

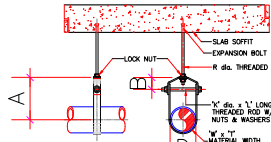


GENERAL NOTES:

- ALL PLUMBING WORKS INCLUDED HEREIN SHALL BE EXECUTED ACCORDING TO THE PROVISIONS OF THE PLUMBING CODE OF THE MALDIVES. IN THE ABSENCE THEREOF, SHALL BE IN ACCORDANCE WITH ACCEPTABLE INTERNATIONAL CODE AND STANDARDS.
- COORDINATE THE DRAWING WITH OTHER RELATED DRAWINGS AND SPECIFICATION. THE ENGINEER SHALL BE NOTIFIED IMMEDIATELY OF ANY DISCREPANCY FOUND THEREIN.
- ALL PIPES SHALL BE INSTALLED AS INDICATED ON PLANS. ANY RELOCATIONS REQUIRED FOR PROPER EXECUTION OF OTHER TRADE SHALL BE WITH PRIOR APPROVAL OF THE ARCHITECT OR ENGINEER.
- PROPOSED SANITARY UTILITIES SHALL CONFORM TO THE ACTUAL LOCATION, DEPTH AND INVERT ELEVATION OF ALL EXISTING PIPES AND STRUCTURES AS VERIFIED BY THE CONTRACTOR.
- ALL SLOPES FOR HORIZONTAL DRAINAGE SHALL MAINTAIN 1% UNLESS OTHERWISE SPECIFIED.
- SIZE OF WATER SUPPLY PIPES TO FIXTURES SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
- THE CONTRACTOR SHALL VERIFY ALL EXISTING UTILITIES AT SITE, COORDINATE THE WORKS WITH THE SEWER LINE EFFLUENT DISPOSAL POINT AND WATER LINE SERVICE CONNECTING POINT.
- ALL PIPE SIZES ARE IN MILLIMETERS AND ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE SPECIFIED.
- THE PROPOSED UTILITIES SHALL BE MADE TO CONFORM TO THE ACTUAL LOCATION, TAPPING POINT, DEPTH AND INVERT LEVELS OF ALL EXISTING PIPES AND STRUCTURES AS VERIFIED BY THE CONTRACTOR.
- ALL PIPE DIAMETER INDICATED ON PLANS ARE NOMINAL PIPE SIZES.
- VENT AND WASTE STACK TO CONNECT TO SOL PIPE. SOL PIPE STACK AS MAIN SOL AND WASTE VENT THRU ROOF.

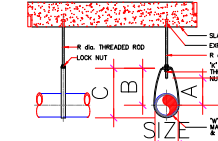
LEGEND:

WATER DISTRIBUTION SYSTEM	
HL	COLD WATER LINE
HW	HOT WATER LINE
CH/WH	COLD WATER RISER/DOWNPIPE
OV/SV	OVERFLOW / DRAIN VALVE / ISOLATION VALVE
CV	CHECK VALVE
HD	HOSE REEL
WM	WATER METER
WASTE, DRAINAGE, SEWER & VENT SYSTEM	
SP	SEWER PIPE
WP	WASTE PIPE
VP	VENT PIPE
RWP	RAINWATER PIPE
SEWAGE	SEWAGE PASTE STACK
VE	VENT STACK THRU ROOF
FG/SG	FLOOR/GRAND GLEND/IT
CE/SG	CLEANING/GRAND GLEND/IT
FG	FLOOR DRAIN GULLY TRAP
FG	FLOOR DRAIN GULLY TRAP
SG	SCUPPER DRAIN NO SEWER OUTLET
SG	SCUPPER DRAIN (NO SEWER OUTLET)
L-R	LEFT TO RIGHT
T-B	TOP TO BOTTOM
US	UNDERGROUND / UNDERSLAB
AC	AIR-LOCK
RWP	RAINWATER COLLECTOR PIPE
OFF / OF	OVERFLOW PIPE / OVERFLOW



ELEVATION

STANDARD CLEVIS HANGERS	
TABLE OF DIMENSIONS	
24	80 45 12 20 x 3 WD x 70
32	80 60 12 25 x 3 WD x 80
40	80 60 12 25 x 3 WD x 85
50	100 60 12 25 x 3 WD x 100
75	125 60 14 40 x 6 WD x 115
100	150 60 14 40 x 6 WD x 120
125	175 60 14 40 x 6 WD x 130
150	175 60 14 40 x 6 WD x 130
175	175 60 14 40 x 6 WD x 130
200	175 60 14 40 x 6 WD x 130



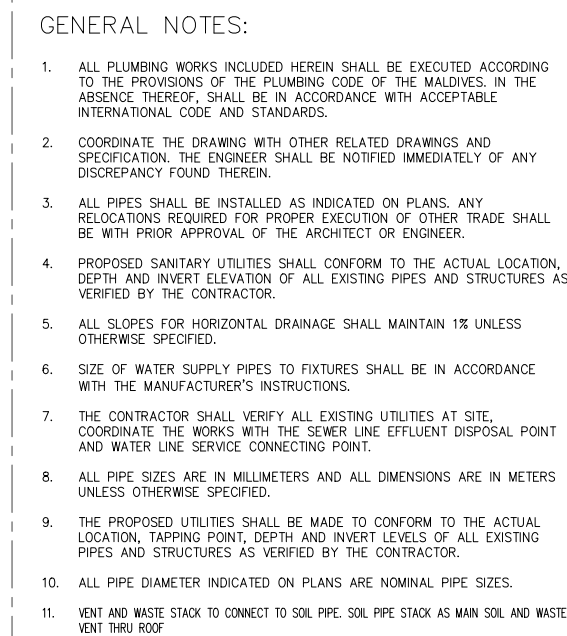
ELEVATION

TRAPEZE HANGERS	
DIMENSIONS IN MM	
25	100 20 10 20 x 3 WD x 70
32	100 20 10 20 x 3 WD x 80
40	100 20 10 20 x 3 WD x 85
50	125 20 10 20 x 3 WD x 100
75	150 20 10 20 x 3 WD x 115
100	175 20 10 20 x 3 WD x 120
125	175 20 10 20 x 3 WD x 130
150	175 20 10 20 x 3 WD x 130
175	175 20 10 20 x 3 WD x 130
200	175 20 10 20 x 3 WD x 130

DETAILS OF PIPE HANGERS  
NTS







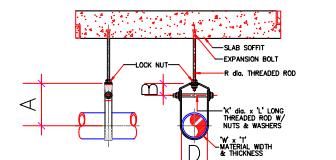
# LEGEND:

## WATER DISTRIBUTION SYSTEM

	CML	COLD WATER LINE
	HML	HOT WATER LINE
	CM/CMF	COLD WATER REINFORCED
	CV/CV	COLD WATER / DRAIN VALVE / ISOLATION VALVE
	CV	CHECK VALVE
	HW	HOT WATER
	HW	WATER METER

## WASTE, DRAINAGE, SEWER & VENT SYSTEM

	SP	SEWER PIPE
	WP	WASTE PIPE
	SP	SEWER
	HWF	RAINWATER PIPE
	SV/S/S/S	SEWAGE / SINK / SINK / SINK
	WTR	WATER
	FD/DO	FLOOR DRAIN / CLEANOUT
	CO/CO	CLEANING / CLEANOUT
	FD	FLOOR DRAIN GALLY TRAP
	FD	FLOOR DRAIN GALLY TRAP
	SD 90°	SUPPER DRAIN 90 DEGREE OUTLET
	U	UPPER DRAIN (DOWN DRAIN)
	L-R	LEFT TO RIGHT
	T	TOP TO BOTTOM
	U-V	UNDERDRAIN / UNDERLAY
	AC	ABOVE CEILING
	RWP	RAINWATER COLLECTOR PIPE
	DP	DOWN DRAIN / DRAIN



D	A	B	R	W x T	K x L
34	80	45	12	25 x 3	WFO x 70
43	90	50	12	25 x 3	WFO x 80
48	95	50	12	25 x 3	WFO x 85
60	105	55	12	25 x 3	WFO x 100
76	115	60	14	40 x 6	W12 x 115
89	125	60	14	40 x 6	W12 x 130
114	145	65	18	40 x 6	W16 x 160
140	165	75	18	40 x 6	W16 x 190

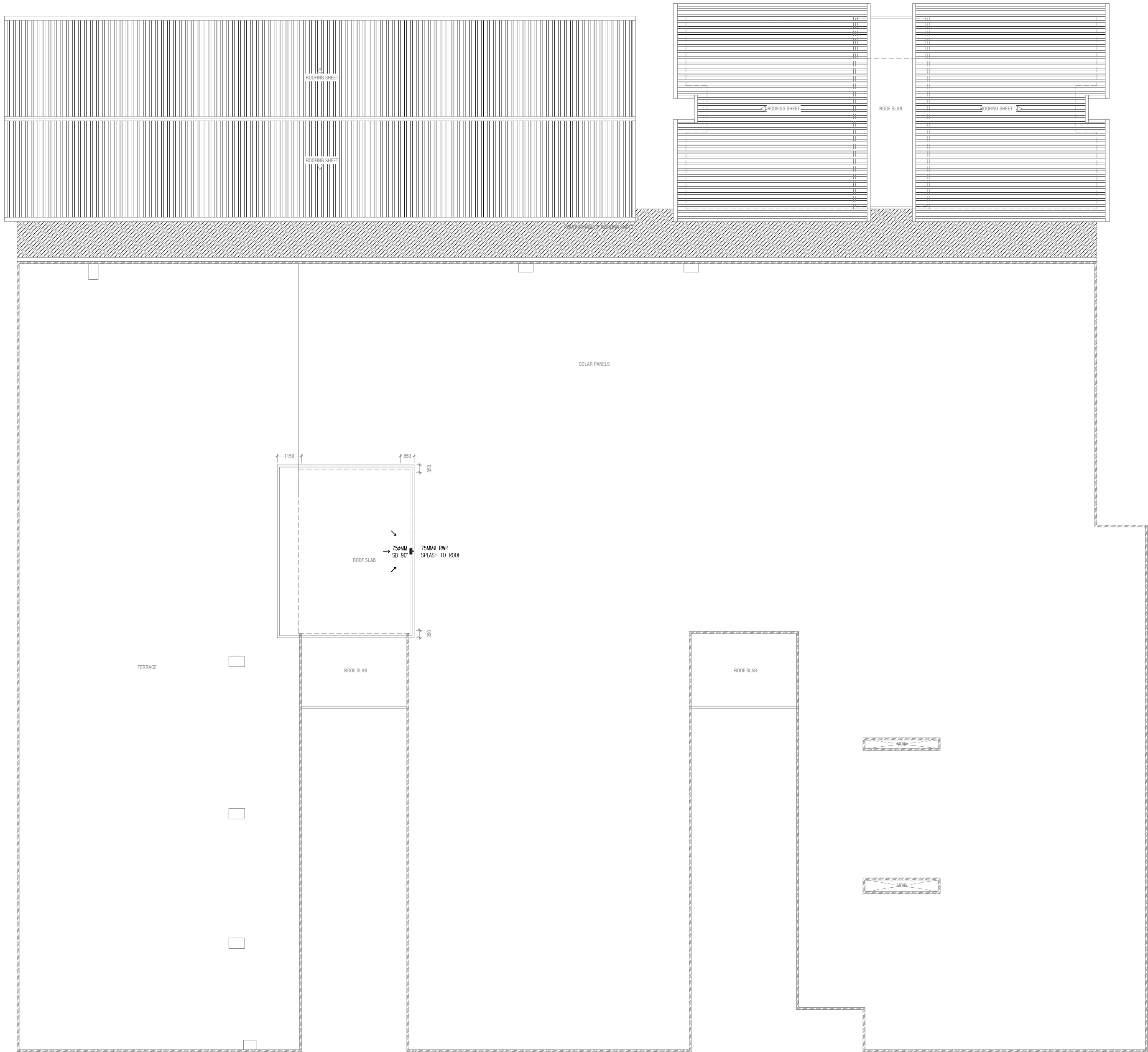


PIPE SIZE (MM)	RIGID H.A. (MM)	A	B	C	W (H)	THICK
25	10	36	55	75	22	1.8
32	10	46	65	87	22	1.8
40	10	49	57	95	22	1.8
50	10	56	76	106	22	1.8
65	15	76	98	135	38	2.5
75	15	84	108	152	38	2.5
100	16	90	124	181	52	2.5

### DETAILS OF PIPE HANGER

1



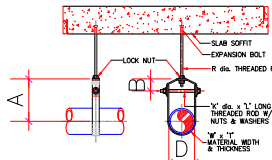


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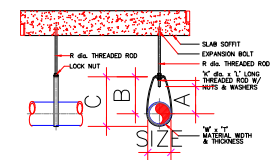
LEGEND:

WATER DISTRIBUTION SYSTEM	
CM	COLD WATER LINE
HM	HOT WATER LINE
CM/DMV	COLD WATER RISE/DOWN
SV/TV	SAFETY VALVE / DRAIN VALVE / ISOLATION VALVE
CV	CHECK VALVE
HB	HOSE BIBB
WM	WATER METER
WASTE, DRAINAGE, SEWER & VENT SYSTEM	
WP	WASTE PIPE
VP	VENT PIPE
RWP	RANWATER PIPE
SS/VS/W	SOIL/VENT/ WASTE STACK
VS/R	VENT STACK THRU ROOF
FGD/GCD	FLOOR/CEILING DRAIN/OUT
GD/GCD	CEILING/WALL DRAIN/OUT
FD	FLOOR DRAIN DAILY TRAP
FG	FLOOR DRAIN DAILY TRAP
SD/ST	SCUPPER DRAIN NO DEGREE OUTLET
LD	LEFT TO RIGHT
TR	TOP TO BOTTOM
UD/S	UNDERGROUND / UNDERSLAB
AC	ABOVE CEILING
RWP	RANWATER COLLECTOR PIPE
OP / OF	OVERFLOW PIPE / OVERFLOW



ELEVATION

STANDARD CLEVIS HANGERS							
TABLE OF DIMENSIONS							
Ø	A	B	C	D	E	F	G
34	80	45	12	25	3	W3 x 70	
42	80	50	12	25	3	W3 x 80	
48	80	50	12	25	3	W3 x 85	
60	105	60	12	25	3	W3 x 100	
76	115	80	14	25	3	W3 x 115	
89	125	85	14	25	3	W3 x 130	
114	145	95	16	25	3	W3 x 160	
140	165	115	18	25	3	W3 x 180	
165	185	140	20	25	3	W3 x 200	



SECTION

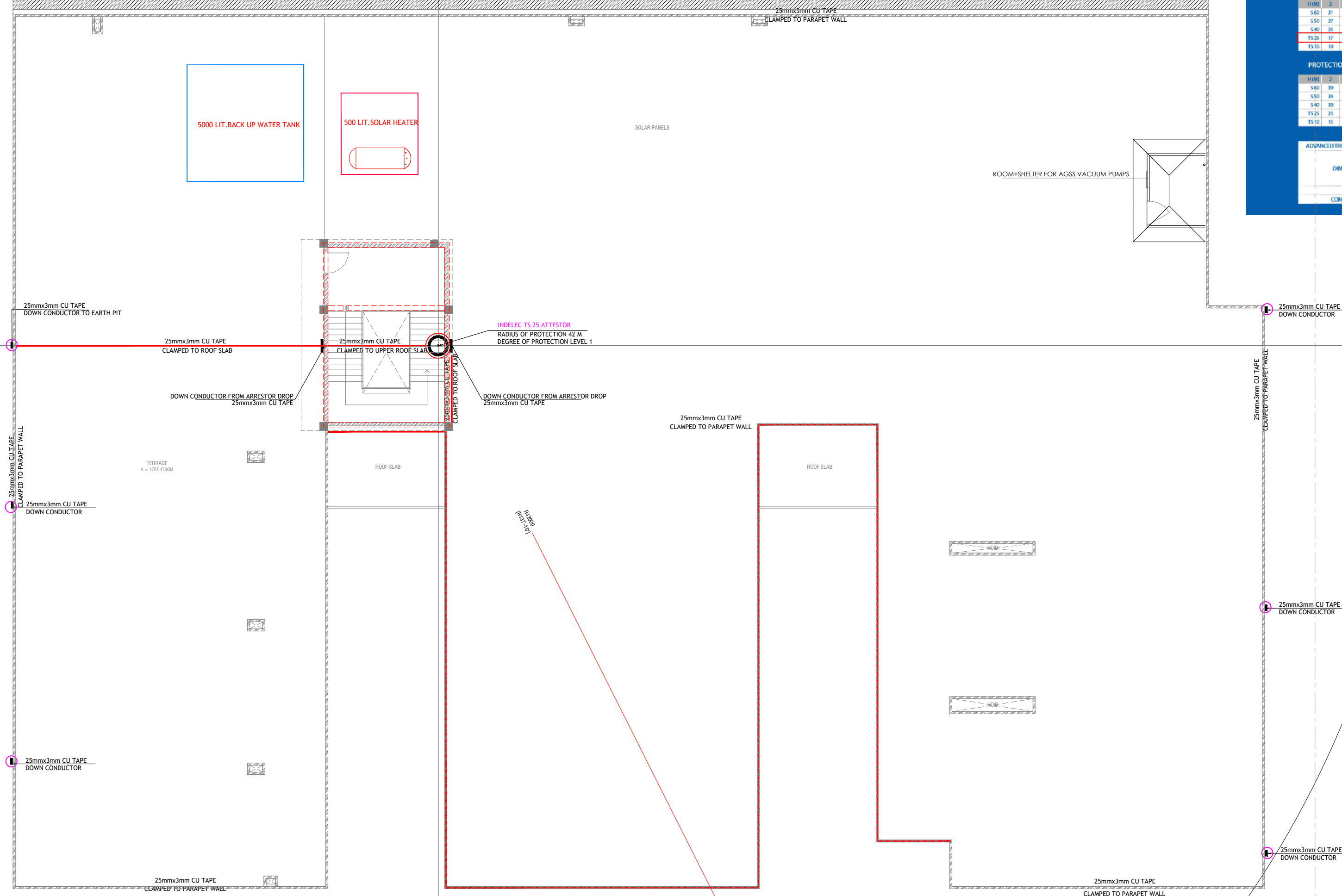
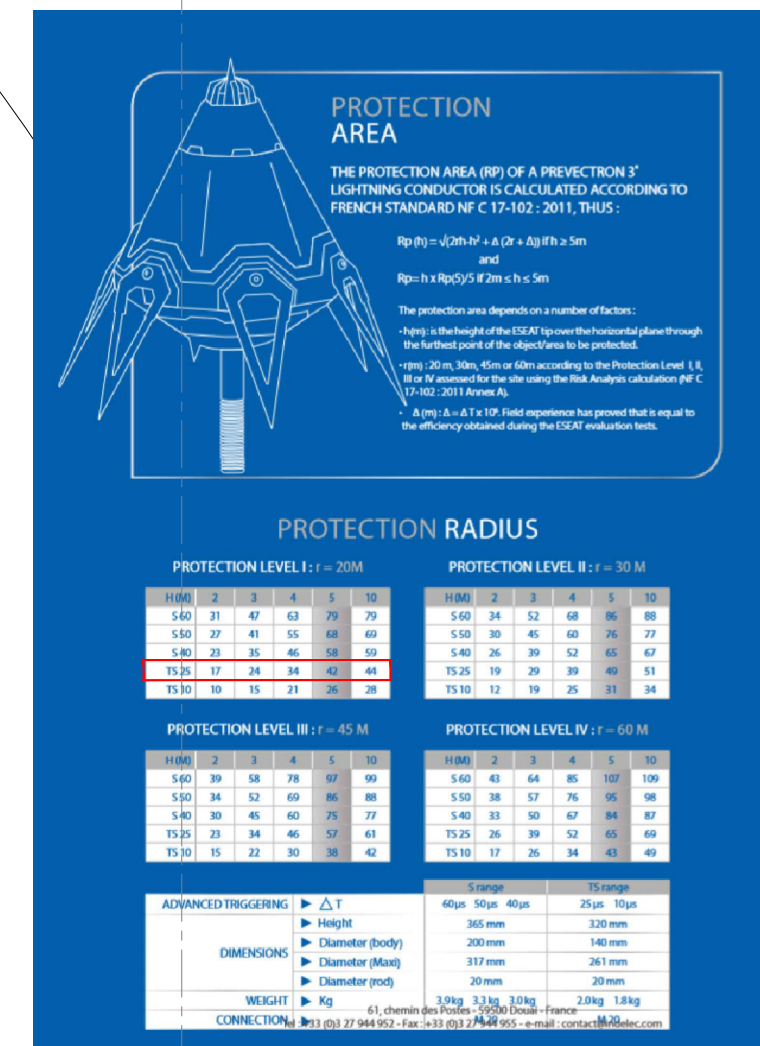
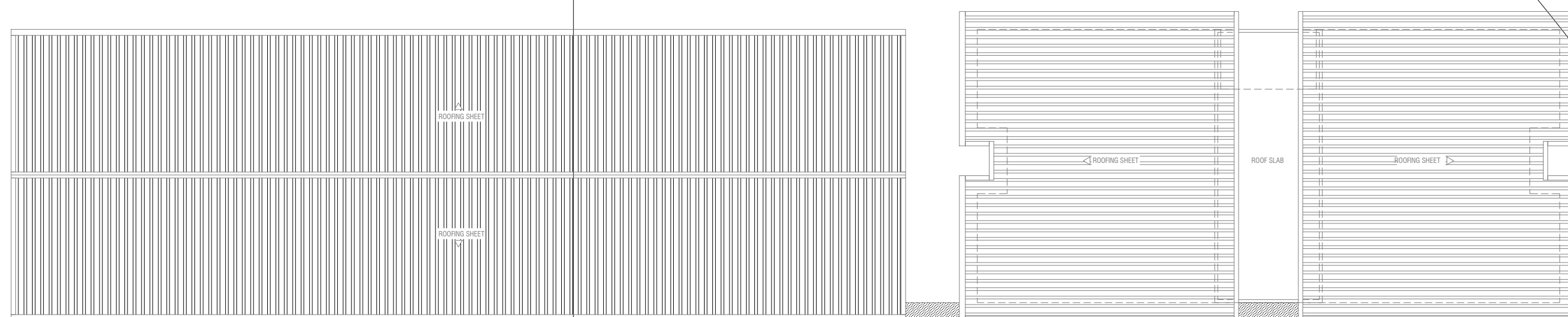
TRAPEZE HANGERS							
TABLE OF DIMENSIONS IN MM							
Ø	A	B	C	D	E	F	G
25	10	38	6	22	1.8		
32	10	46	6	22	1.8		
40	10	48	6	22	1.8		
50	10	58	6	22	1.8		
65	15	70	8	25	2.5		
75	15	84	8	25	2.5		
100	15	108	10	25	2.5		
150	20	132	12	25	2.5		

DETAILS OF PIPE HANGERS  
NTS









### Roof Plan-Lightning Protection Layout





LEGEND : FDP SYSTEM		
1	SMOKE DETECTOR - ADDRESSABLE/ANALOG	SD
2	HEAT DETECTOR - ADDRESSABLE/ANALOG	HD
3	FIRE ALARM CONTROL PANEL	FACP
4	FIRE MANUAL CALL POINT	MCB
5	FIRE ALARM SOUNDER WITH STROBE LIGHT 95DB	FHS/SL
6	FIRE RESISTANT CABLE 1.5MM² X 2 CORE	
7	FIRE BLANKET	FB
8	FIRE EXTINGUISHERS - 9 LTRS H2O & 2KG Co2	
9	FIRE EXTINGUISHERS - 50KG TROLLEY DCP & 2KG DCP	
10	FIRE HOSE REEL W/ 25mm HOSE & 30 METERS	FHR
11	EMERGENCY LIGHT	EM
12	EXIT SIGNS LIGHT W/ BACK UP BATTERIES	EXIT
13	MWSC WATER METER	M
14	25 MMø AIR RELEASE VALVE	
15	PVC PIPE - 40MMø CONNECTION TO FILL FIRE TANK	
16	PIPE RISER - GI PIPE 100MMø, SCHEDULE 40	
17	PIPE RISER - GI PIPE 25MMø, SCHEDULE 40	
18	PIPE RISER - GI PIPE 50MMø, SCHEDULE 40	
19	PIPE RISER - GI PIPE 25MMø, SCHEDULE 40	
20	PIPE HDPE 100MMø, PE100, PN16, SDR11	
21	FIRE PUMP SYSTEM CONSIST OF ELECTRICAL DUTY PUMP & DIESEL STAND BY PUMP - PUMPS CAPACITY IS 100 GPM @ 40M HEAD - JOCKEY PUMPS IS 3 GPM @ 40m HEAD	
22	FIRE RATED DOOR - 90 MINS.	

GROUND FLOOR FDP LAYOUT  
SCALE 1:150





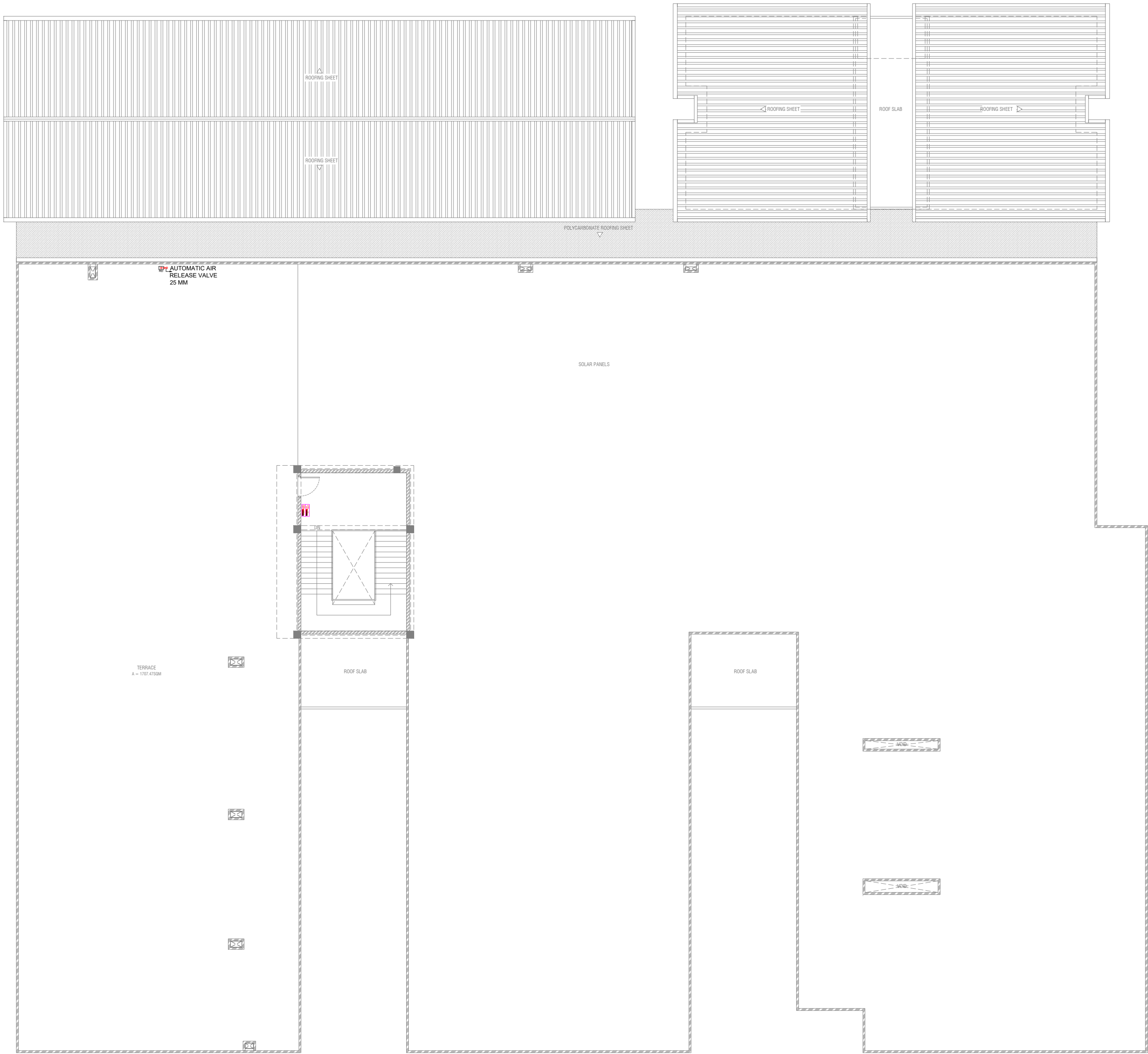
LEGEND : FDP SYSTEM		
1	SMOKE DETECTOR - ADDRESSABLE/ANALOG	SD
2	HEAT DETECTOR - ADDRESSABLE/ANALOG	HD
3	FIRE ALARM CONTROL PANEL	FACP
4	FIRE MANUAL CALL POINT	MCP
5	FIRE ALARM SOUNDER WITH STROBE LIGHT 95DB	FHSL
6	FIRE RESISTANT CABLE 1.5MM² X 2 CORE	
7	FIRE BLANKET	FB
8	FIRE EXTINGUISHERS - 9 LTRS H2O & 2KG Co2 FIRE EXTINGUISHERS - 50KG TROLLEY DCP & 2KG DCP	FE
9	FIRE HOSE REEL W/ 25mm HOSE & 30 METERS	FHR
10	EMERGENCY LIGHT	EL
11	EXIT SIGNS LIGHT W/ BACK UP BATTERIES	EXIT
12	MWSC WATER METER	M
13	25 MMØ AIR RELEASE VALVE	ARV
14	PVC PIPE - 40MMØ CONNECTION TO FILL FIRE TANK	
15	PIPE RISER - GI PIPE 100MMØ, SCHEDULE 40	○
16	PIPE RISER - GI PIPE 25MMØ, SCHEDULE 40	○
17	PIPE RISER - GI PIPE 50MMØ, SCHEDULE 40	—
18	PIPE RISER - GI PIPE 25MMØ, SCHEDULE 40	—
19	PIPE HDPE 100MMØ, PE100, PN16, SDR11	—
20	FIRE PUMP SYSTEM CONSIST OF ELECTRICAL DUTY PUMP & DIESEL STAND BY PUMP - PUMPS CAPACITY IS 100 GPM @ 40M HEAD - JOCKEY PUMPS IS 3 GPM @ 40m HEAD	FP
21	FIRE RATED DOOR - 90 MINS.	FRD

FIRST FLOOR FDP LAYOUT  
SCALE 1:150



TERRACE FLOOR FDP LAYOUT

SCALE 1:150  
0 0.5 1 2 3 4

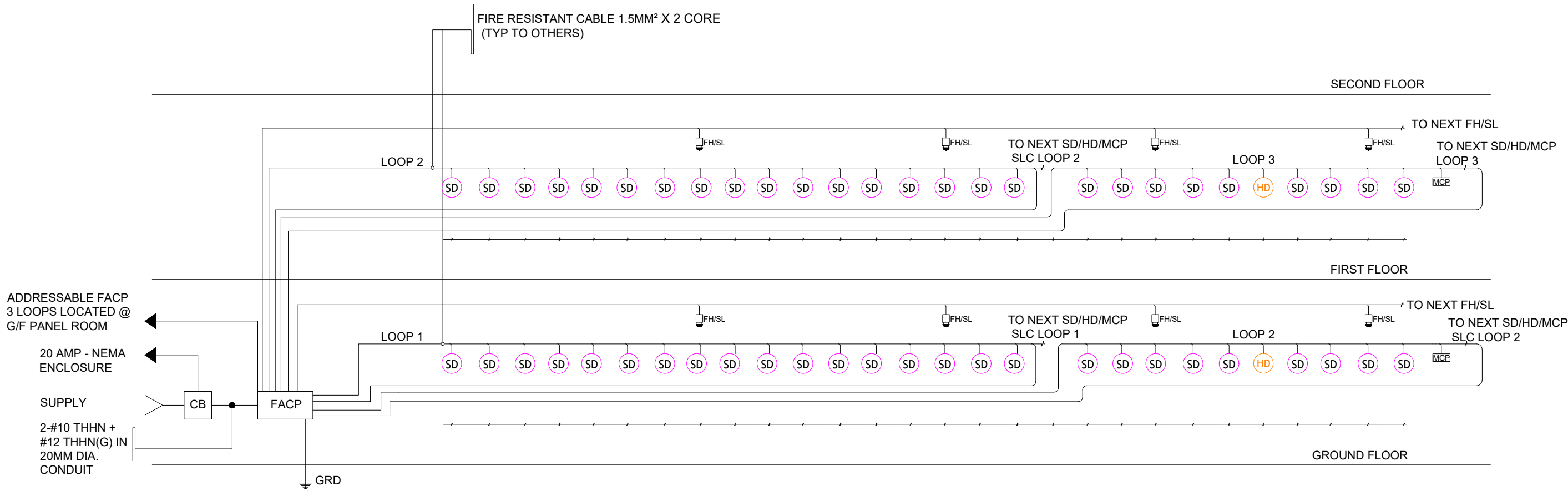


LEGEND : FDP SYSTEM		
1	SMOKE DETECTOR - ADDRESSABLE/ANALOG	
2	HEAT DETECTOR - ADDRESSABLE/ANALOG	
3	FIRE ALARM CONTROL PANEL	
4	FIRE MANUAL CALL POINT	
5	FIRE ALARM SOUNDER WITH STROBE LIGHT 95DB	
6	FIRE RESISTANT CABLE 1.5MM² X 2 CORE	
7	FIRE BLANKET	
8	FIRE EXTINGUISHERS - 9 LTRS H2O & 2KG Co2 FIRE EXTINGUISHERS - 50KG TROLLEY DCP & 2KG DCP	
9	FIRE HOSE REEL W/ 25mmø HOSE & 30 METERS	
10	EMERGENCY LIGHT	
11	EXIT SIGNS LIGHT W/ BACK UP BATTERIES	
12	MWSC WATER METER	
13	25 MMø AIR RELEASE VALVE	
14	PVC PIPE - 40MMø CONNECTION TO FILL FIRE TANK	
15	PIPE RISER - GI PIPE 100MMø, SCHEDULE 40	
16	PIPE RISER - GI PIPE 25MMø, SCHEDULE 40	
17	PIPE RISER - GI PIPE 50MMø, SCHEDULE 40	
18	PIPE RISER - GI PIPE 25MMø, SCHEDULE 40	
19	PIPE HDPE 100MMø, PE100, PN16,SDR11	
20	FIRE PUMP SYSTEM CONSIST OF ELECTRICAL DUTY PUMP & DIESEL STAND BY PUMP - PUMPS CAPACITY IS 100 GPM @ 40M HEAD - JOCKEY PUMPS IS 3 GPM @ 40m HEAD	
21	FIRE RATED DOOR - 90 MINS.	

NOTE :

1. CONTRACTOR MAY MODIFY THE SYSTEM TO SUIT THE SUPPLIED EQUIPMENT.
2. FOR ACTUAL NUMBER OF DETECTORS/ANUNCIATOR MANUAL PULL STATION AND HORN, REFER TO LAY-OUT PLAN .
3. FIREMANS TELEPHONE JACKS AT RESPECTIVE FLOORS SHALL BE TREATED AS ONE ZONE PER FLOOR.
4. j MEANS FIRE RATED CABLE WIRE GAUGE#16.
5. SIZE , TYPE AND NUMBER OF WIRES MAY BE MODIFIED BY THE CONTRACTOR TO SUIT THE SUPPLIED EQUIPMENT AND AS PER MANUFACTURERS STANDARD REQUIREMENT.
6. WIRING BETWEEN TB's/PB's AND FACP ARE MULTIPLEX SIGNAL WIRING.
7. CIRCUIT CONNECTION BETWEEN DETECTORS,MCP,ANNUNCIATOR ETC... SHALL BE CONFORM VIA LOOP INTERFACE MODULES (ADDRESSABLE).

LEGEND : FDP SYSTEM		
1	SMOKE DETECTOR - ADDRESSABLE/ANALOG	SD
2	HEAT DETECTOR - ADDRESSABLE/ANALOG	HD
3	FIRE ALARM CONTROL PANEL	FACP
4	FIRE MANUAL CALL POINT	MCP
5	FIRE ALARM SOUNDER WITH STROBE LIGHT 95DB	FHSL
6	FIRE RESISTANT CABLE 1.5MM² X 2 CORE	
7	FIRE BLANKET	
8	FIRE EXTINGUISHERS - 9 LTRS H2O & 2KG Co2 FIRE EXTINGUISHERS - 50KG TROLLEY DCP & 2KG DCP	
9	FIRE HOSE REEL W/ 25mmø HOSE & 30 METERS	FHR
10	EMERGENCY LIGHT	EL
11	EXIT SIGNS LIGHT W/ BACK UP BATTERIES	EXIT
12	MWSC WATER METER	M
13	25 MMø AIR RELEASE VALVE	
14	PVC PIPE - 40MMø CONNECTION TO FILL FIRE TANK	
15	PIPE RISER - GI PIPE 100MMø, SCHEDULE 40	
16	PIPE RISER - GI PIPE 25MMø, SCHEDULE 40	
17	PIPE RISER - GI PIPE 50MMø, SCHEDULE 40	
18	PIPE RISER - GI PIPE 25MMø, SCHEDULE 40	
19	PIPE HDPE 100MMø, PE100, PN16, SDR11	
20	FIRE PUMP SYSTEM CONSIST OF ELECTRICAL DUTY PUMP & DIESEL STAND BY PUMP - PUMPS CAPACITY IS 100 GPM @ 40M HEAD - JOCKEY PUMPS IS 3 GPM @ 40m HEAD	
21	FIRE RATED DOOR - 90 MINS.	



WIRING SCHEDULE:

SYMBOL	WIRING		CONDUIT	
	SIZE	TYPE	SIZE	TYPE
W	1 - 1.5 MM. SQ.	TF	15MM DIA.	IMC
2W	2 - 1.5 MM. SQ.	TF	15MM DIA.	IMC
3W	3 - 1.5 MM. SQ.	TF	15MM DIA.	IMC
4W	4 - 1.5 MM. SQ.	TF	20MM DIA.	IMC
5W	5 - 1.5 MM. SQ.	TF	20MM DIA.	IMC
6W	6 - 1.5 MM. SQ.	TF	20MM DIA.	IMC
7W-9W	7-9 - 1.5 MM. SQ.	TF	20MM DIA.	IMC
10W-12W	10-12 - 1.5 MM. SQ.	TF	25MM DIA.	IMC
15W	15 - 1.5 MM. SQ.	TF	32MM DIA.	IMC
20W-28W	20-28 - 1.5 MM. SQ.	TF	40MM DIA.	IMC

1  
AUX-1 SCALE NTS

FDAS SINGLE LINE  
RISER DIAGRAM

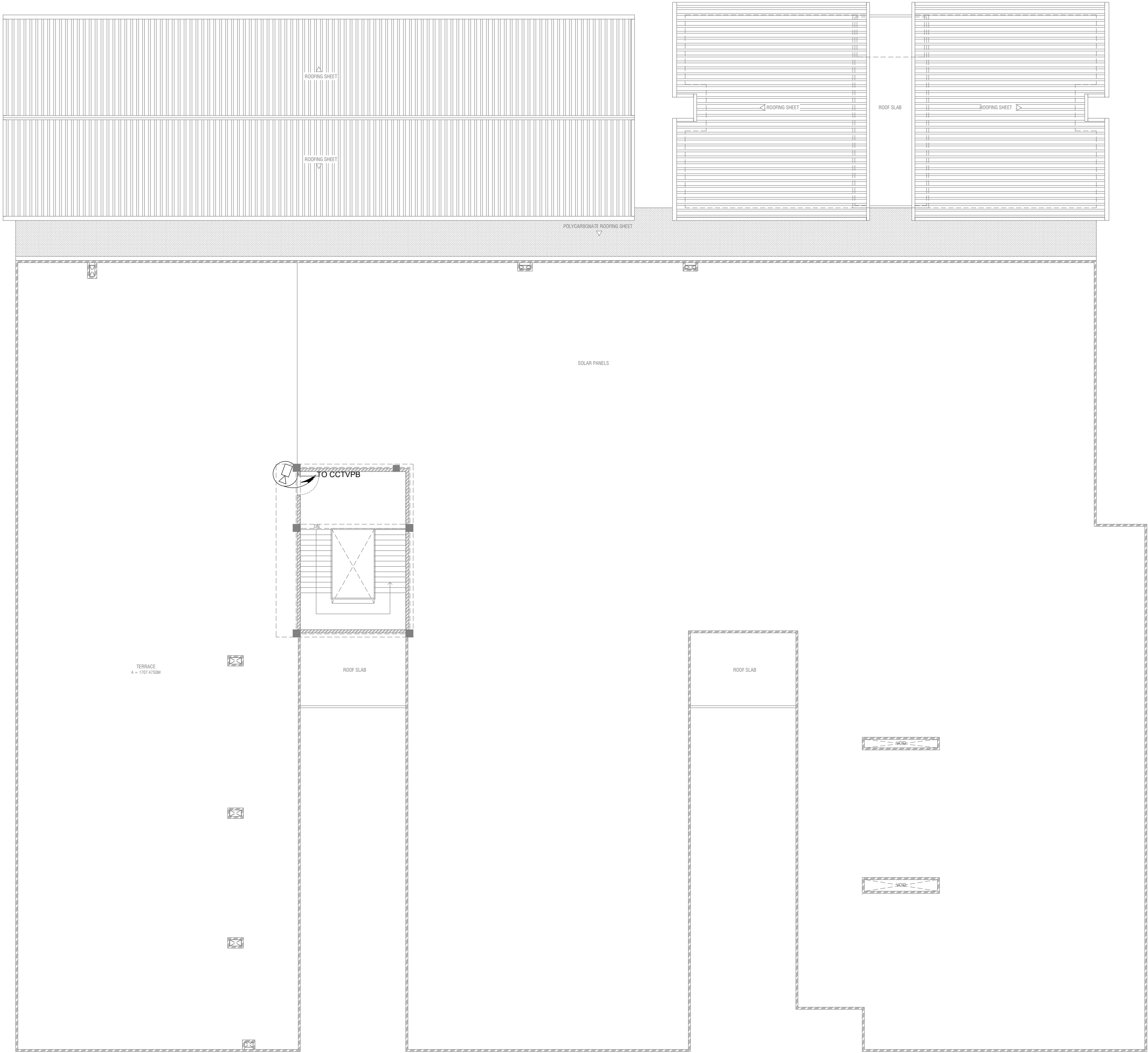
















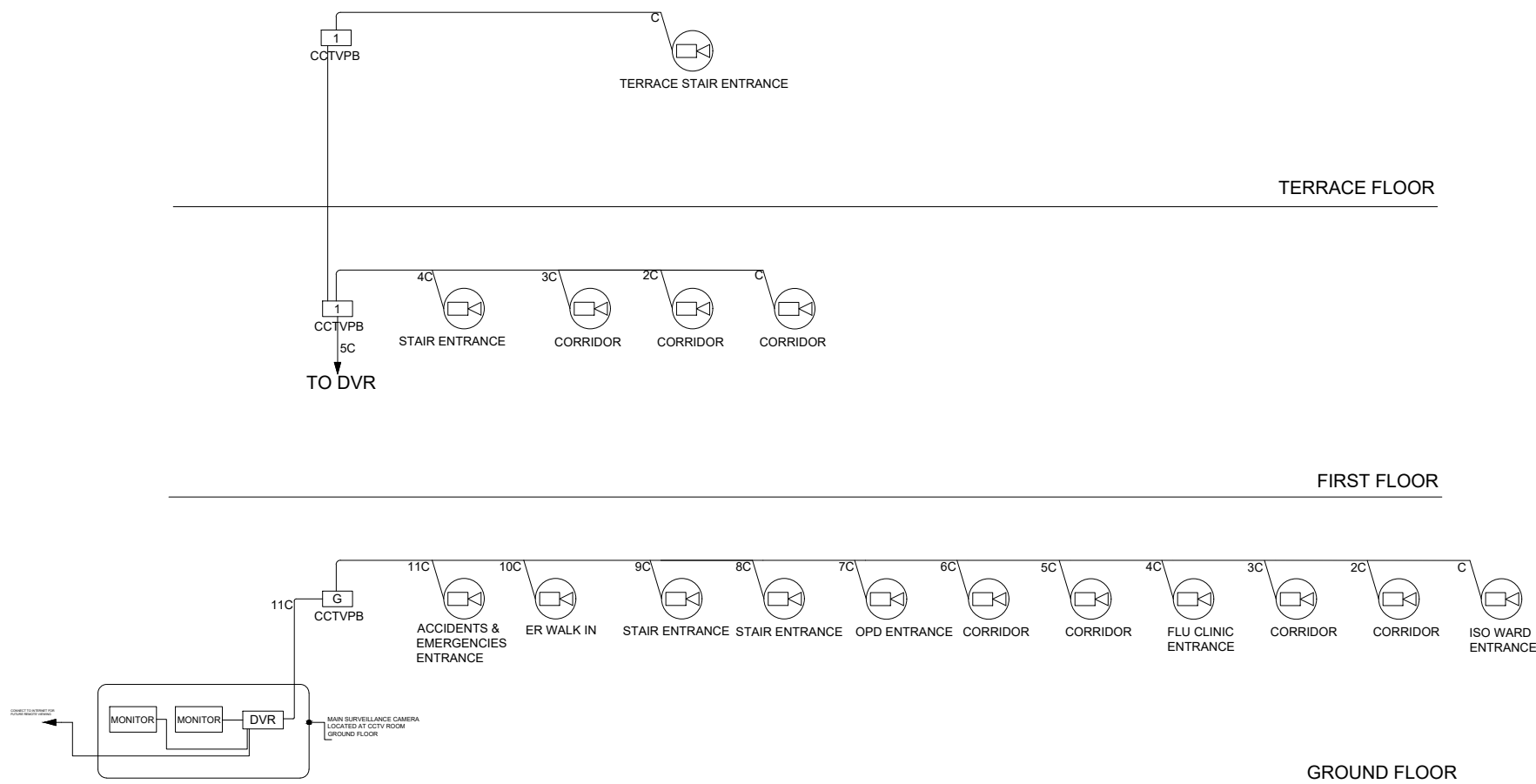




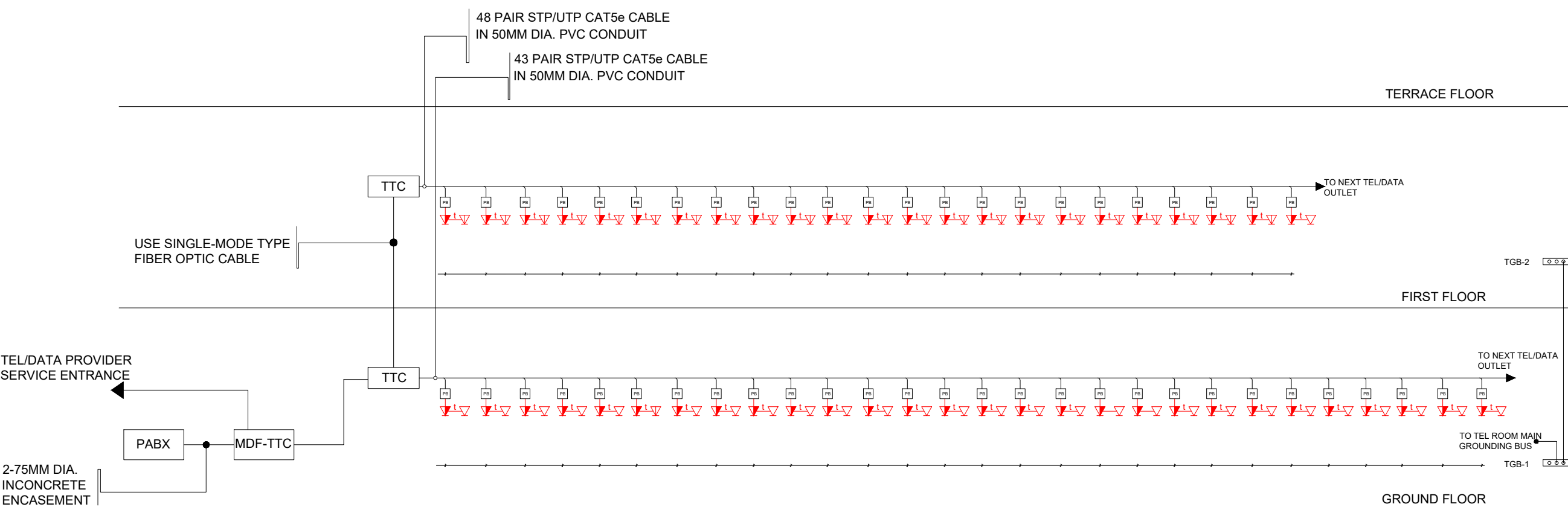


LEGEND : AUXILIARY SYSTEM		
1	CLOSE-CIRCUIT TELEVISION	
2	CLOSE-CIRCUIT TELEVISION PULLBOX	
3	CENTRALIZATION MODULE	
4	NURSE CALL	
5	PILOT LIGHT	
6	TEL/DATA TERMINAL CABINET	
7	MAIN DISTRIBUTION FRAME - TTC	
8	TEL/DATA OUTLET	
9	TEL/DATA CIRCUIT RUN	
10	PRIVATE AUTOMATED BRANCH EXCHANGE	

NUMBER OF RUNS	CCTV WIRES & CONDUITS
C	CAT5e IN 15mm dia. EMT
2C	CAT5e IN 20mm dia. EMT
3C	CAT5e IN 20mm dia. EMT
4C	CAT5e IN 20mm dia. EMT
5C	CAT5e IN 25mm dia. EMT
6C	CAT5e IN 25mm dia. EMT
7C	CAT5e IN 25mm dia. EMT
8C	CAT5e IN 32mm dia. EMT
9C	CAT5e IN 32mm dia. EMT
10C	CAT5e IN 32mm dia. EMT



# CCTV SINGLE LINE DIAGRAM



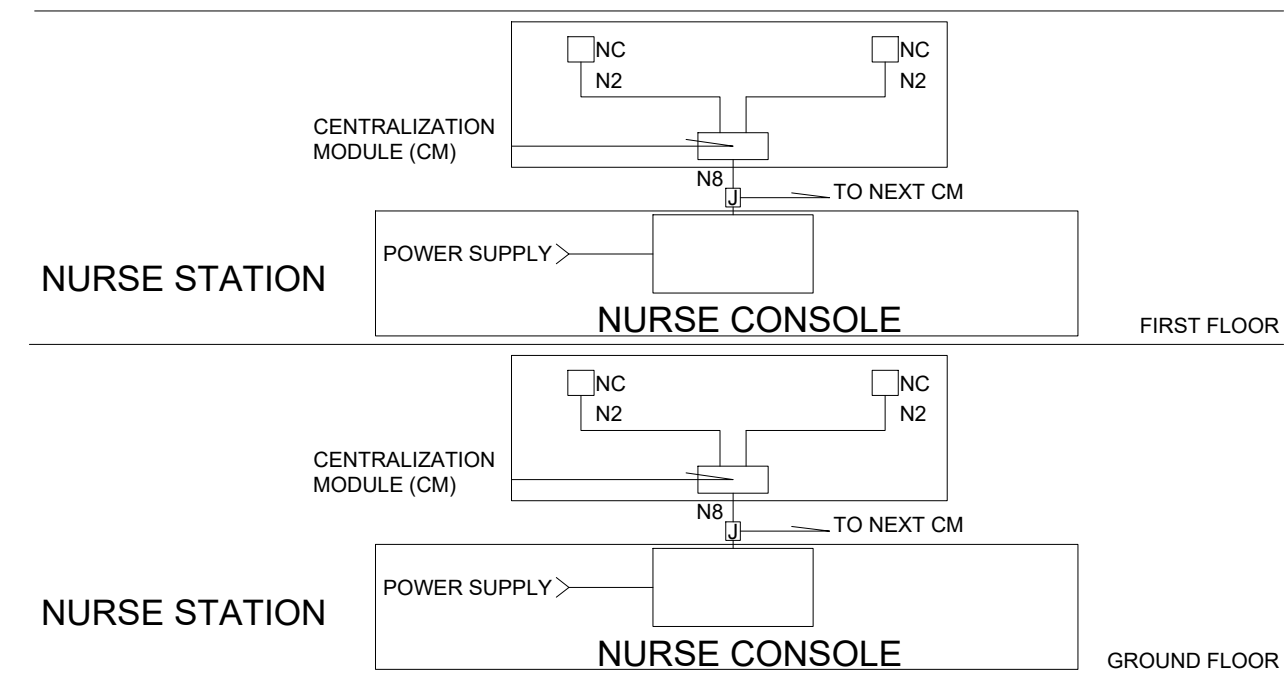
# VOICE/DATA ONE LINE RISER DIAGRAM

NOTE :

1. CONTRACTOR MAY MODIFY THE SYSTEM TO SUIT THE SUPPLIED EQUIPMENT.
2. FOR LOCATION & CIRCUIT WIRING OF CM, NURSE CONSOLE REFER TO PLAN.
3. CONTRACTOR MAY MODIFY THE SIZE THE OF WIRE SHOWN TO CONSIDER THE VOLTAGE DROP AS PER STANDARD WIRING REQUIREMENT TO NURSE CONSOLE MANUFACTURER.
4. CONTRACTOR MAY SELECT APPROPRIATE BRAND/MANUFACTURER FOR HOSPITAL NURSE CALL SIGNALLING SYSTEM.

N2 = 2 - 2MM2 TF WIRE IN 25MM DIA. EMT.  
N4 = 4 - 2MM2 TF WIRE IN 32MM DIA. EMT.











N8 = 8 - 2MM2 TF WIRE IN 50MM DIA. EMT.



2 TYPICAL NURSE CALL SYSTEM  
ONE LINE RISER DIAGRAM

NOTE :

1. CONTRACTOR MAY MODIFY THE SYSTEM TO SUIT THE SUPPLIED EQUIPMENT.
2. FOR HORIZONTAL CABLING USE STP / UTP CABLE CAT5E USE CONNECTOR RJ45, STP/UTP COUPLER/ADAPTER IF NECESSARY.
3. FOR BACKBONE CABLING USE SINGLE-MODE TYPE FIBER OPTIC CABLE.
4. t MEANS 4 PAIRS CAT5e STP/UTP CABLE.
5. ALL STP/UTP SHALL BE TERMINATE DIRECTLY TO RJ45 INFORMATION OUTLET TO EQUIPMENT WITHOUT SPLICE. CONTRACTOR SHALL PROVIDE PULLBOX. PROVIDE 3 METERS CABLE ALLOWANCE BOTH ENDS, PROVIDE 1 -4 PAIR STP/UTP CABLE FOR EACH RUN.
6. CONTRACTOR MAY SELECT APPROPRIATE BRAND/ MANUFACTURERS SUITED FOR TEL/DATA SYSTEM.

LEGEND : AUXILIARY SYSTEM		
1	CLOSE-CIRCUIT TELEVISION	
2	CLOSE-CIRCUIT TELEVISION PULLBOX	 CCTVPB
3	CENTRALIZATION MODULE	 CM
4	NURSE CALL	 NC
5	PILOT LIGHT	
6	TEL/DATA TERMINAL CABINET	 TTC
7	MAIN DISTRIBUTION FRAME - TTC	 MDF-TTC
8	TEL/DATA OUTLET	
9	TEL/DATA CIRCUIT RUN	
10	PRIVATE AUTOMATED BRANCH EXCHANGE	 PARX



**Project Name:** Makunundhoo Hospital

07.03.2022

# Documentation

## Customer Details

Company

Customer Number

Contact person

Address

Phone

Fax

E-Mail

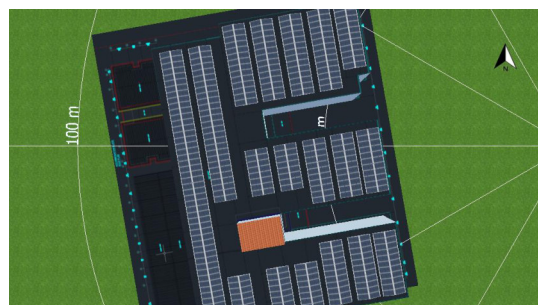
## Project Data

Project Name Makunundhoo Hospital

Offer no.

Project Designer

Address



## Project Overview



Figure: Overview Image, 3D Design

## PV System

### 3D, Grid-connected PV System

Climate Data	Makunudhoo, MDV (1996 - 2015)
Values source	Meteonorm 8.1(i)
PV Generator Output	225,68 kWp
PV Generator Surface	1 084,3 m <sup>2</sup>
Number of PV Modules	496
Number of Inverters	8



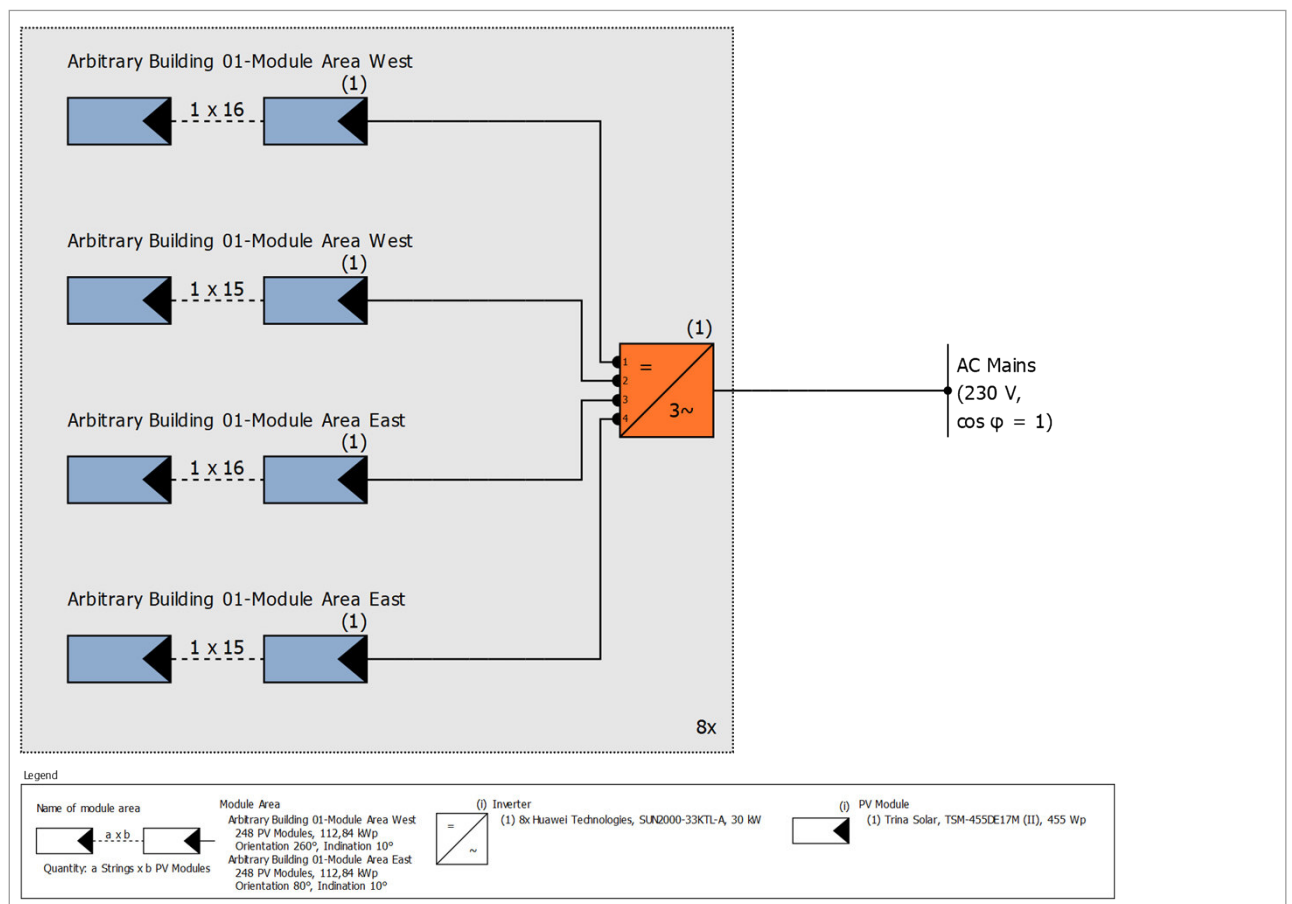


Figure: Schematic diagram

## Production Forecast

### Production Forecast

PV Generator Output	225,68 kWp
Spec. Annual Yield	1 555,00 kWh/kWp
Performance Ratio (PR)	79,66 %
Yield Reduction due to Shading	0,6 %/Year
Grid Feed-in	351 018 kWh/Year
Grid Feed-in in the first year (incl. module degradation)	346 134 kWh/Year
Standby Consumption (Inverter)	84 kWh/Year
CO <sub>2</sub> Emissions avoided	164 939 kg / year

The results have been calculated with a mathematical model calculation from Valentin Software GmbH (PV\*SOL algorithms). The actual yields from the solar power system may differ as a result of weather variations, the efficiency of the modules and inverter, and other factors.

# Set-up of the System

## Overview

### System Data

Type of System	3D, Grid-connected PV System
----------------	------------------------------

### Climate Data

Location	Makunudhoo, MDV (1996 - 2015)
Values source	Meteonorm 8.1(i)
Resolution of the data	1 h
Simulation models used:	
- Diffuse Irradiation onto Horizontal Plane	Hofmann
- Irradiance onto tilted surface	Hay & Davies

## Module Areas

### 1. Module Area - Arbitrary Building 01-Module Area West

#### PV Generator, 1. Module Area - Arbitrary Building 01-Module Area West

Name	Arbitrary Building 01-Module Area West
PV Modules	248 x TSM-455DE17M (II) (v1)
Manufacturer	Trina Solar
Inclination	10 °
Orientation	West 260 °
Installation Type	Mounted - Roof
PV Generator Surface	542,1 m²



Figure: 1. Module Area - Arbitrary Building 01-Module Area West



## Degradation of Module, 1. Module Area - Arbitrary Building 01-Module Area West

Characteristic curve	Exponential
Remaining power (power output) after 1 year	97,5 %
Remaining power (power output) after 30 years	83 %

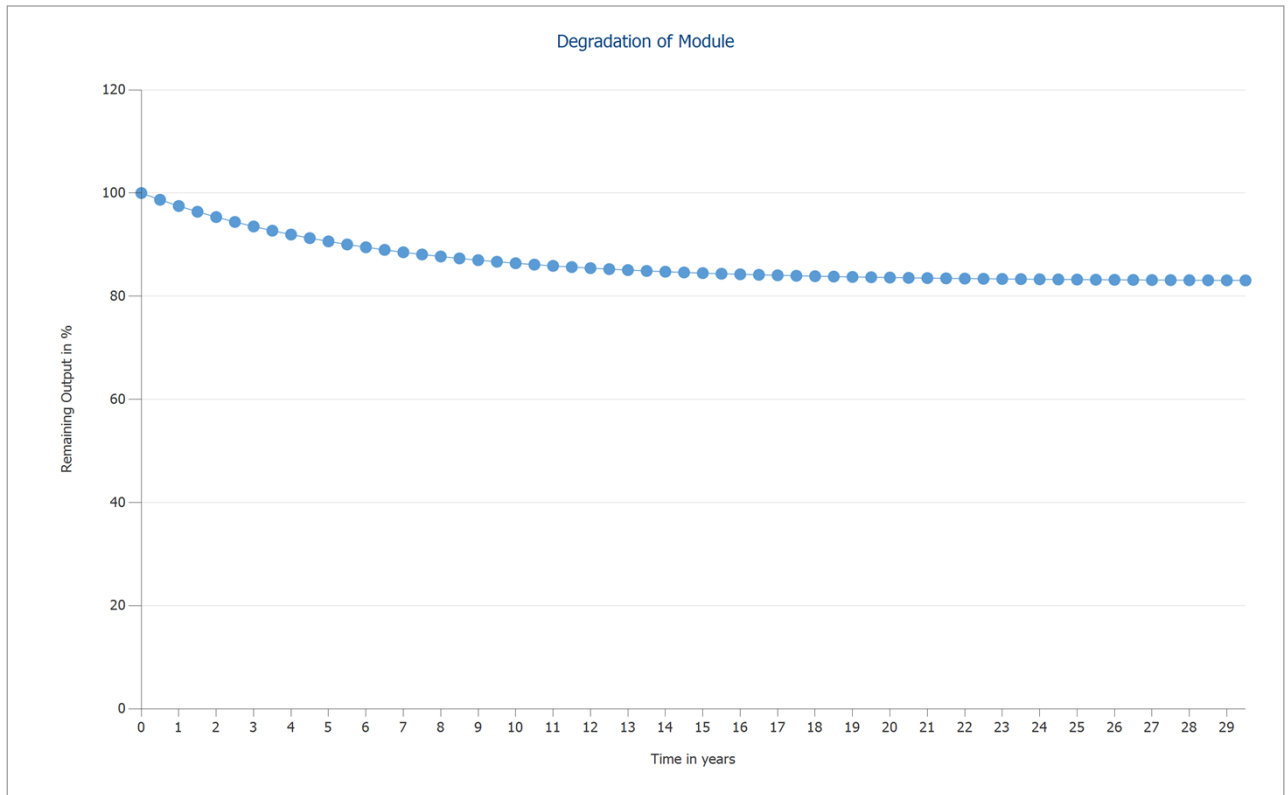


Figure: Degradation of Module, 1. Module Area - Arbitrary Building 01-Module Area West

### 2. Module Area - Arbitrary Building 01-Module Area East

#### PV Generator, 2. Module Area - Arbitrary Building 01-Module Area East

Name	Arbitrary Building 01-Module Area East
PV Modules	248 x TSM-455DE17M (II) (v1)
Manufacturer	Trina Solar
Inclination	10 °
Orientation	East 80 °
Installation Type	Mounted - Roof
PV Generator Surface	542,1 m <sup>2</sup>

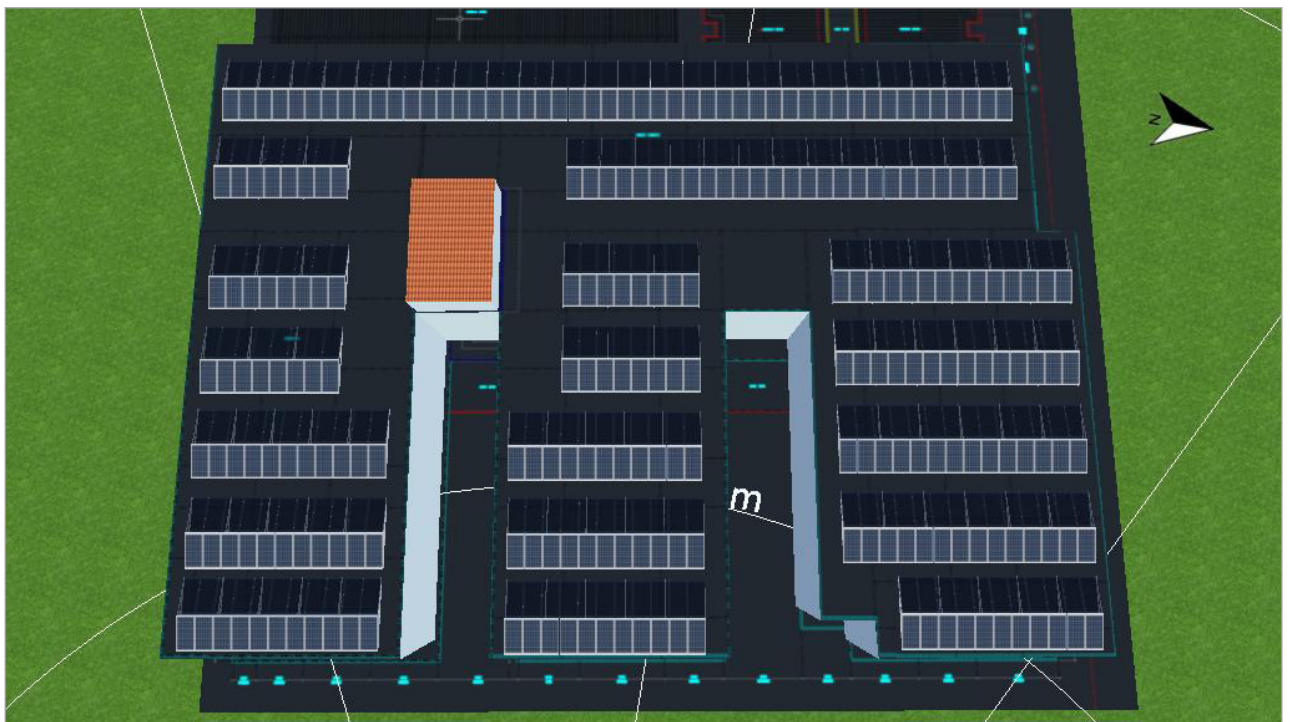


Figure: 2. Module Area - Arbitrary Building 01-Module Area East



## Degradation of Module, 2. Module Area - Arbitrary Building 01-Module Area East

Characteristic curve	Exponential
Remaining power (power output) after 1 year	97,5 %
Remaining power (power output) after 30 years	83 %

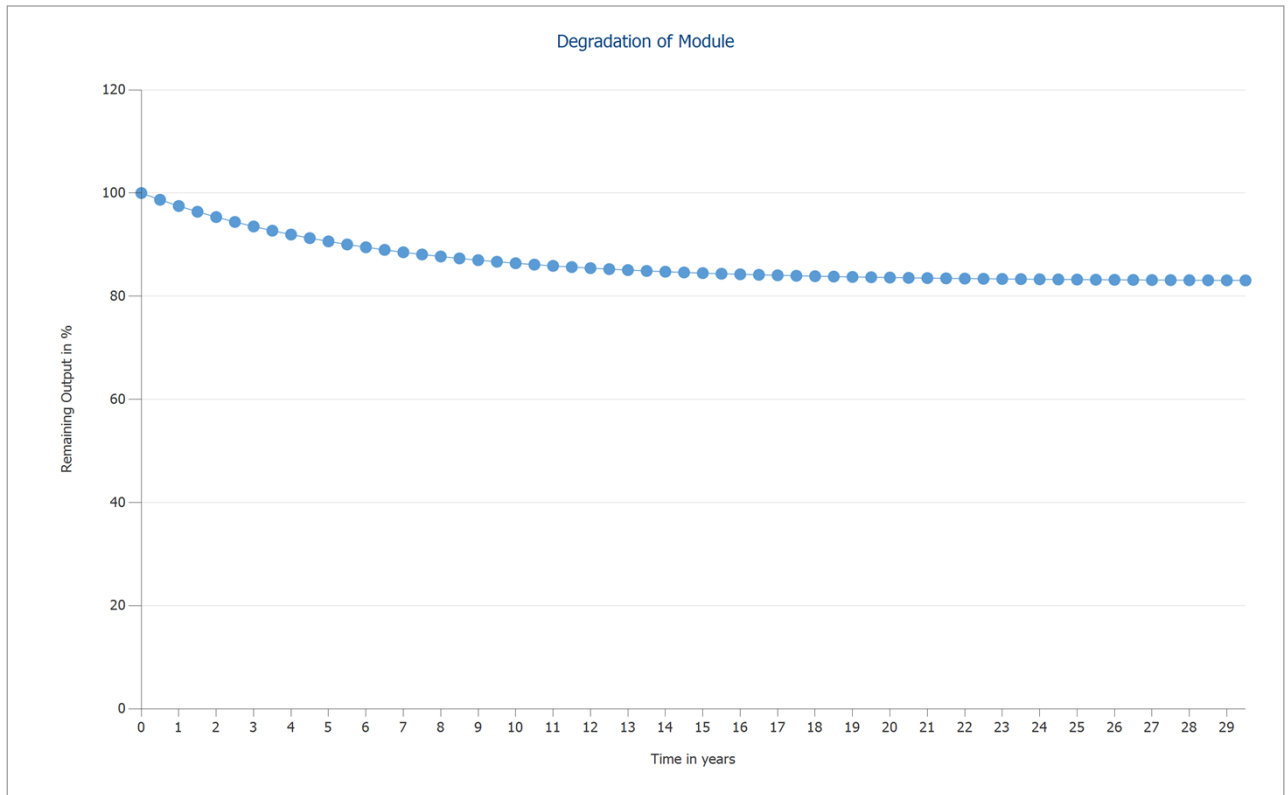


Figure: Degradation of Module, 2. Module Area - Arbitrary Building 01-Module Area East

## Horizon Line, 3D Design

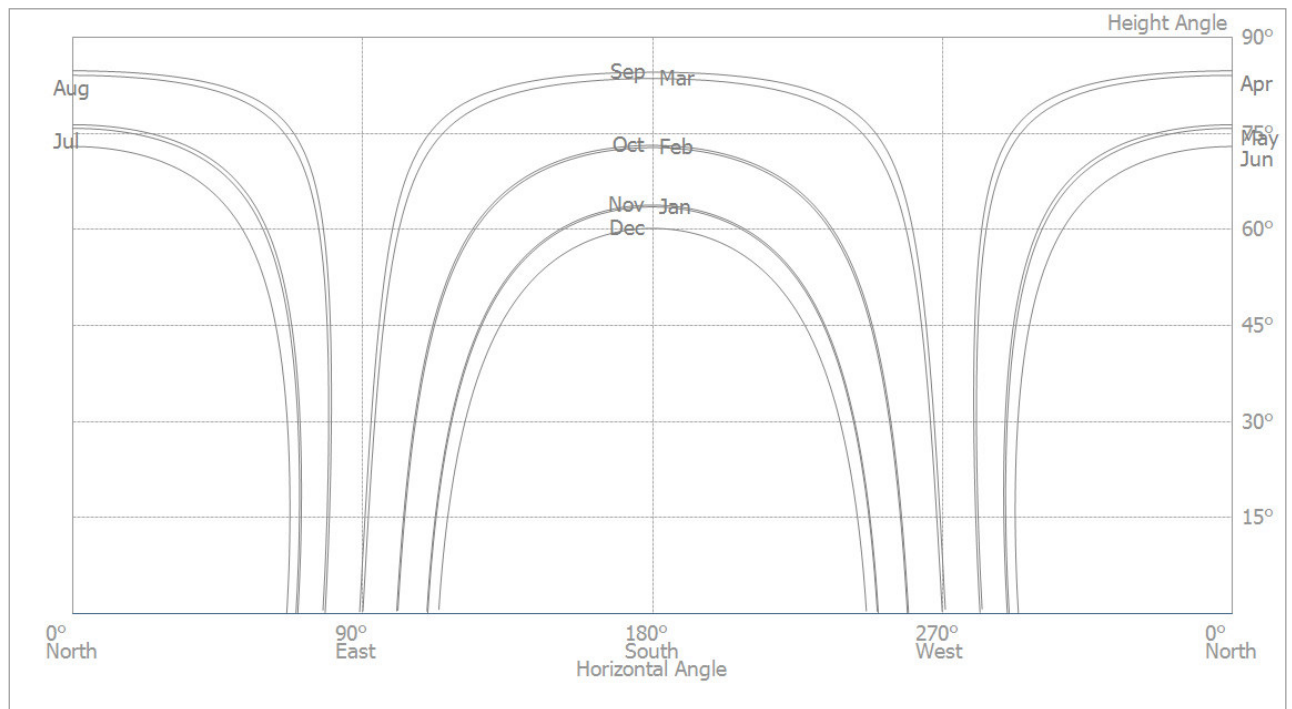


Figure: Horizon (3D Design)

## Inverter configuration

### Configuration 1

Module Areas	Arbitrary Building 01-Module Area West + Arbitrary Building 01-Module Area East
Inverter 1	
Model	SUN2000-33KTL-A (v1)
Manufacturer	Huawei Technologies
Quantity	8
Sizing Factor	94 %
Configuration	MPP 1: 1 x 16
	MPP 2: 1 x 15
	MPP 3: 1 x 16
	MPP 4: 1 x 15

## AC Mains

### AC Mains

Number of Phases	3
Mains voltage between phase and neutral	230 V
Displacement Power Factor (cos phi)	+/- 1



# Simulation Results

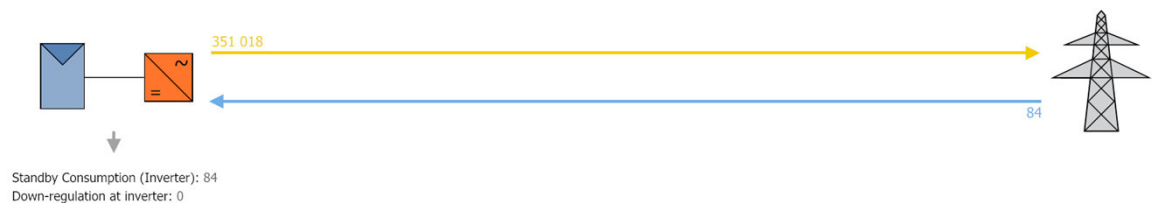
## Results Total System

### PV System

PV Generator Output	225,68 kWp
Spec. Annual Yield	1 555,00 kWh/kWp
Performance Ratio (PR)	79,66 %
Yield Reduction due to Shading	0,6 %/Year
Grid Feed-in	351 018 kWh/Year
Grid Feed-in in the first year (incl. module degradation)	346 134 kWh/Year
Standby Consumption (Inverter)	84 kWh/Year
CO <sub>2</sub> Emissions avoided	164 939 kg / year

### Energy Flow Graph

Project: Makunundhoo Hospital



All values in kWh  
Small deviations in the totals can occur due to rounding  
created with PV\*SOL

Figure: Energy flow

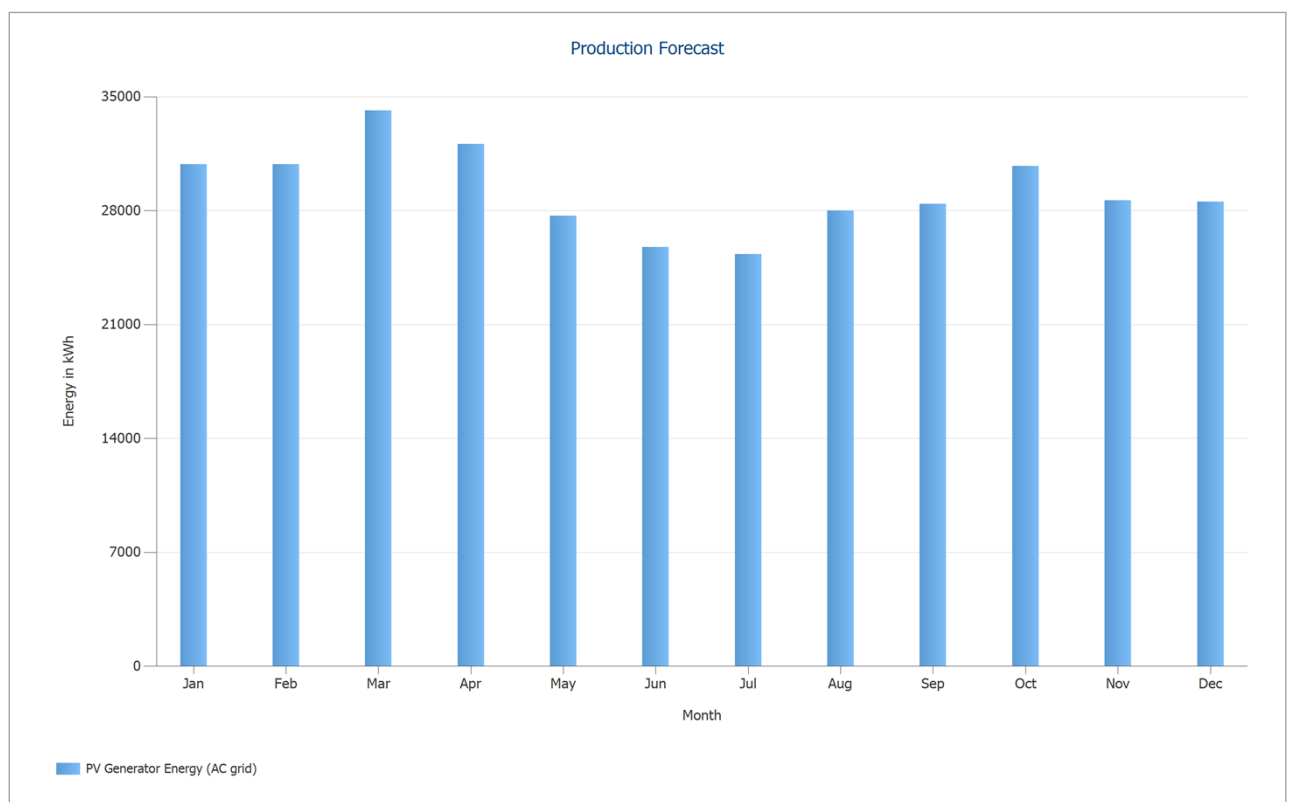


Figure: Production Forecast

## Results per Module Area

### Arbitrary Building 01-Module Area West

PV Generator Output	112,84 kWp
PV Generator Surface	542,15 m <sup>2</sup>
Global Radiation at the Module	1790,28 kWh/m <sup>2</sup>
Global Radiation on Module without reflection	1956,34 kWh/m <sup>2</sup>
Performance Ratio (PR)	79,52 %
PV Generator Energy (AC grid)	175790,82 kWh/Year
Spec. Annual Yield	1557,88 kWh/kWp

### Arbitrary Building 01-Module Area East

PV Generator Output	112,84 kWp
PV Generator Surface	542,15 m <sup>2</sup>
Global Radiation at the Module	1779,76 kWh/m <sup>2</sup>
Global Radiation on Module without reflection	1942,19 kWh/m <sup>2</sup>
Performance Ratio (PR)	79,84 %
PV Generator Energy (AC grid)	175227,04 kWh/Year
Spec. Annual Yield	1552,88 kWh/kWp



## PV System Energy Balance

### PV System Energy Balance

<b>Global radiation - horizontal</b>	<b>1 991,00 kWh/m<sup>2</sup></b>	
Deviation from standard spectrum	-19,91 kWh/m <sup>2</sup>	-1,00 %
Ground Reflection (Albedo)	2,99 kWh/m <sup>2</sup>	0,15 %
Orientation and inclination of the module surface	-24,82 kWh/m <sup>2</sup>	-1,26 %
Module-independent shading	0,00 kWh/m <sup>2</sup>	0,00 %
Reflection on the Module Interface	-164,24 kWh/m <sup>2</sup>	-8,43 %
<b>Global Radiation at the Module</b>	<b>1 785,02 kWh/m<sup>2</sup></b>	
	1 785,02 kWh/m <sup>2</sup>	
	x 1084,296 m <sup>2</sup>	
	= 1 935 487,88 kWh	
<b>Global PV Radiation</b>	<b>1 935 487,88 kWh</b>	
Soiling	0,00 kWh	0,00 %
STC Conversion (Rated Efficiency of Module 20,84 %)	-1 532 049,93 kWh	-79,16 %
<b>Rated PV Energy</b>	<b>403 437,95 kWh</b>	
Module-specific Partial Shading	-2 055,09 kWh	-0,51 %
Low-light performance	-6 111,12 kWh	-1,52 %
Deviation from the nominal module temperature	-30 179,71 kWh	-7,64 %
Diodes	-72,07 kWh	-0,02 %
Mismatch (Manufacturer Information)	-7 300,40 kWh	-2,00 %
Mismatch (Configuration/Shading)	-168,31 kWh	-0,05 %
<b>PV Energy (DC) without inverter down-regulation</b>	<b>357 551,25 kWh</b>	
Failing to reach the DC start output	-37,98 kWh	-0,01 %
Down-regulation on account of the MPP Voltage Range	0,00 kWh	0,00 %
Down-regulation on account of the max. DC Current	0,00 kWh	0,00 %
Down-regulation on account of the max. DC Power	0,00 kWh	0,00 %
Down-regulation on account of the max. AC Power/cos phi	0,00 kWh	0,00 %
MPP Matching	-210,27 kWh	-0,06 %
<b>PV energy (DC)</b>	<b>357 303,00 kWh</b>	
<b>Energy at the Inverter Input</b>	<b>357 303,00 kWh</b>	
Input voltage deviates from rated voltage	-364,96 kWh	-0,10 %
DC/AC Conversion	-5 920,19 kWh	-1,66 %
Standby Consumption (Inverter)	-84,35 kWh	-0,02 %
Total Cable Losses	0,00 kWh	0,00 %
<b>PV energy (AC) minus standby use</b>	<b>350 933,50 kWh</b>	
<b>PV Generator Energy (AC grid)</b>	<b>351 017,85 kWh</b>	