installation works of the power distribution networks by the Maldives side from the commencement of the installation.
- (3) The Maldives side shall report to Japanese side the conditions and all aspects of the operation and maintenance of the facilities, equipment and materials supplied and constructed under the Project on every six(6) months from the completion of the Project up to at least 5 years.

5. Items discussed by both parties

- (1) In accordance with the request made by Maldives side, Naifaru island at Lhaviyani atoll and Eydhafushi island at Baa atoll will be electrified under the Project when the Grant Aid assistance by the Government of Japan is extended to the Project.
- (2) Both parties have confirmed and have accepted work items and working shares described in Annex-II for purpose of smooth and effective implementation of the Project.

6. Recommendations

The Maldives side has accepted the Team's recommendations described in ANNEX-III to ensure the long-term proper functioning of facilities and equipment to be provided under the Project.

ANNEX-I

UNDERTAKINGS BY THE GOVERNMENT
OF THE REPUBLIC OF MALDIVES

- a) To secure and provide cleared, embanked and leveled land as well as access road for the project sites prior to the commencement of the construction by Japanese side.
- b) To provide proper arrangements for unloading and for inland transportation of the equipment and materials necessary for the Project.
- c) To construct boundary fences, gates and plantation for the power stations.
- d) To provide the land for temporary site offices, warehouses and stock yards in the project sites during the implementation period.
- e) To ensure speedy unloading, tax exemption, custom clearance of the goods for the Project at the port and/or airport of disembarkation.
- f) To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contracts such facilities as may be necessary for their entry into the Republic of Maldives and stay therein for the performance of their work.
- g) To meet the charge of customs duties, internal taxes and other fiscal levies which may be imposed in the Republic of Maldives with respect to the supply of the products and services under the verified contracts.
- h) To maintain and use properly and effectively the facilities constructed and equipment provided under the Project.
- i) To bear commissions to a Japanese foreign exchange bank for the banking services based upon the Banking Arrangement.
- j) To bear all the expenses, other than those to be born by the Grant Aid necessary for the execution of the Project.
- k) To provide proper arrangements for the construction, such as water supply, drainage, etc.,
- l) To install the equipment and materials supplied by the Japan's Grant Aid for power distribution networks, workshop equipment etc, according to the proper plan.
- m) To relocate two(2) sets of existing diesel engine generators and distribution facilities including cables installed at Eydhafushi island in order to utilize them for another island(s).

- n) To take necessary measures for the prevention of the environmental pollution such as disposal of oil sludge, etc.
- o) To assign exclusive-counterpart engineers and technicians to the Project in order to transfer the operation and maintenance technique for the Project and to witness and confirm construction when inspection is carried out.
- p) To provide a bench mark at the sites.
- q) To bear the cost for the fuel and the lubrication oil during commissioning.
- r) To provide necessary data and information for the detailed design of the Project.
- s) To provide topographical survey maps for the Project sites.
- t) To take necessary measures to expedite the approval for executions of the Project by the Government of Maldives.
- u) To facilitate proper arrangement for inter island transportation of the facilities of the Project.
- v) To provide the disposal places of the surplus soil during the construction period.

ANNEX-II

WORKING SHARE

Both sides have confirmed work items and working shares between Japanese side and Maldives side described in the following table for smooth and effective implementation of the Project on condition that the Grant Aid assistance by the Government of Japan is extended to the Project.

Work Items	Japanese Side	Maldives Side
I. Equipment and Materials		
(1) Diesel engine generators (DEG)	Supply & installation	
(2) Auxiliary equipment for DEG	Supply & installation	
(3) Electrical equipment for DEG	Supply & installation	
(4) Fuel oil tanks & fuel supply line	Supply & installation	
(5) Main power distribution panel	Supply & installation	
(6) Grounding system within the power station	Supply & installation	
(7) Main power distribution system	Supply	installation
(8) Branch power distribution system	Supply	installation
(9) Workshop equipment	Supply	installation
(10) Communication equipment	Supply	installation
(11) Street lighting	Supply	installation
(12) Grounding system for power distribution system	Supply	installation
(13) Spare parts and maintenance tools for DEG and its Auxiliaries	Supply	stock
(14) Operation and Maintenance Manuals	Supply	
(15) On-the-Job Training(OJT)	Execution	attend
II. Construction		
(1) Power house building	Execution	
(2) Equipment foundations	Execution	

(3) Office building	Execution	
(4) Rain water collection and supply	Execution	
(5) Well and well water supply system	Execution	
(6) Furniture		Supply & installation
(7) Site leveling and plantation		Execution
(8) Boundary fence & Access road		Execution
(9) Water supply & drainage for construction		Execution

ANNEX-III

RECOMMENDATIONS

- (1) Engineers in the Maldives must acquire a proper understanding of the general functioning of the facilities and equipment to be provided under the Project, and must also prepare a sound operation and maintenance plan to ensure a constant, highly reliable supply of electricity.
- (2) The Maldives side must appoint operation and maintenance engineers and have these engineers participate in on-the-job training (OJT) provided as part of the Project for the efficient and effective operation of the facilities and equipment to be provided under the Project to achieve the project's objectives.
- (3) The Maldivian engineers undergoing said OJT should learn appropriate operation and maintenance technologies/techniques from the Japanese engineers, devote themselves to improving their technical expertise following completion of the Project, and transfer such expertise to other engineers in order to contribute the electrification of the remaining outlying atoll islands.
- (4) In the case of Maldivian engineers undergoing technical training in Japan to learn operation and maintenance technologies/techniques in relation to the equipment to be provided under the Project by the Government of Japan, these engineers must earnestly try to master such technologies/techniques and then try to educate and train other engineers in the Maldives following the commencement of operation of the new generation facilities.
- (5) The electricity rate to be introduced for the islands should ensure the sustainability and recovery of the operation, maintenance and depreciation costs.
- (6) Work teams should be organized to install the distribution cable without any delay in accordance with the distribution network construction plan, the completion of which is timed to the completion of the Project.
- (7) The provision of a subsidy to cover part of the connection cost for each household should be considered to facilitate distribution to all household.
- (8) The introduction of a progressive rate system, whereby a higher unit rate is imposed for larger consumption, should be considered to provide low cost electricity for the poor and an energy-saving incentive for large users.

APPENDIX 5

FIELD REPORT

(FLDREP1)
[COVER]

(C2L1)

THE BASIC DESIGN STUDY
ON
ATOLL ISLAND ELECTRIFICATION PROJECT
IN
THE REPUBLIC OF MALDIVES

FIELD REPORT

September 1993

Yachiyo Engineering Co., Ltd.

Basic Design Study Team

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2.3 Generating Facility Data by MEB	2
3. Present Situation of Candidated Islands	3
3.1 Land Acquisition of the Project Sites	3
3.2 Present situation of Candidated Islands	3
4. Conceptual Plan for the Project	3
4.1 General	4
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4.3 Generating Facility	6
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4.6 On-the-Job Training (OJT)	9
5. Undertakings by the Government of Maldives	9
6. Tentative Implementation Schedule	9

ATTACHMENT

Attachment-1	Data of Atolls and Islands
Attachment-2	Power Demand and Supply by MEB (In Maldives, Male, Gan, Khulhudhuffushi, Thinadhoo, Thulhusdhoo, Hanimaadhoo and Foahmulah)
Attachment-3	Transition of power demand by MEB
Attachment-4	Technical Data of Existing Generating Facilities
Attachment-5	Number of Staff
Attachment-6	Data of Electrification Islands
Attachment-7	Statistics of Population and Household (1989-1993)
Attachment-8	Data of Islands

1. Introduction

This field report has been prepared by JICA basic design study team (hereinafter referred to as 'the Team') for Atoll Island Electrification Project (hereinafter referred to as 'the Project') in the Republic of Maldives based on the field survey and discussions with the authorities concerned of the Maldives Electricity Board (hereinafter referred to as 'MEB'), in order to build mutual understanding of the Project.

This report describes the information obtained during the field survey, as well as the basic concept of the Project components consist of the three (3) candidated islands.

However, all the items and components in this report are subject to the approval of the Japanese Government.

In addition to the above, this report describes some undertakings to be carried out by the Government of Maldives if Grant Aid is extended.

As described in the Minutes of Discussion (M/D), the Team will continue the study in Japan in accordance with this Field Report, data and Informations, collected during the field survey, as well as the consultation by authorities concerned of Japanese Government.

A Final Draft report of the Project will be prepared in consultation with the Japanese authorities concerned, and will be submitted by the middle of November 1993 as mentioned in the Minutes of Discussions (M/D) concluded on 30th of August 1993.

2. Power Demand and Supply in Maldives

2.1 Power Demand and Supply in Maldives

The Government of Maldives had established Male Power House on November 1959 as sole public electricity sector.

In order to meet the electric power demand of the Maldives, Maldives Electricity Board (MEB) was established at 1982 by act of Parliament under the office of the President as the result of the reformation of Male Power House.

Since November 1982, MEB is continuing to construct power stations and distribution lines and to suppling the power to consumers in Male, capital in Maldives, and some of islands, as shown in attachment-1 and attachment-2 shows demand and supply data.

MEB has studied the power demand per consumer from 1988 to 1992 as shown in attachment-3 and also studied power demand forecast for candidated islands as shown in table-1

Table-1 Forecast of Power Demand at Projected islands

Atoll	Island	1994	1995	1996	1997	1998
Lhaviyani	Naifaru	121	133	146	161	177
Baa	Eydhafushi	82	90	99	109	120
Laamu	Gan	57	63	69	76	84

Remarks : 1) Power demand per consumer is assumed as 200W
 2) Annual increasing rate of power demand is 10 %.

2.2 Related Projects under Planning and/or On-going

Based on the strategy of national development plan, Ministry of Atoll Administration (hereinafter referred as 'MAA') formulated various projects under cooperation and financing by Aid countries and organizations. Related electrification project is shown on the table below:

Table-2 Electrification Project

Atoll	Island	Expected Completion	Donor
On-going			
Haa Alifu	Dhidhdhoo	Dec. 1993	Government of Maldives
Gaafu Dhaalu	Gadhdhoo	Dec. 1993	Government of Maldives
Gaafu Alifu	Villingili	Dec. 1993	Government of Maldives
Raa	Hulhudhuffaaruu	Dec. 1993	Government of Maldives
Proposed			
Seenu	Hithadhoo	Dec. 1993	Italy (Loan)
Seenu	Hulhudhoo	Dec. 1993	Japan (Loan)
Seenu	Meedhoo	Dec. 1993	Japan (Loan)

Other detail projects are described on Island Electrification Project : February 1993 issued by MAA.

2.3 Generating Facility Data by WEB

There are ten (10) electrified islands including male, and major generating facility data is shown on attachment-4. Attachment-5 shows data of MEB's staff and attachment-6 shows other facility data in each islands.

3. Present Situation of Candidated Islands

3.1 Land Acquisition of the Project Sites

Conditions of the land acquisition for the Project are as follows;

No.	Atoll	Island	Owner of Land
1.	Lhaviyani	Naifaru	Government of Maldives
2.	Baa	Eydafushi	Government of Maldives
3.	Laamu	Gan	Government of Maldives

Notes : 1) MEB must obtain the permission of the land use from the MAA, Community and other related sectors and shall inform Japanese side of the permission with area and location by the end of October 1993.

2) MEB must provide the detailed topographic survey map of the Project Sites

3) Location of the Project sites are shown in Attachment-5.

3.2 Present Situation of Candidated Islands

Site reconnaissance was executed by the Team with MEB and MAA, and so many data was corrected.

Attachment-7 shows Statistics of population and household from 1989 to 1992, and islands data is shown on attachment-8.

4. Conceptual Plan for the Project

4.1 General

This section describes the basic concept for the design and installation of the new power stations requested by the Maldives side, as well as the procurement of distribution materials for the Project.

As a result of the field survey on the existing facilities, following items shall be principally be applied for the basic design.

- (1) Power demand forecast shown on the Table-1 in section 2.1
- (2) Power house and administration houses shown on Fig.3
- (3) The capacity of fuel oil storage shall be for one month
- (4) IEC, ISO and Japanese code and standards shall be applied
- (5) Manual and Automatic synchronization of DEG sets
- (6) Continuous power supply (24 hours operation)
- (7) Rain water collection and supply system
- (8) Supply of 2 years spare parts
- (9) Fuel analysis is as per attachment-9

Scope of the works by the Japan's Grant Aid:

The following works shall be carried out by the Japanese side as the Japan's Grant Aid for three (3) islands.

The Maldives side shall bear all expenses other than those to be born by the Japan's Grant Aid necessary for the execution of the Project in accordance with Annex-II, in the Minutes of discussions concluded on 30th August 1993 by both parties.

- (1) Supply and installation of the diesel engine generators (two sets for normal operation and one set for standby)
- (2) Supply of spare parts (Necessary for two years) and testing & inspection tools for diesel engine generators and their auxiliaries.
- (3) Construction of power house including equipment foundations and office.
- (4) Construction of main power distribution lines including distribution boards.
- (5) Supply of equipment and materials for branch power distribution lines including WH meter and breaker for the house
- (6) OJT for the installation and O & M technique of the diesel power plant during construction period.

4.2 Design Conditions

As a basis of facilities design, following conditions shall be considered:

(1) Climatic and Site Conditions

Following data sourced from SOME METEOROLOGICAL DATA 1966-1991, Department of Meteorology Male.

1) Altitude	Approximately 1 m from sea level
2) Ambient temperature	Maximum 34.1 °C
	Minimum 17.2 °C
	Average 28.0 °C
	Design Temp. 34 °C
3) Wind : Velocity	Maximum 31.9 m/sec
	Average 4.9 m/sec
: Direction	Spring W to E Wet Monson
	Summer W to E Wet Monson
	Autum W to E Wet Monson
	Winter NE to SW Dry Monson
4) Relative humidity	Mean Annual 95 %
5) Rainfall	Mean Annual 1.943 mm
	Mean Month 162 mm
	Max. Day 175.9 mm
	Max. One Hour 10.0 mm (Assumed)
6) Seismic acceleration	Nil --- gal
7) Thunder days	34 Times/year
8) Soil bearing capacity	10 ton/m ² (Assumed)
9) Water level (Ground level minus)	1 m
10) Other	Near sea coast
 (2) Power Supply Condition	
1) Power demand forecast	See Table-1
2) Number of DEG sets	2-Continuous and 1-Stand-by
3) Fuel system	Diesel oil
	Storage capacity is for one month
4) System voltage	Generator : AC 415/240V (3-phase, 4-wire)
	Distribution : AC 400/230V (3-phase, 4-wire)
	Control AC 200/100V and DC 24V
5) Frequency	50 Hz
6) Earthing system	Direct earthed to the ground for 400V line
	Fuel storage tank shall be earthed separately
7) Voltage drop	According to JEAC (Max. less than 10%)
 (3) Others	
1) Noize level	According to JEAC or equivalent
2) Exhaust gas	Related Japanese code
3) Civil and Buildings	AIJ (exclusion of earthquake)
4) Consideration of future extension	one DEG set and one fuel storage tank

4.3 Generating Facility

(1) Outline of Major Facilities

Outline of major facilities shown on Plot Plan, One Line Diagram and Fuel Flow Diagram is as follows:

Table -3 : Outline of Major Facilities

No.	Description	Naifaru	Eydafushi	Gan
1.	Plot Plan	---	Fig. 1b	---
2.	One Line Diagram	Fig. 2	Fig. 2	Fig. 2
3.	Fuel Flow Diagram	Fig. 3	Fig. 3	Fig. 3
4.	Diesel Engine Generator			
	1) Capacity	100kW	75kW	50kW
	2) Voltage	AC 415/240V	AC 415/240V	AC 415/240V
	3) Number	2 + (1)	2 + (1)	2 + (1)
5.	Fuel System			
	1) Storage Tank			
	- Capacity	32 m3	26 m3	26 m3
	- Number	1	1	1
	2) Fuel Transfer pumps	1 + (1)	1 + (1)	1 + (1)
	3) Day Tank	0.6 m3	0.6 m3	0.6 m3
	4) Oil/Water separator around storage tank	Yes	Yes	Yes
6.	Panels and etc.			
	1) Control and Dist. board	1	1	1
	2) DC 24V Battery and charger	1 + (1)	1 + (1)	1 + (1)
7.	Houses			
	1) Power House (Fig. 4)	1	1	1
	2) Office House (Fig. 5)	1	1	1

Remarks : 1) Numerical values in () show stand-by purpose
2) Portable fire extinguisher (ABC type) shall be provided to the power and office house

(2) Diesel Engine Generator (DEG) Set

Outline of the main equipment is as follows:

- 1) Diesel Engine
 - a) Operation duty : Continuous
 - b) Capacity : See Table-3
 - c) Revolution : 1500 or 1000 rpm
 - d) Type : Indoor
 - e) fuel : Diesel Oil
 - f) Starting method : Motor

2) Generator

- | | |
|-------------------|-------------------------------|
| a) Type | : Synchronous |
| b) Capacity (kVA) | : See Table-3 |
| c) Voltage (V) | : 415/240 |
| d) Phase | : 3P4W Neutral solid grounded |
| e) Frequency | : 50 Hz |
| f) Synchronizing | : Auto and Manual |

(3) Fuel System

Brief explanation of this system is as follows:

- 1) The capacity of fuel storage tank is for one month.
- 2) The capacity of day tank is for 12 hours.
- 3) Automatic fuel transfer system by fuel transfer pump controlled by level switch located in day tank.
- 4) Fuel transfer pump can be used to unloading pump.
- 5) One set of Handy type of fuel pump with 5 meter hose.
- 6) Fuel pipings shall be located in the ground, aerial or in the trench.
- 7) Water separator shall be provided on the common delivery line of fuel transfer pump.

(4) DC System

Common DC 24 V system shall be applied for:

- 1) Starter of DEG
- 2) Control Source for control panel
- 3) Power supply for communication facility

4.4 Distribution Facility

(1) Outline of Major Facilities

Outline of major facilities shown on One Line Diagram is as follows:
This facility is also including feeder provision for street lighting system

1. Local Distribution Boards (D/B)

This board consists of following equipment:

- 1) Incoming ELB 100 Amp
- 2) Outgoing MCB : 15 sets of single phase 20 Amp.
and one set of 3-phase 30 Amp.
- 3) Jumper terminal to the next local distribution board
- 4) Type : Outdoor self-standing and polycarbonate
- 5) Location of local D/B is 0.5 meter from the house-wall

2. WH meter panel board

This panel board (Indoor wall mounted) is located inside of each consumers and consists of followings:

- 1) Disconnecting switch with fuses (with sealing)
- 2) Watthour meter (with sealing)
- 3) ELB with (100mA)
- 4) Three switch sockets (BS type)

3. Main and branch power cable

1) Main distribution cable

This cable is applied from discription board located in power house to local distribution panel with following conditions;

- a) Directly buried in the street with approximately 750 mm deep.
- b) Cable location in the street is one third of the road width and any one side of road can be taken for cable installation.

2) Branch cable

This cable is applied from local distribution panel to each consumers with following conditions;

- a) Direct buried to the adequate point to the house and put on the wall to the WH meter panel.
- b) Minimum cable size shall be 5.5 mm²

3) Specification of Cables

a) Main and branch power cables

- Specification : XLPE insulated and corrugated metal armour and PVC sheathed cable for main and branch cable is XLPE insulated PVC sheath.

- Color Identification : 2 cores : Black & White

4 cores : Black, White, Red and Green

4.5 Spare Parts

Following spare parts will be supplied

- 2 years spare

The items and quantities to be supplied will be determined in the final report based on the study results of the field survey.

4.6 On-the-Job Training (OJT)

OJT for operation and maintenance (O & M) will be carried out by the Japanese contractor of the Project during the implementation period.

The program will contain the following items:

- (1) O & M plan of the new DEG set including schedule, record and document control.
- (2) O & M procedure of the new DEG set.
- (3) O & M execution knowhow of the new DEG set.

5. Undertakings by the Government of Maldives

The undertakings by the Government of Maldives are described in the Minutes of Discussions (M/D) concluded on 30th August 1993.

In addition to the above, necessary measures for the following additional notes and/or items shall also be taken by the Government of Maldives if Grant Aid is extended.

- (1) To remove any obstacles in project area.
- (2) To provide and install street lighting facilities if necessary.

6. Tentative Implementation Schedule

The project may be executed in accordance with the attached tentative implementation schedule on condition that Grant Aid is extended to the Project.

Tentative implementation schedule is shown on Table-4.

Eydhafushi Site (1/300)

66,708 (218.00 ft)

43.200 m

46.200 m

66,736 (218.09 ft)

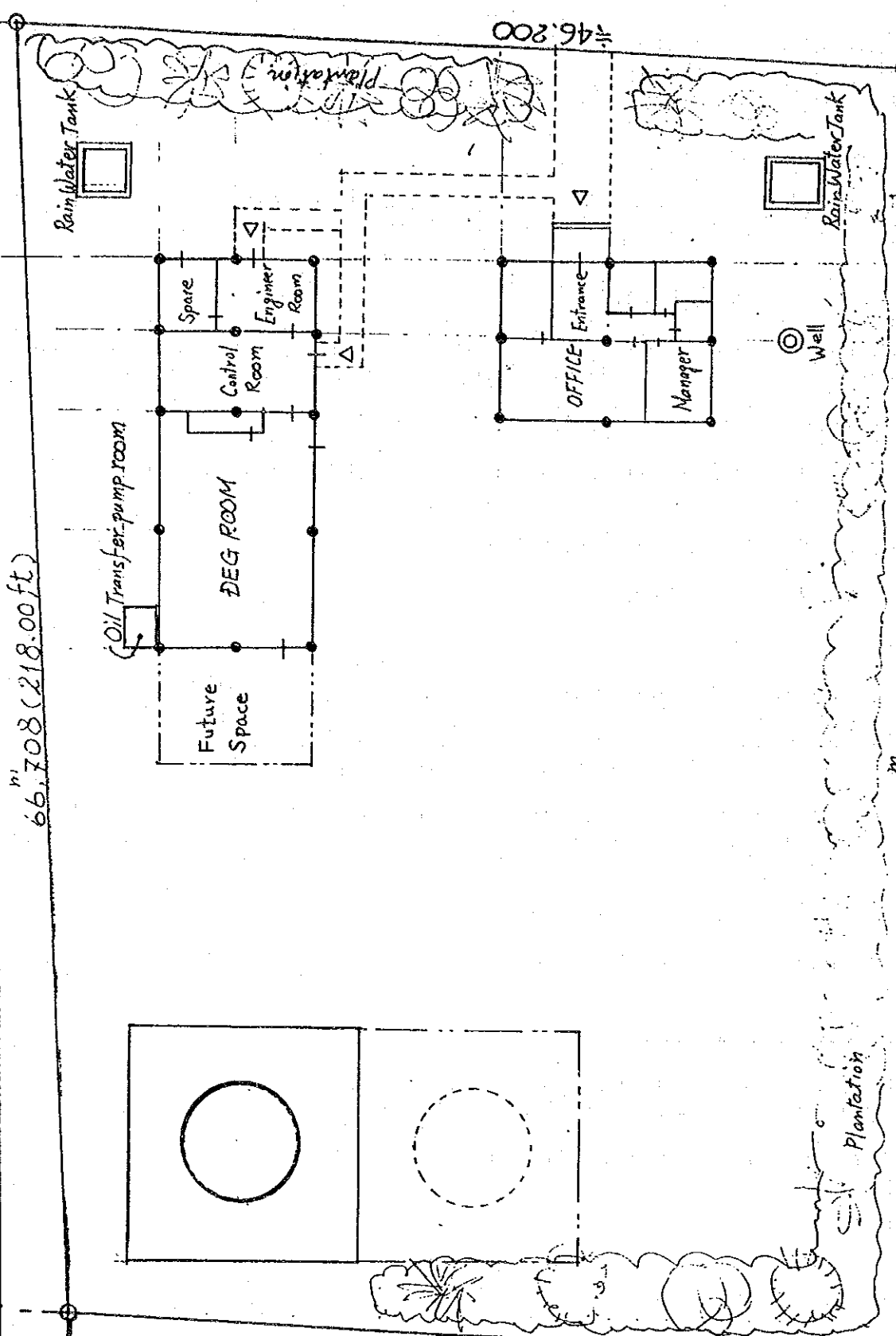
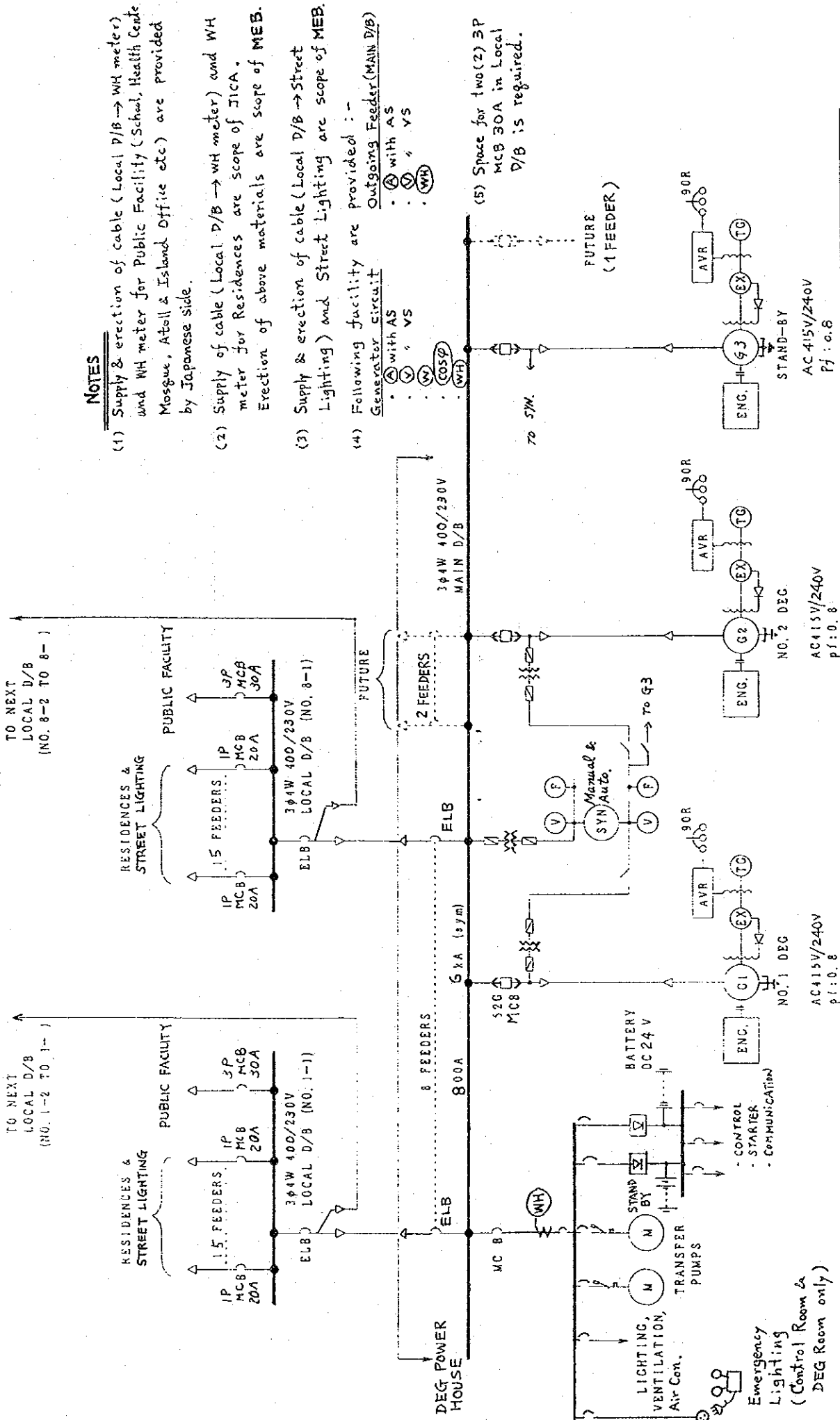


FIG. 1b: PLOT PLAN

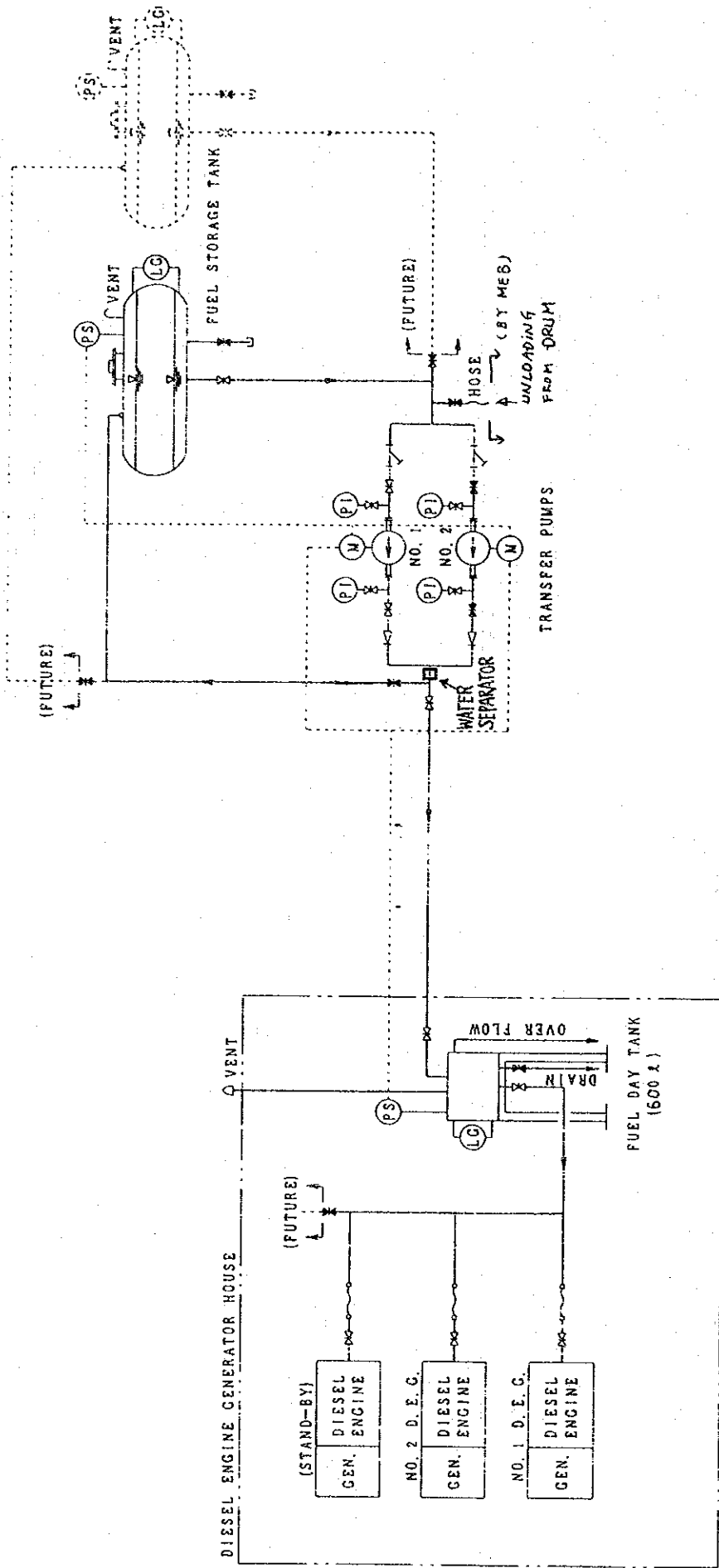


- NOTES**
- (1) Supply & erection of cable (Local D/B → WH meter) and WH meter for Public Facility (School, Health Centre Mosque, Atoll & Island Office etc) are provided by Japanese side.
 - (2) Supply of cable (Local D/B → WH meter) and WH meter for Residences are scope of JICA. Erection of above materials are scope of MEB.
 - (3) Supply & erection of cable (Local D/B → Street Lighting) and Street Lighting are scope of MEB.
 - (4) Following facility are provided :-
 Outgoing Feeder (MAIN D/B)
 • A with AS
 • V / VS
 • WH
 • COSφ
 • WH

(5) Space for two (2) 3P MCB 30A in Local D/B is required.

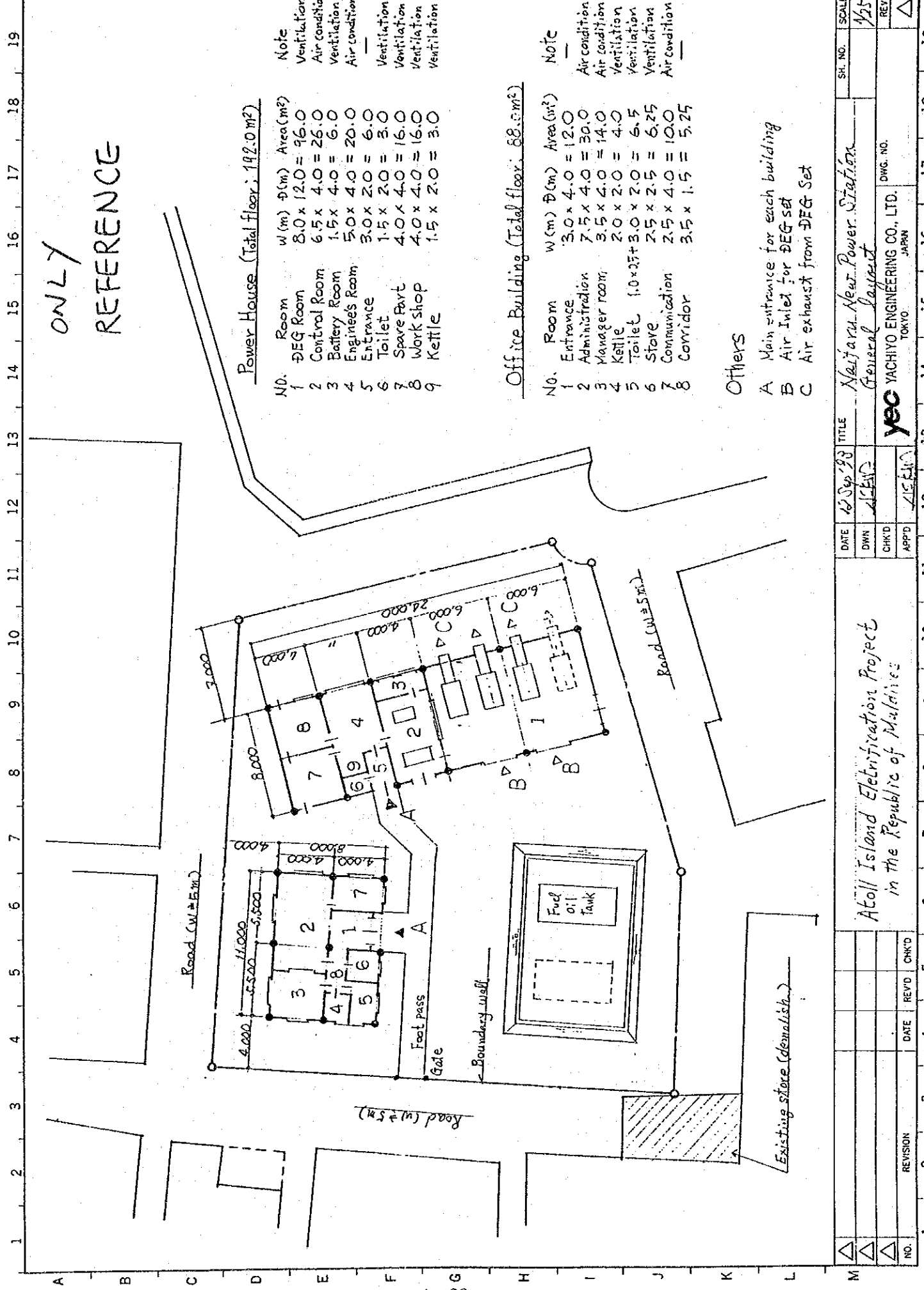
The final drawing will be decided after further study.

FIG. 2 ONE LINE DIAGRAM (3 D/G SETS)



Note : The final drawing will be decided after further study.

FIG.3 FUEL FLOW DIAGRAM (3 D/G SETS)



ONLY
REFERENCE

Power House (Total floor: 192.0 m²)

No.	Room	W (m)	Φ (m)	Area (m ²)	Note
1	DEG Room	8.0 x 12.0	=	96.0	Ventilation
2	Control Room	6.5 x 4.0	=	26.0	Air Condition
3	Battery Room	1.5 x 4.0	=	6.0	Ventilation
4	Engine's Room	5.0 x 4.0	=	20.0	Air condition
5	Entrance	3.0 x 2.0	=	6.0	—
6	Toilet	1.5 x 2.0	=	3.0	Ventilation
7	Spare Part	4.0 x 4.0	=	16.0	Ventilation
8	Work shop	4.0 x 4.0	=	16.0	Ventilation
9	Kettle	1.5 x 2.0	=	3.0	Ventilation

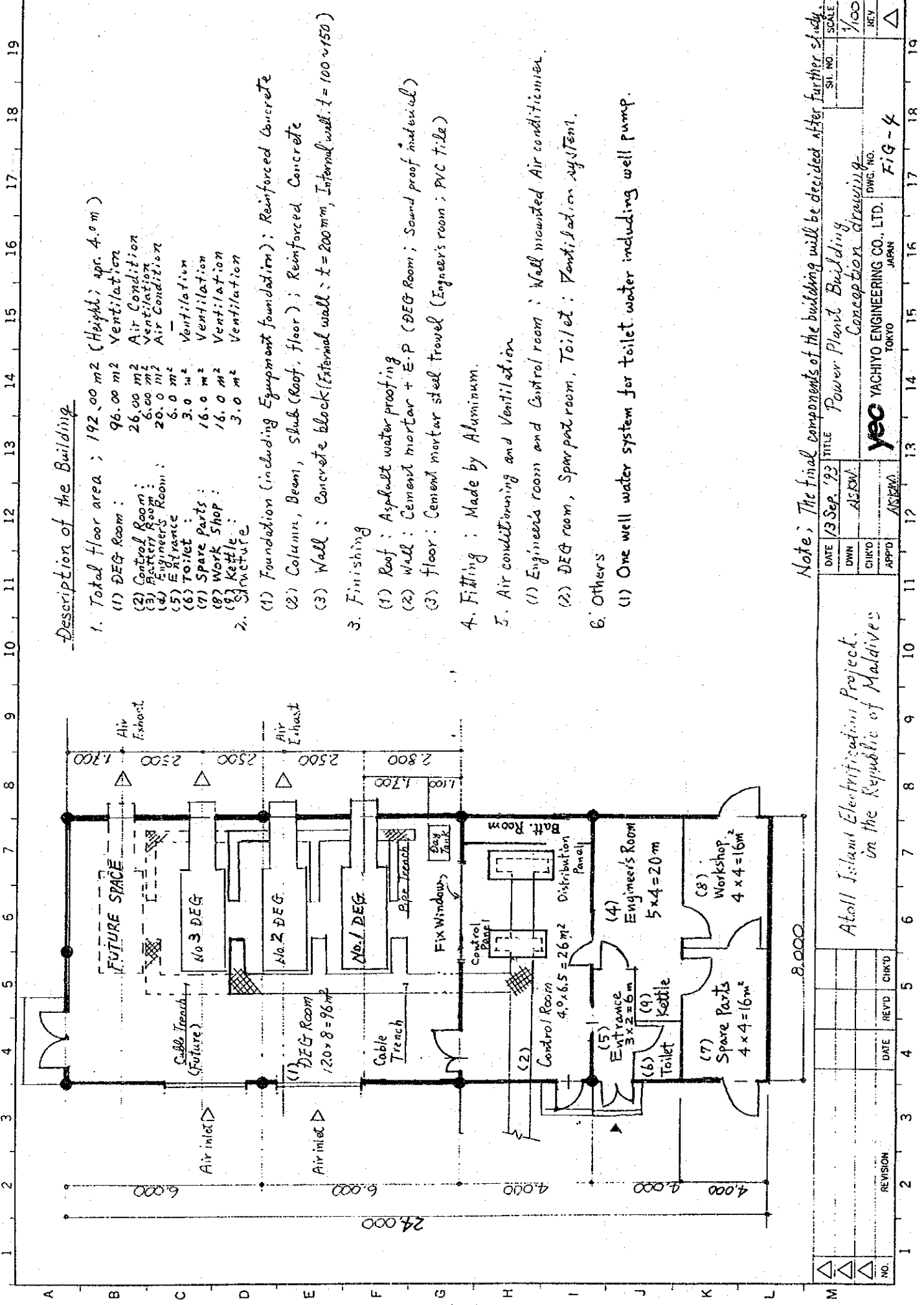
Office Building (Total floor: 88.0 m²)

No.	Room	W (m)	Φ (m)	Area (m ²)	Note
1	Entrance	3.0 x 4.0	=	12.0	—
2	Administration	7.5 x 4.0	=	30.0	Air condition
3	Manager room	3.5 x 4.0	=	14.0	Air condition
4	Kettle	2.0 x 2.0	=	4.0	Ventilation
5	Toilet	1.0 x 2.5 + 3.0 x 2.0	=	6.5	Ventilation
6	Store	2.5 x 2.5	=	6.25	Ventilation
7	Communication	2.5 x 4.0	=	10.0	Air condition
8	Corridor	3.5 x 1.5	=	5.25	—

Others

- A Main entrance for each building
- B Air Inlet for DEG set
- C Air exhaust from DEG Set

NO.	REVISION	DATE	REV'D	CHK'D	DATE	CHK'D	TITLE	DATE	SH. NO.	SCALE
△							Atoll Island Electrification Project in the Republic of Maldives	12 Sep 93		1/250
△							YACHIYO ENGINEERING CO., LTD. TOKYO, JAPAN			
△							General Layout			
△							New Yamu New Power Stations			



Description of the Building

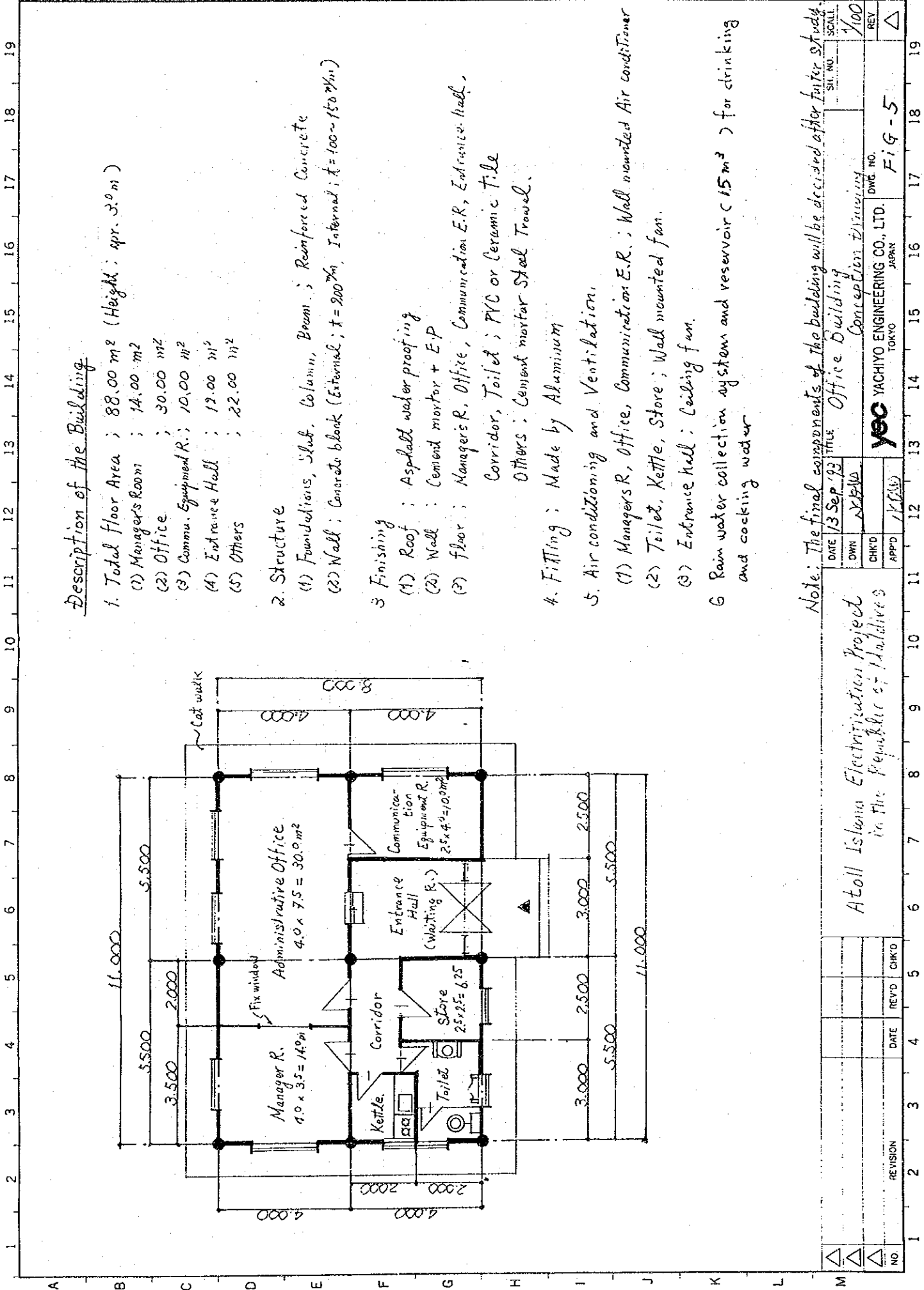
1. Total floor area ; 192.00 m² (Height) apr. 4.0 m
 - (1) DEG Room : 96.00 m² Ventilation
 - (2) Control Room : 26.00 m² Air Condition
 - (3) Spare Parts : 16.00 m² Ventilation
 - (4) Engineers Room : 20.00 m² Air Condition
 - (5) Entrance : 6.00 m² Ventilation
 - (6) Toilet : 3.00 m² Ventilation
 - (7) Spare Parts : 16.00 m² Ventilation
 - (8) Work Shop : 16.00 m² Ventilation
 - (9) Kettle : 3.00 m² Ventilation
2. Structure
 - (1) Foundation (including Equipment foundation) ; Reinforced Concrete
 - (2) Column, Beam, Slab (Roof, Floor) ; Reinforced Concrete
 - (3) Wall : Concrete block (External wall : t = 200 mm, Internal wall : t = 100 ~ 150)
3. Finishing
 - (1) Roof : Asphalt water proofing
 - (2) Wall : Cement mortar + E.P (DEG Room ; Sound proof material)
 - (3) Floor : Cement mortar steel trowel (Engineer's room ; PVC Tile)
4. Fitting : Made by Aluminium.
5. Air conditioning and Ventilation
 - (1) Engineer's room and Control room : Wall mounted Air conditioner.
 - (2) DEG room, Spare room, Toilet : Ventilation system.
6. Others
 - (1) One well water system for toilet water including well pump.

Note ; The final components of the building will be decided after further study

DATE	19 Sep. 93	TITLE	Power Plant Building	SI. NO.	SCALE
DWN	AS/SM	Conception drawing		DWG. NO.	1/100
CHK'D		YEC		REV	△
APP'D		YACHIO ENGINEERING CO., LTD.		FIG - 4	
		TOKYO JAPAN			

Atoll Islands Electrification Project.
in the Republic of Maldives

NO.	REVISION	DATE	REV'D	CHK'D



Description of the Building

1. Total floor Area ; 88.00 m² (Height : apr. 3.0 m)

- (1) Manager's Room ; 14.00 m²
- (2) Office ; 30.00 m²
- (3) Commu. Equipment R. ; 10.00 m²
- (4) Entrance Hall ; 12.00 m²
- (5) Others ; 22.00 m²

2. Structure

- (1) Foundations, Slab, Column, Beam ; Reinforced Concrete
- (2) Wall ; Concrete block (External ; t = 200 mm, Internal ; t = 100 ~ 150 mm)

3. Finishing

- (1) Roof ; Asphalt water proofing
- (2) Wall ; Cement mortar + E.P
- (3) floor ; Manager's R, Office, Communication E.R, Entrance hall, Corridor, Toilet ; PVC or Ceramic tile
Others ; Cement mortar Steel Trowel.

4. Fitting ; Made by Aluminium

5. Air conditioning and Ventilation.

- (1) Manager's R, Office, Communication E.R. ; Wall mounted Air conditioner
- (2) Toilet, Kettle, Store ; Wall mounted fan.
- (3) Entrance hall ; Ceiling fan.

6. Rain water collection system and reservoir (15 m³) for drinking and cooking water

Note: The final components of the building will be decided after further study.

DATE	13 Sep '92	TITLE	Office Building	SCALE	1/100
DWN	YCH	CHK'D	YCH	DWG. NO.	Fig-5
APP'D	YCH	YEC YACHIYO ENGINEERING CO., LTD.		REV	△
		TOKYO JAPAN			
Atoll Islanda Electrification Project in the Republic of Maldives					
NO.	REVISION	DATE	REV'D	CHK'D	
△					

(IMPSCH1)

Table-4. Tentative Implementation Schedule

(COL4)

Description	Year	1994												1995			
	Month	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
1.0 Exchange of Notes		▼															
2.1 Consulting Services Contract			▽														
2.2 Detailed Design/Preparation of T/D		-----	-----														
2.3 Approval of D/D and T/D by MEB				==													
2.4 Tendering (Including prequalification)				====													
2.5 Tender Evaluation				=													
3.1 Construction Contract					◆												
3.2 Preparation of Shop Fabrication Drawings					-----	-----											
3.3 Tempolary Works at Sites					-----	-----											
3.4 Fabrecations and Procurement of E/M					-----	-----	-----										
3.5 Civil and Building Works					-----	-----	-----	-----									
3.6 Ocean and Inland Transportation					-----	-----	-----	-----	-----								
3.7 Construction of Main distribution Lines					-----	-----	-----	-----	-----	-----							
3.8 Installation of Diesel Engine Generator					-----	-----	-----	-----	-----	-----	-----						
3.9 Test and Commissioning					-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	▲
3.10 On-the-Job Training					-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	

- Legend : ▲ : Completion
 T/D : Tender Document
 D/D : Detail Design
 E/M : Equipment and Materials

Attachment-1

(EXDATA2)
[PAGE1]

DATA OF ATOLLS AND ISLANDS (1/3)

(COLO)

Name of Atoll and Islands	Population (Mar. 1990)	Household	Area (x1000m ²)	F.O. No.	Tank of MEB Cap. (m ³)	No. of Electrification Existing	Is. Ongoing Plan
1. Haa Alifu (16/40)	13,830	1,836	16,895			0	
* Dhidhdhoo	2,510		144				1
(Kelaa)	1,348	306	1,986				
Ihavandhoo	1,637	220	600				
Huvarufushi	2,246	180	625	(1)*2	50		
Other	6,089	1,130	13,540	(1)*2	50		
2. Haa Dhall (17/37)	15,016	2,293	20,601				
* Kulhudhuffushi	5,189		1,675	1+(1)*2	37+50	1	
Hanimaadhoo	778		2,708	1+(1)*2	9+50	1	
Nolhivaranfaru	463		1,568				
Other	9,364	2,293	14,650	(1)*2	50		
3. Shaviyan (15/56)	9,986	1,506	15,742			0	
* Farcolhufunadhoo	642	73	803				
Maakadoodhoo	310		891				
Other	9,034	1,433	14,048	(1)*2	50		
4. Noonu (14/79)	9,909	1,408	13,982			0	
* Manadhoo	1,100	170	858				
Holhudhoo	1,514	224	187				
Velidhoo	1,654	320	431				
Other	5,641	694	12,506	(1)*2	50		
5. Raa (16/90)	12,987		9,883			0	
* Ugoofaaruu	842	120	275				
(Kan' dholhudhoo)	504	278	44	(1)*2	50		
Arifushi	1,593	283	444	(1)*2	50		
Maduvvari	1,303	213	170	(1)*2	50		
Hulhudhuffaaruu			500				1
Other	8,745	-894	8,450				
6. Baa (13/80)	8,908	1,145	7,709			0	
* (Eydhafushi)	2,168	249	225	(1)*2	50		
Thulhadhoo	1,870	224	100				
Other	4,870	672	7,384	(1)*2	50		
7. Lhaviyani (7/61)	8,499	1,038	5,532			0	
* (Naifaruu)	3,615	586	156				
(Hinnavaruu)	3,323	430	113				0
Felivaru	0		368	(3)*1	1,200		
Kurendhoo	1,207		197	1	(Not used)		
Other	354	22	4,698	(1)*1	500		
8. Kaafu (9/112)	6,745	920	6,525				
* Thulusdhoo	595		300				1
Kaashidhoo	1381		2,445				
Other	4,769	920	3,780				
9. Male	29,964	---	1,773			1	
10. Alifu (17/47)	5,761	560	7,490			0	
* Mahibadhoo	1,283	157	168				
Maamigili	1260		714				
Other	3,218	403	6,608				
11. Vaavu (6/19)	1,688	213	652			0	
* Felidhoo	398	66	116	(1)*2	50		
Keyodho	532		69				
Other	758	147	467				

Attachment-1

(EXDATA2)
[PAGE2]

DATA OF ATOLLS AND ISLANDS (2/3)

Name of Atoll and Islands	Population (Mar. 1990)	Household	Area (m ²)	Fuel oil tanks		No. of Electrification Is.	
				No.	Cap(m ³)	Existing	Ongoing Plan
12. Faafu (9/25)	3,013	387	1,739			0	
* Magoodhoo	409	103	177				
Nilandhoo	986		450				
Other	1,618	284	1,112				
13. Meemu (5/34)	4,957	619	3,193			0	
* Muli	614	90	276				
Mulah	1015		552	(1)*2	50		
Dhiggaru	960		48	(1)*2	50		
Other	2,368	529	2,317				
14. Dhaalu (8/57)	4,917	647	3,482			0	
* Kudahuvadhoo	1,229	387	600	(1)*2	50		
Meedhoo	771		98				
Other	2,917	260	2,784	(1)*2	50		
15. Thaa (13/68)	10,180	1,176	6,718			0	
* Veymandoo	690	91	423				
Thimarafushi	1,784	208	144	(1)*2	50		
Guraidhoo	1,373	148	180	(1)*2	50		
Vilufushi	1,350	165	144				
Other	4,983	564	5,827	(1)*2	50		
16. Laamu (12/84)	9,793	1,430	18,867				
* Fonadhoo	1,273	231	1,590				
(Gan)	1,667	247	5,124			0	
Kadhoo	0	0	846				
Maandhoo	0	0	540				
Isdhoo	1,328	250	2,958				
Hithdhoo	663		1,056				
Maavah	1,223		318				
Other	3,639	702	6,435				
17. Gaafu Alifu (20/91)	8,287	1,246	8,851				
* Vilingili	2,073	171	534				1
Kedela	0		28	1			
Dhaandhoo	1202		127				
Other	5,012	1,075	8,162				
18. Gaafu Dhaalu (10/159)	13,025	1,809	17,114				
* Thinadhoo	4,478		576	2	78	1	
Gadhoo	1,904	412	222				1
Kadohalagolar	0		45	(1)*1	500		
Other	6,643	1,397	16,271				
19. Gnaviyani (1/1)	7,052	921	4,080				
* Foanulah	7,052	921	4,080	1	40	1	

Attachment-1

(EXDATA2)
[PAGE3]

DATA OF ATOLLS AND ISLANDS (3/3)

Name of Atoll and Islands	Population (Mar. 1990)	Household	Area (sq2)	Fuel oil tanks		No. of Electrification Is.			
				No.	Cap (m3)	Existing	Ongoing	Plan	
20. Seenu (4/43)	20,787	2,389	244,587						
* Hithadhoo	9,398		4,530					1	
Gan	0		2,454	1	112		1		
Feydhoo	3,455		465			(1)			
Maradhoo-Feydhoo	0					(1)			
Maradhoo	3,315		708			(1)			
Hulhudhoo								1	
Meedhoo	0							1	
Other	4,619		236,430						
Total	205,304	0	27,156	415,415	28		10	4	3

- Remarks :
1. Marked with * shows administrative island
 2. Marked with *1 means existing and *2 means under construction facility
 3. Data with () in the column of existing shows energy come from other island by transmission line.
 4. Number after name of atoll means (Inhabited/Non inhabited islands)
 5. Data with () in the column of Fuel Oil Tanks means for fishary use.
 6. population is resistered one.
 7. Source by MEB

Attachment-2

(EXDATA6)

(MALDV1)

POWER DEMAND AND SUPPLY IN MALDIVES BY MEB (1988-1992)

(C110)

No.	Description	Unit	1988	1989	1990	1991	1992	A. I. R. (%)
1.	Installed Capacity	(kVA)	8,760	8,760	10,760	10,760	16,584	17.30
2.	Available Capacity	(kVA)	2,850	2,850	9,395	9,397	13,838	48.44
3.	Peak Demand	(kW)	4,536	4,945	4,893	5,507	6,466	9.27
4.	Average Demand	(kW)	1,854	2,045	2,530	2,949	3,412	16.47
5.	Generated Energy	(MWh)	19,638	21,839	26,513	28,300	30,810	11.92
6.	Power Demand	(MWh)	16,243	17,911	22,160	25,837	29,462	16.05
7.	Power Loss	(MWh)	3,394	3,929	4,353	2,463	903	-28.19
8.	Utilization Factor	(%)	25.6	28.5	28.1	30.0	21.2	-4.59

Remarks : ① : A. I. R. is Average Increase Rate
 ② : (7) = (5) - (6), (8) = (5) / (8760 x (1)) x 100

TRANSITION OF POWER DEMAND AND TARIFF BY SECTOR IN MALDIVES BY MEB (1988-1992)

No.	Description	Unit	1988	1989	1990	1991	1992	A. I. R. (%)
1.	Power Demand	(MWh)						
1)	Residential		7,474	8,238	10,813	12,176	13,538	16.01
2)	Commercial		2,470	2,492	5,506	6,284	7,589	32.40
3)	Industrial		412	347	0	0	0	-100.00
4)	Official		4,089	5,059	3,857	5,104	6,060	10.34
5)	Public (Schools)		0	0	66	63	100	10.95
6)	Other (Islands)		1,798	1,775	1,918	2,210	2,175	4.87
	Total		16,243	17,911	22,160	25,837	29,462	16.05
2.	Tariff	(MRf/kWh)						
1)	Residential		1.16	1.06	1.78	1.81	2.35	19.30
2)	Commercial		3.50	3.50	3.50	3.50	3.94	3.00
3)	Industrial		3.50	3.50	0.00	0.00	0.00	-100.00
4)	Official		2.25	2.25	2.25	2.25	2.99	7.37
5)	Public (Schools)		0.00	0.00	0.00	0.00	2.97	
6)	Other (Islands)		1.50	1.50	1.50	1.50	1.50	0.00
	Average		1.89	1.83	2.26	2.28	2.83	10.67

Remarks : ① : A. I. R. is Average Increase Rate

Attachment-2

(EXDATA6)

[MALE1]

POWER DEMAND AND SUPPLY IN MALE BY MEB (1988-1992)

(C1L0)

No.	Description	Unit	1988	1989	1990	1991	1992	A.I.R. (%)
1.	Installed Capacity	(kVA)	5,272	5,272	7,272	7,272	12,672	24.51
2.	Available Capacity	(kVA)			6,545	6,547	10,622	27.39
3.	Peak Demand	(kW)	3,992	4,391	4,177	4,830	5,569	8.68
4.	Average Demand	(kW)	1,649	1,842	2,311	2,697	3,115	17.24
5.	Generated Energy	(MWh)	17,189	19,558	24,000	25,500	27,439	12.40
6.	Power Demand	(MWh)	14,445	16,136	20,242	23,627	27,287	17.24
7.	Power Loss	(MWh)	2,744	3,422	3,758	1,873	152	-51.49
8.	Utilization Factor	(%)	37.2	42.3	37.7	40.0	24.7	-9.73

Remarks : ① : A.I.R. is Average Increase Rate

② : (7) = (5) - (6), (8) = (5) / (8760 x (1)) x 100

TRANSITION OF POWER DEMAND AND TARIFF BY SECTOR IN MALE (1988-1992)

No.	Description	Unit	1988	1989	1990	1991	1992	A.I.R. (%)
1.	Power Demand	(MWh)						
1)	Residential		7,474	8,238	10,813	12,176	13,538	16.01
2)	Commercial		2,470	2,492	5,506	6,284	7,589	32.40
3)	Industrial		412	347	0	0	0	-100.00
4)	Official		4,089	5,059	3,857	5,104	6,060	10.34
5)	Public (Schools)		0	0	66	63	100	23.09
6)	Other							
	Total		14,445	16,136	20,242	23,627	27,287	17.24
2.	Tariff	(MRF/kWh)						
1)	Residential		1.16	1.06	1.78	1.81	2.35	19.30
2)	Commercial		3.50	3.50	3.50	3.50	3.94	3.00
3)	Industrial		3.50	3.50	0.00	0.00	0.00	-100.00
4)	Official		2.25	2.25	2.25	2.25	2.99	7.37
5)	Public (Schools)		0.00	0.00			2.97	
6)	Other							
	Average		1.94	1.86	2.33	2.35	2.94	10.99

Remarks : ① : A.I.R. is Average Increase Rate

Attachment-2

(EXDATA6)

[GAN1]

POWER DEMAND AND SUPPLY IN GAN BY MEB (1988-1992)

(C1L0)

No.	Description	Unit	1988	1989	1990	1991	1992	A. I. R. (%)
1.	Installed Capacity	(kVA)	2,700	2,700	2,700	2,700	2,700	0.00
2.	Available Capacity	(kVA)	2,160	2,160	2,160	2,160	2,160	0.00
3.	Peak Demand	(kW)	446	370	475	406	406	-2.32
4.	Average Demand	(kW)	181	161	161	169	189	1.18
5.	Generated Energy	(MWh)	2,128	1,805	1,870	1,900	2,170	0.49
6.	Power Demand	(MWh)	1,584	1,413	1,411	1,484	1,660	1.18
7.	Power Loss	(MWh)	544	392	459	416	510	-1.60
8.	Utilization Factor	(%)	9.0	7.6	7.9	8.0	9.2	0.49

Remarks : ① : A. I. R. is Average Increase Rate

② : (7) = (5) - (6). (8) = (5) / (8760 x (1)) x 100

TRANSITION OF POWER DEMAND AND TARIFF BY SECTOR IN GAN (1988-1992)

No.	Description	Unit	1988	1989	1990	1991	1992	A. I. R. (%)
1.	Power Demand	(MWh)						
	1) Residential							
	2) Commercial							
	3) Industrial							
	4) Official							
	5) Public							
	6) Other		1,584	1,413	1,411	1,484	1,215	-6.42
	Total		1,584	1,413	1,411	1,484	1,215	-6.42
2.	Tariff	(MRf/kWh)						
	1) Residential							
	2) Commercial							
	3) Industrial							
	4) Official							
	5) Public							
	6) Other		1.50	1.50	1.50	1.50	1.50	0.00
	Average		1.50	1.50	1.50	1.50	1.50	0.00

Remarks : ① : A. I. R. is Average Increase Rate

Attachment-2

(EXDATA6)
[KULHU1]

POWER DEMAND AND SUPPLY IN KULHUDHUFFUSHI BY MEB (1988-1992)

(C110)

No.	Description	Unit	1988	1989	1990	1991	1992	A. I. R. (%)
1.	Installed Capacity	(kVA)	300	300	300	300	300	0.00
2.	Available Capacity	(kVA)	270	270	270	270	270	0.00
3.	Peak Demand	(kW)	69	85	126	145	152	21.83
4.	Average Demand	(kW)	7	15	24	38	48	61.20
5.	Generated Energy	(MWh)	103	183	290	420	510	49.29
6.	Power Demand	(MWh)	62	129	210	332	420	61.20
7.	Power Loss	(MWh)	40	54	80	88	90	22.11
8.	Utilization Factor	(%)	3.9	6.9	11.0	16.0	19.4	49.29

Remarks : ① : A.I.R. is Average Increase Rate
 ② : (7) = (5) - (6). (8) = (5) / (8760 x (1)) x 100
 ③ : Commercial operation is from April 1988

TRANSITION OF POWER DEMAND AND TARIFF BY SECTOR IN KULHUDHUFFUSHI (1988-1992)

No.	Description	Unit	1988	1989	1990	1991	1992	A. I. R. (%)
1.	Power Demand	(MWh)						
	1) Residential							
	2) Commercial							
	3) Industrial							
	4) Official							
	5) Public							
	6) Other (Average)		62	129	210	332	420	61.20
	Total		62	129	210	332	420	61.20
2.	Tariff	(MRf/kWh)						
	1) Residential							
	2) Commercial							
	3) Industrial							
	4) Official							
	5) Public							
	6) Other		1.50	1.50	1.50	1.50	1.50	0.00
	Average		1.50	1.50	1.50	1.50	1.50	0.00

Remarks : ① : A. I. R. is Average Increase Rate

Attachment-2

(EXDATA6)

[THINA1]

POWER DEMAND AND SUPPLY IN THINADHOO BY MEB (1988-1992)

(C110)

No.	Description	Unit	1988	1989	1990	1991	1992	A. I. R. (%)
1.	Installed Capacity	(kVA)	300	300	300	300	300	0.00
2.	Available Capacity	(kVA)	270	270	270	270	270	0.00
3.	Peak Demand	(kW)	0	63	66	76	82	9.25
4.	Average Demand	(kW)	8	16	19	26	37	46.75
5.	Generated Energy	(MWh)	108	139	180	290	390	37.85
6.	Power Demand	(MWh)	69	136	171	228	320	46.75
7.	Power Loss	(MWh)	39	3	9	62	70	15.75
8.	Utilization Factor	(%)	4.1	5.3	6.8	11.0	14.8	37.85

Remarks : ① : A. I. R. is Average Increase Rate
 ② : (7) = (5) - (6), (8) = (5) / (8760 x (1)) x 100
 ③ : Commercial operation is from April 1988

TRANSITION OF POWER DEMAND AND TARIFF BY SECTOR IN THINADHOO (1988-1992)

No.	Description	Unit	1988	1989	1990	1991	1992	A. I. R. (%)
1.	Power Demand	(MWh)						
	1) Residential							
	2) Commercial							
	3) Industrial							
	4) Official							
	5) Public							
	6) Other		69.0	135.8	170.8	228.2	320.0	46.75
	Total		69.0	135.8	170.8	228.2	320.0	46.75
2.	Tariff	(MRf/kWh)						
	1) Residential							
	2) Commercial							
	3) Industrial							
	4) Official							
	5) Public							
	6) Other		1.50	1.50	1.50	1.50	1.50	0.00
	Average		1.50	1.50	1.50	1.50	1.50	0.00

Remarks : ① : A. I. R. is Average Increase Rate

Attachment-2

(EXDATA6)

[THUL1]

POWER DEMAND AND SUPPLY IN THULUSDHOO BY WEB (1988-1992)

(C1L0)

No.	Description	Unit	1988	1989	1990	1991	1992	A. I. R. (%)
1.	Installed Capacity	(kVA)	188	188	188	188	188	0.00
2.	Available Capacity	(kVA)	150	150	150	150	150	0.00
3.	Peak Demand	(kW)	29	36	48	50	52	15.92
4.	Average Demand	(kW)	9	11	14	19	19	19.63
5.	Generated Energy	(MWh)	110	155	173	190	242	21.83
6.	Power Demand	(MWh)	83	97	126	166	170	19.63
7.	Power Loss	(MWh)	27	58	47	24	72	27.92
8.	Utilization Factor	(%)	6.7	9.4	10.5	11.5	14.7	21.83

Remarks : ① : A. I. R. is Average Increase Rate
 ② : (7) = (5) - (6). (8) = (5) / (8760 x (1)) x 100

TRANSITION OF POWER DEMAND AND TARIFF BY SECTOR IN THULUSDHOO (1988-1992)

No.	Description	Unit	1988	1989	1990	1991	1992	A. I. R. (%)
1.	Power Demand	(MWh)						
	1) Residential							
	2) Commercial							
	3) Industrial							
	4) Official							
	5) Public							
	6) Other		83	97	126	166	170	19.63
	Total		83	97	126	166	170	19.63
2.	Tariff	(MRF/kWh)						
	1) Residential							
	2) Commercial							
	3) Industrial							
	4) Official							
	5) Public							
	6) Other		1.50	1.50	1.50	1.50	1.50	0.00
	Average		1.50	1.50	1.50	1.50	1.50	0.00

Remarks : ① : A. I. R. is Average Increase Rate

Attachment-2

(EXDATA6)
[HANI1]

POWER DEMAND AND SUPPLY IN HANIMAADHOO BY NEB (1988-1992)

(C1L0)

No.	Description	Unit	1988	1989	1990	1991	1992	A. I. R. (%)
1.	Installed Capacity	(kVA)	---	---	---	---	74	
2.	Available Capacity	(kVA)	---	---	---	---	66	
3.	Peak Demand	(kW)	---	---	---	---	20	
4.	Average Demand	(kW)	---	---	---	---	2	
5.	Generated Energy	(MWh)	---	---	---	---	15	
6.	Power Demand	(MWh)	---	---	---	---	10	
7.	Power Loss	(MWh)	---	---	---	---	5	
8.	Utilization Factor	(%)	---	---	---	---	1.4	

Remarks : ① : A. I. R. is Average Increase Rate
 ② : (7) = (5) - (6). (8) = (5) / (8760 x (1)) x 100
 ③ : Commercial operation is from August 1992

TRANSITION OF POWER DEMAND AND TARIFF BY SECTOR IN HANIMAADHOO (1988-1992)

No.	Description	Unit	1988	1989	1990	1991	1992	A. I. R. (%)
1.	Power Demand	(MWh)						
1)	Residential		---	---	---	---	0	
2)	Commercial		---	---	---	---	0	
3)	Industrial		---	---	---	---	0	
4)	Official		---	---	---	---	0	
5)	Public		---	---	---	---	0	
6)	Other		---	---	---	---	10	
	Total		---	---	---	---	10	
2.	Tariff	(MRf/kWh)						
1)	Residential		---	---	---	---		
2)	Commercial		---	---	---	---		
3)	Industrial		---	---	---	---		
4)	Official		---	---	---	---		
5)	Public		---	---	---	---		
6)	Other		---	---	---	---	1.50	
	Average		---	---	---	---	1.50	

Remarks : ① : A. I. R. is Average Increase Rate

Attachment-2

(EXDATA6)

[FOAH1]

POWER DEMAND AND SUPPLY IN FOAHMULAH BY MEB (1988-1992)

(C110)

No.	Description	Unit	1988	1989	1990	1991	1992	A. I. R. (%)
1.	Installed Capacity	(kVA)	---	---	---	---	350	
2.	Available Capacity	(kVA)	---	---	---	---	300	
3.	Peak Demand	(kW)	---	---	---	---	185	
4.	Average Demand	(kW)	---	---	---	---	2	
5.	Generated Energy	(MWh)	---	---	---	---	43	
6.	Power Demand	(MWh)	---	---	---	---	40	
7.	Power Loss	(MWh)	---	---	---	---	3	
8.	Utilization Factor	(%)	---	---	---	---	0.6	

Remarks : ① : A.I.R. is Average Increase Rate
 ② : (7) = (5) - (6), (8) = (5) / (8760x(1)) x100
 ③ : Commercial operation is from October 1992

TRANSITION OF POWER DEMAND AND TARIFF BY SECTOR IN HOAHMULAH (1988-1992)

No.	Description	Unit	1988	1989	1990	1991	1992	A. I. R. (%)
1.	Power Demand	(MWh)						
1)	Residential		---	---	---	---		
2)	Commercial		---	---	---	---		
3)	Industrial		---	---	---	---		
4)	Official		---	---	---	---		
5)	Public		---	---	---	---		
6)	Other		---	---	---	---	40	
	Total		---	---	---	---	40	
2.	Tariff	(Mrf/kWh)						
1)	Residential		---	---	---	---		
2)	Commercial		---	---	---	---		
3)	Industrial		---	---	---	---		
4)	Official		---	---	---	---		
5)	Public		---	---	---	---		
6)	Other		---	---	---	---	1.50	
	Average		---	---	---	---	1.50	

Remarks : ① : A.I.R. is Average Increase Rate

Attachment-3

(EXDATA6)

[INCRE1]

TRANSITION OF POWER DEMAND BY MEB (1988-1992) (1/2)

(C110)

No.	Description	Unit	1988	1989	1990	1991	1992	A. I. R. (%)
1. Maldives								
1)	No. of Consumer	No.	7,875	8,280	9,280	9,490	12,106	11.35
2)	Population	Man					48,056	
3)	Power per Consumer							
a)	Peak	(W)	1,795	1,868	2,057	2,007	2,061	3.51
b)	Average	(W)	695	707	776	877	834	4.68
2. Male								
1)	No. of Consumer	No.	5,778	6,130	7,090	7,244	7,744	7.60
2)	Population	Man					29,964	
3)	Power per Consumer							
a)	Peak	(W)	691	716	589	667	719	1.01
b)	Average	(W)	285	300	326	372	402	8.96
3. Thulusdhoo								
1)	No. of Consumer	No.	89	96	97	113	112	5.91
2)	Population	Man					595	
3)	Power per Consumer							
a)	Peak	(W)	324	375	495	446	464	9.44
b)	Average	(W)	106	115	148	168	173	12.95
4. Gan								
1)	No. of Consumer	No.	645	654	670	679	1,366	20.63
2)	Population	Man						
3)	Power per Consumer							
a)	Peak	(W)	692	565	709	599	298	-19.03
b)	Average	(W)	280	247	240	249	139	-16.13
5. Kulhudhuffushi								
1)	No. of Consumer	No.	778	807	828	855	919	4.25
2)	Population	Man					5,189	
3)	Power per Consumer							
a)	Peak	(W)	88.68894	105	153	169	165	12.01
b)	Average	(W)	9	18	29	44	52	54.63
6. Thinadhoo								
1)	No. of Consumer	No.	585	593	595	599	663	3.18
2)	Population	Man					4,478	
3)	Power per Consumer							
a)	Peak	(W)	0	107	112	127	124	3.92
b)	Average	(W)	13	26	33	43	55	42.23

Attachment-3

(EXDATA6)
[INCRE2]

TRANSITION OF POWER DEMAND BY MEB (1988-1992) (2/2)

(C1L0)

No.	Description	Unit	1988	1989	1990	1991	1992	A. I. R. (%)
8.	Foahmulah							
1)	No. of Consumer	No.	0	0	0	0	1,147	
2)	Population	Man					7,052	
3)	Power per Consumer							
a)	Peak	(W)	0	0	0	0	161	
b)	Average	(W)	0	0	0	0	2	
9.	Feydhoo							
1)	No. of Consumer	No.						
2)	Population	Man					3,455	
3)	Power per Consumer							
a)	Peak	(W)						
b)	Average	(W)						
10.	Maradhoo-Feydhoo							
1)	No. of Consumer	No.						
2)	Population	Man						
3)	Power per Consumer							
a)	Peak	(W)	0	0	0	0		
b)	Average	(W)	0	0	0	0		
11.	Maradhoo							
1)	No. of Consumer	No.						
2)	Population	Man					3,315	
3)	Power per Consumer							
a)	Peak	(W)	0	0	0	0		
b)	Average	(W)	0	0	0	0		

Remarks : Power supply for item No.9, 10 and 11 is made from Gan island.

Attachment-4

(EXDATA1)
(MALE1)

TECHNICAL DATA OF EXISTING GENERATING FACILITIES

(COLO)

Name of Island	Ope. Year	Specification of Engine		Specification of Generator			Method of Synchro.
		Manufacturer	RPM	Manufacturer	Capacity (kVA) Installed Available	Voltage (V)	
1. Male (Note : Unit #4, 7 and 10 are out of order)							
#1	1978	Mirrlees Blackstone	750	Brush	186.25	149	400 Man.
#2	1978	Mirrlees Blackstone	750	Brush	186.25	149	400 Man.
#3	1962	Ruston & Hornsby	600	Lancashire	298.00	207	400 Man.
#5	1978	Yanmar	1000	Taiyo	625.00	469	400 Man.
#6	1978	Yanmar	1000	Taiyo	625.00	469	400 Man.
#8	1972	Mirrlees Blackstone	750	Brush	291.50	231	400 Man.
#9	1972	Mirrlees Blackstone	750	Brush	291.50	231	400 Man.
#11	1984	Yanmar	1000	Taiyo	625.00	469	400 Man.
#12	1986	Mirrlees Blackstone	1000	Markon	656.00	491	400 Man.
#13	1987	Mirrlees Blackstone	1000	Markon	1,487.00	1,055	11,000 Man/Auto
#14	1989	Cunnins	1500	Marathon Electric	1,000.00	851	400 Man.
#15	1989	Cunnins	1500	Marathon Electric	1,000.00	851	400 Man.
#16	1991	Wartsila	750	Leroy Somer	2,700.00	2,500	11,000 Man.
#17	1991	Wartsila	750	Leroy Somer	2,700.00	2,500	11,000 Man.
Sub-total					12,671.50	10,622	
2. Gan (Seenu atoll) : #2 was manufactured at 1959 and others were 1956							
#1	Aug. 1985	Crossely	428	Brush	675	540	3,300 Man.
#2	Aug. 1985	Crossely	428	Brush	675	540	3,300 Man.
#3	Aug. 1985	Crossely	428	Brush	675	540	3,300 Man.
#4	Aug. 1985	Crossely	428	Brush	675	540	3,300 Man.
Sub-total					2,700	2,160	
3. Kulhadhuffushi (Haa Dhaalu)							
#1	Apr. 1988	Cummins	1500	Markon	100	90	400 Man/Auto
#2	Apr. 1988	Cummins	1500	Markon	100	90	400 Man/Auto
#3	Apr. 1988	Cummins	1500	Markon	100	90	400 Man/Auto
Sub-total					300	270	
4. Thinadhoo (Gaafu Dhaalu)							
#1	Apr. 1988	Cummins	1500	Markon	100	90	400 Man/Auto
#2	Apr. 1988	Cummins	1500	Markon	100	90	400 Man/Auto
#3	Apr. 1988	Cummins	1500	Markon	100	90	400 Man/Auto
Sub-total					300	270	
5. Thulusdhoo (Kaafu) : (#3 unit is now out of order which is same size as #1)							
#1	Jul. 1984	Guizho	1500	No name plate	94	75	400 Man.
#2	Jul. 1984	Guizho	1500	No name plate	94	75	400 Man.
Sub-total					188	150	
6. Hanimaadhoo (Haa Dhaalu)							
#1	Jul. 1992	Cummins	1500	Markon	37.5	33	400 Man.
#2	Jul. 1992	Cummins	1500	Markon	37.5	33	400 Man.
Sub-total					75	66	
7. Fuahmulah (Gnaviyani)							
#1	Oct. 1992	Cummins	1500	Leroy Somer	175	150	400 Man.
#2	Oct. 1992	Cummins	1500	Leroy Somer	175	150	400 Man.
Sub-total					350	300	

Attachment-5

(EXDATA1)

[STAFF]

NUMBER OF STAFF

(CILI)

Atoll	Island	①	②	③	④	⑤	Total
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A. Existing Facility

1. Male	Male	46	28	118	153	22	367	
2. Seenu	Gan	9	0	12	31	2	54	
3. Seenu	Feydhoo	-----Staff from Seenu Gan					-----	0
4. Seenu	Maradhoo-Feydhoo	-----Staff from Seenu Gan					-----	0
5. Seenu	Maradhoo	-----Staff from Seenu Gan					-----	0
6. Haa Dhaalu	Kulhudhuffushi	2	2	5	9	5	23	
7. Gaafu Dhaalu	Thinadhoo	3	1	3	11	3	21	
8. Kaafu	Thulusdhoo	-----Under Male's Resister					-----	0
9. Haa Dhaalu	Hanimaadhoo	4	3	3	11	1	22	
10. Gnaviyani	Foahmulah	6	5	13	21	5	50	
Sub-total		70	39	154	236	38	537	

B. Under Construction

1. Haa Alifu	Dhidhdhoo	3	2	3	12	4	24
2. Gaafu Dhaalu	Gadhdhoo	3	2	3	12	4	24
3. Gaafu Alifu	Villingili	3	2	3	12	4	24
4. Raa	Hulhudhuffaaruu	3	2	3	12	4	24
Sub-total		12	8	12	48	16	96
Grand Total		82	47	166	284	54	633

Remarks : ① : Administrative Section
 ② : Accounting Section
 ③ : Electrical Section
 ④ : Engine Room Section
 ⑤ : General Section

Attachment-8

(EXDATA1)

[ELECT1]

DATA OF ELECTRIFICATION ISLANDS (1/2)

Atoll	Name of Island	Plant Area (sq2)	Put-into Commercial Operation	Facility data			Condition		
				Capacity (kVA)	Qty	Volt (V)	Ope.	Stop	Standby
A. Existing Facility									
1. Male	Male : Old			7,272		11 ^{kV} /230V			
	: New		.06.1991	5,400		11,000			
2. Seenu	Gan	1,260	31.08.1985	675	4		2	0	2
3.	Feydhoo		02.02.1988	---	---	---	---	---	---
4.	Maradhoo-Feydhoo		27.07.1992	---	---	---	---	---	---
5.	Maradhoo		27.07.1992	---	---	---	---	---	---
6. Haa Dhaalu	Kulhudhuffushi	792	13.04.1988	100	3	400/231	2	0	1
7. Gaafu Dhaalu	Thinadhoo	707	01.04.1988	100	3	415/240	2	0	1
8. Kaafu	Thulusdhoo		18.07.1984	94	3	415/240	2	1	0
9. Haa Dhaalu	Hanimaadhoo	900	27.07.1992	37.5	2	400/231	2	0	0
10. Gnaviyani	Foahmulah	3,600	--.10.1992	175	2	415/240	2	0	0
Sub-total		7,259		11,279					
B. Under Construction									
1. Haa Alifu	Dhidhdhoo		Dec 1993	100	2	415/240	1	0	1
				75	1	415/240	1	0	0
2. Gaafu Dhaalu	Gadhdhoo		Dec 1993	100	2	415/240	1	0	1
				75	1	415/240	1	0	0
3. Gaafu Alifu	Villingili		Dec 1993				Design is not finished yet		
4. Raa	Hulhudhuffaaruu		Dec 1993	100	2	415/240	1	0	1
				80	1	415/240	1	0	0
Sub-total				557					

Attachment-8

(EXDATA1)

[ELECT1]

DATA OF ELECTRIFICATION ISLANDS (2/2)

(COL1)

Atoll	Name of Island	Rain Water Tank			Well Water Tank			Category of Works			
		Q'ty	U/Cap	Total	Q'ty	U/Cap	Total	①	②	③	④
		(m3)	(m3)	(m3)	(m3)	(m3)					
A. Existing Facility											
1. Male	Male : Old : New									○	
2. Seenu	Gan	1	112	112			○				
3.	Feydhoo									△	
4.	Maradhoo-Feydhoo									△	
5.	Maradhoo									△	
6. Haa Dhaalu	Kulhudhuffushi	1	37	37	2	0.2	0.4	○		○	
7. Gaafu Dhaalu	Thinadhoo							○		○	
8. Kaafu	Thulusdhoo										
9. Haa Dhaalu	Hanimaadhoo	2	1+2	3					○		
10. Gnaviyani	Foahmulah								○		
Sub-total											
B. Under Construction											
1. Haa Alifu	Dhidhdhoo							○		○	
2. Gaafu Dhaalu	Gadhoo										
3. Gaafu Alifu	Villingili							○			
4. Raa	Hulhudhuffaaruu										
Sub-total											

Legend : ① : Fishery ② : Agriculture ③ : Industry ④ : Coral Stone and etc.

Attachment-7

(EXDATA3)
[PAGE1]

STATISTICS OF POPULATION (1989-1992)

(C1L0)

Name of Atoll and Island	1989 Mar.	1990 Mar.	1991 Mar.	1992 Mar.	1993 Jun.	Growth Rate
1. Lhaviyani	6,414	8,499			9,741	
- Naifaru	3,588	3,615	3,769	3,839	3,938	2.21
- Hinnavaru	3,447	3,323	3,710	3,785	3,933	3.15
2. Baa	7,446	8,908			10,031	
- Eydhafushi	2,173	2,168	2,303	2,338	2,408	2.45
3. Laamu	8,782	9,793			11,227	
- Gan		1,667		1,862	1,961	
4. Raa	10,907	12,987		11,303	15,314	
- Kan' dholhudhoo	2,336	2,393	2,630	2,635	2,847	4.76
5. Haa Alifu	11,610	13,830		12,031	16,144	
- Kelaa	1,386	1,348	1,476	1,543	1,615	3.66

Note : Population is resistered one.

(EXDATA3)

STATISTICS OF HOUSEHOLD (1989-1992)

Name of Atoll and Island	1989 Mar.	1990 Mar.	1991 Mar.	1992 Mar.	1993 Jun.	Growth Rate
1. Lhaviyani				1,038	1,322	
- Naifaru	476	502	502	586	583	4.89
- Hinnavaru	421	462	462	430	453	1.74
2. Baa				1,145	1,692	
- Eydhafushi	275	275	275	249	386	8.30
3. Laamu				1,430	1,717	
- Gan				266	275	
4. Raa				1,847	2,815	
- Kan' dholhudhoo	298	298	298	278	340	3.15
5. Haa Alifu				1,836	2,930	
- Kelaa	238	249	279	306	319	7.14