

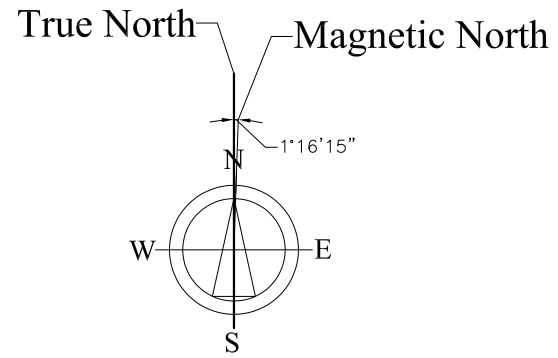
2-2-3 Outline Design Drawing

The following outline design drawings for the Project are attached hereunder.

<Sukkur Meteorological Radar Tower Building>

- Site Plan : A-01
- Floor Plan 1 : A-02
- Floor Plan 2 : A-03
- Floor Plan 3 : A-04
- Floor Plan 4 : A-05
- Floor Plan 5 : A-06
- Floor Plan 6 : A-07
- Floor Plan 7 : A-08
- Elevation 1 : A-09
- Elevation 2 : A-10
- Section : A-11

- Equipment & Furniture Layout Plan 1 : EQ-01
- Equipment & Furniture Layout Plan 2 : EQ-02
- Equipment & Furniture Layout Plan 3 : EQ-03
- Equipment & Furniture Layout Plan 4 : EQ-04

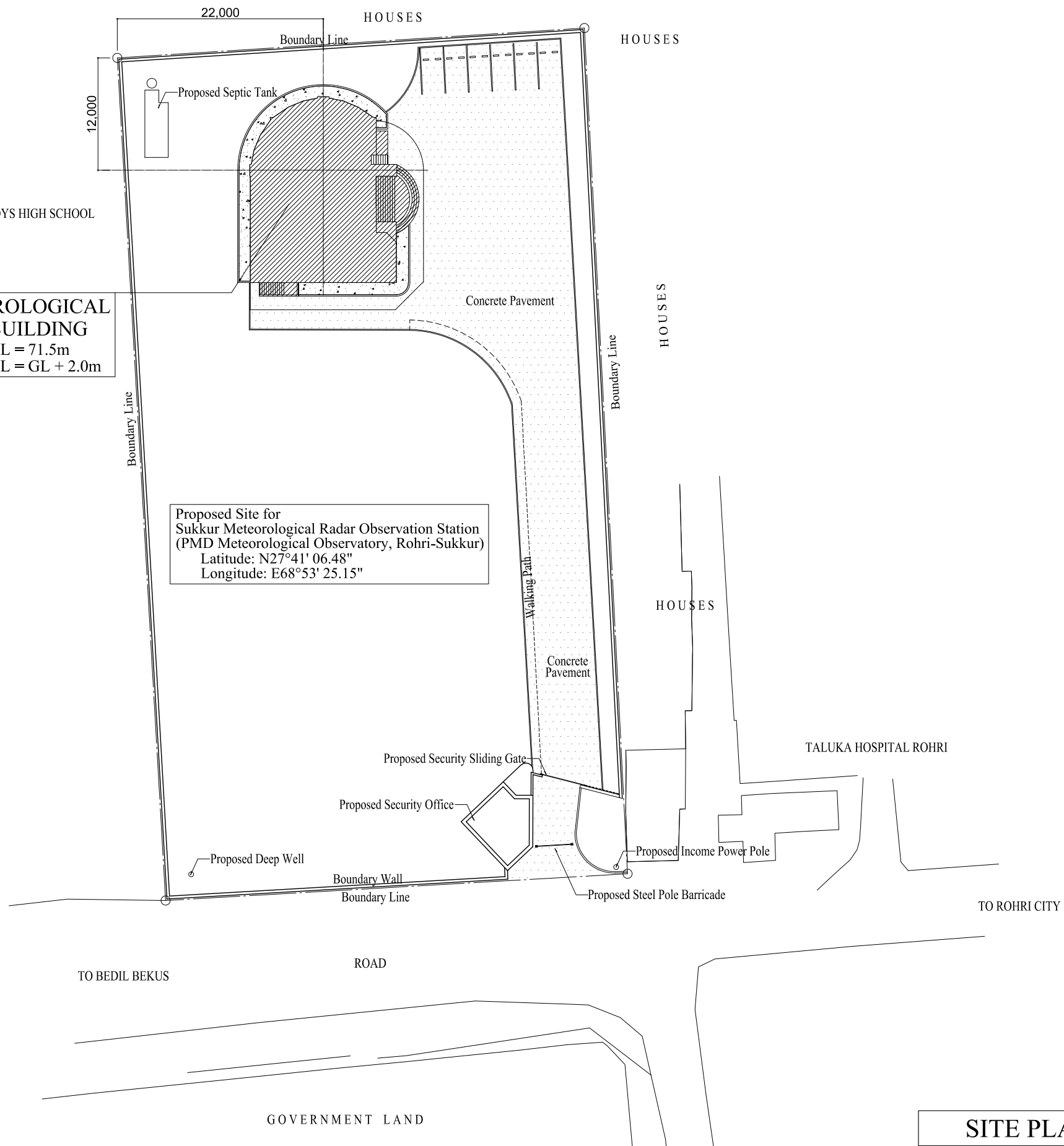


**PROPOSED METEOROLOGICAL
RADAR TOWER BUILDING**
Design GL = 71.5m
1FL = GL + 2.0m

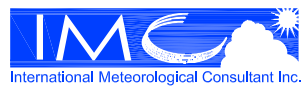
Proposed Site for
Sukkur Meteorological Radar Observation Station
(PMD Meteorological Observatory, Rohri-Sukkur)
Latitude: N27°41' 06.48"
Longitude: E68°53' 25.15"

Area Calculations

Floor	Floor Area (m2)	Construction Area (m2)
1FL	245.07	292.78
M2FL	—	274.81
2FL	175.55	374.42
3FL	181.37	250.08
4FL	116.64	203.58
5FL	19.31	116.64
6FL	—	116.64
7FL	—	116.64
8FL	—	116.64
9FL	35.78	168.31
Total	773.72 m2	2,030.54 m2
Building Coverage Area	334.63 m2	—



SITE PLAN



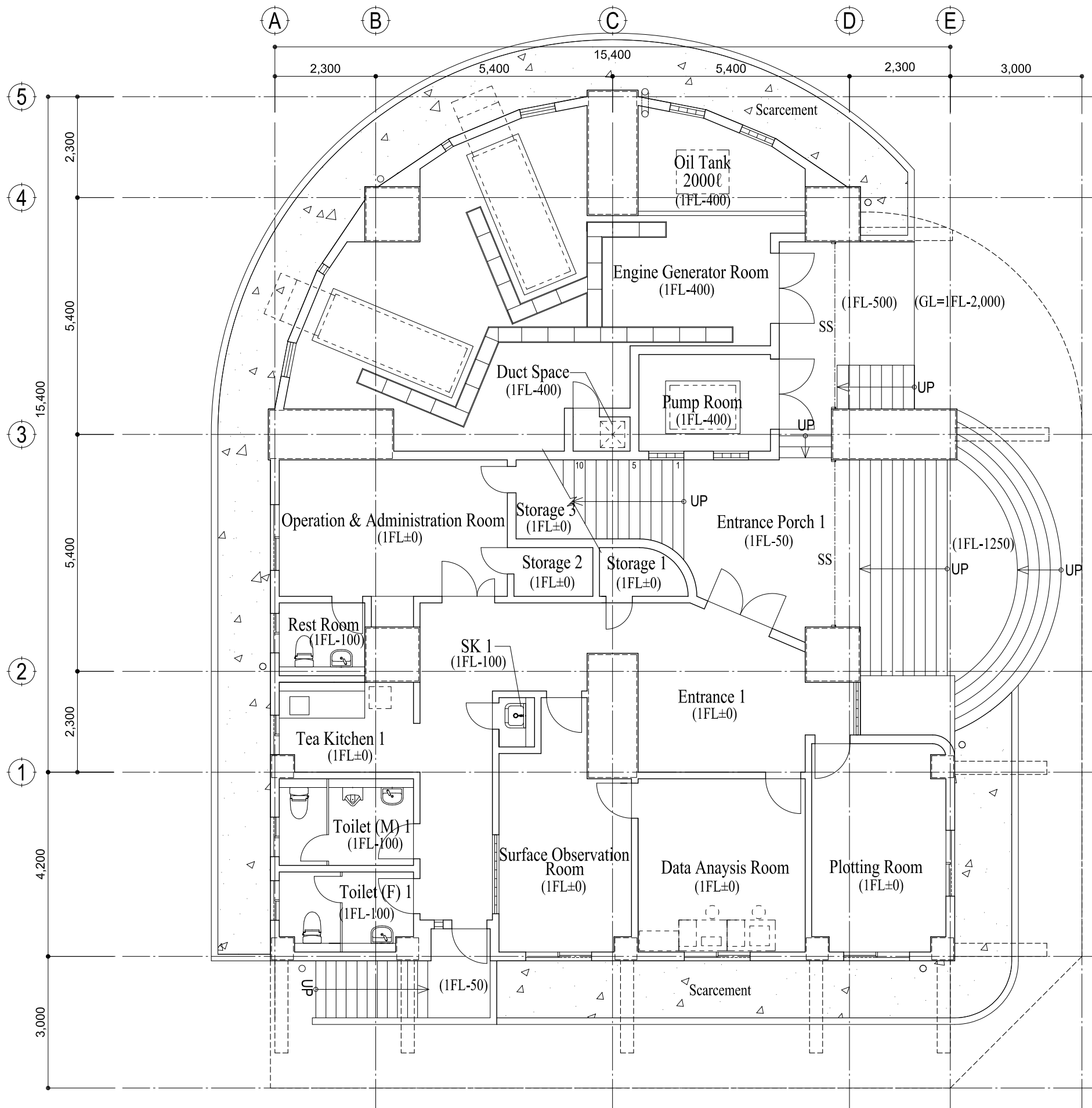
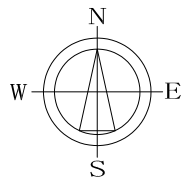
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THE PROJECT FOR THE INSTALLATION OF
WEATHER SURVEILLANCE RADAR AT SUKKUR
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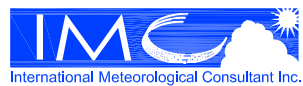
DRAWING TITLE
SUKKUR METEOROLOGICAL RADAR TOWER BUILDING
SITE PLAN

SCALE
1:500

DRAWING No.
A - 01



1FL PLAN



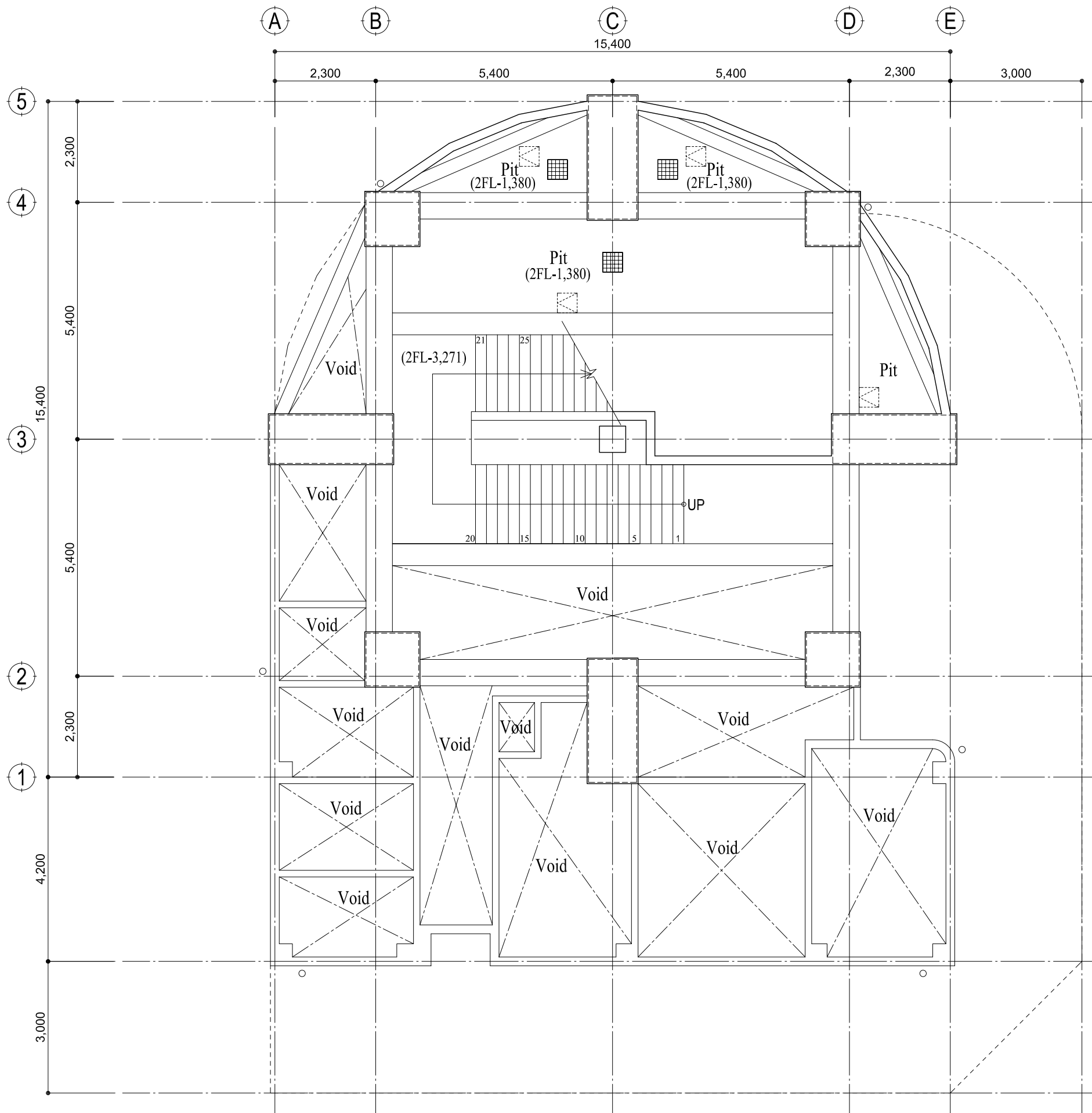
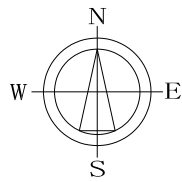
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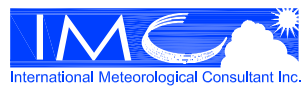
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 SUKKUR METEOROLOGICAL RADAR TOWER BUILDING
 FLOOR PLAN 1

SCALE
 1:100

DRAWING No.
 A - 02



M2FL PLAN



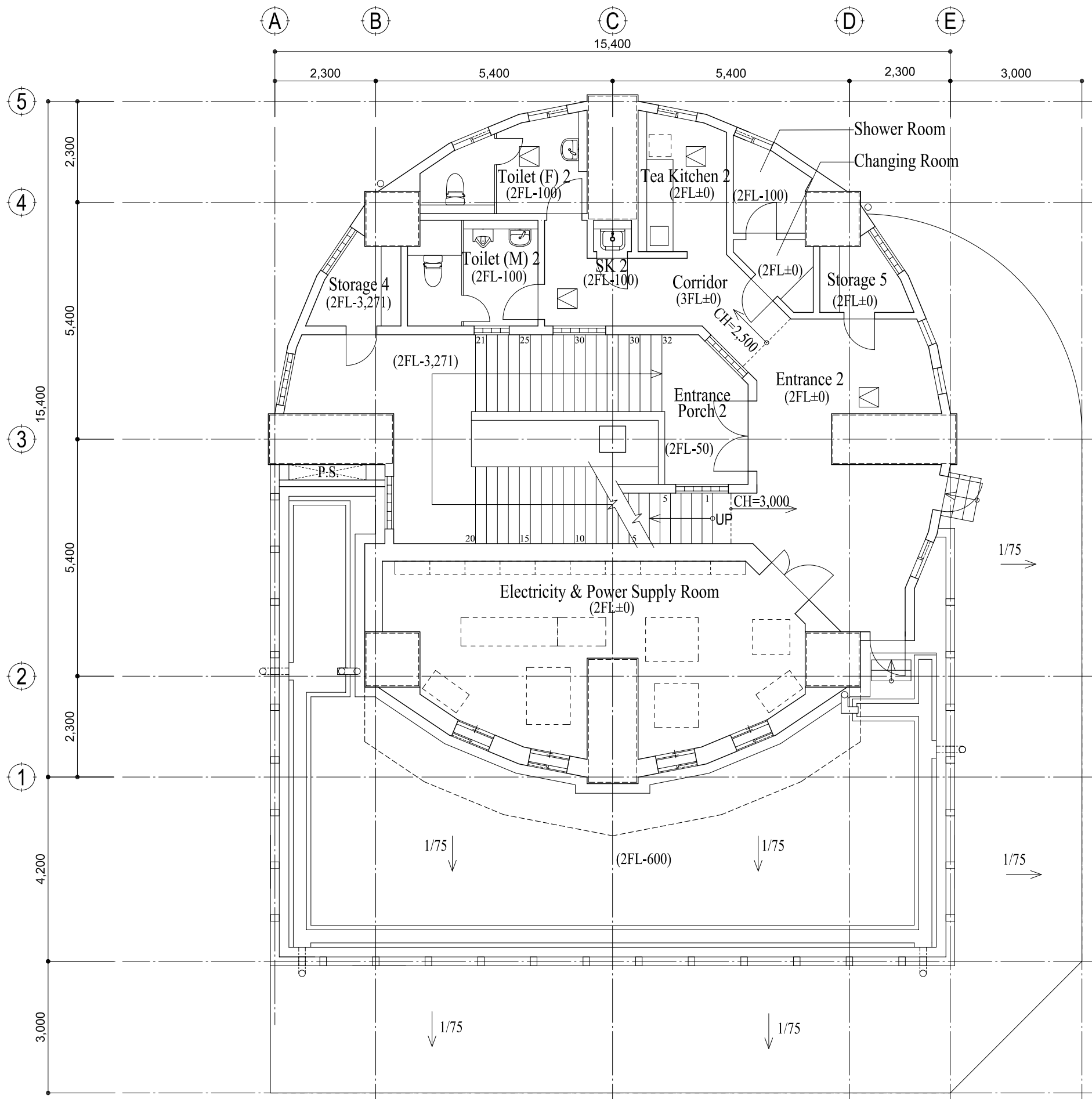
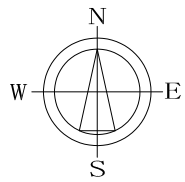
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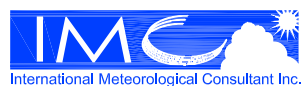
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 FLOOR PLAN 2

SCALE
 1:100

DRAWING No.
 A - 03



2FL PLAN



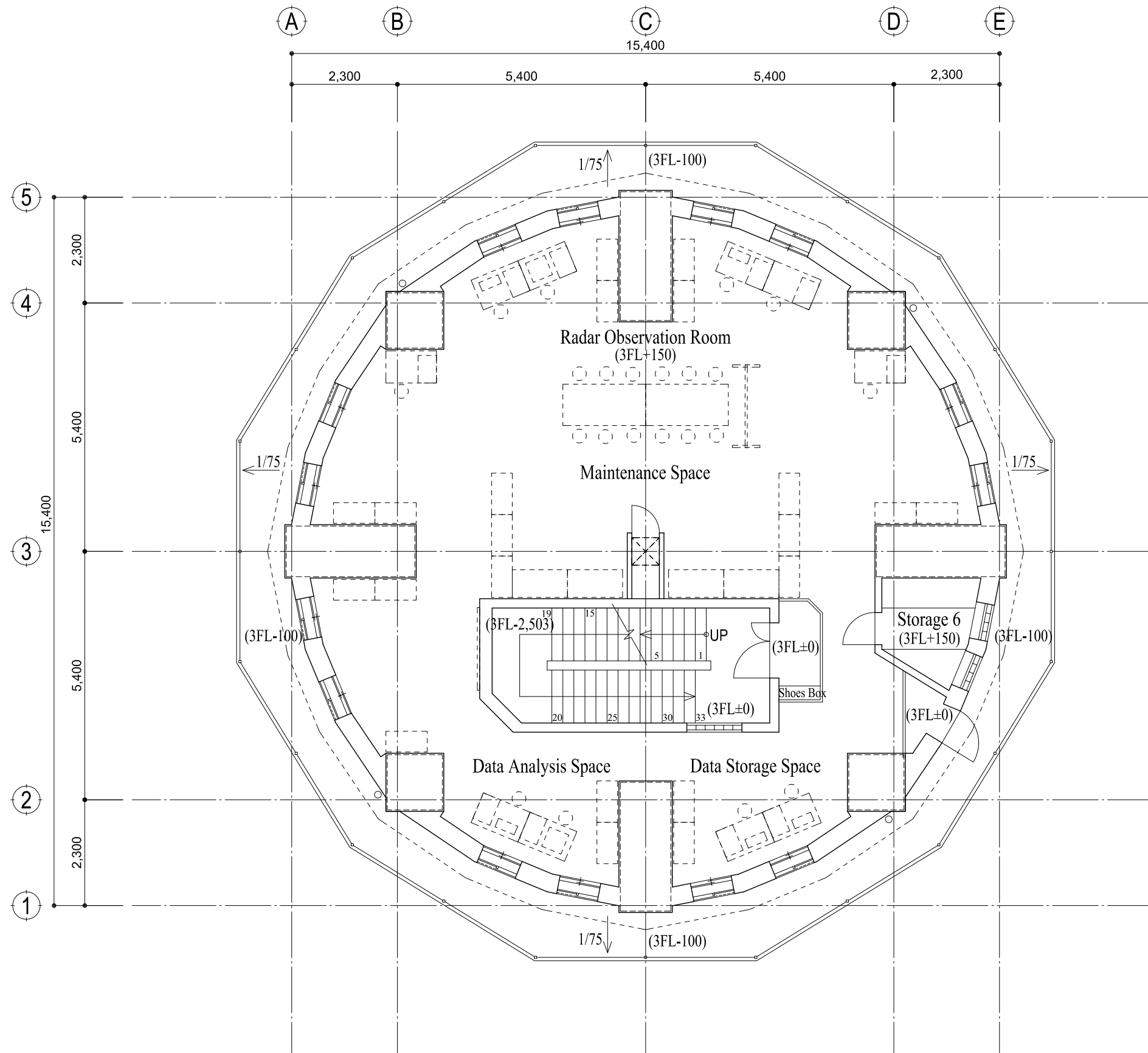
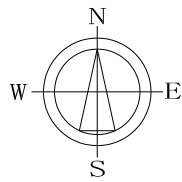
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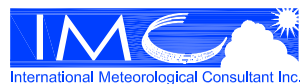
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 SUKKUR METEOROLOGICAL RADAR TOWER BUILDING
 FLOOR PLAN 3

SCALE
 1:100

DRAWING No.
 A - 04



3FL PLAN



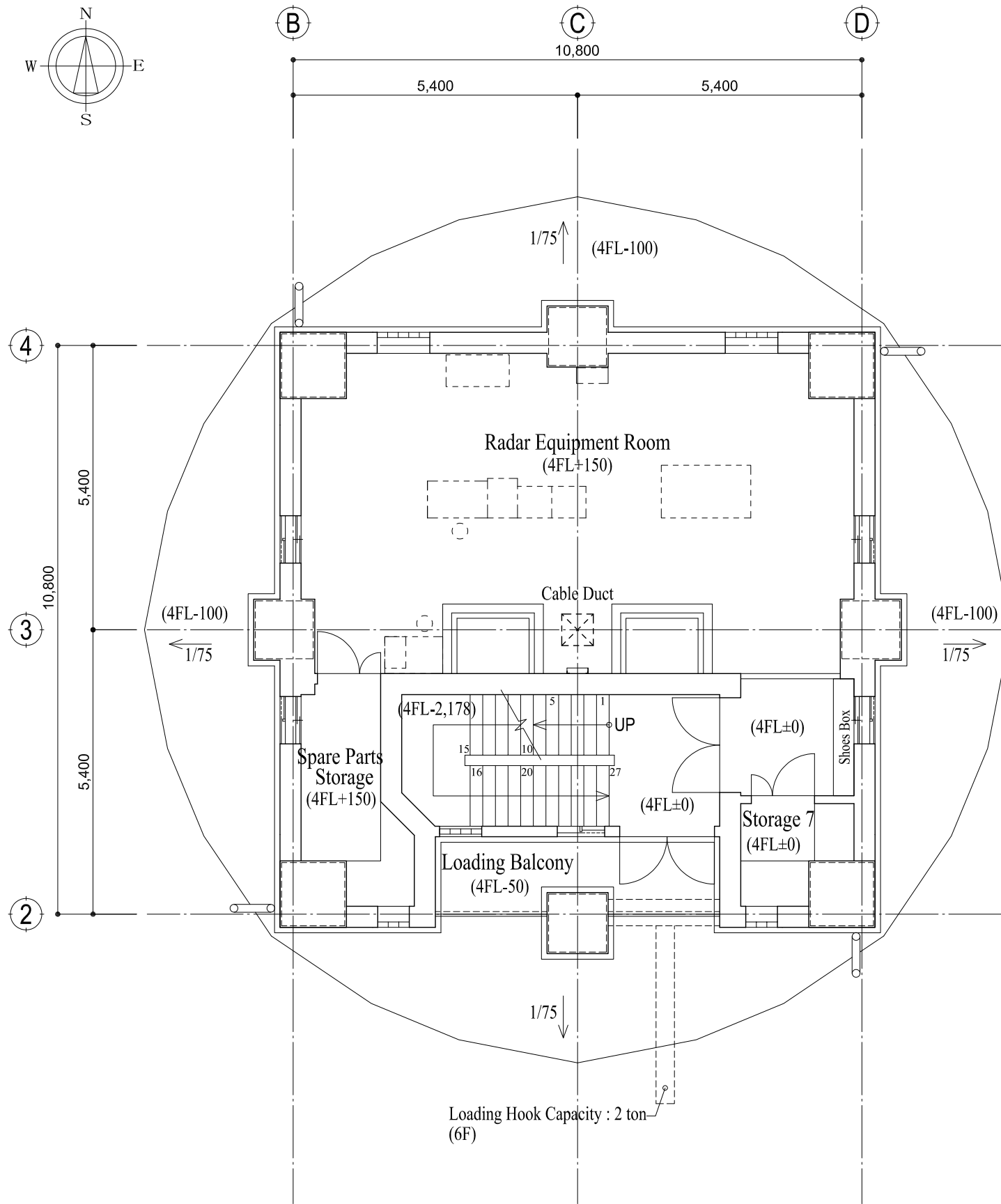
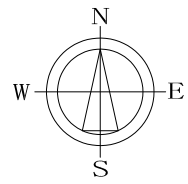
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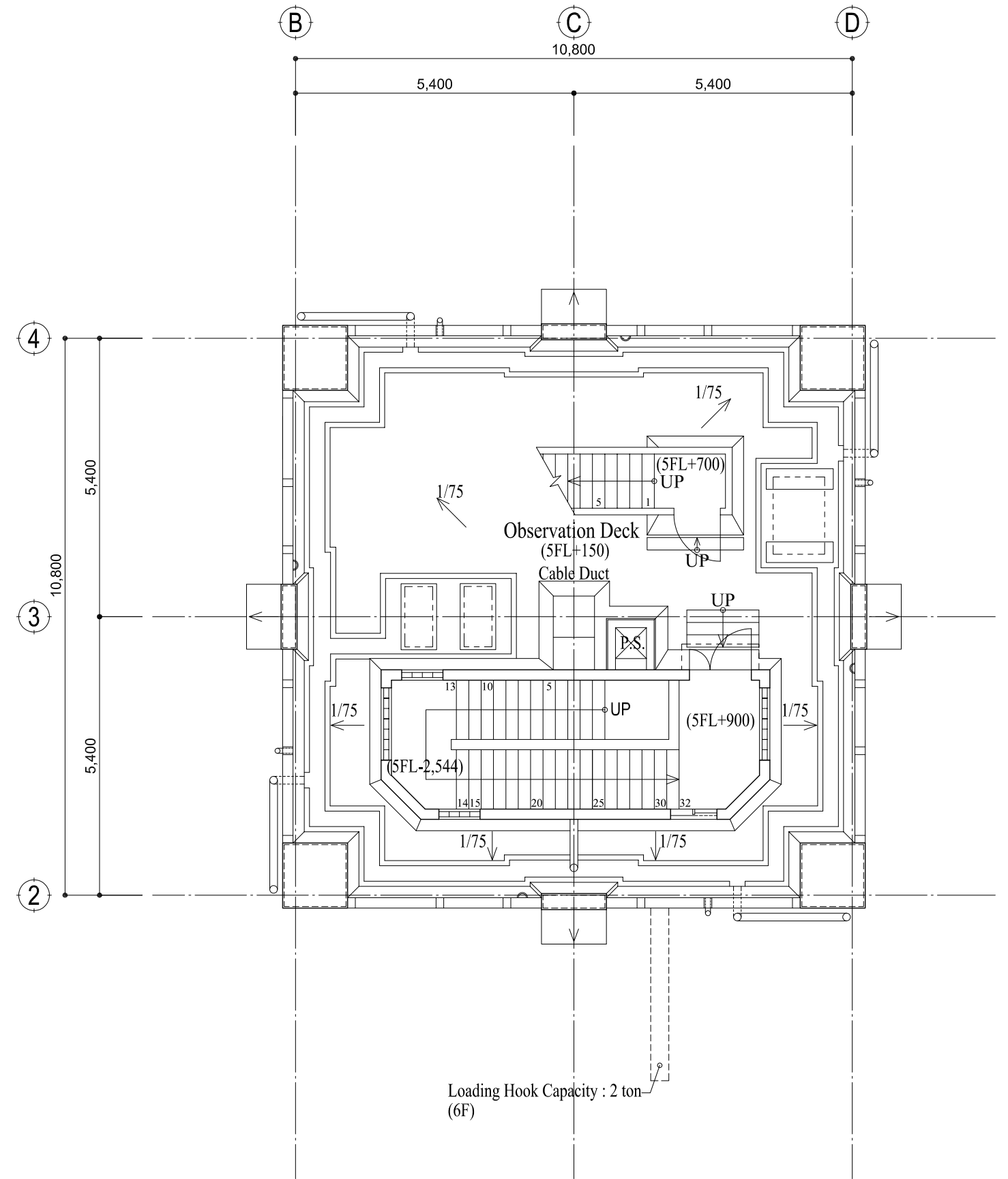
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 SUKKUR METEOROLOGICAL RADAR TOWER BUILDING
 FLOOR PLAN 4

SCALE
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DRAWING No.
 A - 05

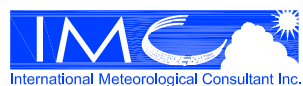


4FL PLAN



5FL PLAN

- Overflow Pipe
- Parapet Hanger



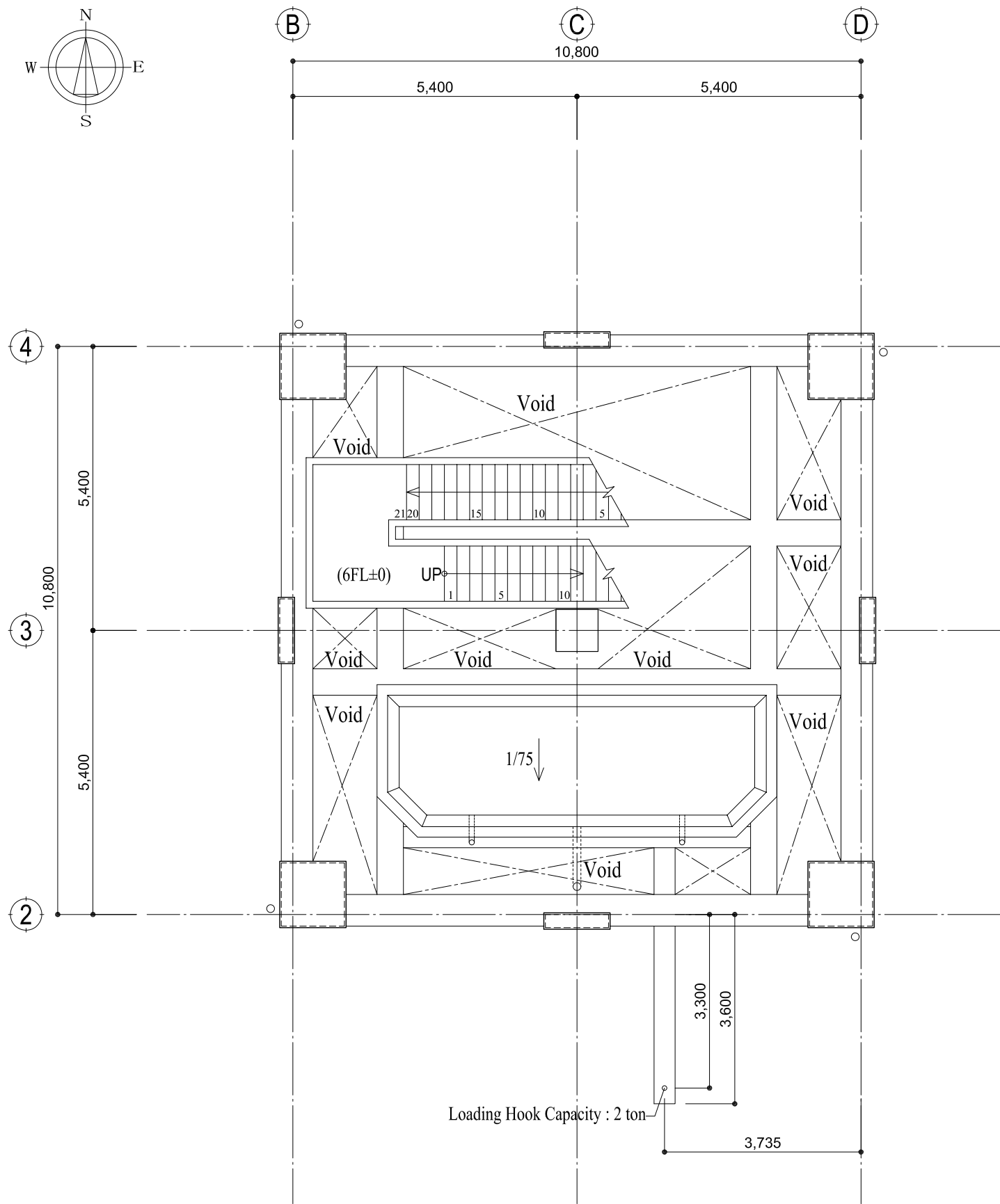
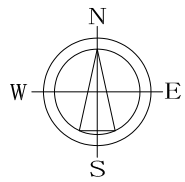
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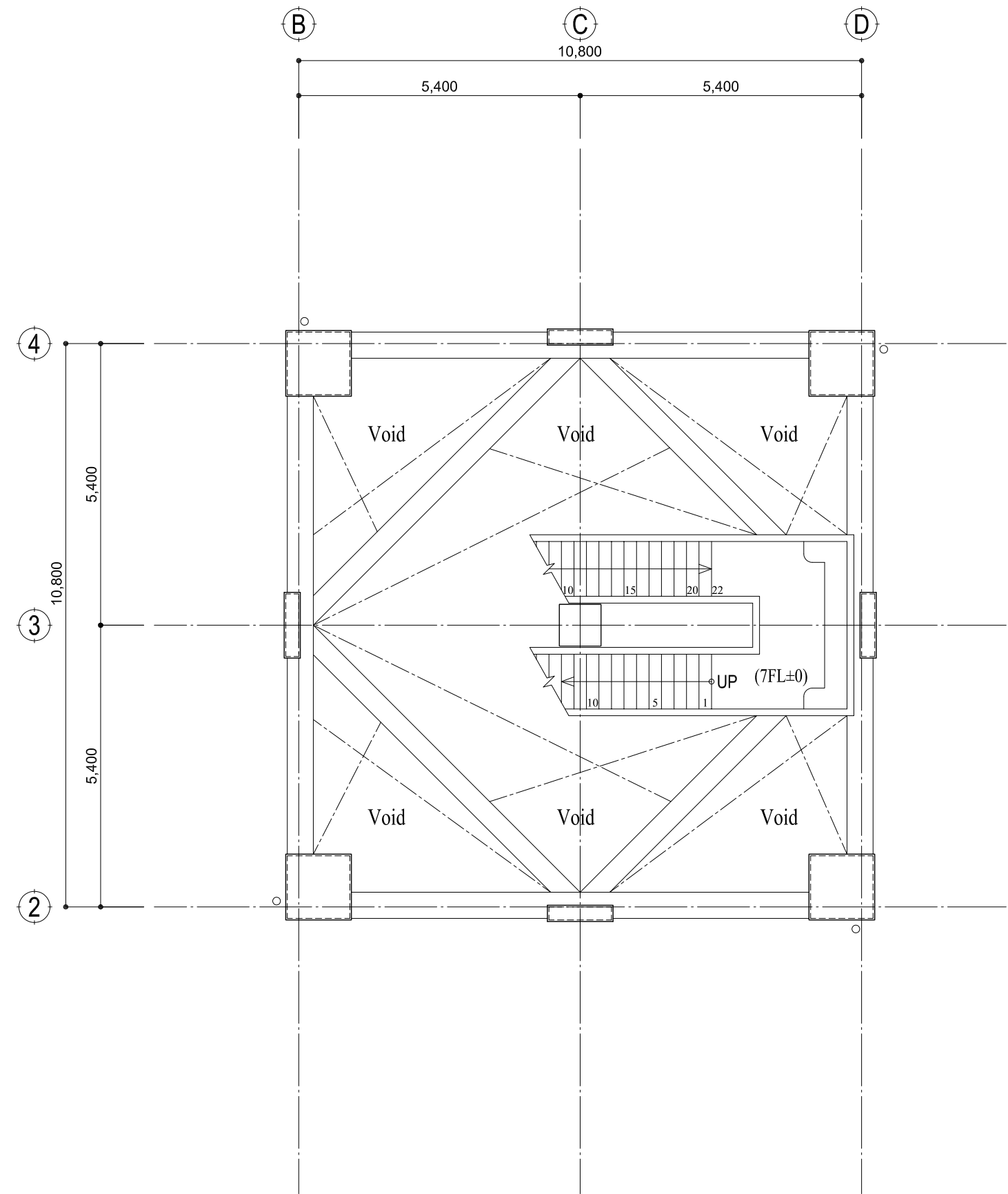
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 SUKKUR METEOROLOGICAL RADAR TOWER BUILDING
 FLOOR PLAN 5

SCALE
 1:100

DRAWING No.
 A - 06

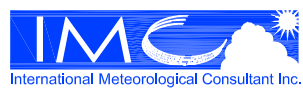


6FL PLAN



7FL PLAN

- Overflow Pipe
- Parapet Hanger



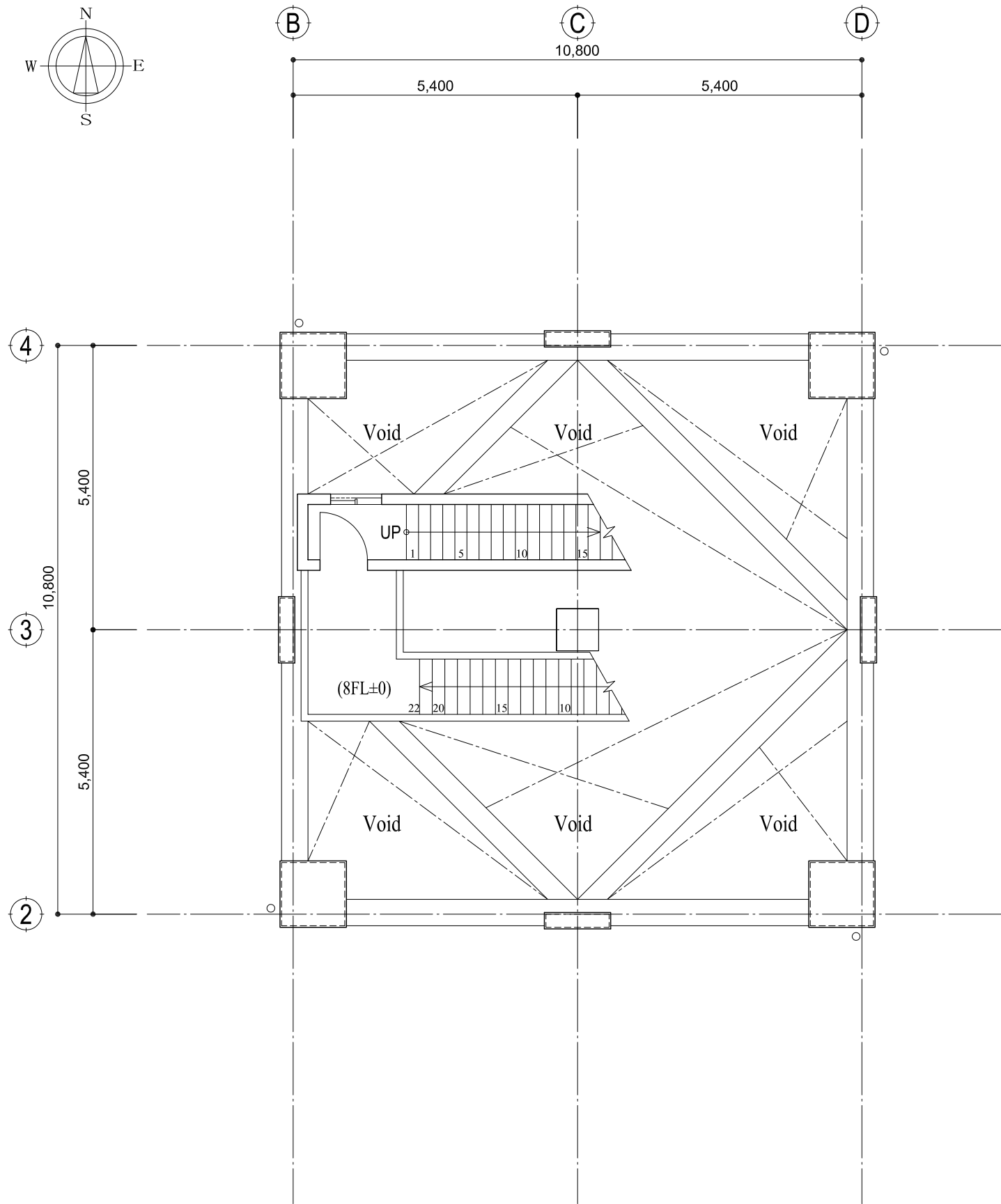
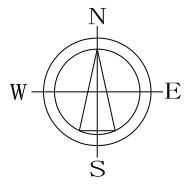
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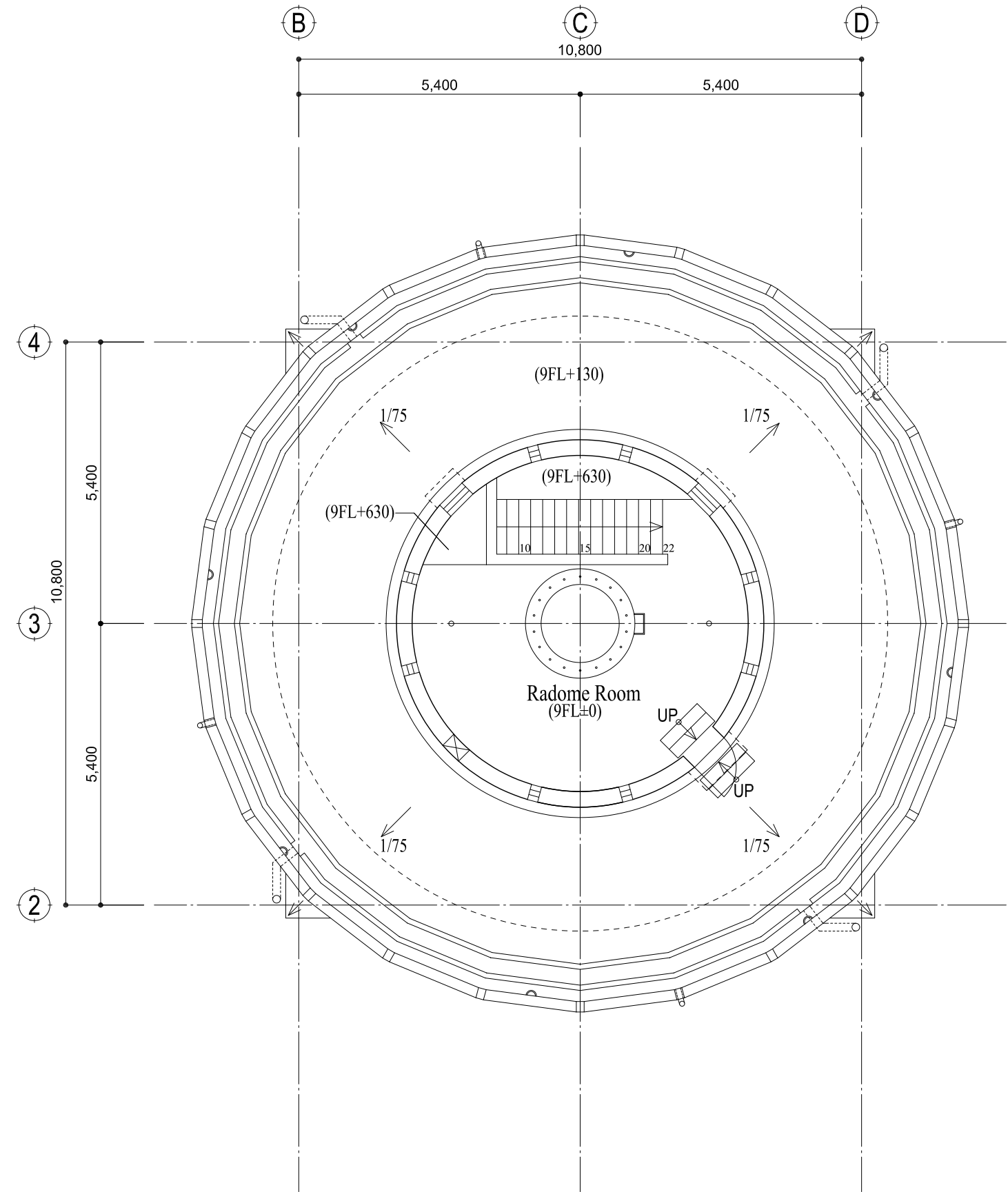
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 SUKKUR METEOROLOGICAL RADAR TOWER BUILDING
 FLOOR PLAN 6

SCALE
 1:100

DRAWING No.
 A - 07

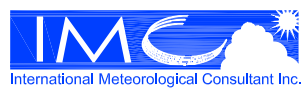


8FL PLAN



9FL PLAN

- Overflow Pipe
- Parapet Hanger



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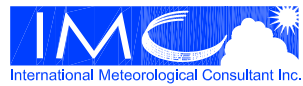
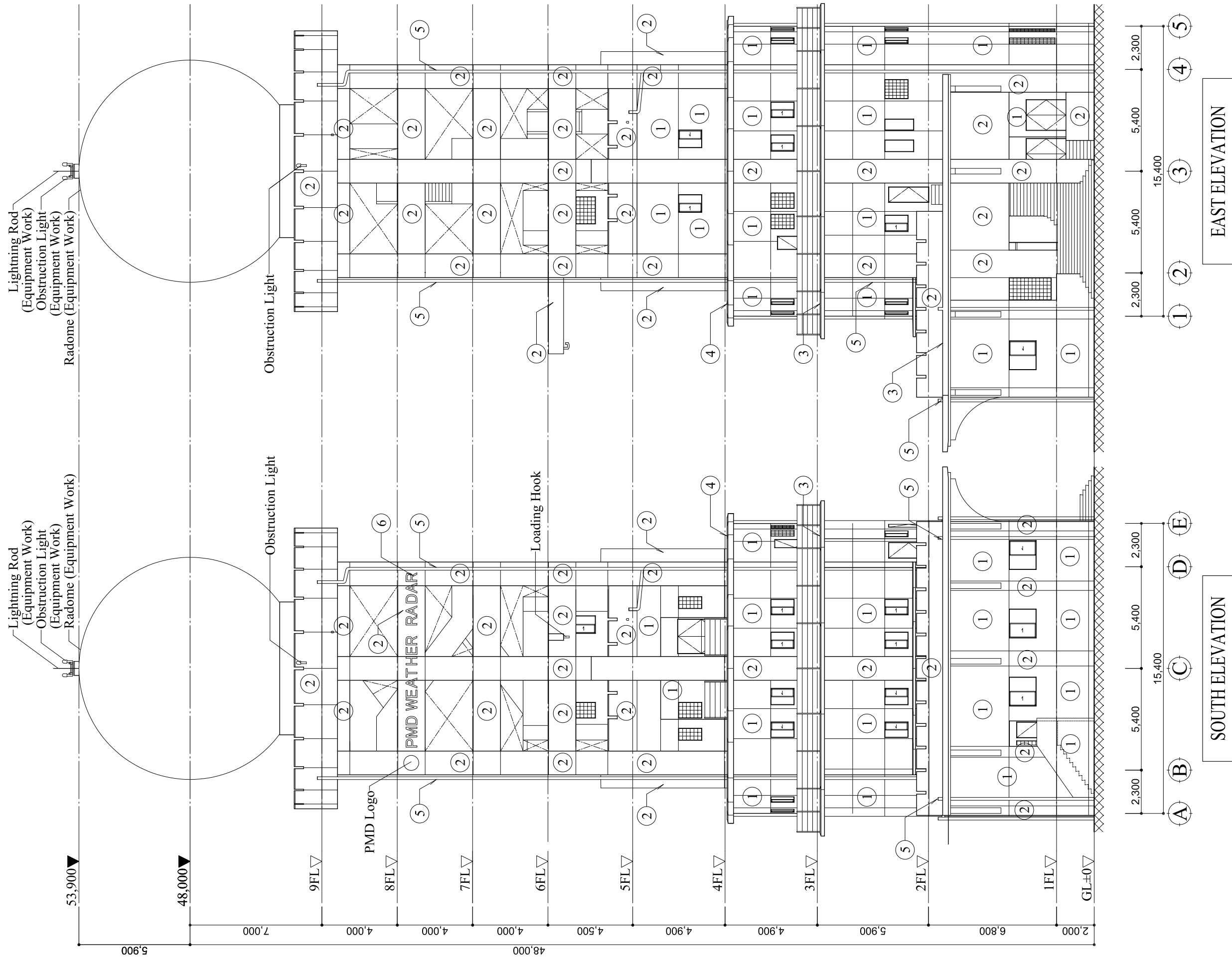
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 SUKKUR METEOROLOGICAL RADAR TOWER BUILDING
 FLOOR PLAN 7

SCALE
 1:100

DRAWING No.
 A - 08

LEGEND

①	C.S. Mortar t=25 Spray Tile
②	Fair-faced Concrete, Mortar Mending, Spray Tile
③	Waterproof Mortar t=30, ERP
④	Asphalt Waterproofing, Protection Concrete
⑤	Rain Leader Pipe: Galvanized Steel Pipe 150A, Spray Tile
⑥	Building Sign Name (Color Stainless)



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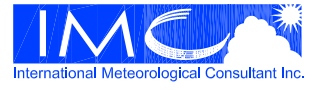
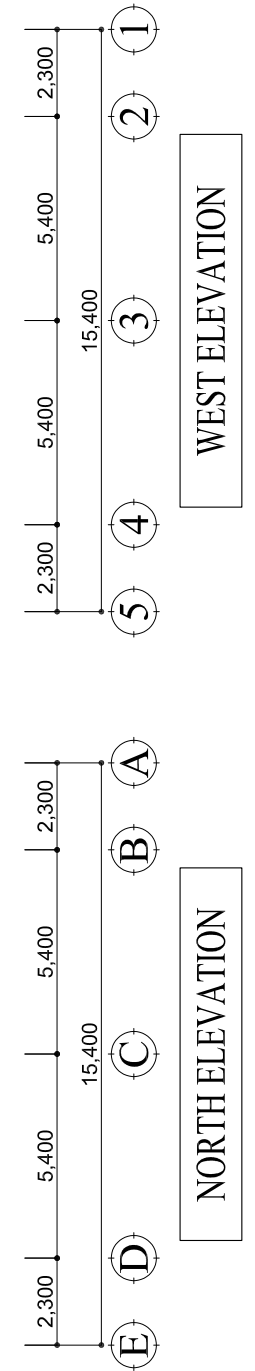
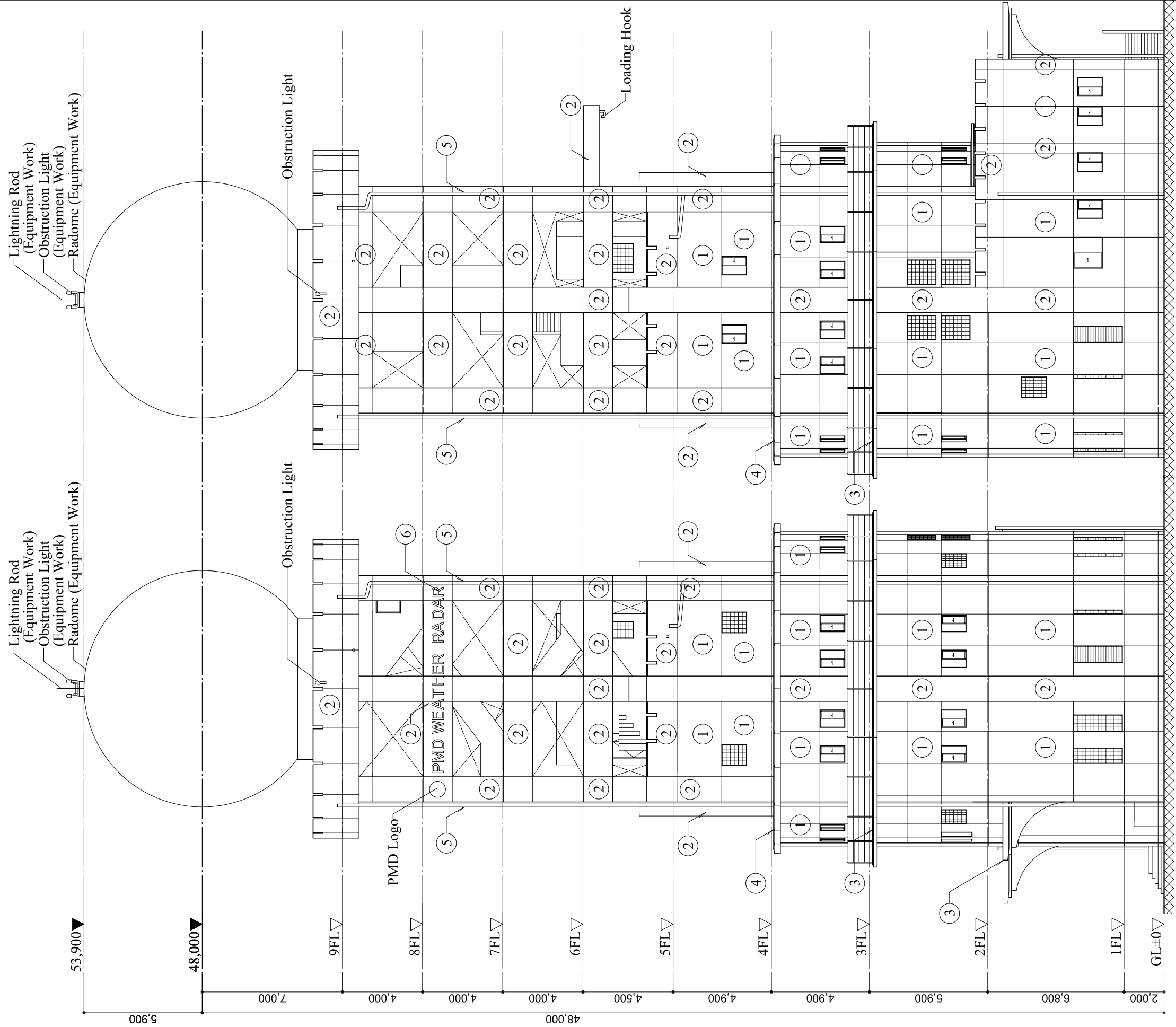
DRAWING TITLE
 SUKKUR METEOROLOGICAL RADAR TOWER BUILDING
 ELEVATION 1

SCALE
 1:200

DRAWING No.
 A - 09

LEGEND

①	C.S. Mortar t=25 Spray Tile
②	Fair-faced Concrete, Mortar Mending, Spray Tile
③	Waterproof Mortar t=30, ERP
④	Asphalt Waterproofing, Protection Concrete
⑤	Rain Leader Pipe: Galvanized Steel Pipe 150A, Spray Tile
⑥	Building Sign Name (Color Stainless)



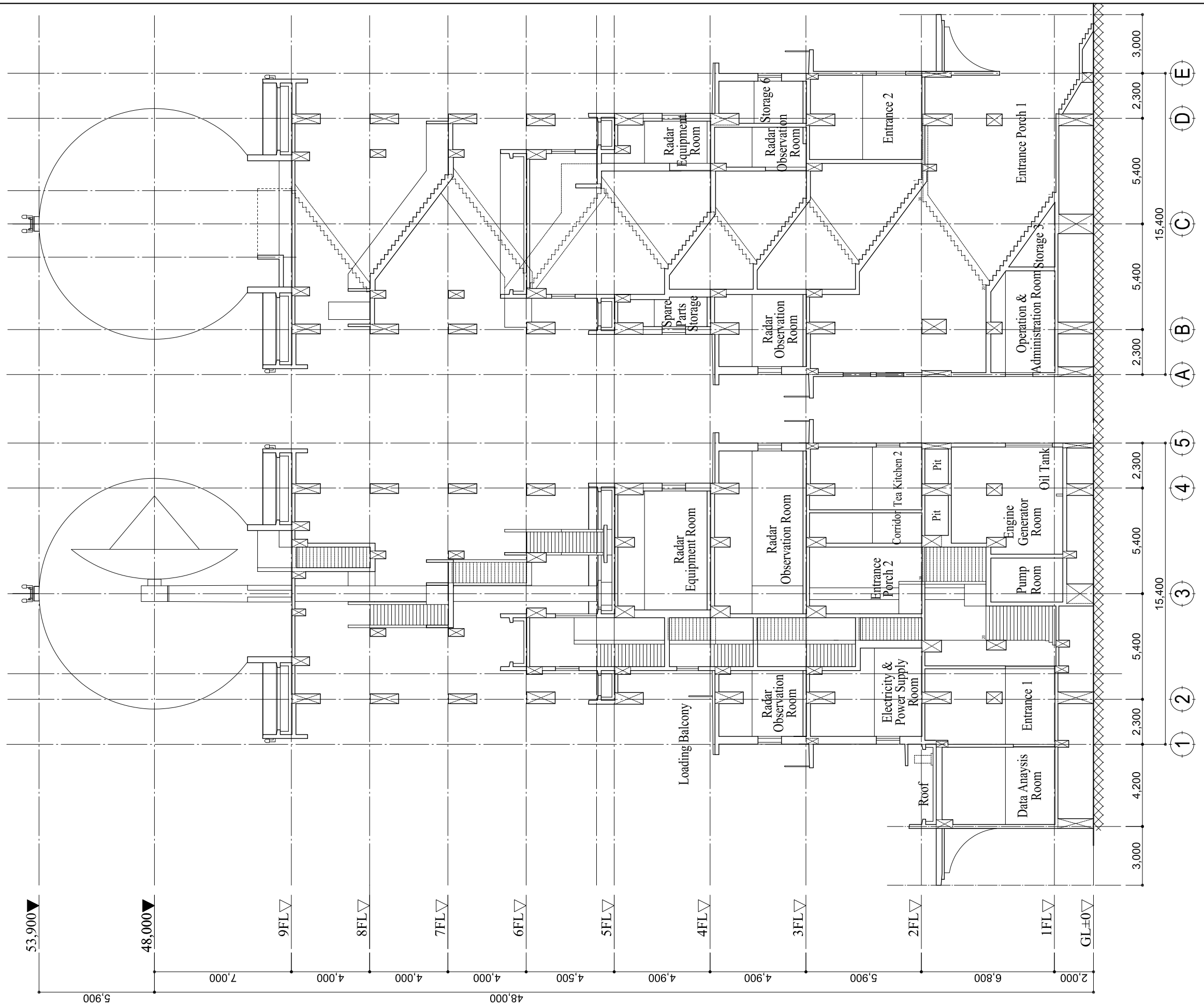
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DRAWING TITLE
 SUKKUR METEOROLOGICAL RADAR TOWER BUILDING
 ELEVATION 2

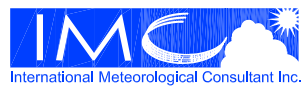
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DRAWING No.
 A - 10



SECTION 1

SECTION 2



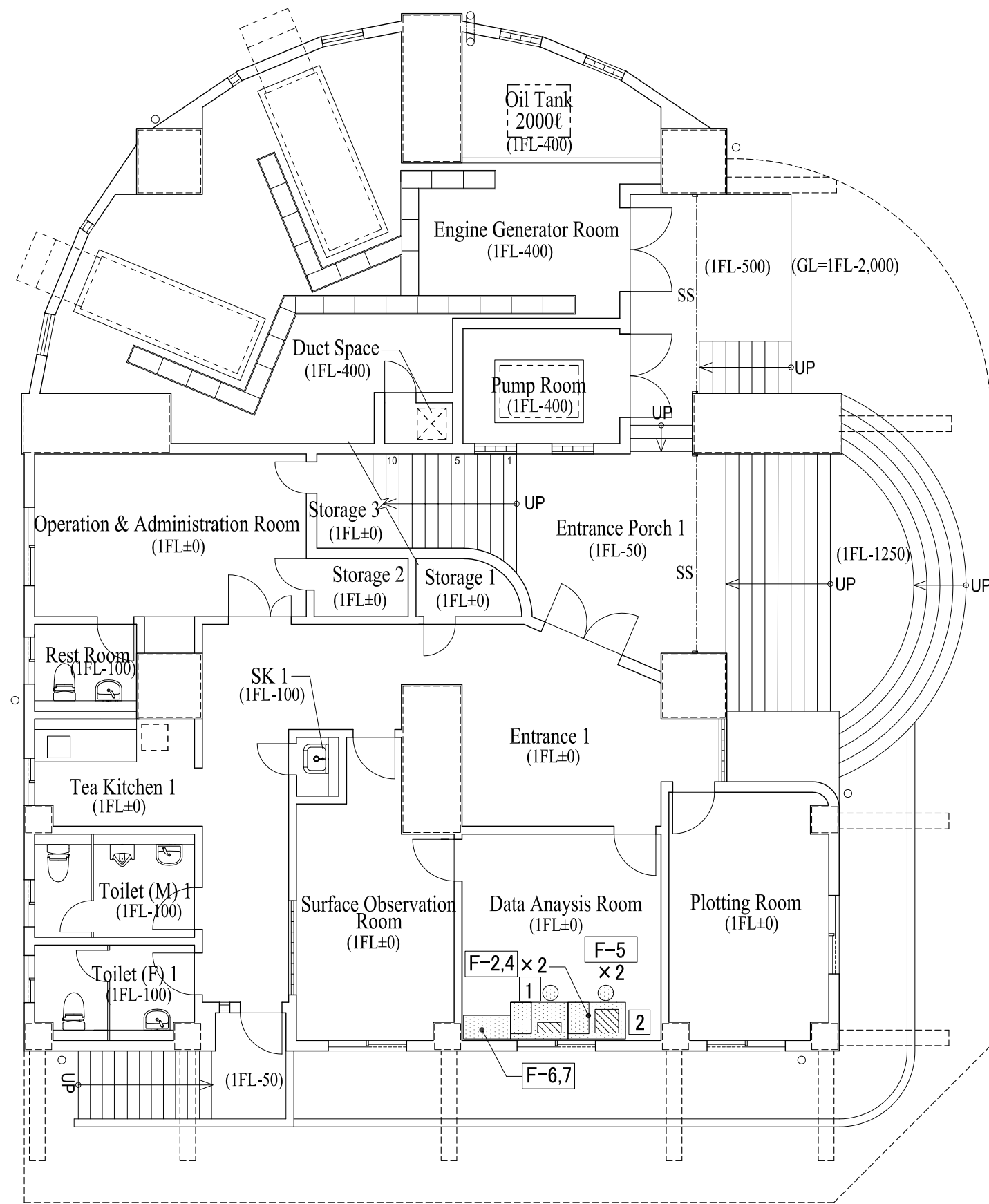
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DRAWING TITLE
 SUKKUR METEOROLOGICAL RADAR TOWER BUILDING
 SECTION

SCALE
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DRAWING No.
 A - 11



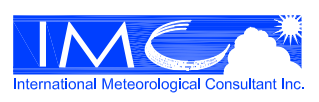
FURNITURE (EQUIPMENT WORK)

- F-2 Pedestal-free Desk (W1,100 × D700)
- F-4 Drawer Unit with Casters
- F-5 Chair
- F-6 Lateral Filling Cabinet H1,100
- F-7 Cabinet (Double Hinged Doors) H1,000

EQUIPMENT (EQUIPMENT WORK)

- 1 Meteorological Product Display
- 2 Colour Printer

1FL PLAN



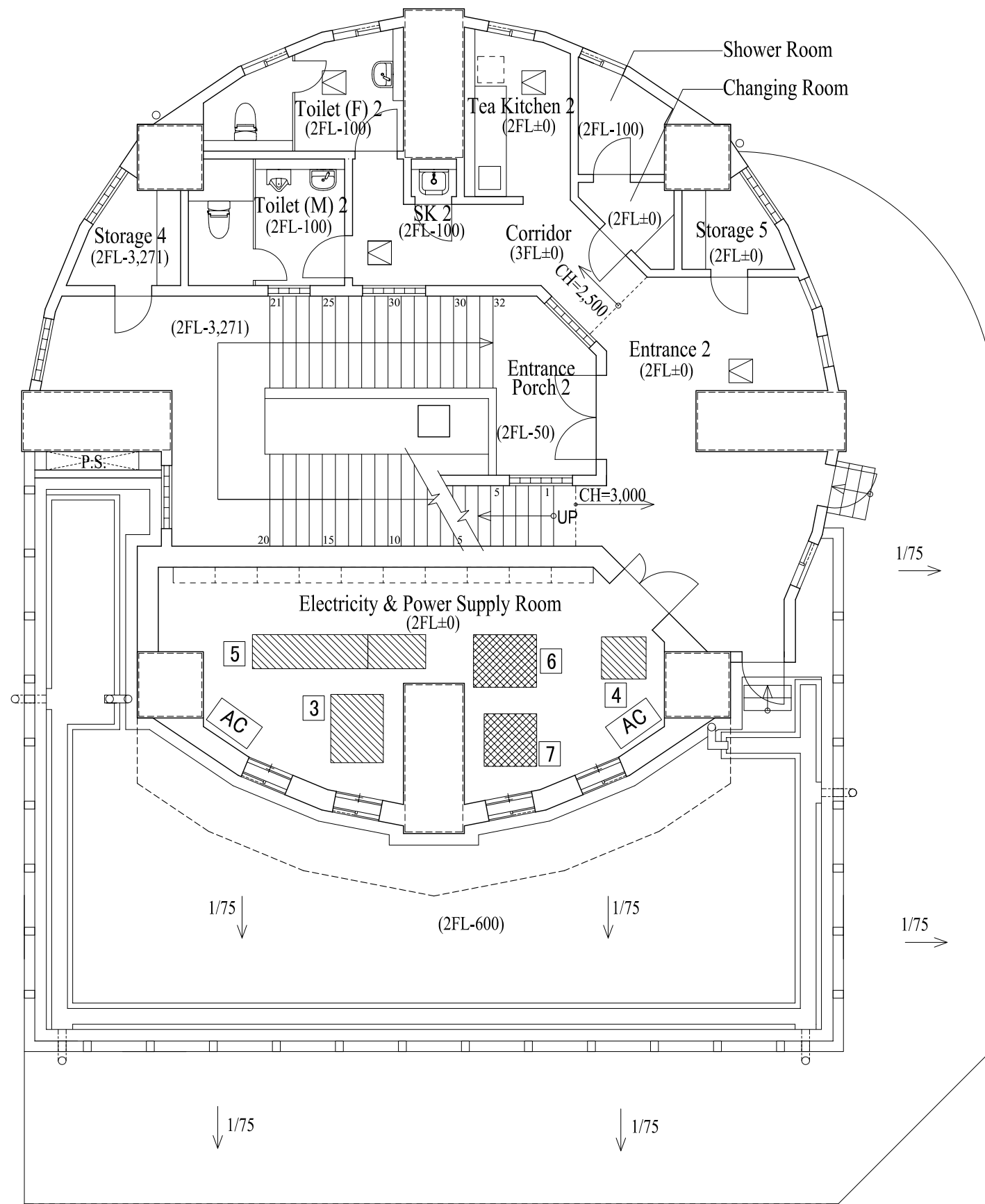
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


DRAWING TITLE
 SUKKUR METEOROLOGICAL RADAR TOWER BUILDING
 EQUIPMENT & FURNITURE LAYOUT PLAN 1


SCALE
 1:100



DRAWING No.
 EQ - 01



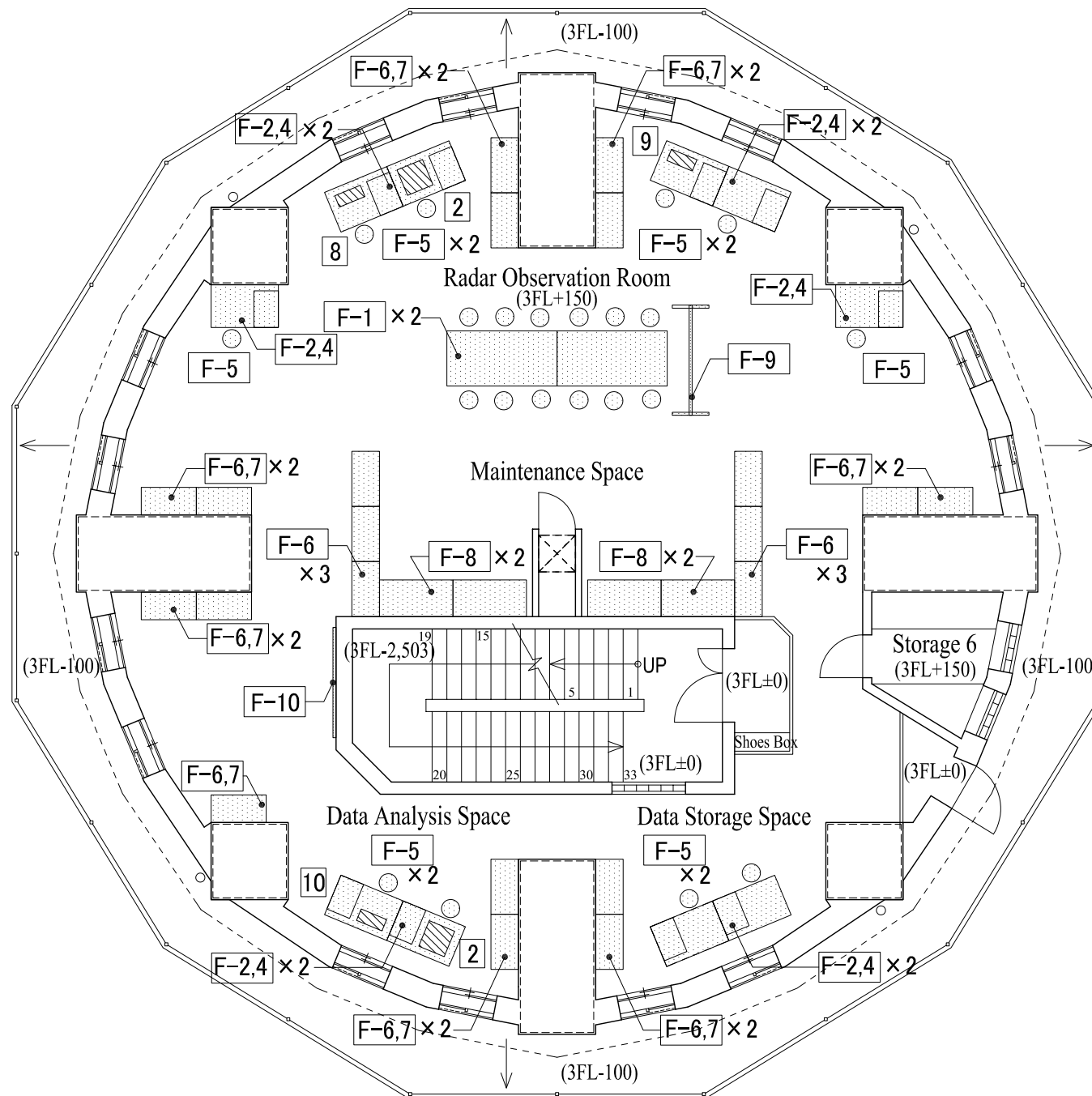
 EQUIPMENT (EQUIPMENT WORK)

-  Equipment Power Regulator
-  Surge Protector
-  Power Backup System

 EQUIPMENT (CONSTRUCTION WORK)

-  Commercial Power Voltage Controller
-  Isolation Transformer

2FL PLAN



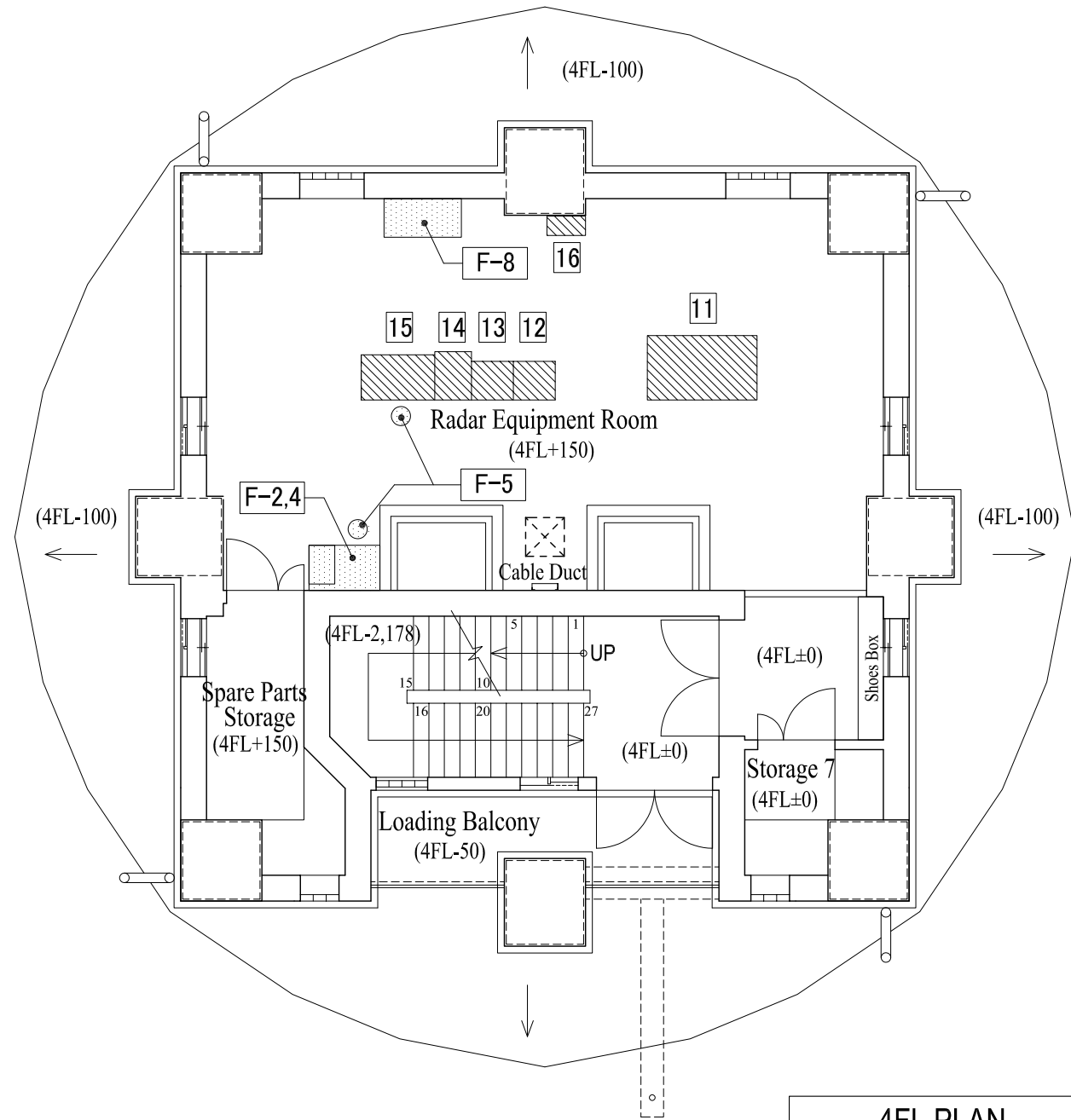
3FL PLAN

EQUIPMENT (EQUIPMENT WORK)

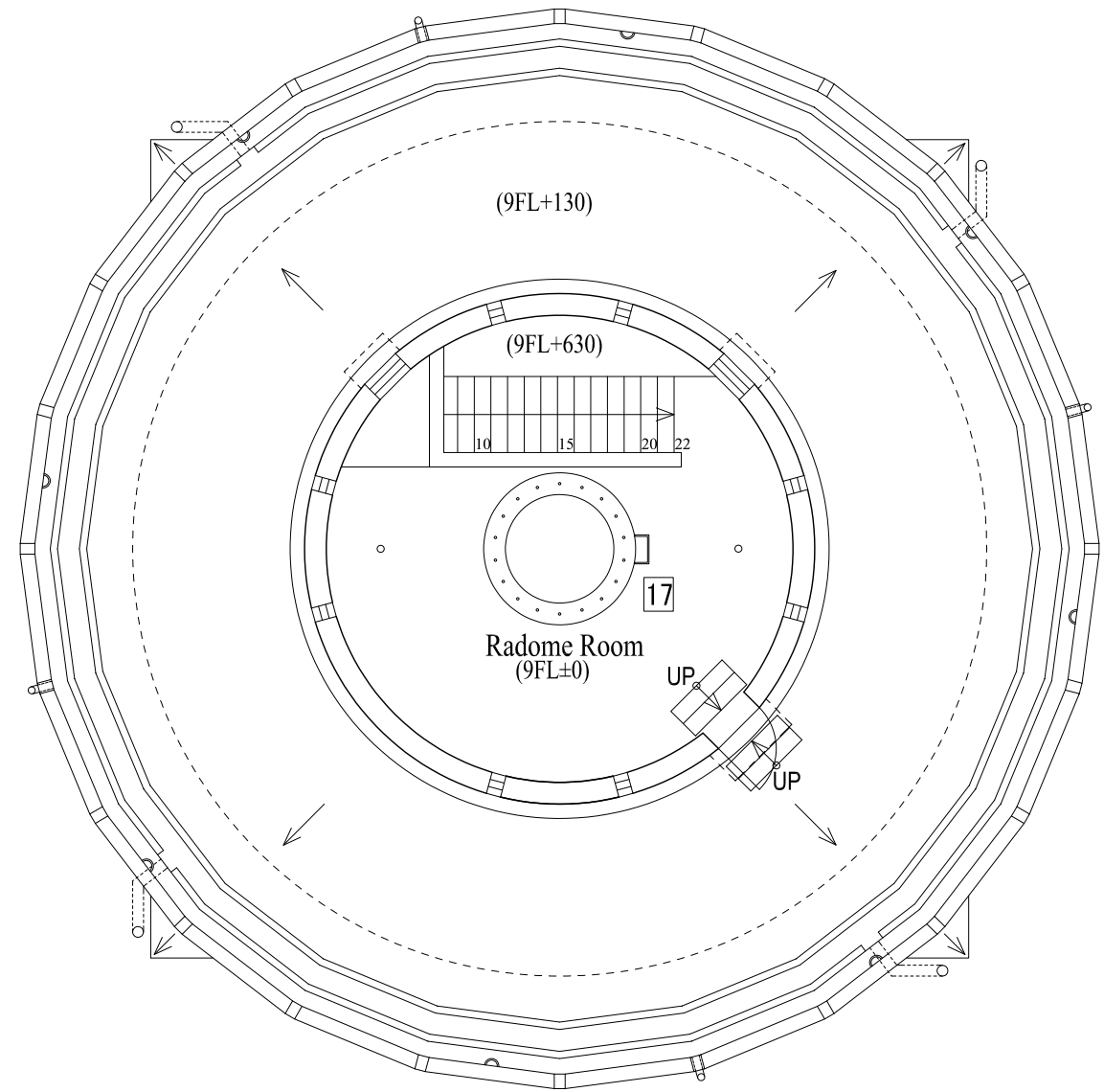
- Colour Printer
- Rainfall Intensity Indicator
- Doppler Velocity Indicator
- Data Analyzing Unit

FURNITURE (EQUIPMENT WORK)

- Meeting Table (W900 × L1,800)
- Pedestal-free Desk (W1,100 × D700)
- Drawer Unit with Casters
- Chair
- Lateral Filling Cabinet H1,100
- Cabinet (Double Hinged Doors) H1,000
- Shelves (Double Hinged Doors) H1,800
- White Board : W1,800 × H900
- Pin Board



4FL PLAN



9FL PLAN

EQUIPMENT (EQUIPMENT WORK)

- | | |
|------------------------------------|----------------------------------|
| 11 Transmitter | 15 Radar TASK Controller |
| 12 Antenna Controller & Dehydrator | 16 Radar Power Maintenance Panel |
| 13 DRSP | 17 Antenna |
| 14 Data & Protocol Converter | |

FURNITURE (EQUIPMENT WORK)

- | |
|---|
| F-2 Pedestal-free Desk (W1,100 × D700) |
| F-4 Drawer Unit with Casters |
| F-5 Chair |
| F-8 Shelves(Double Hinged Doors) H1,800 |

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

The Project covers many fields, including procurement and installation of meteorological and communication equipment, construction work, etc. For the successful completion of the Project, close coordination will be required among all parties.

1) Implementing agency for the Project

The responsible government agency of Pakistan for the implementation of the Project is the PMD under the supervision of the Secretary Aviation Division, Cabinet Secretariat. The PMD, as the Client, will be a signatory to the Consultancy Agreement and to the Contract.

2) Consultant

After the signing of the Exchange of Notes (E/N) between Pakistan and the Government of Japan and the Grant Agreement (G/A) between Pakistan and JICA for the Project, it is important to finalize the Agreement of Consulting Services as early as possible. The Agreement of Consulting Services will be signed by the PMD and a Japanese consulting firm having its principal office in Japan and recommended by JICA.

The consulting firm will become the Consultant for the Project by signing the Agreement. The Consultant will then conduct a detailed design study in Pakistan with the PMD and prepare tender documents including technical specifications, drawings, diagrams, etc. in Japan. In addition, the Consultant, instead of the PMD, will conduct a tender and supervise the Project implementation for the successful completion of the Project as a project of Japan's Grant Aid Assistance.

3) Contractor

A contractor with the required qualifications (an equipment supplier and a construction company) incorporated and registered in Japan, having its principal office in Japan, will be selected through an open public tender, in accordance with the tender documents prepared by the Consultant and in accordance with JICA guidelines as approved by the PMD.

2-2-4-2 Implementation Conditions

<Conditions for the Installation of the Equipment>

The meteorological radar system, computing equipment and other sophisticated equipment with electric and electronic circuits will be installed in the radar tower building. In accordance with the construction schedule, the dispatch of an electrical engineer is required during the time of the installation, adjustment and wiring of the electric power supply and power back-up equipment. During the construction period, it is important that there should be a smooth procurement of the required materials and hiring of skilled

laborers to meet the construction schedule. In addition, specialized skilled engineers are needed for the installation, adjustment and commissioning of the radar system, the computing equipment and the sophisticated meteorological equipment. They are essential to ensure the quality of the installation work necessary for accurate meteorological observations. Furthermore, as part of the technology transfer to the PMD staff, specialized highly skilled engineers are required as on-the-job trainees to ensure that the PMD can operate and maintain the equipment efficiently after the Project installation.

2-2-4-3 Scope of Works

The scope of works to be undertaken by Japan’s Grant Aid Assistance and the Pakistani side for the implementation of the Project are as follows.

Table 32: Major Undertakings to be Done by Japan’s Grant Aid Assistance and Pakistan/PMD for the Implementation of the Project

No	Items	To be covered by Japan’s Grant Aid	To be covered by Pakistan (PMD)
General Items			
1	To undertake all necessary institutional and juridical procedures in Pakistan.		•
2	To undertake the Initial Environmental Examination (IEE) procedures in Pakistan, if required so.		•
3	To handle duty (tax) exemption procedures and to take necessary measures as well as provide requisite legal and/or administrative documentations for import permit and customs clearance to the customs broker/forwarder to be employed by the Contractor at the port of disembarkation for the materials and equipment to be imported for the Project as well as the sending back of any defective equipment and/or spare parts to the manufacturer for repair at the factory or replacement and re-importation thereof into Pakistan during the implementation and warranty periods of the Project.		•
4	To provide necessary working spaces with Internet Connection at the PMD Islamabad Head Office and the PMD Karachi for the Consultant and the Contractor during the implementation of the Project.		•
5	To facilitate and provide marine (or air) transportation of the materials and equipment imported from overseas (Japan).	•	
6	To facilitate and provide in-land transportation from the port of disembarkation in Pakistan to each Project site.	•	
7	To accord Japanese and other foreign nationals including their dependent/s (if any), whose services may be required in connection with the supply of products and services under the signed contracts, such facilities as may be necessary for their entry into Pakistan and stay therein for the smooth and uninterrupted performance of their work (i.e. to secure the appropriate visa including its extension/s required by the recipient country in connection thereof).		•
8	To exempt goods of Japanese and other foreign nationals from customs duties, internal taxes and other fiscal levies which may be imposed by the Government of Pakistan with respect to their supply (products) and services under the signed contracts.		•
9	To open Bank Account (Banking Arrangement (B/A)).		•
10	To pay bank charge (commission) for the issuance of the Authorization to Pay (A/P) and amendments of A/P, if required, for the Consultant and the Contractor.		•
11	To bear all the expenses, other than those to be borne by the Japanese Grant, necessary for construction of the facilities as well as for the transportation and installation of the equipment.		•

12	To demolish the exiting Rohri-Sukkur observatory building (after handing over the Project from Japan side).		•
13	To construct category III house, bachelor hostels (after handing over the Project from Japan side).		•
Items for Safety Measures			
14	To take responsibility for arranging the maximum countermeasures and ensure the appropriate security of the whole Project site/s and of the Japanese and other foreign nationals assigned to the Project prior to the commencement of and during the implementation of the Project.		•
15	To arrange security around the proposed Project Site in Sukkur with the police.		•
16	To arrange security around the accommodation(s) of the Consultant & the Contractor with the police.		•
17	To arrange escort guard with the police during movements between the accommodation(s) of the Consultant & the Contractor and the proposed Project Site in Sukkur.		•
18	To construct security concrete boundary wall(s) on the front gate side with a height of 4m + a barbed wire for the proposed Radar Observation Station (PMD Meteorological Observatory, Rohri-Sukkur) and gates (boom gates, a sliding main gate: 4m width and a back gate: 4m width).	•	
19	To install security cameras and night time monitoring lights to be used during the implementation of the Project.	•	
20	To arrange guards (24 hours, 3 shifts) in the proposed Radar Observation Station (PMD Meteorological Observatory, Rohri-Sukkur).	•	
21	To procure security equipment (vehicle under-verification mirror, gate type walk-through metal detector and handy type metal detector) during the implementation of the Project.	•	
22	To procure satellite mobile phone and Wi-Fi pocket router for the Consultant & the Contractor to ensure emergency contact during the implementation of the Project.	•	
For the Construction of the Radar Tower Building			
23	To fill soil to the proposed Radar Observation Station (PMD Meteorological Observatory, Rohri-Sukkur), compact and level prior to the commencement of construction work.	•	
24	To secure sufficient spaces at the proposed Radar Observation Station (PMD Meteorological Observatory, Rohri-Sukkur) for temporary facilities such as a consultant's site office, contractor's office, workshop, building materials storage, etc. needed for the construction work.		•
25	To obtain all prior regulatory compliance and necessary permissions from the relevant agencies/authorities for the construction of the Radar Tower Building in the proposed Radar Observation Station (PMD Meteorological Observatory, Rohri-Sukkur).		•
26	To provide the commercial power (400V, 3-phase, 4-wire, 50Hz) supply (capacity: no less than 200kVA) along with electric poles/wires, etc. from the main supply line to the proposed Radar Observation Station (PMD Meteorological Observatory, Rohri-Sukkur) for the Radar Tower Building and other facilities to be constructed by the PMD prior to the commencement of construction work.		•
27	To install the required step-down transformer (capacity: no less than 200kVA) as well as service entrance connections for the commercial power supply at the proposed Radar Observation Station (PMD Meteorological Observatory, Rohri-Sukkur) for the Radar Tower Building (400V, 3-phase, 4-wire, 50Hz) prior to the commencement of construction work.		•
28	To relocate the existing meteorological observation field in the proposed Radar Observation Station (PMD Meteorological Observatory, Rohri-Sukkur).		•
29	To provide telephone lines for the Radar Tower Building in the proposed Radar Observation Station (PMD Meteorological Observatory, Rohri-Sukkur).		•
30	To provide temporary facilities for the availability or accessibility of electricity for the construction work.		•
31	To construct the Radar Tower Building, including: a) Architectural and civil works; b) Electrical works including a lightning protection system; c) Air-conditioning and Ventilation works; and,	•	

	d) Plumbing works.		
32	To procure and install furniture for installation of the equipment procured under the Project and operation of the Radar Tower Building.	•	
33	To procure and install standard furniture for the Radar Tower Building.		•
34	To undertake incidental outdoor works such as gardening/landscaping and exterior lighting in and around the proposed Radar Observation Station (PMD Meteorological Observatory, Rohri-Sukkur), if necessary.		•
35	To provide On-the-Job Trainings (Initial Trainings) by the contractor on the operation and maintenance of the Radar Tower Building as well as its inherent facilities for the PMD.	•	
36	To assign appropriate number of trainees and shoulder their dispatching cost to the training sites, such as daily allowance, transportation fee, accommodation, if any.		•
37	To provide the contractor's written guarantee to the PMD for the Radar Tower Building constructed under the Project for a period of twelve (12) months from the completion date of the equipment installation work.	•	
For Installation Work of the Equipment			
38	To provide free of charge and allocate secure temporary storage area/room for the materials, tools and equipment needed during the installation process.		•
39	To obtain the required frequencies for the Sukkur Meteorological Radar System and Polarimetric Test Horn Devices.		•
40	To promptly provide reliable and high-speed Internet environment at the Sukkur Meteorological Radar Observation Station (PMD Meteorological Observatory, Rohri-Sukkur), National Weather Forecasting Center, PMD Islamabad Head Office and other project sites (with each corresponding global/fix IP) for the establishment of a Virtual Private Network.		•
41	To set up the required and new assigned IP addresses in the computing equipment supplied under the Project and facilitate any required configuration i.e. firewall settings, etc. of the existing PMD equipment which may be made part of the project network communication system, if any.		•
42	To secure ample and strategically located space/sat the National Weather Forecasting Center, PMD Islamabad Head Office, the Flood Forecasting Division, PMD Lahore, PMD Meteorological Office Islamabad International Airport (New Benazir Bhutto International Airport), PMD Karachi Tropical Cyclone Warning Center and PMD Meteorological Office Karachi International Airport for the installation of the equipment (PC terminals and peripherals) to be supplied under the Project.		•
43	To procure, install and adjust the required Equipment (including the lightning protection system) for the Project implementation.	•	
44	To procure and install furniture for the Equipment to be procured under the Project.	•	
45	To conduct the reliability & final tests and commissioning for the total system.	•	
46	To provide On-the-job Trainings (Initial Trainings) by the contractor on the operation and maintenance of the Equipment as well as the radar data/products display software training for the PMD.	•	
47	To support the Contractor to procure/obtain relevant and vital information or data i.e. shape file map of Pakistan containing the administrative boundaries (regions, provinces, cities, districts, wards, etc.) as well as the rivers, lakes, and dams in Pakistan to be incorporated into the radar data/products display software.		•
48	To assign appropriate number of trainees and shoulder their dispatching cost to the training sites, such as daily allowance, transportation fee, accommodation, if any.		•
49	To provide the contractor's written guarantee to the PMD for the Equipment and Installation Work executed under the Project for a period of twelve (12) months from the completion date of the equipment installation work.	•	
50	To shoulder the miscellaneous expenditures such as library books, petrol, telephone, application fee (obtaining the required frequencies for the meteorological radar system and the construction permissions of a new Radar Tower Building).		•
After the completion of the Project			
51	To assign the required staff including a responsible personnel of the PMD who has reliable technical skill and ample experience for the smooth operation and maintenance of the Equipment.		•

52	To procure the required spare parts and consumables for the smooth operation and maintenance of the Equipment, and enter into a Preventive Maintenance Service Agreement with the equipment supplier if so desired.		•
53	To ensure adequate maintenance of the Radar Tower Building constructed under the Project so that they may function effectively for a long time.		•
54	To properly operate and maintain, and also effectively utilize the facilities constructed and the Equipment procured/installed under the Project.		•
55	To allocate the necessary budget and personnel for the smooth conduct of meteorological radar observation and forecasting works.		•
56	To periodically update all the operating system/antivirus/application software(s).		•
57	To procure the appropriate number and capacity of disk media, hard disks, solid state disks, etc., and dutifully conduct the required scheduled archiving of radar observation raw data and products.		•

Since the following two (2) works (No. 18 and No. 23) indicated above, which are large scale and require special technical knowledge and experience relative to civil engineering construction, are difficult to be implemented and supervised by the PMD (a meteorological agency) and in order to prevent any delay of the Project implementation, it has been decided that the said works are to be implemented by a contractor (a building construction company) of this Project as part of the construction of the Sukkur Meteorological Radar Tower Building. Since there are some risks such as accidents and unclear warranty liability, etc., due to quality of soil filling work and soil compacting work during construction work of a meteorological radar tower building and after the construction completion, it is important to unify the responsibility for the quality of the whole construction work of a meteorological radar tower building including the soil filling work from the viewpoint of risk management in the construction work.

<Filling soil, soil compacting and leveling to the proposed Project Site prior to the commencement of construction work (No. 23 in the table above)>

The ground level of PMD Meteorological Observatory, Rohri-Sukkur (proposed Sukkur Meteorological Radar Observation Station) is lower than the road by 0.9m-3.0m (in depth), and is the lowest elevation in the surrounding area, plus the fact that the drainage and sewer ditches are still undeveloped, all the nearby rainwater concentrates and enters into the PMD Meteorological Observatory. As a result, the proposed Sukkur Meteorological Radar Observation Station is in a muddy condition. Therefore, it is necessary to fill about 11,000m³ of soil into the site. Filling soil to the proposed Project Site will be implemented after completion of the construction of the security concrete boundary wall(s).

- Area of the proposed Project Site: 50.2m × 90.0m = 4,518m²
- Required soil depth at each corner of the Site:
North-West: 3.0m, North-East: 3.0m, South-West: 0.9m and South-East: 1.3m
- Average required soil depth: (3.0m + 3.0m + 0.9m + 1.3m)/4 = 2.05m
- Volume of filling soil: 4,518m² (Area of the Proposed Project Site) × 2.05m (Average Required Soil Depth) = 9,261.9m³

- $9,261.9\text{m}^3 \times 1.2$ (Premium rate in cost estimate) = $11,114.28\text{m}^3$
- Soil volume of the existing hump for utilization for filling soil: approx. 200m^3
- Required volume of filling soil: $11,114.28\text{m}^3 - 200\text{m}^3 = 10,914.28\text{m}^3 \approx$ approx. $11,000\text{m}^3$
- Required implementation period: 1.5 months

In order to properly and effectively implement the soil filling work to the proposed Project Site, special technical knowledge related to civil engineering listed below with abundant experience are required.

- ◆ Selection of filling soil materials: to confirm less compressibility soil material and less settlement & deformation after soil filling and secure the required trafficability and bearing resistance
- ◆ Filling soil material adjustment: to implement water content ratio adjustment or particle size adjustment by expert engineers
- ◆ Soil grading: to plan for transport of filling soil materials, selection of grading machineries, management of each grading thickness
- ◆ Compacting: to select compacting machineries and compaction method through soil filling test
- ◆ Quality control: to implement density & intensity measurement and quality control of soil compaction

<Construction of security concrete boundary wall(s) + a barbed wire (No. 18 in the table above)>

Regarding the construction of concrete security boundary wall(s), etc., as a result of discussions with Sindh Central Police, Sukkur Police and the JICA security advisor and as stipulated in the JICA Safety Measures Guidance, it is a precondition for the project implementation for safety measures. In order to ensure safety during the Project implementation period, it is necessary to enclose the construction site of concrete security boundary wall(s) with height 4m from the designed ground level+ barbed wire (boom gates, a sliding main gate: 4m width and a back gate: 4m width) are indispensable. Since the construction of concrete security boundary wall(s), etc. cannot be built on the compacted filling soil in view of the risk of uneven settlement, it is essential to carry out the filling soil after the construction of concrete security boundary wall(s), etc.

- Concrete security boundary wall (height 4m): about 263m
- Required implementation period: 4.0 months

2-2-4-4 Consultant Supervision

1) Principal Guidelines

- a) To ensure the appropriate security of the Japanese and other foreign nationals assigned to the Project prior to the commencement of and during implementation of the Project as the top priority.
- b) To take responsibility for expediting project implementation as well as providing smooth supervision in accordance with the guidelines of Japan's Grant Aid Assistance and the Outline Design.
- c) To communicate closely with the responsible organizations and personnel of both countries, and complete the Project in time and in accordance with the implementation schedule.
- d) To provide appropriate advice to the personnel of the PMD and the contractor.
- e) To ensure the safety of project implementation as its top priority through the earlier/advance detection of severe weather phenomena.

2) Consultant Supervision

- a) The Consultant will dispatch at least one responsible and highly capable personnel to Pakistan during each implementation stage of the Project.
- b) Consultant technical specialists will be dispatched to Pakistan for installation guidance, inspection work, and etc. for the installation and configuration work of the major hardware, data communication equipment, computing equipment and system software.
- c) The Consultant will attend factory performance tests, configuration verifications and inspections of the equipment on behalf and instead of the PMD.
- d) Qualified engineer(s) will be dispatched for data transmission tests in Pakistan.

3) Scope of Work for Supervision

- a) The Consultant, in coordination with the PMD, will prepare the contract in accordance with JICA standards; select a Japanese primary contractor through tendering; and recommend the nominated contractor to Pakistan.
- b) The Consultant will inspect and approve shop-drawings, system drawings & the diagrams and material samples submitted by the contractor, and verify the performance and function of all the equipment.
- c) Based on a review of the implementation schedule, the Consultant will provide instructions to the contractor and submit progress reports on the implementation of the Project to the PMD, the Embassy of Japan in Pakistan, the JICA Pakistan local office, etc.
- d) The Consultant will cooperate in the certification of payment, such as through the examination of notices of approval and invoices in connection with the implementation costs to be disbursed during the implementation period and upon completion of the Project.

2-2-4-5 Quality Control Plan

The temperature in Sukkur could frequently reach up to more than 40°C in April, May, June and July. In this regard, the ambient and concrete temperatures will be measured during concrete pouring to ensure correct concrete quality and concrete pouring work at nighttime when the outside air temperature goes down is required. The quality control plan for the main work is described in the table below.

Table 33: Quality Control Plan

Work	Work Type	Control Item	Method	Remarks
Structural Work	Concrete work	Fresh concrete Concrete strength	Slump, air volume, temperature Comprehensive strength test Chloride Quantity Test Alkali Aggregate Reactivity Test	Concrete strength test will be conducted at a public test institution. Chloride quantity test and alkali aggregate reactivity test will be conducted by a private laboratory.
	Reinforcing work	Reinforcing bar Arrangement	Tensile test, mill sheet check Bar arrangement check Factory inspection sheet check	Tensile test of reinforcing bar will be conducted by a private laboratory.
	Pile work	Material, bearing capacity	Bearing capacity check	
Finishing Work	Roof work	Workmanship, leakage	Visual inspection, water spray test	
	Tile work	Workmanship	Visual inspection	
	Plastering work	Workmanship	Visual inspection	
	Door & Window work	Products, Installation accuracy	Factory inspection sheet check Visual inspection, dimension check	
	Painting work	Workmanship	Visual inspection	
	Interior work	Products, workmanship	Visual inspection	
Electrical Work	Power Receiving & Transformer	Performance, operation installation check	Factory inspection sheet check; withstand voltage, megar, operation, visual inspection	
	Conduit work	Bending, support check	Visual inspection, dimension check	
	Wiring and Cable work	Sheath damage, loose connection check	Performance sheet check, cleaning before laying, marking after bolt fixing	
	Lightning work	Resistance, conductor support pitch check	Resistance measuring, visual inspection, dimension check	
	Lighting work	Performance, operation, installation check	Performance sheet check, illumination measurement, visual inspection	
Mechanical Work	Water Piping Work	Support pitch, leakage	Visual inspection, leakage, water pressure test	
	Pump Installation	Slope, Support pitch, leakage	Visual inspection, leakage, flow test	
	Air-Con. work	Performance, operation, installation check	Performance sheet check, temperature measurement	
	Sanitary Fixture	Operation, installation, leakage check	Visual inspection, flow test	

2-2-4-6 Procurement Plan

(1) Equipment Procurement

Maintenance requirements and the availability of the necessary parts and consumables in Pakistan are two of the most important factors in selecting the equipment. The equipment procurement process must provide for continuing maintenance after the completion of the Project. None of the meteorological equipment, such as the pulse compression solid state Doppler radar system, the meteorological radar data display system, and etc., to be supplied under the Project is produced in Pakistan. The Pulse Compression Solid State Dual Polarization (Polarimetric) Meteorological Doppler Radar System which has already been put into practical use for meteorological observation and has confirmed its reliability, durability, accuracy and performance is made in Japan. The designed mean time between failure (MTBF) of the transmitter for this system is more than 50,000 hours and the designed mean time to repair (MTTR) of the transmitter is 0.5 hours. In addition, since almost all the Japanese meteorological radar systems established under Japan's Grant Aid in other developing countries have been working well over the years, Japanese systems have received a high degree of confidence in the world. Therefore, a Japanese system is the most suitable system for developing countries normally faced with operational and maintenance difficulties.

The activities of the private sector in Pakistan will be useful in support of the computer and other sophisticated systems. There are major computing equipment manufactures and local agents/suppliers in the country. The procurement plan for the equipment is designed with a view to achieve a maximum possible degree of standardization as well as facilitating the acquisition of spare parts and maintenance services for the chosen computing equipment.

(2) Procurement of Construction Material

1) Procurement Policy of Construction Material

As the main construction materials can be procured locally, they will, in principle, be procured in Pakistan. Some construction materials imported from the Association of Southeast Asian Nations (ASEAN) are marketed throughout Pakistan. As these imported materials can be easily procured locally, they are considered as locally procurable products. In order to ensure the easy maintenance of the radar tower building, locally available materials will be utilized for its construction.

2) Procurement Plan of Construction Material

[1] Structural Work

An ordinary portland cement packed in a 50 kg bag, which is also locally manufactured, can be procured. Concrete coarse aggregate and fine aggregate can be obtained in the Sukkur. The main materials for the

structural works, such as fresh concrete, reinforcing bar and form (plywood), can be obtained locally. Locally made concrete blocks are available and are a common material for building construction.

[2] Building Exterior and Interior Work

Timber, tiles, paint, glass, aluminum window frames, and etc. used for the exterior and interior of a building are imported and, as such, are readily available in the local market.

[3] Air-Conditioning and Plumbing Work

Imported air-conditioning equipment, exhaust fans, sanitary-fixtures, and etc. are popular in Pakistan. As a result, those products can be procured in the local market and will be used with a view to ease repair and maintenance. Large air-conditioning units and exhaust fans are also available in the local market.

[4] Electrical Work

Imported and local lighting fixtures, switches, lamps, electrical wires and cables, conduits and other items are available in the local market. They will be procured in Pakistan for the convenience of repair and maintenance. Custom-made building equipment such as control panels, power distribution boards and switch boards imported from ASEAN countries can also be procured in the local market.

Table 34: Major Materials Procurement Plan (Architectural Work)

Materials	Local Market		Procurement Plan		
	Condition	Import	Pakistan	Third Country	Japan
Portland cement	○		✓		
Sand, aggregate	○		✓		
Reinforcing bar	○		✓		
Form (plywood)	○		✓		
Concrete block	○		✓		
Asphalt waterproofing	○		✓		
Wood	○		✓		
Aluminum door & window	△		✓		
Steel door & window	△		✓		
Wooden door & window	○		✓		
Door handle, lock	○		✓		
Floor hinge	○		✓		
Plane glass	○		✓		
Glass block	○		✓		
Laminated safety glass	○		✓		
Access floor panel	○		✓		
Access floor panel (heavy duty type)	△		✓		
Paint	○		✓		
Gypsum board	○		✓		
Cement board	○		✓		
Rockwool acoustic board (T-bar)	○		✓		
Glass wool, glass cloth	○		✓		
Carpet tile	○		✓		
PVC tile	○		✓		
Porcelain tile	○		✓		
Ceramic tile	○		✓		
Floor maintenance hatch	○		✓		
Kitchen	○		✓		
Roof drain	○		✓		
Steel drainage pipe (galvanized)	○		✓		
Concrete pavement block	○		✓		
Spray tile	○		✓		
Caulking	○		✓		

○ : Easy to procure in Pakistan

△ : Available in the local market in Pakistan but model and quantity are limited

× : Difficult to procure in Pakistan

Table 35: Major Materials Procurement Plan (Mechanical and Electrical Works)

Work type	Materials	Local Market		Procurement Plan		
		Condition	Import	Pakistan	Third Country	Japan
Air-conditioning work	Air conditioner	△		✓		
	Heat exchanger	△		✓		
	Exhaust fan (salt-proof)	△		✓		
Plumbing work	Sanitary fixture	○		✓		
	Pipe	○		✓		
	Fire extinguisher	○		✓		
	Water lifting pump	○		✓		
	Electric water heater	○		✓		
Electrical work	Lighting fixture (including LED)	○		✓		
	Obstruction light (LED)	△	Japan			✓
	Panel	△		✓		
	Wire, cable	○		✓		
	Conduit (PVC)	○		✓		
	Conduit (Steel)	○		✓		
	Cable-rack	○		✓		
	Telephone system	○		✓		
	Isolation Transformer	△	Japan			✓
	Commercial Power Voltage Controller	△	Japan			✓
	Fire alarm system	○		✓		
	Diesel engine generator	○		✓		
Lightening protection	○		✓			

○ : Easy to procure in Pakistan

△ : Available in the local market in Pakistan but model and quantity are limited

× : Difficult to procure in Pakistan

3) Transportation Plan

The equipment shipped from overseas to Pakistan is to be unloaded at the Karachi Port, a main port in Pakistan, and then transported to each Project site by land. The required number of days and the schedule of vessels from major ports in Japan to the Karachi Port are indicated in the following table.

Table 36: Scheduled Vessels to Karachi Port from Japan

Country	Name of Port	Schedule	Number of Days
Japan	Yokohama, Tokyo, Nagoya, Kobe	6 ships/week	Approx. 30-40 days

<Inland Transport>

The equipment unloaded at the Karachi Port is to be transported to the Project sites in Karachi, Sukkur, Lahore and Islamabad via a container-trailer. The longest road is approximately 1,800km which requires 4-5 days to traverse. While the road condition is not so bad, the equipment must be kept in a locked container from Karachi to the Project sites since there is a high risk of theft during transportation. In some sections of the country, countermeasures for safe transportation of the equipment, such as avoidance of night driving, may be required.

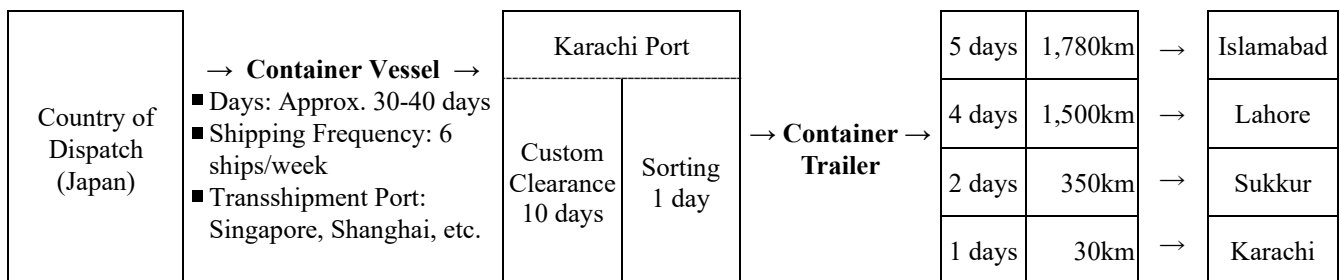


Figure 35: Transportation Period to the Project Sites

2-2-4-7 Operational Guidance Plan

The required operational guidance will be implemented through the practical operational simulation of each system during the course of the completion of equipment installation. The operational guidance for

each system will be implemented at the following places indicated in the table attached hereunder.

Table 37: Operation and Maintenance Training (OJT)

Component	Proposed Sukkur Meteorological Radar Observation Station	PMD Islamabad Head Office National Weather Forecasting Center	PMD Tropical Cyclone Warning Center	PMD Flood Forecasting Division, Lahore	PMD Meteorological Office in the International Airports, Karachi, Islamabad and Lahore
Procurement and Installation of Equipment					
S-Band Pulse Compression Solid State Dual Polarization (Polarimetric) Meteorological Doppler Radar System • Power Unit • Antenna • Radar Unit • Meteorological Radar Transmission Unit • Computer Network Unit • Power Back-up Unit • Application Software	○	-	-	-	-
Meteorological Radar Central Processing System • Power Unit • Computer Network Unit • Application Software	-	○	-	-	-
Meteorological Radar Data Display System • Power Unit • Computer Network Unit • Application Software	○	○	○	○	○

Apart from the Operation and Maintenance Training (OJT), technology transfer through practical installation and adjustment works to be carried out by the PMD staff together with the Consultant and the contractor will be necessary and quite effective if done during the installation period. If technology transfer is conducted after completion of the installation work, it is difficult to simulate training on some parts/areas located in deeper places within the system such as cabling and wiring routes, connecting points of each unit, and etc. which would require disassembling the radar system to be able to see them. In addition, repeated software installation by the PMD staff themselves is important to have further familiarization and technical knowledge. In case of a down in the system, disassembling the system and software reinstallation by the PMD staff may be required. Therefore, all the significant parts of technology transfer must be completed during the installation work period.

2-2-4-8 Soft Component Plan

<Soft Component>

In order to operate the systems procured by this project in a good condition for the long term, to improve the accuracy of the weather and flooding information and their forecasts and warnings in Pakistan and to contribute to the reduction of damages caused by natural disasters, it is crucial to optimize and strengthen the PMD's monitoring capability of weather phenomena which can cause disasters through the appropriate use of the Meteorological Radar with the dual polarization function. To achieve this, the staff who has appropriate operation and maintenance skills is required, and, thus, it is necessary to conduct the Soft Component.

As previously mentioned, 3 Meteorological Radars have been or will be established in Pakistan. The Soft Component with regards to the Single Polarization Meteorological Radar established in Islamabad had been conducted from July to Aug 2018 and from Apr to May 2019. It is planned to be conducted in mid-2020 in Karachi where a Single Polarization Radar will be similarly established. The Soft Component items are aimed at establishing the appropriate maintenance and management structure of the equipment procured by the Project and the preparation of the regular inspection and maintenance manuals and learning of the methods by the PMD engineers for the continued use of the project outcome achieved by the Single Polarization Meteorological Radars and the expression of its effect. Furthermore, they will focus on having a deep understanding of the displayed contents of the Meteorological Radar products and how they are generated, and improving their awareness on why it is necessary to confirm the Meteorological Radar products on a daily basis so that PMD forecasters can quickly identify meteorological phenomena necessary for weather forecasting and warning among the products generated by the Meteorological Radars.

Sukkur will be the 2nd case of establishing a Dual Polarization Meteorological Radar in Pakistan. The Soft Component regarding the Dual Polarization Radar in Multan, which will be the first case, will be conducted in late 2022. Considering the antecedent Soft Component, the Soft Component of this project will revise the training materials and manuals that will be created during the Soft Component for the Multan Meteorological Radar to improve the contents more suitable for Pakistan, and will be efficiently conducted by avoiding duplicated training contents with the following important focus points in mind.

- Understanding of the features of the Dual Polarization Meteorological Radar compared to the Single Polarization Radar, its observation principle, and the adjustment items unique to the Dual Polarization Meteorological Radar.
- Explanation of the Dual Polarization Meteorological Radar using the Multan Meteorological Radar observation data and their use in the weather forecasting work.
- Promotion of understanding of the observation mode (PPI, RHI, etc.) and CAPPI that is obtained by processing the observation data, and derived products by composing them.
- Explanation of the non-precipitation echo of the Meteorological Radar, methods of automatic removal by the Meteorological Radar and its limitation, and the overview of other quality management methods.
- Explanation of the processing method of the Dual Polarization Meteorological Radar raw data.

<Soft Component Target>

Enabling the PMD to independently and appropriately operate the Dual Polarization (Polarimetric) Meteorological Doppler Radar System being established in Sukkur.

<Soft Component Achievement Indicators>

Soft Component Achievement Indicators are as follows.

Table 38: Soft Component Achievement Indicators

No.	Achievement	Objectively Verifiable Indicators	Means of Verification
1	PMD staff acquires the knowledge on the measurement and confirmation methods of the dual-polarization (vertical and horizontal polarization) function.	Implementation of the measurement and confirmation methods of the dual-polarization (vertical and horizontal polarization) function.	Confirmation of proficiency through visual checks and technical interviews of the measurement and confirmation of the dual-polarization function (vertical and horizontal polarization).
2	PMD staff acquires the knowledge on how to operate and administer the Sukkur Meteorological Radar System.	Prompt and appropriate operation and administration skills using the Sukkur Meteorological Radar System Summary and Maintenance Manual as well as the Maintenance Record Book.	Confirmation of the frequency of using the Sukkur Meteorological Radar System Summary & Maintenance Manual, and entries in the Meteorological Radar System Maintenance Record Book through check of contents and technical interviews
3	PMD staff acquires the knowledge on the maintenance (inspection and adjustment) of the Sukkur Meteorological Radar System.	Inspection, adjustment, minor fault finding, remedy and recovery such as: a. routine maintenance using measuring instruments and tools, b. practice of replacing spare parts into the actual system and the subsequent confirmation of system operation, c. major fault countermeasures: distributing information to the Consultant and the manufacturer and receiving technical advice.	Confirmation of proficiency through visual checks and technical interviews of the followings: 1) routine maintenance using measuring instruments and tools 2) practice of replacing spare parts into the actual system and the subsequent confirmation of system operation 3) practice of minor fault finding, remedy and recovery 4) major fault countermeasures.
4	PMD staff appropriately operate and use the Sukkur Meteorological Radar System and conduct weather observation.	<ul style="list-style-type: none"> • Meteorological Radar Observation according to the observation sequence schedule • Confirmation whether a ground clutter and other non-precipitation echo exist. • Utilization of the weather phenomena identified in the observation for the forecasting work. 	<ul style="list-style-type: none"> • Confirmation of execution of meteorological radar observation in accordance with the sequence schedule from the operation information. • Confirmation whether ground clutters and other non-precipitation echoes exist. • Quiz to assess the skills to find out weather phenomena in the meteorological radar data display system with appropriate operations.
5	PMD staff acquires radar observation raw data of the Sukkur Meteorological Radar as well as the composite data with the existing other Meteorological Radars and share them with relevant organizations.	<ul style="list-style-type: none"> • Acquisition of radar observation data from radar data display systems. • Conversion of the radar observation data into suitable data for the forecasting work. • Converted data share with is shared with relevant organizations in an appropriate manner and updated regularly 	<ul style="list-style-type: none"> • Confirmation of acquisition of radar observation data from radar data display systems. • Confirmation of conversion of the radar observation data into suitable data for the forecasting work. • Confirmation of regular update of converted data shared with relevant organizations.

By achieving the 5 targets in the aforementioned Soft Component, the following effects are expected and those effects will contribute to the achievement of the target of this Project.

Table 39: Effects from the Soft Component Achievements

No.	Achievements	Effects from the Soft Component Achievements
1	PMD staff acquires the knowledge on how to measure and confirm the dual-polarization function (vertical and horizontal polarization).	As the PMD engineers acquire the knowledge on the maintenance method of the Sukkur Meteorological Radar System equipment with the dual-polarization function and regularly conduct the adjustment of the equipment relevant to the Meteorological Radar observation and the proper maintenance and management including the regular inspection according to the defined procedures and recording, they will contribute to the operation of the Meteorological Radar established through the Japanese Grant Aid in a good condition for a longer term.
2	PMD staff acquires the knowledge on how to operate and administer the Sukkur Meteorological Radar System.	
3	PMD staff acquires the knowledge of the maintenance method (inspection and adjustment) of the Sukkur Meteorological Radar System.	
4	PMD staff can appropriately operate and use the Sukkur Meteorological Radar System, and can conduct weather observation with high accuracy.	By properly operating the Sukkur Meteorological Radar according to the optimal observation schedule configured during the Soft Component, the PMD can do the Meteorological Radar observation with high accuracy in Sindh and Punjab provinces, and the wider area of the Indian side. Moreover, by applying the analysis method of meteorological phenomena from the meteorological radar products, which the PMD staff learn through the trainings, they will contribute to creation of the weather and flood forecasts and warnings.
5	PMD staff establishes the method to acquire the Meteorological Radar observation raw data as well as its composite data and to share them with the stakeholders.	The Soft Component will contribute to reduction of damages caused by natural disasters that is the Project's target, by acquiring the meteorological radar observation raw data and composite data and converting them into suitable formats to use them for weather forecasting and warning work, and providing these products timely to the disaster management organizations and to the people of Pakistan

<Means of Verification for the Achievement of Outputs>

The means of verification for the achievement of outputs of the Soft Component are also indicated in Table "Soft Component Achievement Indicators".

<Scheduled Activities of the Soft Component>

Scheduled Activities of the Soft Component are as follows: Table 40 describes the contents of each activity, required skills, job categories, and technical skill levels; Table 41 describes the means of implementation, products, and the human resources required by each activity; and, Table 42 describes the target group of each activity.

As a consequence of further scrutiny by the Preparatory Study Team together with the Japan Meteorological Agency and others in connection with the activities of the Soft Component, the necessity was recognized and, therefore, it was concluded to include the training on the "Measurement and Confirmation of the Dual Polarization function (systematic error and standard deviation of the Vertical and Horizontal Polarization)." Such process is being introduced as a new maintenance management method in Japan for a Dual Polarization Meteorological Radar. Since the Project is for the establishment of a 2nd Dual Polarization Meteorological Radar in Pakistan, the aforementioned training is necessary to

include in the Soft Components of the Project. Since it is very difficult to take time for the bird-bath scan during rainfall to be carried out in Activity 1 once the radar continues observation after completion of the Project has been commenced, Activity 1 will be conducted in the time between radar adjustment work and the installation work completion. Activity 2 and 3 on essential items for the operation and maintenance of meteorological radar systems are planned to be provided to the PMD staff who are newly assigned to the Sukkur Radar Observation Station and related staff who is involved in the operation of the meteorological radars. The manuals and other documents prepared by the manufacturer may be significantly different from the ones from the existing radar's since the radar equipment to be introduced under the Project is determined by the tendering. Needless to say, all meteorological radar systems are custom-ordered products manufactured according to the order. Furthermore, if the manufacturers are different, the inspection locations and adjustment procedures will be different due to the different shapes and locations of the units constituting each device of the radar system. Therefore, in fact re-creation of the training materials for Activities 2 & 3 are needed through the revision of most training materials and manuals for the soft component of the Multan Meteorological Radar. Based upon these points, Activity 2 is planned to use the training materials and manuals to be prepared in the Soft Components of Multan Meteorological Radar as much as possible in order to shorten preparation work and to conduct training more efficiently. Activity 3 is planned to focus on training items that are essential for maintenance of meteorological radar system. Regarding the training to be conducted in Activity 4, the same training as the Soft Component conducted at the other existing meteorological radar stations will required for the PMD staff who use Sukkur Meteorological Radar Images after a new meteorological radar has been established owing to topography, altitude, height of meteorological radar tower building and surrounding area conditions (availability of mountains, buildings, bridges, steel towers, etc.), the place of ground clutter occurrence, the direction & distribution of obstruction for observation, the method of complementing observation data in the obstructed range, the radar antenna observation elevation angle, etc. differ greatly from each other. Activity 5 is planned to conduct training to acquire radar raw data and composite data from meteorological radar systems and convert them into data suitable for use in other meteorological works. In addition, implementation of the training on the data share and the regular data updating for timely and appropriate response by disaster management authorities is planned.

Table 40: Scheduled Activities of the Soft Component

Achievement No.	Activity	Contents of the Activity	Required Skills and Job Categories	Current Skill Level	Required Skill Level
1	Activity 1	Measurement and confirmation of the Dual Polarization function	An engineer with the knowledge and skills of measurement and confirmation of the Dual Polarization function.	Experience of inspection, adjustment, fault finding, remedy and recovery of analog meteorological radar systems or single polarization meteorological radar systems.	Skill to measure and confirm the dual polarization function.

2	Activity 2	Preparation and utilization of the Summary & Maintenance Manual and the Maintenance & Management Record Book of the Sukkur Meteorological Radar System.	An engineer capable of operation and maintenance of a dual polarization meteorological radar.	Experience of operation and maintenance of analog meteorological radar systems or single polarization meteorological radar systems.	Skill for operation and management of the Dual Polarization Meteorological Doppler Radar System according to the manual summary and the Maintenance & Management Record book
3	Activity 3	Inspection, Adjustment, Minor Fault Finding, Remedy and Recovery, Major Fault Countermeasures of the Sukkur Meteorological Radar System.	An engineer capable of adjustment and minor fault finding of Dual Polarization (Polarimetric) Meteorological Radar System.	Experience of inspection, adjustment, fault finding, remedy and recovery of analog meteorological radar systems or single polarization meteorological radar systems.	Skill to check, adjust, troubleshoot, remedy and recovery of Dual Polarization Meteorological Doppler Radar System
4	Activity 4	Fundamental of the Dual Polarization Meteorological Radar System, Data quality control overview, Meteorological Radar Observation according to the sequence schedule. Explanation for use of Meteorological Radar products for the weather forecasting work.	Staff who can conduct the quality control such as identifying and complementing Clutters and Blind Areas from the meteorological radar observation data, and create the observation sequence schedule which is suited to the weather phenomena in Pakistan	Experience of observation and forecasting based on the observation data of analog meteorological radar systems or single polarization meteorological radar systems.	<ul style="list-style-type: none"> Understanding of the characteristics of a dual polarization meteorological radar system compared to a single polarization meteorological radar. Skill to create a sequence schedule and run the observation following the schedule. Skill to effectively use the observation data of the dual polarization meteorological radar system to the forecasting work.
5	Activity 5	Establishment of the method to obtain the meteorological radar observation raw data and the composite data and to share them to the stakeholders.	Staff who understand the data flow of the meteorological observation data and has the skills to convert the data format and share them.	Experience of conversion of the observation data format from the existing Islamabad meteorological radar.	<ul style="list-style-type: none"> Skill to acquire the observation raw data and the composite data. Understanding how to read the data format of the observation raw data. Skill to share the PMD meteorological radar products and its continued operation.

Table 41: Implementation Contents of the Soft Component

Activity	Means of Implementation	Products	Human resource for the activity
Activity 1	Technical discussion with the PMD engineers	<ul style="list-style-type: none"> Operation Procedure to measure and confirm the Dual Polarization Function 	Expert Consultant on Measurement and confirmation of dual polarization function meteorological radar operation and maintenance: 0.83 man-months (Period of Technology Transfer in Pakistan: 25days) Direct Support
	Preparation of the procedure to measure and confirm the Dual Polarization function through the bird-bath scan		
	Preparation of the procedure to measure and confirm the Dual Polarization function through the Polarimetric Test Horn Device		
	Training to measure and confirm the Dual Polarization function through the bird-bath scan		
	Training to measure and confirm the Dual Polarization function through the Polarimetric Test Horn Device		
Activity 2	Technical discussion with the PMD engineers	<ul style="list-style-type: none"> Sukkur Meteorological Radar System Maintenance Manual Sukkur Meteorological Radar System Maintenance & Management Record 	Expert Consultant on meteorological radar operation and maintenance: 0.70 man-months (Period of Technology Transfer in Pakistan: 21days) Direct Support
	Explanation of the Sukkur Meteorological Radar System Summary		
	Comparison with the Multan Meteorological Radar System Maintenance Manual and Maintenance & Management Record Book, confirmation of differences and sections requiring improvement,		

	and revision Training on maintenance work according to the Sukkur Meteorological Radar System Maintenance Manual and recording in the Maintenance & Management Record Book by the PMD engineer	Book	
Activity 3	Discussion with the PMD engineers Comparison, confirmation of differences and improvement points from the procedure document for Multan, and revision Practice of routine maintenance using measuring instruments, detector, attenuators and tools Practice of replacing spare parts into the actual system and the subsequent confirmation of system operation Training on Fault Finding, Remedy and Recovery Confirmation assuming failure conditions Practice of major fault countermeasures Preparation of the procedure document	• Various implementation procedures described in the Sukkur Meteorological Radar System Maintenance Manual for Activity 2	Expert Consultant on meteorological radar adjustment and fault finding: 0.87 man-months (Period of Technology Transfer in Pakistan: 26days) Direct Support
Activity 4	Technical discussion with the PMD forecasters and engineers Preparation of training materials Explanation of the Sukkur Meteorological Radar products and utilization for forecasting works Training of the data quality control overview of the Dual Polarization Meteorological Radar Explanation of generation procedure of the surface rain intensity product Estimation of ground clutter and blind areas at each antenna elevation angle, and creation of the elevation composite table based on the estimation result Preparation of the observation sequence schedule of the Sukkur Meteorological Radar OJT of the meteorological radar observation according to the created sequence schedule	• Sukkur Meteorological Radar Product Explanation Material • Data Quality Management Training Material • Observation Sequence Explanation Material • Quiz using Sukkur weather radar observations	Expert Consultant on meteorological radar observation: 1.07 man-months (Period of Technology Transfer in Pakistan: 32days) Direct Support
Activity 5	Preparation of training materials Training for acquisition of raw data (including the data obtained by the Dual Polarization) and composite data Training on reading observation raw data format Operational Training for publishing and utilizing Sukkur Meteorological Radar products	• Guidebook for obtaining and sharing weather radar data and products	Expert Consultant on meteorological radar observation data utilization: 0.63 man-months (Period of Technology Transfer in Pakistan: 19days) Direct Support

<Target Groups of each Activity>

Target Groups of each Activity are as follows.

Table 42: Target Groups of each Activity

Activity	Designation	Islamabad	Sukkur	Karachi	Multan	Lahore
Activity 1	Principal Engineer	1		1		
	Electronic Engineer	3	2	4	2	
	Electronic Sub-Engineer	1	1	1	1	
	Electric Engineer		2			
	Mechanical Engineer		1			
Activity 2	Principal Engineer	1		1		
	Electronic Engineer	3	2	4		
	Electronic Sub-Engineer	1	1	1		
	Electric Engineer		2			
	Mechanical Engineer		1			
	Principal Engineer	1		1		
	Electronic Engineer	3	2	4		

Activity 3	Electronic Sub-Engineer	1	1	1		
	Electric Engineer		2			
	Mechanical Engineer		1			
Activity 4	Meteorological Staff	15	11	15		10
Activity 5	Meteorological Staff	15		15		
	R&D Division Staff	5				
	Programmer	5		3		

<Soft Component Product>

Soft Component Products are as follows.

Table 43: Soft Component Products (Outputs)

Product Name	Contents	Submission Time	No. of Pages
Operation Procedure to measure and confirm the Dual Polarization Function	<ul style="list-style-type: none"> Procedures to measure and confirm the Dual Polarization function by the bird-bath scan Procedures for a) reading and b) recording and confirmation of the observation data during the bird-bath scan a) Setup and Adjustment, b) Transmission and Reception of test signal, and c) Measurement and Confirmation of the Dual Polarization function by the Polarimetric Test Horn Device 	After Technology Transfer	15
Sukkur Meteorological Radar System Maintenance Manual	<ul style="list-style-type: none"> Summary of the Sukkur Meteorological Radar System Procedures for the routine maintenance using measuring instruments and tools. Procedures for replacing spare parts into the actual system and the subsequent confirmation of system operation (observation situation) Procedures for fault finding, remedy and recovery confirmation Procedures for major fault countermeasure/s 		20
Sukkur Meteorological Radar System Maintenance & Management Record Book	<ul style="list-style-type: none"> Date and time of issues encountered Cause/s of issues (abnormal sound, partial degradation, etc.) Troubleshooting steps Name and quantity of the replaced parts Name of the engineer who executed the trouble shooting and recovery 		10
Observation Sequence Schedule Explanation Material	<ul style="list-style-type: none"> Observation shadow area chart for each antenna elevation Beam elevation chart for each antenna elevation Surface precipitation intensity product chart 		15
Data Quality Management Overview Training Material	<ul style="list-style-type: none"> Type of non-precipitation echoes Examples of ground clutters and sea clutters Examples of bright band observation Techniques to remove non-precipitation echoes 		10
Sukkur Meteorological Radar Product Explanation Material	<ul style="list-style-type: none"> Explanation of essential meteorological radar products and their use for weather forecasting 		30
Guidebook for obtaining and sharing weather radar data and products	<ul style="list-style-type: none"> Methods to acquire the raw observation data in the NetCDF and other formats How to read the data table of the raw observation data How to process the composite observation data Procedures for sharing weather radar observation data Explanation on folder directory and script Configuration file description Maintenance and troubleshooting procedures 		10
Soft Component Completion Report	<ul style="list-style-type: none"> Scheduled Activities and Actual Achievement Planned Outputs and Achievement Factors that have influenced Achievement of Outputs Recommendations for sustaining the effects of the Soft Component and its further development Outputs 		Completion of Soft Component

2-2-4-9 Implementation Schedule

Table 44: Implementation Schedule

Month	1	2	3	4	5	6	7	8
Detailed Design & Tendering Procedure	Total: 8.0 months							
Detailed Design	■	■	■	■	■	■	■	■
Tendering Procedure	■	■	■	■	■	■	■	■

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	
Sukkur Meteorological Radar Observation Station																																									
Construction Work	Total: 22.5 months																																								
Preparation Work/Boundary Wall/Soil Filling	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Temporary/Foundation Works	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Structure Work	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Finishing Work	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Building Equipment Work	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Equipment Work	Total: 17.3 months																																								
Equipment Manufacturing	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Equipment Transportation	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Equipment Installation/Adjustment	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
PMD Islamabad Headquarter Office National Weather Forecasting Centre																																									
Equipment Work	Total: 13.3 months																																								
Equipment Manufacturing	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Equipment Transportation	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Equipment Installation/Adjustment	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
PMD Karachi Tropical Cyclone Warning Centre																																									
Equipment Work	Total: 13.3 months																																								
Equipment Manufacturing	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Equipment Transportation	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Equipment Installation/Adjustment	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
PMD Lahore Flood Forecasting Centre																																									
Equipment Work	Total: 13.3 months																																								
Equipment Manufacturing	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Equipment Transportation	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Equipment Installation/Adjustment	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
PMD Meteorological Office in the International Airports, Karachi, Islamabad, and Lahore																																									
Equipment Work	Total: 13.3 months																																								
Equipment Manufacturing	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Equipment Transportation	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Equipment Installation/Adjustment	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
Soft Component																																									
Soft Component (Activity 1)	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Soft Component (Activity 2)	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Soft Component (Activity 3)	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Soft Component (Activity 4)	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
Soft Component (Activity 5)	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	

2-3 Security Plan

The Project implementation plan has been prepared according to the following Safety Management Measures which are required in order to ensure over-all safety during the Project implementation period. The said Safety Management Measures are the outcome of several discussions in Karachi among the Study Team, the Regional Police of Sukkur, and a security officer from the JICA Pakistan Office.

Table 45: Details of Safety Management Measures to be Done by Japan's Grant Aid Assistance and Pakistan/PMD for the Implementation of the Project

Items of Safety Management Measures		To be covered by Japan's Grant Aid	To be covered by Pakistan (PMD)
General	Arrangement of the maximum countermeasures and the appropriate security for the Japanese and other foreign nationals assigned to the Project prior to the commencement of and during the Project implementation.		●
Physical Defense	Establishment of protective facilities to enclose the Project Site and the space(s) for the temporary facilities.	●	
Monitoring for Outside and inside of the Project Site	Arrangement of security around the Project Site by the Regional Police of Sukkur.		●
	Arrangement of escort security by the Regional Police of Sukkur at the accommodations of the Consultant and the Contractor, as well as between the accommodations and the Project Site.		●
	Installation of security cameras and security lights.	●	
	Allocation of security guards (24 hours, 3 shifts) in the Project Site (Sukkur).	●	
	Procurement of security equipment (under-vehicle confirmation mirror, metal detector)	●	
Vehicles	The vehicles used by the Consultant and the Contractor will be a four-wheel drive vehicle for smooth evacuation even on rough roads.	●	
Communication Equipment	In addition to a normal mobile phone, a plurality of communication means are secured.	●	
Accommodation	Accommodations for the Consultant and the Contractor (Japanese and other foreign nationals) will be the hotels in Sukkur City recommended by the security officer from the JICA Pakistan Office.	●	

2-4 Obligations of Recipient Country

In the implementation of the Project under Japan's Grant Aid Assistance, Pakistan (PMD) is responsible for the following tasks.

Table 46: Major Undertakings to be Done by Pakistan/PMD during and after the Implementation of the Project

No	Items
Before the Tender	
1	To open Bank Account (Banking Arrangement (B/A))
2	To secure sufficient spaces at the proposed Radar Observation Station (PMD Meteorological Observatory, Rohri-Sukkur) for temporary facilities such as a consultant's site office, contractor's office, workshop, building materials storage, etc. needed for the construction work.
3	To obtain all prior regulatory compliance and necessary permissions from the relevant agencies/authorities for the construction of the Radar Tower Building in the proposed Radar Observation Station (PMD Meteorological Observatory, Rohri-Sukkur).
4	To undertake the Initial Environmental Examination (IEE) procedures in Pakistan, if required so.
5	To obtain the required frequencies for the Sukkur Meteorological Radar System and Polarimetric Test Horn Devices.
During the Project Implementation	
1	To pay bank charge (commission) for the issuance of the Authorization to Pay (A/P) and amendments of A/P, if required, for the Consultant and the Contractor.
2	To undertake all necessary institutional and juridical procedures in Pakistan.
3	To handle duty (tax) exemption procedures and to take necessary measures as well as provide requisite legal and/or administrative documentations for import permit and customs clearance to the customs broker/forwarder to be employed by the Contractor at the port of disembarkation for the materials and equipment to be imported for the Project as well as the sending back of any defective equipment and/or spare parts to the manufacturer for repair at the factory or replacement and re-importation thereof into Pakistan during the implementation and warranty periods of the Project.
4	To take responsibility for arranging the maximum countermeasures and ensure the appropriate security of all the Project site/s and of the Japanese and other foreign nationals assigned to the Project prior to the commencement of and during the implementation of the Project.
5	To arrange security around the proposed Project Site in Sukkur with the police.
6	To arrange security around the accommodation(s) of the Consultant & the Contractor with the police.
7	To arrange escort guard with the police during movements between the accommodation(s) of the Consultant & the Contractor and the proposed Project Site in Sukkur.
8	To provide necessary working spaces with Internet Connection at the PMD Islamabad Head Office and the PMD Karachi for the Consultant and the Contractor during the implementation of the Project.
9	To provide necessary installation spaces for the equipment procured under the Project at the PMD existing facilities (Project Sites).
10	To accord Japanese and other foreign nationals including their dependent/s (if any), whose services may be required in connection with the supply of products and services under the signed contracts, such facilities as may be necessary for their entry into Pakistan and stay therein for the smooth and uninterrupted performance of their work (i.e. to secure the appropriate visa including its extension/s required by the recipient country in connection thereof).
11	To exempt goods of Japanese and other foreign nationals from customs duties, internal taxes and other fiscal levies which may be imposed by the Government of Pakistan with respect to their supply (products) and services under the signed contracts.
12	To bear all the expenses, other than those to be borne by the Japanese Grant, necessary for construction of the facilities as well as for the transportation and installation of the equipment.
13	To provide temporary facilities for the availability or accessibility of electricity for the construction work.
14	To provide the commercial power (400V, 3-phase, 4-wire, 50Hz) supply (capacity: no less than 200kVA) along with electric poles/wires, etc. from the main supply line to the proposed Radar Observation Station (PMD Meteorological Observatory, Rohri-Sukkur) for the Radar Tower Building and other facilities to be constructed by the PMD prior to the commencement of construction work.
15	To install the required step-down transformer (capacity: no less than 200kVA) as well as service entrance connections for the commercial power supply at the proposed Radar Observation Station (PMD Meteorological Observatory, Rohri-Sukkur) for the Radar Tower Building (400V, 3-phase, 4-wire, 50Hz) prior to the commencement of construction work.
16	To relocate the existing power cables and meteorological observation field in the proposed Radar Observation Station (PMD Meteorological Observatory, Rohri-Sukkur).
17	To provide telephone lines for the Radar Tower Building in the proposed Radar Observation Station (PMD Meteorological Observatory, Rohri-Sukkur).
18	To procure and install standard furniture for the Radar Tower Building.
19	To undertake incidental outdoor works such as gardening/landscaping and exterior lighting in and around the

	proposed Radar Observation Station (PMD Meteorological Observatory, Rohri-Sukkur), if necessary.
20	To provide free of charge and allocate secure temporary storage area/room for the materials, tools and equipment needed during the installation process.
21	To promptly provide reliable and high-speed Internet environment at the Sukkur Meteorological Radar Observation Station (PMD Meteorological Observatory, Rohri-Sukkur), National Weather Forecasting Center, PMD Islamabad Head Office and other Project Sites (with each corresponding global/fix IP) for the establishment of a Virtual Private Network.
22	To set up the required and new assigned IP addresses in the computing equipment supplied under the Project and facilitate any required configuration i.e. firewall settings, etc. of the existing PMD equipment which may be made part of the project network communication system, if any.
23	To support the Contractor to obtain relevant and vital information or data i.e. shape file map of Pakistan containing the administrative boundaries (regions, provinces, cities, districts, wards, etc.) as well as the rivers, lakes, and dams in Pakistan to be incorporated into the radar data/products display software.
24	To assign appropriate number of trainees and shoulder their dispatching cost to the training sites, such as daily allowance, transportation fee, accommodation, if any.
25	To shoulder the miscellaneous expenditures such as library books, petrol, telephone, application fee (obtaining the required frequencies for the meteorological radar system and the construction permissions of a new Radar Tower Building).
26	To demolish the exiting Rohri-Sukkur observatory building (after handing over the Project from Japan side).
27	To construct category III house, bachelor hostels (after handing over the Project from Japan side).
After the Project Completion	
1	To assign the required staff including a responsible personnel of the PMD who has reliable technical skill and ample experience for the smooth operation and maintenance of the Equipment.
2	To procure the required spare parts and consumables for the smooth operation and maintenance of the Equipment, and enter into a Preventive Maintenance Service Agreement with the equipment supplier if so desired.
3	To ensure adequate maintenance of the Radar Tower Building constructed under the Project so that they may function effectively for a long time.
4	To properly operate and maintain, and also effectively utilize the facilities constructed and the Equipment procured/installed under the Project.
5	To allocate the necessary budget and personnel for the smooth conduct of meteorological radar observation and forecasting works.
6	To periodically update all the operation/antivirus/application software(s).
7	To procure the appropriate number and capacity of disk media, hard disks, solid state disks, etc., and dutifully conduct the required scheduled archiving of radar observation raw data and products.

2-5 Project Operation Plan

(1) Operational and Maintenance Plan for the Equipment

1) Operational Plan of the Meteorological Radar System

The PMD should operate the meteorological radar system after completion of this project at least for 24 hours of non-stop operation during the monsoon season.

2) Staff Allocation at Sukkur Meteorological Radar Observation Station

After completion of the Project, 17 personnel shown in the table below in addition to the current 10 personnel will be allocated at the Sukkur Meteorological Radar Observation Station according to the PMD's plan (total 27 personnel). During the daytime, there are 7 personnel for radar operation & maintenance and 3 personnel for the PMD Meteorological Observatory, Rohri-Sukkur under the 3 shifts (from 8 am to 2 pm) with a total of 10 personnel. Additionally, from 2 pm to the next morning (8 am), 3

personnel for radar operation & maintenance and 2 personnel for the PMD Meteorological Observatory, Rohri-Sukkur with a total of 5 personnel would be allocated (staff allocations consist of No. 1-10 as per the following table excluding a driver, a peon, a security guard, a gardener and a sweeper).

Table 47: Staff Allocation Plan for the Sukkur Meteorological Radar Observation Station

No.	Name of Post	New Staff Allocation for Meteorological Radar Observation Station	Existing Staff Allocation for Rohri-Sukkur Meteorological Synoptic Observatory
1	Senior Meteorologist	1	-
2	Meteorologist	2	-
3	Electronic Engineer	2	-
4	Assistant Meteorologist	1	-
5	Assistant Electronic Engineer	1	-
6	Sub-engineer Electrical	2	-
7	Sub-Engineer Mechanical	1	-
8	Meteorological Assistant	1	1
9	Senior Observer	2	3
10	Driver	1	-
11	Peon	1	3
12	Security Guard	-	1
13	Gardener	1	1
14	Sweeper	1	1
Total		17	10

Data Source: PMD

Table 48: Proposed Work Schedule of the Sukkur Meteorological Radar Observation Station

		Morning	Afternoon	Night	Number of Personnel/day
Ordinary and Monsoon Season (July-September)	Working Hours	08:00-14:00	14:00-20:00	20:00-08:00	13
	Number of Personnel on Duty	7	3	3	
Emergency ^(*)		It depends on the intensity of weather phenomenon			

^(*) In case of occurrence of severe weather

3) Operational and Maintenance Plan for the Equipment

In connection with equipment maintenance, consideration must be given to the following.

- Technical training for the PMD staff
- Establishment of appropriate measures against system failure
- A fully documented maintenance system with proper document control
- Scheduled replacement of parts and overhauls
- Strengthening of the operation and maintenance structure of the PMD
- Establishment of the technical and financial self-reliance of the PMD

(2) Operational and Maintenance Plan for the Radar Tower Building

There are three key issues for the maintenance of the radar tower building to be implemented by the PMD:

(i) daily cleaning; (ii) maintenance to cover wear and tear, damage and aging; and, (iii) security measures to ensure safety and to prevent crimes.

The implementation of the daily cleaning of the building leaves a good impression on the visitors/users and encourages people to respect the building and the equipment in it. Cleaning is also important to ensure the equipment continues to operate correctly. It helps in the rapid detection and repair of damaged equipment and prolongs the life of the building equipment. The main repair work will be refurbishing or replacing the exterior and interior materials protecting the building structure. The required inspections are outlined below.

Table 49: Outline of Regular Inspection for the Building

	Items of Maintenance Work	Frequency
Exterior	Repair and repainting of external walls	Repair: every 5 years Repaint: every 15 years
	Inspection and repair of roofs	Inspection: every year Repair: as required
	Regular cleaning of drain pipes and drainage systems	Monthly
	Inspection and repair of sealing of external windows and doors	Every year
	Regular inspection and cleaning of ditches and manholes	Every year
Interior	Renewal of interior finishing	As required
	Repair and repainting of partition walls	As required
	Adjustment of window and door fitting	Every year Others: as required

It is important that the regular preventive maintenance of the building equipment is carried out before the equipment fails or requires repair or before the replacement of part(s). The life of the building equipment can be significantly extended through proper operation and regular inspection, lubrication, adjustment and cleaning. These regular inspections can prevent equipment failure and accidents. Regular inspection, the replacement of consumables and the cleaning/replacement of filters for ventilation and air-conditioning units should be carried out in accordance with the maintenance manual.

It is essential to establish a proper maintenance structure in the PMD, involving the rigorous implementation of regular inspection and maintenance procedures. This work may be assigned to the private sector (local agents), if required. The general life expectancy of the major building equipment is shown below.

Table 50: Life Expectancy of Building Equipment

System	Building Equipment	Life Expectancy
Electrical System	• Distribution panels	20 - 30 years
	• LED	20,000 - 60,000 hours
Water Supply and Drainage Systems	• Pipes and valves	15 years
	• Sanitary fixture	25 - 30 years
Air-Conditioning System	• Pipes	15 years
	• Air-conditioning units and exhaust fans	15 years

2-6 Project Cost Estimation

2-6-1 Estimate of the Project Capital Cost (Initial Cost Estimate)

The required capital costs for the Project to be borne by Pakistan/PMD have been estimated and are shown in the following table.

Estimated Total Project Capital Cost: 70,000,000 PKR (approx. 63 Million JP Yen)

Table 51: Estimated Project Capital Cost to be Borne by the Government of Pakistan/PMD

No.	Items	Capital Cost (PKR)
1	To pay bank charge (commission) for the issuance of the Authorization to Pay (A/P) and amendments of A/P, if required, for the Consultant and the Contractor.	11,000,000
2	To undertake incidental outdoor works such as gardening/landscaping and exterior lighting in and around the proposed Project Site.	1,500,000
3	To relocate the existing power cables and meteorological observation field in the proposed Radar Observation Station (PMD Meteorological Observatory, Rohri-Sukkur).	1,500,000
4	To provide telephone lines for the Radar Tower Building in the proposed Radar Observation Station (PMD Meteorological Observatory, Rohri-Sukkur).	500,000
5	To provide the commercial power (400V, 3-phase, 4-wire, 50Hz) supply (capacity: no less than 200kVA) along with electric poles/wires, etc. from the main supply line to the proposed Radar Observation Station (PMD Meteorological Observatory, Rohri-Sukkur) for the Radar Tower Building and other facilities to be constructed by the PMD prior to the commencement of construction work.	3,500,000
6	To install the required step-down transformer (capacity: no less than 200kVA) as well as service entrance connections for the commercial power supply at the proposed Radar Observation Station (PMD Meteorological Observatory, Rohri-Sukkur) for the Radar Tower Building (400V, 3-phase, 4-wire, 50Hz) prior to the commencement of construction work.	2,500,000
7	To promptly provide reliable and high-speed Internet environment at the Sukkur Meteorological Radar Observation Station (PMD Meteorological Observatory, Rohri-Sukkur), National Weather Forecasting Center, PMD Islamabad Head Office and other Project Sites (with each corresponding global/fix IP) for the establishment of a Virtual Private Network.	1,000,000
8	To assign appropriate number of trainees and shoulder their dispatching cost to the training sites, such as daily allowance, transportation fee, accommodation, if any.	1,000,000
9	To shoulder the miscellaneous expenditures such as library books, petrol, telephone, application fee (obtaining the required frequencies for the meteorological radar system and the construction permissions of a new Radar Tower Building).	1,000,000
10	To demolish the exiting Rohri-Sukkur observatory building	1,500,000
11	To construct category III house, bachelor hostels.	45,000,000
Total		70,000,000

Applied Exchange Rate: US\$ 1 = 110.90 JP Yen, 1 PKR= 0.9044 JP Yen

2-6-2 Estimate of the Project Annual Recurrent Cost (Operation & Maintenance Cost)

(1) Project Annual Recurrent Cost to be borne by the Government of Pakistan (PMD)

The estimated annual recurrent costs for all the systems procured under the Project to be borne by the PMD after the completion of the Project are attached hereunder. The recurrent costs have been calculated in accordance with the following fundamental conditions.

- Operation and maintenance to be carried out by the PMD
- Appropriate operation in accordance with the operations manuals
- Regular and proper maintenance according to the maintenance manuals

Estimated Project Annual Recurrent Cost: 17,050,000 PKR (approx. 15 Million JP Yen)

Table 52: Estimated Project Annual Recurrent Cost to be Borne by the Government of Pakistan (PMD) after Completion of the Project

No.	Description	Recurrent Cost (PKR)
1	Electricity Charges	3,000,000
2	Salary of 17 personnel	8,000,000
3	Telephone, Fax, Leased Lines, Internet Connections	2,000,000
4	Spare Parts, Consumables and Special Maintenance of the Systems	2,000,000
5	Consumables, Stationary, etc.	300,000
6	Books & Journals	50,000
7	Contingencies	200,000
8	P.O.L. Charges (for engine generators, vehicles, etc.)	1,500,000
	Total	17,050,000

As a general guidance, the renewal or expected upgrade/modernization of the meteorological radar system installed under the Project is projected to be from 15 to 20 years (estimated life-span of the equipment) after completion of the Project if adequate and proper operation and maintenance is implemented by the PMD.

(2) Annual Budget Trends

In order to secure the estimated recurrent cost of the Project, the PC-I Form (Detail of the Project) must be approved by the Executive Committee of the National Economic Council (ECNEC). If the PC-IV Form (Completion of the Project) is approved right after the completion of the Project, the budget necessary for the operation and maintenance of the system will be secured without much difficulty. The Pakistan side has a plan to obtain the approval of the PC-I Form before the conclusion of the Exchange of Notes. In addition, the Secretary Aviation Division, Cabinet Secretariat, as the supervising ministry of the PMD, and the Economic Affairs Division (EAD), acting as a liaison with aid agencies, have committed to the Preparatory Survey Team to allocate the required budget for the Project. Therefore, it has been assessed that there is no problem in this regard. The following table indicates the movement of the PMD budget.

Table 53: Movement of the PMD Annual Budget

Fiscal Year	Budget (In Thousand PKR)	Comparison with the previous year (%)
2009-10	417,880	-
2010-11	451,327	108.0
2011-12	578,825	128.2
2012-13	680,347	117.5
2013-14	797,220	117.2
2014-15	874,369	109.7
2015-16	969,000	110.8
2016-17	1,027,937	106.1
2017-18	1,079,287	105.0
2018-19	1,235,000	114.4
2019-20 (Prospective)	1,521,999	123.2

Budget for Public Sector Development Programme is not included

Chapter 3

Project Evaluation

Chapter 3 Project Evaluation

3-1 Preconditions

Arrangement for tax exemption by the Pakistani side for the following items will be required as considered in the Project cost estimation.

The import tax exemption arrangement by the PMD will be required for all the equipment related to the S-Band Pulse Compression Solid State Dual Polarization (Polarimetric) Meteorological Doppler Radar System, Meteorological Radar Central Processing System and Meteorological Radar Data Display Systems since they are all planned to be wholly procured in Japan.

Due to difficulty of local procurement of some building construction materials of the Sukkur Meteorological Radar Tower Building, the Obstruction light (LED), Isolation Transformer and Commercial Power Voltage Controller are planned to be imported from Japan in order to fully satisfy the required quality. Hence, the import tax exemption is likewise required to be arranged by the PMD. On the other hand, all the other building construction materials are intended to be procured locally, therefore the general sales tax (GST) exemption procedure will be required.

Described below are the relevant information to the aforementioned import tax and general sales tax (GST) exemption procedures.

<Import and Duty Exemption Procedures>

For the import of the equipment from overseas, the two-stage procedures indicated in the table below are required. For the acquisition of the Tax Exemption Certificate for the Imported Goods, approximately one month is required at earliest it after the submission of the required documents to the Federal Board of Revenue (FBR). It is important that the required procedures must be commenced as soon as possible.

Table 54: Required Procedures for Tax Exemption and Customs Clearance

Required Procedures	Office Concerned	Submission Time	Required Period	Required Documents to be submitted by Pakistan Meteorological Department (PMD)	Applicant
Tax Exemption Certificate for the Imported Goods	Federal Board of Revenue (FBR)	Immediately after the signing of the Exchange of Notes	1 month	Exchange of Notes: 1 photocopy	PMD
Custom Clearance	Custom Office	Immediately after a shipment's arrival at a port	10 days	Shipping Documents <ul style="list-style-type: none"> • Shipping Invoice: 1 original • Bill of Lading: 1 original • Packing List: 1 original • Tax Exemption Certificate issued by FBR: 1 photocopy 	

<Required Procedures for the Project Implementation>

The other procedures required for the project implementation in Pakistan are as follows.

Table 55: Details of the Procedures Required for the Project Implementation

Required Procedures	Office Concerned	Approximate Period Required	Required Documents to be submitted to the Aviation Division, Cabinet Secretariat by the Pakistan Meteorological Department (PMD)	Applicant
Application for Commercial Power Supply and Step-down Transformer Installation for the Radar Tower Building to be constructed	Sukkur Electric Power Company (SEPCO)	2 months	<ul style="list-style-type: none"> Application Form: 1 set Site Location Map: 1 set Allotment Letter: 1 set 	PMD
Frequency Permit for the Meteorological Radar System	Frequency Allocation Board (FAB)	6 months	<ul style="list-style-type: none"> Application Form: 14 sets Letter of Intent: 14 sets Detailed Technical Literature of the Equipment: 14 sets Antenna Pattern: 14 sets Spectrum Chart for Transmitter: 14 sets Network Diagram/Site Plan: 14 sets 	
Building Construction Permit	Sindh Building Control Authority, Regional Office, Sukkur	2 months	Application Form with the following drawings and documents <ul style="list-style-type: none"> Architectural Drawings: 3 sets Structural Drawings: 3 sets Electrical Drawings: 3 sets Air-conditioning & Ventilation Drawings: 3 sets Plumbing Drawings: 3 sets Structural Calculation Sheet: 3 sets Copy of Non-Objection Certificates (NOC) to be issued by the Civil Aviation Authority (CAA): 3 sets Copy of Non-Objection Certificates (NOC) to be issued by the Pakistan Air Force (PAF): 3 sets 	
Building Height Clearance	Civil Aviation Authority (CAA) Karachi Headquarters	2 months	<ul style="list-style-type: none"> Application Form: 1 set Site Location Map: 1 set WGS84 Coordinate Map to be issued by the Geological Survey of Pakistan: 1 set 	

<General Sales Tax (GST)>

The General Sales Tax (GST) imposed on the materials and equipment to be purchased locally by the main contractor under this Project will be exempted in accordance with the GST exemption procedures as presented in the following figure and as advised by the Economic Affairs Division (EAD) of the Ministry of Economic Affairs and Statistics. The required period for the GST exemption procedures is about one month. In addition, it is essential that the addresses in all the receipts must be the main contractor to be tax exempted.

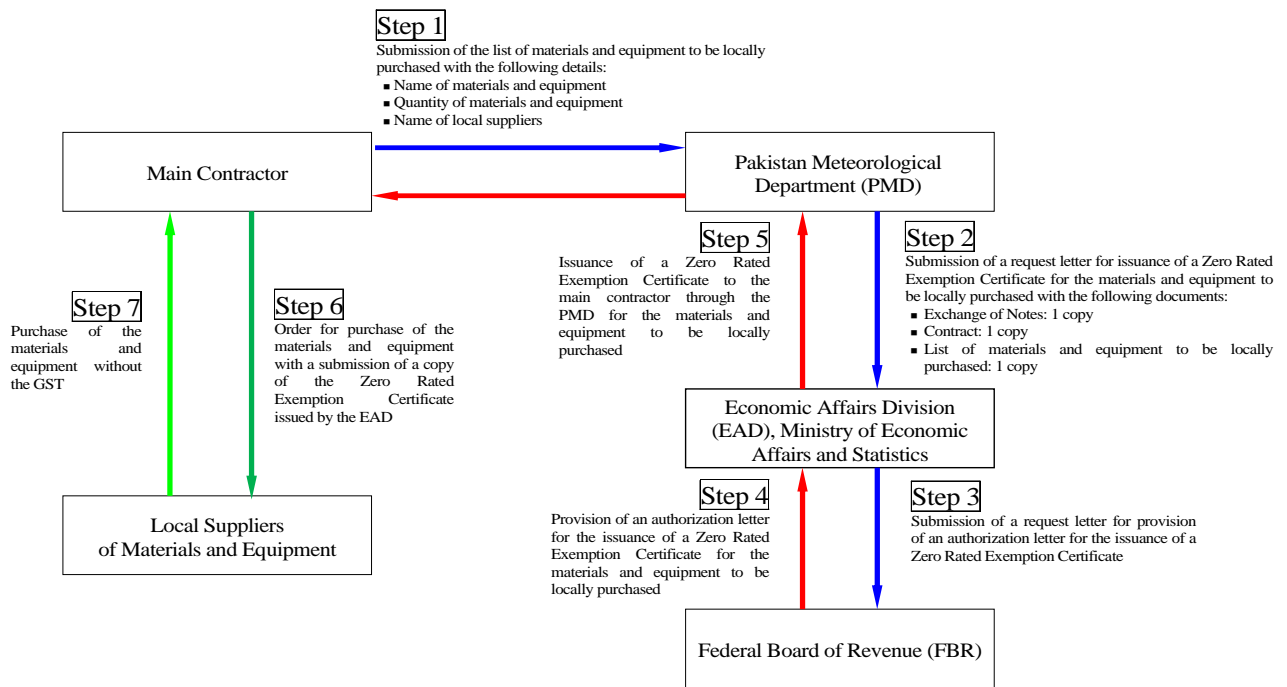


Figure 36: GST Exemption Procedures for Materials and Equipment to Be Purchased Locally

The General Sales Tax will not be exempted for the procurement of reinforcing bars and air conditioners, even if the main contractor submits a copy of the Zero-Rated Exemption Certificate. Therefore, in order to claim a refund for such General Sales Tax which the main contractor paid, it is indispensable to apply for a refund with the Federal Board of Revenue (FBR). It usually takes more than a year to execute a refund to the main contractor. In addition, it has to be noted that materials and equipment purchased by subcontractor(s) shall not be exempted.

3-2 Necessary Inputs by Recipient Country

In order to further enhance the benefits of this Project, the following recommendations are strongly encouraged and should be implemented accordingly.

1) Manpower Development

- a) Continuous recruitment of human resources for the next generation; and,
- b) Development of more qualified technical personnel through training and other related manpower development programs.

2) Natural Disaster Prevention and Management

- a) Making announcements in duplicate from multiple routes to ensure the dissemination of warnings and other information to the general public; and,

- b) Continuing educational activities for the general public in coordination with various related disaster management agencies and the mass media for a more effective natural disaster prevention and management strategy.
- 3) Longer Life Span of the Equipment procured and the Radar Tower Buildings constructed under the Project
 - a) Regularly secure the necessary budget for the efficient operation and maintenance of the systems and building equipment and procure requisite spare parts and consumables for all the equipment to be supplied under the Project;
 - b) Ensure the protection of the buildings, equipment and facilities against theft and vandalism; and,
 - c) Regularly paint and caulk the caulking grooves of the Radar Tower Buildings.

3-3 Important Assumptions

- 1) No change in global warming countermeasures, natural disaster countermeasures and meteorological service policies as determined by the government of Pakistan.
- 2) Maintenance of a cooperative structure among the mass media (TV, radio, newspaper), the Prime Minister's Office, the National/State/Provincial Disaster Management Authority, the Federal Flood Commission, Ministry of Water & Power, Provincial Information and Public Works Department, other government-affiliated organizations, Pakistan Red Crescent Society, etc.
- 3) Continuance of service by a PMD staff who has received the soft component training or on-site training related to the Project.

3-4 Project Evaluation

3-4-1 Relevance

- 1) Development Plan of Pakistan

The enhancement and modernization of the meteorological services in Pakistan are urgent issues to alleviate the negative impact of severe weather and to ensure the people's safety as well as to significantly contribute to the sustainable development of the country. From the viewpoint of the PMD, in order to contribute to the achievement of the government goals indicated in "Vision 2025", which is the long-term national development policy of Pakistan, and the National Disaster Management Plan (NDMP), the Ten Year Development Plan of the PMD (a step towards modernization) has been formulated in 2016 by the PMD.

“Vision 2025” is a national development policy for the whole country published in August 2014 by the Ministry of Planning, Development & Reform. “Vision 2025” declares that Pakistan will enter the upper middle income country group by 2025 and sets numerical targets of 25. The numerical targets include increasing the per capita national income from US\$1,299 to US\$ 4,200 and reducing the population's poverty ratio from the current 49% to 20%. In addition, the declaration statement in “Vision 2025” that it will become one of the world’s top ten economic nations by total GDP by 2047, when it celebrates the 100th anniversary of independence of the country, is included as a long-term goal.

The National Disaster Management Plan (NDMP) is a guideline for strengthening and modernizing the disaster-prevention sector in Pakistan and is one of the major achievements in support of disaster management measures of Pakistan by the Government of Japan. The NDMP is also a base of support by donor organizations in the area of disaster prevention.

In the document, "Reducing Vulnerability and Exposure to Disasters," published by the United Nations ESCAP/UNISDR, the disasters that occurred every year between 2004 and 2010 have pushed down Pakistan’s GDP by US\$ 20 billion compared with no disasters in 2011. In view of such reports, the significance of promoting disaster reduction is considered to be very high for the sustainable development of the country.

Since the modernization of a meteorological radar observation network in Pakistan is mentioned in the first chapter (Chapter 1) of the Ten Year Development Plan of the PMD as one of the top priority implementation items, this Project agrees with the national development plan and disaster prevention plan, and in the first five years of the National Flood Protection Plan IV (Ten Year Plan) approved by the Government of Pakistan in May 2017, the upgrade and expansion of the PMD’s existing meteorological radar observation network and the flood forecasting & warnings are indicated. Based on the above, this project is consistent with the national development plan and disaster prevention plan of the country.

2) Aid Policy of Japan

Japan and Pakistan have long since developed congenial bilateral relations and have commemorated the sixtieth anniversary of the establishment of diplomatic ties between the two countries in 2012. Japan’s major aid policy for Pakistan issued on February 2018 is the “building of a stable and sustainable society through middle class expansion.” In addition to supporting the self-sustaining growth of Pakistan through development cooperation, Japan intends to make good use of Japan’s strengths, including high technological capabilities, to further develop favorable bilateral relations. Furthermore, the aim of development cooperation is to promote peace and stability and economic development in Pakistan and in the region. The Government of Japan focuses on the following three priority areas for the realization of the aid policy indicated above.

1. Development of an economic foundation
2. Ensuring human security and improvement of social foundation

3. Establishment of peace and stability

Under the second priority area, the provision of aid for the “strengthening of disaster prevention capability against frequent natural disasters” is stated as one of Japan’s important roles. Since both Pakistan and Japan are frequent victims to natural disasters, the Sendai Framework for Disaster Risk Reduction 2015-2030 adopted at the Third UN World Conference on Disaster Risk Reduction in view of climate change risk supports the strengthening of disaster prevention systems centered on disaster prevention (preparedness) and disaster mitigation that utilize Japan’s knowledge and technology and aims at building a strong society that is not inferior to disasters. It is truly significant to strengthen the meteorological monitoring system of Pakistan and improve disaster prevention capabilities nationwide through the Grant Aid from Japan as it is consistent with Japanese priorities in terms of international cooperation.

3) Utilization of Meteorological Radar Observation Data

The flood forecasting system of the PMD Flood Forecasting Division at Lahore currently collects satellite rainfall data and other global data, such as actual rainfall, forecasting rainfall topography, elevation and land use, which are provided by various organizations to cover lack of temporal and spatial data. Based on these data as inputs, rainfall runoff and inundation calculation are implemented for the Indus River and its tributaries. Under these circumstances, the PMD aims to improve the accuracy of its flood forecast & warning by expanding their observation data of ground stations and meteorological radars as input data. Therefore, the establishment of a nationwide meteorological radar network is the top priority and highly expected as an essential factor to improve forecast & warning accuracy.

According to the National Flood Protection Plan-IV (2017-2026), there are still blind areas in rainfall observation in spite of advancing new observatory installation. More accurate flood forecast & warning would increase the lead time for evacuation or preparation in response to any incoming flooding. Therefore, the establishment of a meteorological radar network is recognized as a vital factor to quantitatively detect heavy rain and torrential rain over the entire basin.

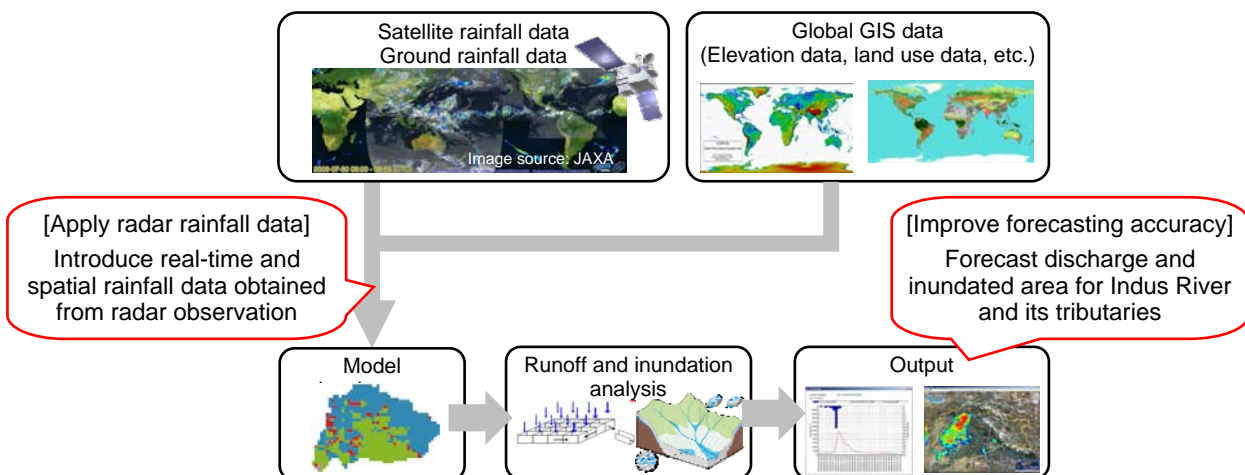


Figure 37: Outline of Flood Forecasting System of PMD

Image source: ICHARM

Some urban rivers in Pakistan have standard operation procedures in terms of early warning to flash flood. In case an excess in actual rainfall of 50mm/3hrs is observed as the criteria for early warning pre-alert is issued. Applying real-time and spatial rainfall data obtained from meteorological radar observation, very short-term forecasting for the next 3 hours or more will be enabled to issue timely early warning to the region where there is an anticipated occurrence of a flash flood. This would be an enabler for various groups to prepare and implement measures to protect human life and properties of residents and administrative organization.

4) Expected improvements following the implementation of the Project

It will be expected that the following points related to the management of flood caused by heavy rain and torrential rain in Pakistan will improve:

1. Timely issuance of forecasting and early warning to the hilly area responding to the flash flood;
2. Timely issuance of forecasting and early warning to urban flooding;
3. The accuracy of flood forecasting system for the Indus River and its tributaries by providing spatial rainfall data with higher resolution; and,
4. The accuracy of inflow discharge to the Indus River in the downstream basin.

These improvements will have a great effect on ensuring the appropriate lead time for coming floods. It would lead to secure valuable time for residents, administration and private companies, to evacuate from dangerous areas, to develop protection measures and to move materials and machineries respectively.

Therefore, the installation of the Sukkur radar is essentially effective and valuable.

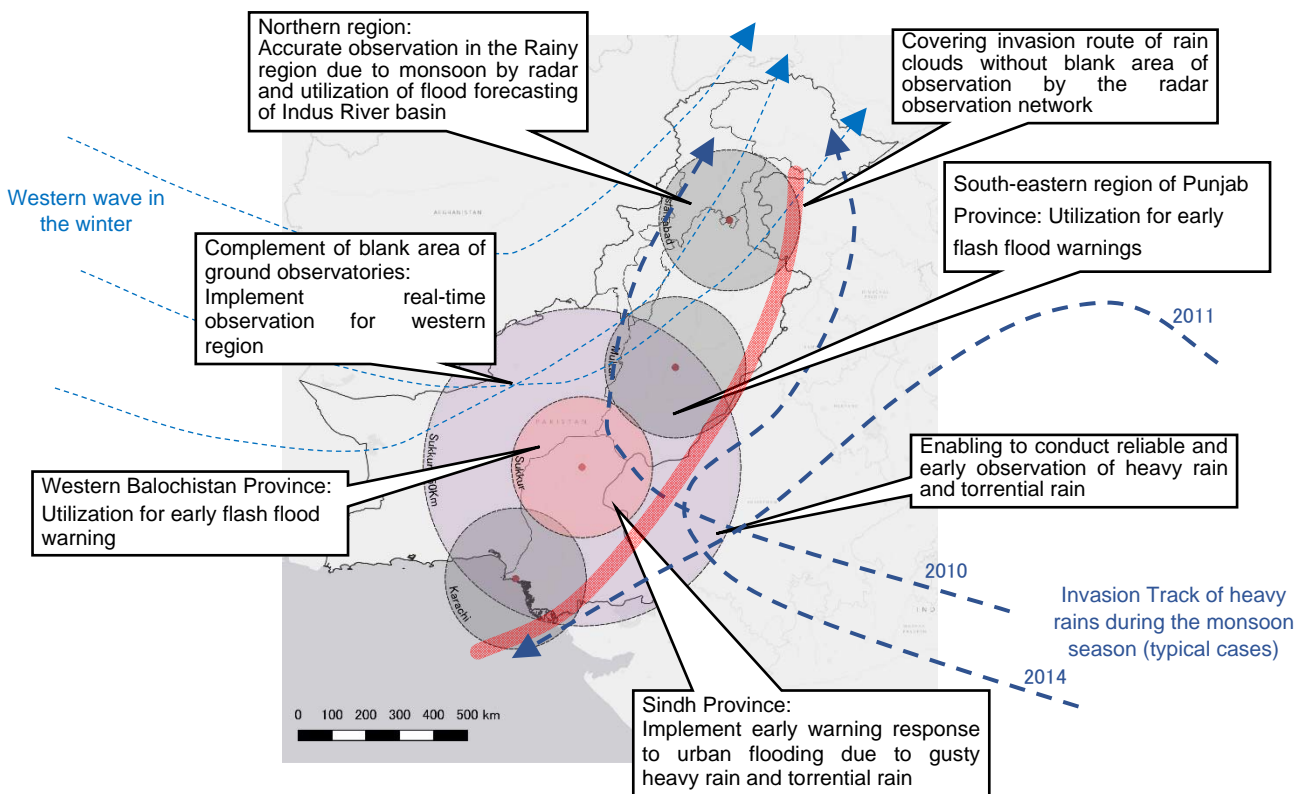


Figure 38: Importance of Sukkur Radar

3-4-2 Effectiveness

1) Quantitative indicators

Table 56: Achievement Indicators

Indicators	Present (Baseline in 2020)	Target (2026) (3 years after the Project Completion)
Improvement in the observation density of meteorological information (rainfall, wind direction & speed) provided to organizations related to Disaster Risk Reduction (DRR)	Spatial resolution of the latest 45 automatic observation systems in Punjab and Sindh Provinces: 88km mesh on average	<ul style="list-style-type: none"> • Spatial resolution for precipitation data calibrated with Synoptic Meteorological Observation data within the maximum radar detection range between 450km: approx. 1km mesh. • Spatial resolution for wind speed & direction data calibrated with Synoptic Meteorological Observation data within the maximum radar detection range within 200km: approx. 1km mesh.
Improvement in the temporal observation ability of meteorological information (rainfall, wind direction & speed) provided to organizations related to Disaster Risk Reduction (DRR)	Time interval of meteorological information (rainfall, wind direction & speed) obtained in the area <ul style="list-style-type: none"> • Meteorological Satellite: 30-minute. • Synoptic Meteorological Observation: 1 hour. 	Time intervals of radar observation data calibrated with Synoptic Meteorological Observation data: 10-minute.

2) Qualitative indicators

- a) To enable DRR-related organizations (NDMA and its allied DRR authorities in provinces and districts) and mass-media to timely response and commence necessary countermeasures against disasters in order to reduce the number of potential disaster victims.
- b) To ensure aviation safety connecting to contribute to the improvement of social infrastructures through the provision of timely and accurate information to the international airports in Pakistan.
- c) To promote the implementation of DRR measures in order to reduce economic losses, through the provision of accurate weather information to users engaged in industries such as transportation, tourism and agriculture.

Since the improvement of PMD’s capacity is expected to directly contribute to the reduction of human and economic losses due to natural disasters based on a careful and comprehensive evaluation of the project effects, this Project will greatly contribute to the reduction of the adverse effects of natural disasters and effectively protect the people of Pakistan. In conclusion, the implementation of the Project is considered to be an appropriate, suitable, viable and worthwhile endeavor.

Appendices

Appendix 1. Member List of the Study Team

(1) Preparatory Survey (1) Team

Mr. Kunio AKATSU	Team Leader	Senior Advisor (Meteorology), Japan International Cooperation Agency (JICA)
Mr. Wataru ONO	Project Planning	Deputy Director, Disaster Risk Reduction Team 1, Disaster Risk Reduction Group, Global Environment Department, Japan International Cooperation Agency (JICA)
Mr. Masahito ISHIHARA	Technical Advisor for Meteorological Radar	Japan Meteorological Agency (Retired)
Mr. Yoshihisa UCHIDA	Chief Consultant/Meteorological Radar Planning/Operation & Maintenance	International Meteorological Consultant Inc. (IMC)
Mr. Takeshi MATSUMURA	Deputy Chief Consultant/Procurement Planning/Cost Estimation	International Meteorological Consultant Inc. (IMC)
Mr. Toshihide ENDO	Data Communication/Equipment Planning	International Meteorological Consultant Inc. (IMC)
Mr. Kenji MORI	Meteorological Radar Facility Planning/Natural Conditions Survey (Construction)	International Meteorological Consultant Inc. (IMC)
Mr. Yasushi INOUE	Project Implementation Planning/Natural Conditions Survey (Meteorology/Hydrology)	International Meteorological Consultant Inc. (IMC)

(2) Preparatory Survey (2) Team

Mr. Kunio AKATSU	Team Leader	Senior Advisor (Meteorology), Japan International Cooperation Agency (JICA)
Mr. Wataru ONO	Project Planning	Deputy Director, Disaster Risk Reduction Team 1, Disaster Risk Reduction Group, Global Environment Department, Japan International Cooperation Agency (JICA)
Mr. Yoshihisa UCHIDA	Chief Consultant/Meteorological Radar Planning/Operation & Maintenance	International Meteorological Consultant Inc. (IMC)
Mr. Takeshi MATSUMURA	Deputy Chief Consultant/Procurement Planning/Cost Estimation	International Meteorological Consultant Inc. (IMC)

Appendix 2. Study Schedule

Preparatory Survey 1

Schedule	Governmental Member			Consultant Member				
	Mr. Kumio AKATSU Team Leader (Meteorology Cooperation)	Mr. Wataru ONO Project Planning	Mr. Masahito ISHIHARA Technical Advisor (Meteorological Radar)	Mr. Yoshihisa UCHIDA Chief Consultant/Meteorological Radar Planning/Operation & Maintenance	Mr. Takeshi MATSUMURA Deputy Chief Consultant/Procurement Planning/Cost Estimation	Mr. Toshihide ENDO Data Communication/Equipment Planning	Mr. Kenji MORI Meteorological Radar Facility Planning/Natural Conditions Survey (Construction)	Mr. Yasushi INOUE Project Implementation Planning/Natural Conditions Survey (Meteorology/Hydrology)
1	11 Jun	Tue			Tokyo → Karachi Discussion with the Local Contractor for Topographic and Geotechnical Survey		Tokyo → Karachi Discussion with the Local Contractor for Topographic and Geotechnical Survey	
2	12 Jun	Wed			Discussion with PMD Karachi, Arrangement for Inland Transport for the existing UPS to PMD Meteorological Observatory, Rohri-Sukkur Study for Unit Price of Construction Materials		Discussion with PMD Karachi, Discussion with the Local Contractor for Topographic and Geotechnical Survey, Study for Unit Price of Construction Materials	
3	13 Jun	Thu		Tokyo → Islamabad	Discussion with PMD Karachi, Data Collection, Quantity Survey, Study for Unit Price of Construction Materials	Tokyo → Islamabad	Discussion with PMD Karachi, Data Collection, Quantity Survey, Study for Unit Price of Construction Materials	
4	14 Jun	Fri		Discussion with PMD Islamabad Headquarters	Karachi → Islamabad Discussion with PMD Islamabad Headquarters	Discussion with PMD Islamabad Headquarters	Karachi → Islamabad Discussion with PMD Islamabad Headquarters	
5	15 Jun	Sat		Data Collection, Internal Meeting	Data Collection, Internal Meeting	Data Collection, Internal Meeting	Data Collection, Internal Meeting	
6	16 Jun	Sun		→ Islamabad	Data Collection, Internal Meeting	Data Collection, Internal Meeting	Data Collection, Internal Meeting	Tokyo → Islamabad
7	17 Jun	Mon	Discussion with JICA Pakistan Office, Courtesy call on PMD Islamabad Headquarters, Aviation Division, National Disaster Management Authority (NDMA), Economic Affairs Division (EAD), Courtesy call on Federal Flood Commission (FFC), Embassy of Japan (EOJ)	→ Islamabad	Discussion with JICA Pakistan Office, Courtesy call on PMD Islamabad Headquarters, Aviation Division, National Disaster Management Authority (NDMA), Economic Affairs Division (EAD), Courtesy call on Federal Flood Commission (FFC), Embassy of Japan (EOJ)		Site Survey at PMD Islamabad Headquarters Data Collection, Internal Meeting	Discussion with PMD Islamabad Headquarters, Data Collection
8	18 Jun	Tue	Discussion with PMD Islamabad Headquarters, Confirmation of Minutes of Discussions Islamabad → Sukkur		Discussion with PMD Islamabad Headquarters, Confirmation of Minutes of Discussions Islamabad → Sukkur			Discussion with PMD Islamabad Headquarters, Data Collection
9	19 Jun	Wed	Site Survey at Proposed Sukkur Meteorological Radar Station (PMD Meteorological Observatory, Rohri-Sukkur, Sindh) and PMD Meteorological Office in Sukkur Airport Discussion with Regional Police Office, Sukkur Sukkur → Islamabad		Site Survey at Proposed Sukkur Meteorological Radar Station (PMD Meteorological Observatory, Rohri-Sukkur, Sindh) and PMD Meteorological Office in Sukkur Airport Discussion with Regional Police Office, Sukkur Sukkur → Islamabad			Discussion with PMD Islamabad Headquarters, Data Collection
10	20 Jun	Thu	Discussion with PMD Islamabad Headquarters, Finalization of Minutes of Discussions		Discussion with PMD Islamabad Headquarters, Finalization of Minutes of Discussions			Discussion with PMD Islamabad Headquarters, Data Collection
11	21 Jun	Fri	Signing on Minutes of Discussions, Report to JICA Pakistan Office, Report to Embassy of Japan		Signing on Minutes of Discussions, Report to JICA Pakistan Office, Report to Embassy of Japan			Discussion with PMD Islamabad Headquarters, Data Collection
12	22 Jun	Sat	Islamabad → Tokyo	Data Collection, Internal Meeting	Data Collection, Internal Meeting	Data Collection, Internal Meeting	Data Collection, Internal Meeting	Data Collection, Internal Meeting
13	23 Jun	Sun		Data Collection, Internal Meeting	Data Collection, Internal Meeting	Data Collection, Internal Meeting	Data Collection, Internal Meeting	Data Collection, Internal Meeting
14	24 Jun	Mon		Discussion with PMD Islamabad Headquarters Data Collection from Internet Service Provider	Discussion with PMD Islamabad Headquarters Data Collection from Internet Service Provider	Discussion with PMD Islamabad Headquarters Islamabad → Lahore	Site Survey at PMD Islamabad Headquarters Data Collection	Discussion with PMD Islamabad Headquarters Islamabad → Lahore
15	25 Jun	Tue		Survey at PMD Islamabad Headquarters Data Collection	Discussion with PMD Islamabad Headquarters Islamabad → Sukkur	Discussion with PMD Lahore Data Collection	Discussion with PMD Islamabad Headquarters Islamabad → Sukkur	Discussion with PMD Lahore Data Collection
16	26 Jun	Wed		Survey at PMD Islamabad Headquarters Data Collection	Site Survey at Proposed Sukkur Meteorological Radar Station Discussion with Sindh Building Control Authority, Sukkur Electrical Power Company (SEPCO) and Municipal Committee Rohri	Discussion with PMD Lahore Data Collection	Site Survey at Proposed Sukkur Meteorological Radar Station Discussion with Sindh Building Control Authority, Sukkur Electrical Power Company (SEPCO) and Municipal Committee Rohri	Discussion with PMD Lahore Data Collection
17	27 Jun	Thu		Survey at PMD Islamabad Headquarters Data Collection	Site Survey at Proposed Sukkur Meteorological Radar Station Data Collection, Quantity Survey, Study for Unit Price of Construction Materials	Discussion with PMD Lahore Data Collection	Site Survey at Proposed Sukkur Meteorological Radar Station Data Collection, Quantity Survey, Study for Unit Price of Construction Materials	Discussion with PMD Lahore Data Collection
18	28 Jun	Fri		Survey at PMD Islamabad Headquarters Data Collection	Site Survey at Proposed Sukkur Meteorological Radar Station Data Collection Sukkur → Islamabad	Discussion with PMD Lahore Data Collection Lahore → Islamabad	Site Survey at Proposed Sukkur Meteorological Radar Station Data Collection Sukkur → Islamabad	Discussion with PMD Lahore Data Collection Lahore → Islamabad
19	29 Jun	Sat		Data Collection, Internal Meeting	Data Collection, Internal Meeting	Data Collection, Internal Meeting	Data Collection, Internal Meeting	Data Collection, Internal Meeting
20	30 Jun	Sun		Data Collection, Internal Meeting	Data Collection, Internal Meeting	Data Collection, Internal Meeting	Data Collection, Internal Meeting	Data Collection, Internal Meeting
21	1 Jul	Mon		Discussion with PMD Islamabad Headquarters	Islamabad → Karachi Discussion with PMD Karachi	Site Survey at PMD Islamabad Headquarters Data Collection	Islamabad → Karachi Discussion with PMD Karachi	Site Survey at PMD Islamabad Headquarters Data Collection
22	2 Jul	Tue		Islamabad → Karachi Discussion with Environmental Protection Agency (EPA), Sindh Province	Discussion with Central Police Office of Sindh Province Discussion with Environmental Protection Agency (EPA), Sindh Province	Discussion with PMD Islamabad Headquarters, Data Collection	Discussion with Central Police Office of Sindh Province Discussion with Environmental Protection Agency (EPA), Sindh Province	Discussion with PMD Islamabad Headquarters, Data Collection
23	3 Jul	Wed		Discussion with PMD and JICA Karachi Security Officer Discussion with PMD Karachi	Discussion with PMD and JICA Karachi Security Officer Discussion with PMD Karachi	Discussion with PMD Islamabad Headquarters, Data Collection	Discussion with PMD and JICA Karachi Security Officer Discussion with PMD Karachi	Discussion with PMD Islamabad Headquarters, Data Collection
24	4 Jul	Thu		Discussion with PMD Karachi Karachi → Islamabad	Discussion with PMD Karachi Karachi → Islamabad	Discussion with PMD Islamabad Headquarters, Data Collection	Discussion with PMD Karachi Karachi → Islamabad	Discussion with PMD Islamabad Headquarters Data Collection
25	5 Jul	Fri		Discussion with PMD Islamabad Headquarters Data Collection	Data Collection, Quantity Survey, Study for Unit Price of Construction Materials	Discussion with PMD Islamabad Headquarters, Data Collection	Data Collection, Quantity Survey, Study for Unit Price of Construction Materials	Discussion with PMD Islamabad Headquarters Data Collection
26	6 Jul	Sat		Data Collection, Internal Meeting	Data Collection, Internal Meeting	Data Collection, Internal Meeting	Data Collection, Internal Meeting	Data Collection, Internal Meeting
27	7 Jul	Sun		Data Collection, Internal Meeting	Data Collection, Internal Meeting	Data Collection, Internal Meeting	Data Collection, Internal Meeting	Data Collection, Internal Meeting Islamabad →
28	8 Jul	Mon		Survey at PMD Islamabad Headquarters Data Collection	Site Survey at PMD Islamabad Headquarters Data Collection	Site Survey at PMD Islamabad Headquarters Data Collection	Site Survey at PMD Islamabad Headquarters Data Collection	→ Tokyo
29	9 Jul	Tue		Discussion with PMD Islamabad Headquarters Data Collection	Site Survey at PMD Islamabad Headquarters Data Collection	Site Survey at PMD Islamabad Headquarters Data Collection	Data Collection, Quantity Survey, Study for Unit Price of Construction Materials	
30	10 Jul	Wed		Discussion with PMD Islamabad Headquarters Data Collection	Discussion with PMD Islamabad Headquarters Data Collection	Discussion with PMD Islamabad Headquarters Data Collection	Data Collection, Quantity Survey, Study for Unit Price of Construction Materials	
31	11 Jul	Thu		Discussion with PMD Islamabad Headquarters Data Collection	Discussion with PMD Islamabad Headquarters Data Collection	Discussion with PMD Islamabad Headquarters Data Collection	Discussion with PMD Islamabad Headquarters Data Collection Islamabad → Sukkur	
32	12 Jul	Fri		Discussion with PMD Islamabad Headquarters Report to JICA Pakistan Office	Discussion with PMD Islamabad Headquarters Report to JICA Pakistan Office	Discussion with PMD Islamabad Headquarters Report to JICA Pakistan Office	Topographic and Geotechnical Survey Follow-up at Proposed Sukkur Meteorological Radar Station Sukkur → Islamabad	
33	13 Jul	Sat		Data Collection, Internal Meeting	Data Collection, Internal Meeting	Data Collection, Internal Meeting	Data Collection, Internal Meeting	
34	14 Jul	Sun		Data Collection, Internal Meeting Islamabad →	Data Collection, Internal Meeting Islamabad →	Data Collection, Internal Meeting Islamabad →	Data Collection, Internal Meeting Islamabad → Karachi	
35	15 Jul	Mon		→ Tokyo	→ Tokyo	→ Tokyo	Discussion with PMD Karachi	
36	16 Jul	Tue					Discussion with PMD Karachi Karachi →	
37	17 Jul	Wed					→ Tokyo	

Preparatory Survey 2

Schedule 2020			Governmental Member		Consultant Member	
			Mr. Kunio AKATSU	Mr. Wataru ONO	Mr. Yoshihisa UCHIDA	Mr. Takeshi MATSUMURA
			Team Leader (Meteorology Cooperation)	Project Planning	Chief Consultant/Meteorological Radar Planning/Operation & Maintenance	Deputy Chief Consultant/Procurement Planning/Cost Estimation
1	20 Jan	Mon			Tokyo → Islamabad	
2	21 Jan	Tue			Discussion with PMD Islamabad, Explanation of Draft Final Report, Data Collection	
3	22 Jan	Wed			Discussion with PMD Islamabad, Explanation of Draft Final Report, Data Collection	
4	23 Jan	Thu			Discussion with PMD Islamabad, Explanation of Draft Final Report, Data Collection	
5	24 Jan	Fri			Discussion with PMD Islamabad, Explanation of Draft Final Report, Data Collection	
6	25 Jan	Sat			Data Collection, Internal Meeting	
7	26 Jan	Sun			Data Collection, Internal Meeting	
8	27 Jan	Mon	Tokyo → Islamabad	Tokyo → Islamabad	Discussion with PMD Islamabad, Explanation of Draft Final Report, Data Collection	Tokyo → Islamabad
9	28 Jan	Tue	Discussion with PMD Islamabad on Minutes of Discussions	Discussion with PMD Islamabad on Minutes of Discussions	Discussion with PMD Islamabad on Minutes of Discussions	Discussion with PMD Islamabad on Minutes of Discussions
10	29 Jan	Wed	Finalization of Minutes of Discussions, Signing on Minutes of Discussions, Report to JICA Pakistan Office Islamabad →	Finalization of Minutes of Discussions, Signing on Minutes of Discussions, Report to JICA Pakistan Office Islamabad →	Finalization of Minutes of Discussions, Signing on Minutes of Discussions, Report to JICA Pakistan Office	Finalization of Minutes of Discussions, Signing on Minutes of Discussions, Report to JICA Pakistan Office
11	30 Jan	Thu	→ Tokyo	→ Tokyo	Discussion with PMD Islamabad, Data Collection, Support for Procedures of PMD in Pakistan	Discussion with PMD Islamabad, Data Collection, Support for Procedures of PMD in Pakistan, Quantity Survey
12	31 Jan	Fri			Discussion with PMD Islamabad, Data Collection, Support for Procedures of PMD in Pakistan	Discussion with PMD Islamabad, Data Collection, Support for Procedures of PMD in Pakistan, Quantity Survey
13	1 Feb	Sat			Data Collection, Internal Meeting	Data Collection, Internal Meeting
14	2 Feb	Sun			Data Collection, Internal Meeting	Data Collection, Internal Meeting
15	3 Feb	Mon			Discussion with PMD Islamabad, Data Collection, Support for Procedures of PMD in Pakistan, Report to JICA Pakistan Office	Discussion with PMD Islamabad, Data Collection, Support for Procedures of PMD in Pakistan, Report to JICA Pakistan Office
16	4 Feb	Tue			Discussion with PMD Islamabad, Data Collection, Support for Procedures of PMD in Pakistan	Discussion with PMD Islamabad, Data Collection, Support for Procedures of PMD in Pakistan
17	5 Feb	Wed			Data Collection, Internal Meeting Islamabad →	Data Collection, Internal Meeting Islamabad →
18	6 Feb	Thu			→ Tokyo	→ Tokyo

Meteorological Complex, Camp Office, Karachi

Mr. Sardar Sarafaraz	Chief Meteorologist
Mr. Abdul Qayoom Bhutto	Director (Forecasting)
Mr. Ameer Hider	Director (Tropical Cyclone Warning Center)
Mr. Shahid Abbas	Director (Regional Meteorological Center)
Mr. Asif Hussain	Programmer
Mr. Muhammad Kashif	Programmer

- **National Disaster Management Authority (NDMA)**

Mr. Muhammad Idrees Mahsud	Member
Mr. Raza Iqbal, TI(M)	Director
Mr. Abdul Latif	Assistant Director

- **Federal Flood Commission (FFC)**

Mr. Ahmed Kamal	Chief Engineering Advisor & Chairman
Mr. Ashhok Kumar	Senior Engineer
Mr. Yawar Rasheed	Assistant Engineer (Floods)

- **Sindh Central Police**

Dr. Syed Kaleem Imam	Inspector General of Police, Sindh
Mr. Nasir Aftab	Deputy Inspector General, Operation

- **Regional Police Sukkur**

Dr. Jamir Ahmed	Additional Inspector General of Police, Karachi, Sindh
Mr. Ifran Ali Samo	Senior Superintendent of Police, Sukkur

- **Sindh Building Control Authority**

Mr. Amir Kamal Jafri	Regional Director Sukkur
Mr. Roshan Ali	Assistant Director

- **Environmental Protection Agency, Government of Sindh**

Mr. Naeem Ahmed Mughal	Director General
Mr. Waqar Hussain Phulpoto	Additional Director General
Mr. Imran Sabir	Deputy Director (Technical)

- **Sukkur Electrical Power Company (SEPCO)**

Mr. Manzoor Hussain Soomro	Executive Engineer
Mr. Munawar Bhatti	Head Drafts Man

- **Sukkur IBA University**

Mr. Zahid Hussain Khand
Mr. Abdul Jabbar Soomro

Registrar
Project Director

- **Embassy of Japan in Pakistan**

Mr. Yuji Tokita
Mr. Taiji Tsuchiya

Counsellor
Primary Secretary

- **Japan International Cooperation Agency, Pakistan Office**

Mr. Shigeki Furuta
Mr. Yoshihisa Onoe
Ms. Ritsuko Hagiwara
Mr. M. Abrar Khan
Mr. Shoji Hasegawa
Mr. Lt Col (R) Qutaibah Saleem

Chief Representative, JICA Pakistan
Senior Representative, JICA Pakistan
Representative, JICA Pakistan
Programme Officer, JICA Pakistan
JICA Expert
JICA Security Advisor, Sindh

Appendix4-1. Minutes of Discussions

**Minutes of Discussions
on
the Preparatory Survey
for
the Project for the Installation of Weather Surveillance Radar at Sukkur
in
the Islamic Republic of Pakistan**

In response to the request from the Government of the Islamic Republic of Pakistan (hereinafter referred to as "Pakistan"), the Government of Japan decided to conduct a Preparatory Survey for the Project for the Installation of Weather Surveillance Radar at Sukkur (hereinafter referred to as "the Project"), and entrusted the Preparatory Survey to Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent the Preparatory Survey Team for the Outline Design (hereinafter referred to as "the Team") to Pakistan, headed by Mr. Kunio Akatsu, Senior Advisor of Disaster Risk Reduction Group, Global Environment Department, and is scheduled to stay in Pakistan from 10 June to 16 July, 2019.

The Team held a series of discussions with the officials concerned of the Government of Pakistan and conducted a field survey in the Project area. In the course of the discussions, both sides have confirmed the main items described in the attached sheets. The Team will proceed to further works and prepare the Preparatory Survey Report.

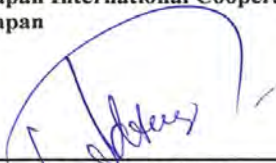
Islamabad, 21st June 2019



Mr. Kunio Akatsu
Team Leader
Preparatory Survey Team
Japan International Cooperation Agency
Japan



Mr. Muhammad Riaz
Director General
Pakistan Meteorological Department
Aviation Division
Government of Pakistan



Mr. Muhammad Idrees
Member,
Disaster Risk Reduction
National Disaster Management Authority
Government of Pakistan



Mr. Ashok Kumar
Superintending Engineer (Floods)
O/O Chief Engineering Adviser/ Chairman
Federal Flood Commission, Ministry of Water
Resources, Government of Pakistan



Mr. Shahid Ahmed Vakil
Mr. Syed Mujtaba Hussain
Joint Secretary
Economic Affairs Division
Government of Pakistan

ATTACHMENT

1. **Objective of the Project**
The objective of the Project is to improve the PMD's capabilities in meteorological observation, weather forecasting and dissemination of forecast/warnings through the installation of a Weather Surveillance Radar system at Sukkur. This will largely contribute to the mitigation of damages caused by natural/hydro-meteorological disasters in Pakistan which are predicted to increase due to climate change.
2. **Title of the Preparatory Survey**
Both sides confirmed the title of the Preparatory Survey as "the Preparatory Survey for the Project for the Installation of Weather Surveillance Radar at Sukkur".
3. **Project Site**
Both sides confirmed that the site of the Project is Sukkur (Sindh) which is shown in Annex 1.
4. **Responsible/ Sponsoring Agency and Implementing Agency**
Both sides confirmed the responsible/ sponsoring agency and implementing agency as follows:
 - 4-1. The Responsible/ Sponsoring Agency: Aviation Division, Cabinet Secretariat.
 - 4-2. The Implementing Agency: Pakistan Meteorological Department (hereinafter referred to as "PMD"). The organization chart of PMD is shown in Annex 2.
 - 4-3. The Coordinating Agencies: Economic Affairs Division (EAD), National Disaster Management Authority (NDMA, under the domain of NDMP) and Federal Flood Commission (FFC for contributing in improvements of flood forecasting and warning on countrywide basis including NFPP-IV).
5. **Items requested by the Government of Pakistan**
As a result of discussions, both sides confirmed that the items requested by the Government of Pakistan are as shown in Table below.

Table: Main Components to be required for the Project

Component	Proposed Sukkur Meteorological Radar Observation Station	PMD Islamabad Head Office National Weather Forecasting Center	PMD Flood Forecasting Division, Lahore	PMD Tropical Cyclone Warning Center	PMD Meteorological Office in the International Airports, Karachi, Islamabad and Lahore
Procurement and Installation of Equipment					
Meteorological Radar System including Power Back-up System, Lightning System, Measuring Equipment and Spare Parts	1	-	-	-	-
Central Processing System	-	1	-	-	-
Meteorological Radar Data Display System	1	1	1	1	1 at each office
Construction of Radar Tower Building					
Radar Tower Building	1				

Initial Technical Training of the equipment	Initial operation guidance in the contract of manufacturer
Soft Component	Guidance for operation and maintenance of the equipment and machineries

- 5-1. JICA will assess the feasibility of the above requested items through the survey and will report findings to the Government of Japan. The final components of the Project would be decided by the Government of Japan.
- 5-2. The Government of Pakistan shall submit an official request to the Government of Japan through a diplomatic channel before the appraisal of the Project, which is scheduled in January, 2020.
6. Procedures and Basic Principles of Japanese Grant
- 6-1. The Pakistan side agreed with the Japanese Grant Scheme and its procedures as described in Annex 3, and necessary measures to be taken by the Government of Pakistan.
As for the monitoring of the implementation of the Project, JICA requires Pakistan side to submit the Project Monitoring Report. The Form/Template is attached as Annex 4.
- 6-2. The Pakistan side understands to take the necessary measures, as described in Annex 5. The contents of the Annex 5 will be elaborated and refined during the Preparatory Survey and be agreed in the mission dispatched for explanation of the Draft Preparatory Survey Report.
The Contents of Annex 5 will be updated as the Preparatory Survey progresses, and eventually, will be used as an attachment to the Grant Agreement.
7. Schedule of the Survey
- 7-1. The Team will proceed with further survey in Pakistan until 16 July 2019.
- 7-2. An official request to the Government of Japan will be submitted before January, 2020
- 7-3. JICA will prepare a draft Preparatory Survey Report in English and dispatch a mission to Pakistan in order to explain its contents around the end of January 2020.
- 7-4. If the contents of the draft Preparatory Survey Report is accepted in principle and the undertakings are fully agreed by the Pakistan side, JICA will complete the Final Report in English and send it to the Government of Pakistan around July 2020.
- 7-5. The above schedule is tentative and subject to change.
8. Environmental and Social Considerations
- 8-1. The Pakistan side confirmed to give due environmental and social considerations during implementation, and after completion of the Project, in accordance with the JICA Guidelines for Environmental and Social Considerations (April, 2010).
- 8-2. The Project is categorized as "C" from the following considerations:
Not located in a sensitive area, nor has it sensitive characteristics, nor falls it into sensitive sectors under the Guidelines, and its potential adverse impacts on the environment are likely to be insignificant.
9. Other Relevant Issues
- 9-1. Security Arrangements
The Government of Pakistan shall take all possible and necessary measures to ensure the safety of the concerned Japanese and other foreign persons during the implementation of the Project at the Project site and movement to the Project site from their accommodations, whenever Japanese side requests in advance.
As for security wall during the Project implementation, the Team explained that such

Handwritten signature and stamp.

security measure is responsibility of PMD side. However PMD side expressed the concern on the technical capacity and experience to complete the above mentioned works on schedule, and requested to be included in the Project. The team will convey this request to JICA HQ.

9-2. Specifications Summary

Both sides confirmed basic specifications as follows:

1) Specifications of the requested Radar System:

PMD explained frequency required for C-band is not allowed to use for civil organizations such as PMD, because Air Force use it and already obtained the frequency permission for S-band. JICA requested PMD to submit some documents that PMD can't use frequency required for C-band by the end of 1st survey (mid of July).

The Team explained the necessity of optimal utilization of S-Band Dual Polarization (Polarimetric) Radar, and final specification of Radar will be determined after analysis in Japan.

PMD understood explanation by the Team, the PMD still strongly requested to install S-Band Pulse Compression Solid State Dual Polarization (Polarimetric) Meteorological Doppler Radar System at the site due to its importance of monitoring torrential rains that caused urban, rivers, hill torrents and flush flooding in monsoon season. Furthermore, DG PMD gave detailed briefing of utilization and benefit to the masses, if such equipment is installed by the Government of Japan. The Team will convey this request to JICA Headquarters.

2) Specifications of the data communication to be arranged by Pakistan side:

VPN with the required transmission speed for the Project is arranged by PMD.

3) Specifications of the radar tower (steel or reinforced concrete tower building) will be further examined by the Team to consider necessary functions, cost and construction period.

The Team will make further necessary survey and make analysis in Japan. Detailed specifications will be explained in next Mission to be scheduled around the end of January 2020.

9-3. Soft Component

Both sides confirmed that guidance for operation and maintenance of the equipment and machinery will be included in the Project to support smooth operation. Components will be studied further.

9-4. Necessary Clearance/ Permit for the Project and Approval of PC-I

Both sides confirmed the time table of the following key actions for the Project:

- 1) In order to implement the Project smoothly, the PMD shall confirm with the Environmental Protection Agency (EPA), Sindh Province that an Environmental Impact Assessment (EIA) and Initial Environmental Examination (IEE) permit is not required for the Project. Necessary information will be provided by the Team.
- 2) The height clearance (No Objection Certificate) from the relevant authorities such as the Civil Aviation Authority, Pakistan Air Force, and etc., for construction of a new meteorological radar tower shall be obtained for the approval of PC-I.
- 3) The Building Construction Permit of the Sukkur City Government or any other relevant agencies for the construction of a new meteorological radar tower building shall be obtained for the approval of PC-I.
- 4) PMD will get the frequencies of the proposed radar system in Sukkur from the Pakistan

M. H. Khan (A)

Telecommunication Authority (PTA)/ Frequency Allocation Board (FAB) for the approval of PC-I.

- 5) PMD agreed to make arrangements to provide commercial power supply from the main supply line to the proposed project site in Sukkur for the radar tower building for the approval of PC-I.
- 6) In order to obtain the required approval from the Japanese Cabinet for the Grant Aid for the implementation of the Project, the PC-I shall be approved by the Central Development Working Party (CDWP) or Executive Committee of the National Economic Council (ECNEC), Government of Pakistan by the end of March 2020. The Team will provide necessary information for preparation of the PC-I by the end of January 2020.
- 7) PC-IV shall be submitted soon after the completion of the Project.

9-5. Land Acquisition

PMD explained that the land of Sukkur Meteorological Radar Observation Station is available for the Project, therefore further land acquisition is not necessary. On the other hand, reclaiming and leveling are needed before the building construction.

The Team explained that such works are the responsibility of PMD side. However, PMD side expressed the concern on the technical capacity and experience to complete the above mentioned works on schedule, and strongly requested to be included in the Project. The Team will convey this request to JICA Headquarters.

9-6. Dissemination of Weather Radar Data

Both sides confirmed: 1) near real-time radar data/products will be provided to the public through PMD web site and also provided to other related organizations through data servers in PMD, and 2) radar data will be archived and be available to other disaster management related organizations for disaster survey.

9-7. Necessary Budget and Number of Staff for Operation and Maintenance

PMD agreed to allocate necessary budget and staff estimated by the Team for proper operation and maintenance including data quality.

9-8. Tax Exemption

The tax exemption including the General Sales Tax (GST), custom duty, and any other taxes and fiscal levies in Pakistan which are to arise from the Project activities shall be ensured by the Government of Pakistan. The Government of Pakistan shall take necessary procedures for tax exemption.

9-9. Height Restriction

The Team recommended PMD that the Government of Pakistan shall establish Height Restriction avoiding construction of any other building/facility higher than new weather radar building within 10km radius from the new weather radar tower building to be constructed under the Project for ensuring appropriate radar observation.

PMD agreed to request the relevant authorities to restrict the height limitations set by the Sukkur City Government.

9-10. Visibility of the Project

The Pakistan side affirmed the following measures to be taken in order to enhance publicity of the Project:

- (a) Mass media sources
- (b) Brochures
- (c) Commemoration panels

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9-11. Adaptation to Climate Change

In Pakistan, the adverse impacts of climate change induced by global warming have been notable as evidenced by the increase in meteorological disasters such as floods, draught tropical cyclones, GLOFs, etc. The visible causes broadly include increase in the frequency and intensity of heavy rains and the intensity of tropical cyclones generated in the Arabian Sea which are closely associated with the increase in sea surface temperature of the Arabian Sea compared to the Bay of Bengal. In recent years, the number of tropical cyclones approaching/ landing in Pakistan has increased. To mitigate the impacts of climate change, it is absolutely necessary to monitor tropical cyclones through the Sukkur meteorological radar system. Therefore, the Project is expected to contribute to climate change adaptation.

9-12. Contribution for Implementation of the Sendai Framework for Disaster Risk Reduction 2015-2030:

In March 2015, the Third UN World Conference on Disaster Risk Reduction was held in Sendai, Japan and the Sendai Framework for Disaster Risk Reduction 2015-2030 (hereinafter referred to as "SFDRR 2015-2030") was adopted. The concept of the Project is in line with SFDRR 2015-2030 and priorities for action. Particularly, the Project contributes to implement "Priority 1: Understanding disaster risk" through an improved meteorological observation capability, and "Priority 4: Enhancing disaster preparedness for effective response" through an improved accuracy of forecasts and warnings.

9-13. Contribution to the National Disaster Management Plan (NDMP)

Both sides confirmed that the Project is in line with the priority areas identified in the National Disaster Management Plan (NDMP) which has been approved by the National Disaster Management Commission (NDMC), Government of Pakistan in 2012.

9-14. Contribution to the National Flood Protection Plan of Federal Flood Commission (FFC)

Both sides confirmed that the Project is in line with the priority non-structural interventions identified in Fourth National Flood Protection Plan (NFPP-IV) approved by the Council of Common Interests (CCI), Government of Pakistan in 2017. Being the main coordinating agency of the Government of Pakistan for integrated flood management, FFC will coordinate with other stakeholders to harness the benefits of this Project.

9-15. Confidentiality of the Project

The Team explained that the Preparatory Survey Report to be prepared at the end of the survey would be disclosed to the public in Japan. However, the Team also explained that a confidential part which might affect bidding process such as cost estimation should be kept undisclosed until the bidding has completed.

Annex 1 Project Site

Annex 2 Organization Chart

Annex 3-1 Japanese Grant

Annex 3-2 Flow Chart of Japanese Grant Procedures

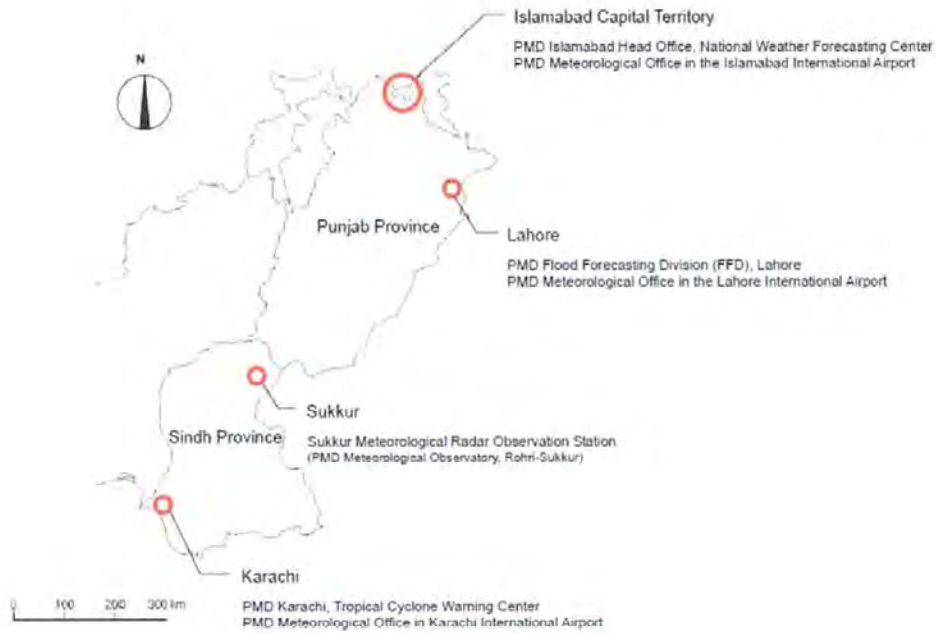
Annex 3-3 Financial Flow of Japanese Grant

Annex 4 Project Monitoring Report (template) Major Undertakings to be taken by Recipient Government

Annex 5 Major Undertakings to be taken by Recipient Government

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■ Islamic Republic of Pakistan



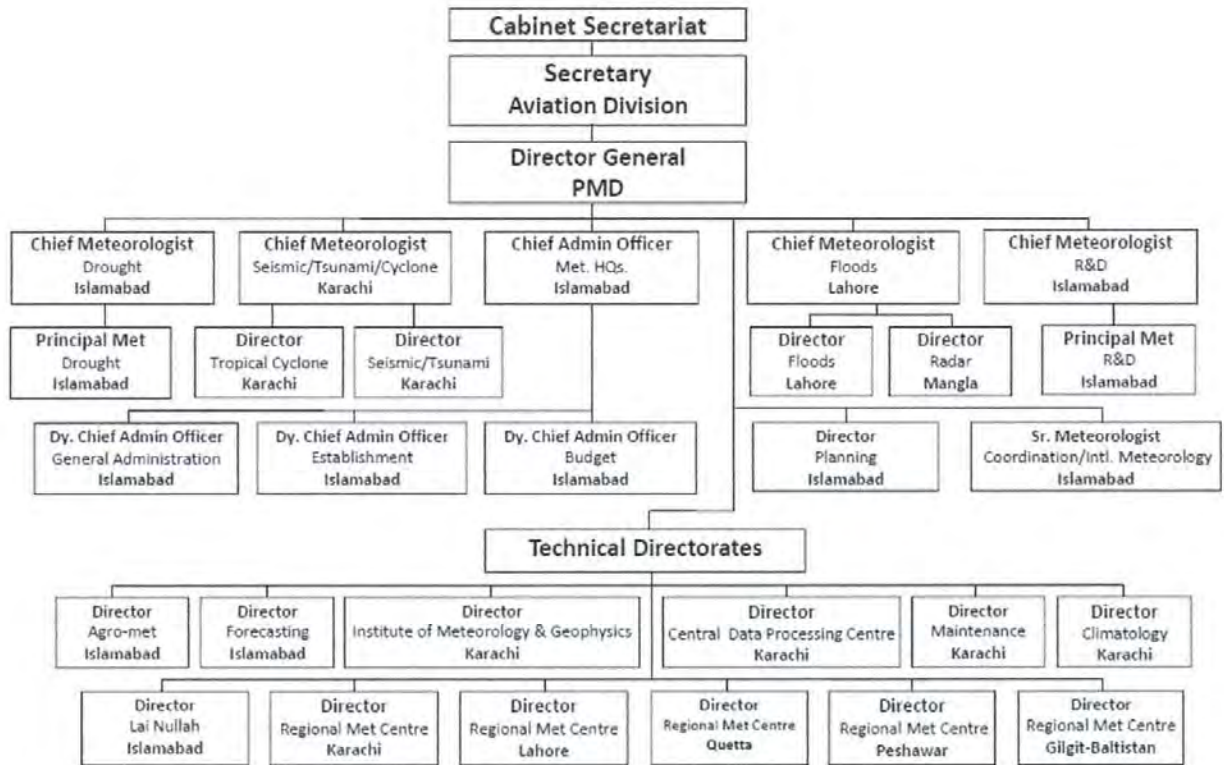
Project Sites

The depiction and use of boundaries, geographic names and related data shown on the map do not necessarily imply official endorsement or acceptance by JICA.

m. H. W. Khan (Signature) (Stamp)

Annex 2

ORGANIZATIONAL CHART OF PAKISTAN METEOROLOGICAL DEPARTMENT (PMD)



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JAPANESE GRANT

The Japanese Grant is non-reimbursable fund provided to a recipient country (hereinafter referred to as "the Recipient") to purchase the products and/or services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. Followings are the basic features of the project grants operated by JICA (hereinafter referred to as "Project Grants").

1. Procedures of Project Grants

Project Grants are conducted through following procedures (See "PROCEDURES OF JAPANESE GRANT" for details):

(1) Preparation

- The Preparatory Survey (hereinafter referred to as "the Survey") conducted by JICA

(2) Appraisal

-Appraisal by the government of Japan (hereinafter referred to as "GOJ") and JICA, and Approval by the Japanese Cabinet

(3) Implementation

Exchange of Notes

-The Notes exchanged between the GOJ and the government of the Recipient

Grant Agreement (hereinafter referred to as "the G/A")

-Agreement concluded between JICA and the Recipient

Banking Arrangement (hereinafter referred to as "the B/A")

-Opening of bank account by the Recipient in a bank in Japan (hereinafter referred to as "the Bank") to receive the grant

Construction works/procurement

-Implementation of the project (hereinafter referred to as "the Project") on the basis of the G/A

(4) Ex-post Monitoring and Evaluation

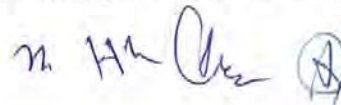
-Monitoring and evaluation at post-implementation stage

2. Preparatory Survey

(1) Contents of the Survey

The aim of the Survey is to provide basic documents necessary for the appraisal of the the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the Recipient necessary for the implementation of the Project.



- Evaluation of the feasibility of the Project to be implemented under the Japanese Grant from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of an outline design of the Project.
- Estimation of costs of the Project.
- Confirmation of Environmental and Social Considerations

The contents of the original request by the Recipient are not necessarily approved in their initial form. The Outline Design of the Project is confirmed based on the guidelines of the Japanese Grant.

JICA requests the Recipient to take measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the executing agency of the Project. Therefore, the contents of the Project are confirmed by all relevant organizations of the Recipient based on the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA contracts with (a) consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.


(3) Result of the Survey

JICA reviews the report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the feasibility of the Project.

3. Basic Principles of Project Grants

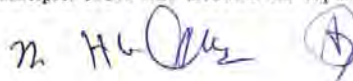
(1) Implementation Stage

1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes (hereinafter referred to as "the E/N") will be signed between the GOJ and the Government of the Recipient to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Recipient to define the necessary articles, in accordance with the E/N, to implement the Project, such as conditions of disbursement, responsibilities of the Recipient, and procurement conditions. The terms and conditions generally applicable to the Japanese Grant are stipulated in the "General Terms and Conditions for Japanese Grant (January 2016)." 

2) Banking Arrangements (B/A) (See "Financial Flow of Japanese Grant (A/P Type)" for details)

- a) The Recipient shall open an account or shall cause its designated authority to open an account under the name of the Recipient in the Bank, in principle. JICA will disburse the Japanese Grant in Japanese yen for the



Recipient to cover the obligations incurred by the Recipient under the verified contracts.

- b) The Japanese Grant will be disbursed when payment requests are submitted by the Bank to JICA under an Authorization to Pay (A/P) issued by the Recipient.

3) Procurement Procedure

The products and/or services necessary for the implementation of the Project shall be procured in accordance with JICA's procurement guidelines as stipulated in the G/A.

4) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the Recipient to continue to work on the Project's implementation after the E/N and G/A.

5) Eligible source country

In using the Japanese Grant disbursed by JICA for the purchase of products and/or services, the eligible source countries of such products and/or services shall be Japan and/or the Recipient. The Japanese Grant may be used for the purchase of the products and/or services of a third country as eligible, if necessary, taking into account the quality, competitiveness and economic rationality of products and/or services necessary for achieving the objective of the Project. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm, which enter into contracts with the Recipient, are limited to "Japanese nationals", in principle.

6) Contracts and Concurrence by JICA

The Recipient will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be concurred by JICA in order to be verified as eligible for using the Japanese Grant.

7) Monitoring

The Recipient is required to take their initiative to carefully monitor the progress of the Project in order to ensure its smooth implementation as part of their responsibility in the G/A, and to regularly report to JICA about its status by using the Project Monitoring Report (PMR).

8) Safety Measures

The Recipient must ensure that the safety is highly observed during the implementation of the Project.

9) Construction Quality Control Meeting

Construction Quality Control Meeting (hereinafter referred to as the "Meeting") will be held for quality assurance and smooth implementation of the Works at each stage of the Works. The member of the Meeting will be composed by the Recipient (or executing agency), the Consultant, the Contractor and JICA. The functions of the Meeting are as followings:

- a) Sharing information on the objective, concept and conditions of design from the Contractor, before start of construction.



- b) Discussing the issues affecting the Works such as modification of the design, test, inspection, safety control and the Client's obligation, during of construction.

(2) Ex-post Monitoring and Evaluation Stage

- 1) After the project completion, JICA will continue to keep in close contact with the Recipient in order to monitor that the outputs of the Project is used and maintained properly to attain its expected outcomes.
- 2) In principle, JICA will conduct ex-post evaluation of the Project after three years from the completion. It is required for the Recipient to furnish any necessary information as JICA may reasonably request.

(3) Others

1) Environmental and Social Considerations

The Recipient shall carefully consider environmental and social impacts by the Project and must comply with the environmental regulations of the Recipient and JICA Guidelines for Environmental and Social Considerations (April, 2010).

2) Major undertakings to be taken by the Government of the Recipient

For the smooth and proper implementation of the Project, the Recipient is required to undertake necessary measures including land acquisition, and bear an advising commission of the A/P and payment commissions paid to the Bank as agreed with the GOJ and/or JICA. The Government of the Recipient shall ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the Recipient with respect to the purchase of the Products and/or the Services be exempted or be borne by its designated authority without using the Grant and its accrued interest, since the grant fund comes from the Japanese taxpayers.

3) Proper Use

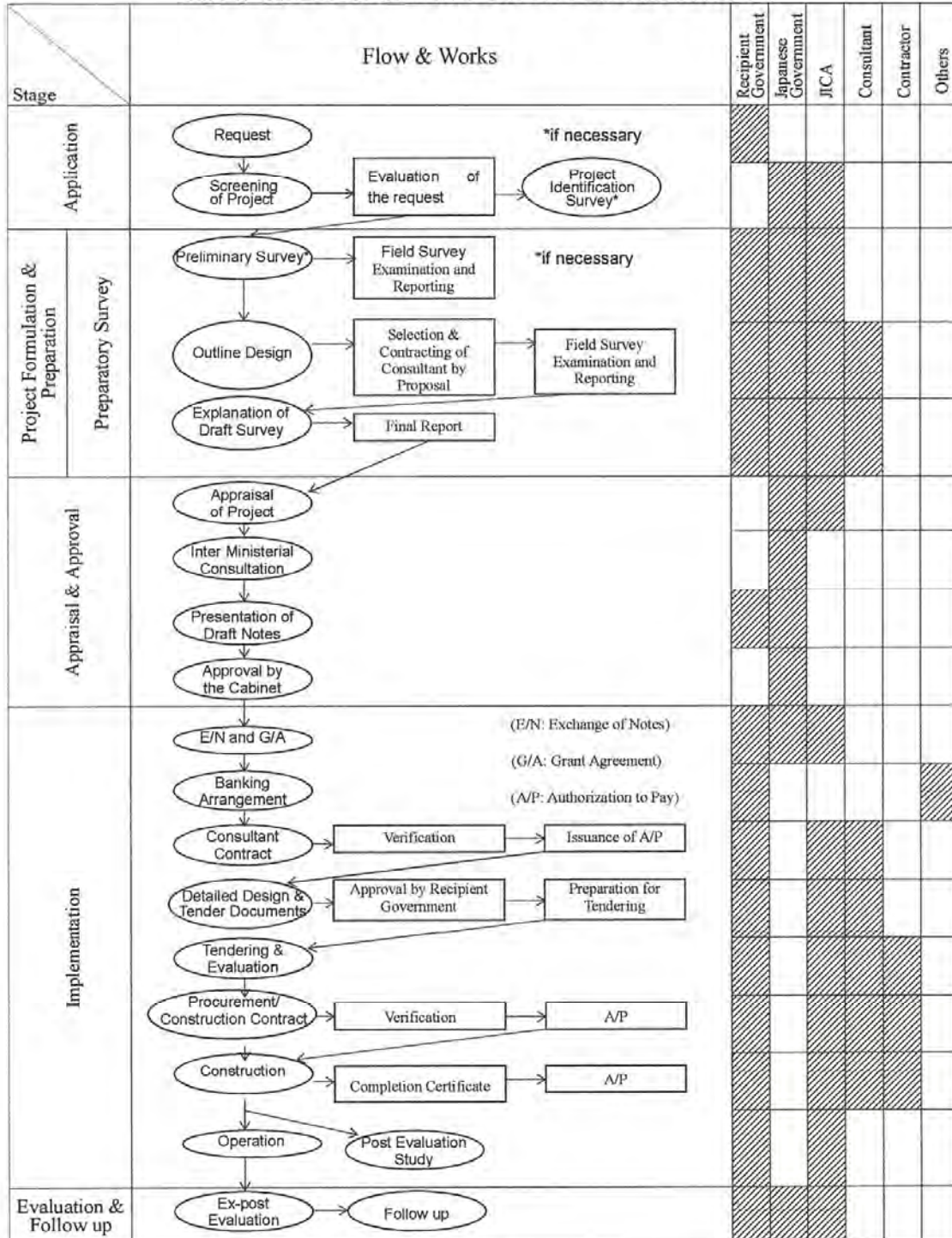
The Recipient is required to maintain and use properly and effectively the products and/or services under the Project (including the facilities constructed and the equipment purchased), to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Japanese Grant.

4) Export and Re-export

The products purchased under the Japanese Grant should not be exported or re-exported from the Recipient.

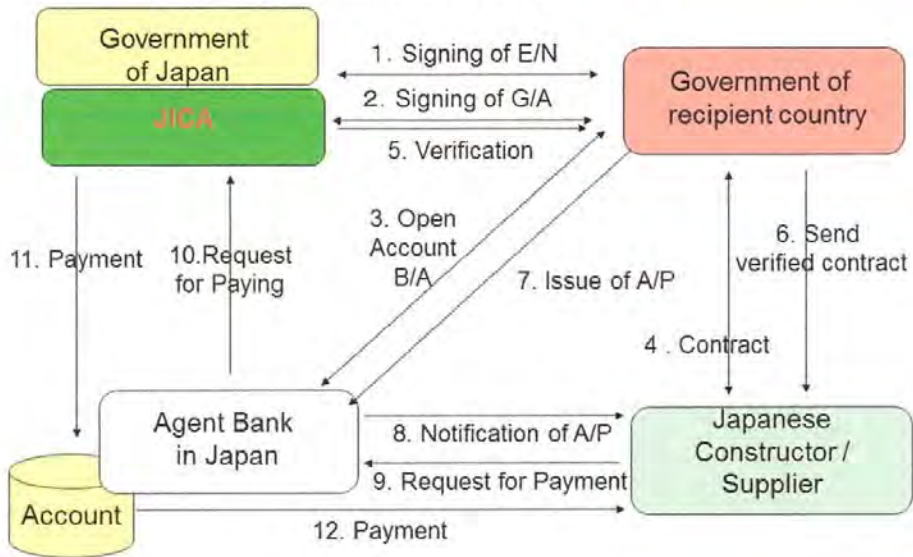
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FLOW CHART OF JAPAN'S GRANT AND PROCEDURES



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Financial Flow of Grant Aid



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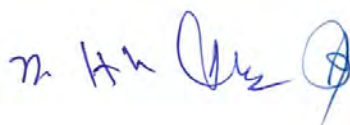
<p><u>Project Monitoring Report</u> on</p> <p>Grant Agreement No. <u>XXXXXXXX</u> 20XX, Month</p>

Organization Information

Authority (Signer of the G/A)	_____ Person in Charge _____ Contacts _____ Address: _____ Phone/FAX: _____ Email: _____
Executing Agency	_____ Person in Charge _____ Contacts _____ Address: _____ Phone/FAX: _____ Email: _____
Line Agency	_____ Person in Charge _____ Contacts _____ Address: _____ Phone/FAX: _____ Email: _____

Outline of Grant Agreement:

Source of Finance	Government of Japan: Not exceeding JPY _____ Government of Pakistan: _____
Project Title	_____
E/N	Signed date: _____ Duration: _____
G/A	Signed date: _____ Duration: _____



1: Project Description

1-1 Project Objective

1-2 Necessity and Priority of the Project

- Consistency with development policy, sector plan, national/regional development plans and demand of target group and the recipient country.

1-3 Effectiveness and the indicators

- Effectiveness by the project

Quantitative Effect (Operation and Effect indicators)		
Indicators	Original (Yr 2017)	Target (Yr 2021)
Qualitative Effect		



2: Project Implementation

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2-1 Project Scope

Table 2-1-1a: Comparison of Original and Actual Location

Location	Original: (M/D)	Actual: (PMR)
	Attachment(s):Map	Attachment(s):Map

Table 2-1-1b: Comparison of Original and Actual Scope

Items	Original	Actual

2-1-2 Reason(s) for the modification if there have been any.

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2-2 Implementation Schedule

2-2-1 Implementation Schedule

Table 2-2-1: Comparison of Original and Actual Schedule

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Items	Original		Actual
	DOD	G/A	
Cabinet Approval E/N G/A Approval of consultant contract Early Mobilization of consultant Detailed Design Budget Request for FY2016 Tender Process of contractor and supplier Approval of contractor and supplier contract Budget Appropriation and Issuance of A/P Construction Period Shipment Custom Clearance Installation and acceptance Check Soft component Project Completion Date Defect Liability Period		-	-

*Project Completion was defined as Completion of Soft component at the time of G/A.

2-2-2 Reasons for any changes of the schedule, and their effects on the project.

2-3 Undertakings by each Government

2-3-1 Major Undertakings

See Attachment 2.

2-3-2 Activities

See Attachment 3.

2-3-3 Report on RD

See Attachment 4.

2-4 Project Cost
 2-4-1 Project Cost

Table 2-4-1a Comparison of Original and Actual Cost by the Government of Japan
 (Confidential until the Tender)

Items	Cost (Million Yen)			
	Original	Actual	Original	Actual
Construction of Facilities				
Equipment				
Soft Component				
Consulting Services				
Contingency				
Total				

Note: 1) Date of estimation:
 2) Exchange rate: 1 US Dollar =**Yen

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Table 2-4-1b Comparison of Original and Actual Cost by the Government of **

Items			Cost (Thousand MMK)	
	Original	Actual	Original	Actual
				Please state not only the most updated schedule

Note: 1) Date of estimation:

2) Exchange rate: 1 US Dollar =(local currency)

2-4-2 Reason(s) for the wide gap between the original and actual, if there have been any, the remedies you have taken, and their results.

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2-5 Organizations for Implementation

2-5-1 Executing Agency:

- Organization's role, financial position, capacity, cost recovery etc,
- Organization Chart including the unit in charge of the implementation and number of employees.

Original: (M/D)
Actual, if changed: (PMR)

2-6 Environmental and Social Impacts

- The environmental monitoring is not required in the Project as this project was categorized as category C in accordance with the GUIDELINES FOR ENVIRONMENTAL AND SOCIAL CONSIDERATIONS of JICA as of April 2010.

3: Operation and Maintenance (O&M)

3-1 O&M and Management

- Organization chart of O&M
- Operational and maintenance system (structure and the number ,qualification and skill of staff or other conditions necessary to maintain the outputs and benefits of the project soundly, such as manuals, facilities and equipment for maintenance, and spare part stocks etc)

Original: (M/D)
Actual: (PMR)

3-2 O&M Cost and Budget

- The actual annual O&M cost for the duration of the project up to today, as well as the annual O&M budget.

Original: (M/D)
Actual: (PMR)

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4: Precautions (Risk Management)

- Risks and issues, if any, which may affect the project implementation, outcome, sustainability and planned countermeasures to be adapted are below.

Original Issues and Countermeasure(s): (M/D)	
Potential Project Risks	Assessment
1. Delay of budget appropriation	Probability: H/M/L
	Impact: H/M/L
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action during the Implementation:
	Contingency Plan (if applicable):
2. (Description of Risk)	Probability: H/M/L
	Impact: H/M/L
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action during the Implementation:
	Contingency Plan (if applicable):
3. (Description of Risk)	Probability: H/M/L
	Impact: H/M/L
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action during the Implementation:
	Contingency Plan (if applicable):
Actual issues and Countermeasure(s) (PMR)	

5: Evaluation at Project Completion and Monitoring Plan

5-1 Overall evaluation

Please describe your overall evaluation on the project.

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5-2 Lessons Learnt and Recommendations

Please raise any lessons learned from the project experience, which might be valuable for the future assistance or similar type of projects, as well as any recommendations, which might be beneficial for better realization of the project effect, impact and assurance of sustainability.

5-3 Monitoring Plan for the Indicators for Post-Evaluation

Please describe monitoring methods, section(s)/department(s) in charge of monitoring, frequency, the term to monitor the indicators stipulated in 1-3.

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Attachment

1. Project Location Map
 2. Undertakings to be taken by each Government
 3. Monthly Report
 4. Report on RD
 5. Yearly disbursement plan
 6. Monitoring sheet on price of specified materials (Quarterly)
 7. Report on Proportion of Procurement (Recipient Country, Japan and Third Countries)
- (Final Report Only)


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Annex 5

Major Undertakings to be taken by Recipient Government

1) Before the Tender

NO	Items	Deadline	In charge	Cost	Ref.
1	To open Bank Account (Banking Arrangement (B/A))	within 3 months after G/A	PMD		
2	To secure sufficient spaces at the proposed Radar Observation Station (PMD Meteorological Observatory, Rohri-Sukkur) for temporary facilities such as a consultant's site office, contractor's office, workshop, building materials storage, etc. needed for the construction work.	before notice of of the Tender	PMD		
3	To obtain all prior regulatory compliance and necessary permissions from the relevant agencies/authorities for the construction of the Radar Tower Building in the proposed Radar Observation Station (PMD Meteorological Observatory, Rohri-Sukkur).	before completion of PC-I	PMD		
4	To undertake the Initial Environmental Examination (IEE) procedures in Pakistan, if required so.	before completion of PC-I	PMD		
5	To obtain the required frequencies for the Sukkur Meteorological Radar System, and Polarimetric Test Horn Devices.	before notice of the Tender	PMD		

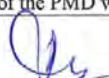
2) During the Project

NO	Items	Deadline	In charge	Cost	Ref.
1	To pay bank charge (commission) for the issuance of the Authorization to Pay (A/P) and amendments of A/P, if required, for the Consultant and the Contractor.	every payment	PMD		
2	To undertake all necessary institutional and juridical procedures in Pakistan.	every payment	PMD		
3	To handle duty (tax) exemption procedures and to take necessary measures as well as provide requisite legal and/or administrative documentations for import permit and customs clearance to the customs broker/forwarder to be employed by the Contractor at the port of disembarkation for the materials and equipment to be imported for the Project as well as the sending back of any defective equipment and/or spare parts to the manufacturer for repair at the factory or replacement and re-importation thereof into Pakistan during the implementation and warranty periods of the Project.	during the Project	EAD PMD		
4	1) To take responsibility for arranging the maximum countermeasures and ensure the appropriate security of the whole Project site/s and of the Japanese and other foreign nationals assigned to the Project prior to the commencement of and during the implementation of the Project. 2) To arrange security around the proposed Project Site in Sukkur with the police. 3) To arrange security around the accommodation(s) of the Consultant & the Contractor with the police. 4) To arrange escort guard with the police during movements between the accommodation(s) of the Consultant & the Contractor and the proposed Project Site in Sukkur.	during the Project	PMD		
5	To provide necessary working spaces with Internet Connection at the PMD Islamabad Head Office and the PMD Karachi for the Consultant and the Contractor during the implementation of the Project.	during the Project	PMD		
6	To accord Japanese and other foreign nationals including their dependent/s (if any), whose services may be required in connection with the supply of products and services under the signed contracts, such facilities as may be necessary for their entry into Pakistan and stay therein for the smooth and uninterrupted	during the Project	PMD		

	performance of their work (i.e. to secure the appropriate visa including its extension/s required by the recipient country in connection thereof).				
7	To exempt goods of Japanese and other foreign nationals from customs duties, internal taxes and other fiscal levies which may be imposed by the Government of Pakistan with respect to their supply (products) and services under the signed contracts.	during the Project	PMD		
8	To bear all the expenses, other than those to be borne by the Japanese Grant, necessary for construction of the facilities as well as for the transportation and installation of the equipment.	during the Project	PMD		
9	To provide temporary facilities for the availability or accessibility of electricity for the construction work.	during the Project	PMD		
10	1) To provide the commercial power (400V, 3-phase, 4-wire, 50Hz) supply (capacity: no less than 150kVA) along with electric poles/wires, etc. from the main supply line to the proposed Radar Observation Station (PMD Meteorological Observatory, Rohri-Sukkur) for the Radar Tower Building and other facilities to be constructed by the PMD prior to the commencement of construction work. 2) To install the required step-down transformer (capacity: no less than 150kVA) as well as service entrance connections for the commercial power supply at the proposed Radar Observation Station (PMD Meteorological Observatory, Rohri-Sukkur) for the Radar Tower Building (400V, 3-phase, 4-wire, 50Hz) prior to the commencement of construction work.	Before commencement of the radar tower building construction	PMD		
11	To relocate the existing meteorological observation field in the proposed Radar Observation Station (PMD Meteorological Observatory, Rohri-Sukkur).	during the Project	PMD		
12	To provide telephone lines for the Radar Tower Building in the proposed Radar Observation Station (PMD Meteorological Observatory, Rohri-Sukkur).	during the Project	PMD		
13	To procure and install standard furniture for the Radar Tower Building.	during the Project	PMD		
14	To undertake incidental outdoor works such as gardening/landscaping and exterior lighting in and around the proposed Radar Observation Station (PMD Meteorological Observatory, Rohri-Sukkur), if necessary.	during the Project	PMD		
15	To provide free of charge and allocate secure temporary storage area/room for the materials, tools and equipment needed during the installation process.	during the Project	PMD		
16	To promptly provide reliable and high-speed Internet environment at the Sukkur Meteorological Radar Observation Station (PMD Meteorological Observatory, Rohri-Sukkur), National Weather Forecasting Centre, PMD Islamabad Head Office and other Project Sites (with each corresponding global/fix IP) for the establishment of a Virtual Private Network.	during the Project	PMD		
17	To set up the required and new assigned IP addresses in the computing equipment supplied under the Project and facilitate any required configuration i.e. firewall settings, etc. of the existing PMD equipment which may be made part of the project network communication system, if any.	during the Project	PMD		
18	To support the Contractor to obtain relevant and vital information or data i.e. shape file map of Pakistan containing the administrative boundaries (regions, provinces, cities, districts, wards, etc.) as well as the rivers, lakes, and dams in Pakistan to be incorporated into the radar data/products display software.	during the Project	PMD		
19	To assign appropriate number of trainees and shoulder their dispatching cost to the training sites, such as daily allowance, transportation fee, accommodation, if any.	during the Project	PMD		

3) After the Project

NO	Items	Deadline	In charge	Cost	Ref.
1	To assign the required staff including a responsible personnel of the PMD who has	after completion of	PMD		


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	reliable technical skill and ample experience for the smooth operation and maintenance of the Equipment.	the Project			
2	To procure the required spare parts and consumables for the smooth operation and maintenance of the Equipment, and enter into a Preventive Maintenance Service Agreement with the equipment supplier if so desired.	after completion of the Project	PMD		
3	To ensure adequate maintenance of the Radar Tower Building constructed under the Project so that they may function effectively for a long time.	after completion of the Project	PMD		
4	To properly operate and maintain, and also effectively utilize the facilities constructed and the Equipment procured/installed under the Project.	after completion of the Project	PMD		
5	To allocate the necessary budget and personnel for the smooth conduct of meteorological radar observation and forecasting works.	after completion of the Project	PMD		
6	To periodically update all the operation/antivirus/application software(s).	after completion of the Project	PMD		
7	To procure the appropriate number and capacity of disk media, hard disks, solid state disks, etc., and dutifully conduct the required scheduled archiving of radar observation raw data and products.	after completion of the Project	PMD		

(B/A: Banking Arrangement, A/P: Authorization to pay, N/A: Not Applicable)

(Note) Progress of the specific obligations of the Recipient may be confirmed and updated from time to time with written agreement between JICA and the Recipient in the form other than the amendment of the G/A.



