II. SOLAR PANEL BATTERY POWER CALCULATION

SOLAR PANEL AND BATTERY POWER CALCULATION

1. Type :Rain & Water level Station (w/ short distance transceiver)

1.1.River Site

1. Conditions

(1) Sensors

a. Fluviometer : Ultrasonic water level gauge (W-826/YOKOGAWA) :700 mA

b. Meteorological sensor : Air temperature (E-734/YOKOGAWA) : -----
Ventilator (E-834-02/YOKOGAWA) : 160 mA
SIO/BCD converter (M-832/YOKOGAWA) : 200mA

(2) Transmitter : Low-power radio equipment (NJT-389/JRC)
At transmitting : 100 mA
At stand-by : negligible

(3) Current drain (12V DC)

a. At transmitting : 0.7 A (Fluviometer) + 0.16 A (Ventilator) + 0.2 A (SIO/BCD converter) + 0.1 A (Transmitter) = 1.16 A = It

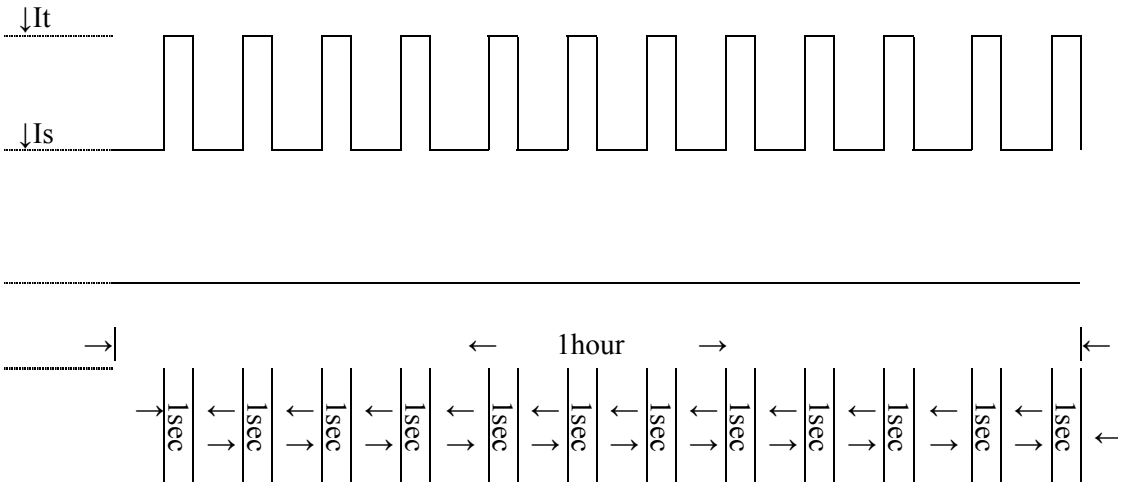
b. At stand-by : 0.7 A (Fluviometer) + 0.16 A (Ventilator) + 0.2 A (SIO/BCD converter) = 1.06 A = Is

(4) Power supply system : Solar cells power supply type

(5) Transmitting interval : 5 minutes

(6) Autonomy : 336 hour (14 days)

(7) Average annual sunshine : 1,900 hours



2. Calculation of discharge time

(1) Transmitting time ----- Ht

- Data transmission : 1 second / time x 288 times = 288 seconds / day

Ht = 1 second / time x 288 times = 288 seconds / day
= 0.08 hours / day

(2) Sleeping time ----- Hs

Hs= 24 hours – Ht
=23.92 hours / day

3. Calculation of average load current

(1) Daily load electric consumption ---- Q
Q = Ht x It + Hs x Is
= 0.08 hours x 1.16 A + 23.92 hours x 1.06 A
= 25.448 Ah

(2) Average load current ---- Ia
Ia = Q / 24 hours
= 25.448 Ah / 24hours = 1.06 A

4. Calculation of solar cells output

(1) Annual sunshine time : 3,290 hours
(2) Multiplier : S=20.0
(3) Solar cells output voltage : E1 = 12.0V
(4) Solar cells output ----- Ps
Ps = Ia x E1 x S
= 1.06 A x 12.0V x 20.0
= 254.4 W
→ 327 W x 1

5. Calculation of battery's capacity

(1) Type of battery : Sealed lead-acid battery
(2) Maintenance factor : L=0.8
(3) Allowable minimum voltage : 1.8 V/cell
Battery's capacity
C = Ia x 336 hours ÷ 0.8
= 1.06 A x 336 hours ÷ 0.8
= 445.2 Ah
→ 500 Ah x 1

1.2. RTU Site

1. Conditions

(1) Remote Terminal Unit : Remote Terminal Unit (RTU) w radio (20W)
At waiting : 50 mA
At receiving : 120 mA
At transmitting : 9.1 A

(2) Sensors
a. Pluviometer : Rain gauge (B-011-21-Z/YOKOGAWA) : 250mA
or Rain gauge
(NKC-500A + RHG-5/IKEDA) : -----

(3) Receiver : Low-power radio equipment (NJT-390/JRC)
At receiving : 60 mA

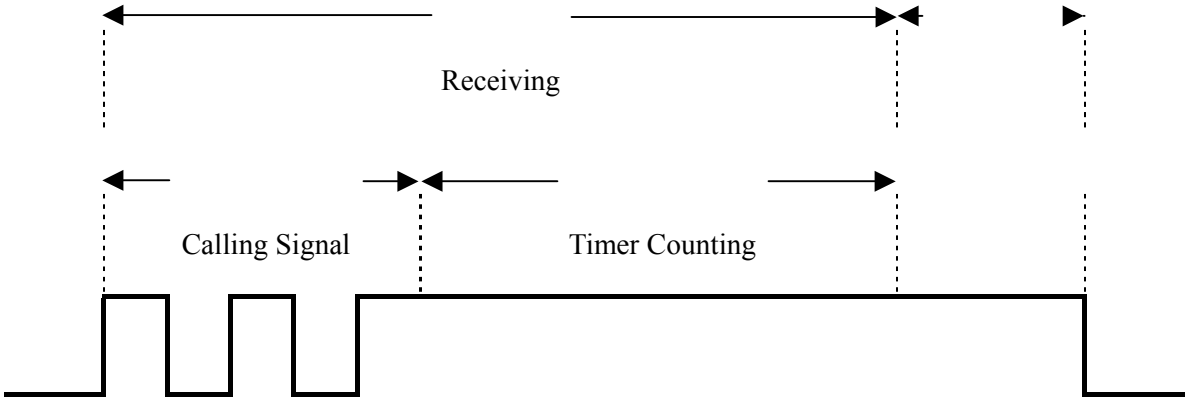
(4) Current drain (12V DC)
a. At waiting : 0.05 A (RTU) + 0.25 A (Rain gauge) + 0.06 A (Receiver) = 0.36 A = Iw
b. At receiving : 0.12 A (RTU) + 0.25 A (Rain gauge) + 0.06 A (Receiver) = 0.43 A = Ir
c. At transmitting : 9.1 A (RTU) + 0.25 A (Rain gauge) + 0.06 A (Receiver) = 9.41 A = It

(5) Power supply system : Solar cells power supply type
(6) Autonomy : 336 hour (14 days)
(7) Average annual sunshine : 1,900 hours
(8) Voice Communication : Transmitting Time 8 min (1 Month)

Receiving Time 12 min (1 Month)

2. Calculation of discharge time

The station, which takes the longest time from receiving signal of 1st calling to ending of the series of batch calling, is the last station. It also consumes power in the worst way. Every station consume the same current at timer counting as receiving time. That is, the last station wait the longest term so that it consumes power in the worst way.



(1) Receiving Time: Hr

-1 Calling Signal Receiving: Hr1

Usual : 2.45 s x 1 time x 24 hour x 23 day = 1,352.4 s / month
Urgency : 2.45 s x 4 times x 24 hour x 5 day = 1,176 s / month
Optional : 2.45 s x 2 time x 24 hour x 2 day = 235.2 s / month
Hr1 = 1,352.4 s / month + 1,176 s / month + 235.2 s / month = 2,763.6 s / month

-2 Timer Counting: Hr2

Usual : 0.6 s x (6-1) x 1 times x 24 hour x 23 day = 1,656 s / month
Urgency : 0.6 s x (6-1) x 4 times x 24 hour x 5 day = 1,440 s / month
Optional : 0.6 s x (6-1) x 2 times x 24 hour x 2 day = 288 s / month
Hr2 = 1,656 s / month + 1,440 s / month + 288 s / month = 3,384 s / month

-3 Voice Communication Receiving: Hr3

Hr3 = 12 min / month + 20 min / month x 2 = 52 min / month = 3,120 s / month

-4 Total Receiving

Hr = Hr1 + Hr2 + Hr3 = 2,763.6 s / month + 3,384 s / month + 3,120 s / month
= 9,267.6 s / month = 308.92 s / day = 0.086 hour / day

(2) Transmitting Time: Ht

-1 Response Transmitting: Ht1

Usual : 0.515 s x 1 time x 24 hour x 23 day = 284.28 s / month
Urgency : 0.515 s x 4 times x 24 hour x 5 day = 247.2 s / month
Optional : 0.515 s x 2 time x 24 hour x 2 day = 49.44 s / month
Ht1 = 284.28 s / month + 247.2 s / month + 49.44 s / month = 580.92 s / month

-2 Voice Communication Transmitting: Ht2

Ht2 = 8 min / month = 480 s / month

-3 Total Transmitting

Ht = Ht1 + Ht2 = 580.92 s / month + 480 s / month = 1,060.92 s / month
= 35.364 s / day □ 0.010 hour / day

(3) Waiting Time: Hw

-1 Total Waiting

Hw = 24 hour – Hr – Ht

= 24 hour – 0.086 hour / day – 0.010 hour / day

 23.90 hour / day

3. Calculation of average load current

(1) Daily load electric consumption ---- Q

-1 Receiving Time

Qr = 0.086 hour / day x 0.43 A 0.037 Ah / day

-2 Transmitting Time

Qt = 0.010 hour / day x 9.41 A 0.094 Ah / day

-3 Waiting Time

Qw = 23.90 hour / day x 0.36 A 8.6 Ah / day

-4 Total

Q = 0.037 Ah + 0.094 Ah + 8.6 Ah = 8.73 Ah / day

(2) Average load current ---- Ia

Ia = Q / 24 hours

= 8.73 Ah / 24 hours = 0.364 A

4. Calculation of solar cells output

(1) Annual sunshine time : 3,290 hours

(2) Multiplier : S=20.0

(3) Solar cells output voltage : E1 = 12.0V

(4) Solar cells output ----- Ps

Ps = Ia x E1 x S

= 0. 364 A x 12.0V x 20.0

= 87.36 W

→ 109 W x 1

5. Calculation of battery's capacity

(1) Type of battery : Sealed lead-acid battery

(2) Maintenance factor : L=0.8

(3) Allowable minimum voltage : 1.8 V/cell

Battery's capacity

C = Ia x 336 hours ÷ 0.8

= 0. 364 A x 336 hours ÷ 0.8

= 152.88 Ah

→ 150 Ah x 1

2. Type: Rainfall Station

1. Conditions

(1) Remote Terminal Unit : Remote Terminal Unit (RTU) w radio (20W)

At waiting : 50 mA

At receiving : 120 mA

At transmitting : 9.1 A

(2) Sensors

a. Pluviometer : Rain gauge (B-011-21-Z/YOKOGAWA) : 250mA

or Rain gauge

(NKC-500A + RHG-5/IKEDA) : -----

(3) GPS : GPS receiver (GPS100/JRC) : 250 mA

(4) Current drain (12V DC)

a. At waiting : 0.05 A (RTU) + 0.25 A (Rain gauge) = 0.30 A = Iw
b. At receiving : 0.12 A (RTU) + 0.25 A (Rain gauge) = 0.37 A = Ir
c. At transmitting : 9.1 A (RTU) + 0.25 A (Rain gauge) = 9.35 A = It

(5) Power supply system : Solar cells power supply type

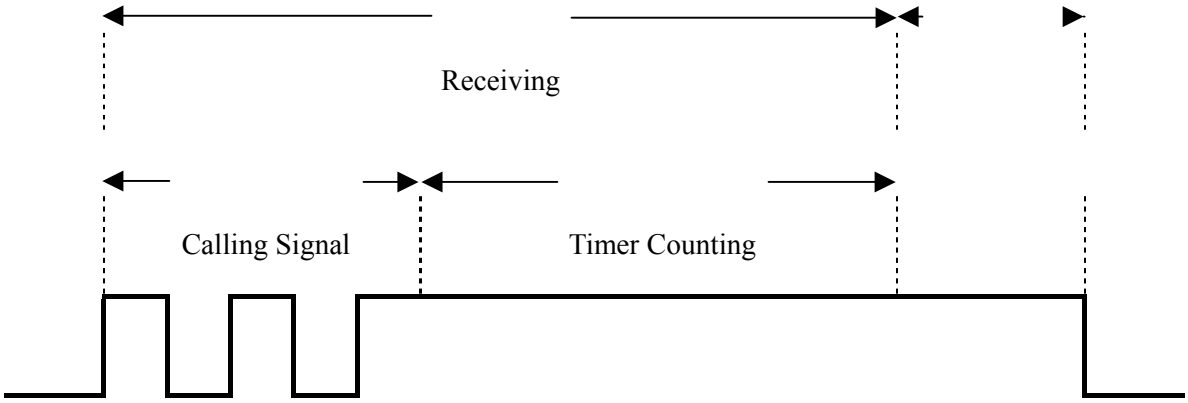
(6) Autonomy : 336 hour (14 days)

(7) Average annual sunshine : 1,900 hours

(8) Voice Communication : Transmitting Time 8 min (1 Month)
Receiving Time 12 min (1 Month)

2. Calculation of discharge time

The station, which takes the longest time from receiving signal of 1st calling to ending of the series of batch calling, is the last station. It also consumes power in the worst way. Every station consume the same current at timer counting as receiving time. That is, the last station wait the longest term so that it consumes power in the worst way.



(1) Receiving Time: Hr

-1 Calling Signal Receiving: Hr1

Usual : 2.45 s x 1 time x 24 hour x 23 day = 1,352.4 s / month
Urgency : 2.45 s x 4 times x 24 hour x 5 day = 1,176 s / month
Optional : 2.45 s x 2 time x 24 hour x 2 day = 235.2 s / month
Hr1 = 1,352.4 s / month + 1,176 s / month + 235.2 s / month = 2,763.6 s / month

-2 Timer Counting: Hr2

Usual : 0.6 s x (6-1) x 1 times x 24 hour x 23 day = 1,656 s / month
Urgency : 0.6 s x (6-1) x 4 times x 24 hour x 5 day = 1,440 s / month
Optional : 0.6 s x (6-1) x 2 times x 24 hour x 2 day = 288 s / month
Hr2 = 1,656 s / month + 1,440 s / month + 288 s / month = 3,384 s / month

-3 Voice Communication Receiving: Hr3

Hr3 = 12 min / month + 20 min / month x 2 = 52 min / month = 3,120 s / month

-4 Total Receiving

Hr = Hr1 + Hr2 + Hr3 = 2,763.6 s / month + 3,384 s / month + 3,120 s / month
= 9,267.6 s / month = 308.92 s / day = 0.086 hour / day

(2) Transmitting Time: Ht

-1 Response Transmitting: Ht1

Usual : 0.515 s x 1 time x 24 hour x 23 day = 284.28 s / month
Urgency : 0.515 s x 4 times x 24 hour x 5 day = 247.2 s / month

Optional : 0.515 s x 2 time x 24 hour x 2 day = 49.44 s / month
Ht1 = 284.28 s / month + 247.2 s / month + 49.44 s / month = 580.92 s / month

-2 Voice Communication Transmitting: Ht2
Ht2 = 8 min / month = 480 s / month

-3 Total Transmitting
Ht = Ht1 + Ht2 = 580.92 s / month + 480 s / month = 1,060.92 s / month
= 35.364 s / day ÷ 0.010 hour / day

(3) Waiting Time: Hw

-1 Total Waiting
Hw = 24 hour – Hr – Ht
= 24 hour – 0.086 hour / day – 0.010 hour / day
÷ 23.90 hour / day

3. Calculation of average load current

(3) Daily load electric consumption ---- Q

-1 Receiving Time
Qr = 0.086 hour / day x 0.37 A ÷ 0.032 Ah / day

-2 Transmitting Time
Qt = 0.010 hour / day x 9.35 A ÷ 0.094 Ah / day

-3 Waiting Time
Qw = 23.90 hour / day x 0.30 A≒ 7.17 Ah / day

-4 Total
Q = 0.032 Ah + 0.094 Ah + 7.17 Ah = 7.296 Ah / day

(4) Average load current ---- Ia
Ia = Q / 24 hours
= 7.296 Ah / 24 hours = 0.304 A

4. Calculation of solar cells output

(1) Annual sunshine time : 3,290 hours
(2) Multiplier : S=20.0
(3) Solar cells output voltage : E1 = 12.0V
(4) Solar cells output ----- Ps
Ps = Ia x E1 x S
= 0.304 A x 12.0V x 20.0
= 72.96 W
→ 77.9 W x 1

5. Calculation of battery's capacity

(1) Type of battery : Sealed lead-acid battery
(2) Maintenance factor : L=0.8
(3) Allowable minimum voltage : 1.8 V/cell
Battery's capacity
C = Ia x 336 hours ÷ 0.8
= 0.304 A x 336 hours ÷ 0.8
= 127.68 Ah
→ 150 Ah x 1

3. Type: Rain & Water level Station

1. Conditions

(1) Remote Terminal Unit : Remote Terminal Unit (RTU) w radio (20W)

	At waiting	: 50 mA
	At receiving	: 120 mA
	At transmitting	: 9.1 A
(2) Sensors		
a. Pluviometer	: Rain gauge (B-011-21-Z/YOKOGAWA)	: 250mA
	or Rain gauge	
	(NKC-500A + RHG-5/IKEDA)	: -----
b. Fluviometer	: Ultrasonic water level gauge	
	(W-826/YOKOGAWA)	: 700 mA
c. Meteorological sensor	: Air temperature (E-734/YOKOGAWA)	: -----
	Ventilator (E-834-02/YOKOGAWA)	: 160 mA
	SIO/BCD converter	
	(M-832/YOKOGAWA)	: 200mA

(3) Current drain (12V DC)

a. At waiting : 0.05 A (RTU) + 0.25 A (Rain gauge) + 0.7 A (Fluviometer) + 0.16 A (Ventilator) + 0.2 A (SIO/BCD converter) = 1.36 A = Iw

b. At receiving : 0.12 A (RTU) + 0.25 A (Rain gauge) + 0.7 A (Fluviometer) + 0.16 A (Ventilator) + 0.2 A (SIO/BCD converter) = 1.43 A = Ir

c. At receiving : 9.1 A (RTU) + 0.25 A (Rain gauge) + 0.7 A (Fluviometer) + 0.16 A (Ventilator) + 0.2 A (SIO/BCD converter) = 10.41 A = It

(4) Power supply system : Solar cells power supply type

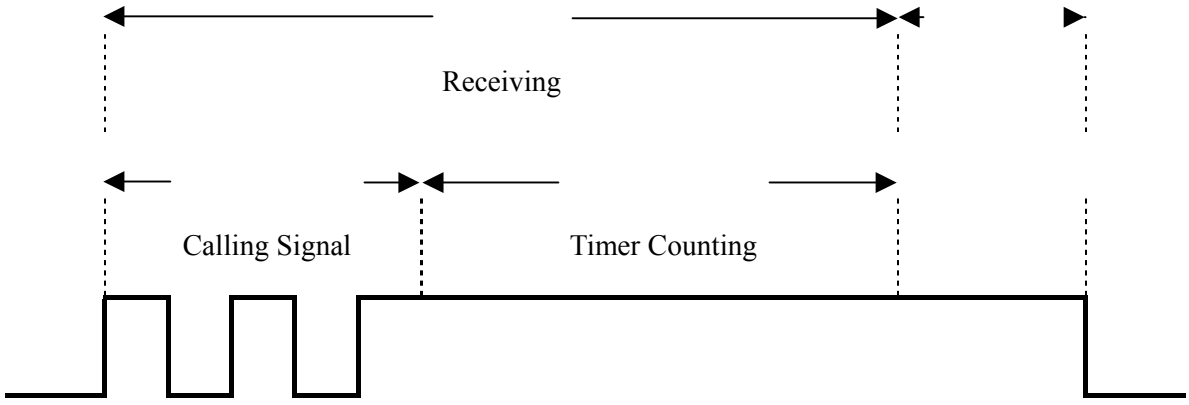
(5) Autonomy : 336 hour (14 days)

(6) Average annual sunshine : 1,900 hours

(7) Voice Communication : Transmitting Time 8 min (1 Month)
Receiving Time 12 min (1 Month)

2. Calculation of discharge time

The station, which takes the longest time from receiving signal of 1st calling to ending of the series of batch calling, is the last station. It also consumes power in the worst way. Every station consume the same current at timer counting as receiving time. That is, the last station wait the longest term so that it consumes power in the worst way.



(1) Receiving Time: Hr

-1 Calling Signal Receiving: Hr1

Usual : 2.45 s x 1 time x 24 hour x 23 day = 1,352.4 s / month

Urgency : 2.45 s x 4 times x 24 hour x 5 day = 1,176 s / month

Optional : 2.45 s x 2 time x 24 hour x 2 day = 235.2 s / month
Hr1 = 1,352.4 s / month + 1,176 s / month + 235.2 s / month = 2,763.6 s / month

-2 Timer Counting: Hr2
Usual : 0.6 s x (6-1) x 1 times x 24 hour x 23 day = 1,656 s / month
Urgency : 0.6 s x (6-1) x 4 times x 24 hour x 5 day = 1,440 s / month
Optional : 0.6 s x (6-1) x 2 times x 24 hour x 2 day = 288 s / month
Hr2 = 1,656 s / month + 1,440 s / month + 288 s / month = 3,384 s / month

-3 Voice Communication Receiving: Hr3
Hr3 = 12 min / month + 20 min / month x 2 = 52 min / month = 3,120 s / month

-4 Total Receiving
Hr = Hr1 + Hr2 + Hr3 = 2,763.6 s / month + 3,384 s / month + 3,120 s / month
= 9,267.6 s / month = 308.92 s / day = 0.086 hour / day

(2) Transmitting Time: Ht

-1 Response Transmitting: Ht1
Usual : 0.515 s x 1 time x 24 hour x 23 day = 284.28 s / month
Urgency : 0.515 s x 4 times x 24 hour x 5 day = 247.2 s / month
Optional : 0.515 s x 2 time x 24 hour x 2 day = 49.44 s / month
Ht1 = 284.28 s / month + 247.2 s / month + 49.44 s / month = 580.92 s / month

-2 Voice Communication Transmitting: Ht2
Ht2 = 8 min / month = 480 s / month

-3 Total Transmitting
Ht = Ht1 + Ht2 = 580.92 s / month + 480 s / month = 1,060.92 s / month
= 35.364 s / day ÷ 0.010 hour / day

(3) Waiting Time: Hw

-1 Total Waiting
Hw = 24 hour – Hr – Ht
= 24 hour – 0.086 hour / day – 0.010 hour / day
÷ 23.90 hour / day

3. Calculation of average load current

(5) Daily load electric consumption ---- Q

-1 Receiving Time
Qr = 0.086 hour / day x 1.43 A ÷ 0.123 Ah / day

-2 Transmitting Time
Qt = 0.010 hour / day x 10.41 A ÷ 0.104 Ah / day

-3 Waiting Time
Qw = 23.90 hour / day x 1.36 A≒ 32.50 Ah / day

-4 Total
Q = 0.123 Ah + 0.104 Ah + 32.50 Ah = 32.73 Ah / day

(6) Average load current ---- Ia
Ia = Q / 24 hours
= 32.73 Ah / 24 hours = 1.364 A

4. Calculation of solar cells output

(1) Annual sunshine time : 3,290 hours
(2) Multiplier : S=20.0
(3) Solar cells output voltage : E1 = 12.0V
(4) Solar cells output ----- Ps
Ps = Ia x E1 x S
= 1.364 A x 12.0V x 20.0
= 327.36 W

→ **327 W x 1**

5. Calculation of battery's capacity

(1) Type of battery : Sealed lead-acid battery
(2) Maintenance factor : L=0.8
(3) Allowable minimum voltage : 1.8 V/cell

Battery's capacity
C = Ia x 336 hours ÷ 0.8
= 1.364 A x 336 hours ÷ 0.8
= 572.88 Ah
→ **300 Ah x 2**

III. PILOT PROJECT INSPECTION DATA

I. Telemetry System

1. Marrakech Master Information Center

Inspection Date	Tested by	Inspected by	Weather	Temperature
22/Jul/2003	K. Usui		Fair	
	S. Iida			

Supervisory Equipment		Operating Console		Alarm Indicator	
Model	GWD-3020-TT	Model	GWD-2835	Model	GWD-2836
Serial No.	DY47426	Serial No.	DY47512	Serial No.	DY47513
Manufactured	Jan.2003	Manufactured	Jan.2003	Manufactured	Jan.2003
System No.	09(09H)				
Area Code	15(0F H)				
FS frequency	1700±400Hz				
Transmission	1200bps				

Radio Equipment			
Model		GWD-73-10	
Serial No.		DG47426	
Transmitter		Receiver	
Model	NSE-720-1	Model	NRE-720
Serial No.	DM59961	Serial No.	DM59650
Frequency	72.325MHz	Frequency	70.325MHz
Amplifier	NAH-720-10		
Serial No.	DM60372		
Power	10W		

-1. Inventory Check

Please refer to the attached list

-2. Installation Check

No.	Item	Check point	Results
1	Telemetry Supervisory Equipment	Fixing and wiring	GOOD
2	Telemetry Operating Console	Fixing and wiring	GOOD
3	Alarm Indicator	Fixing and wiring	GOOD
4	Interface Covert Unit (Communication Control Unit))	Fixing and wiring	GOOD
5	Battery	Fixing and wiring	GOOD
6	Antenna Mast	Fixing and wiring	GOOD
7	Antenna and feeder	Fixing and wiring	GOOD
8	Coaxial Arrester	Fixing and wiring	GOOD
9	Lightning Rod	Fixing and wiring	GOOD
10	Grounding system	Fixing and wiring	GOOD
11	Site cleaning	Clean or not	GOOD

-3. Individual Equipment Test

(1) Radio Equipment (GWD-73-10)

Transmitter	Forwarded power	Reflected power	V.S.W.R.
No.1	10.0 W	0.05 W	1.15

(2) Telemetry Supervisory Equipment (Model:GWD-3020-TT)

Item		Standard	Measured Value
Input voltage		198V-242V AC	228 V
Output voltage of Power Supply Unit		13.13V – 13.67V	13.45 V
Power Consumptions (incl. Radio and Alarm Indicator)	Stand-by	200mA or less	142 mA
	Receiving	200mA or less	159 mA
	Transmitting	820mA or less	545 mA
	Sounding	240mA or less	171 mA
Signal Level	Input level	Within 0dB±2dB at S/N terminal on CME-4091 when -26dBm input from RA side U-link	0 dBs
	Output level	Within -10dBm±2dBm at TA side U-link on CME-4091	-10.0 dBm
Storage battery operation		It can operate for 60 minutes in case power failure	GOOD

(3) Telemetry Operating Console (GWD-2835)

Item	Standard	Measured Value
Input voltage	90V-264V AC	228 V

(4) Alarm Indicator (GWD-2836)

Item	Standard	Measured Value
Input voltage	13.13V – 13.67V	13.45 V

-4. Total Performance Test

(1) Telemetry Supervisory Equipment (Model:GWD-3020-TT)

Item	Standard	Results
Automatic calling interval	Automatic calling is performed in accordance with selected intervals. 10-minute, 30-minute and 1-hour	GOOD
Manual calling	Manual calling (individual/all stations) is performed by operator.	GOOD
Recalling	Recalling is performed at receiving error or at no-response from a gauging station.	GOOD
Repeater control	Repeater control is performed automatically at automatic calling, and operator performs manual controls such as repeater start, repeater stop and transmitter changeover.	GOOD
Event call	Event call is performed to all stations in 10-minutes interval after system lock, in case of receiving of “rainfall start” or “caution of water level exceeding” as a start.	GOOD
Cancellation of event call	Event call is canceled by judgment of server system, and automatic calling interval returns to preset condition.	GOOD
Manual lock	Manual operations are inhibited under the following conditions: - For protection of DMP function : Every 10 minutes – 1 minute to + 1 minute - For protection of automatic calling : Every polling interval time – 1 minute to the end of the transmission data to operating console	GOOD
Repeater information receiving/display	Repeater status is received and displayed in LCD panel correctly.	GOOD
Display	Present date/time, measuring data and settings are displayed in LCD panel.	GOOD
Serial output	Measuring data is output to PC type operating console in prescribed format by RS-232C protocol.	GOOD
Voice communication	Voice communication is performed with repeater and gauging stations.	GOOD

(2) Telemetry Operating Console (GWD-2835)

Item	Standard	Results
Date and time display	Current date and time is displayed and the time is almost the same as telemetry supervisory equipment.	GOOD
Calling interval change	Calling interval is changed to 10min., 30min or 60min., and current interval is displayed.	GOOD
Data monitor	All measured data (including lack of data) by automatic calling and manual calling are displayed.	GOOD
Manual calling	Manual calling (individual/all stations) is performed by operator.	GOOD
Repeater information receiving/ display	Repeater status is displayed.	GOOD
Repeater control	Repeater control is performed manually by operator. (Repeater start, repeater stop and transmitter changeover)	GOOD
Alarm indication	Caution and warning of rainfall and water level are indicated.	GOOD
Alarm stop	Alarm sounding of the alarm indicator can be stopped manually.	GOOD

Manual lock	Manual operations are inhibited under the following conditions: - For protection of DMP function : Every 10 minutes – 1 minute to + 1 minute - For protection of automatic calling : Every polling interval time – 1 minute to +5 minutes	GOOD
Print	All screens are printed by displayed image.	GOOD
Serial input/output	Measuring data are input into the telemetry supervisory equipment and they are output to the CCU. Calculated caution/warning data are input from the CCU and they output to the telemetry supervisory equipment.	GOOD
Shutdown	When power failure occurs, the personal computer shutdowns automatically by connected UPS.	GOOD

(3) Alarm Indicator (GWD-2836)

Item	Standard	Results
Alarm sounding	Alarm sounds after receive “Alarm ON” signal from the telemetry supervisory equipment.	GOOD
Indicator blink	“Alarm” button blinks with the alarm sound during caution/warning condition.	GOOD
Alarm confirmation	Pressing “Alarm” button, alarm sounding stops, then “Alarm” button turns from blinking to lighting.	GOOD
Alarm stop	Alarm sounding stops after receive “Alarm OFF” signal from the telemetry supervisory equipment.	GOOD
Indicator off	“Alarm” button turns after receive “Indicator OFF” signal from the telemetry supervisory equipment.	GOOD

-5. Radio Propagation Test

(1) Radio Signal Strength

Antenna height AGL (m)	Feeder length (m)	Feeder type	Coaxial arrester loss (dB)	Antenna type
14.0 m	42 m	10D-2E	0.1 dB	3-EL Yagi type 7.65 dBi gain
	5.5 m	5D-2V		

Income Signal		
Aoulouss→ Marrakech	35.0	dBμV
Adar Tazaina→ Marrakech	33.3	dBμV

Note: Existence of Interference: None
Existence of City noise: None

(2) S/N Ratio (1000Hz, -4dBm input)

Station	Signal level	Noise level	S/N ratio
Tourcht → Marrakech	6.5 dBm	-40.2 dBm	46.7 dB
Agouns → Marrakech	5.7 dBm	-37.0 dBm	42.7 dB
Tiourdiou → Marrakech	6.5 dBm	-39.5 dBm	46.0 dB
Amenzal → Marrakech	6.6 dBm	-34.8 dBm	41.4 dB
Tazzitount → Marrakech	6.4 dBm	-39.9 dBm	46.3 dB
Aoulouss (TX1) → Marrakech	5.5 dBm	-39.5 dBm	45.0 dB
Aoulouss (TX2) → Marrakech	5.5 dBm	-39.0 dBm	44.5 dB
Adar Tazaina (TX1) → Marrakech	5.7 dBm	-39.0 dBm	44.7 dB
Adar Tazaina (TX2) → Marrakech	5.7 dBm	-39.5 dBm	45.2 dB

2. Aoulouss Repeater Station

Inspection Date	Tested by	Inspected by	Weather	Temperature
23/Jun/2003	K. Usui		Fair	
22/Jul/2003			Fair & Lightning	

Repeater Equipment		Status Return Unit		Antenna Filter	
Model	GWD-650	Model	GWD-1556	Model	7AFWD0370
Serial No.	DY47427	Station No.	61 (3DH)	Serial No.	02C931
Manufacture	Jan. 2003	RP status	Word: 00		

Radio Equipment No.1		
Model		GWD-73-10
Serial No.		DG47427-1
Transmitter	Model	NSE-720-1
	Serial No.	DM59957
	Frequency	70.325MHz
	Amplifier	NAH-720-10
	Serial No.	DM60367
	Power	10W
Receiver	Model	NRE-720
	Serial No.	DM59646
	Frequency	72.325MHz

Radio Equipment No.2		
Model		GWD-73-10
Serial No.		DG47427-2
Transmitter	Model	NSE-720-1
	Serial No.	DM59958
	Frequency	70.325MHz
	Amplifier	NAH-720-10
	Serial No.	DM60368
	Power	10W
Receiver	Model	NRE-720
	Serial No.	DM59647
	Frequency	72.325MHz

-1. Inventory Check

Please refer to the attached list

-2. Installation Check

No.	Item	Check point	Results
1	Repeater Equipment	Fixing and wiring	GOOD
2	Solar Panel and protection cage	Fixing and wiring	GOOD
3	Solar panel power distribution Board	Fixing and wiring	GOOD
4	Door switch	Fixing and wiring	GOOD
5	Battery	Fixing and wiring	GOOD
6	Antenna Mast	Fixing and wiring	GOOD
7	Antenna and feeder	Fixing and wiring	GOOD
8	Coaxial Arrester	Fixing and wiring	GOOD
9	Lightning Rod	Fixing and wiring	GOOD
10	Grounding system	Fixing and wiring	GOOD
11	Site Cleaning	Clean or not	GOOD

-3. Individual Equipment Test

(1) Radio Equipment (GWD-73-10)

Transmitter	Forwarded power	Reflected power	V.S.W.R.
No.1	10.0 W	0.28 W	1.40
No.2	10.0 W	0.28 W	1.40

(2) Repeater Equipment GWD-650

Item		Standard	Measured Value
Input voltage		10.8V-14.5V DC	14.2 V
Power Consumptions	Stand-by	100mA or less	64 mA
	Receiving	2.0 A or less	0.2 A
	Transmitting No.1	5.5 A or less	3.2 A
	Transmitting No.2	5.5 A or less	3.4 A

(3) Power distribution board Test

Voltage		Current	
Solar battery output	14.2 V	Solar battery output	A
Storage battery	14.2 V	Load current (Transmitting)	3.2 A
		Load current (Stand-by)	64 mA

-4. Performance Test

Item	Standard	Results
Repeater start	Local and remote	GOOD
Repeater stop	Local and remote	GOOD
TX changeover	TX No.1 to TX No.2, TX No.2 to TX No.1	GOOD
TX changeover lock	TX changeover is prohibited manually in operating panel.	GOOD
TX off	TX is set to unavailable manually at operating panel.	GOOD
Receiver separation	When RX has faults, it shall cutout from parallel running automatically.	GOOD
Reset fault	Transmitter/receiver fault or receiver separation is cleared manually.	GOOD
Voice communication	Voice communication is performed with master and gauging stations.	GOOD
Measuring meter	RX LIM, RX OUT, TX OUT and PA OUT are referred to measuring meter.	GOOD

Repeater status	Repeater ON	All item shall transmit to master station during observation time automatically	GOOD
	Repeater OFF		GOOD
	TX No.1 operation		GOOD
	TX No.2 operation		GOOD
	TX No.1 fault		GOOD
	TX No.2 fault		GOOD
	Equipment door open		GOOD
	Station door open		GOOD

-5. Radio Propagation Test

(1) Radio Signal Strength

Antenna height	Feeder length	Feeder type	Coaxial arrester loss	Antenna type
AGL (m)	(m)		(dB)	
5.8 m	TX 8 m	10D-2E	0.1 dB	Sleeve type 2.15 dBi gain
	RX 9.5 m			
	TX 2.5 m	5D-2V		
	RX 2.5 m			

Income Signal	
Marrakech → Aoulouss	36.5 dBμV
Tourcht (1W) → Aoulouss	47.6 dBμV
Tazzitount → Aoulouss	42.7 dBμV

Note: Existence of Interference: None
Existence of City noise: None

(2) S/N Ratio (1000Hz, -4dBm input)

Station	Signal level	Noise level	S/N ratio
Marrakech → Aoulouss	-3.7 dBm	-54.9 dBm	51.2 dB
Tourcht → Aoulouss	-3.6 dBm	-56.0 dBm	52.4 dB
Tazzitount → Aoulouss	-3.5 dBm	-49.2 dBm	45.7 dB

3. Adra Tazaina Repeater Station

Inspection Date	Tested by	Inspected by	Weather	Temperature
22/Jun/2003	N. Gomi		Fair	
15/Jul/2003	K. Usui		Fair	

Repeater Equipment		Status Return Unit		Antenna Filter	
Model	GWD-650	Model	GWD-1556	Model	7AFWD0370
Serial No.	DY47428	Station No.	62 (3EH)	Serial No.	02C932
Manufacture	Jan. 2003	RP status	Word: 00		

Radio Equipment No.1		
Model		GWD-73-10
Serial No.		DG47428-1
Transmitter	Model	NSE-720-1
	Serial No.	DM59956
	Frequency	70.325MHz
	Amplifier	NAH-720-10
	Serial No.	DM60370
	Power	10W
Receiver	Model	NRE-720
	Serial No.	DM59645
	Frequency	72.325MHz

Radio Equipment No.2		
Model		GWD-73-10
Serial No.		DG47428-2
Transmitter	Model	NSE-720-1
	Serial No.	DM59959
	Frequency	70.325MHz
	Amplifier	NAH-720-10
	Serial No.	DM60369
	Power	10W
Receiver	Model	NRE-720
	Serial No.	DM59648
	Frequency	72.325MHz

-1. Inventory Check

Please refer to the attached list

-2. Installation Check

No.	Item	Check point	Results
1	Repeater Equipment	Fixing and wiring	GOOD
2	Solar Panel and protection cage	Fixing and wiring	GOOD
3	Solar panel power distribution Board	Fixing and wiring	GOOD
4	Door switch	Fixing and wiring	GOOD
5	Battery	Fixing and wiring	GOOD
6	Antenna Mast	Fixing and wiring	GOOD
7	Antenna and feeder	Fixing and wiring	GOOD
8	Coaxial Arrester	Fixing and wiring	GOOD
9	Lightning Rod	Fixing and wiring	GOOD
10	Grounding system	Fixing and wiring	GOOD
11	Site Cleaning	Clean or not	GOOD

-3. Individual Equipment Test

(1) Radio Equipment (GWD-73-10)

Transmitter	Forwarded power	Reflected power	V.S.W.R
No.1	10.0 W	0.23 W	1.36
No.2	10.0 W	0.23 W	1.36

(2) Repeater Equipment GWD-650

Item		Standard	Measured Value
Input voltage		10.8V-14.5V DC	14.0 V
Power Consumptions	Stand-by	100mA or less	64 mA
	Receiving	2.0 A or less	0.2 A
	Transmitting No.1	5.5 A or less	3.2 A
	Transmitting No.2	5.5 A or less	3.2 A

(3) Power distribution board Test

Voltage		Current	
Solar battery output	14 V	Solar battery output	A
Storage battery	14 V	Load current (Transmitting)	3.2 A
		Load current (Stand-by)	64 mA

-4. Performance Test

Item	Standard	Results
Repeater start	Local and remote	GOOD
Repeater stop	Local and remote	GOOD
TX changeover	TX No.1 to TX No.2, TX No.2 to TX No.1	GOOD
TX changeover lock	TX changeover is prohibited manually in operating panel.	GOOD
TX off	TX is set to unavailable manually at operating panel.	GOOD
Receiver separation	When RX has faults, it shall cutout from parallel running automatically.	GOOD
Reset fault	Transmitter/receiver fault or receiver separation is cleared manually.	GOOD
Voice communication	Voice communication is performed with master and gauging stations.	GOOD
Measuring meter	RX LIM, RX OUT, TX OUT and PA OUT are referred to measuring meter.	GOOD

Repeater status	Repeater ON	All item shall transmit to master station during observation time automatically	GOOD
	Repeater OFF		GOOD
	TX No.1 operation		GOOD
	TX No.2 operation		GOOD
	TX No.1 fault		GOOD
	TX No.2 fault		GOOD
	Equipment door open		GOOD
	Station door open		GOOD

-5. Radio Propagation Test

(2) Radio Signal Strength

Antenna height	Feeder length	Feeder type	Coaxial arrester loss	Antenna type
AGL (m)	(m)		(dB)	
Around 5 to 6 m	TX 47.15 m	10D-2E	0.1 dB	Sleeve type 2.15 dBi gain
	RX 42.15 m			
	TX 2.6 m	5D-2V		
	RX 2.6 m			

Income Signal		
Marrakech → Adar Tazaina	40.2	dBμV
Agouns → Adar Tazaina	(*1)	dBμV
Tiourdiou → Adar Tazaina	45.5	dBμV
Amenzal (1W) → Adar Tazaina	57.4	dBμV

*1: Reference: 55.9 dBμV before frequency has been changed.

Note: Existence of Interference: None
Existence of City noise: None

(2) S/N Ratio (1000Hz, -4dBm input)

Station	Signal level		Noise level		S/N ratio	
Marrakech → Adar Tazaina	-3.5	dBm	-52.0	dBm	48.5	dB
Agouns → Adar Tazaina		dBm		dBm		dB
Tiourdiou → Adar Tazaina	-3.3	dBm	-57.5	dBm	54.2	dB
Amenzal → Adar Tazaina	-3.2	dBm	-57.0	dBm	53.8	dB

4. Tazzitount Observation Station

Inspection Date	Tested by	Inspected by	Weather	Temperature
2/Jul/2003	K. Usui		Fair	
17/Jul/2003	N. Gomi		Fair & Lightning	

Remote Terminal Unit					
Model	GWD-3015	Station No.	05 (05H)	Rainfall	Word: 00
Serial No.	DY46877	System No.	09 (09H)	Water level	Word: 01
Manufacture	Aug. 2001	Group/Area	1FH	FS Frequency	1700±400Hz
		Response order	02		
		Transmission	1200bps		

Radio Equipment			
Model		GWD-73-10	
Serial No.		DG46877	
Transmitter		Receiver	
Model	NSE-720-1	Model	NRE-720
Serial No.	DM59952	Serial No.	DM59641
Frequency	72.325MHz	Frequency	70.325MHz
Amplifier	NAH-720-10		
Serial No.	DM60363		
Power	10W		

-1. Inventory Check

Please refer to the attached list

-2. Installation Check

No.	Item	Check point	Results
1	Radio Equipment	Fixing and wiring	GOOD
2	Antenna Mast	Fixing and wiring	GOOD
3	Antenna and feeder	Fixing and wiring	GOOD
4	Coaxial Arrester	Fixing and wiring	GOOD
5	Lightning Rod	Fixing and wiring	GOOD
6	Grounding system	Fixing and wiring	GOOD
7	Site Cleaning	Clean or not	GOOD

-3. Individual Equipment Test

(1) Radio Equipment

Transmitter	Forwarded power	Reflected power	V.S.W.R
No.1	10.0 W	0.15 W	1.28

(2) Remote Terminal Unit

Item		Standard	Measured value
Input voltage		10.8V-14.5V DC	13.8 V
FS frequency	Space frequency	Within 2100Hz±10Hz at TA side U-link on CME-4091	2100 Hz
	Mark frequency	Within 1300Hz±10Hz at TA side U-link on CME-4091	1300 Hz
Signal level	Input level	Within 0dB±2dB at S/N terminal on CME-4091 when -26dBm input from RA side U-link	0 dBs
	Output level	Within -10dBm±2dBm at TA side U-link on CME-4091	-10.0 dBm

(3) Power distribution board Test

Voltage		Current	
Solar battery output	13.8 V	Solar battery output	A
Storage battery	13.8 V	Load current (Transmitting)	3.2 A
		Load current (Stand-by)	43 mA

-4. Performance Test

Item	Standard	Results
Water level indication	Shall display input data on LCD display	GOOD
Rainfall pulse count up indication	Shall display input data on LCD display	GOOD
Data logger Functions (Existing function)	Data logger functions that are operating at site work correctly after the following new functions are added. (Please refer to attached data sheets about the existing functions.)	GOOD
Response operation	Response signal is transmitted in response to calling signal from master station.	GOOD
Warning water level	Event reporting is performed when preset upper caution water level has been exceeded.	GOOD
Rainfall detection	Event reporting is performed in detection of 1-mm raining start.	GOOD
Lock	Remote terminal unit does not event-report “caution water level exceeding” or “raining” after receiving lock signal from master station. It recovers to transmit with unlock signal.	GOOD
Voice communication	Voice communication is performed with master and repeater station.	GOOD
Test transmission	Test transmission is performed by operator.	GOOD
Repeater control	Repeater control (start/stop/TX changeover) is performed by operator.	GOOD
Manual data sending	Data can send by manual operation	GOOD

-5. Radio Propagation Test

(1) Radio Signal Strength

Antenna height AGL (m)	Feeder length (m)	Feeder type	Coaxial arrester loss (dB)	Antenna type
7 m	15.5 m	10D-2E	0.1 dB	2-EL Yagi type 4.65 dBi gain
	2.3 m	5D-2V		

Income Signal	
Aoulouss → Tazzitount	53.4 dBμV

Note: Existence of Interference: None
Existence of City noise: None

(2) S/N Ratio (1000Hz, -4dBm input)

Station	Signal level	Noise level	S/N ratio
Marrakech → Tazzitount	6.1 dBm	-35.3 dBm	41.4 dB
Aoulouss (TX1) → Tazzitount	5.3 dBm	-48.5 dBm	53.8 dB

5. Tourcht Observation Station

Inspection Date	Tested by	Inspected by	Weather	Temperature
29/Jun/2003	K. Usui		Fair & Lightning	
17/Jul/2003	N. Gomi		Fair & Lightning	

Remote Terminal Unit					
Model	GWD-3015	Station No.	01 (01H)	Rainfall	Word: 00
Serial No.	DY46873	System No.	09 (09H)	Water level	
Manufacture	Aug. 2001	Group/Area	1FH	FS Frequency	1700±400Hz
		Response order	01		
		Transmission	1200bps		

Radio Equipment			
Model		GWD-73-10	
Serial No.		DG46873	
Transmitter		Receiver	
Model	NSE-720-1	Model	NRE-720
Serial No.	DM59951	Serial No.	DM59640
Frequency	72.325MHz	Frequency	70.325MHz
Amplifier			
Serial No.			
Power	1W		

-1. Inventory Check

Please refer to the attached list

-2. Installation Check

No.	Item	Check point	Results
1	Radio Equipment	Fixing and wiring	GOOD
2	Antenna Mast	Fixing and wiring	GOOD
3	Antenna and feeder	Fixing and wiring	GOOD
4	Coaxial Arrester	Fixing and wiring	GOOD
5	Lightning Rod	Fixing and wiring	GOOD
6	Grounding system	Fixing and wiring	GOOD
7	Site Cleaning	Clean or not	GOOD

-3. Individual Equipment Test

(1) Radio Equipment

Transmitter	Forwarded power	Reflected power	V.S.W.R
No.1	1.0 W	0.01 W	1.22

(2) Remote Terminal Unit

Item		Standard	Measured value
Input voltage		10.8V-14.5V DC	14.0 V
FS frequency	Space frequency	Within 2100Hz±10Hz at TA side U-link on CME-4091	2100 Hz
	Mark frequency	Within 1300Hz±10Hz at TA side U-link on CME-4091	1300 Hz
Signal level	Input level	Within 0dB±2dB at S/N terminal on CME-4091 when -26dBm input from RA side U-link	0 dBs
	Output level	Within -10dBm±2dBm at TA side U-link on CME-4091	-10.0 dBm

(3) Power distribution board Test

Voltage		Current	
Solar battery output	14.0 V	Solar battery output	A
Storage battery	14.0 V	Load current (Transmitting)	1.0 A
		Load current (Stand-by)	49 mA

-4. Performance Test

Item	Standard	Results
Water level indication	Shall display input data on LCD display	GOOD
Rainfall pulse count up indication	Shall display input data on LCD display	GOOD
Data logger Functions (Existing function)	Data logger functions that are operating at site work correctly after the following new functions are added. (Please refer to attached data sheets about the existing functions.)	GOOD
Response operation	Response signal is transmitted in response to calling signal from master station.	GOOD
Warning water level	Event reporting is performed when preset upper caution water level has been exceeded.	GOOD
Rainfall detection	Event reporting is performed in detection of 1-mm raining start.	GOOD
Lock	Remote terminal unit does not event-report “caution water level exceeding” or “raining” after receiving lock signal from master station. It recovers to transmit with unlock signal.	GOOD
Voice communication	Voice communication is performed with master and repeater station.	GOOD
Test transmission	Test transmission is performed by operator.	GOOD
Repeater control	Repeater control (start/stop/TX changeover) is performed by operator.	GOOD
Manual data sending	Data can send by manual operation	GOOD

-5. Radio Propagation Test

(1) Radio Signal Strength

Antenna height	Feeder length	Feeder type	Coaxial arrester loss	Antenna type
AGL (m)	(m)		(dB)	
7 m	9.8 m	10D-2E	0.1 dB	2-EL Yagi type 4.65 dBi gain
	2.6 m	5D-2V		

Income Signal	
Aoulouss → Tourcht	55.2 dBμV

Note: Existence of Interference: None
Existence of City noise: None

(2) S/N Ratio (1000Hz, -4dBm input)

Station	Signal level	Noise level	S/N ratio
Marrakech → Tourcht	6.2 dBm	-42.8 dBm	49.0 dB
Aoulouss (TX1) → Tourcht	5.3 dBm	-48.5 dBm	53.8 dB

6. Amenzal Observation Station

Inspection Date	Tested by	Inspected by	Weather	Temperature
25/Jun/2003	N. Gomi		Fair	
15/Jul/2003			Fair	

Remote Terminal Unit					
Model	GWD-3015	Station No.	04 (04H)	Rainfall	Word: 00
Serial No.	DY46876	System No.	09 (09H)	Water level	Word: 01
Manufacture	Aug. 2001	Group/Area	2FH	FS Frequency	1700±400Hz
		Response order	03		
		Transmission	1200bps		

Radio Equipment			
Model		GWD-73-10	
Serial No.		DG46876	
Transmitter		Receiver	
Model	NSE-720-1	Model	NRE-720
Serial No.	DM59953	Serial No.	DM59642
Frequency	72.325MHz	Frequency	70.325MHz
Amplifier			
Serial No.			
Power	1W		

-1. Inventory Check

Please refer to the attached list

-2. Installation Check

No.	Item	Check point	Results
1	Radio Equipment	Fixing and wiring	GOOD
2	Antenna Mast	Fixing and wiring	GOOD
3	Antenna and feeder	Fixing and wiring	GOOD
4	Coaxial Arrester	Fixing and wiring	GOOD
5	Lightning Rod	Fixing and wiring	GOOD
6	Grounding system	Fixing and wiring	GOOD
7	Site Cleaning	Clean or not	GOOD

-3. Individual Equipment Test

(1) Radio Equipment

Transmitter	Forwarded power	Reflected power	V.S.W.R
No.1	1.0 W	0.01 W	1.22

(2) Remote Terminal Unit

Item		Standard	Measured value
Input voltage		10.8V-14.5V DC	14.2 V
FS frequency	Space frequency	Within 2100Hz±10Hz at TA side U-link on CME-4091	2100 Hz
	Mark frequency	Within 1300Hz±10Hz at TA side U-link on CME-4091	1300 Hz
Signal level	Input level	Within 0dB±2dB at S/N terminal on CME-4091 when -26dBm input from RA side U-link	0 dBs
	Output level	Within -10dBm±2dBm at TA side U-link on CME-4091	-10.0 dBm

(3) Power distribution board Test

Voltage		Current	
Solar battery output	14.2 V	Solar battery output	A
Storage battery	14.2 V	Load current (Transmitting)	1.4 A
		Load current (Stand-by)	40 mA

-4. Performance Test

Item	Standard	Results
Water level indication	Shall display input data on LCD display	GOOD
Rainfall pulse count up indication	Shall display input data on LCD display	GOOD
Data logger Functions (Existing function)	Data logger functions that are operating at site work correctly after the following new functions are added. (Please refer to attached data sheets about the existing functions.)	GOOD
Response operation	Response signal is transmitted in response to calling signal from master station.	GOOD
Warning water level	Event reporting is performed when preset upper caution water level has been exceeded.	GOOD
Rainfall detection	Event reporting is performed in detection of 1-mm raining start.	GOOD
Lock	Remote terminal unit does not event-report “caution water level exceeding” or “raining” after receiving lock signal from master station. It recovers to transmit with unlock signal.	GOOD
Voice communication	Voice communication is performed with master and repeater station.	GOOD
Test transmission	Test transmission is performed by operator.	GOOD
Repeater control	Repeater control (start/stop/TX changeover) is performed by operator.	GOOD
Manual data sending	Data can send by manual operation	GOOD

-5. Radio Propagation Test

(1) Radio Signal Strength

Antenna height	Feeder length	Feeder type	Coaxial arrester loss	Antenna type
AGL (m)	(m)		(dB)	
7 m	20 m	10D-2E	0.1 dB	2-EL Yagi type 4.65 dBi gain
	4.2 m	5D-2V		

Income Signal	
Adar Tazaina → Amenzal	75.0 dBμV

Note: Existence of Interference: None
Existence of City noise: None

(2) S/N Ratio (1000Hz, -4dBm input)

Station	Signal level	Noise level	S/N ratio
Marrakech → Amenzal	6.1 dBm	-45.7 dBm	51.8 dB
Adar Tazaina (TX1) → Amenzal	5.7 dBm	-48.1 dBm	53.8 dB

7. Tiourdiou Observation Station

Inspection Date	Tested by	Inspected by	Weather	Temperature
4/Jul/2003	N. Gomi		Fair	
16/Jul/2003			Fair	

Remote Terminal Unit					
Model	GWD-3015	Station No.	03 (03H)	Rainfall	Word: 00
Serial No.	DY46875	System No.	09 (09H)	Water level	Word: 01
Manufacture	Aug. 2001	Group/Area	2FH	FS Frequency	1700±400Hz
		Response order	02		
		Transmission	1200bps		

Radio Equipment			
Model		GWD-73-10	
Serial No.		DG46875	
Transmitter		Receiver	
Model	NSE-720-1	Model	NRE-720
Serial No.	DM59954	Serial No.	DM59643
Frequency	72.325MHz	Frequency	70.325MHz
Amplifier	NAH-720-10		
Serial No.	DM60365		
Power	10W		

-1. Inventory Check

Please refer to the attached list

-2. Installation Check

No.	Item	Check point	Results
1	Radio Equipment	Fixing and wiring	GOOD
2	Antenna Mast	Fixing and wiring	GOOD
3	Antenna and feeder	Fixing and wiring	GOOD
4	Coaxial Arrester	Fixing and wiring	GOOD
5	Lightning Rod	Fixing and wiring	GOOD
6	Grounding system	Fixing and wiring	GOOD
7	Site Cleaning	Clean or not	GOOD

-3. Individual Equipment Test

(1) Radio Equipment

Transmitter	Forwarded power	Reflected power	V.S.W.R
No.1	9.8 W	0.1 W	1.22

(2) Remote Terminal Unit

Item		Standard	Measured value
Input voltage		10.8V-14.5V DC	14.2 V
FS frequency	Space frequency	Within 2100Hz±10Hz at TA side U-link on CME-4091	2100 Hz
	Mark frequency	Within 1300Hz±10Hz at TA side U-link on CME-4091	1300 Hz
Signal level	Input level	Within 0dB±2dB at S/N terminal on CME-4091 when -26dBm input from RA side U-link	0 dBs
	Output level	Within -10dBm±2dBm at TA side U-link on CME-4091	-10.0 dBm

(3) Power distribution board Test

Voltage		Current	
Solar battery output	14.2 V	Solar battery output	A
Storage battery	14.2 V	Load current (Transmitting)	3.5 A
		Load current (Stand-by)	30 mA

-4. Performance Test

Item	Standard	Results
Water level indication	Shall display input data on LCD display	GOOD
Rainfall pulse count up indication	Shall display input data on LCD display	GOOD
Data logger Functions (Existing function)	Data logger functions that are operating at site work correctly after the following new functions are added. (Please refer to attached data sheets about the existing functions.)	GOOD
Response operation	Response signal is transmitted in response to calling signal from master station.	GOOD
Warning water level	Event reporting is performed when preset upper caution water level has been exceeded.	GOOD
Rainfall detection	Event reporting is performed in detection of 1-mm raining start.	GOOD
Lock	Remote terminal unit does not event-report “caution water level exceeding” or “raining” after receiving lock signal from master station. It recovers to transmit with unlock signal.	GOOD
Voice communication	Voice communication is performed with master and repeater station.	GOOD
Test transmission	Test transmission is performed by operator.	GOOD
Repeater control	Repeater control (start/stop/TX changeover) is performed by operator.	GOOD
Manual data sending	Data can send by manual operation	GOOD

-5. Radio Propagation Test

(1) Radio Signal Strength

Antenna height	Feeder length	Feeder type	Coaxial arrester loss	Antenna type
AGL (m)	(m)		(dB)	
7 m	8.0 m	10D-2E	0.1 dB	2-EL Yagi type 4.65 dBi gain
	2.3 m	5D-2V		

Income Signal	
Adar Tazaina → Tiourdiou	31.5 dBμV

Note: Existence of Interference: None
Existence of City noise: None

(2) S/N Ratio (1000Hz, -4dBm input)

Station	Signal level	Noise level	S/N ratio
Marrakech → Tiourdiou	6.3 dBm	-42.7 dBm	49.0 dB
Adar Tazaina (TX1) → Tiourdiou	5.6 dBm	-43.7 dBm	49.3 dB

8. Agouns Observation Station

Inspection Date	Tested by	Inspected by	Weather	Temperature
6/Jul/2003	N. Gomi		Fair	
18/Jul/2003			Fair & Lightning	

Remote Terminal Unit					
Model	GWD-3015	Station No.	02 (02H)	Rainfall	Word: 00
Serial No.	DY46878	System No.	09 (09H)	Water level	
Manufacture	Aug. 2001	Group/Area	2FH	FS Frequency	1700±400Hz
		Response order	01		
		Transmission	1200bps		

Radio Equipment			
Model		GWD-73-10	
Serial No.		DG46874	
Transmitter		Receiver	
Model	NSE-720-1	Model	NRE-720
Serial No.	DM61085	Serial No.	DM60984
Frequency	72.325MHz	Frequency	70.325MHz
Amplifier	NAH-720-10		
Serial No.	DM60598		
Power	10W		

-1. Inventory Check

Please refer to the attached list

-2. Installation Check

No.	Item	Check point	Results
1	Radio Equipment	Fixing and wiring	GOOD
2	Antenna Mast	Fixing and wiring	GOOD
3	Antenna and feeder	Fixing and wiring	GOOD
4	Coaxial Arrester	Fixing and wiring	GOOD
5	Lightning Rod	Fixing and wiring	GOOD
6	Grounding system	Fixing and wiring	GOOD
7	Site Cleaning	Clean or not	GOOD

-3. Individual Equipment Test

(1) Radio Equipment

Transmitter	Forwarded power	Reflected power	V.S.W.R
No.1	10.0 W	0.08 W	1.20

(2) Remote Terminal Unit

Item		Standard	Measured value
Input voltage		10.8V-14.5V DC	13.5 V
FS frequency	Space frequency	Within 2100Hz±10Hz at TA side U-link on CME-4091	2100 Hz
	Mark frequency	Within 1300Hz±10Hz at TA side U-link on CME-4091	1300 Hz
Signal level	Input level	Within 0dB±2dB at S/N terminal on CME-4091 when -26dBm input from RA side U-link	0 dBs
	Output level	Within -10dBm±2dBm at TA side U-link on CME-4091	-10.0 dBm

(3) Power distribution board Test

Voltage		Current	
Solar battery output	13.5 V	Solar battery output	A
Storage battery	13.5 V	Load current (Transmitting)	3.3 A
		Load current (Stand-by)	30 mA

-4. Performance Test

Item	Standard	Results
Water level indication	Shall display input data on LCD display	GOOD
Rainfall pulse count up indication	Shall display input data on LCD display	GOOD
Data logger Functions (Existing function)	Data logger functions that are operating at site work correctly after the following new functions are added. (Please refer to attached data sheets about the existing functions.)	GOOD
Response operation	Response signal is transmitted in response to calling signal from master station.	GOOD
Warning water level	Event reporting is performed when preset upper caution water level has been exceeded.	GOOD
Rainfall detection	Event reporting is performed in detection of 1-mm raining start.	GOOD
Lock	Remote terminal unit does not event-report “caution water level exceeding” or “raining” after receiving lock signal from master station. It recovers to transmit with unlock signal.	GOOD
Voice communication	Voice communication is performed with master and repeater station.	GOOD
Test transmission	Test transmission is performed by operator.	GOOD
Repeater control	Repeater control (start/stop/TX changeover) is performed by operator.	GOOD
Manual data sending	Data can send by manual operation	GOOD

-5. Radio Propagation Test

(1) Radio Signal Strength

Antenna height	Feeder length	Feeder type	Coaxial arrester loss	Antenna type
AGL (m)	(m)		(dB)	
7 m	11.9 m	10D-2E	0.1 dB	2-EL Yagi type 4.65 dBi gain
	2.1 m	5D-2V		

Income Signal	
Adar Tazaina → Agouns	43.5 dBμV

Note: Existence of Interference: None
Existence of City noise: None

(2) S/N Ratio (1000Hz, -4dBm input)

Station	Signal level	Noise level	S/N ratio
Marrakech → Agouns	5.8 dBm	-45.4 dBm	51.2 dB
Adar Tazaina (TX1) → Agouns	dBm	dBm	dB

II Warning Radio System

9. Tahannaout Warning Station

Inspection Date	Tested by	Inspected by	Weather	Temperature
14/Jul/2003	N. Gomi		Fair	

VHF Radio Equipment			
Model	IC-F310	Output Power	25W
Serial No.	67405		
TX Frequency CH1	154.000MHz	RX frequency CH1	160.825MHz
TX Frequency CH2	154.125MHz	RX frequency CH2	160.650MHz

-1. Inventory Check

Please refer to the attached list

-2. Installation Check

No.	Item	Check point	Results
1	Radio Equipment	Fixing and wiring	GOOD
2	Antenna Mast	Fixing and wiring	Existing
3	Antenna and feeder	Fixing and wiring	GOOD
4	Coaxial Arrester	Fixing and wiring	GOOD
5	Lightning Rod	Fixing and wiring	NONE
6	Grounding system	Fixing and wiring	GOOD
7	Site Cleaning	Clean or not	GOOD

-3. Individual Equipment Test

(1) Radio Equipment

Transmitter	Forwarded power	Reflected power	V.S.W.R
CH1	24.0 W	0.1 W	1.14
CH2	24.0 W	0.1 W	1.14

(2) AC Power supply unit

Voltage		Current	
Input	213 V AC	Input	A
Output	13.58 V DC	Output TX (CH1)	4.68 A
		Output TX (CH2)	A
		Output RX	370 mA
		Output ST-BY (Light Off)	150 mA
		Output ST-BY (Light On)	160 mA

-4. Performance Test

Item	Standard	Results
Voice communication	Voice communication can be possible	GOOD
Selective call function	5-tone selective calling function can be possible	GOOD
Calling sound	When partner station calls, calling sound shall blow on siren and stop manually	GOOD

-5. Radio Propagation Test

(1) Radio Signal Strength

Antenna height	Feeder length	Feeder type	Coaxial arrester loss	Antenna type
AGL (m)	(m)		(dB)	
10 m	47.6 m	10D-2E	0.1 dB	3-EL Yagi type 8 dBi gain
	2.5 m	5D-2V		

Note: Existence of Interference: None
Existence of City noise: None

Income Signal	
CH1	39.5 dBμV
CH2	37.9 dBμV

(2) S/N Ratio

Signal level	Noise level	S/N ratio

10. **Ourica Caidat Warning Station**

Inspection Date	Tested by	Inspected by	Weather	Temperature
11/Jul/2003	K. Usui		Fair	

VHF Radio Equipment			
Model	IC-F310	Output Power	25W
Serial No.	64041		
TX Frequency CH1	154.000MHz	RX frequency CH1	160.825MHz
TX Frequency CH2	154.125MHz	RX frequency CH2	160.650MHz

-1. Inventory Check

Please refer to the attached list

-2. Installation Check

No.	Item	Check point	Results
1	Radio Equipment and 5-tone unit	Fixing and wiring	GOOD
2	Antenna Mast	Fixing and wiring	GOOD
3	Antenna and feeder	Fixing and wiring	GOOD
4	Coaxial Arrester	Fixing and wiring	GOOD
5	Lightning Rod	Fixing and wiring	NONE
6	Grounding system	Fixing and wiring	GOOD
7	Siren	Fixing and wiring	GOOD
8	Site cleaning	Clean or not	GOOD

-3. Individual Equipment Test

(1) Radio Equipment

Transmitter	Forwarded power	Reflected power	V.S.W.R
CH1	26.0 W	0.6 W	1.36
CH2	26.0 W	0.5 W	1.32

(2) Power supply unit (Charger with battery)

Voltage		Current	
Input	208 V AC	Capacity	12V, 100AH
Output	13.62 V DC	Output TX (CH1)	4.6 A
		Output TX (CH2)	4.8 A
		Output RX	400 mA
		Output ST-BY (Light Off)	mA
		Output ST-BY (Light On)	170 mA

-4. Performance Test

Item	Standard	Results
Voice communication	Voice communication can be possible	GOOD
Selective call function	5-tone selective calling function can be possible	GOOD
Calling sound	When partner station calls, calling sound shall blow on siren and stop manually	GOOD

-5. Radio Propagation Test

(1) Radio Signal Strength

Antenna height	Feeder length	Feeder type	Coaxial arrester loss	Antenna type
AGL (m)	(m)		(dB)	
22.5 m	48.7 m	10D-2E	0.1 dB	3-EL Yagi type 8 dBi gain
	4.8 m	5D-2V		

Note: Existence of Interference: None
Existence of City noise: None

Income Signal	
CH1	61.0 dBμV
CH2	20.3 dBμV

(2) S/N Ratio

Signal level	Noise level	S/N ratio

11. **Iragf Warning Station**

Inspection Date	Tested by	Inspected by	Weather	Temperature
9/Jul/2003	K. Usui		Fair	
24/Jul/2003	K. Usui		Fair & Rain	

VHF Radio Equipment			
Model	IC-F310	Output Power	25W
Serial No.	64002		
TX Frequency CH1	154.000MHz	RX frequency CH1	160.825MHz
TX Frequency CH2	154.125MHz	RX frequency CH2	160.650MHz

-1. Inventory Check

Please refer to the attached list

-2. Installation Check

No.	Item	Check point	Results
1	Radio Equipment and 5-tone unit	Fixing and wiring	GOOD
2	Antenna Mast	Fixing and wiring	Existing
3	Antenna and feeder	Fixing and wiring	Existing
4	Coaxial Arrester	Fixing and wiring	Existing
5	Lightning Rod	Fixing and wiring	Existing
6	Grounding system	Fixing and wiring	Existing
7	Siren	Fixing and wiring	GOOD
8	Site cleaning	Clean or not	GOOD

-3. Individual Equipment Test

(1) Radio Equipment

Transmitter	Forwarded power	Reflected power	V.S.W.R
CH1	26.8 W	0.5 W	1.32
CH2	26.8 W	0.5 W	1.32

(2) AC Power supply unit

Voltage		Current	
Input	200 V AC	Input	A
Output	12.10 V DC	Output TX (CH1)	5.3 A
		Output TX (CH2)	5.2 A
24th Jul:		Output RX	420 mA
Input	184 V AC	Output ST-BY (Light Off)	160 mA
		Output ST-BY (Light On)	170 mA

-4. Performance Test

Item	Standard	Results
Voice communication	Voice communication can be possible	GOOD
Selective call function	5-tone selective calling function can be possible	GOOD
Calling sound	When partner station calls, calling sound shall blow on siren and stop manually	GOOD

-5. Radio Propagation Test

(1) Radio Signal Strength

Antenna height	Feeder length	Feeder type	Coaxial arrester loss	Antenna type
AGL (m)	(m)		(dB)	
Existing	Existing	Existing	Existing	Omni-directional 2 dBi gain

Note: Existence of Interference: None
Existence of City noise: None

Income Signal		
CH1	18.0	dBμV
CH2	-7.0	dBμV

(2) S/N Ratio

Signal level	Noise level	S/N ratio

III. Data Processing System

The spot examination results document

NO.	Inspection item	Work contents	Judgment standard	Judgment	Note
1. 1.1	Interface Convert Unit Specification	The specification of this Unit is as follows and have the function which distributes the data outputted from the Telemetry supervisory equipment to data-processing equipment by LAN. Interface：Serial(Considerable RS-232C) Input speed ：1,200bps～19.2kbps Grade Sync. method：ASYNC Com. Control：Telemeter output agrees No. of Data input：2 port Above Network：10BASE-T / 100BASE-TX No. of Data output：TCP/IP 2 port Above	< WAN Side > Interface：Serial D-SUB25pin RS-232C of EIA conform Input speed：9,600bps(Com. speed) Sync. Method：ASYNC Com. Control：Telemeter output agrees No. of Data input：2 port (Serial D-SUB25pin) < LAN Side > Network：10BASE-T / 100BASE-TX Auto detection change No. of Data output：TCP/IP 1 port Two or more ports are supported by HUB connection.	Good Good Good	Only one port is in use.

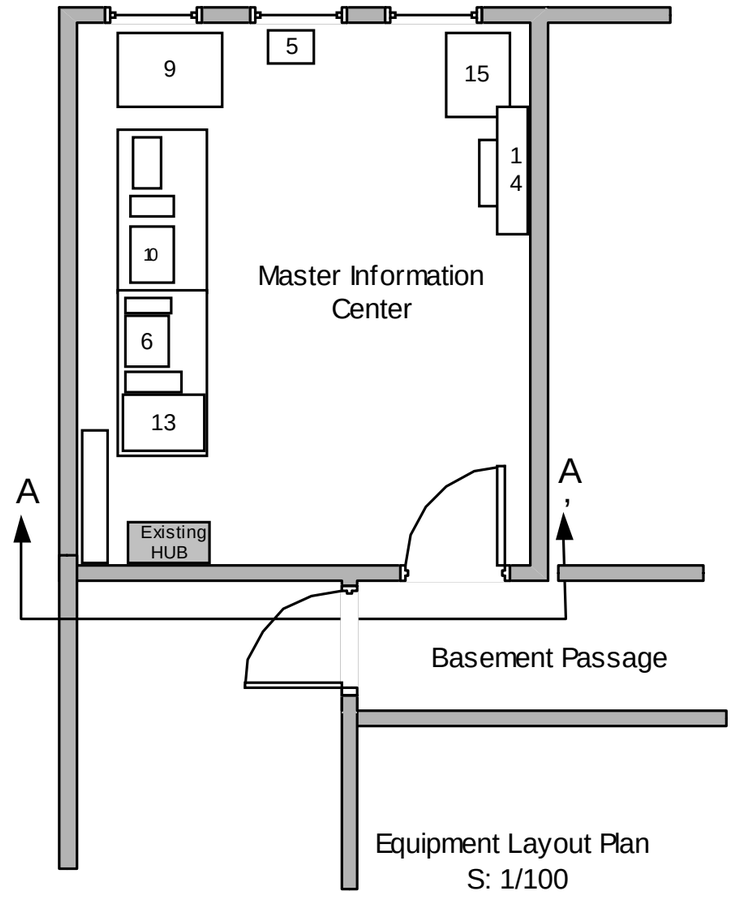
The spot examination results document

NO.	Inspection item	Work contents	Judgment standard	Judgment	Note
1.2	WAN Communication (Between Telemetry supervisory equipment)	Perform data communications with Telemetry supervisory equipment by the following communication specifications. Input line ：1 line(1 versus 1) Partner Communication point： Telemetry supervisory equipment Signal regulation ： RS-232C of EIA conform communication method：Half-duplex transmission control method： Basic protocol(Non procedural) Sync. method：ASYNC Communication speed：9,600bps <Mark composition> Start bit 1bit Stop bit 1bit Character bit 8bit (JIS8 unit code) Parity bit none <Mark official approval> Character (Even parity) Text (BCC new spec.) Standard Horizontal parity (even number parity) Delimiter CR-LF (2 character continuation) Max. text length 255 Character(STX～LF)	It can check that data communications can be normally performed on mentioned communication conditions.	Good	

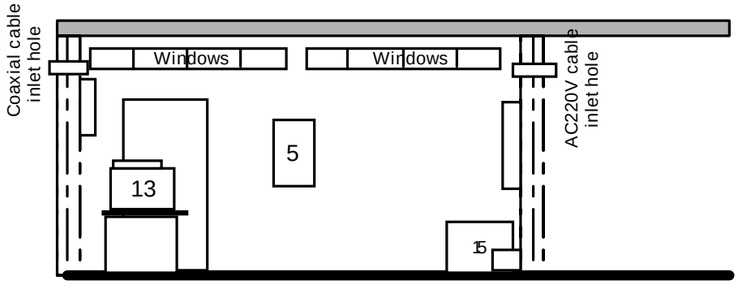
The spot examination results document

NO.	Inspection item	Work contents	Judgment standard	Judgment	Note
1.3	On-line data reception	The following observation classification data is receivable from Telemetry supervisory equipment. ・00min. ・10min. or 30min. ・Observation by the unusual value（Event observation）	It can check that on-line data reception can be performed normally. Receiving data can express as the WEB contents of Client PC and Monitoring Station PC normally.	Good	
1.4	Transmission of an alarm judging	Data-processing equipment performs primary operation after on-line data reception, and the result can be transmitted.	It can check that alarm judging processing can be performed normally. Moreover, Telemetry supervisory equipment is being able to resonate the buzzer of the corresponding alarm item using alarm information.	Good	
1.5	The past observation data request	Communication Control Unit is being able to request the past observation data of Telemetry supervisory equipment. And resending the past data received to the Data Processing Equipment normally.	Data-processing equipment is being able to check a past observation data demand being performed to a surveillance control device via CCU. And resending the past data received to the Data Processing Equipment normally	Good	

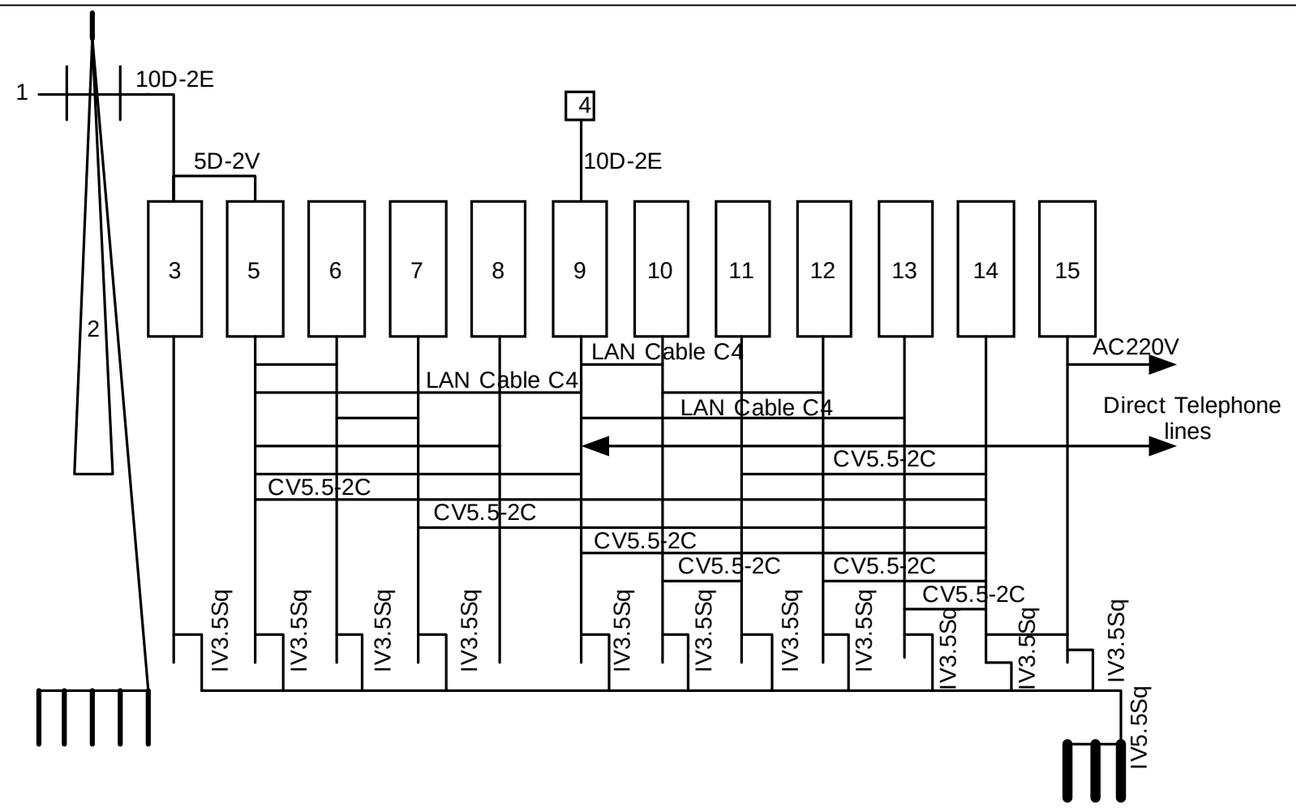
IV. PILOT PROJECT INSTALLATION DRAWINGS



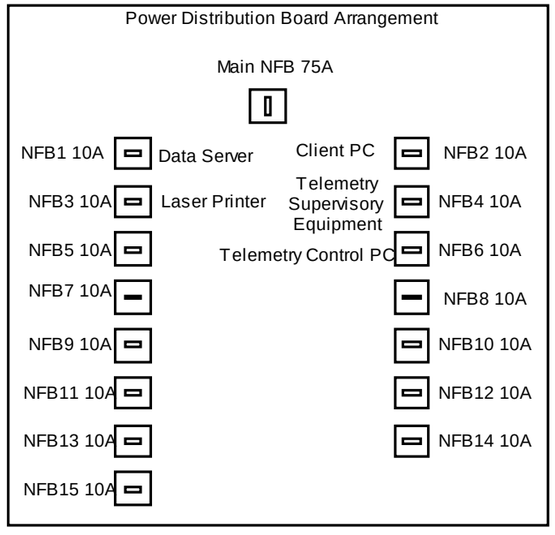
Equipment Layout Plan
S: 1/100



Section A - A'
S: 1/100

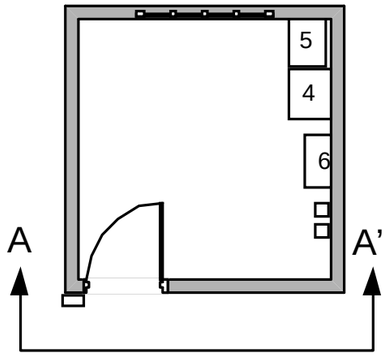


	Equipment Name		Equipment Name
1	Antenna	9	Data Server Equipment
2	Antenna Mast	10	Client PC
3	Coaxial Arrester	11	UPS
4	GPS Antenna	12	Ink jet Printer
5	Telemetry Supervisory Equipment	13	Laser Printer
6	Telemetry Control PC	14	Power Distribution Board
7	UPS	15	Isolation Transformer
8	Battery		

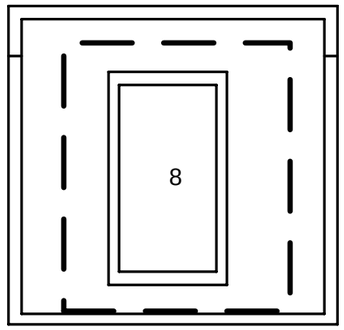


THE MASTER PLAN STUDY ON
FLOOD FORECASTING AND WARNING SYSTEM
FOR ATLAS REGION IN THE KINGDOM OF MOROCCO

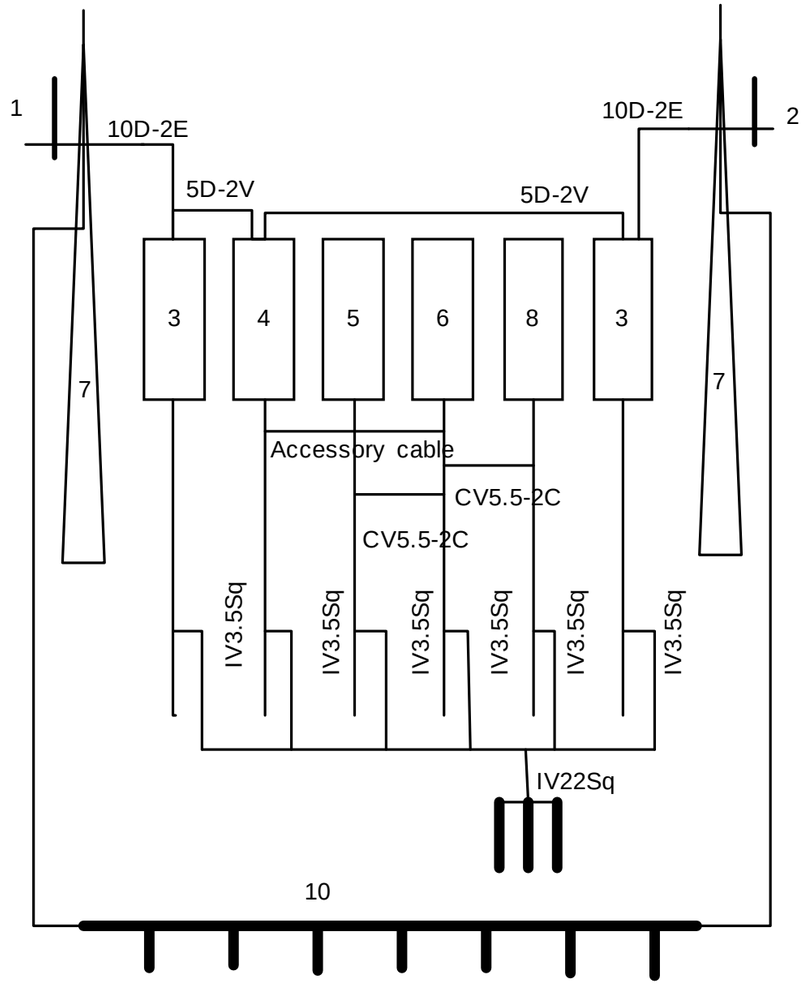
Fig. IV-1 EQUIPMENT LAYOUT PLAN AND HT MASTER INFORMATION CENTER

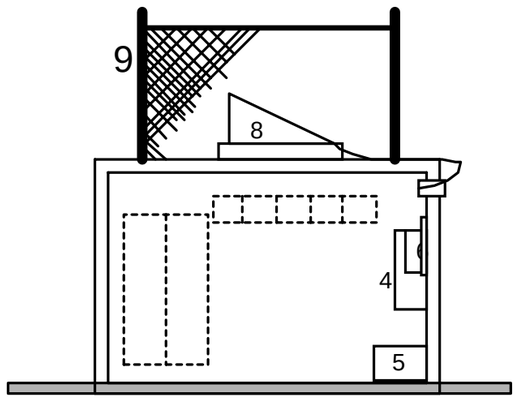


Equipment Layout Plan
S:1/100



Equipment Layout Plan on the Roof
S: 1/100

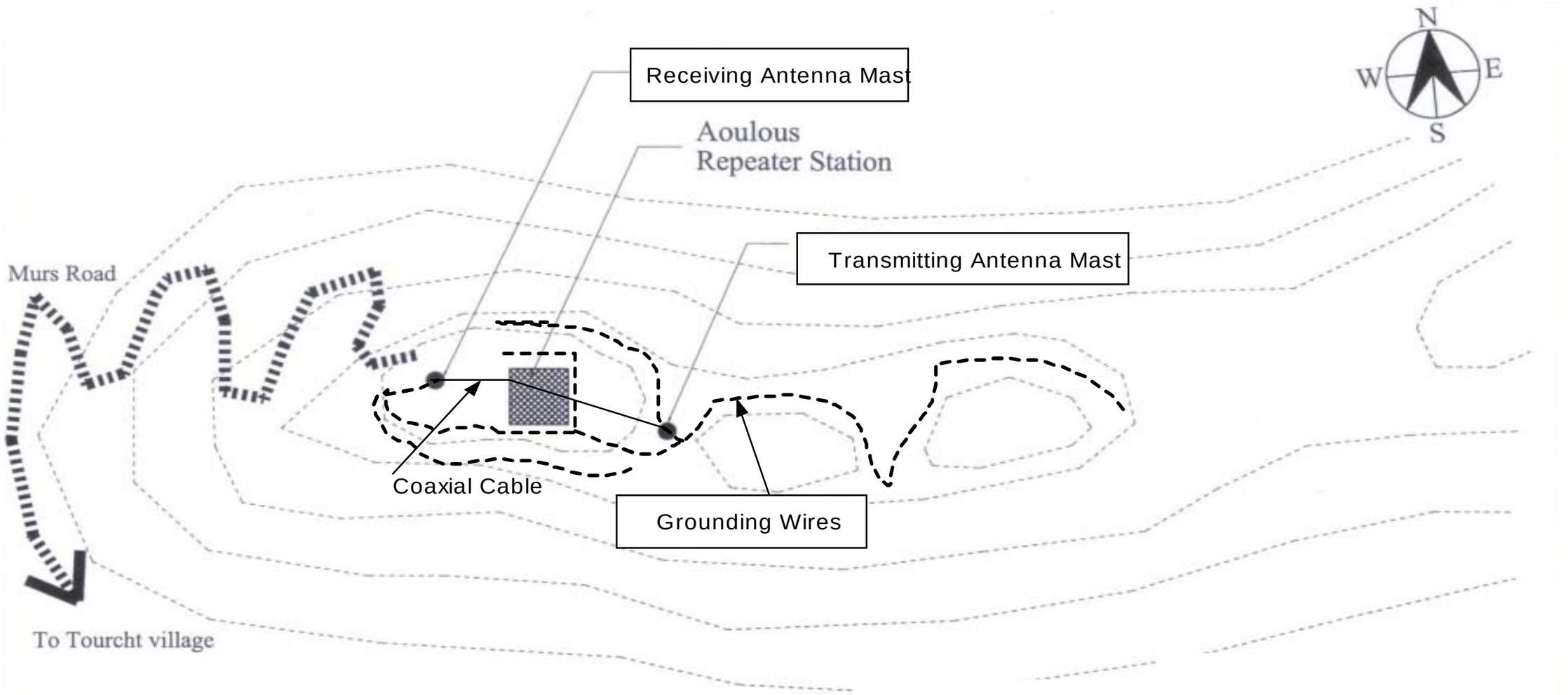




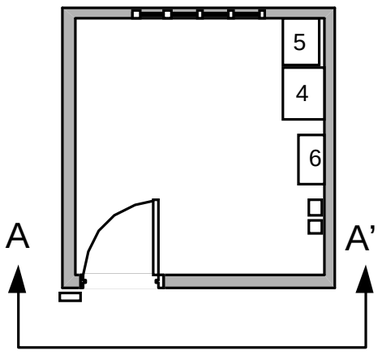
Section A-A'
S: 1/100

No.	Equipment Name	No.	Equipment Name
1	Receiving Antenna	6	Power Distribution Board
2	Transmitting Antenna	7	Antenna Mast
3	Coaxial Arrester	8	Solar Panel
4	Repeater Equipment	9	Protection cage
5	Battery	10	Grounding System

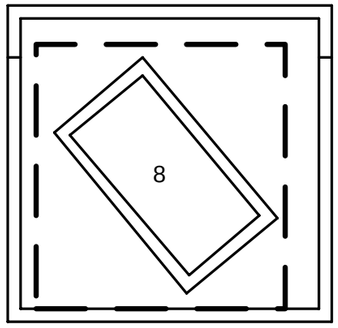
THE MASTER PLAN STUDY ON FLOOD FORECASTING AND WARNING SYSTEM FOR ATLAS REGION IN THE KINGDOM OF MOROCCO	Fig. IV-2(1) EQUIPMENT LAYOUT PLAN AND WIRING PLAN FOR AOULOUSS REPEATER STATION



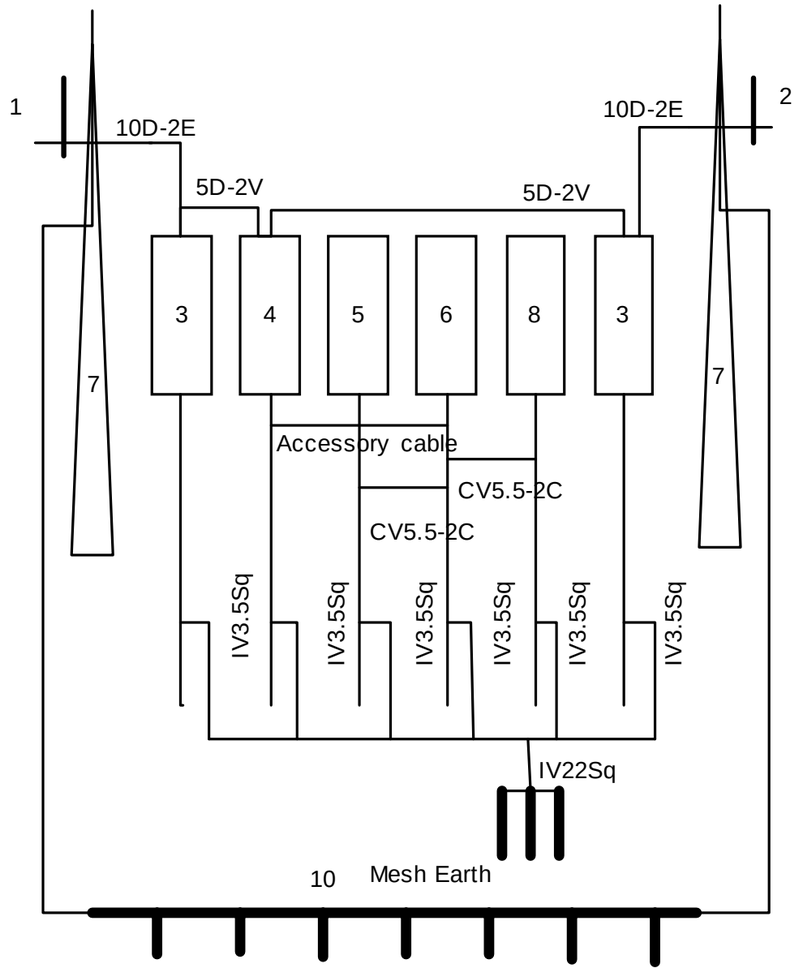
THE MASTER PLAN STUDY ON FLOOD FORECASTING AND WARNING SYSTEM FOR ATLAS REGION IN THE KINGDOM OF MOROCCO	Fig. IV-2(2) LOCATION PLAN AND CABLE WIRING PLAN FOR AOULOUSS REPEATER STATION

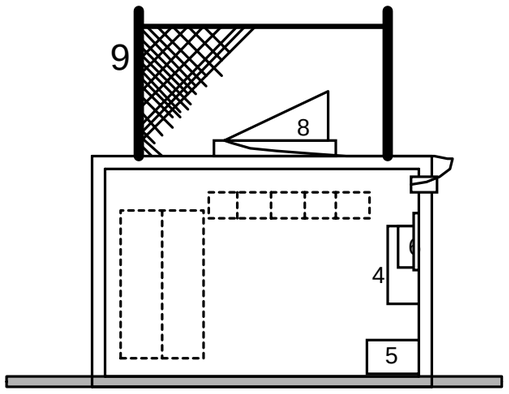


Equipment Layout Plan
S:1/100



Equipment Layout Plan on the Roof
S: 1/100



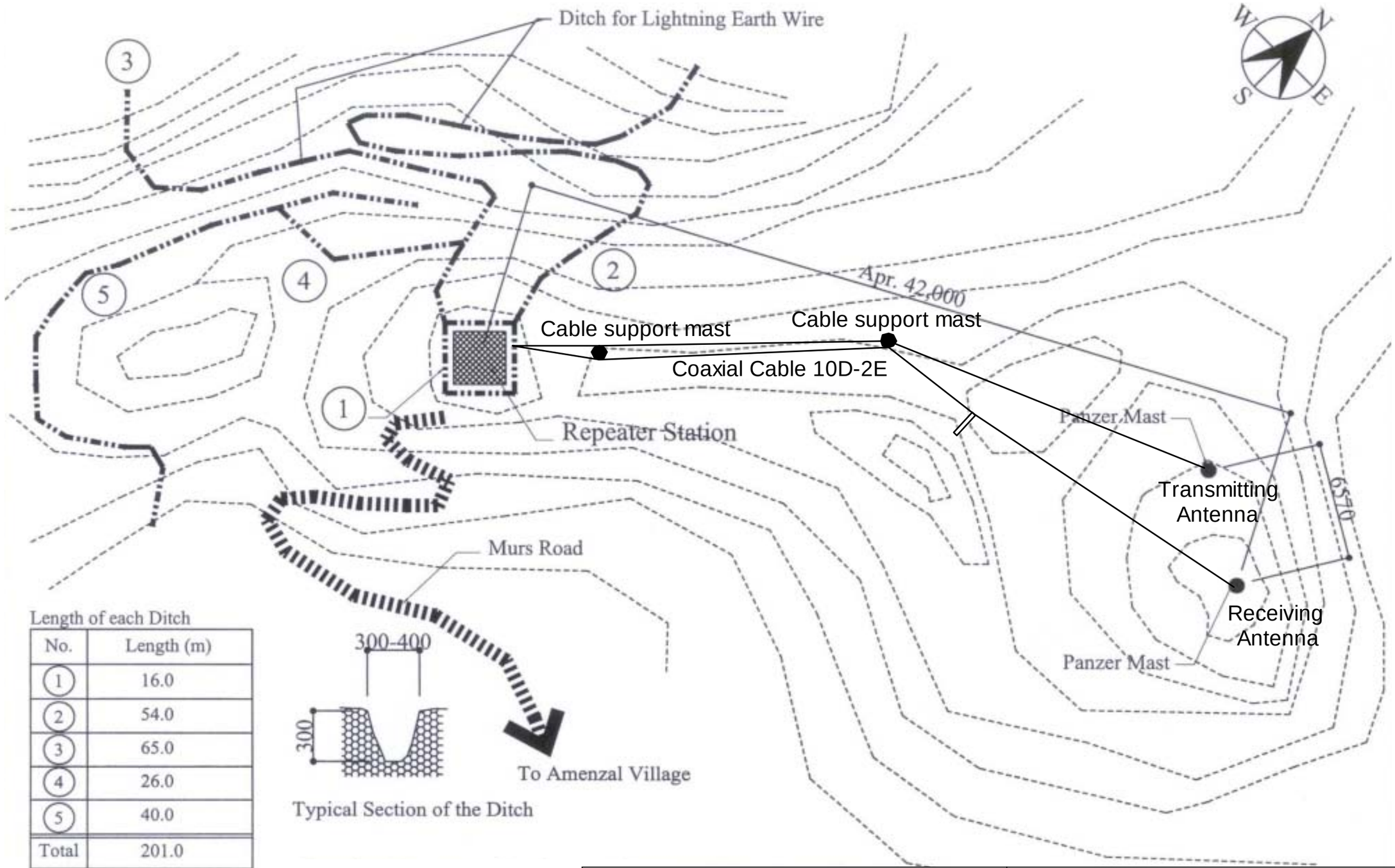


Section A-A'
S: 1/100

No.	Equipment Name	No.	Equipment Name
1	Receiving Antenna	6	Power Distribution Board
2	Transmitting Antenna	7	Antenna Mast
3	Coaxial Arrester	8	Solar Panel
4	Repeater Equipment	9	Protection cage
5	Battery	10	Grounding System

THE MASTER PLAN STUDY ON
FLOOD FORECASTING AND WARNING SYSTEM
FOR ATLAS REGION IN THE KINGDOM OF MOROCCO

Fig. IV-3(1) EQUIPMENT LAYOUT PLAN AND
R ADRAR TAZAINA
REPEATER STATION



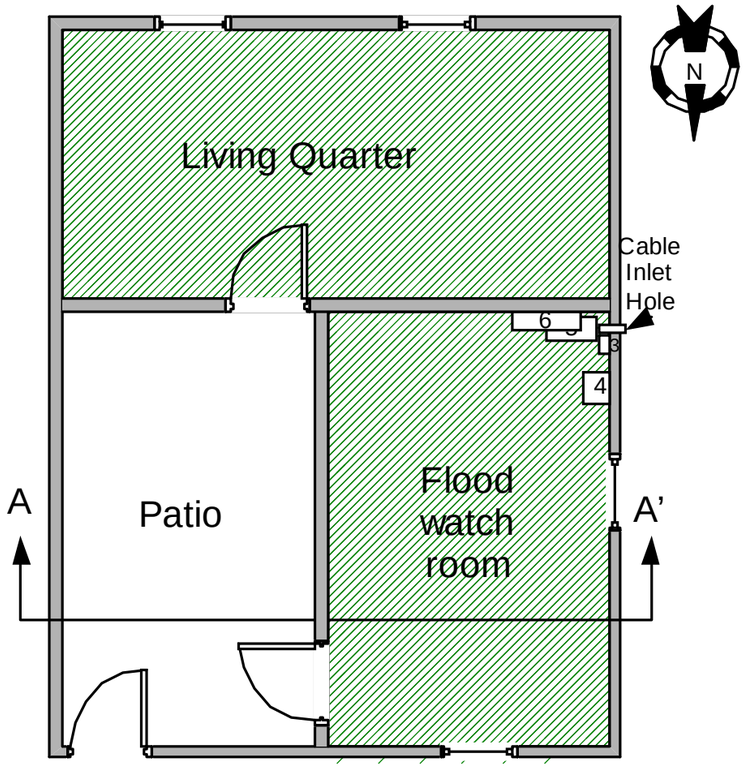
Length of each Ditch

No.	Length (m)
①	16.0
②	54.0
③	65.0
④	26.0
⑤	40.0
Total	201.0

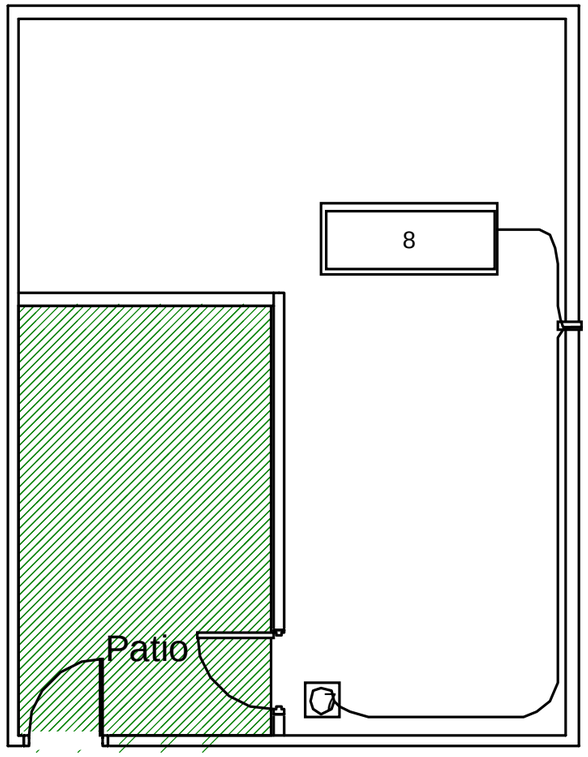
Typical Section of the Ditch

THE MASTER PLAN STUDY ON
FLOOD FORECASTING AND WARNING SYSTEM
FOR ATLAS REGION IN THE KINGDOM OF MOROCCO

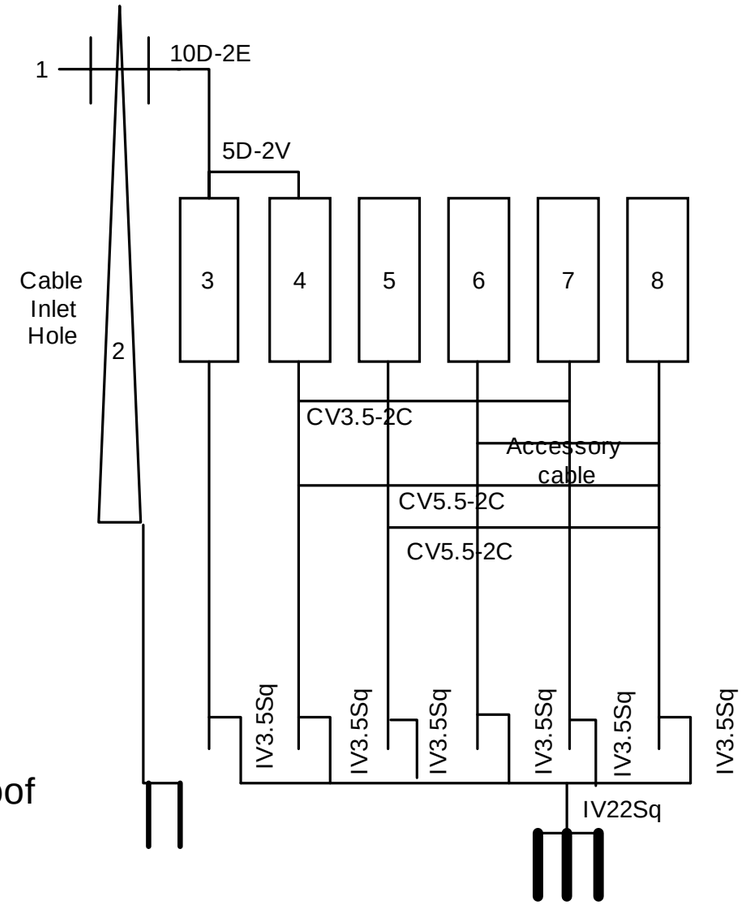
Fig. IV-3(2) LOCATION PLAN AND CABLE
R ADRAR TAZAINA
ON

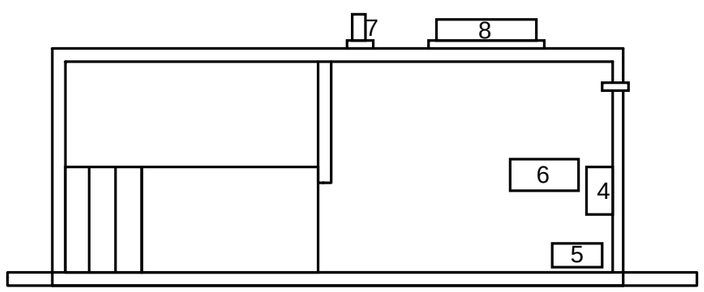


Equipment Layout Plan
S:1/100



Equipment Layout Plan on the Roof
S: 1/100



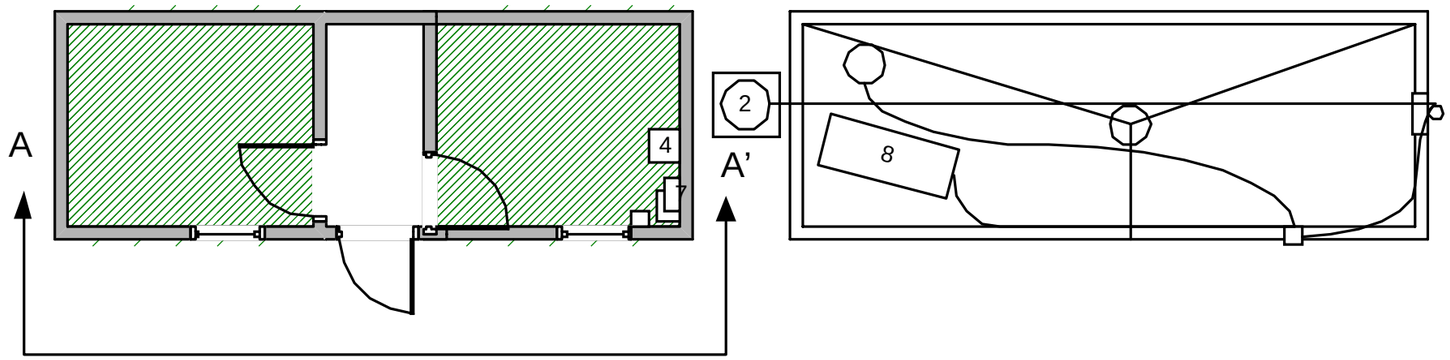


Section A-A'
S: 1/100

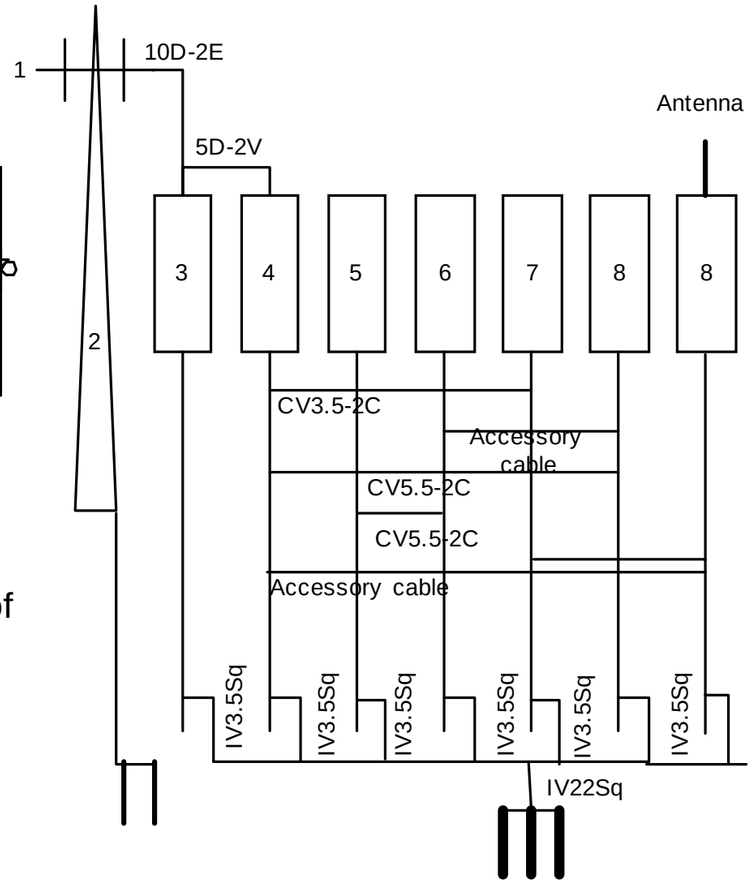
No.	Equipment Name	No.	Equipment Name
1	2-element Yagi Antenna	6	Power Distribution Board
2	Antenna Mast	7	Rain Gauge
3	Coaxial Arrester	8	Solar Panel
4	Remore Terminal Unit		
5	Battery		

THE MASTER PLAN STUDY ON
FLOOD FORECASTING AND WARNING SYSTEM
FOR ATLAS REGION IN THE KINGDOM OF MOROCCO

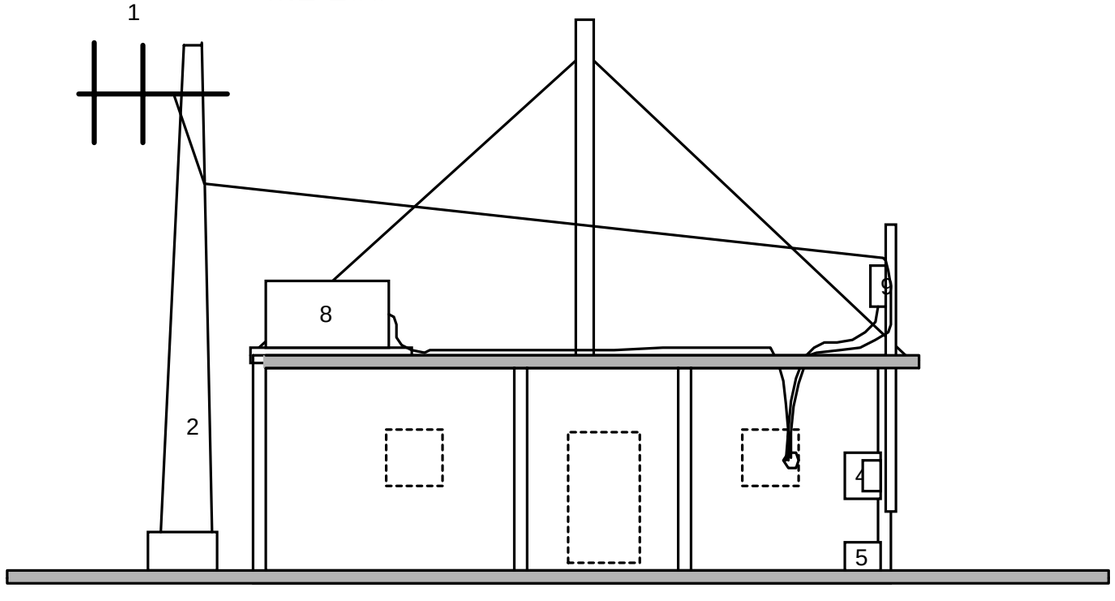
Fig. IV-4 EQUIPMENT LAYOUT PLAN AND CABLE WIRING PLAN FOR AGOUNS FLOOD WATCH STATION



Equipment Layout Plan
S:1/100



Equipment Layout Plan on the Roof
S: 1/100

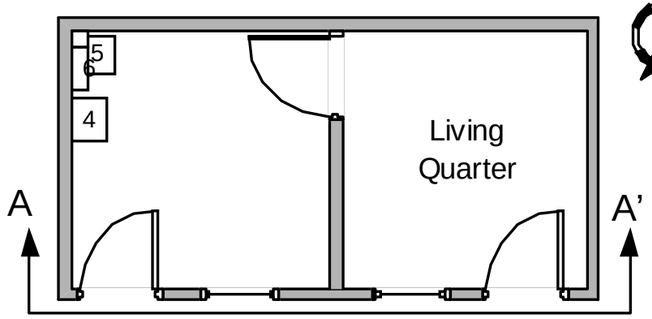


Section A-A'
S: 1/100

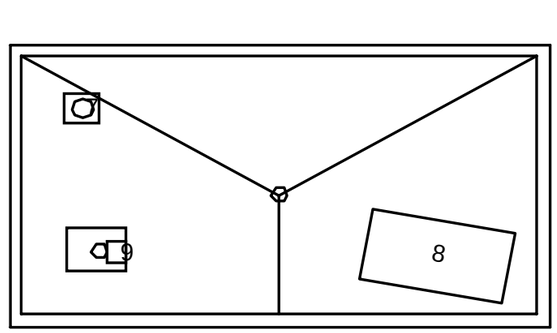
No.	Equipment Name	No.	Equipment Name
1	2-element Yagi Antenna	6	Power Distribution Board
2	Antenna Mast	7	Rain Gauge
3	Coaxial Arrester	8	Solar Panel
4	Remore Terminal Unit	9	Short Distance Data Receiver
5	Battery		

THE MASTER PLAN STUDY ON
FLOOD FORECASTING AND WARNING SYSTEM
FOR ATLAS REGION IN THE KINGDOM OF MOROCCO

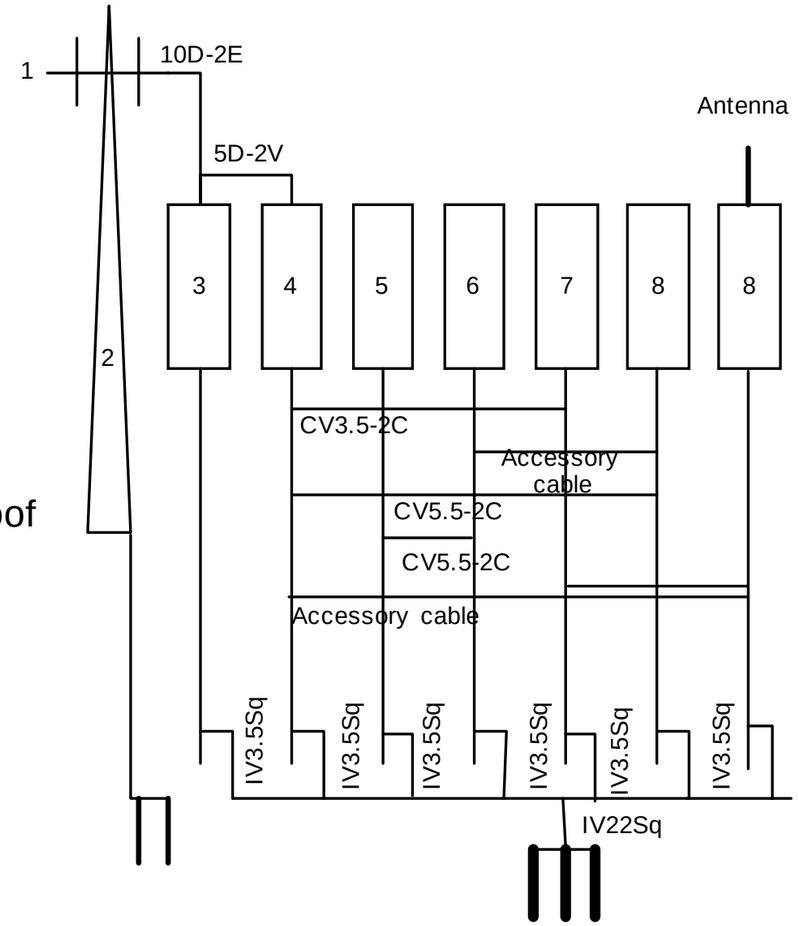
Fig. IV-5 EQUIPMENT LAYOUT PLAN AND CABLE WIRING PLAN FOR AMENZAL FLOOD WATCH STATION

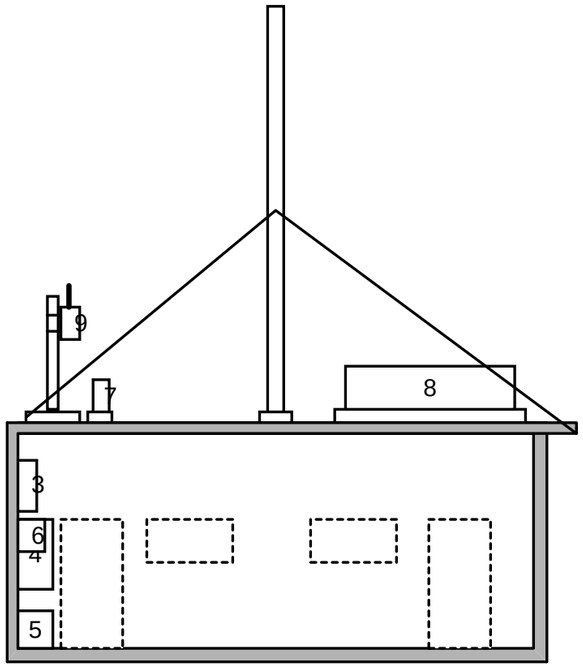


Equipment Layout Plan
S:1/100



Equipment Layout Plan on the Roof
S: 1/100



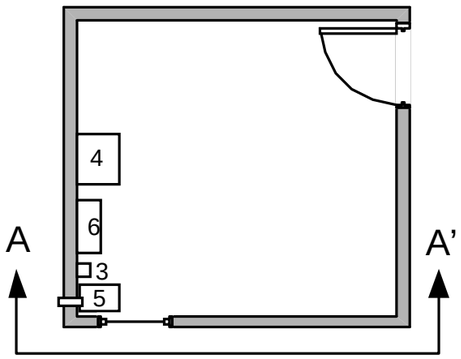


Section A-A'
S: 1/100

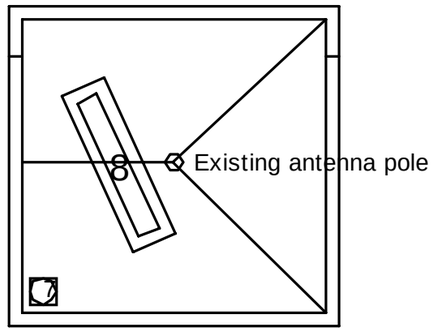
No.	Equipment Name	No.	Equipment Name
1	2-element Yagi Antenna	6	Power Distribution Board
2	Antenna Mast	7	Rain Gauge
3	Coaxial Arrester	8	Solar Panel
4	Remore Terminal Unit	9	Short Distance Data Receiver
5	Battery		

THE MASTER PLAN STUDY ON
FLOOD FORECASTING AND WARNING SYSTEM
FOR ATLAS REGION IN THE KINGDOM OF MOROCCO

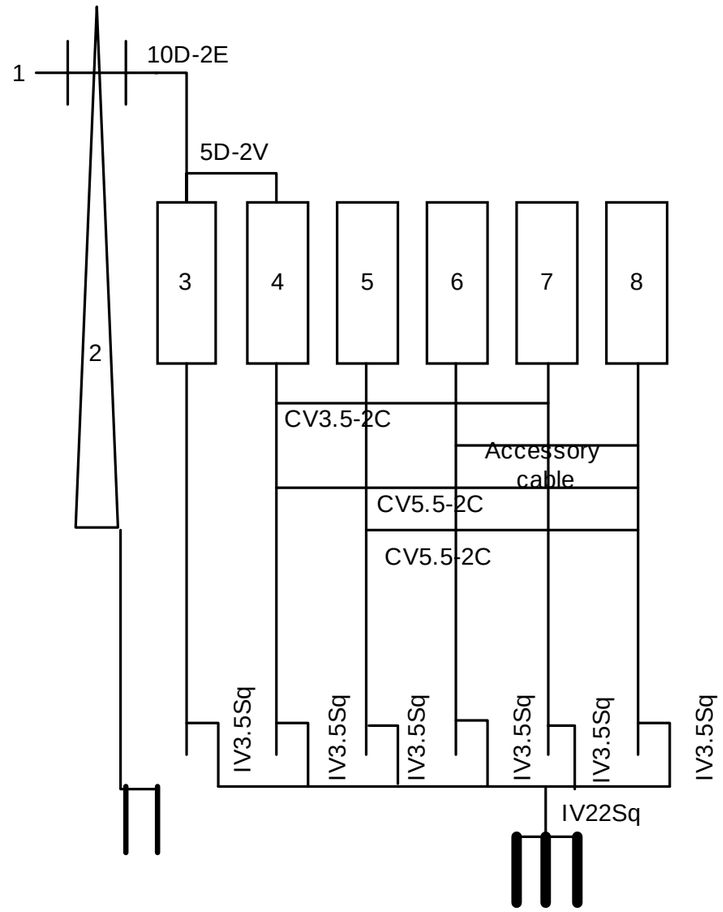
Fig. IV-6 EQUIPMENT LAYOUT PLAN AND CABLE WIRING PLAN FOR TIOURDIOU FLOOD WATCH STATION

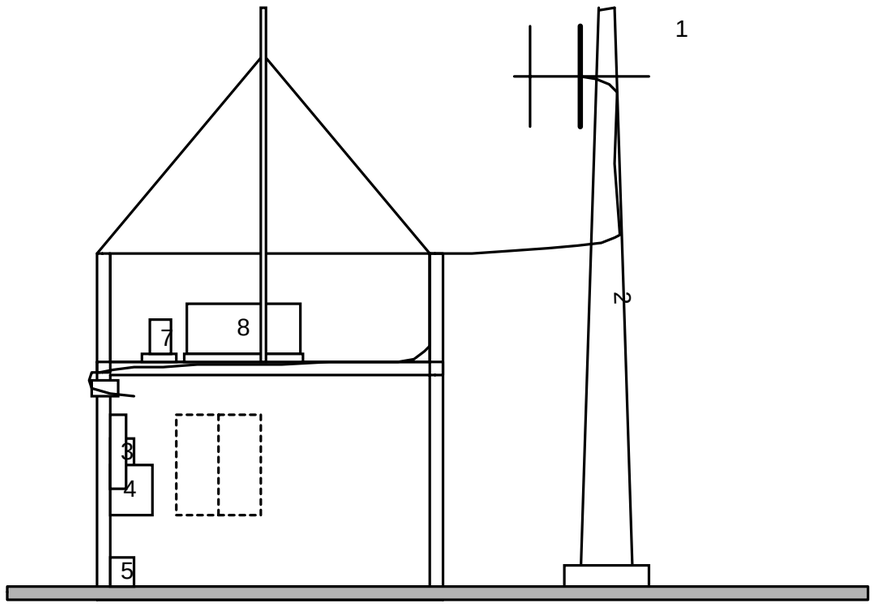


Equipment Layout Plan
S:1/100



Equipment Layout Plan on the Roof
S: 1/100



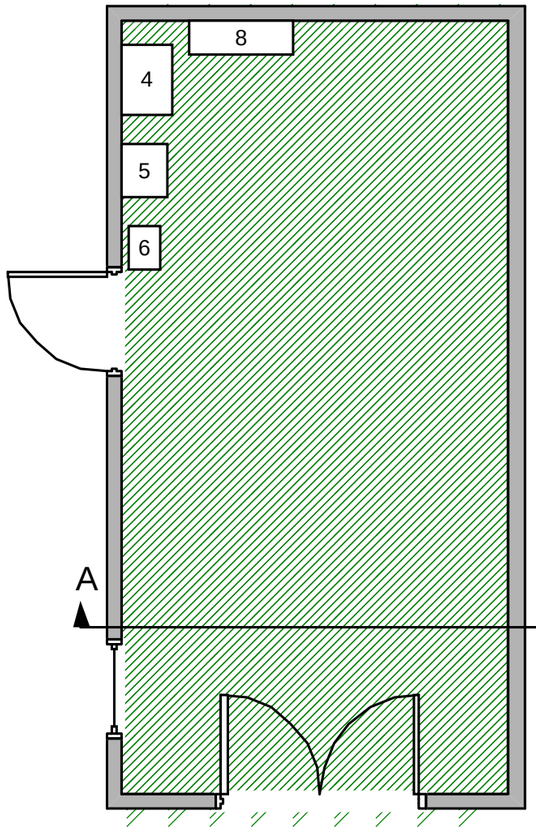


Section A-A'
S: 1/100

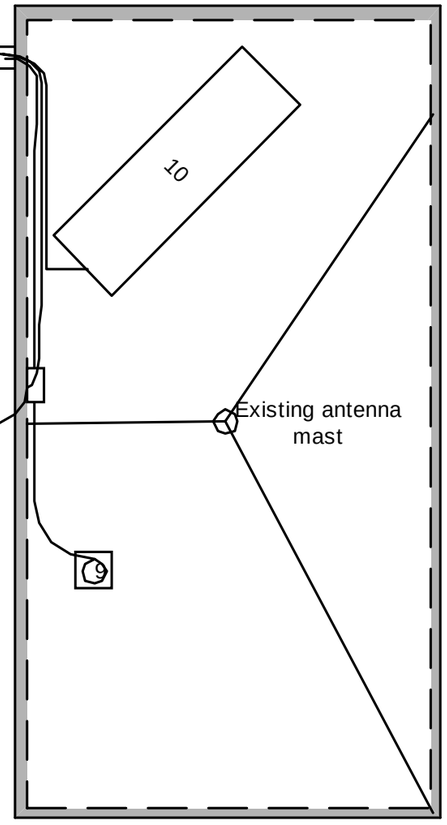
No.	Equipment Name	No.	Equipment Name
1	2-element Yagi Antenna	6	Power Distribution Board
2	Antenna Mast	7	Rain Gauge
3	Coaxial Arrester	8	Solar Panel
4	Remore Terminal Unit		
5	Battery		

THE MASTER PLAN STUDY ON
FLOOD FORECASTING AND WARNING SYSTEM
FOR ATLAS REGION IN THE KINGDOM OF MOROCCO

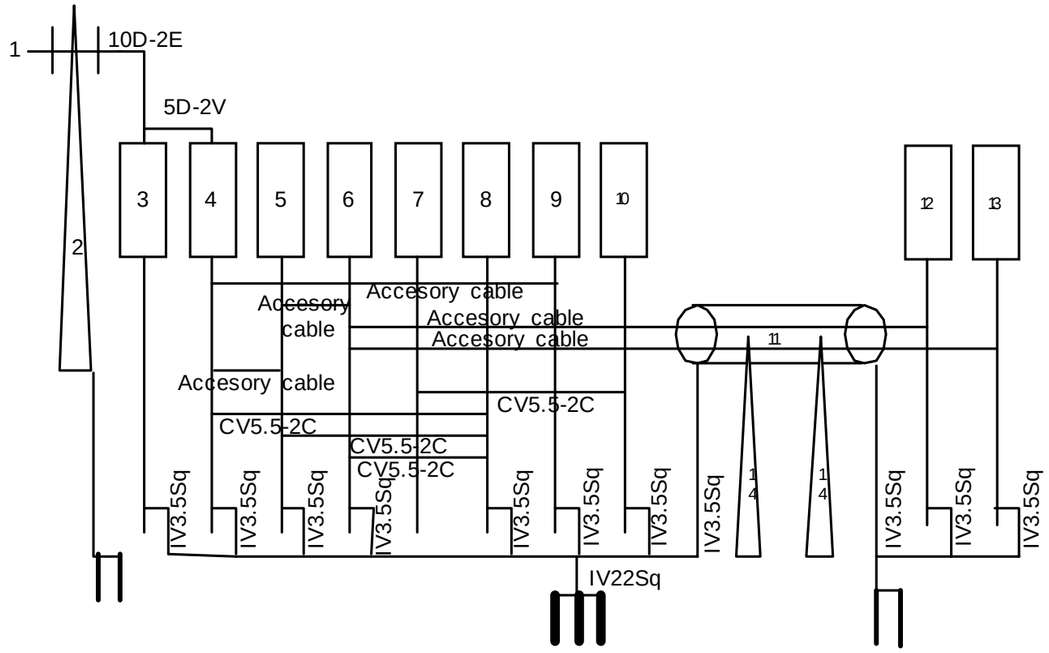
Fig. IV-7 EQUIPMENT LAYOUT PLAN AND CABLE WIRING PLAN FOR TOURCHT FLOOD WATCH STATION

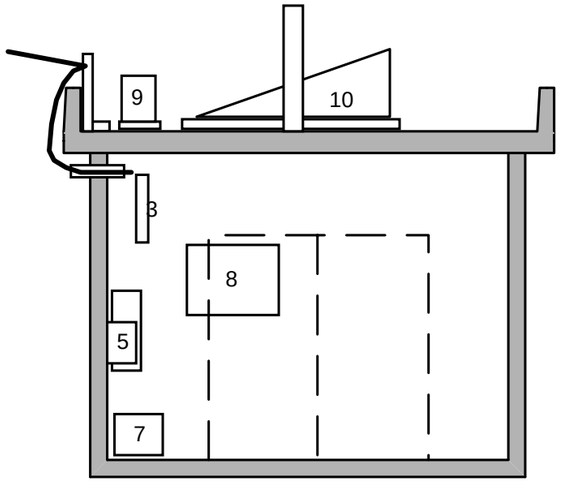


Equipment Layout Plan
S: 1/50



Equipment Layout on Roof
S: 1/50



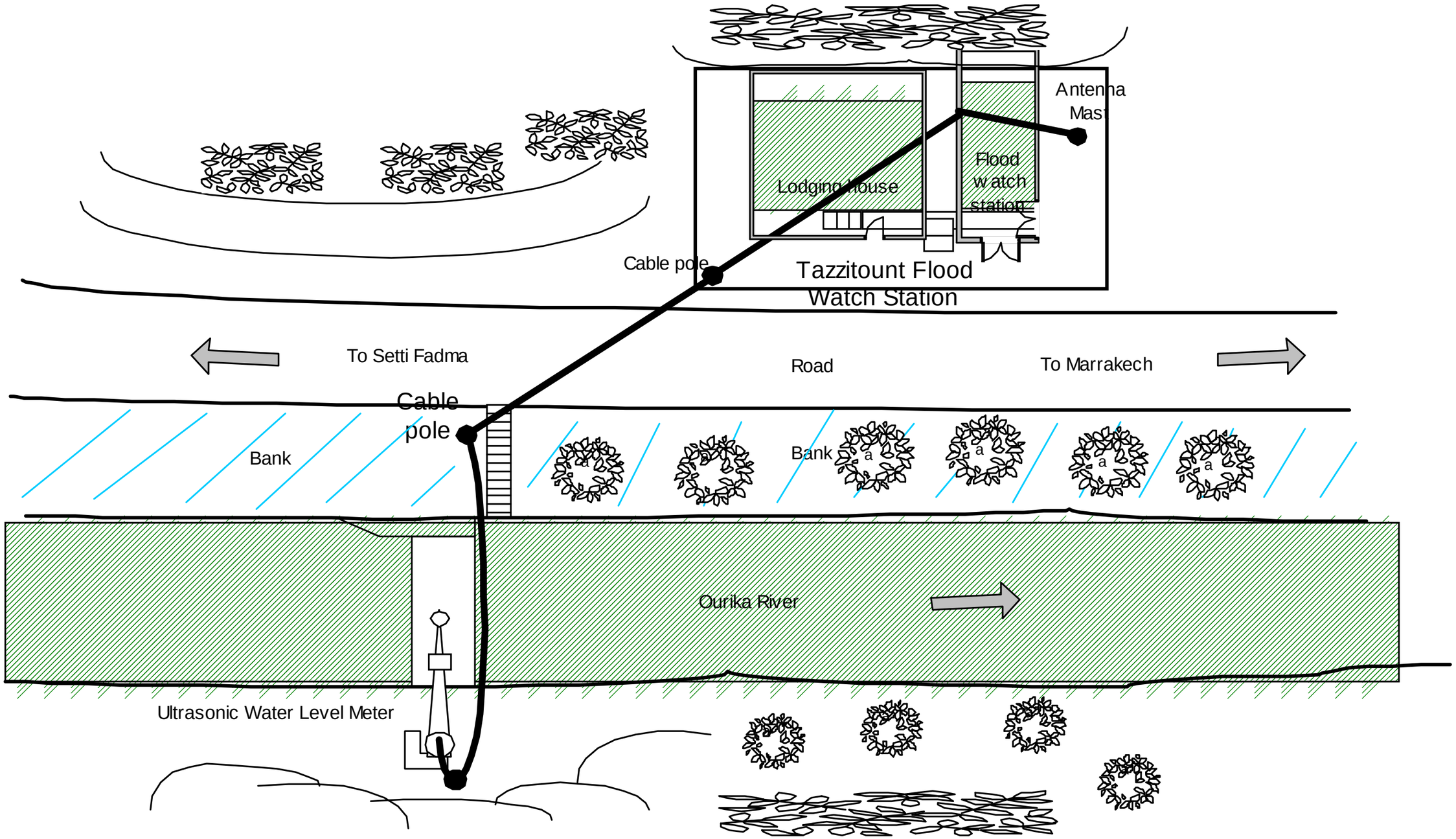


Section A - A'
S: 1/50

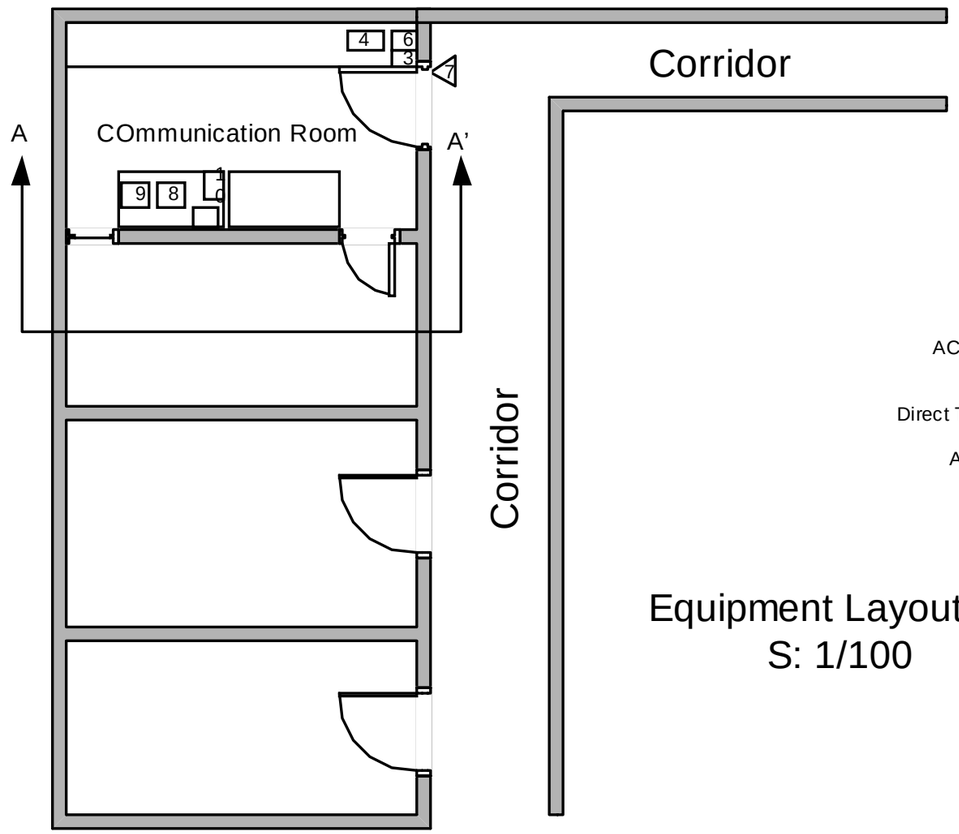
No.	Equipment Name	No.	Equipment Name
1	2-element Yagi Antenna	8	Power Distribution Board
2	Antenna Mast	9	Rain Gauge
3	Coaxial Arrester	10	Solar Panel
4	Remore Terminal Unit	11	Water Level Gauge Signaling Cable
5	Coder	12	Ultrasonic Water Level Guage
6	SIO/BCD Code Converter	13	Air Temperture Sensor
7	Battery	14	Cable Mast

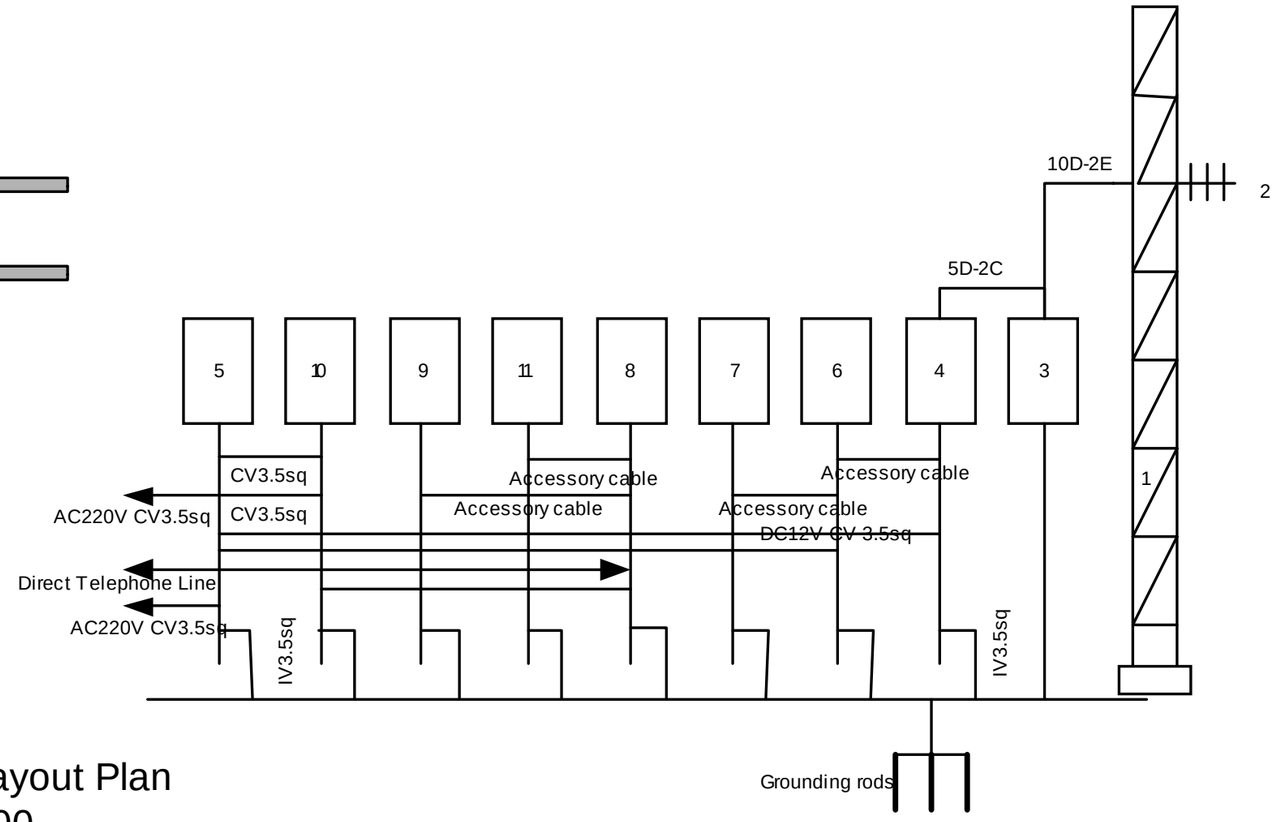
THE MASTER PLAN STUDY ON
FLOOD FORECASTING AND WARNING SYSTEM
FOR ATLAS REGION IN THE KINGDOM OF MOROCCO

Fig. IV-8(1) EQUIPMENT LAYOUT PLAN AND CABLE WIRING PLAN FOR TAZITOUNT FLOOD WATCH STATION



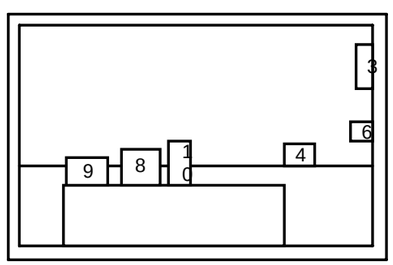
THE MASTER PLAN STUDY ON FLOOD FORECASTING AND WARNING SYSTEM FOR ATLAS REGION IN THE KINGDOM OF MOROCCO	Fig. IV-8(2) CABLE LAYOUT PLAN FOR D WATCH STATION





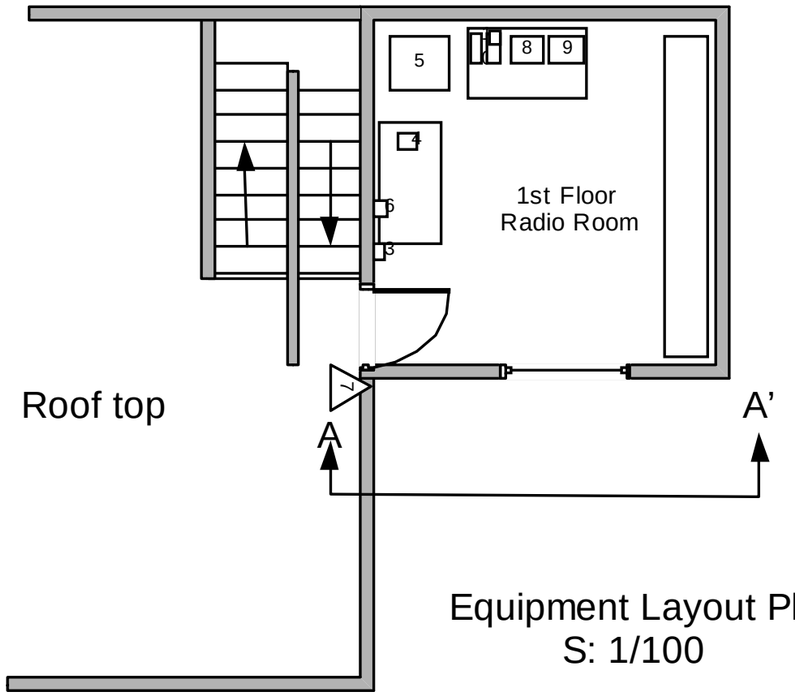
Equipment Layout Plan
S: 1/100

	Equipment		Equipment
1	Existing Antenna Tower	7	Warning Siren
2	3 element Yagi Antenna	8	Client PC
3	Coaxial Arrester	9	Ink jet Printer
4	VHF Radio Equipment	10	UPS
5	AC Power Supply Equipmer	11	MODEM
6	Siren Control Box		

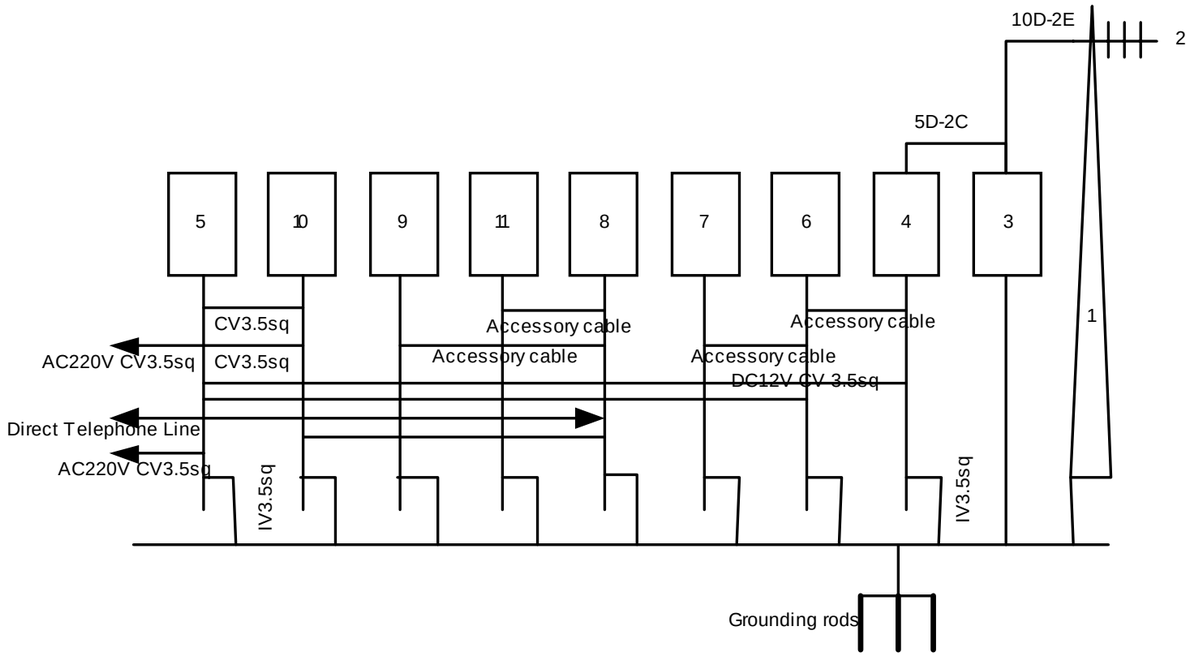


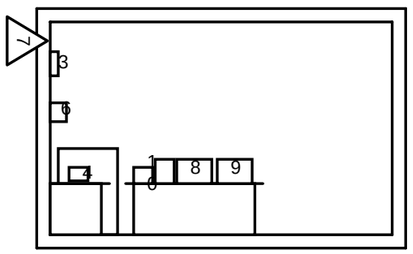
Section A - A'
S: 1/100

THE MASTER PLAN STUDY ON FLOOD FORECASTING AND WARNING SYSTEM FOR ATLAS REGION IN THE KINGDOM OF MOROCCO	Fig. IV-9 EQUIPMENT LAYOUT PLAN AND CABLE WIRING PLAN FOR AL HAOUZ PROVINCE OFFICE



Equipment Layout Plan
S: 1/100



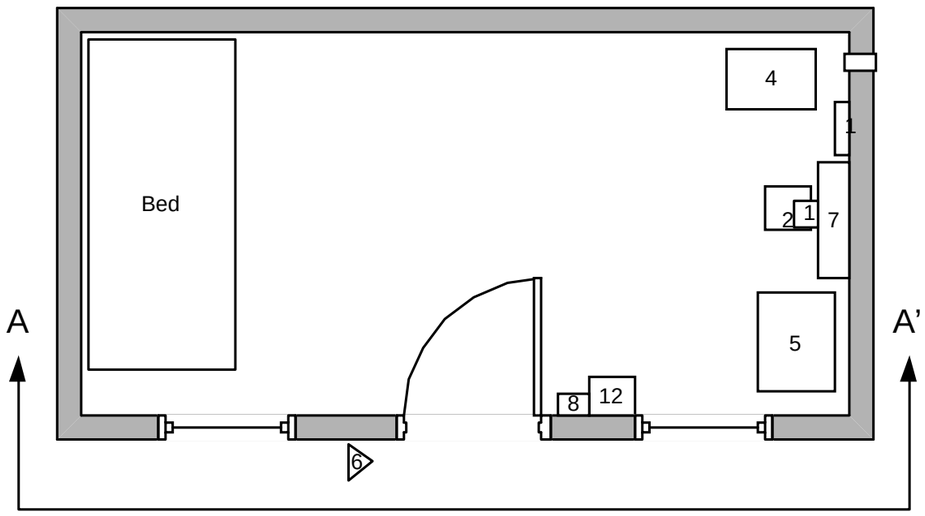


Section A - A'
S: 1/100

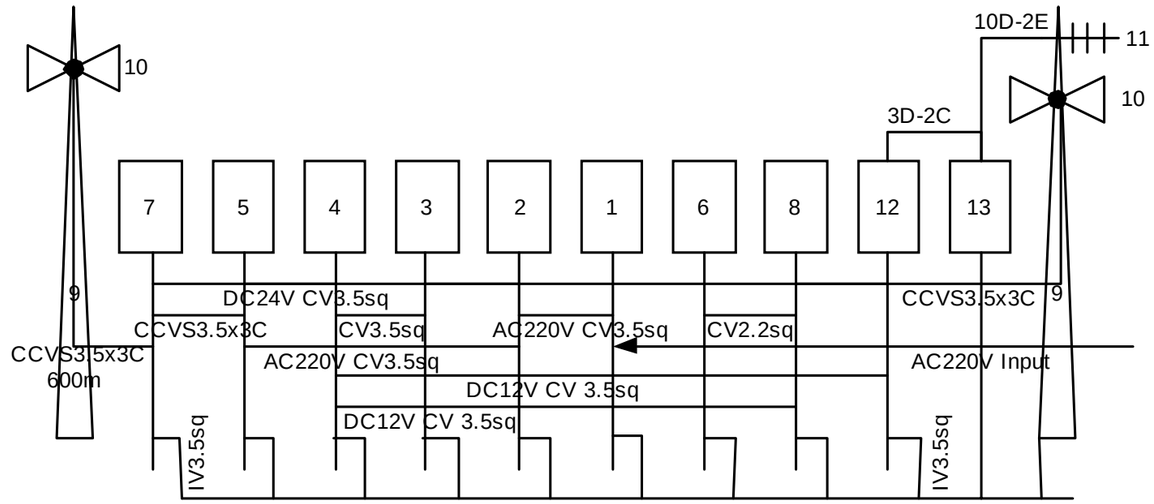
	Equipment		Equipment
1	Antenna Mast	7	Warning Siren
2	3 element Yagi Antenna	8	Client PC
3	Coaxial Arrester	9	Ink jet Printer
4	VHF Radio Equipment	10	UPS
5	DC Power Supply Equipment	11	MODEM
6	Siren Control Box		

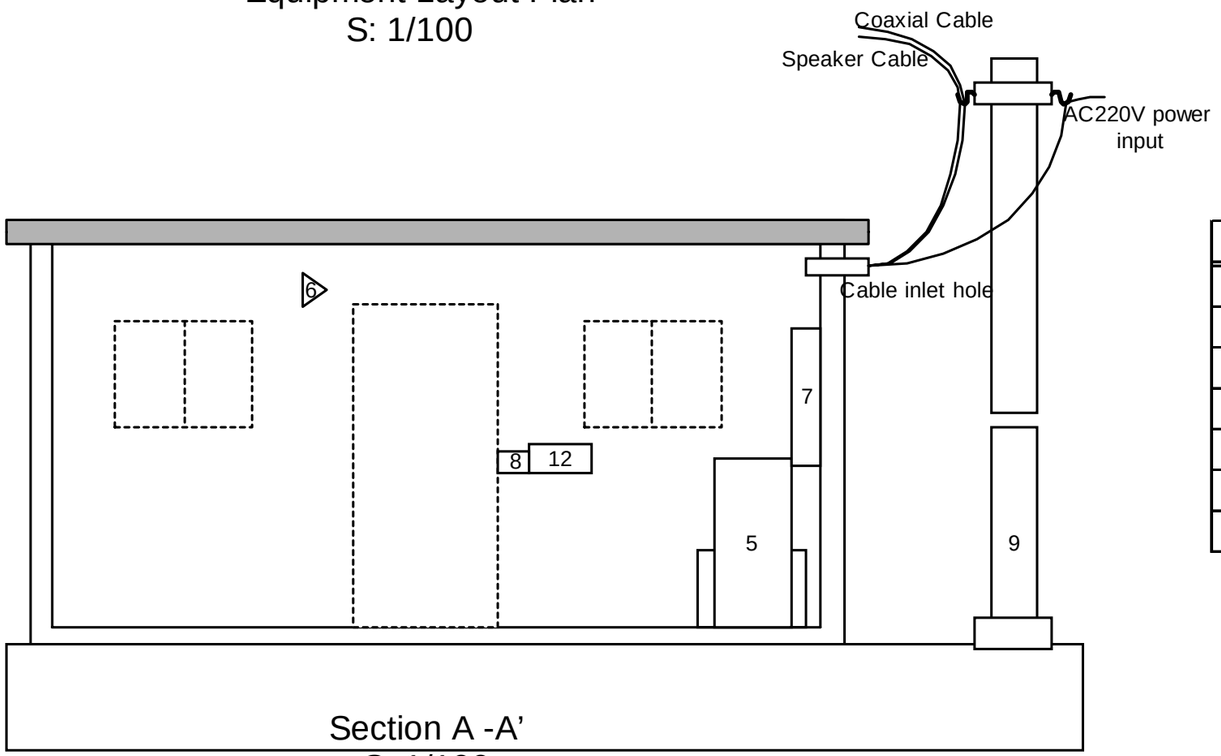
THE MASTER PLAN STUDY ON
FLOOD FORECASTING AND WARNING SYSTEM
FOR ATLAS REGION IN THE KINGDOM OF MOROCCO

Fig. IV-10 EQUIPMENT LAYOUT PLAN AND CABLE WIRING PLAN FOR OURIKA CAIDAT OFFICE



Equipment Layout Plan
S: 1/100

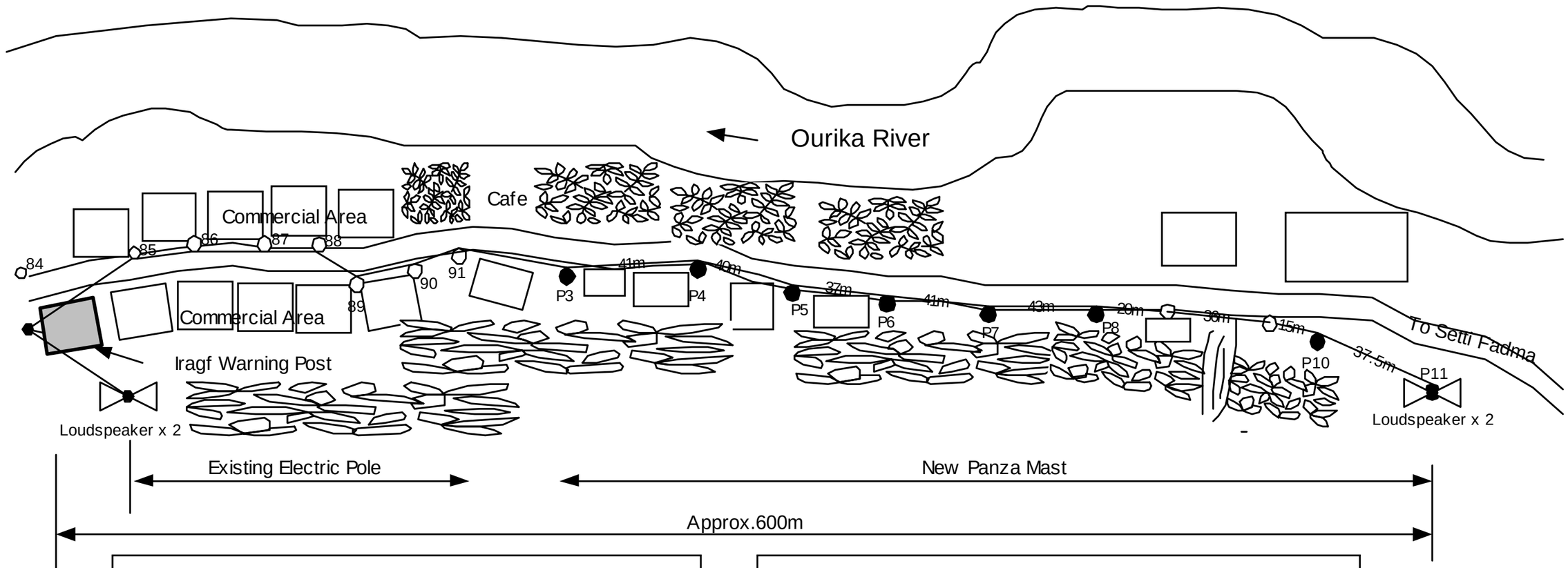


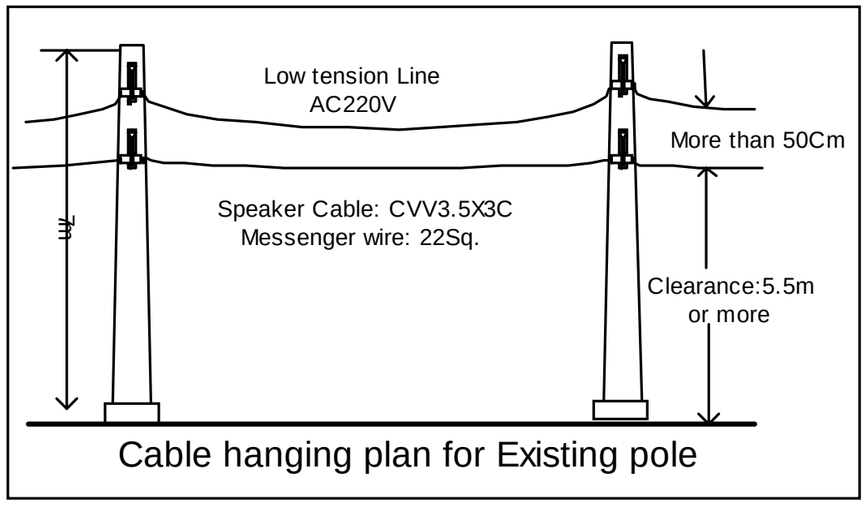


Section A -A'
S: 1/100

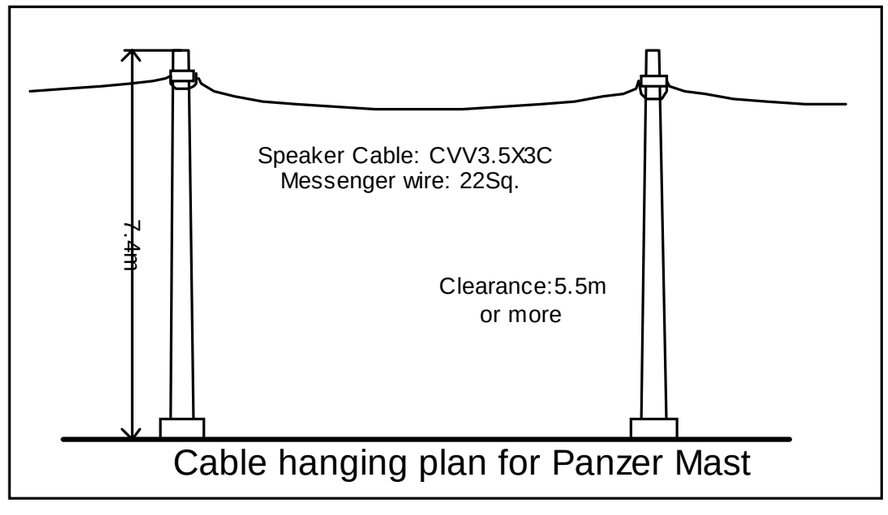
	Equipment Name		Equipment Name
1	Power Distribution Board	8	Siren Conrol Box
2	Isolation Transformer	9	Panzer Mast
3	Automatic Voltage Regulator	10	Loudspeaker
4	DC Power Supply Equipment	11	Antenna
5	Warning Equipment	12	VHF Radio Equipment
6	Warning Siren	13	Coaxial Arrester
7	Cable Protection Board		

THE MASTER PLAN STUDY ON FLOOD FORECASTING AND WARNING SYSTEM FOR ATLAS REGION IN THE KINGDOM OF MOROCCO	Fig. IV-11(1) EQUIPMENT LAYOUT PLAN AND CABLE WIRING PLAN FOR IRAGHF WARNING POST





Cable hanging plan for Existing pole



Cable hanging plan for Panzer Mast

THE MASTER PLAN STUDY ON FLOOD FORECASTING AND WARNING SYSTEM FOR ATLAS REGION IN THE KINGDOM OF MOROCCO	Fig. IV-11(2) SPEAKER CABLE LAYOUT PLAN AND CABLE WIRING PLAN FOR IRAGHF WARNING POST