Directorate General of Sea Communications
Ministry of Communications
The Republi of Indonesia

No.

BASIC DESIGN STUDY REPORT ON

THE PROJECT FOR REHABILITATION FOR MEDIUM WAVE RADIO BEACON STATIONS IN THE REPUBLIC OF INDONESIA

November 2000

Japan International Cooperation Agency
Japan Aids to Navigation Association

GR3
CR (1)
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PREFACE

In response to a request from the Government of the Republic of Indonesia, the Government of Japan decided to conduct a basic design study on the Project for Rehabilitation for Medium Wave Radio Beacon Stations and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Indonesia a study team from April 9 to May 19, 2000.

The team held discussions with the officials concerned of the Government of Indonesia, and conducted a field study at the study area. After the team retuned to Japan, further studies were made. Then, a mission was sent to Indonesia in order to discuss a draft basic design, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Indonesia for their close cooperation extended to the teams.

November 2000

Kun ihiko Sato

President

Japan International Cooperation Agency

November 2000

LETTER OF TRANSMITTAL

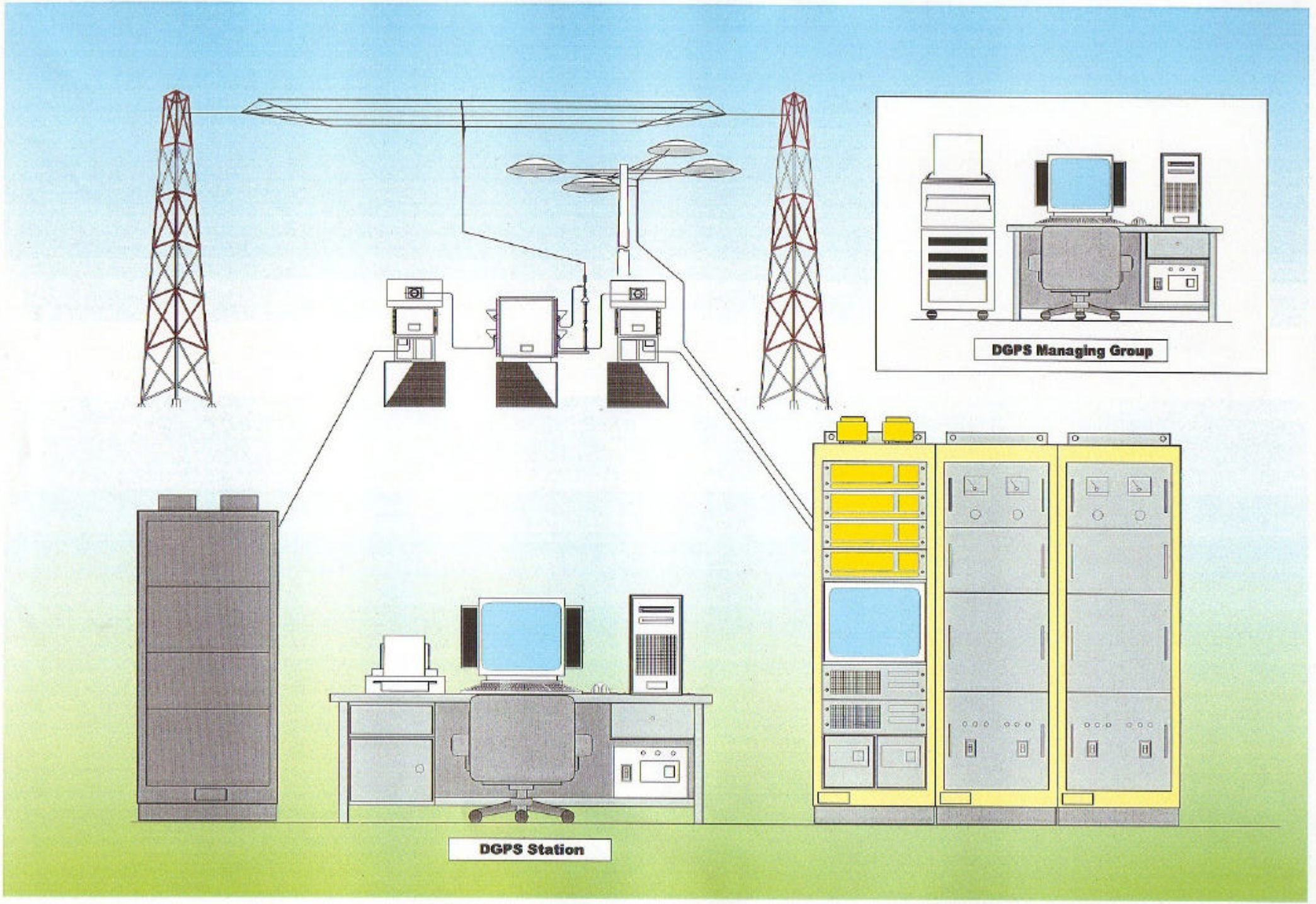
We are pleased to submit to you the basic design study report on the Project for Rehabilitation for Medium Wave Radio Beacon Stations in the Republic of Indonesia.

This study was concerned by Japan Aids to Navigation Association, under a contract to JICA, during the period from March 24, 2000 to November 30, 2000. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Indonesia and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

Finally, we hope that this report will contribute to further promotion of the project.

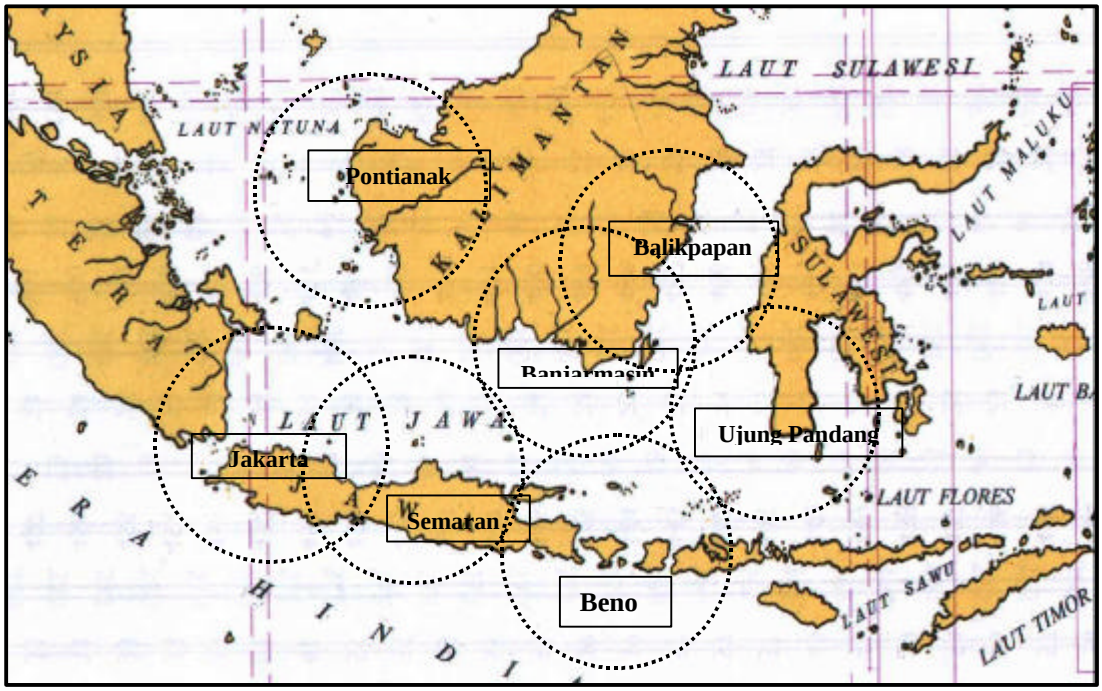
Very truly yours,

Senji Tanaka
Project Manager,
Basic design study team on
The Project for Rehabilitation Medium Wave Radio Beacon Stations
Japan Aids to Navigation Association


DGPS Managing Group
DGPS Station

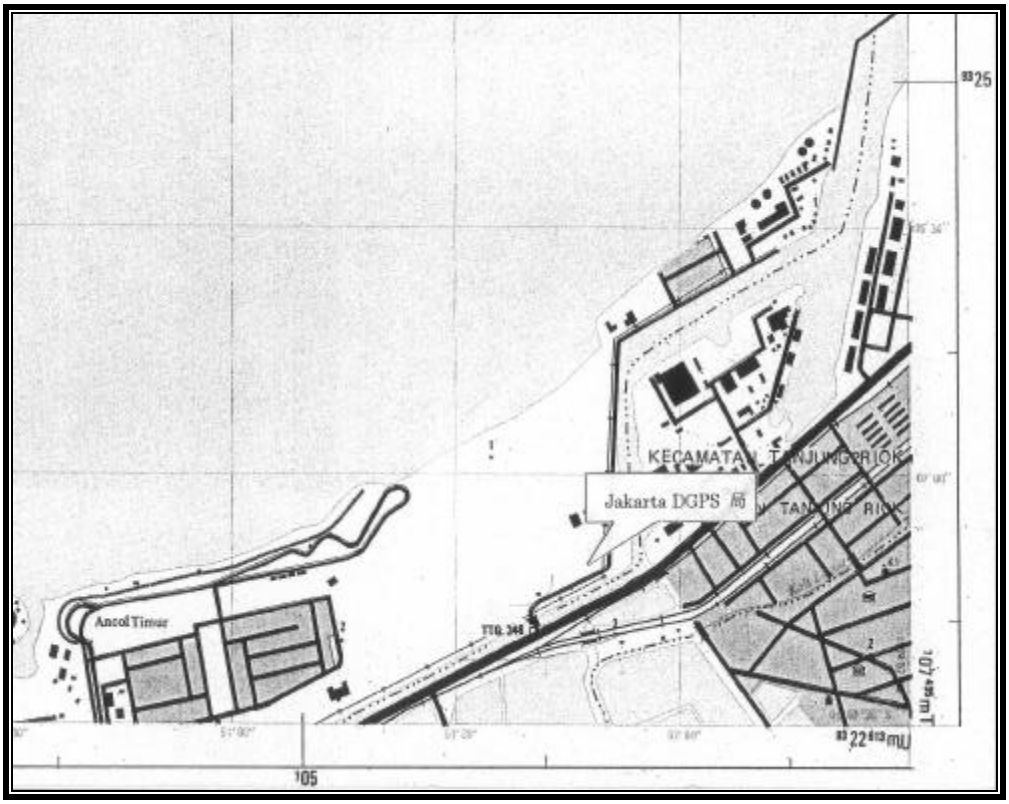
The Project for Rehabilitation for Medium Wave Radio Beacon Stations

Coverage Area of DGPS System

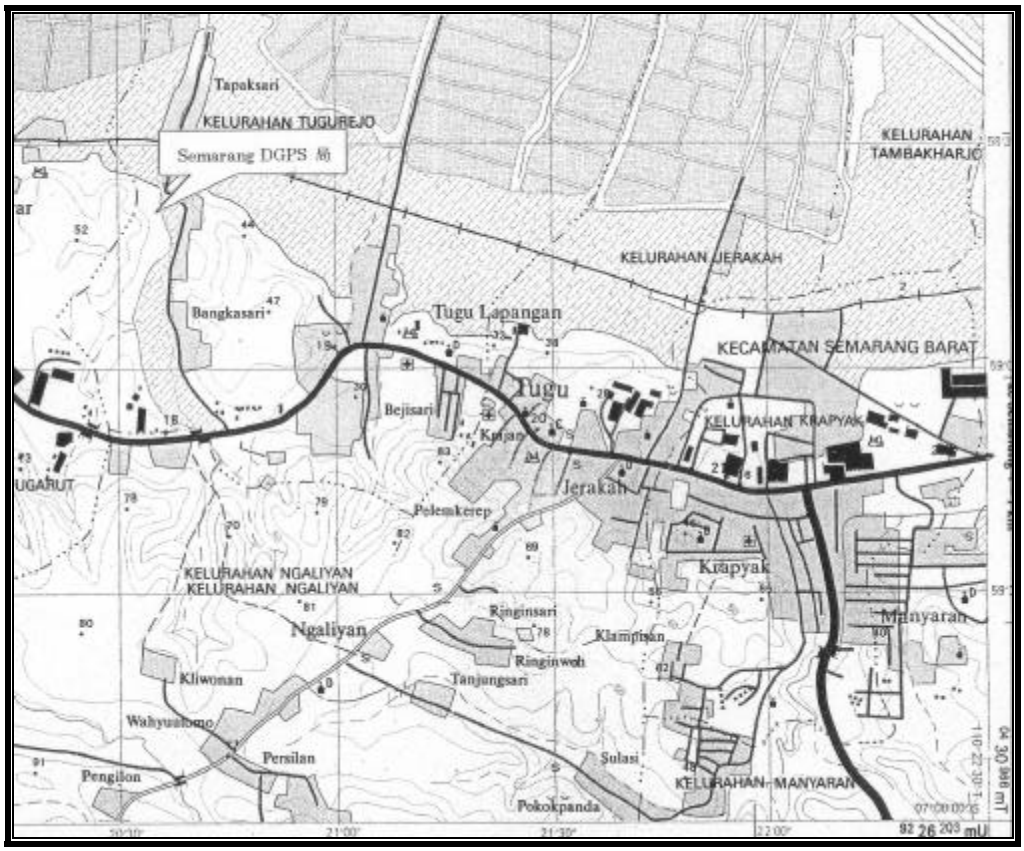


Location Map

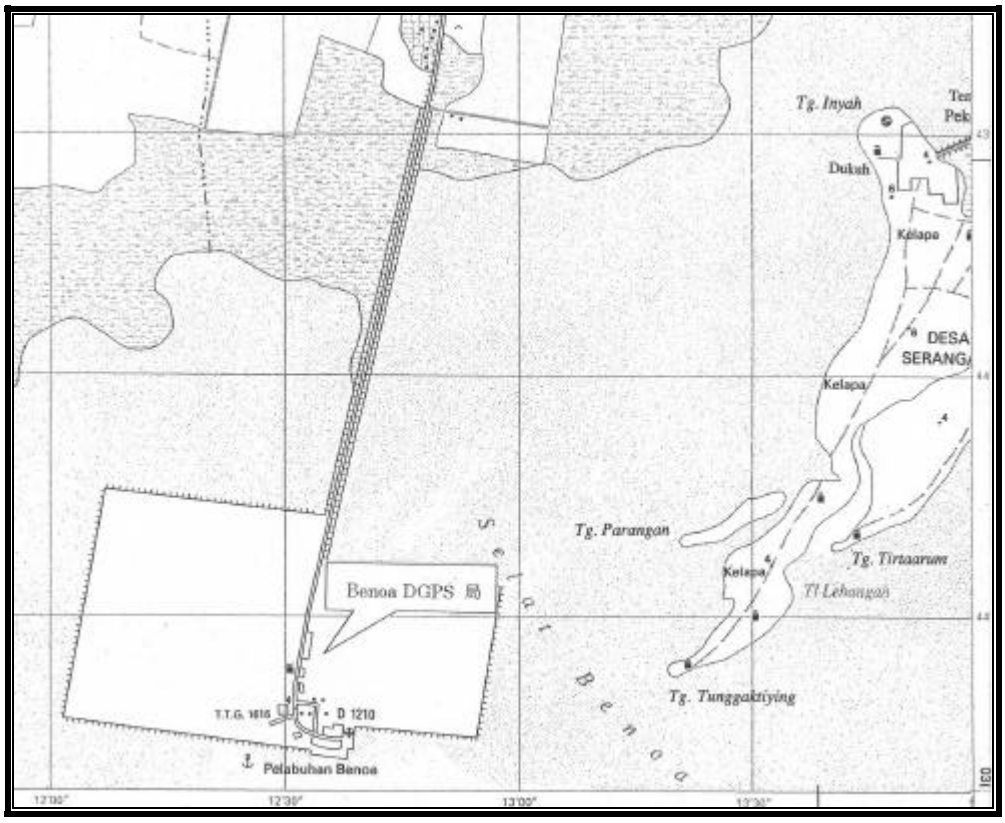
Jakarta DGPS Station (Coastal Radio Transmitting Station)



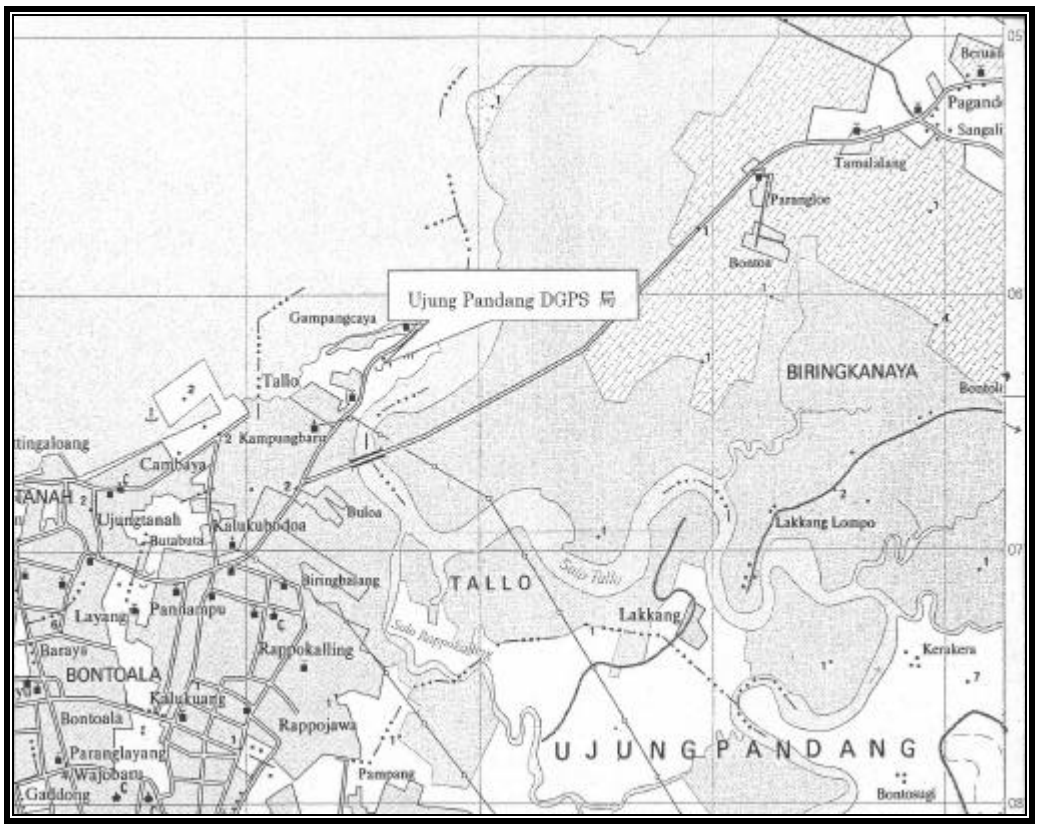
Semarang DGPS Station (Coastal Radio Transmitting Station)



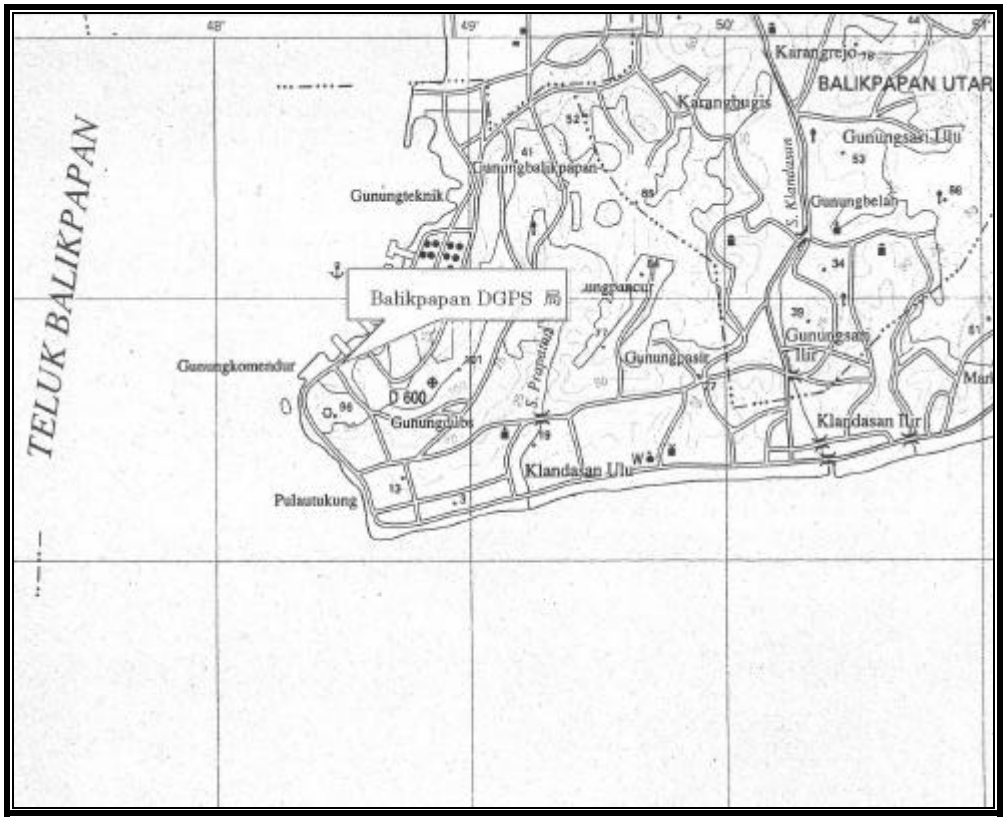
Benoa DGPS Station (Coastal Radio Transmitting Station)



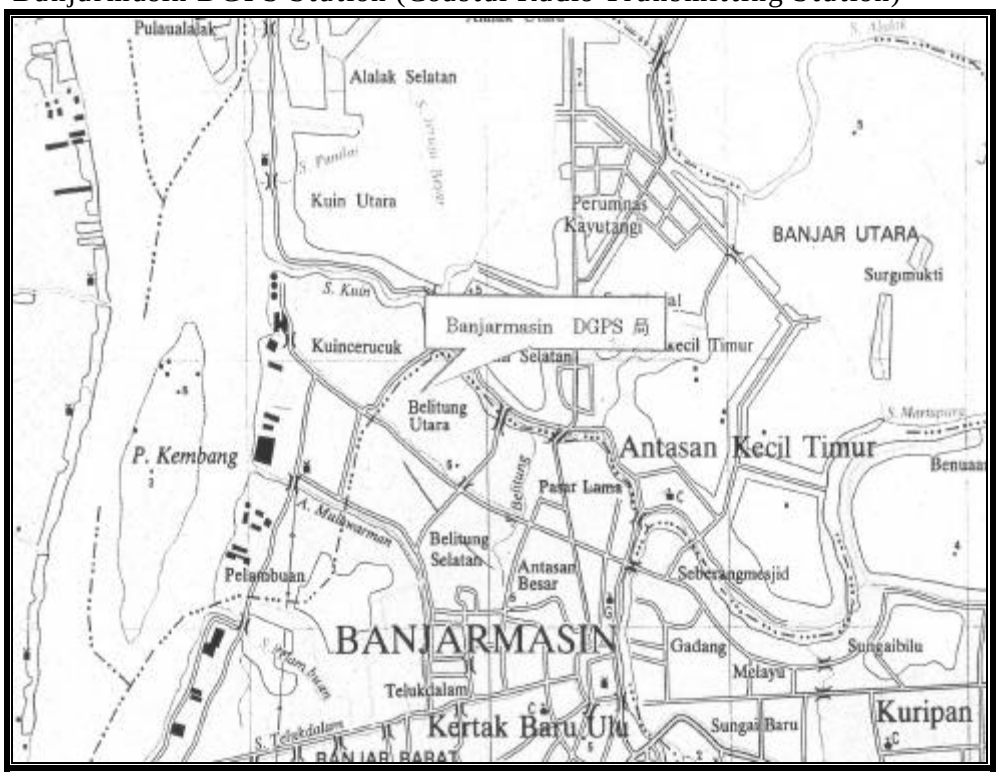
Ujung Pandang DGPS Station (Coastal Radio Transmitting Station)



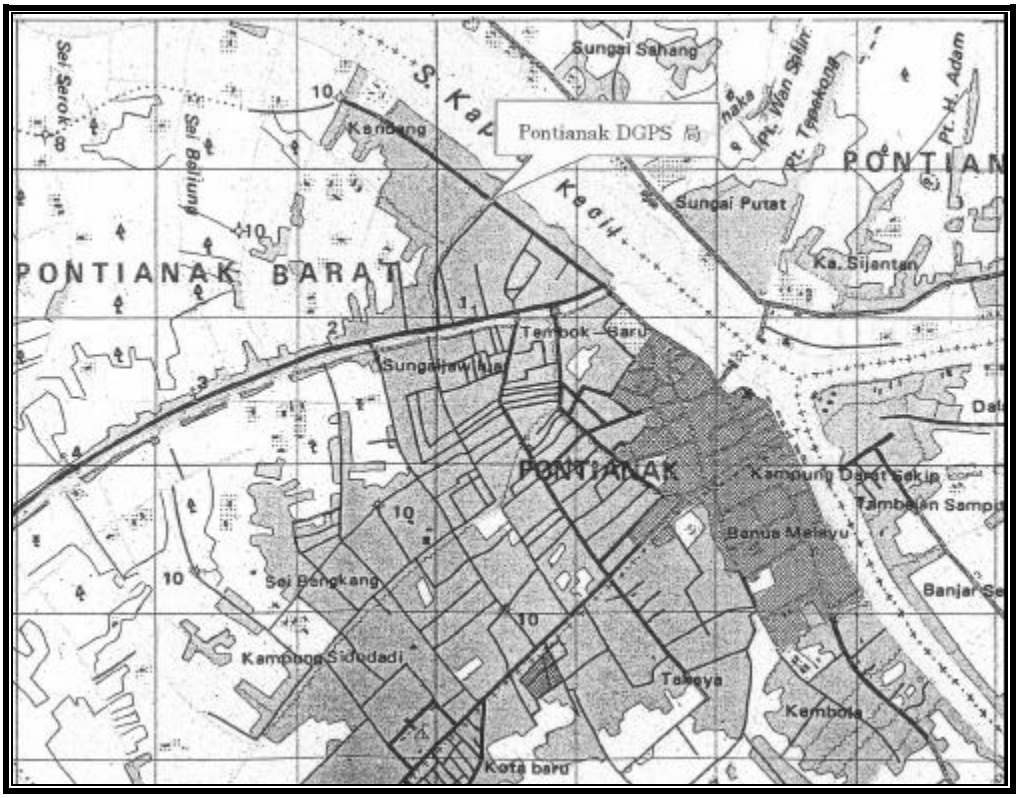
Balikpapan DGPS Station (Coastal Radio Transmitting Station)



Banjarmasin DGPS Station (Coastal Radio Transmitting Station)



Pontianak DGPS Station (Coastal Radio Transmitting Station)



Abbreviations

ABS-95	Absolute Accuracy at 95%
AC	Alternative Current
ADPEL	Administrator Pelabuhan (Port Administrator)
AIS or UAIS	Universal ship-borne Automatic Identification System
AtoN	Aids to Navigation
AVR	Automatic Voltage Regulator
B/A	Banking Arrangements
B/D	Basic Design
BAKOSURTANAL	Badan Kodinasi dan Survei Pemetaan Nasional (National Mapping Survey and Coordination Agency)
BAPPENAS	Badan Perencanaan Pembangunan Nasional (National Development Planning Agency)
BPPT	Badan Pengkajian dan Penerapan Teknologi (Agency for the Assessment and Application of Technology)
C/A	Course Acquisition
CCIR (IRCC)	International Radio Consultative Commission
CD-ROM	Compact Disk Read-only Memory
CH	Channel
CRT	Cathode Ray Tube
CP	Check Point
CPU	Central Processing Unit
D B/D	Draft Basic Design
DC	Direct Current
DCT	Data Communication Transfer
DGPS	Differential GPS
DGSC	Directorate General of Sea Communications
DISNAV	District of Navigation Office
DOP	Dilution of Precision
DRMS	Distance Root Mean Square
E/N	Exchange of Notes
ECDIS	Electric Chart Display Information System
FDD	Floppy Disk Drive
GL	Ground Level
GMDSS	Global Maritime Distress and Safety System
GPS	Global Positioning System
HDD	Hard Disk Drive
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
IAPH	International Association of Ports and Harbors
ICAO	International Civil Aviation Organization
I/F	Interface
IGEB	Interagency GPS Executive Board
IM	Integrity Monitor
IMO	International Maritime Organization
in	Inch
ISO	International Standards Organization
ITU	International Telecommunication Union
JANA	Japan Aids to Navigation Association
JBIC	Japan Bank for International Cooperation
JGC	Japan Coast Guard

JICA	Japan International Cooperation Agency
JIS	Japan Industry Standards
KANPEL	Kantor Pelabuhan (Port Office)
LAN	Local Area Network
M/P	Master Plan
MFB	Medium Wave Radio Beacon
MOC	Ministry of Communications
MSK	Minimum Shift Keying
NAVIGASI	Directorate of Navigation
NMEA	National Marine Electronics Association's standards
OECF	Overseas Economic Cooperation Fund
OS	Operating System
PC	Personal Computer
PCB	Print Circuit Board
PPS	Precise Positioning Service
PRE 95	Predictable Accuracy at 95%
RAIM	Receiver Autonomous Integrity Monitoring
REP 95	Repeatable Accuracy at 95%
RMS	Root Mean Square
RS	Reference Station
RTCM	Radio Technical Commission for Maritime Services
RX	Receiving Station or Receiver
SA	Selective Availability
SAR	Search and Rescue
SII	Standard Industry Indonesia
SOLAS	IMO International Convention for the Safety of Life at Sea
SPS	Standard Positioning Service
SROP	Stasion Radio Pantai (Coastal Radio Station)
SRS	Ship Reporting System
TCP/IP	Transmission Control Protocol/Internet Protocol
TSS	Traffic Separation Scheme
TX	Transmitting Station or Transmitter
UDP/IP	User Datagram Protocol/Internet Protocol
UKC	Under Keel Clearance
UPS	Un-interrupted Power Supply
USCG	United States Coast Guard
VTS	Vessel Traffic Services
WGS	World Geodetic System

Chapter 1 Background of the Project

Indonesia is an archipelago country with about 1.9 million square kilometers of the land area , which is composed of many large and small islands spread in the area, about 5 thousand kilometers east-west and about 2 thousand kilometers north-south. In addition, Indonesia is a maritime country, which has the sea area of about 7.9 million square kilometers including exclusive economic zone.

Indonesia, archipelago and maritime country, is greatly dependent for the inter-islands transportation upon a marine transportation. Therefore, Indonesia has positively promoted many maritime modernization projects on maritime sector such as shipbuilding, harbor, aids to navigation and so forth for promotion of maritime industry.

As a part of this development, eighteen (18) of the Medium Wave Radio Beacon (MFB) Stations were established by Japan's Yen Loan of 1982 fiscal year in order to secure navigation safety and promote efficiency of sea traffic at the seawaters with large traffic volume in Indonesian waters.

However, the MFB stations almost stop their operation by 1996. It is a major reason that the failures of power supply system and so forth were not recovered because of weakness of management and maintenance system including a lack of budget for operation and maintenance, difficulty of access to the sites, complex factors such as lightning attack, salty wind and rain and so forth exceeding pre-estimate at the time of planning of construction. At the present time, only one (1) station of No.1 Sabang MFB is still operated.

In connection with the MFB station, the International Maritime Organization (IMO) and the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) have a concept to introduce Differential GPS (DGPS) for an improvement of ship positioning accuracy as a global system. Many of the MFB station in the world were changed to DGPS station, and the exclusive MFB stations out of subject for the DGPS has been closing. Some DGPS stations have been operated by the neighboring country of Indonesia at Malacca Singapore Strait and waters around its strait. Singapore operates one (1) station, Malaysia operates four (4) stations and India operates one (1) station at least around its Strait.

On the other hand, as the present trend around Indonesian water, Indonesia has established three (3) strategic sea-lanes that are No.1 sea-lane, No.2 sea-lane and No. 3 sea-lane around Sunda strait, Lombok Strait and other waters respectively. Indonesia has approved that foreign warships and other vessels can free navigate at the sea-lanes as a parts of Indonesian waters since 1998. The extension of Traffic Separation Scheme (TSS) and the introduction of Ship Reporting System at Malacca Singapore Strait were decided. Ministry of Sea Exploration and Fishers was newly established along with start of new administrative power. Based on those points, further, Indonesia has been stressing on the policy as a maritime country.

As those circumstances above, the development of aids to navigation facilities, which is the basis of securing navigation safety in maritime traffic, has become

important matter. It is expected that the function of MFB stations, which is available for twenty four (24) hours under all-weather conditions, is voluntarily recovered by Indonesia. However, it is difficult to recover immediately the function of MFB station because of economy crisis of Indonesia.

Therefore, the Government of Indonesia requested Japan's Grant Aids based on the Project for Rehabilitation for Medium Wave Radio Beacon Stations according to the international trend of IMO and so forth, to the Government of Japan on March 1999. The project area requested in the Project is seven (7) stations faced to the most important sea waters. Those MFB stations to be rehabilitated in the Project are re-located and co-sited with the existing Coastal Radio Stations in order to secure the operation and maintenance system for DGPS system.

Chapter 2 Contents of the Project

2-1Objective of the Project

The Project for Rehabilitation for Medium Wave Radio Beacon Stations in Indonesia (hereinafter referred to as “the Project”) has the objective to improve the functionality of the existing MF radio beacon stations (hereinafter referred to as “MFB stations”) installed under the Japanese Yen Loan project by providing those stations with differential GPS for navigation purpose (hereinafter referred to as “DGPS”) that is capable of providing highly accurate aids to navigation services, in order that Indonesia will be able to fulfill its international responsibility as one of the signatories of the SOLAS Convention in keeping improved safety of navigation and promoting efficient marine traffic.

2-2 Basic Concept of the Project

2-2-1 Summary of Study of the Request

(1) Change of Sites under the Request

The study was made on the request of the Republic of Indonesia for relocating seven (7) existing MFB stations to the neighboring coast radio stations. As a result of the study, it was judged to be appropriate that the No.2 Simedan Is. and No. 13 Tg. Mandar MFB stations should be relocated from the request sites Tg. Pandang and Donggala coast radio stations to the Pontianak and Balikpapan coast radio stations respectively. The major reason for change of request sites was that the number of the staff members and the facilities and equipment of the existing coast radio stations to be the request sites are so poor that the system will face difficulties in operation and maintenance management. Therefore, the request sites were changed into other existing coast radio stations that can secure sufficient maintenance personnel. The following seven (7) sites were selected as the relocation sites:

DGPS Station	Coastal radio station	Address
• Jakarta	Jakarta (TX station)	Jl. Ancol Baru No.1 Jakarta Utara
• Semarang	Semarang (TX station)	Jl. Tapak (Tugurejo)
• Benoa	Benoa	Jl. Pelabuhan Benoa
• Ujung Pandang	Makassar (TX station)	J. S. Abdullah No.42, Talo Lama
• Balikpapan	Balikpapan (TX station)	Jl. Yos Soedarso No. 1
• Banjarmasin	Banjarmasin (TX station)	Jl. Palabuhan No. 1 Trisakti
• Pontianak	Pontianak	Jl. Gusti Hamzah No.1

The management system of the coast radio stations as seven (7) sites and the competent District of Navigation Offices was also examined. As a result, it was judged that the DGPS personnel necessary for the Project are available at these stations. The natural conditions at these sites have no problem in operating the system in a continuous and stable manner. The effective coverage of the DGPS system at each site includes the main commercial ports and port areas. In particular, the DGPS systems at Jakarta and Benoa sites and so forth cover the important international straits and the sea-lanes established by Indonesia.

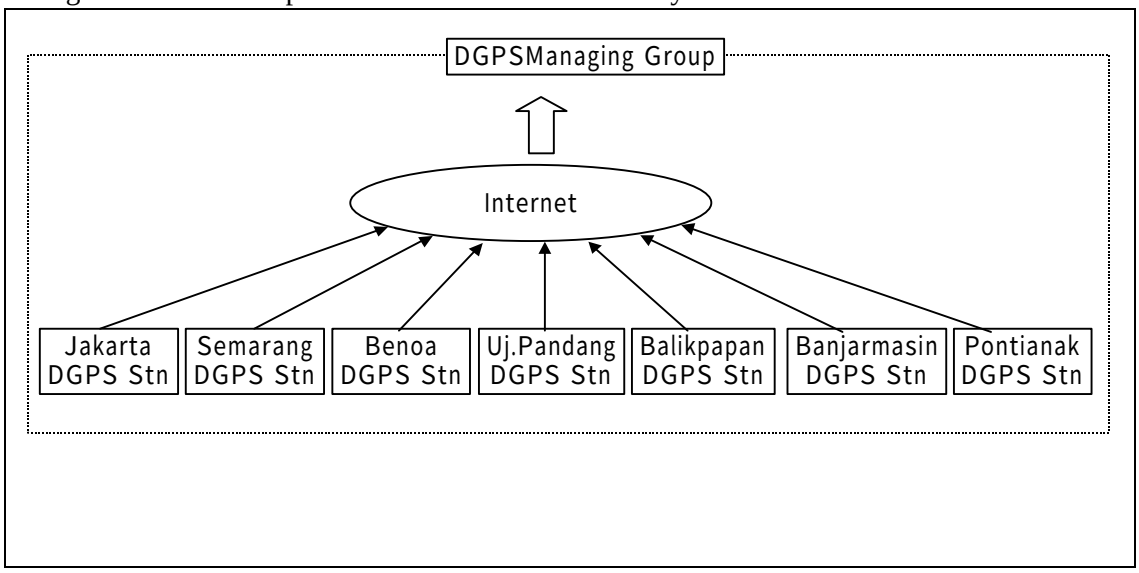
As described above, the seven (7) target sites were judged to be appropriate for implementation of the Project.

(2) Operation and Maintenance Management System

Most of the existing MFB stations constructed under the Japanese Yen Loan had suspended their operation several years after their opening because of lack of operation and maintenance costs and weakness of the operation and maintenance management system. In the Project for rehabilitation of the existing MFB stations, the study of project sustainability was implemented as one of the most important issues. As a result, the Indonesian counterpart explained the plan of raising the fund for the operation and maintenance costs for the aids to navigation-related facilities from the Light Due enforced in June 2000. However, no official report on the collection of Light Due has been issued yet in the middle of August this year.

For the operation and maintenance system, the Plan of DGPS Operation and Maintenance System as shown in Fig - 1 below was drafted. In this plan, the DGPS Managing Group having the overall responsibility for the operation and maintenance of the system will be established in the Directorate General of Sea Communication (hereinafter referred to as "DGSC"), Ministry of Communications (hereinafter referred to as "MOC)" and at least two dedicated maintenance technicians will be assigned to each DGPS station. Therefore, it is deemed that the continuous and stable operation and maintenance of the system will be secured.

Fig－**1** DGPS Operation and Maintenance System Plan



(3) Possibility of Reuse of Existing Equipment and Facilities of Existing MFB Stations

In the Project, it was planned to install a DGPS station at each of seven (7) coast radio stations, and the study of whether some of the existing equipment and facilities at the existing MFB stations can be reused was made, especially focusing on the transmitting antennas and the engine generators. As a result, it was made clear that no equipment and facilities could be reused for the Project for the following reason:

Maintenance such as coating or change of Guy wires had never been made for

the transmitting antennas after their construction, so that it will be very difficult to reuse these antennas for next ten (10) years or more. The engine generators do not meet the requirement for the power capacity necessary for the Project and could not be reused in the Project.

(4) Study of Frequency Allocation in Redeployment of Rehabilitated Stations

As seven (7) rehabilitated stations will be re-deployed to expand their effective coverage, it is needed to coordinate various problems including interference with the existing MF aeronautical beacon stations with the frequency authority concerned before implementation of the Project.

(5) Response to Lightning Troubles

In general, there is a difficulty in taking absolutely secure measures against lightning, but it is required to take any adequate measures for new antennas and other equipment to be installed in the Project.

(6) Baseline Analysis

At each of the stations to be rehabilitated, the positions of two points (point A and point B) within the sites were measured to determine the base points for the system. The results of the baseline analysis made on each point is shown in Table 1:

Table 1 Analysys Point for Reference Station Datum ：WGS-84

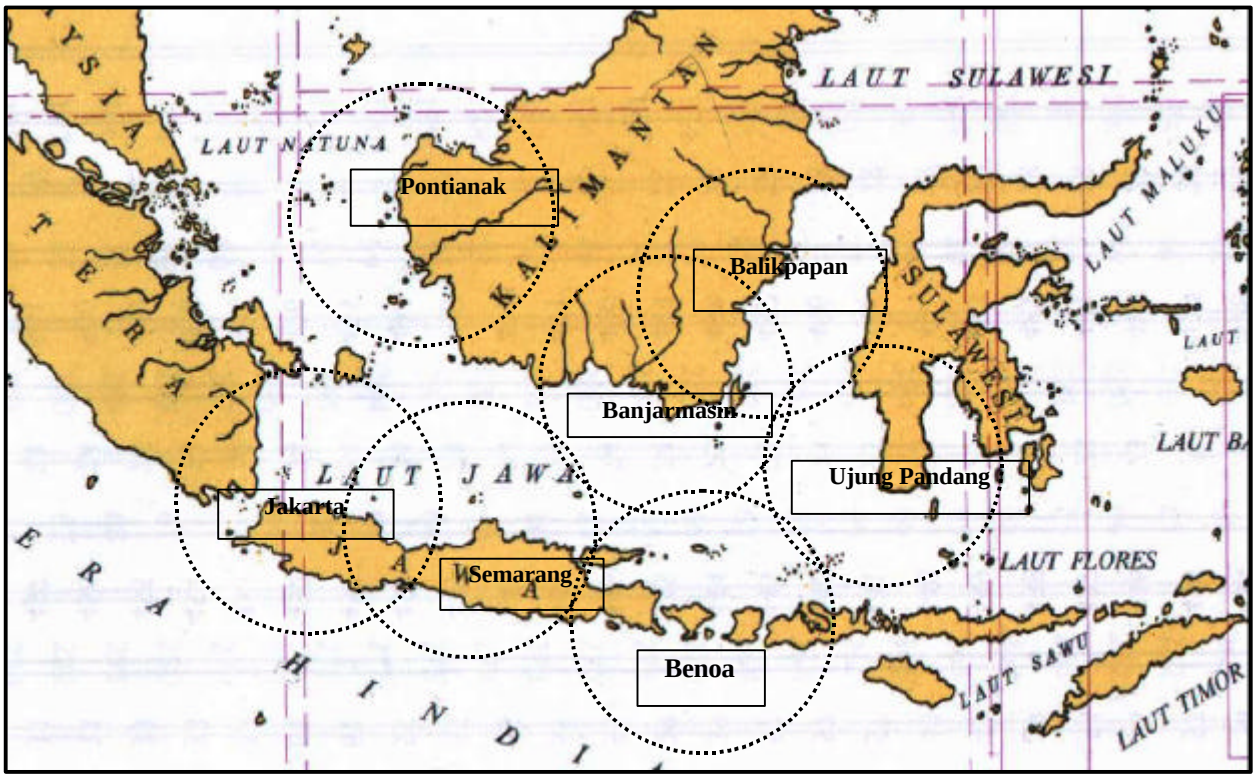
Station	Analysis Points	Latitude	Longitude
Jakarta	A	S 06 ° 07 ′ 08.19820 ″	E 106 ° 51 ′ 47.66374 ″
	B	S 06 ° 07 ′ 08.32962 ″	E 106 ° 51 ′ 47.25311 ″
Semarang	A	S 06 ° 58 ′ 34.96703 ″	E 110 ° 20 ′ 34.57313 ″
	B	S 06 ° 58 ′ 35.15373 ″	E 110 ° 20 ′ 35.92469 ″
Benoa	A	S 08 ° 44 ′ 35.47796 ″	E 115 ° 12 ′ 35.15003 ″
	B	S 08 ° 44 ′ 36.24779 ″	E 115 ° 12 ′ 34.96632 ″
Ujung Pandang	A	S 05 ° 06 ′ 22.84262 ″	E 119 ° 26 ′ 31.75777 ″
	B	S 05 ° 06 ′ 21.59272 ″	E 119 ° 26 ′ 32.26951 ″
Balikpapan	A	S 01 ° 16 ′ 12.36637 ″	E 116 ° 48 ′ 32.02178 ″
	B	S 01 ° 16 ′ 12.59811 ″	E 116 ° 48 ′ 31.70571 ″
Banjarmasin	A	S 03 ° 18 ′ 09.31199 ″	E 114 ° 34 ′ 38.49799 ″
	B	S 03 ° 18 ′ 08.78100 ″	E 114 ° 34 ′ 37.80763 ″
Pontianak	A	S 00 ° 01 ′ 16.72827 ″	E 109 ° 19 ′ 02.57480 ″
	B	S 00 ° 01 ′ 16.37295 ″	E 109 ° 19 ′ 04.10474 ″

3-2-2 Outline and Concept of the Project

The Basic concept of this plan is that seven (7) DGPS Stations are installed at existing coastal radio stations where commercial power source is available. The DGPS technique is applied to the DGPS Stations to serve a stable and high accuracy positioning information with Integrity of the system to the vessel that can navigate in more safety and have high efficiency in aspect of navigation.

The service area of each DGPS Station is shown as Figure –2 “Service Coverage of DGPS Stations”.

Figure - 2 Service Coverage of DGPS Stations



The DGPS system is designed based on the following basic concept;

- Compliance with International standard and Indonesian Law.
- Establishment of long-term operation.
- Securing stable operation of system and easy maintenance.
- Minimization of maintenance cost
- Consideration of environmental condition.
- Rehabilitation of the existing Equipment on the DGPS system
- Maximal utilization of existing equipment and facilities
- Securing the stable operation and maintenance system

2-3 Basic Design

2-3-1 Design Concept

(1) Consideration for Environmental Conditions

The following points shall be considered for the procurement of equipment and materials in the light of the environmental conditions in Indonesia.

- The adequate operational temperature range is applied for Outdoor and Indoor equipment respectively.
- Waterproof mechanism is applied for Outdoor equipment.
- Operational temperature of “40°C” is applied to Outdoor equipment.
- Wind load of “45m/s” is applied to Outdoor equipment.
- Seismic factor is complied with Indonesian Standard.
- Operational temperature of “35°C” and relative humidity of “98% at “35°C” with no condensation are applied to Indoor equipment except Personal Computer (PC) and its peripheral.
- The PC and its peripheral are complied with standard temperature specification that is applied usually in market.
- Improvement of existing anti-lightning apparatus is carried out to reinforce anti-lightning ability. And the Dissipation Array System (DAS) is provided in Semarang to prevent damage for the newly installed GPS antenna by cause of lightning where there are no anti-lightning facilities.

(3) Practical use of Local Contractor

- Engineer of manufacture carries out an adjustment works for equipment because DGPS system is first adoption in Indonesia.
- Local engineer and technician carry out an installation works for equipment under control by Engineer of manufacture.

(4) Countermeasure for ability of Operation and Maintenance by the executing Agency

The DGSC and Survey team has been agreed as follows;
Immediately after the signing of the Exchange of Notes (E/N) on the Project under the Japan’s Grant Aid, the DGPS Managing Group is newly established in DGSC to manage and control the DGPS system. The DGPS Managing Group composes of adequate staffs and leader. Two maintenance personnel at least are assigned for each DGPS Station.

Head of the DGPS Managing Group is recommended to join the counter part training to have knowledge regarding the securing of a budget, establishment of management group, arrangement of staffs, training plan and operation and maintenance schedule for management of the DGPS Station.

Chief of Technical Engineer is recommended to join the counterpart training and On-the-job Training (OJT) for having of knowledge regarding latest technology, and technique of maintenance and operation.

Even though DGSC is able at present to secure two personnel as engineer,

(Table 2), for operation and maintenance of DGPS Station system, the technical training is important to have the more skilled engineer for maintenance and operation in future.

Table 2 List of staffs of Coastl Radio Stations

Name of station (Class)	Station Master	Chief Tech-Nician	Mar-conis	Tech-nician	Total
Jakarta (I)	1	1	96	21	119
Uj. Pandang (I)	1	1	46	11	59
Balikpapan (II)	1	1	15	7	24
Banjarmasin (II)	1	1	22	12	36
Semarang (II)	1	1	31	10	43
Benoa (III)	1	0*	23	1	25
Pontianak (III)	1	0*	18	1	20

Training course for maintenance engineer has been postponed in latest three (3) years because of lacking of budget. The resumption of training course is advised in DGSC to skill up and maintains technical level of engineers.
Maintenance engineers for DGPS Station are advised to skill up by carrying out of Soft-component by JICA and the OJT that will be done by the manufacturer.

(5) Scope of Building and Equipment, Setting of grade

The Project provides no building work because installation space for equipment is available to secure by re-allocation of existing equipment or furniture at each existing coastal radio station.

The DGPS system requires the high-grade (high reliability) equipment in order to offer high accuracy positioning information, even if it is a severe environmental condition for vessel navigating coastal of Indonesian waters in safety.

(6) Concept of the Implementation schedule

In case the Project is carried out under the Japan's Grad Aid, the Project shall be completed usually in a fiscal year. The fifteen-(15) months of implementation period are required from contract to complete the Project. Degradation of outdoor work efficiency will be made on a rainy season from December in Indonesia.

To complete the Project by the target date, the foundation work of tower and embedding work of cable is planed to carry out before the beginning of rainy season.

The Implementation schedule shall be discussed on time with staff of coastal radio station because the system for DGPS Station is planed to co-use with the existing equipment of T-type antenna, Antenna matching unit and Power supply system as a component of the new system.

2-3-2 Basic Design

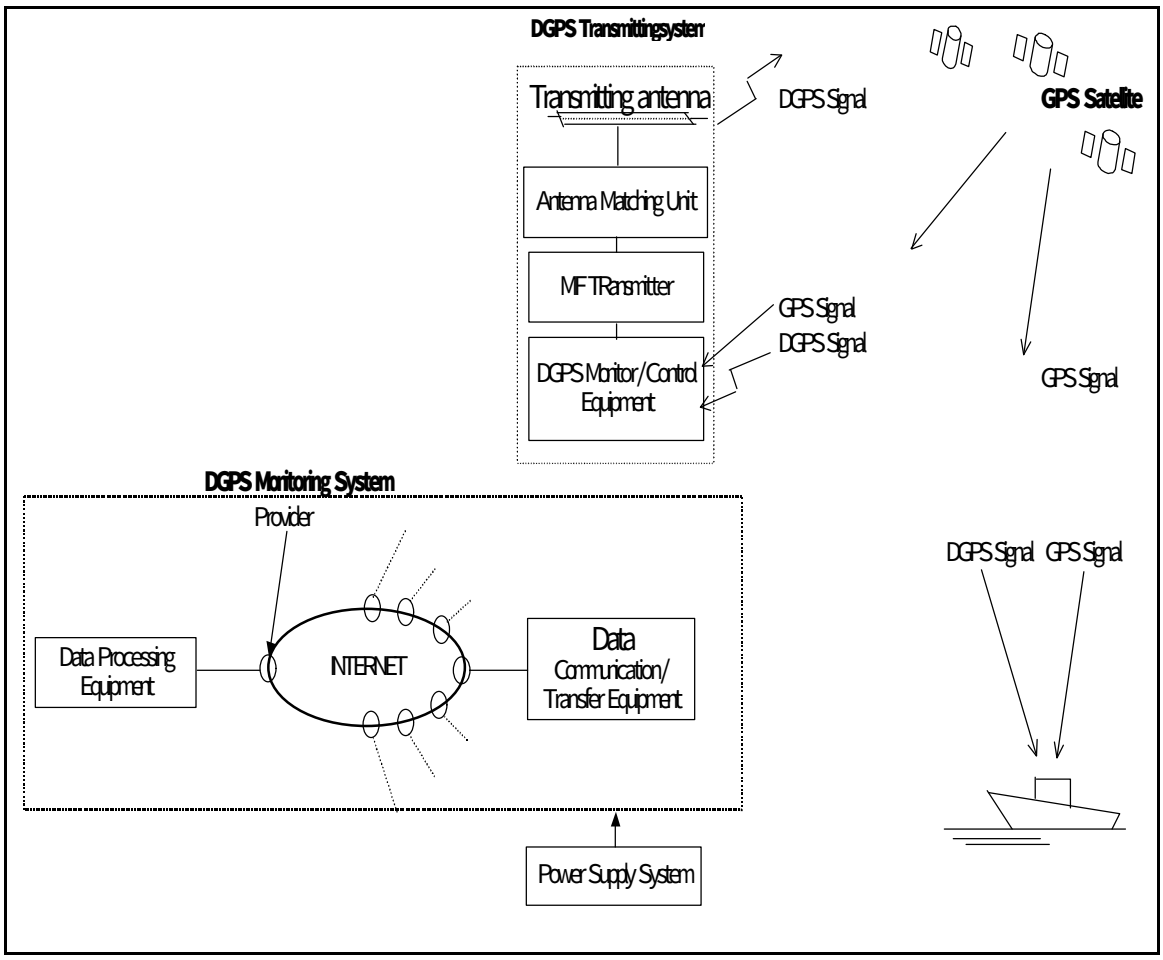
2-3-2-1 Overall Plans

(1) Outline of the system

The DGPS system composes mainly of “DGPS transmitting system” and “DGPS monitoring system” as shown in Fig 3. The DGPS transmitting system composes of a transmitting antenna, antenna-matching unit, MF Transmitter and DGPS monitor/control equipment. The DGPS monitoring system composes of Data communication/transfer equipment and Data processing Equipment that are able to communicate each other by INTERNET. The DGPS Managing Group is finally able to have the DGPS monitoring data of seven (7) stations.

Power supply system and air-conditioner are improved or reinforced upon consideration of actual situation of each station. The navigation vessel at the service coverage of DGPS stations is able to not only use DGPS signal for correction of vessel position, but also confirm the Integrity of system that guarantees positioning accuracy.

Figure 3 DGPS System Outline



(2) Allocation Plan of Main Equipment for Seven (7) Stations

Allocation Plan of main equipment for seven (7) stations is shown in Table 3;

Table 3 Allocation Plan of Main Equipment

Main Equipment	JKT	SMG	BNA	UPG	BPN	BJM	PTK	DMG
1. DGPS Transmitting System								
(1) Transmitting Antenna	○	○	○	○	○	○	○	
(2) Antenna Matching Unit	○	○	○	○	○	○	○	
(3) Antenna tower	○	○	○	○	○	○	○	
(4) MF Transmitter	○	○	○	○	○	○	○	
(5) DGPS Monitor/Control	○	○	○	○	○	○	○	
(6) Software for (5) above.	○	○	○	○	○	○	○	
2. DGPS Monitoring System								
(1) Data Processing Equipment								○
(2)Data Comm./transfer Equip.	○	○	○	○	○	○	○	
(3) Software for (2) above.	○	○	○	○	○	○	○	
3. Power supply system								
(1) Engine Generator			○	○			○	
(2) Isolation transformer			○		○	○	○	
(3) Automatic Voltage Regulator			○		○	○	○	
(4) Step-up/down	○			○	○	○		
4. Interference Protection Equipment			○				○	
5. Associated facility								
(1) Anti-lightning facility		○	○				○	
(2) Air conditioner			○	○	○			
6. Operation & Maintenance Equipment	○	○	○	○	○	○	○	
7. Spares	○	○	○	○	○	○	○	○

Note: JKT: Jakarta, SMG: Semarang, BNA: Benoa, UPG: Ujung Pandang,
BPN: Balikpapan, BJM: Banjarmasin, PTK: Pontianak, DMG: DGPS Managing Group

(3) Circumstances of Operation at Coastal Radio Stations

The coastal radio station where DGPS Station will be installed is categorized as Class I, Class II and Class III. Criteria to categorize coastal radio station are shown in Table 4.

Table 4 Criteria of Coastal Radio Stations in Indonesia

Category	Transmitting Power	Operation Time Schedule	TX and RX Station	Seven (7) stations for the Project
Class **I**	**1** kW～**5** kW	24 hours	Separate	Jakarta, Uj. Pandang
Class **II**	500W	16～18 hours	Separate	Semarang Balikpapan Banjarmasin
Class **III**	250W	**8** hours	Co-site	Benoa Pontianak
Class **IV**	100W	Intermittent operation	Co-site	---------

There are some discrepancies between the actual operation schedule and the schedule above, in aspect of Transmitting Power and Operation Time Schedule because those criterions have been applied before establishment of GMDSS. For example, even though some coastal radio stations are Class II and III, the 24 hours operation has been adopted. The only Pontianak coastal radio station out of seven (7) stations adopts of thirteen (13) hours operation. Other stations adopt 24 hours operation. Pontianak station will adopt 24 hours operation when the DGPS Station is established.

(4) Power supply system and Backup for system

The existing power supply system is utilized as possible as subject to the securing of operation and maintenance in coming ten (10) years. The un-interrupted Power Supply (UPS) with batteries is adopted in minimum for important part as personal computer (PC) that controls and monitors DGPS system. The supporting time duration by UPS is designed of twenty (20) minutes in maximum because the output of engine generator (E/G) system will be established within ten (10) minutes after commercial power off.

2-3-2-2 Equipment Plan

Purposes and Specifications of main equipment for DGPS Station are specified as follows.

(1) DGPS Transmitting System

The MF Transmitter and DGPS Monitor/Control equipment have a duty and a standby those are able to exchange automatically when malfunction will be detected. Purpose, specification and quantity of main equipment is shown in Table 5.

Table 5 Main Equipment for DGPS Transmitting System

Name of equipment	Purpose	Main specification	Q'ty
1.Transmitting Antenna	Simultaneous transmission of two frequencies by one antenna.	T-type, Medium frequency, five(5) element, Rated power: 1/5kW, Anti-corrosion type	7
2. Antenna matching			
a. Combiner	Combine of output for NAVTEX/TG and DGPS system	Rated power:1kW except Jakarta, 5kW for Jakarta、Outdoor type	7
b. Antenna Matching Unit	Matching of impedance for Antenna and transmitter	Rated power:1kW、Outdoor type	7
3. Antenna Tower (Only for SROP Benoa)	Supporting of T-type antenna installed newly.	30m Height、Hot-dipped galvanize:500g/m²、Self supporting、Flat base foundation	7
4. MF Transmitter	Transmitting correct information for DGPS Station system.	RF output power:1kW、All solid stated、Frequency band: 285 - 325kHz、MSK modulation、Consumable power: 4kVAor less、Duty and Standby	7

Name of equipment	Purpose	Main specification	Q'ty
5. DGPS Monitor/ Control Equipment	Reference Station (RS) Unit (Creating Position Correction Information, and send to transmitter) Integrity Monitor Unit (Securing System Integrity) Monitor and Control Unit (Securing of Monitor/Control functions for DGPS Transmitting system)	2 freq. model、RS functions、Mask of each 0.5°steps、RSIM Monitoring、Unti-multi-pass, Waterproof of Ant., Ant for 2 freq. type、Duty and standby. 1 freq. model、IM functions、Mask Angle of each 0.5°steps、Unit-multi-pass, Waterproof of Ant., GPS Ant for 2 freq. type、High electro-magnetic field type Duty and standby CPU:32bits or more、Clock:200MHz or more, Memory::64MB or more、HDD:4GB or more、CD-ROM・FDD、WinNT4.0 latest English Version、Monitor:14 inch、Monitor/ control functions、UPS, LAN:100/10Base-T、Duty and Standby	7
6. Software for DGPS Monitor/Control Equipment	Control and Monitor function for MF Transmitter DGPS Monitor/ Control Equipment	Application Software	1

(2) DGPS Monitoring System

The operation and monitoring system composes of Data communication/transfer equipment and Data processing equipment. The Data communication/transfer equipment is installed at seven (7) coastal radio stations and Data processing equipment is installed at DGSC Jakarta. Purpose, specification and quantity of each equipment is shown in Table 6.

Table 6 Main Equipment for DGPS Monitoring System

Name of equipment	Purpose	Main specification	Q'ty
1. Data processing Equipment	Receiving of Monitoring data, Data Processing, Display, Print out, Calculation of Statistics for DGPS Station, Analyze of Operational status	CPU:32bits or more、Clock:500MHzor more、Memory::64MB or more、HDD:4GB or more、CD-ROM・FDD、Win-NT4.0 latest English Version、Color Laser Printer: 600dots or more A4&A3、Monitor: 17 inch 1027x768dots or more, with Modem, UPS and Integrated application software including spreadsheet, word processor and mailing software at least	1

Name of equipment	Purpose	Main specification	Q'ty
2. Data Communication/ Transfer Equipment	Sending of monitoring data for DGPS Station, Editing of data, Data processing, Display, Print out of processed data	CPU:32bits or more、 Clock:500MHzor more、 Memory::64MB or more、 HDD:4GB or more、 CD-ROM・FDD、 Win-NT4.0 latest English Version、 Ink jet Printer (A4) or more、 Monitor：15 inch 1027x768dots or more, with Modem, UPS and Integrated application software including spreadsheet, word processor and mailing software at least.	7
3. Software for DGPS Monitoring System	Operation and monitor function for DGPS system	Application Software	1

(3) Anti-lightning Facilities

Improvement of anti-lightning facilities and installation of Dissipation Array System are done to prevent damage caused by lightning for newly installed equipment. Purpose, specification and quantity of each equipment is shown in Table 7.

Table 7 Main Equipment for Anti-Lightning Facilities

Name of equipment	Purpose	Main specification	Site	Q'ty
1. Dissipation Array System	Prevention of damage for DGPS equipment by discharging continuously of lightning power.	Dissipation Array System shall cover GPS antenna.	Semarang	1
2. Improvement of anti-lightning facilities	Prevention of damage for DGPS equipment by bypassing of lightning power.	Protection angle 45°, Earth resistance: 10 ohm or less	Semarang (2), Benoa (2), Pontianak (2)	6

(4) Power Supply System

The existing power supply system is basically utilized as backup power system for DGPS Station. Improvement and rehabilitation works are done for the aged power supply system and the lacking of power supply capacity. Purpose, specification and quantity of each equipment is shown in Table 8.

Table 8 Main Equipment for Power Supply System

Name of equipment	Purpose	Main specification	Site	Q'ty
1. 15kVA Engine Generator	Backup of commercial power supply	Rated capacity:15kVA 50Hz、 Output voltage: AC380/220V3P4W、 Local Control Panel、 Day tank	Benoa, Pontianak	2

Name of equipment	Purpose	Main specification	Site	Q'ty
2. 50kVA Engine Generator	ditto	Rated capacity:50kVA 50Hz、Output voltage: AC380/220V3P4W、Local Control Panel、Day tank	Uj. Pandang	1
3. Isolation Transformer	Protection for lightning	Rated capacity:15kVA、Input:AC380/220V3P4W、Output:AC380/220V3P4W、Discharge capacity:15kA Continuous operation	Benoa, Pontianak	2
4. Isolation Transformer	ditto	Rated capacity:40kVA、Input:AC380/380V3P4W、Output:AC380/380V3P4W、Discharge capacity:15kA Continuous operation	Balikpapan, Banjarmasin (2 sets)	3
5. Automatic Voltage Regulator	Voltage regulation for commercial input voltage	Rated capacity:15kVA 50Hz、Continuous operation、Input voltage:AC380/220V3P、Output:AC380/220V3P, Stability±2% or more、Natural cooling	Benoa, Pontianak	2
6. Automatic Voltage Regulator	ditto	Rated capacity:40kVA 50Hz、Continuous operation、Input voltage:AC380/220V3P、Output:AC380/220V3P, Stability±2% or more, Natural cooling	Balikpapan, Banjarmasin	2
7. Step-up/down Transformer	Step-up to AC380V from AC220V and Step-down from AC380V to AC220V	Rated capacity:7.5kVA 50Hz Continuous Operation、Input:AC220V3P4W、Output:AC380V3P4W、Natural cooling	Jakarta, Uj. Pandang, Balikpapan, Banjarmasin	4

(5) Equipment for Operation and Maintenance

The measuring instruments are provided for each station to maintain the DGPS Station equipment. Purpose, specification and quantity of each equipment is shown in Table 9.

Table 9 Main Equipment for Operation and Maintenance

Name of equipment	Purpose	Main specification	Q'ty
1. Frequency counter	Measuring of frequency	Frequency range: 10Hz-150MHz or more、Display:10digits LCD, Input level:-28dBm - +10dBm or more, Stability: $5x10^{-8}$	7
2. Oscilloscope	Measuring of wave form	Frequency: DC – 100MHz, Number of CH: 4 CH、Sensibility: 1mV/div-10V/div or more、Seep mode: auto normal and single or more, Sweep time: 10μS/div-10S/div or more	7
3. Spectrum Analyzer	Analyzing of spectrum	Frequency range: 100kHz-500MHz or more、Measuring range: 10dB/div:-122 to +20dBm; 5dB/div: -100 to +20dBm; 1dB/div: -68 to +20dBm or more、Dynamic range: Ave. noise range; -122dBm at 1M with 100Hz IF BW or more, Scanning time:0.1mS/div to 10S/div and manual-single or more	7

Name of equipment	Purpose	Main specification	Q'ty
4. DGPS Signal Evaluation Equipment	Measuring of DGPS signals, and their evaluation	1freq. type、12CH、S/N, Signal strength、MNEA0183 type、Lap-top type P/C(Pentium 500MHz or more、memory 64MB or more、LCD12inch or more、CD-ROM、FDD、OS:Win98 English Version)、hand-carry case.	7

(6) Spares

The spares are provided to recover the original functions when malfunction is occurred. The unit in failure shall be repaired and putted back in the box. Purpose, specification and quantity of each equipment are shown in Table 10.

Table 10 Main Equipment for Spares

Name of equipment	Purpose of use	Main specification	Storage	Q'ty
1. Spare for MF transmitter system	Maintenance for DGPS station system			
a. Main PCB for MF Transmitter and others	Recovery of function in a short term	TX Power unit, PS Monitor unit, Alarm display, Meter selector, Power amplifier, RF Output monitor, Signal controller, TX power regulator	Jakarta	3 lots
b. Spare for MF transmitter	Recovery of function in a short term	E/O Modem, E/O Cable, Serial I/F, Parallel I/F, Change over unit, Line compensator, TX control unit, I/F for TX control, Switch for TX control unit, MSK Modem	Each DGPS stations	7 lots
2. Spare for DGPS Monitor and Control Equipment	Maintenance for DGPS station system			
a. RS Receive unit	Recovery of function in a short term	RS function, 2 freq. Type, Rack mount type	Jakarta	3 lots
b. IM Receiver unit	Ditto	IM function, 1frq., Rack mount type	Ditto	3 lots
c. Monitor and control unit	Ditto	CPU:32bits or more, Clock: 200MHz or more、HDD:4GB or more, CD-ROM・FDD、OS:WinNT V4 latest English Version, Application software for Monitor and controlling unit	Ditto	3 lots
d. DGPS Antenna	Ditto	High electric magnetic model	Ditto	3 lots
e. GPS Antenna	Ditto	Unti-Multi-pass type、2freq. Type	Each DGPS Station	7 lots
f. Monitor Changer	Ditto	Two-input selectable for Monitor & Mouse	Ditto	7 lots
g. Signal Distributor	Ditto	RS, IM, DGPS Mon/Con Equip signal selectable automatically	Ditto	7 lots

Chapter 3 Implementation Plan

3-1 Implementation Plan

When the Project is defined as a Japan's Grant Aid project, it will be implemented in accordance with the following concept:

3-1-1 Implementation Concept

The Project will be implemented by the DGSC, MOC as the executing agency to control the aids to navigation administration in a centralized way, and the Sub-Directorate of Maritime Telecommunication under the Directorate of Navigation of DGSC will be in charge of the Project. In the operation and maintenance stages after supply of equipment, the DGPS Managing Group to be newly established within the DGSC will have the overall responsibility for all matters related to the supplied equipment.

After the Exchange Note (E/N) is agreed under the resolution of the Cabinet, the contract will be concluded between the executing agency of Indonesia and a Japanese consultant company to entrust the consultant company with the tender and project management works. The contracted consultant must extensively support the executing agency in conducting these works in all the processes in which the contractor to undertake the equipment delivery and installation will be selected and signs the contract in accordance with fair and proper procedures.

The main contractor of the Project will be a Japanese corporation, which is required to be familiar with the local conditions at the project sites, have wealthy experience and to be prepared for the after-delivery service system in the equipment procurement work. In this respect, it is desirable that such corporation has a branch office or resident representative office in Indonesia.

The Project will basically be implemented as an equipment procurement project. The civil work including tower foundation and buried waved-duct works will have a small portion of the entire project, in which the equipment installation work is included.

In the Project, the MFB stations will be improved in their functionality by providing those with DGPS-related equipment and computers for system monitor and control, so that the installation and adjustment works will require special expertise and technique. Therefore, the local technicians will conduct the installation work under the supervision of Japanese engineers, but the Japanese engineers will undertake all the adjustment work.

As a new system is introduced, the technical training and consulting for the operation and maintenance personnel on the Indonesian side will be studied from various aspects. In addition, the soft component will support the Indonesian counterpart in preparing operation and maintenance manuals for the system.

3-1-2 Implementation Conditions

According to the implementation concept above, it is necessary to take the following items into account to smoothly execute the Project based on the implementation schedule.

(1) Securing Prompt Procedure within the Recipient Country

As the Project is one fiscal year matter by the Japan's Grant Aid, it will be required for the smooth and prompt execution of procedures for the Project, in order that a delay of the implementation schedule does not result from the time to be spent for the several procedures within the recipient country.

(2) Re-allocation of Frequency

Since the DGPS station co-establishes at the existing Coastal Radio Station side by side, and the coverage area of the DGPS station enlarges by 300km, it is necessary to coordinate previously with authority concerned on the new frequency to be re-allocated for each DGPS station. The settlement of frequency matter should be completed before the commencement of manufacturer's test for the equipment.

(3) Contract of Commercial Electricity Power Supply

Since the DGPS transmitting system is newly installed at the existing coastal radio station, it is necessary to increase the contract capacity of commercial electricity power for the Benoa and Pontianak stations to be in short supply. It is required to complete the change of contract capacity before the commencement of installation works.

(4) Installation of New Public Telephone Lines

It is required to install more the public telephone lines on the establishment of Internet before the commencement of adjustment work. A delay of the installation of new public telephone Lines not only causes a delay of synthetic and/or individual adjustment works, but also causes retracing adjustment work steps

(5) Selection of the Internet Service Provider

The Internet Service Provider of an established reputation should be selected for the DGPS Managing group and each DGPS station, as the smooth E-mail communication circumstances will be secured.

(6) Temporary Works

Since the existing facilities and equipments of the coastal radio station are co-used for the Project, it is necessary to make a sufficient pre-discussion and a consideration for the execution of temporary works, so as not to hinder the regular services of the coastal radio station at the installation work stage.

3-1-3 Scope of Works

The obligation of both of the Governments on the Project is specified as follows;

(1) Obligation of the Japanese Government

- Procurement of the goods (Equipments and materials) for the Project, and marine transportation and inland transportation to the Sites.
- Installation works for the equipments on the Project, including civil works on the foundation work for self-supporting tower, buried wave ducts work and so

forth.

- Preparation of the operation and maintenance plan, and technical assistance on the system operation.
- Marine Insurance including Inland Transportation

(2) Obligation of the Recipient Country

- Supplement of the Contract of Commercial Electricity Power Supply
- Contract and Installation of the new Public Telephone Line
- Establishment of the E-mail circumstances including contract of the Internet Service Provider
- Establishment of the operation and maintenance system including the organization and budgetary management in order to operate and maintain smoothly the system to be established by the Project.
- Re-allocation of the Frequency

3-1-4 Consultant Supervision

(1) Consulting Services

The Consultant carries out the supervision for the implementation of the Project based on the proper progress management of the works, quality control and the management of amount of works done.

The Consultant dispatches one (1) permanent managing staff in time to the commencement of installation works, and spottily dispatches the engineer as managing specialist for each work progress to the Indonesia on the consulting services.

In consideration with the execution of the Project by the Japan's Grant Aid, the Consultant copes with the first of all for the smooth execution of the Project by means of the proper assigning of managing staff so as to exactly execute the discussion with the authorities concerned that is the executing agency and so forth, and the several procedure in Japan on the Japan's Grant Aid.

And also, the Consultant deals with a positive manner of the technical transfer on the methods and technique of installation. The main services of the Consultant are as follows;

- The consultation and discussion with the executing agency and the authorities concerned on the installation works in Indonesia.
- Confirmation of the installation work progress
- Confirmation of the quality control of the materials
- Witness to the Inspections
- Confirmation of the Coordinates of Antenna Positions of the DGPS Reference Station
- The execution of Evaluation Test of the System Accuracy, and Confirmation of the Accuracy
- Issue of the several Certifications after endorsement by Recipient Country
- Submission of the several Reports
-

(2) Conditions of the Consulting Services

In connection with the execution of the main services above of the Consultant, the items to be considered seriously are as follows;

1) The Consultation and Coordination with the executing agency and the authorities concerned on the installation works in Indonesia

In connection with the progress of the responsible matters to be born by Indonesia and the several procedures and/or formalities, the Consultant should take them into account so as not to cause the effects to the implementation schedule of the Project, as the execution of the Project within one (1) fiscal year.

2) Confirmation of the Work Progress, and so forth
   - Preparation of the inspection manuals on the work progress management, and establishment of the frequency of the execution of their inspection.
   - Preparation of the inspection manuals on the quality control, and establishment of the frequency of the execution of their inspections.
   - Preparation of the inspection manuals on the work progress management, and establishment of the frequency of their inspections.
   - Execution of the proper photographing management of the installation works, and taking and keeping adequately the photographs at the installation work stage, at the portions with the difficulties to watch after installation works and under the construction.

3) Confirmation of the Quality Control of the Materials

The Consultant confirms the quality of materials and so forth upon the submission of the data on quality guaranteed.

4) Witness to the Inspections

   - Execution of the inspection on progress-payment for the Contractor, and the approval procedure
   - Execution of the inspection before the work completion, and Instructions on the readjustment of the works.
   - Execution of the final inspection (Acceptance Test), and procedures on the work completion

5) Confirmation of the Coordinates of the Antenna Position of the DGPS Reference Station

The consultant confirms that the coordinate of the antenna position of the DGPS reference station of each DGPS station complies with the coordinate planned.

6) Evaluation of the System, and Confirmation of the System Accuracy

The Consultant carries out the Evaluation Test due to the confirmation that each DGPS station has a planned positioning accuracy.

7) Issue of the several Certifications after endorsement by Recipient Countries

The Consultant issues the following certificates;
   - Certificates on the work progress at the times of payments to the Contractor

- Certification of the work completion
- Certification of the completion of warranty period

8) Submission of the several Reports

The Consultant shall submit the reports on work progress, as-built drawings and photographs-related to the Project Implementation to the Government of Indonesia and JICA, and shall submit the work completion report to the JICA

(3) Organization of the Consulting Services

The Consulting services on the procurement of equipments and the installation works are major works in the Project. It is planned for nine (9) months of the procurement stage and six (6) months of the installation work stage. In addition, the execution of the services on design stage, inspection of the manufacturing progress and so forth is required as a part of the Consulting services.

Therefore, the Consultant dispatches no permanent managing staff to the Indonesia for the whole period of the Project. However, the Consultant properly dispatches the specialist necessary for each work progress to the Indonesia. Japanese engineers on the Consulting Services are timely dispatched when necessary, and the numbers of engineers and their period to be dispatched are allocated in accordance with the contents of works and implementation schedule as follows

1) Chief Consultant

The Chief Consultant is in charged of the whole Consulting Services. He is dispatched to the Indonesia at the time of the pre-consultation/ discussion before the commencement of the installation works, the commencements of major works and their completion, and the whole work completion.

2) Procurement Plan

The engineer in charge of Procurement Plan is dispatched for the following services;

① Services in Japan
- Prior Discussion with Manufacturer before manufacturing
- Check and approval of the shop/ manufacturing drawing
- Factory Inspection under manufacturing
- Factory Inspection on manufacturing including shipping inspection

② Services in Indonesia
- Work progress management for the installation work period
- Witness to the inspection of the work completion after the installation works

3) Supervision I

The Supervision I stays permanently for the period of installation works on the shift of equipment and improvement of the existing equipment for the Project. He is in charge of the following services;
- Discussion with the Contractor

- Check/ confirmation of the installation drawings, and their approval
- Inspection on the equipment procurement in Indonesia, and their shipping inspection
- Work progress management for the installation work period
- Witness to the inspection of work completion after the installation works
- Check/Confirmation of the operating condition of the system by the inspection for warranty at the time of one (1) year after the acceptance completed

4) Supervision II

The Supervision II supervises for the equipment to be newly installed for the DGPS, in accordance with the contents of services of the Supervision I as described the above.

5) Aids to Navigation Expert

The Aids to Navigation Expert is generally in charge of the supervision of manufacturing on the function of the DGPS monitor/Control equipment in Japan in accordance with the services of Procurement Plan above, and in charge of the following services in Indonesia;

- Witness to the Inspection on the equipment procurement in Indonesia, and their shipping inspection
- Check/ confirmation of the Antenna Position for the reference stations
- Evaluation test of the DGPS system, and check/ confirmation of its system accuracy

3-1-5 Procurement Plan

(1) Examination on Country of Origin of Equipment and Materials

In this project, the rehabilitation of MFB stations are achieved by means of DGPS technique and DGPS station is co-sited at the existing coastal radio station. DGPS transmitting system, which is a core of DGPS system, was designed based on DGPS system operated in Japan. Internet is utilized as data communication line to monitor all DGPS stations as against utilizing a communication satellite in Japan.

This system forms a part of aids to navigation services. Operation and maintenance are very important matter in order to achieve the positioning accuracy and high availability (99.9%) recommended by IALA. For a navigator, not only that the DGPS station continuously transmits the DGPS signal and its signal can be received at ship, but also the Integrity of system (Guarantee of positioning accuracy to be required for the system) must be secured.

When we construct this system, it is necessary not only a close inspection made on performance of each part, but also to confirm that the required positioning accuracy and high availability must be secured for the system.

On the premise that the said availability and positioning accuracy are achieved, it is indispensable that the Consultant and/ or Contractor assist from technical aspect, in order that the operation and maintenance by Indonesia side are put into practice with certainty, after acceptance of the equipment and materials which are procured under Japan's Grant Aids Scheme. In case of consideration of maintainability and securing aftercare system, it is necessary that the supplier's support system for operation and maintenance of the system can be always confirmed by the Consultant and the Contractor. As a result of examination for country of origin of equipment and materials to be procured under the Project in consideration of those important points, there is no advantage to procure goods in the third country. In addition, we decided that the major equipment and materials should be procured in Japan.

Further, we decided the following equipment as local procurements which can procure in Indonesia and be fully supported by the supplier for the operation and maintenance, based on the result of field survey;

① Personal computers and their peripherals except server machines for DGPS Monitor and Control Equipment.
② Antenna tower
③ Diesel engine generator with radiator
④ Air-conditioning Facilities

(2) DGPS Transmitting System

The DGPS Transmitting System consists of MF Transmitter and DGPS Monitor/Control Equipment, and these shall be in compliance with the technical standards on the International Telecommunications Union (ITU), International Maritime Organization (IMO), International Association of Marine Aids to navigation and Lighthouse Authorities (IALA) and so forth. Local Area Network (LAN) is in compliance with the IEEE802.3, and the TCP/IP or UDP/IP is required for the communication protocol.

It is desirable for the manufacturer being well skilled on the equipment related to the DGPS and the MFB band equipment, since the DGPS Monitor/Control Equipment of the DGPS Transmitting System have an influence upon the positioning accuracy of the system, and the existing 500KHz band MF transmitting Antenna is co-used for the Project

In connection with the selection of the Contractor, it should be taken into account for that the assistances are indispensable for the operation and maintenance after acceptance of system.

The specification of server machine level or better as generally required for data processing system is required for the computers on the monitor and control of the DGPS Transmitting system, since those computers are continuously and fully operated for twenty-four (24) hours.

It is desirable that the MF Transmitters and the DGPS monitor /control equipment is manufactured in Japan, by the engineers who have full knowledge of the DGPS system.

(3) Operating & Monitoring System

The Operating and Monitoring System consists of the Data Communication/Transfer Equipment, Internet and Data Processing Equipment. The establishment of E-mail circumstances by Internet is a responsibility of the Government of Indonesia.

The hardware including the peripheral equipment such as laser printer, UPS and so forth for the Data Communication/Transfer Equipment and the Data Processing Equipment shall be procured in Indonesia, and the operating software (OS) for those equipment uses Windows NT 4.0 as the latest English version. E-mail software should be software on the market and being popularly used in Indonesia.

It is desirable for that the functions of the printing forms, graphical display of monitoring data, and data integration should be manufactured in Japan, as those functions have a close relation with the functions of the DGPS Transmitting system.

(4) Power Supply System

The standby engine generator sets among the Power Supply System are water-cooling engine with radiator, and these should be procured in Indonesia.
The AVR and I/T should be procured in Japan, since these operate and connect directly

with the DGPS Transmitting System.

(5) Associated Facilities

1) Air-conditioning Facilities

Whole air-conditioning facilities will be procured in Indonesia.

2) Unti-lightning Facilities

There are actual use results of the Dissipation Array System within the Unti-lightning Facilities in of both the Indonesia and Japan. However, the Japan made should be applied for Dissipation Array System, since the data on those effectiveness and efficiency is completed.

(6) Local Procurement Goods

The goods to be procured in Indonesia are as follows;

- Self Supporting Antenna Tower
- Personal Computers （Excluding Server Machines）
- Displays、Printers、UPSs
- Engine Generators
- Air-conditioning Facilities
- General Construction Materials, i.e. steel bars, sands, cement and so forth

(7) Transportation Routes

The procurement goods to be properly packed to export after the factory inspection in Japan will be made to clear the customs at the main port in Indonesia in accordance with the transportation routes procured in Japan shown in Table 11.

Immediately after the customs clearance, the goods should be transported and stored to each Site by the inland transportation. After the customs clearance, it is land transportation for the destination of Jakarta, Semarang and Ujung Pandang, and sea transportation for the other Sites.

Table 11 Transportation Routes on Procurement Goods in Japan

Port of Shipment	Marine Transportation	Port of Discharge	Inland Transportation	Destination
Japan	～	Tg.Priok（Jakarta）	By land	Jakarta
		Tg.Priok（Jakarta）	Ditto	Semarang
		Surabaya	By sea	Benoa
		Ujung Pandang	By land	Ujung Pandang
		Surabaya	By sea	Balikpapan
		Surabaya	Ditto	Banjarmasin
		Tg.Priok（Jakarta）	Ditto	Pontianak

The transportation routes for the local procurement goods with difficulties to procure at the near Sites, the transportation routes will be made in accordance with the inland transportation for the procurement goods in Japan.

(8) Measures to Repair and Maintenance Service

Most of the serious troubles in the coastal radio stations that will be operated in conjunction with the DGPS system have been caused by lightning. In the Project, therefore, it has been planned that the extensive measures against lightning will be taken to reduce the cost of repairs necessary for system maintenance.

The repairs of the existing radio equipment in the existing coastal radio stations have been carried out by the technical staff at the radio stations in general, though they are depending upon the grade of trouble in the system-related equipment. In the cases of major troubles, the technical staff has received technical advice from the equipment suppliers. For general replacing parts such as resistors and capacitors, the spare parts in stock and the parts procured locally or taken out from similar existing radio equipment have been used or reused.

The units having major troubles that are not reparable in Indonesia have been sent to the manufacturers of those for repairs and the technical staff at the coastal radio stations has replaced the repaired units.

Based on the repair conditions of radio equipment at the coastal radio stations, the proper selection and efficient distribution of spare parts to the coastal radio stations was made. The core equipment of the system that requires uniform maintenance to keep the system accuracy was planned to be stored in the DGPS Managing Group to ensure centralized maintenance management. The units for which the frequency of maintenance is expected to be high and for which no standby units are provided in the system will be stored in each DGPS station to ensure the system that the high availability required for the aids to navigation should be required.

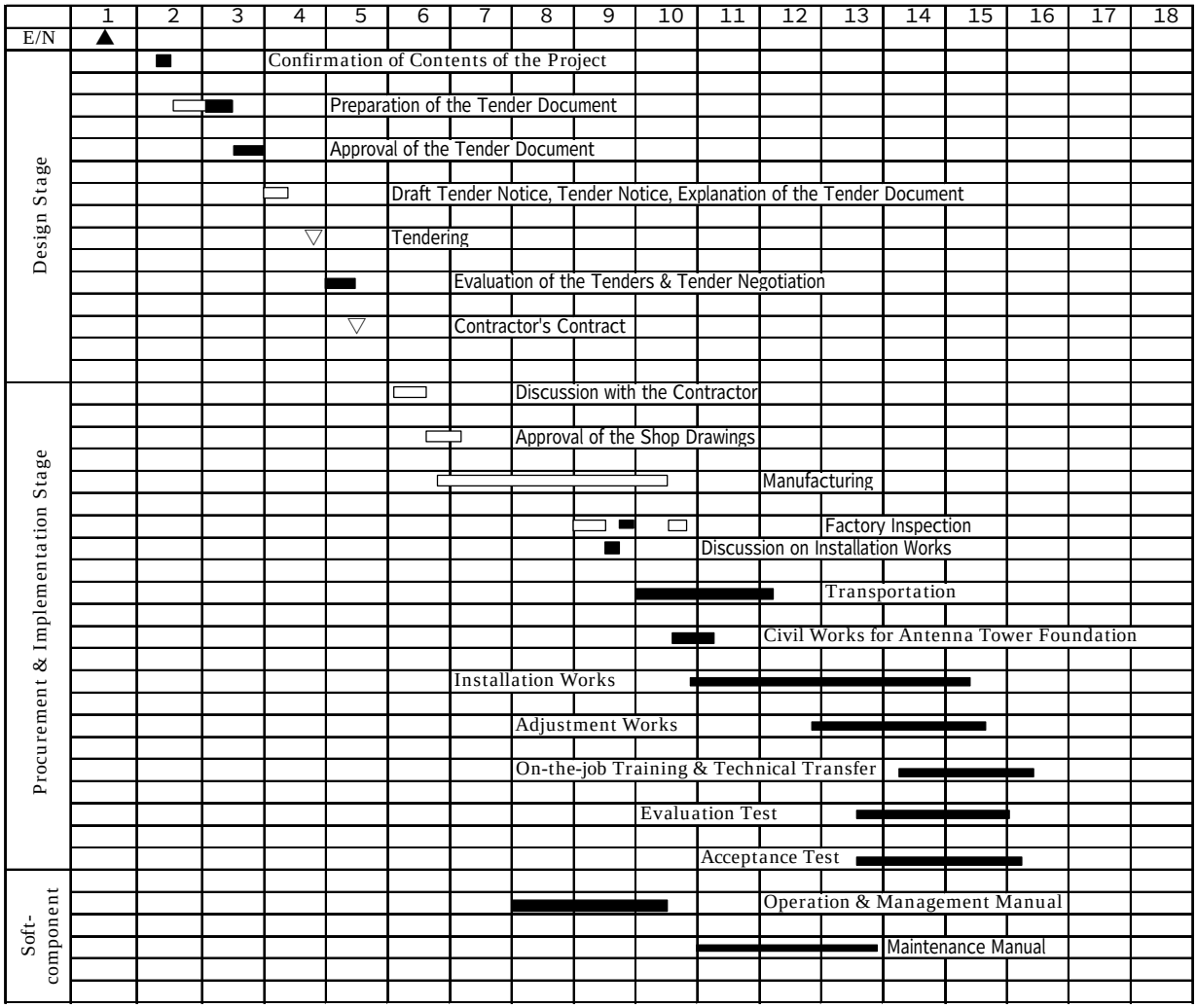
For the related equipment to be procured within Indonesia, the equipment for which the repair parts can be procured and the vendor services are available in Indonesia was selected.

3-1-6 Implementation Schedule

The implementation schedule of the Project is shown as below. The period of approximate fifteen (15) months is required for the Consulting Services, that is design stage including tendering stage, installation and procurement stage and Soft Component.

It is desirable to avoid the rainy season (November to March) in Indonesia for the outdoor works such as the foundation work for self-supporting antenna tower, buried wave-duct work, re-painting work of the existing self-supporting antenna tower and so forth.

Table 12 Implementation Schedule of the Project



3-1-7 Soft Component Plan

Since the DGPS system is a new system for the Indonesia, there was a request of the soft component to assist making the system management/ operation plan and maintenance manual as a part of the establishment of appropriate maintenance management system for the DGPS.

In connection with the execution of the soft component, it was planned for the goal that the DGPS system in Indonesia lasted to steadily provide user with the high accurate positioning information for the long time, with a mind to the following points:

- Smooth operation and management of DGPS System
- Proper maintenance and management for the equipment and facilities of DGPS system

When the soft component is carried out, it is a goal that makes the responsibility of each staff clear and understand his own roles at the individual sections or groups related on the operation and maintenance, and that the whole system should be operated and maintained in good conditions by the operation and maintenance with relationship mutually among each staff of headquarter, and headquarter and local stations.

To achieve this goal as a result of assistance by means of the soft component, the Consultant assists for the preparation of draft manuals, that is, the “Management Manual” defined as efficient management organizations on DGPS services in Indonesia, the “Operation Manual” defined concretely as daily, regular and emergency operation for the DGPS system and the “Maintenance Manual” defined concretely as daily, regular and emergency maintenance for the DGPS system.

3-2 Project Cost Estimation

When the Project is executed under the Japan's Grant Aids, the cost to be borne by the Government of Indonesia is approximately 5.3 million Rupiah as shown in Table 13, according to the Scope of Work given in Chapter 3, item 3-1-3 .

Table 13 Estimated Project Cost Unit： Rupiah

Item	Estimated Cost
1. Amendment of Electricity Power Contract	500,000
2. Preparation of E-mail Circumstances (Public Telephone Lines、 Contract of Provider Services)	4,800,000
Total	5,300,000

3-3 Operation and Maintenance Cost Estimation

It is judged that the Operation and Maintenance Cost for Directorate of Navigation, DGSC in the past five (5) years have chronically fallen into lack. Light Due newly introduced in this year is seriously expected for operation and maintenance for Aids to Navigation and their related matters in the future. The operation and maintenance cost for the DGPS System with improvement of Medium Wave Radio Beacon Stations is to be provided by the Light Due in the future.

It is recommended that Operation and maintenance staff for the DGPS Managing Group to be newly established in DGSC consist of five (5) persons at least, which should be one (1) head in charge of group, two (2) managing staff, one (1) chief in charge of technical matters and one (1) technician. And two (2) operation and maintenance staff should be allocated for each DGPS Station. These can cope by a re-arrangement of the staffs of DGSC.

After the completion of the Project, the operation and maintenance cost required for DGPS Stations to be operated by DGSC is estimated as shown in Table 14.

Table 14 Operation and Maintenance Cost of DGPS Stations Unit：x1000 Rupiah

Item	Amount
1. Personnel Expenses	175,200
(1) DGPS Managing Group	57,600
(2) DGPS Stations	117,600
2. Operation and Maintenance Cost	335,243
3. Traveling Cost	30,620
Total	541,063

In connection with the above personnel expenses of the operation and maintenance cost for DGPS System, it can allot within the personnel expenses in the former budget. The operation and maintenance cost except for the above personnel expenses shall allot the Light Due newly established on 6 June 2000.

Chapter 4 Project Evaluation and Recommendation

4-1 Project Effect

4-1-1 Role of the Project

In verifying the necessity, appropriateness and urgency of The Project, it is necessary to define the role of the Project.

The Project is a Japan's Grant Aid project for the MFB stations system implemented by the Government of Indonesia under a Japanese Yen Loan. The Project is intended to improve the MFB stations to attain the requirements for a radio aids to navigation system from the international point of view, so that vessels navigating in the Indonesian waters will secure the safety and efficiency of navigation. At the same time, the sustainability of the Project should be fully secured.

Therefore, the Project is aimed at providing the DGPS stations with the functions to meet the international standard for positioning information as an operational requirement for radio aids to navigation systems as recommended by the IMO and IALA. In addition, it is also necessary to ascertain that the maintenance system for the DGPS stations and the related budget will be established and secured in Indonesia.

4-1-2 Verification of Project Sustainability

The annual maintenance cost under the Project is roughly estimated to be about 7 million yen (excluding personnel cost), but it is difficult for Indonesia to manage to budget the cost in the conventional general account. Therefore, Indonesia has declared the policy that the maintenance cost will be allocated from the Light Due that was enforced in June 2000.

Then, the Light Due taxation system has been enforced, but no amount of due revenues has not concretely been reported and it is still unclear at this moment whether the maintenance cost for the Project has been secured or not.

4-1-3 Enhanced GPS Accuracy after SA Termination

The US Administration announced hastily on May 1, 2000 to the users of SPS (Standard Positioning Service) that the Selective Availability (SA) intended for GPS positioning with a lower accuracy than that for military use was terminated at midnight on May 1, 2000 Eastern Time under the President's statement of May 1, 2000. As a result, the GPS positioning accuracy was globally enhanced around 10 times as high as before. In this connection, the Interagency GPS Executive Board (IGEB) of the US Administration has declared that "User in the U.S. and the rest of the world should now be experiencing the same basic GPS accuracy of 10-20 meters or better"

The GPS positioning accuracy at the time of the request, namely before the SA Termination, was about 100m. By the SA Termination, the GPS accuracy was enhanced to around 10m. As a large change appeared in the background situation for the request of Indonesia, we could not but review the necessity, appropriateness and urgency of the project as Japan's Grant Aid.

The IMO recommends that a radio navigation system used to assist in the navigation of ships in those harbor entrances and approaches and other waters where freedom to maneuver is limited shall provide positional information with an error not greater than 10m with a probability of 95%. The introduction of DGPS will enhance the positioning accuracy further, ensuring the system to contribute to safety and efficiency of navigation. However, if the current GPS positioning accuracy in Indonesia nearly meets the recommended value, it is necessary to consider deliberately whether the DGPS should be introduced under the Japan's Grant Aid.

The measurement made independently by the Japan Coast Guard made clear that the positioning accuracy was 9.03m (at 95% probability) as a temporary data available from a specific GPS receiver. In addition, the DGSC has obtained the positioning accuracy of 9.43m (at 95% probability) in the measurement made in Jakarta for a short period with the cooperation of JICA Expert. From these measurements, it has been confirmed that the GPS accuracy has been enhanced in general. However, the GPS signals include some errors such as seasonal changes due to the influence of the ionosphere and the atmosphere, because the signals are transmitted from the satellites orbiting at high altitudes of more than 20,000 km. In discussing the GPS positioning accuracy based on SA Termination, therefore, it is necessary to measure the long-time variations including seasonal changes, make accuracy measurements taking into account the difference of GPS receiver models, and check the statistic and dynamic accuracy.

4-2 Technical Cooperation and Relationship with Other Donors

The Japan International Cooperation Agency (JICA) plans to implement a development study "Development Study for the Maritime Safety System Development Plan" to develop the navigation safety system in Indonesia including Aids to Navigation. In the Study, it is desirable to make the study of the following items in relation with the Project:

(1) Check on the conditions for introduction of Light Due

Most of the existing MFB stations installed under the Japanese Yen Loan project have suspended their operation several years after their completion due to lack of maintenance cost. Under these circumstances, it is scarcely expected to budget the maintenance and operation costs for the DGSC from the general account. Therefore, it is absolutely indispensable to securely establish the Light Due taxation system that was enforced in May this year and started to be collected in June as a special account, in order to promote, and maintain and operate the DGPS and other plans as well as the existing services in the Directorate of Navigation (NAVIGASI) of the DGSC. Although it seems that Light Due collection has been started, no official report on the amount of due collected has been issued from the DGSC for its own reason.

Under these circumstances, it is deemed to be necessary ① to check the conditions of the established systems including the system of reporting on Light Due within the Indonesian Government, and ② to fully verify the Light Due amount and its distribution plan that has originally been estimated.

For ①, it will take some time, but it will be cleared sooner or later if the establishment as a system delays simply due to clerical formalities. For ②, it is necessary to analyze the actual conditions of collecting the due amounts, compare the

sum of collected due amounts with the originally estimated sum and check on the plan of allocation, in order to verify that the operation and maintenance costs of the DGPS system can be secured.

In verification of ②, it is also necessary to grasp the total tonnage of all vessels entering port to pay the Light Due and the sum of collected due amounts.

(2) Confirmation of GPS positioning accuracy

It has been confirmed that the GPS positioning accuracy in Indonesia after SA Termination is 11m and 17m in the simple measurement made by the consultant and 9.4m in the successive short-time measurement made by Indonesia counterpart in cooperation of the JICA Expert. These measured values fall within 20m as announced by the US Administration operating the GPS system. However, the GPS signals are transmitted from the satellites orbiting at high altitudes of more than 20,000km, including the errors such as seasonal changes affected the ionosphere and the atmosphere. Therefore, the precise discussions on the GPS positioning accuracy after the SA Termination should be made based on the measurement and analysis considering the following points:

① Error measurement considering the model difference of GPS receivers;
② Error measurement for a long time considering seasonal changes
③ Confirmation of static and dynamic accuracy

(3) International trend for safety navigation and role of DGPS system

Currently, the international move for safe navigation of vessels is actively promoted by the positive use of new technology in the maritime world. The introduction of advanced navigation systems including the Automatic Identification System (AIS) to be obligated to install at the relevant vessel defined in Article V of the SOLAS Convention being now under deliberation at the IMO conference aiming at its enforcement in July 2002, and the Vessel Traffic Services (VTS) and the Electronic Chart Display and Information System (ECDIS) that will operate side by side with the function of the AIS, has been in progress. The VTS and ECDIS will be installed or developed from the independent standpoint by each country individually.

The DGPS is currently positioned as a basic positioning system to be able to provide highly accurate positional information with the Integrity to be secured to those future systems.

In respect of the dealing with the DGPS in Indonesia under the international trends above and the Japan's Grant Aid, it is necessary to discuss how does the Indonesia deal with future VTS and ECDIS in Indonesia, and to discuss on the progress of possible introduction plan of such systems.

(4) Other discussions

It is necessary to define the issues as mentioned above, to determine whether to introduce the DGPS in Indonesia and to verify the necessity, appropriateness and benefits of the project from various angles. For this purpose, the following matters

should be examined with due consideration for the progress after SA Termination:

① Shipping accident cases by sea area
② Number of vessels in voyage
③ Shipping statistics
④ Port development
⑤ Progress of the international maritime policy and cooperation system of Indonesia in relation with Malaysia and Singapore after completion of the basic design study

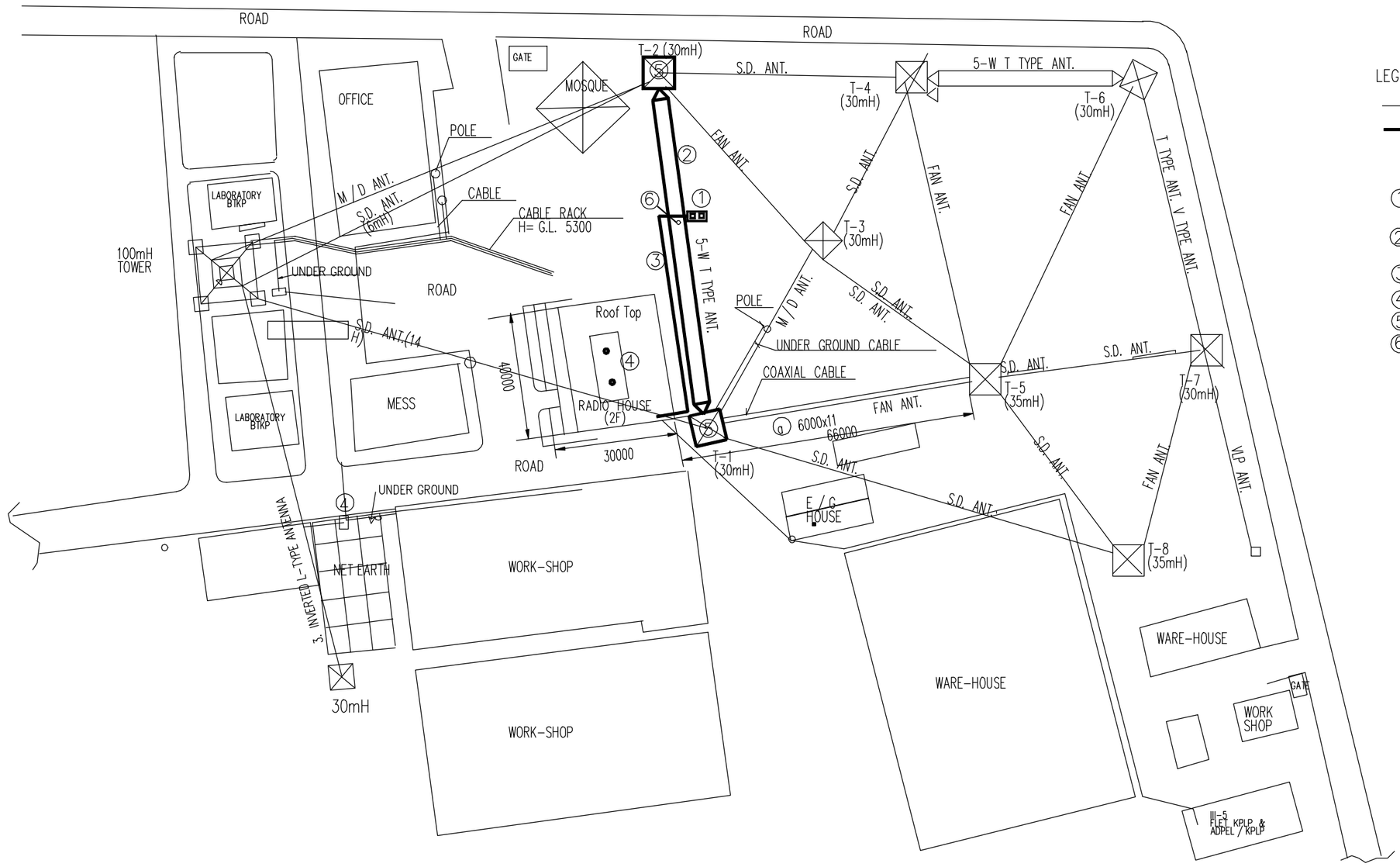
4-3 Recommendation

To further examine the implementation of the Project under the Japan's Grant Aid, as described in section 4-1 and 4-2 above; we deem it indispensable to ascertain the project sustainability, appropriateness and benefits of the Project in the circumstances of GPS that the positioning accuracy has enhanced owing to sudden SA Termination. In addition, the feasibility and the effects of the Project should be ascertained from a higher point of view including the international trend for navigation aids and other factors.

DRAWINGS

Contents of Drawings

Station	Code	Drawing Name
Jakarta	JKT-1	Station Layout
	JKT-2	New Equipment Layout
	JKT-3	Floor Layout
Ujung Pandang	UPD-1	Station Layout
	UPD-2	New Equipment Layout
	UPD-3	Floor Layout
Semarang	SMR-1	Station Layout
	SMR-2	New Equipment Layout
	SMR-3	Floor Layout
Balikpapan	BLP-1	Station Layout
	BLP-2	New Equipment Layout
	BLP-3	Floor Layout
Banjarmasin	BJM-1	Station Layout
	BJM-2	New Equipment Layout
	BJM-3	Floor Layout
Benoa	BEN-1	Station Layout
	BEN-2	New Equipment Layout
	BEN-3	Floor Layout
Pontianak	PON-1	Station Layout
	PON-2	New Equipment Layout
	PON-3	Floor Layout



LEGEND

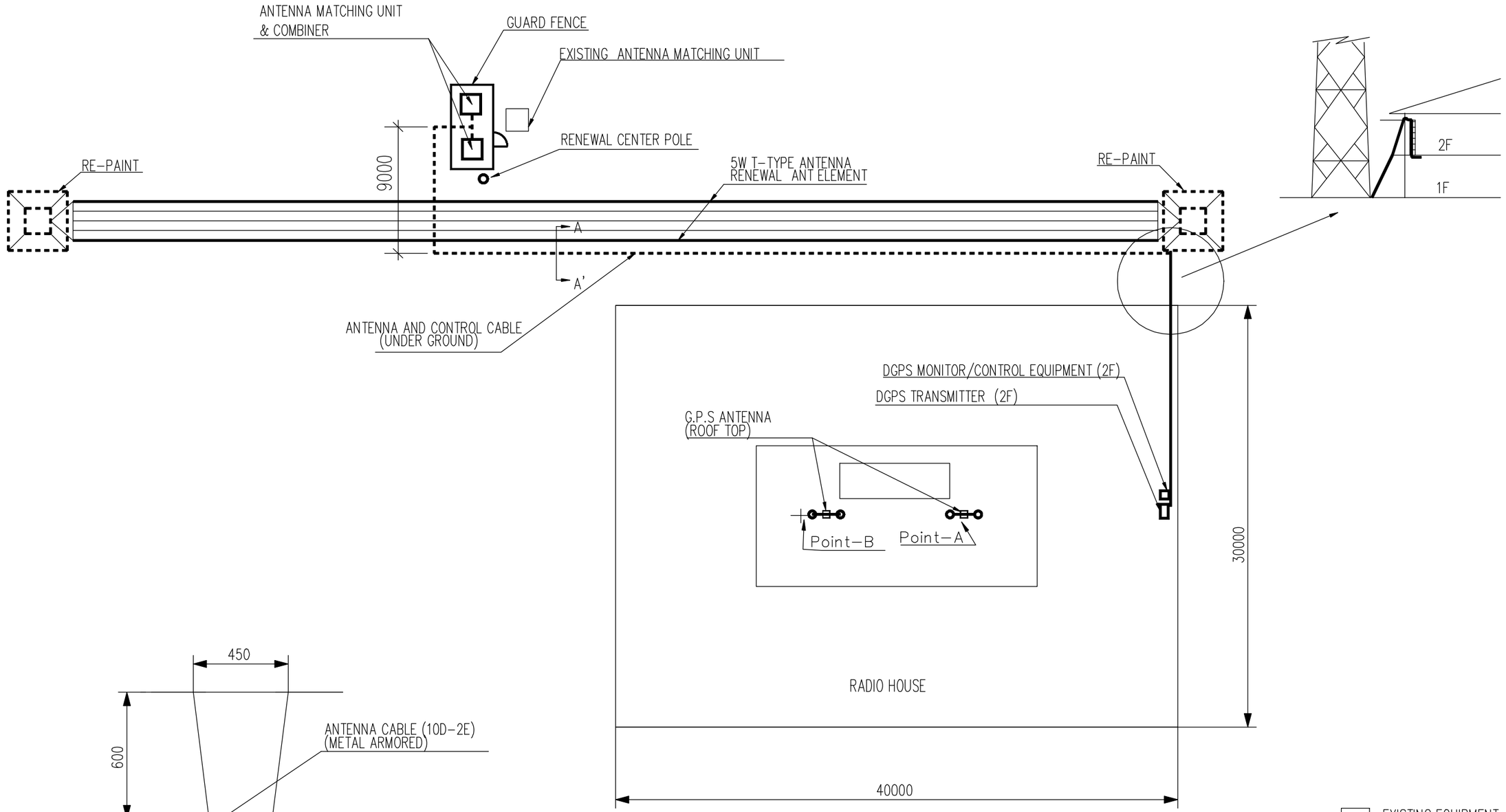
EXSITING EQUIPMENT

NEW EQUIPMENT

① New Antenna Matching Unit & Combiner For D.G.P.S
② Renewal T-type 5-W Antenna Element
③ New Antenna Cable
④ New G.P.S Antenna
⑤ Re-paint of Tower (T-1,T-2)
⑥ Renewal of Center Pole For T-type 5-W Aantenna

S 1/1500

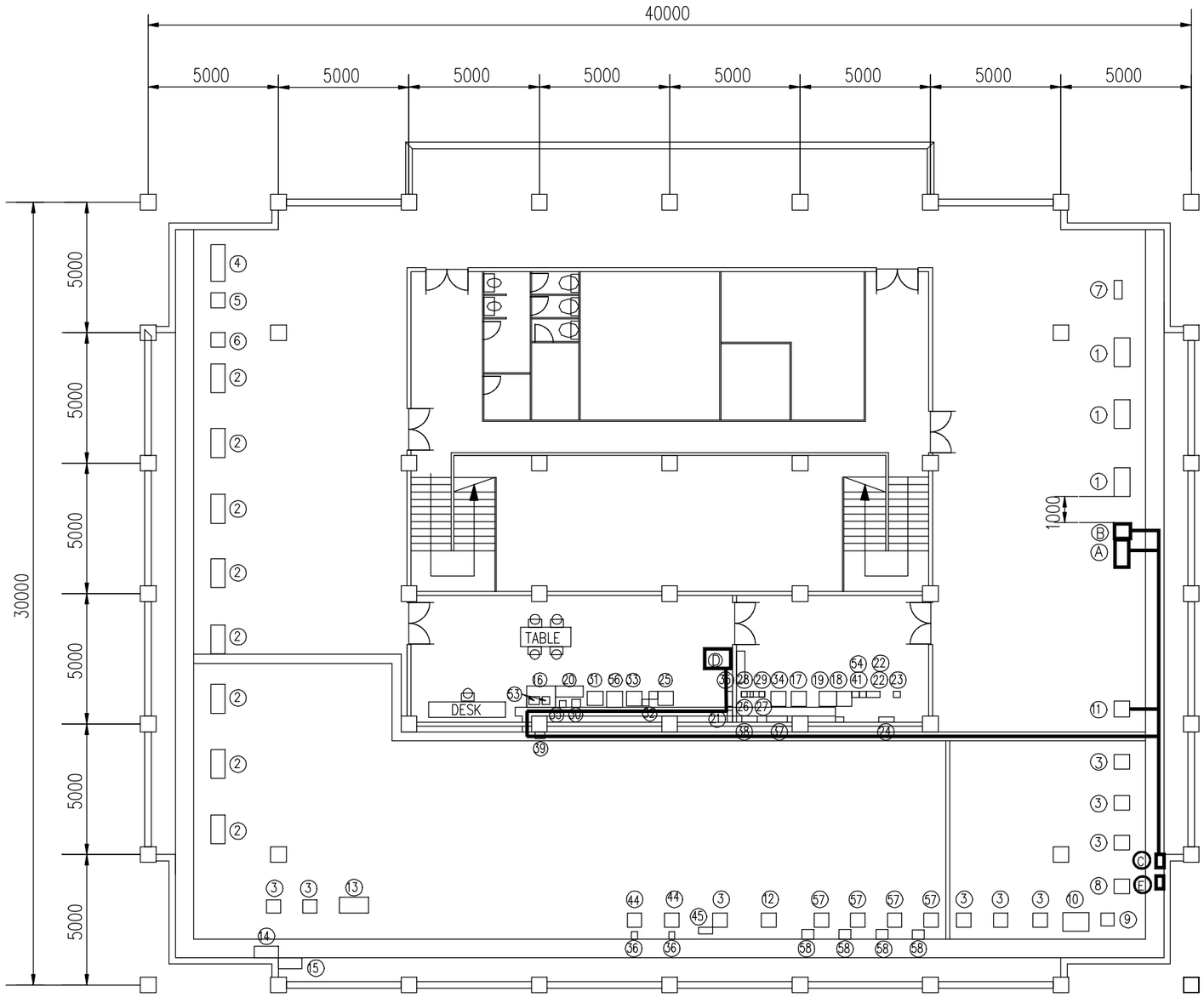
Name of Drawing	Site Name	
STATION LAYOUT	JAKARTA TRANSMITTING STATION	/
	No. of Drawing: JKT – 1	1



DETAIL A-A'
S 1/20

S 1/300

Name of Drawing	Site Name	
NEW EQUIPMENT LAYUOT	JAKARTA TRANSMITTING STATION	/
	No. of Drawing: JKT-2	2



LEGEND

EXISTING EQUIPMENT

NEW EQUIPMENT

EXISTING EQUIPMENT

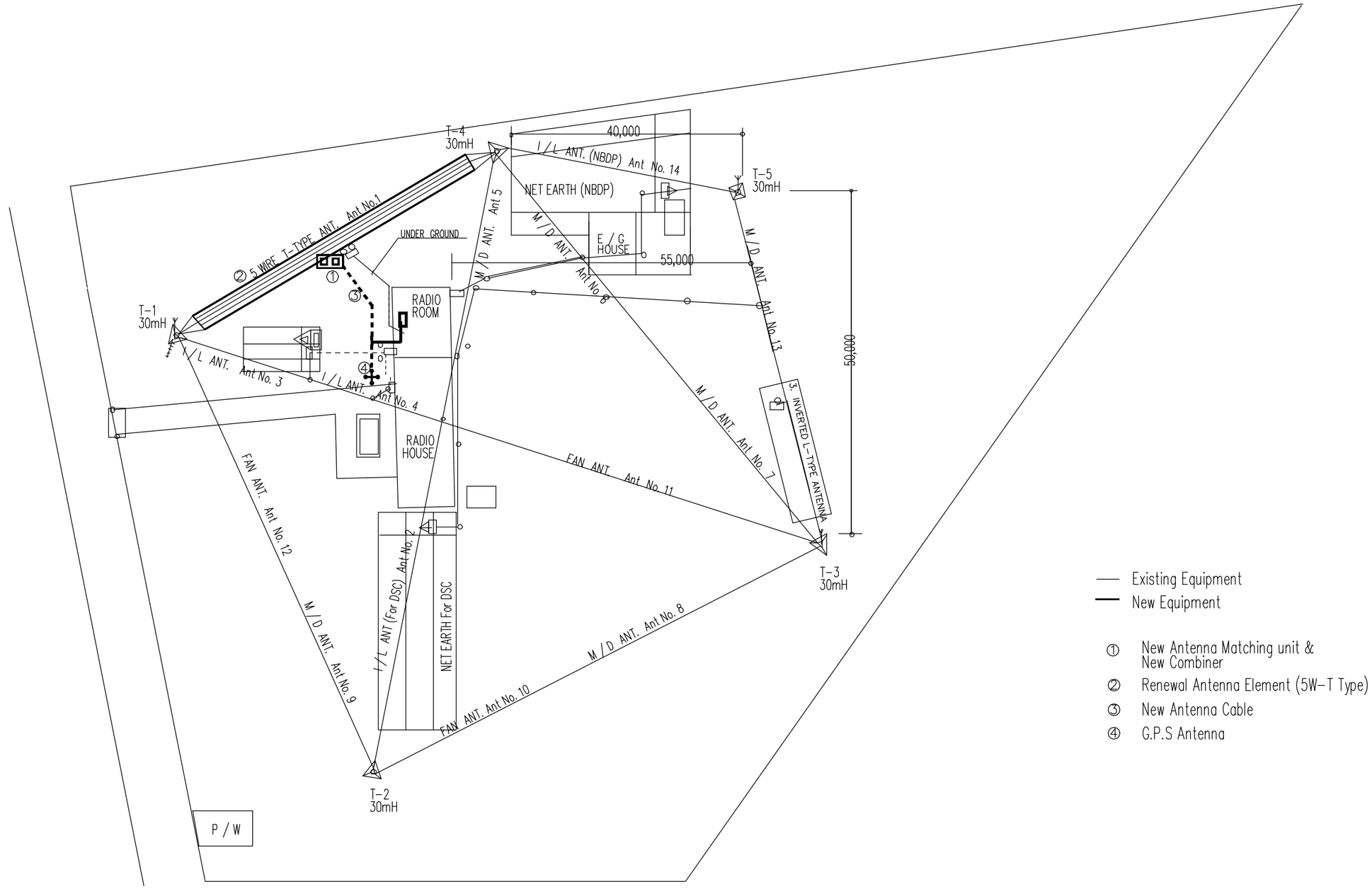
① 5kw MF Transmitter
② 5kw HF Transmitter
③ 1kw HF Transmitter
④ Antenna Switching Matrix
⑤ Antenna Switching Matrix Cont
⑥ Connection Rack
⑦ Antenna Switching
⑧ Antenna Switching Matrix
⑨ Antenna Switching
⑩ Antenna Switching Matrix
⑪ Power Ditribution Board
⑫ Power Distribution Board
⑬ Power Ditribution Board
⑭ Power Ditribution Board
⑮ 40kVA Step Up Transformer
⑯ Supervisory Console
⑰ Remote Control Rack
⑱ Remote Control Rack
⑲ Main Distribution Board
⑳ Station Status Monitor
㉑ DC Power Distribution Board
㉒ Voice Frequency Telegraph
㉓ UHF Radio Eqiopment
㉔ Lightning Arrestor Box
㉕ Beacon Equipment
㉖ 7.5GHz Radio
㉗ 2nd Mux
㉘ DRCS-BS
㉙ DRCS-SS
㉚ 3kVA Isolation Transformer
㉛ 24V/20A Charger
㉜ 1kVA Isolation Transformer
㉝ 24V/10A Charger
㉞ Remort Contorol
㉟ AC PDB
㊱ Step-up Transformer
㊲ Main Distribution Frame
㊳ Dehydrator
㊴ AC Branch
㊵ 7.5GHz UHF Radio
㊶ 1st MUx
㊷ 2nd Mux
㊸ UPS 1kVA
㊹ 1kw HF Transmitter
㊺ Step -up Trandsformer
㊻ Dehydrator
㊼ VHF Transmitter
㊽ Duplexer x1set
㊾ Charger Rectifier
㊿ AC Power Distribution Board
(51) DC Power Distribution Board
(52) Local Terminal Unit
(53) TX Statu8s Display
(54) Telephone Repeater
(55) Isolation Transformer
(56) Charger Rectifier
(57) 1 kW HF Transmitter
(58) Step-up Transformer

NEW EQUIPMENT

Ⓐ 1kW MF Transmitter
Ⓑ DGPS Monitor/Control Equipment
Ⓒ PDB
Ⓓ Data Communication/Transfer Equipment
Ⓔ Step-up Transformer

S 1/200

Name of Drawing	Site Name	
FLOOR LAYOUT	JAKARTA TRANSMITTING STATION	/
	No. of Drawing: JKT-3	3

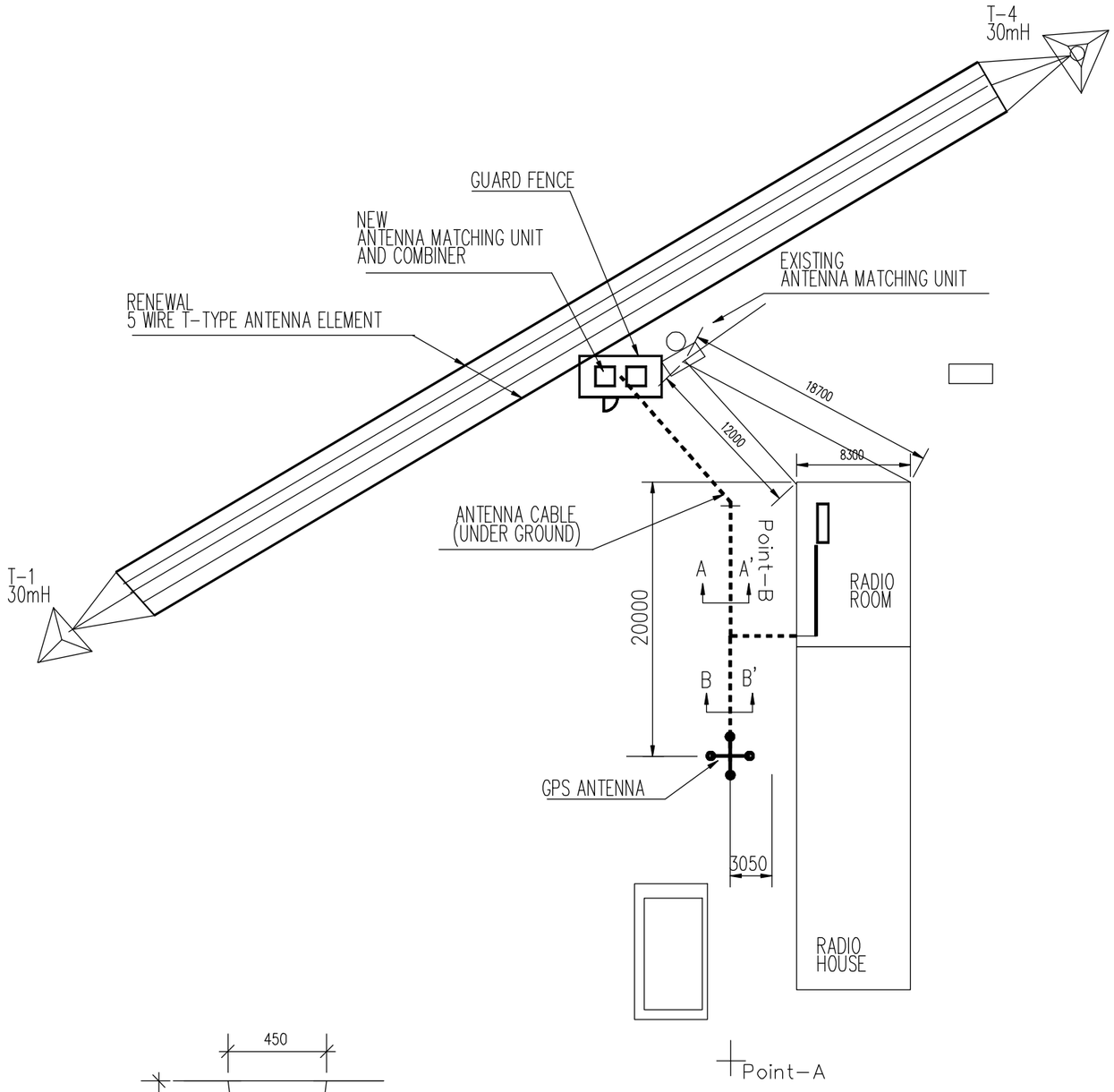


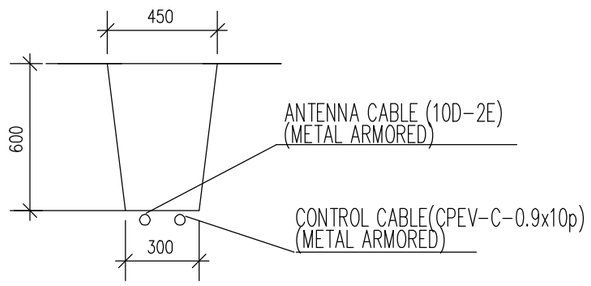
— Existing Equipment
— New Equipment

① New Antenna Matching unit & New Combiner
② Renewal Antenna Element (5W-T Type)
③ New Antenna Cable
④ G.P.S Antenna

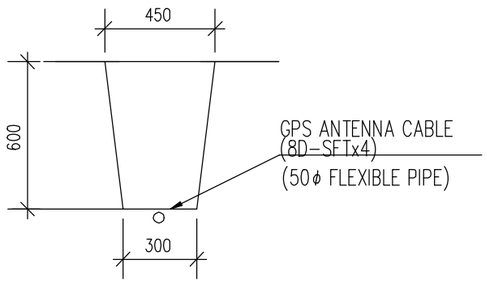
S 1/1000

Name of Drawing	Site Name	
STATION LAYOUT	UJUNG PANDANG TRANSMITTING STATION	/
	No. of Drawing: UPD-1	9





DETAIL A – A'
S 1/25

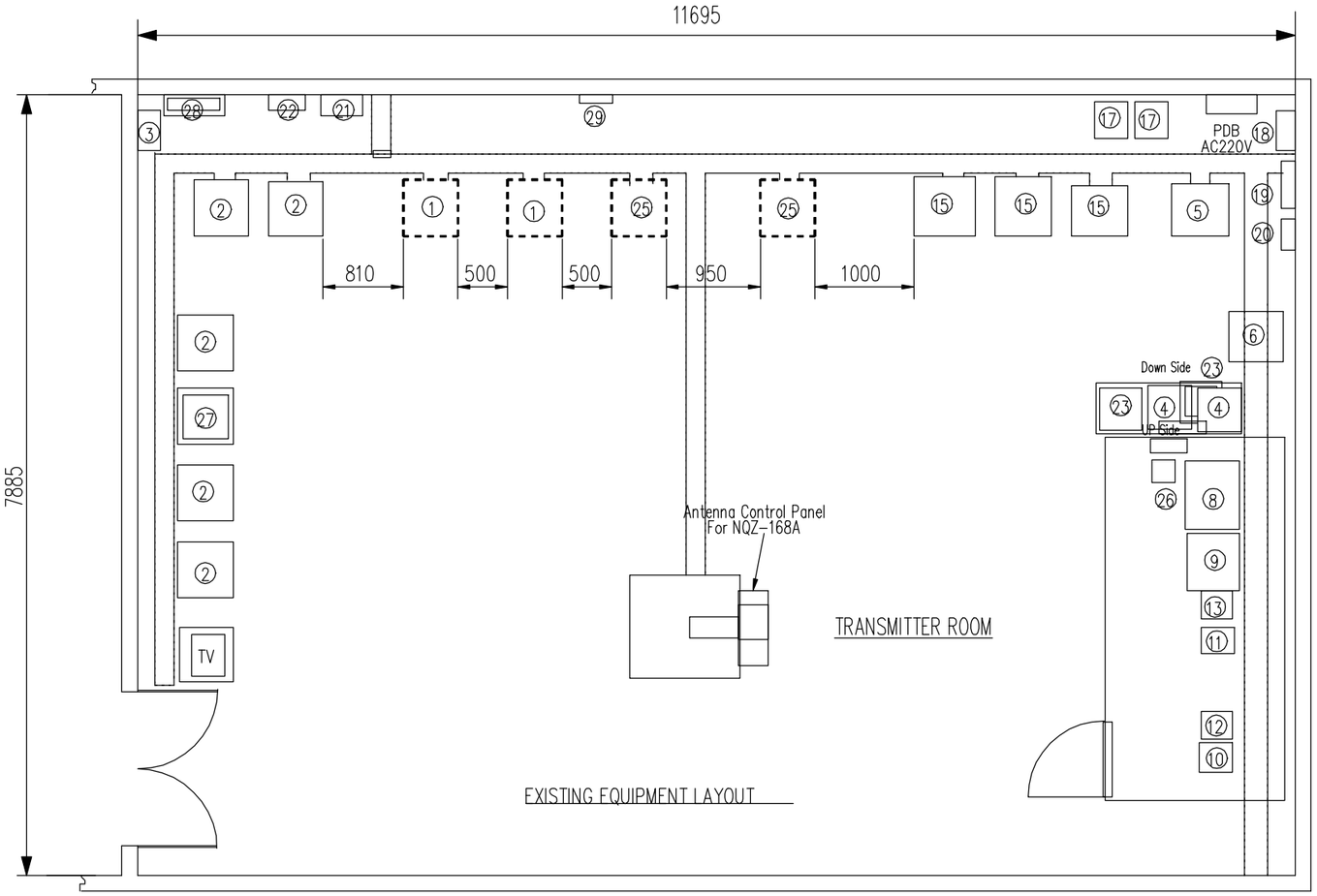


DETAIL B-B'
S 1/25

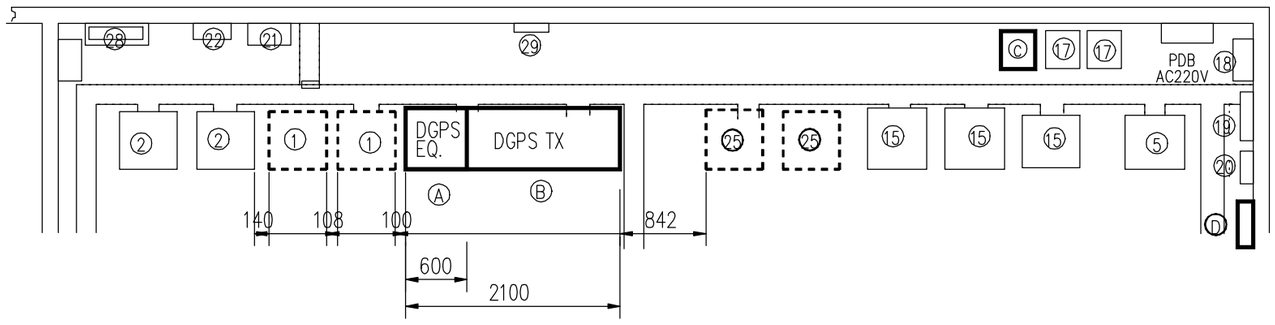
EXISTING EQUIPMENT
NEW EQUIPMENT

S 1/400

Name of Drawing	Site Name	
NEW EQUIPMENT LAYOUT	UJUNG PANDANG TRANSMITTING STATION	/
	No. of Drawing: UPD-2	10



EXISTING EQUIPMENT LAYOUT



NEW EQUIPMENT LAYOUT

LEGEND

- EXISTING EQUIPMENT
- NEW EQUIPMENT
- TRANSFER EQUIPMENT

EXISTING EQUIPMENT

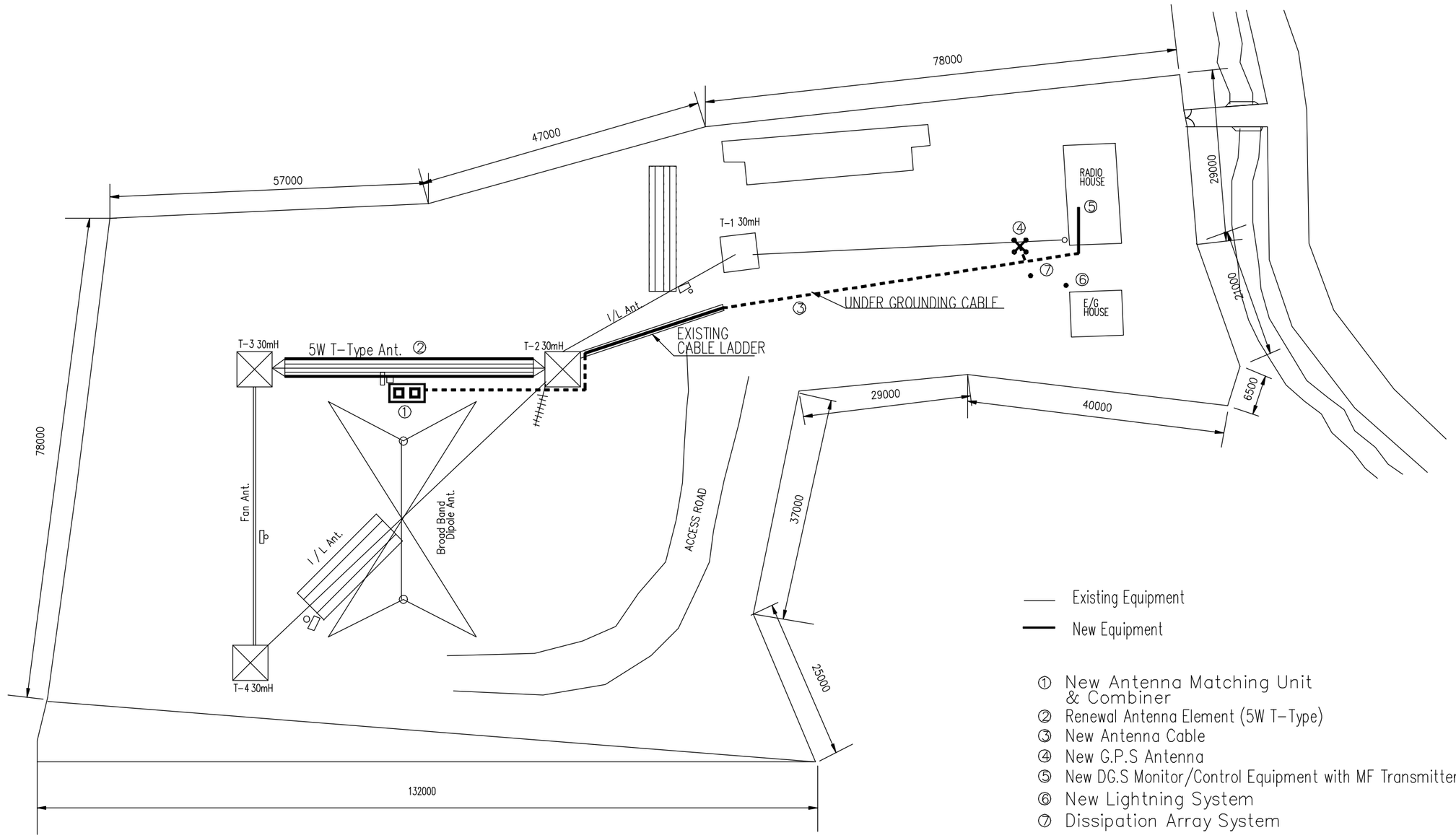
1. 1kW MF Transmitter
2. 1kW HF Transmitter
3. Antenna Exchanger
4. Step-up Transfomer
5. Antenna Switch
6. Power Distribution Frame
7. Supervisory Console
8. Main Distribution Frame
9. Remote Control Rack
10. Voice Frequency Telegraph
11. Multiplex Terminal Equipment
12. UHF Radio Equipment
13. UHF Radio Equipment
14. Line AMP
15. 1kW HF Transmitter
16. Local Terminal Unit
17. Step-up Transformer
18. Antenna Exchanger
19. AC P.D.B
20. AC Branch
21. Antenna Exchanger
22. MF Antenna Matching Unit
23. 3.5kVA Step-up Transfomer
24. TX Status Display
25. 1kW HF Transmitter
26. Repeater
27. 1kW HF Transmitter
28. Antenna Exchanger
29. Antenna Changer

NEW EQUIPMENT

- Ⓐ DGPS MONITOR/CONTROL EQUIPMENT
- Ⓑ 1KW MF TRANSMITTER
- Ⓒ STEP-UP TRANSFORMER 7.5kVA
- Ⓓ DGPS PDB

S 1/60

Name of Drawing	Site Name	
FLOOR LAYOUT	UJUNG PANDANG TRANSMITTEING STATION	/
	No. of Drawing UPD-3	11



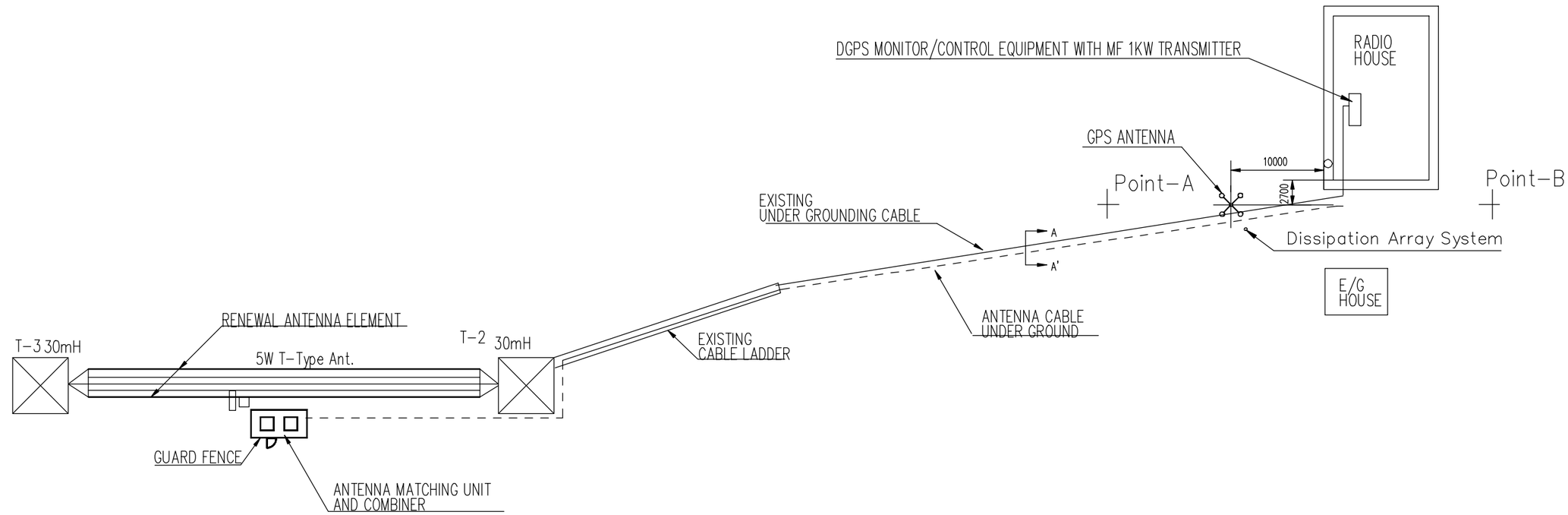
Existing Equipment

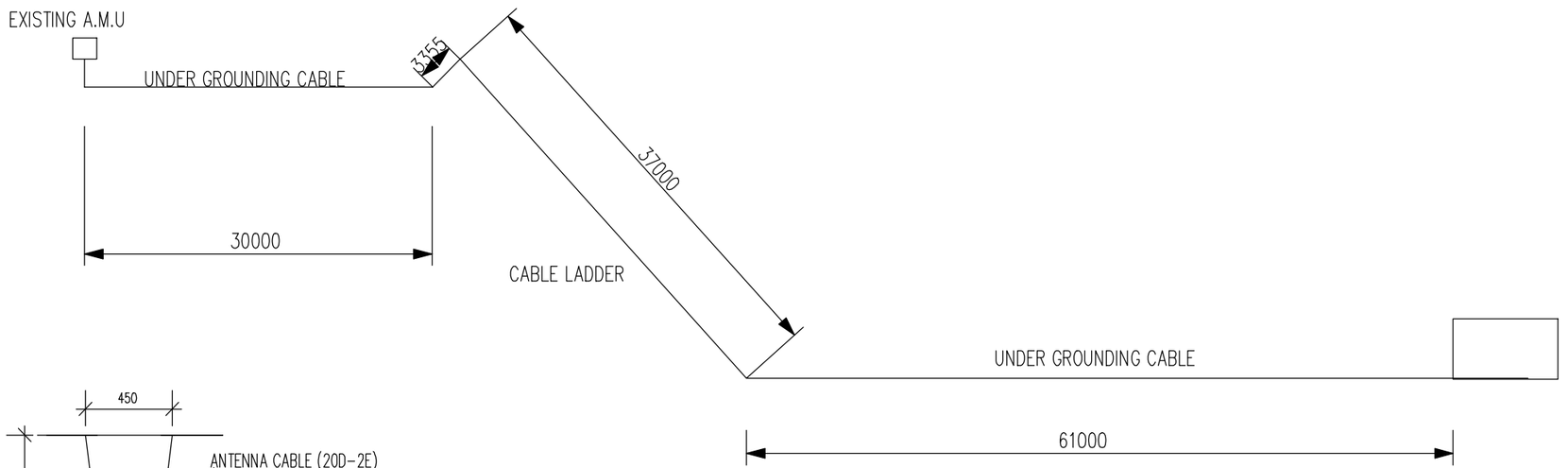
New Equipment

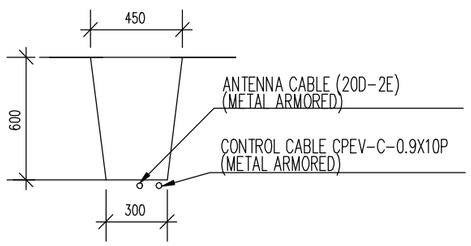
① New Antenna Matching Unit & Combiner
② Renewal Antenna Element (5W T-Type)
③ New Antenna Cable
④ New G.P.S Antenna
⑤ New DG.S Monitor/Control Equipment with MF Transmitter
⑥ New Lightning System
⑦ Dissipation Array System

S 1/750

Name of Drawing	Site Name	
STATION LAYOUT	SEMARANG TRANSMITTING STATION	/
	No. of Drawing: SMR-1	13





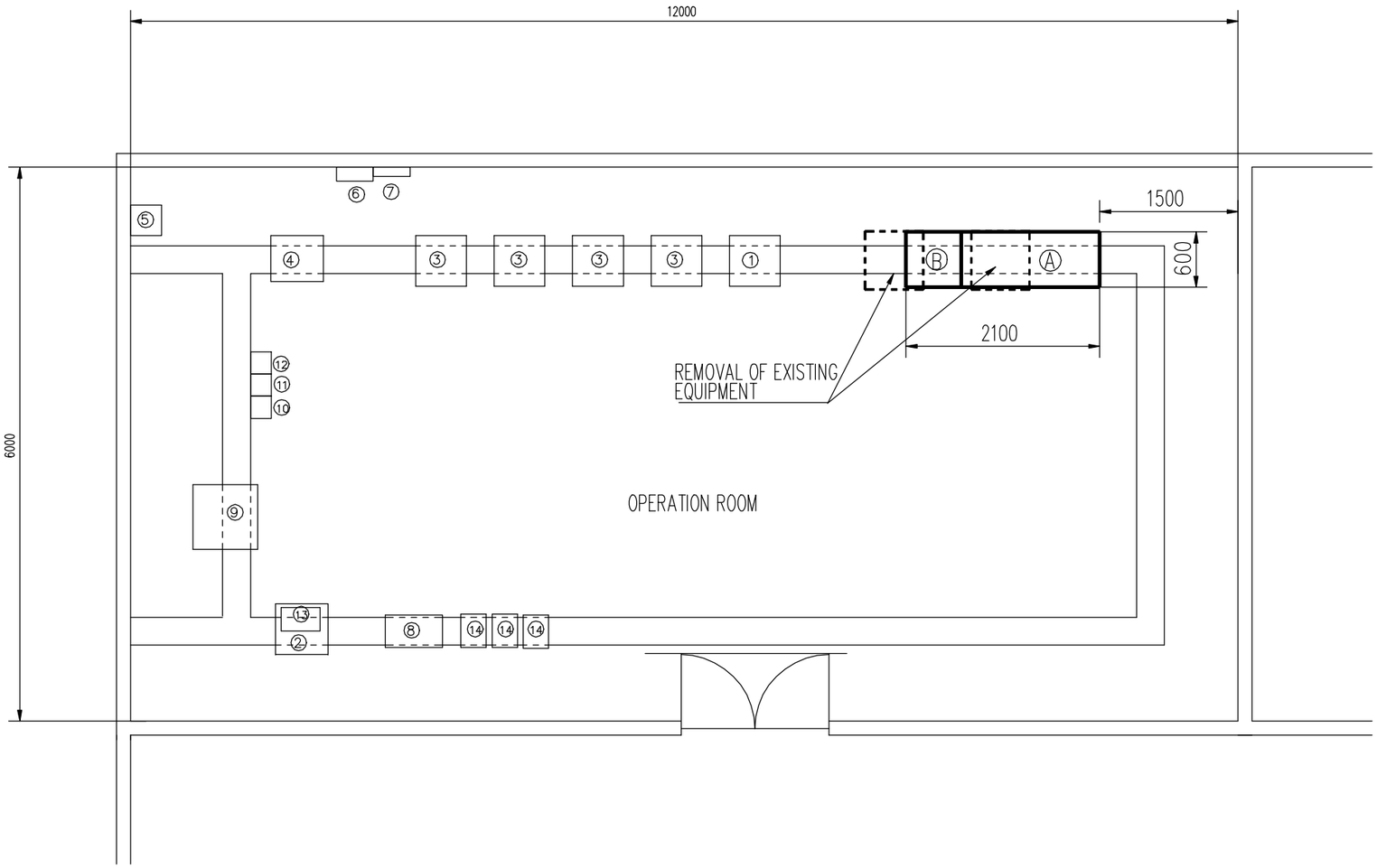


DETAIL A-A'
S 1/30

EXISTING EQUIPMENT
NEW EQUIPMENT

S 1/500

Name of Drawing	Site Name	
NEW EQUIPMENT LAYOUT	SEMARANG TRANSMITTING STATION	/
	No. of Drawing: SMR-2	14



LEGEND

- EXISTING EQUIPMENT
- NEW EQUIPMENT
- REMOVE EQUIPMENT

EXSITING EQUIPMENT

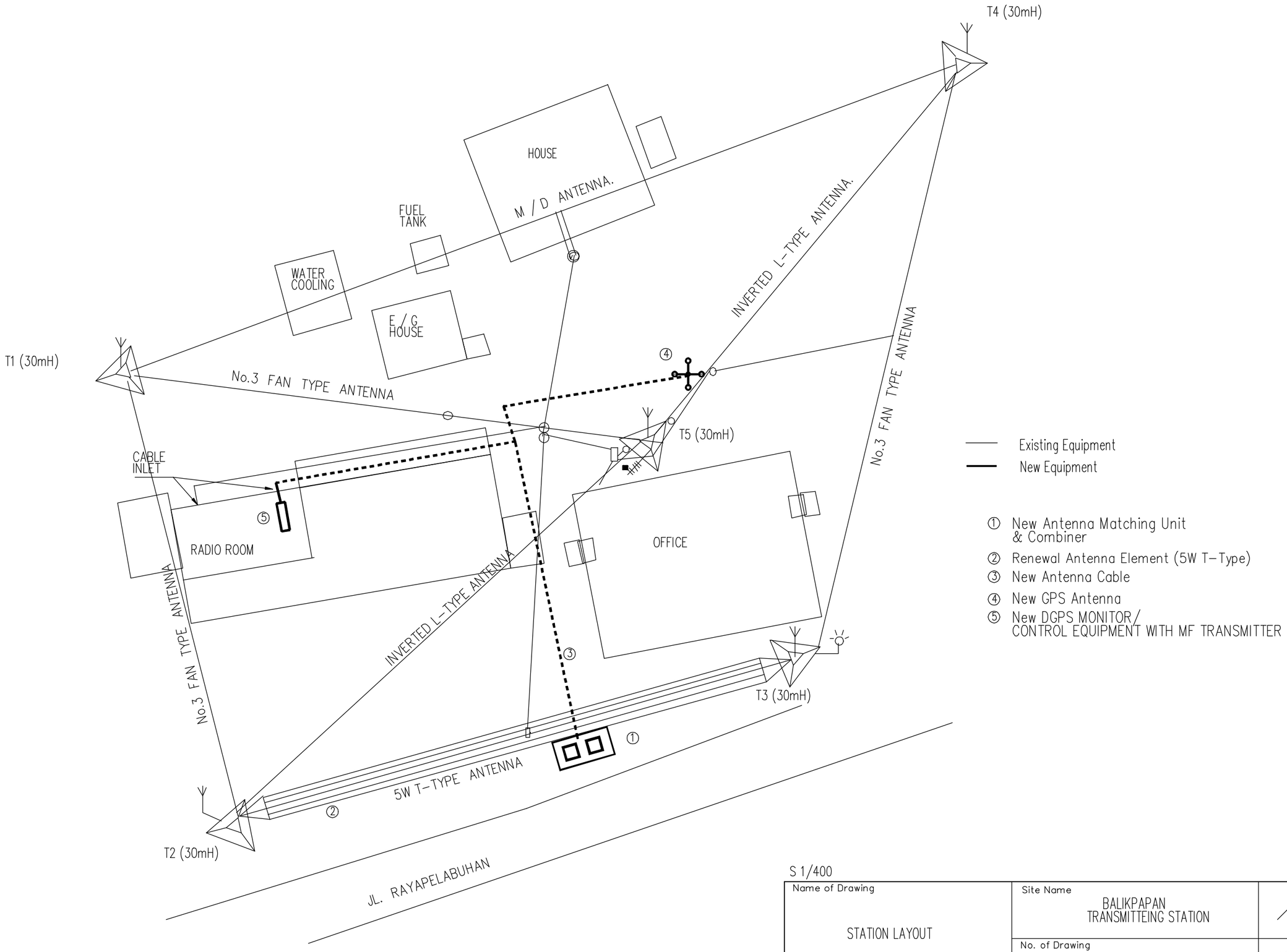
① 1kW MF TRANSMITTER
② REMOTE COTROL RACK
③ 1kW HF TRANSMITTER
④ ANTENNA SWITCHING MATRIX
⑤ 1kW DUMMY LOAD
⑥ MATCHING UNIT CONTROL UNIT
⑦ LOCAL TERMINAL UNIT
⑧ P D B
⑨ M D F
⑩ VFT
⑪ MULTIPLEX RADIO RELAY
⑫ MULTIPLEX TERMINAL
⑬ LOCAL TERMINAL UNIT
⑭ STEP-DOWN TRANSFORMER

NEW EQUIPMENT

Ⓐ 1KW MF TRANSMITTER
Ⓑ DGPS MONITOR/CONTROL EQUIPMENT WITH MF TRANSMITTER

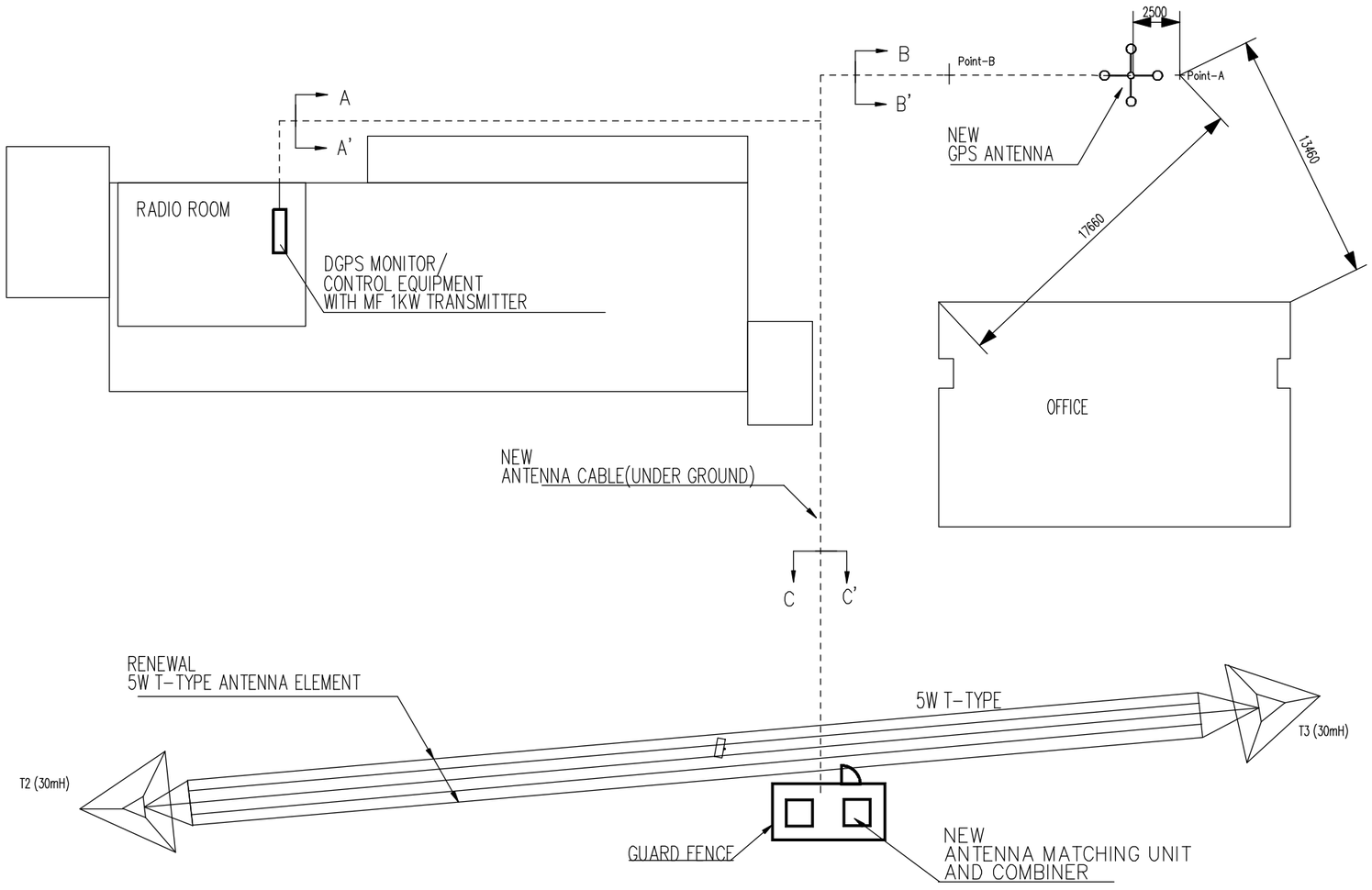
S 1/60

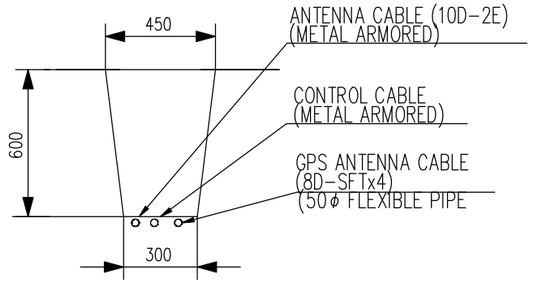
Name of Drawing	Site Name	
FLOOR LAYUOT	SEMARANG TRANSMITTER STATION	/
	No. of Drawing: SMR-3	15



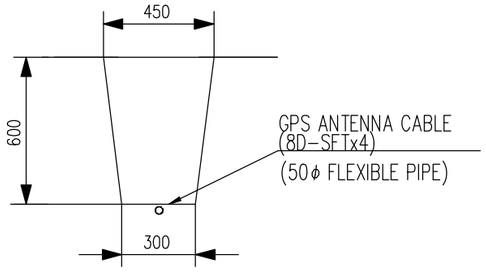
S 1/400

Name of Drawing	Site Name	
STATION LAYOUT	BALIKPAPAN TRANSMITTEING STATION	/
	No. of Drawing: BLP-1	18

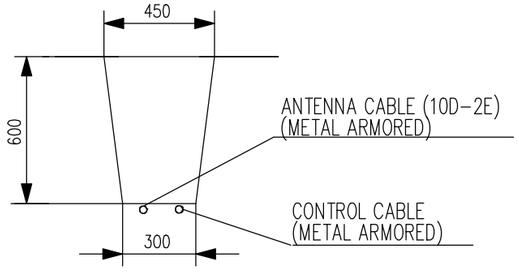




DETAIL A – A'
S 1/25



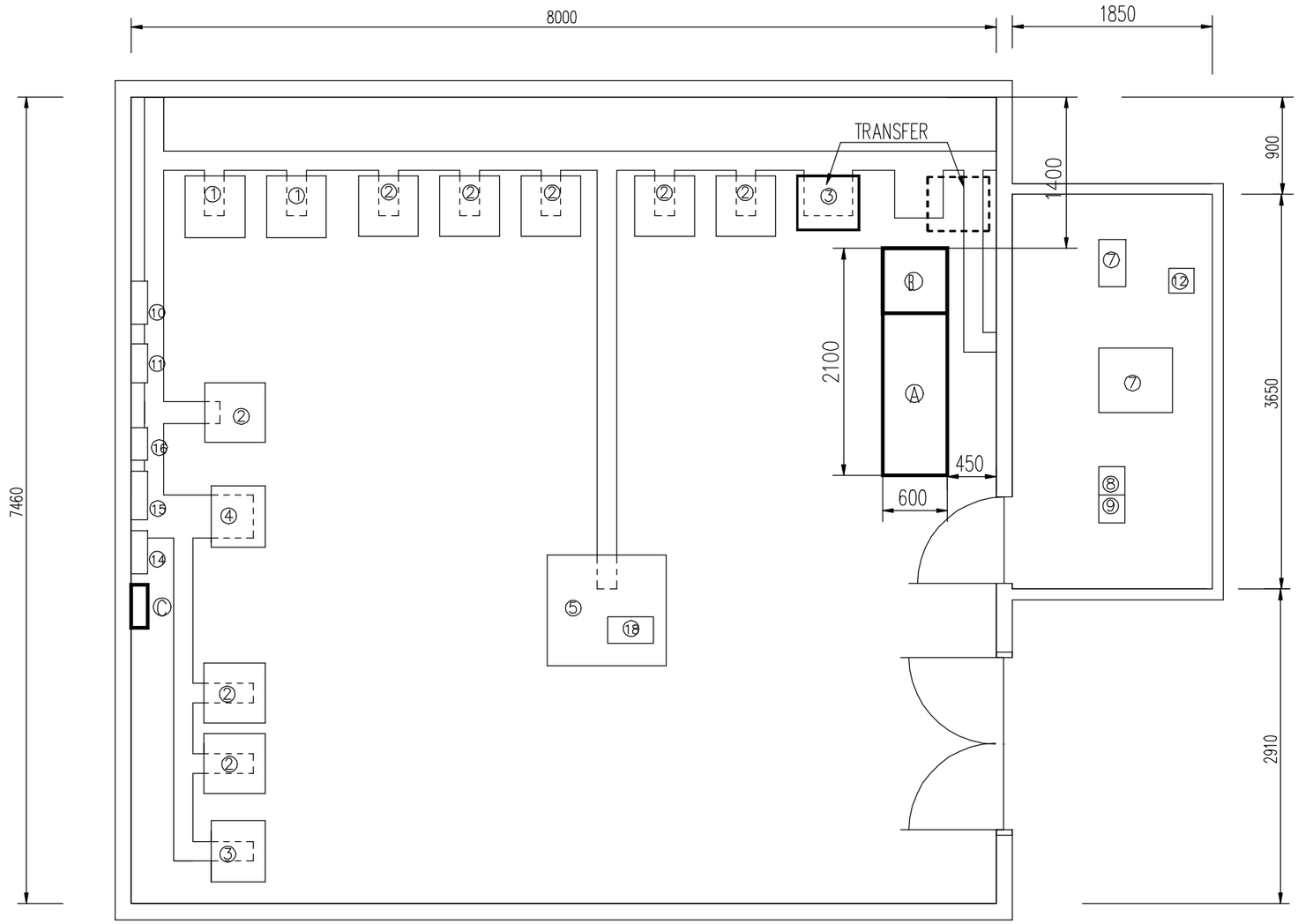
DETAIL B – B'
S 1/25



DETAIL C – C'
S 1/25

S 1/300

Name of Drawing	Site Name	
NEW EQUIPMENT LAYOUT	BALIKPAPAN TRANSMITTEING STATION	/
	No. of Drawing: BLP-2	19



LEGEND

- EXISTING EQUIPMENT
- NEW EQUIPMENT
- EXISTING POSITION

EXISTING EQUIPMENT

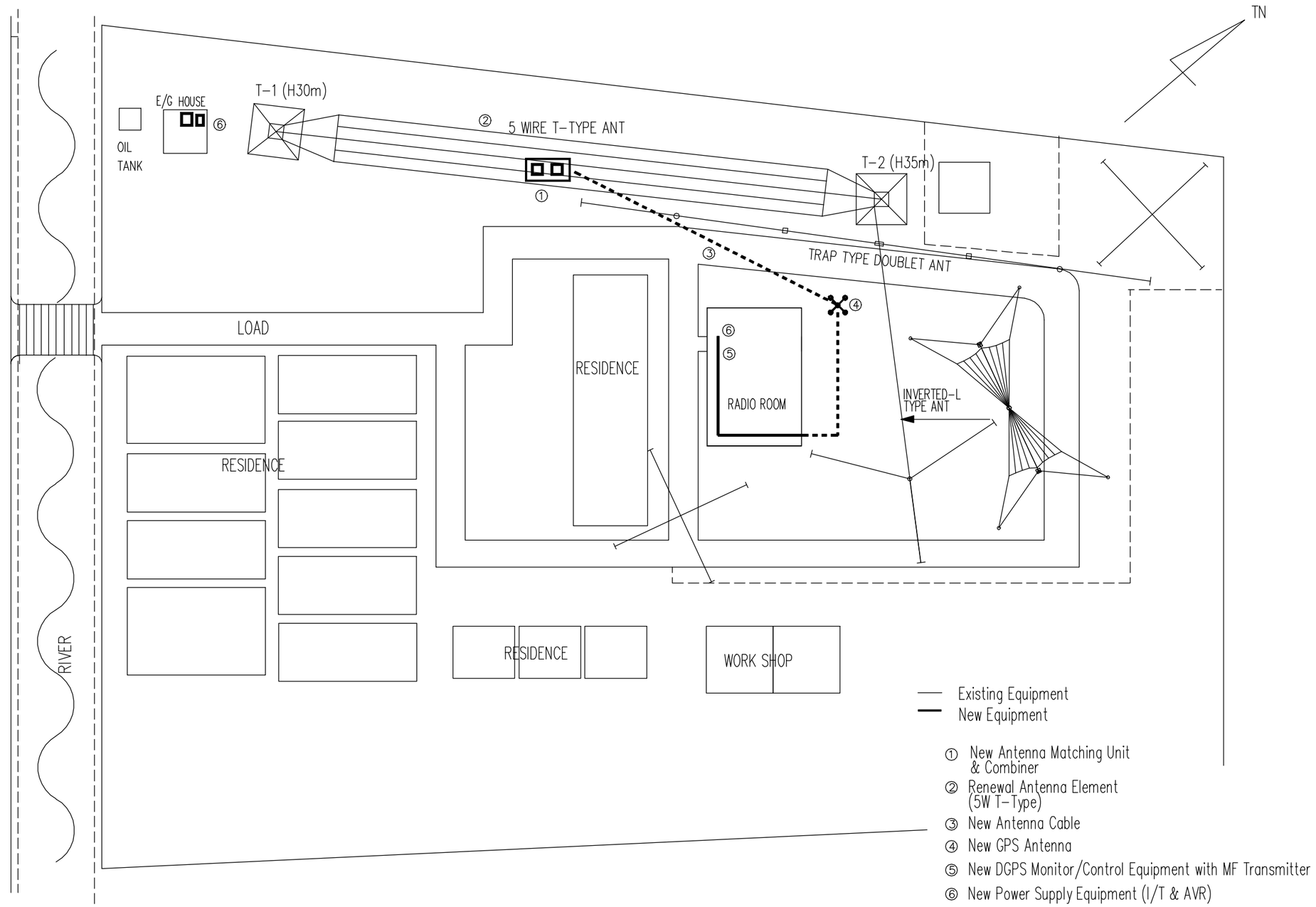
① 1kW MF TRANSMITTER
② 1kW HF TRANSMITTER
③ ANTENNA SWITCHING MATRIX
④ POWER DISTRIBUTION BOARD
⑤ SUPER VISORY CONSOLE
⑥ REMORTE CONTROL RACK
⑦ MAIN DISTRIBUTION FRAME
⑧ MULTIPLEX TERMINAL EQUIPMENT
⑨ 1400MHz SS-PM MULTIPLEX RADIO
⑩ ANTENNA EXCHANGER
⑪ MATCHING UNIT CONTROL
⑫ FS DEMODULATOR
⑬ REMORTE CONTROL RACK
⑭ ANTENNA EXCHENGER
⑮ AC PDB
⑯ AC BRANCH
⑰ LOCAL TERMINAL UNIT
⑱ TX STATUS DISPLAY

NEW EQUIPMENT

Ⓐ MF 1KW TRANSMITTER
Ⓑ DGPS MONITOR/CONTROL EQUIPMENT
Ⓒ PDB

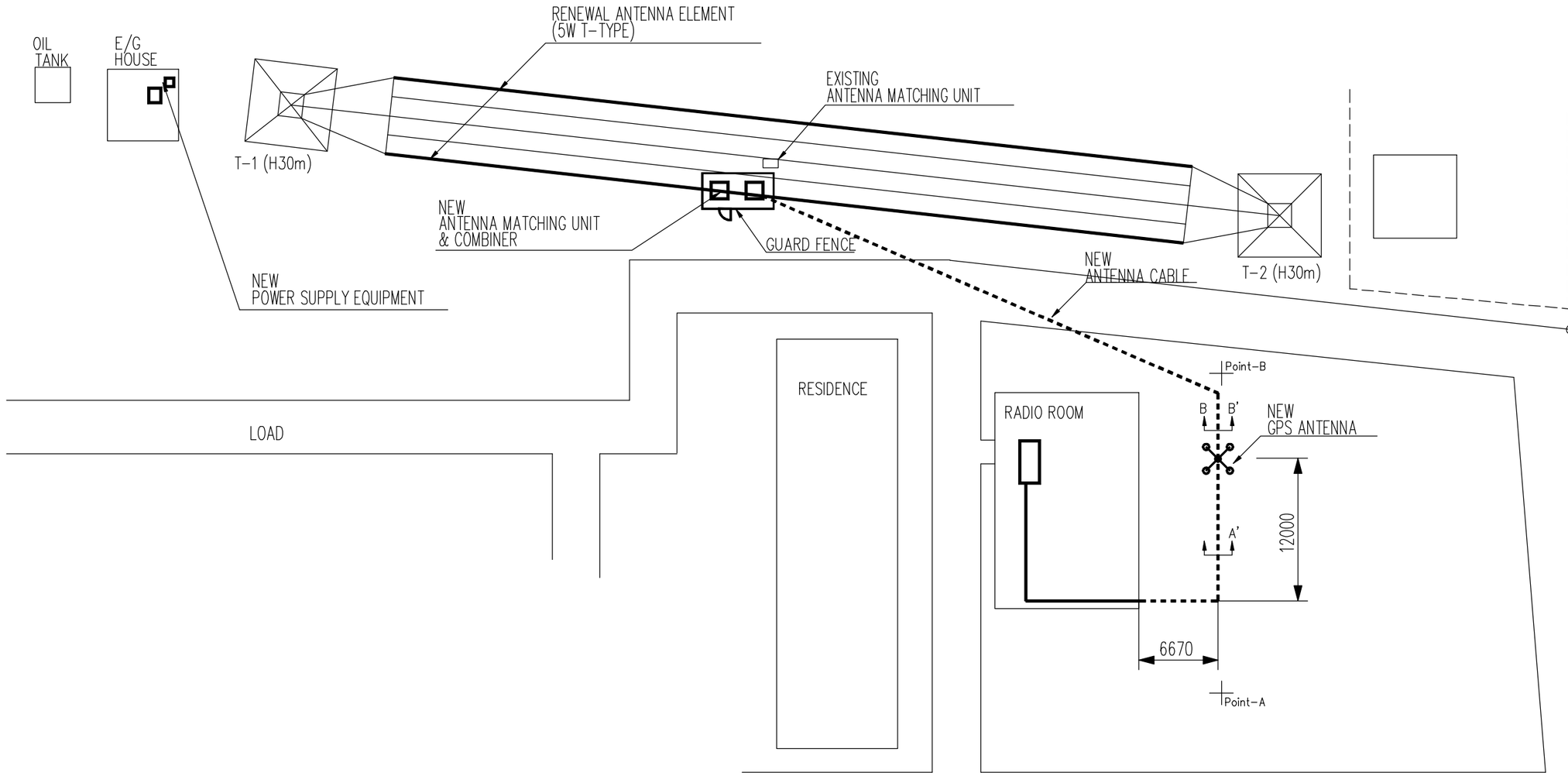
S 1/50

Name of Drawing	Site Name	
FLOOR LAYOUT	BALIKPAPAN TRANSMITTING STATION	/
	No. of Drawing: BLP-3	20

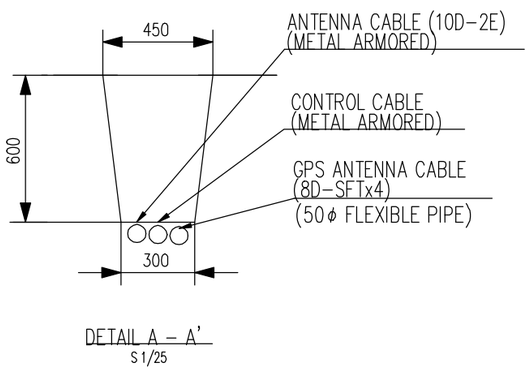


S 1/600

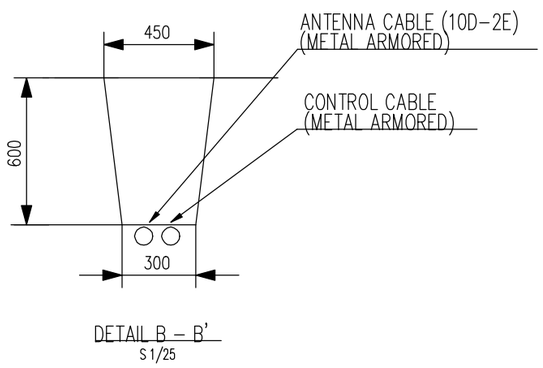
Name of Drawing	Site Name	
STATION LAYOUT	BANJARMASIN TRANSMITTING STATION	/
	No. of Drawing: BJM-1	22



S 1/400



DETAIL A – A'
S 1/25

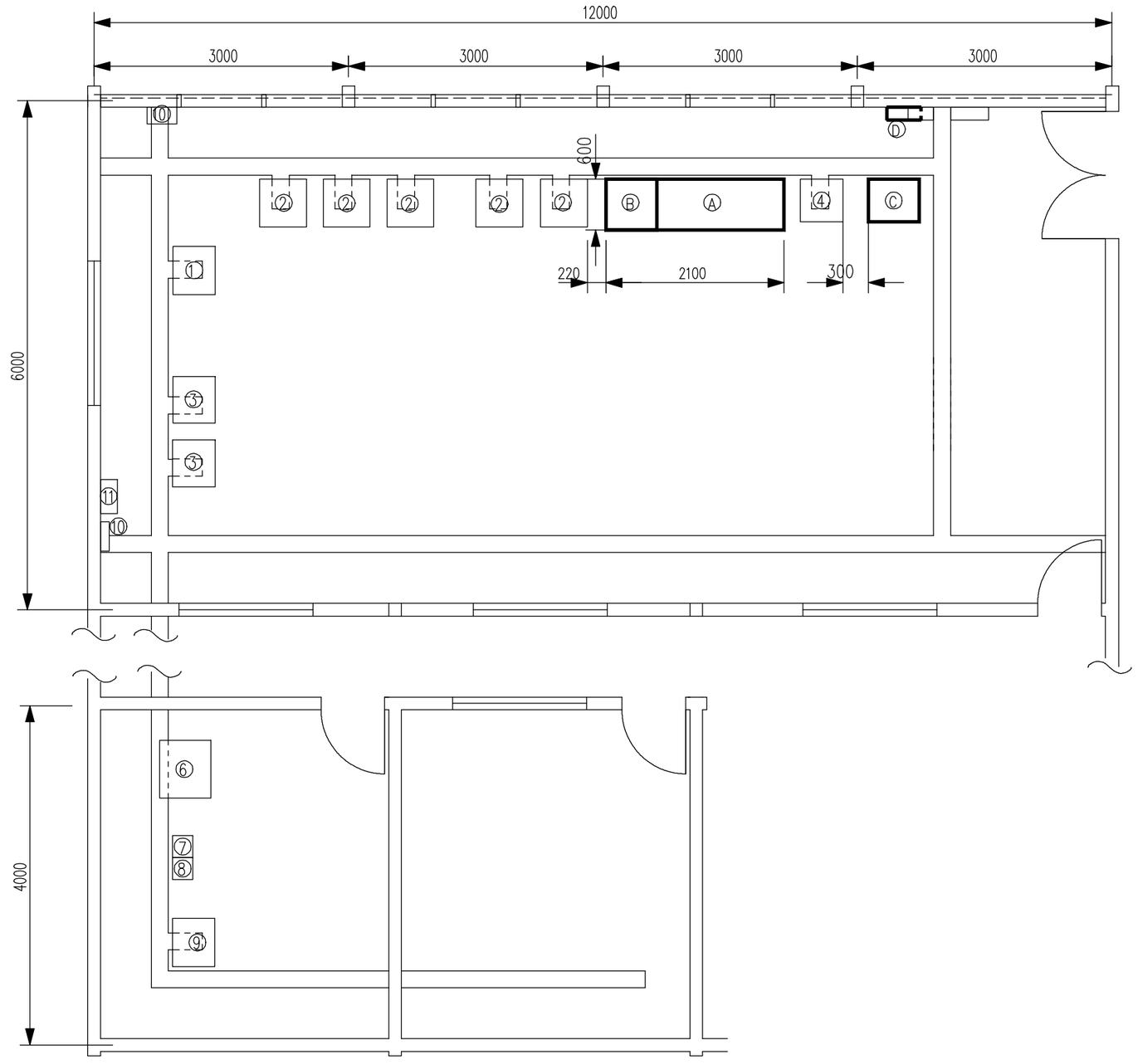


DETAIL B – B'
S 1/25

EXISTING EQUIPMENT
NEW EQUIPMENT

S 1/400

Name of Drawing	Site Name	
NEW EQUIPMENT LAYOUT	BANJARMASIN TRANSMITTEING STATION	/
	No. of Drawing: BJM-2	23



EXISTING EQUIPMENT
NEW EQUIPMENT

EXISTING EQUIPMENT

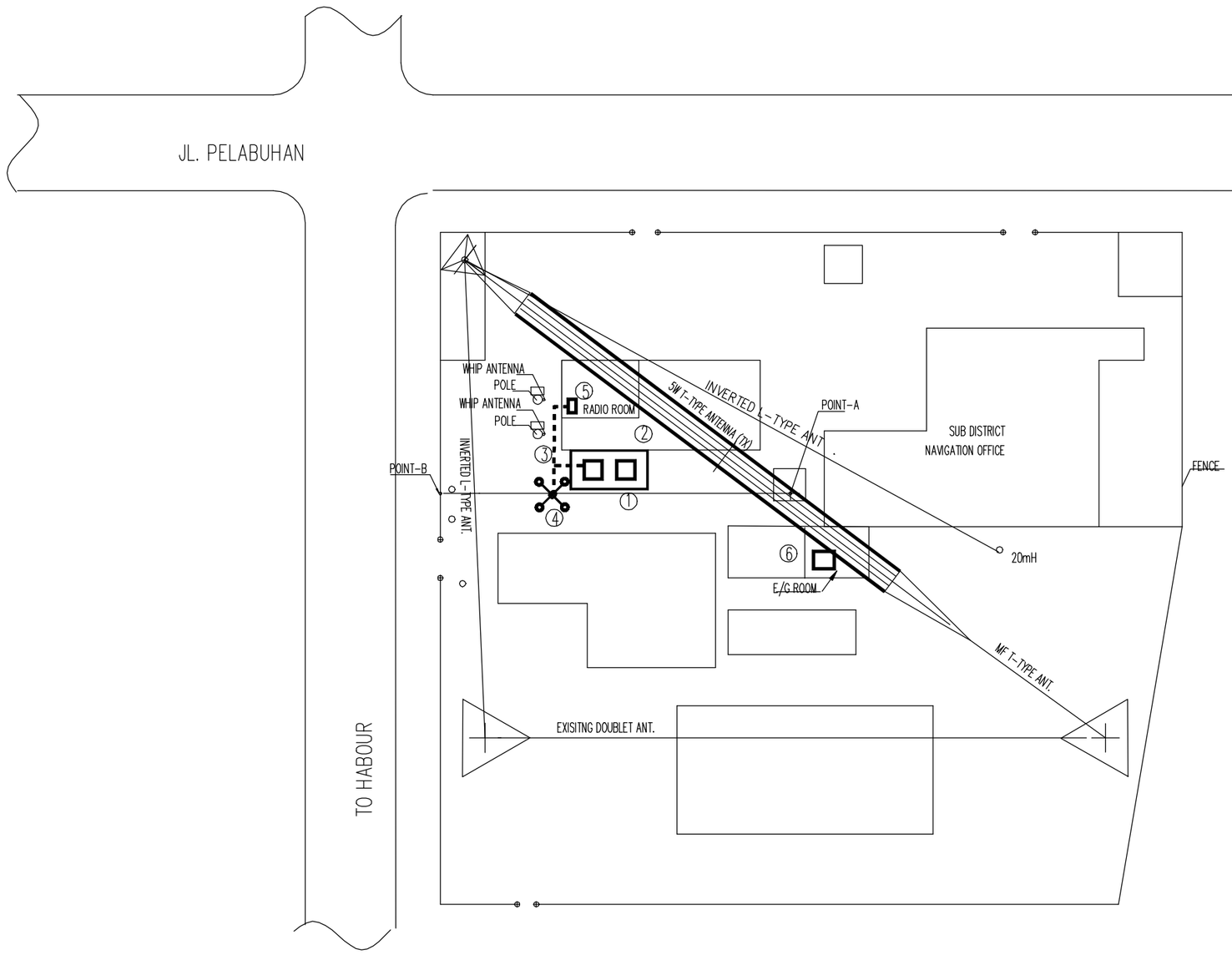
① ANTENNA SWITCHING MATRIX
② 1kw HF TRANSMITTER
③ 1kw MF TRANSMITTER
④ POWER DISTRIBUTION BOARD
⑤ SUPERVISORY CONSOLE
⑥ MAIN DITRIBUTION FRAME
⑦ 400MHz SS-PM MULTIPLEX RADIO
⑧ MULTIPLEX TERMINAL EQUIPMENT
⑨ REMOTE CONTROL RACK
⑩ MATCHING UNIT CONTROL
⑪ ANTENNA EXCHANGER

NEW EQUIPMENT

Ⓐ MF TRANMITTER
Ⓑ DGPS MONITOR/CONTROL EQUIPMENT
Ⓒ ISOLATION TRANSFORMER 40kVA
Ⓓ POWER DISTRIBUTION BOARD (FOR DGPS)

S 1/60

Name of Drawing	Site Name	
FLOOR LAYOUT	BANJARMASIN TRANSMTTING STATION	/
	No. of Drawing BJM-3	24



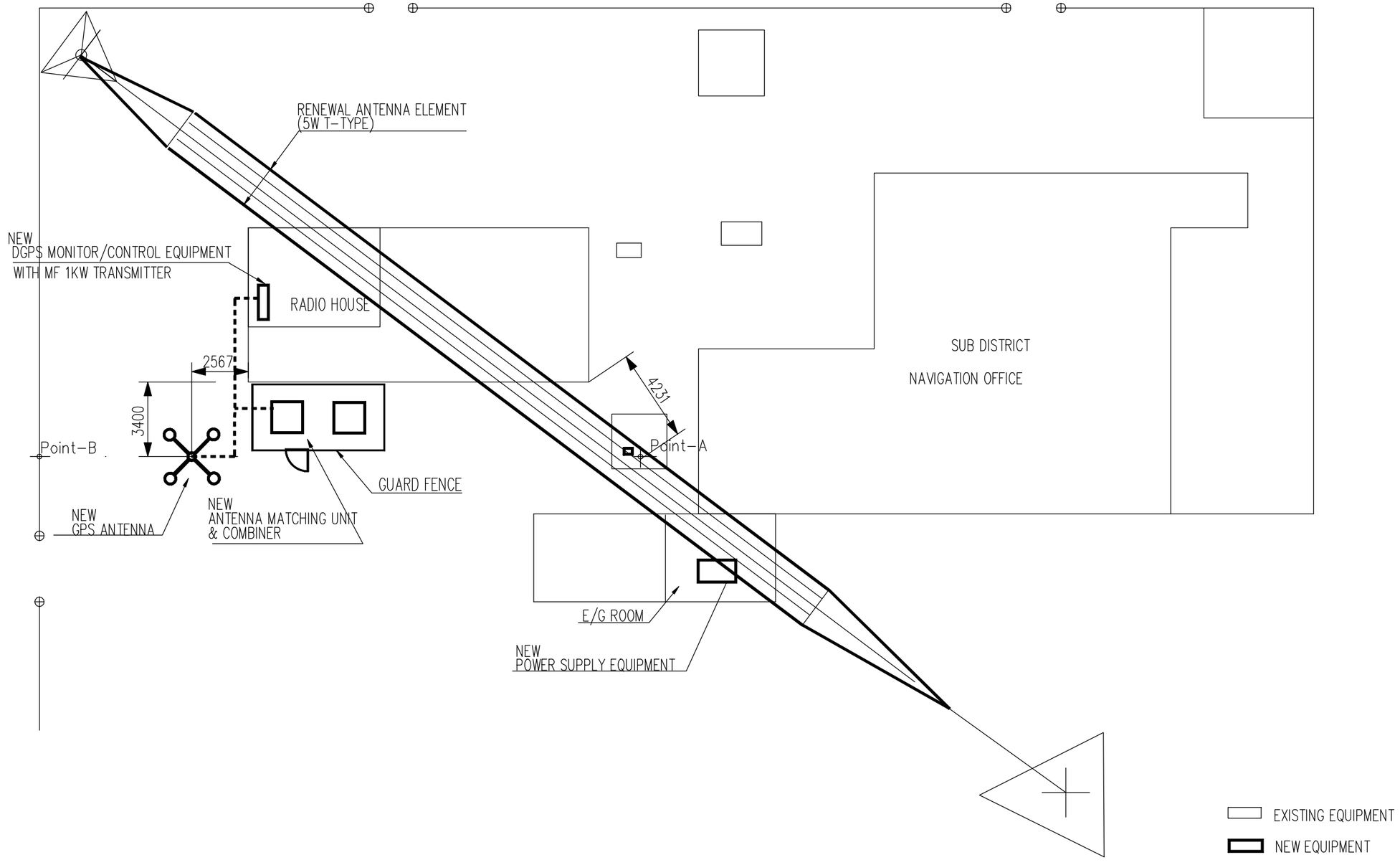
Existing Equipment

New Equipment

① New Antenna Matching Unit & Combiner
② Renewal Antenna Element (5W T-Type)
③ New Antenna Cable
④ New GPS Antenna
⑤ New DGPS Monitor/control Equipment with MF 1kW transmitter
⑥ New Power Supply Equipment (I/T & AVR)

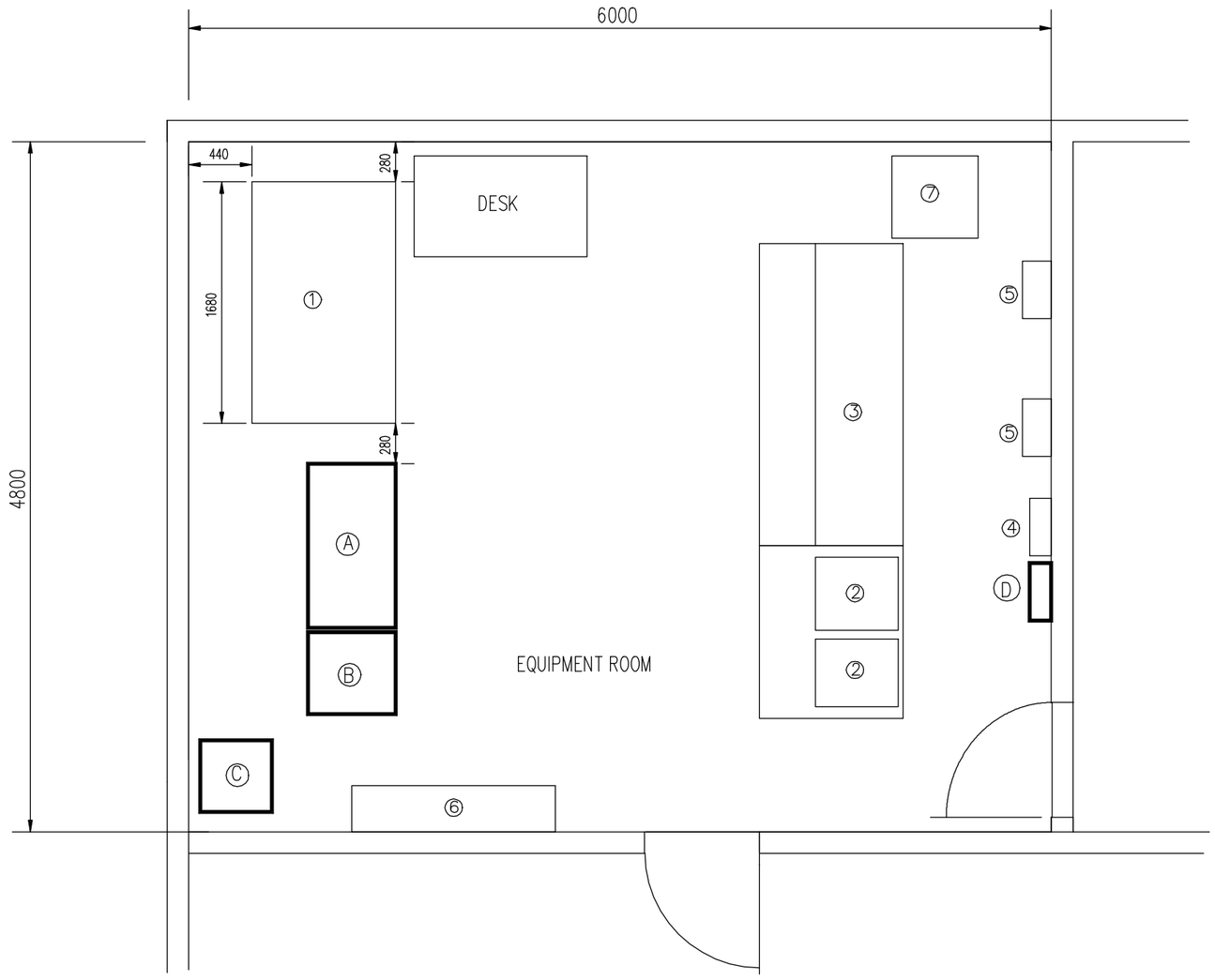
S 1/400

Name of Drawing	Site Name	
STATION LAYOUT	BENOA STATION	/
	No. of Drawing BEN-1	27



S 1/200

Name of Drawing	Site Name	
NEW EQUIPMENT LAYOUT	BENOA STATION	/
	No. of Drawing BEN-2	28



EXISTING EQUIPMENT
NEW EQUIPMENT

EXISTING EQUIPMENT
① RADIO CONSOLE (JRC)
② SAILER
③ RADIO CONSOLE (SAILER)
④ P.D.B
⑤ 600W PA
⑥ STEP-UP TRANS,AVR,I/T
⑦ M.F.B MONITOR

NEW EQUIPMENT
Ⓐ MF 1KW TRANSMITTER
Ⓑ DGPS MONITOR/CONTROL EQUIPMENT
Ⓒ STEP-UP TRANSFORMER
Ⓓ P.D.B FOR DGPS

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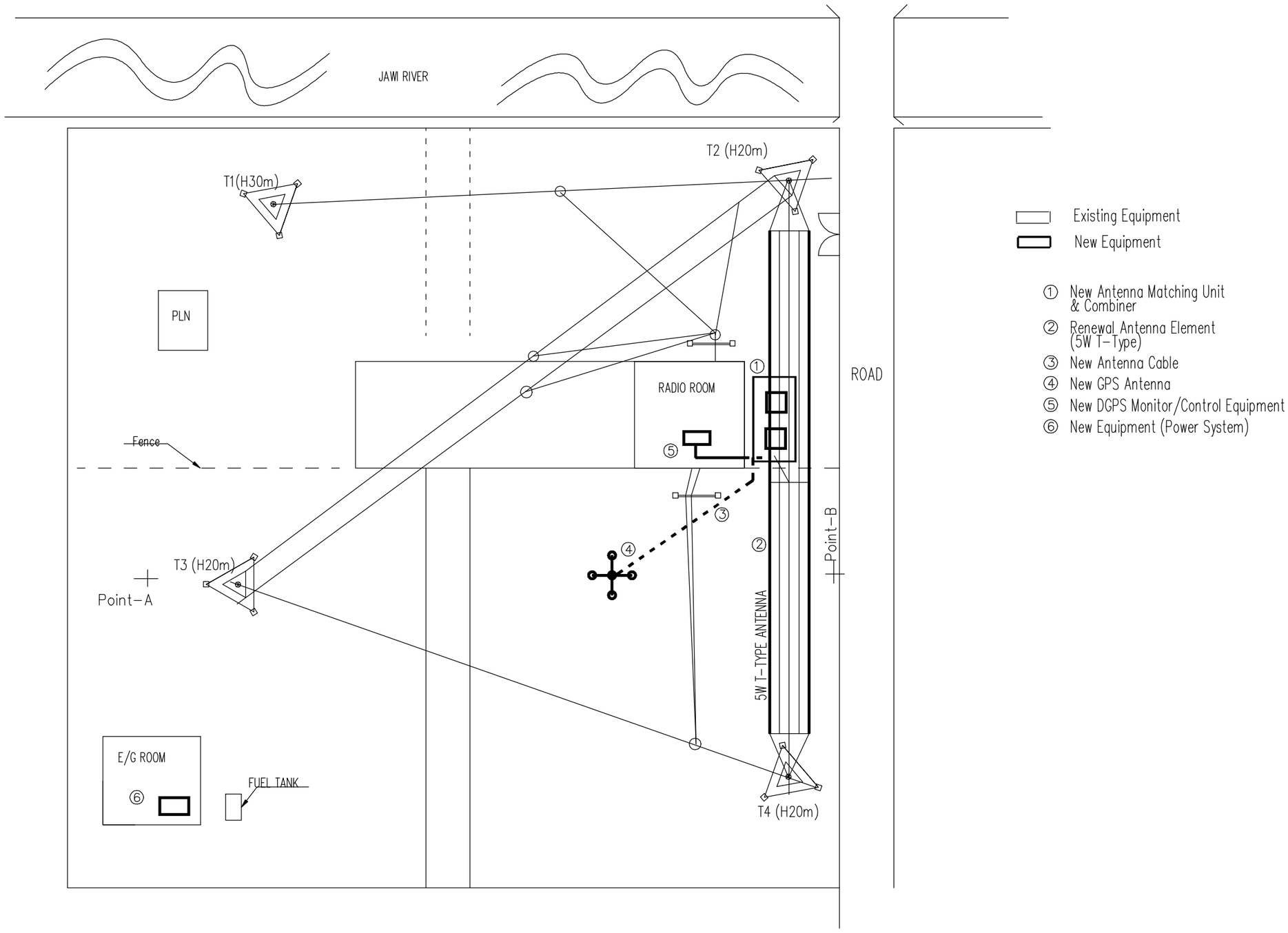
Name of Drawing	Site Name	
FLOOR LAYOUT	BENOA STATION	/
	No. of Drawing BEN-3	29



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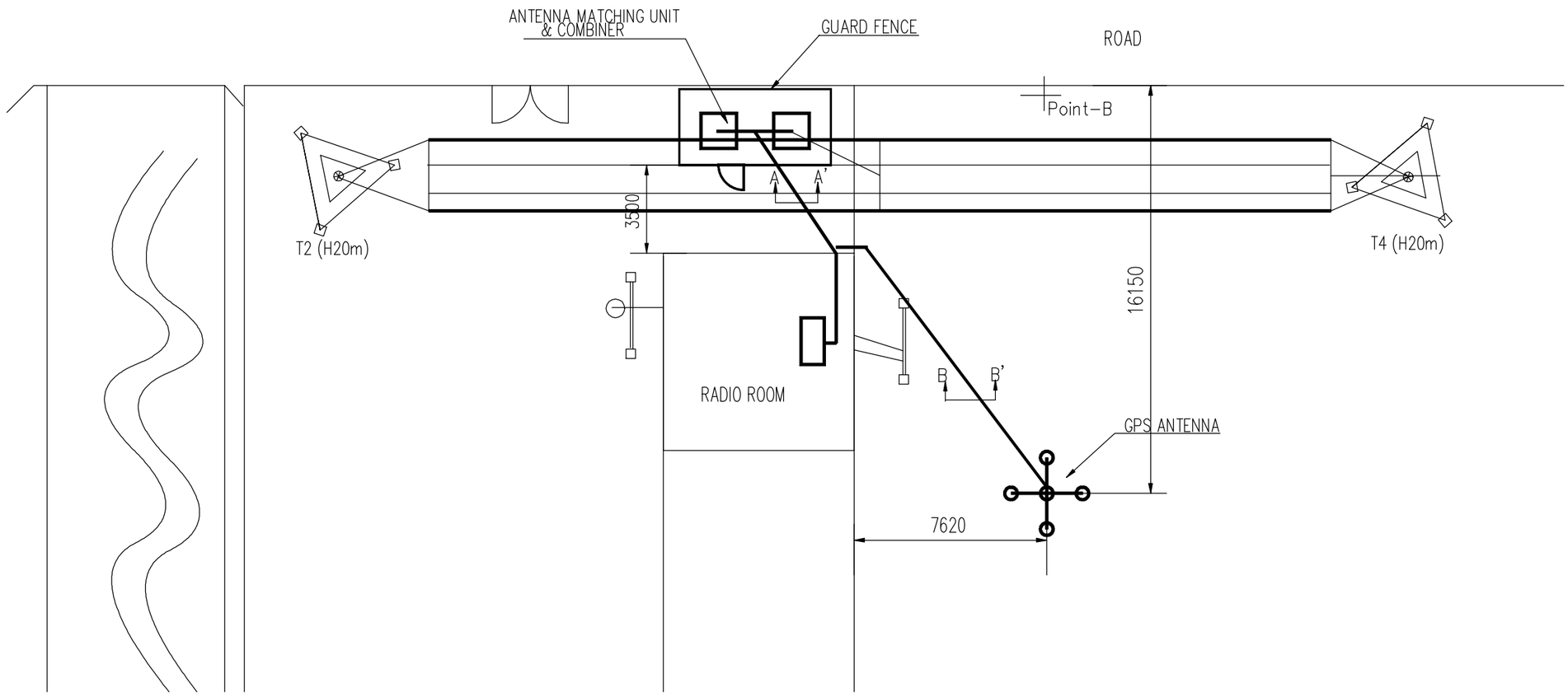
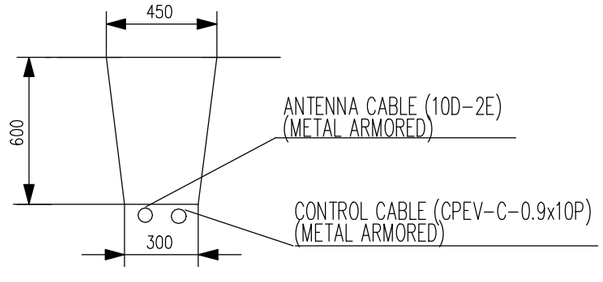
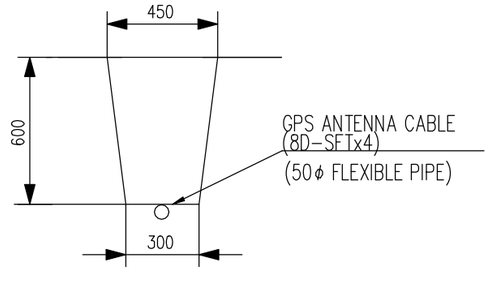
Name of Drawing	Site Name	
STATION LAYOUT	PONTIANAK STATION	/
	No. of Drawing: PON-1	32





DETAIL A – A'
S 1/25



DETAIL B – B'
S 1/25

EXISTING EQUIPMENT

NEW EQUIPMENT

S 1/200

Name of Drawing	Site Name	
NEW EQUIPMENT LAYOUT	PONTIANAK STATION	/
	No. of Drawing PON-2	33

EXISTING EQUIPMENT
NEW EQUIPMENT
REMOVAL EQUIPMENT

EXISTING EQUIPMENT
① RADIO CONSOLE(SAILER)
② SAILER (MF TX) x 2
③ ICOM TRANSCEIVER
④ P.D.B
⑤ 600W PA
⑥ TRANSMITTER(JRC) REMOVAL

NEW EQUIPMENT
Ⓐ MF 1KW TRANSMITTER
Ⓑ DGPS MONITOR/CONTROL EQUIPMENT
Ⓒ STEP-DOWN TRANSFORMER FOR EXISTING EQUIP.
Ⓓ E/G CONTROL & PDB PANEL
Ⓔ P.D.B FOR DGPS

S 1/50

Name of Drawing	Site Name	
FLOOR LAYOUT	PONTIANAK STATION	/
	No. of Drawing: PON-3	34