



Supply, Installation, Testing, and Commissioning of Solar Pumping Systems for Water Well in Matnah City

MATNAH CITY - YEMEN



MAY, 2023

PROJECT:

SUPPLY AND INSTALL OF SOLAR SYSTEM FOR
BAREHOLE AL-SNAFEEAH IN MATNAH CITY

FUNDED BY:

WORLD BANK GROUP.

MAY, 2023.

DRAWING LIST:-

NO	DRAWING TITLE	NO	DRAWING TITLE
S1 - 01	MAIN NOTES	D1- 01	COMBINER BOX FRAME AND CABLE TRAY INSTALLATION DETAILS.
S1 - 02	PV MODULES DIFTRIBUTION AND FENCING PLAN LAYOUT	D1 - 02	SITE LIGHTINGS INSTALLATION DETAILS.
S1 - 03	EQUIPMENT DISTRIBUTION LAYOUT	D1 - 03	EARTHING ELECTRICAL CABLES TRENCHING DETAILS.
S1 - 04	SOLAR SYSTEM SCHEMATIC DIAGRAM DETAILS.	D1 - 04	INVERTER FRAME TYPICAL INSTALLATION.

REMARKS: -

1. THE LAYOUT DRAWINGS DO NOT SHOW ALL THE SYSTEMS, ITEMS, OR ACCESSORIES COVERED UNDER THE SCOPE OF ELECTRICAL WORKS TO BE EXECUTED THE LAYOUT DRAWINGS SHALL BE READ IN CONJANCTION WITH ALL RELEVANT DRAWINGS and SPECIFICATIONS.

2. DO NOT SCALE FROM THE LAYOUT DRAWINGS WORK ACCORDING TO ARCHITECTURAL OR ELECTRICAL DETAILS UNLESS OTHERWISE AUTHORIZED.

3. ALL EQUIPMENT LAYOUTS ARE PROVISIONAL FINAL LAYOUT SHALL BE DETERMINED BY THE CONTRACTOR FROM THE CONSTRUCTION/SHOP DRAWINGS AND AFTER COORDINATION WITH OTHER TRADES.

4. THE SIZE OF CONDUITS AND/OR CABLE TRAYS IS IN GENERAL NOT SHOWN ON DRAWINGS. THE SIZE OF ALL CONDUITS AND/OR CABLE TRAYS SHALL BE SELECTED BY THE CONTRACTOR IN ACCORDANCE WITH BOQ, REGULATIONS AND/OR STANDARDS AND WILL BE FUNCTION OF THE NUMBER AND SIZE OF THE RESPECTIVE CONDUCTORS.

5. PERFORATED CABLE TRAY SHALL BE FIXED AND COVER PROPERLY AND SHALL NOT FIXED DIRECT TO ROOF SLAB.

6. EARTH CONTINUITY CONDUCTORS ARE NOT INDICATED ON THE DRAWINGS, BUT SHALL BE RUN WITH ALL CIRCUITS IN ACCORDANCE WITH SPECIFICATIONS, REGULATIONS AND/OR POWER CABLES IS 300MM. STANDARDS.

7. THE COLOR CODE FOR A FOUR WIRE CIRCUIT IS - ONE BLACK, - ONE RED, ONE BLUE AND ONE YELLOW ANY CONDUCTOR INTENDED FOR GROUNDING PURPOSE SHALL BE GREEN WITH YELLOW STRIPE.

8. IN THE ABSENCE OF ANY INDICATION ON THE DRAWINGS OR THE SPECIFICATIONS, THE INSTALLATIONS SHALL BE DONE TO THE SATISFACTION OF UNOPS ENGINEER.

9. FOR EXACT QUANTITY, TYPE &LOCATIONOF ELECTRICAL OUTLETS REFER TO INTERIOR DESIGN DOCUMEN

10. THECONTRACTOR SHALLBE RESPONSIBLEFOR MODIFYING THE NO .OF CIRCUIT BREAKERS, RATING ,AND WIRING ACCORDING TO MANUFACTURERDATA WITHOUT ANY EXTRA COST

11. UNLESS OTHERWISE INDICATED MINIMUM SIZE CONDUIT

12. CONTRACTOR SHALL PROVIDE MATCHING PLUG IN FOR ALL SPECIAL OUTLE

13. FOR GROUND-FAULT CIRCUIT INTERRUPT (GFCI) REFER TO PLANS AND PANEL SCHEDU

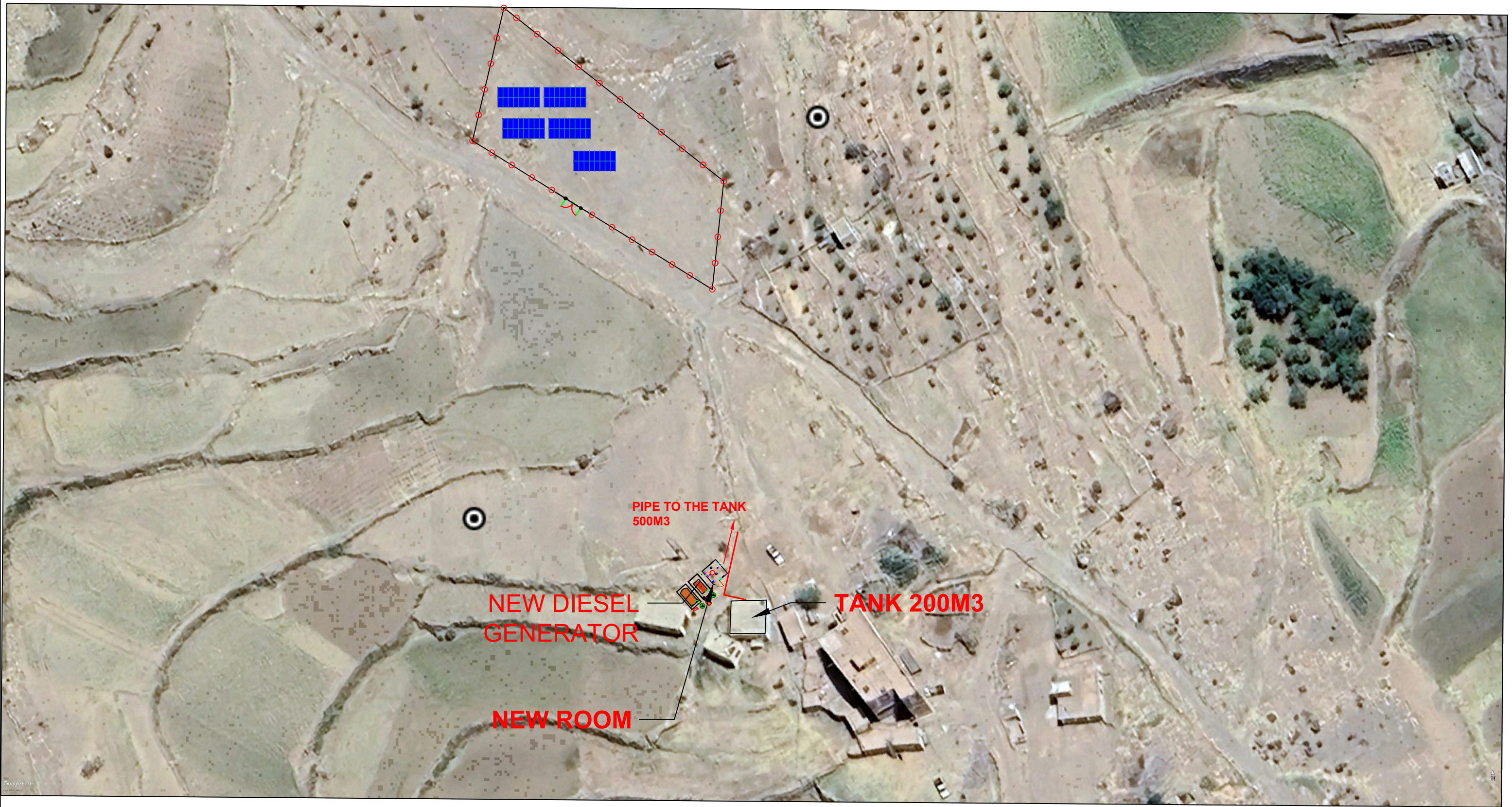
14. THE MINIMUM SEPARATE DISTANCE BETWEEN LOW CURRENT SYSTEMS &LOW VOLTAGE POWER CABLES IS 300MM

15. THE MAXIMUM FILLING RATIO FOR POWER & COMMUNICATION CONDUITS IN SITE WORK MIN50 .MMD FOR POWER CABLE WITH MAX . 40% OF CONDUIT CAPACITY . - MIN50 .MMD FOR LOW CURRENT SYSTEMS WITH MAX 40%.OF CONDUIT CAPACI

16. ALL C.BS WITH FRAM ERATING LARGER THAN 100A SHOULD HAVE ADJUSTABLE THERMAL OVERLOAD SETTIN

17. THE DISTANCE BETWEEN EARTH PIT SHALL BE DOUBLE OR MORE THAN LENGTH OF EARTHING ROD

18. THE CONTRACTOR SHOULD PROVIDE COMPLETE CENTRAL INTERFACE BETWEEN THE SOLAR GENERATION SYSTEM & GENERATOR Set



PREPARED BY:

UNOPS
OPERATIONAL EXCELLENCE
FOR RESULTS THAT MATTER

USS
URBAN WATER SUPPLY & SANITATION
PROJECT MANAGEMENT (UWSP)
ADEN-YEMEN

SANAA YEMEN

FUNDED BY:

THE WORLD BANK

WORLD BANK GROUP

PROJECT TITLE:

**YEMEN EMERGENCY HUMAN
CAPITAL PROJECT(YEHCP)**

PROJECT LOCATION:

MATNAH - CITY-YEMEN

DRAWING TITLE:

**PV MODULES DIFTRIBUTION AND
FENCING PLAN LAYOUT**

WELL CODE:

DESIGN BY:

CHECKED BY:

APPROVED BY:

UNOPS DESIGN REVIEW

PARTNER:

STATUS:

TENDER DOCUMENTS

PROJECT NO:

EHC-AF-WS-SAN-008

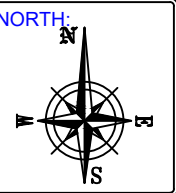
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PAPER SIZE:

A3

SCALE:

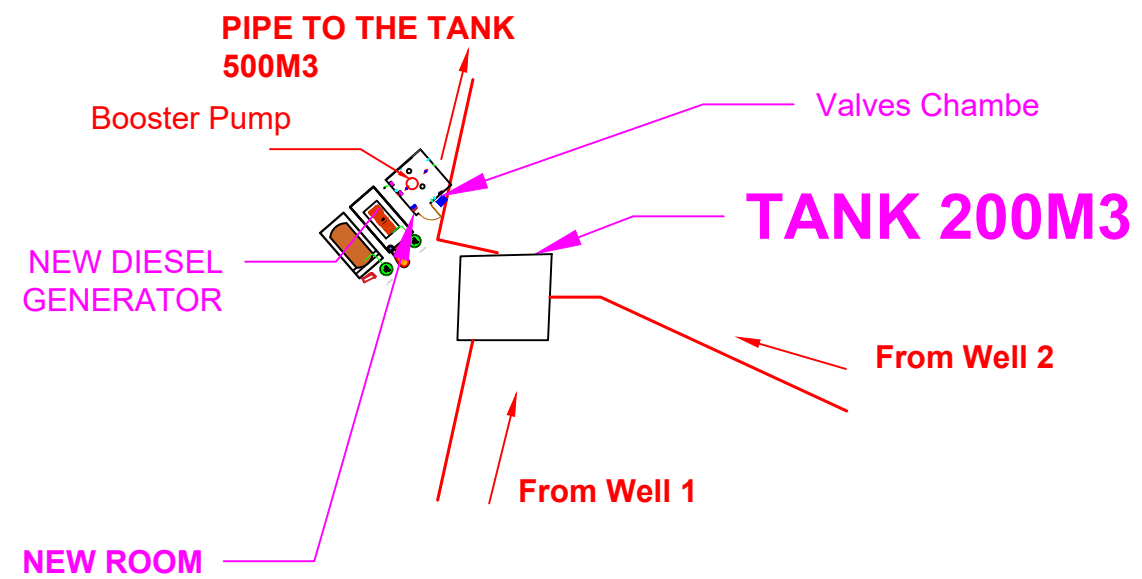
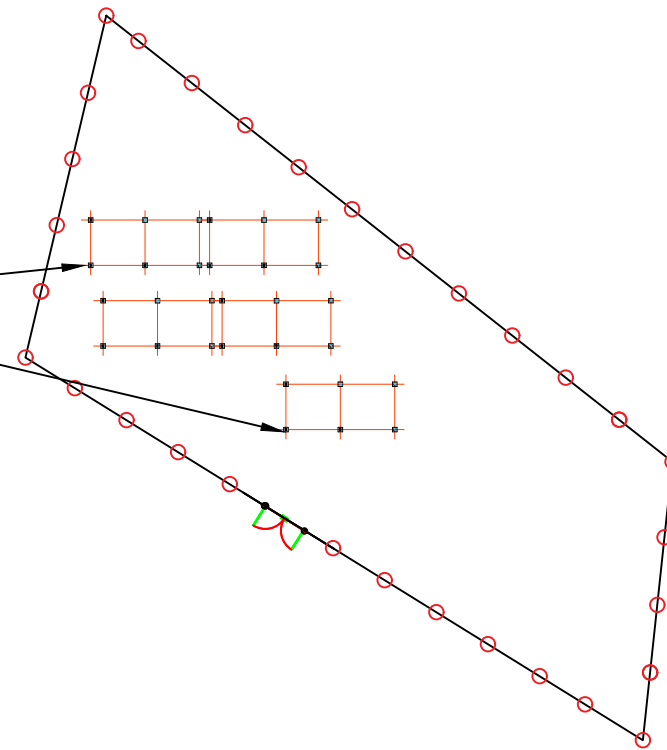
AS SHOWN



DRAWING NO:

S1 - 01

Mounting Structure



PREPARED BY:



SANAA YEMEN

FUNDED BY:



PROJECT TITLE:

YEMEN EMERGENCY HUMAN
CAPITAL PROJECT(YEHCP)

PROJECT LOCATION:

MATNAH - CITY-YEMEN

DRAWING TITLE:

Mounting Structure General site
plane Details

WELL CODE:

DESIGN BY:

CHECKED BY:

APPROVED BY:

UNOPS DESIGN REVIEW

PARTNER:

STATUS:

TENDER DOCUMENTS

PROJECT NO:

EHC-AF-WS-SAN-008

DATE:

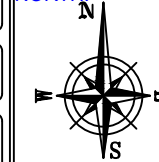
PAPER SIZE:

A3

SCALE:

AS SHOWN

NORTH:



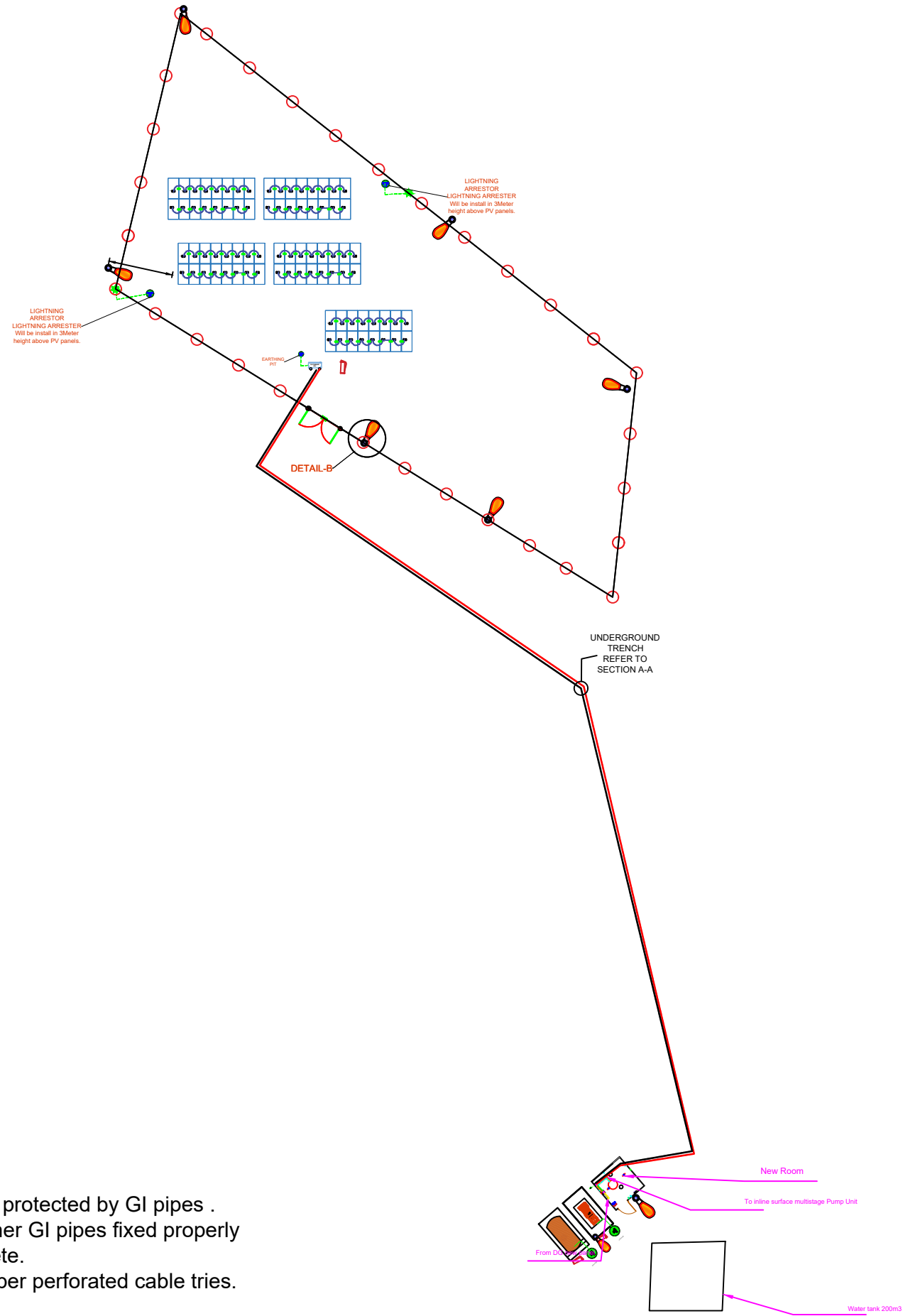
DRAWING NO:

S1 - 02

Notes :

1- Minimum distance of " A " is 5 m, the location of the pole can be adjusted according to site conditions.

2- Perforated cable tray shall be used to protect the cables from the Panels strings to the ground surface, HDPE orPVC pipes shall be used for underground cable laying.



LEGEND:

SYMBOL	DESCRIPTION
INV	WATER PUMP INVERTER
DC-COMBINER BOX	COMBINER BOX
FIRE EXTINGUISHER	FIRE EXTINGUISHER
S&H D	STAND ALONE BATTERY SMOKE & HEAT DETECTOR
STAND ALONE SOLAR STREET LIGHTING	STAND ALONE SOLAR STREET LIGHTING
EARTHING JUMPER	EARTHING JUMPER
EARTHING BUS BAR	EARTHING BUS BAR
LIGHTNING ARRESTOR	LIGHTNING ARRESTOR
EARTHING PIT	EARTHING PIT

Notes :

1-Entrance portion of cable from outside to the inverter room shall be protected by GI pipes .

2-Routing cables on the ground of the room shall be protected by either GI pipes fixed properly to the ground or under ground with plastic pipes covered with concrete.

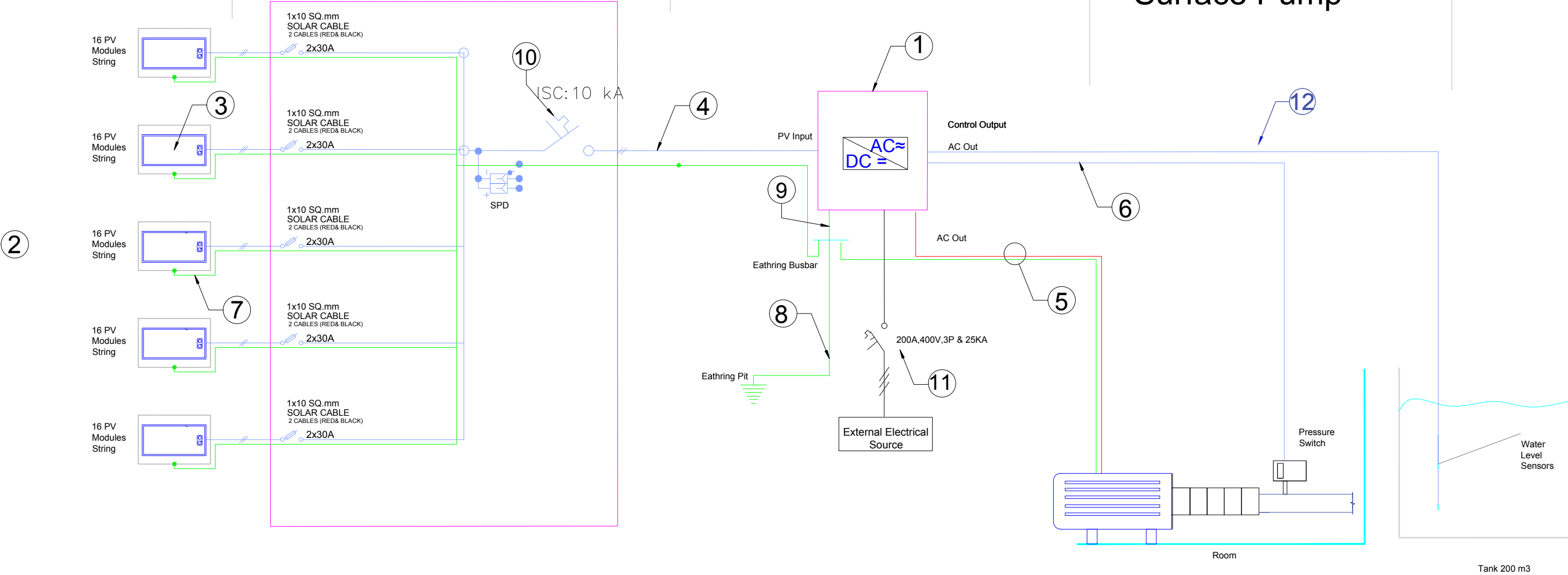
3-Routing cables on the walls of the inverter room shall be inside proper perforated cable tries.

PV Modules Strings

Combiner Box

Hybrid Pump Inverter

Surface Pump



Wall Code		OUR-A
Sn	Item	size/cappacity
1	Inverter power, KW	45
2	#of PV Strings	5
3	DC cable Between Arrays, mm2	10 mm2
4	DC cable for Between& Inverter, mm2	95
5	Pump AC Cable, mm2	35

Sn	Item	size/cappacity
6	Level Sensor Cable,mm2	3x1.5
7	Earthing Cable between PV modules,mm2	1x6
8	Earthing Cable from bus bar to earthing pit,mm2	2x25
9	Earthing Cable from Invert to the bus bar,mm2	1x16
10	Combiner DC Circuit breaker size ,A	150
11	Input Ac CIRCUIT breaker, A	200
12	Pressure SwitchCable, mm2	2 x 1.5

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PROJECT TITLE:

YEMEN EMERGENCY HUMAN
CAPITAL PROJECT(YEHCP)

PROJECT LOCATION:

MATNAH - CITY-YEMEN

DRAWING TITLE:

SOLAR SYSTEM SCHEMATIC DIAGRAM
DETAILS.

WELL CODE:

DESIGN BY:

CHECKED BY:

APPROVED BY:

UNOPS DESIGN REVIEW

PARTNER:

STATUS:

TENDER DOCUMENTS.

PROJECT NO:

EHC-AF-WS-SAN-008

PAPER SIZE:

A3.

SCALE:

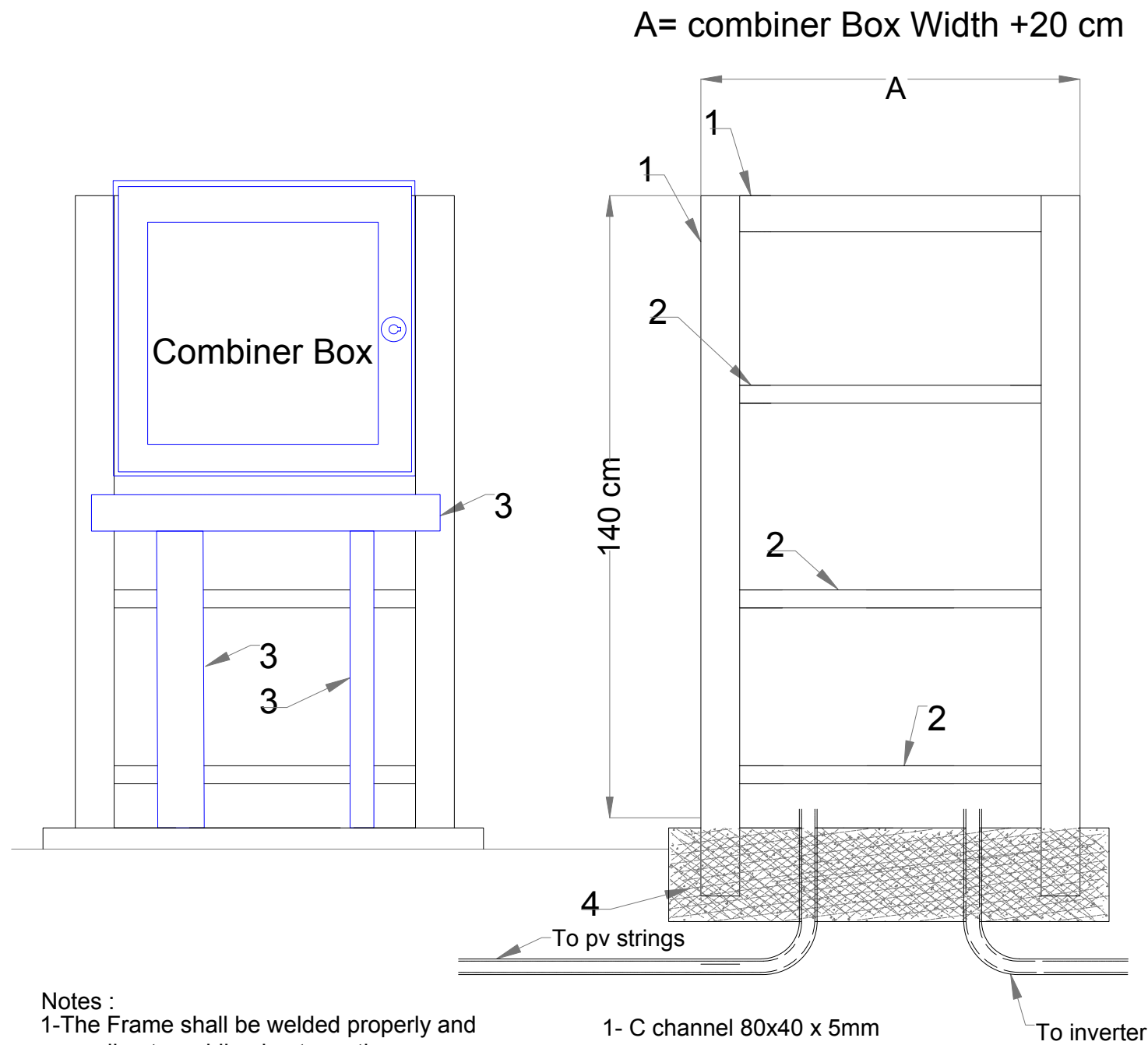
AS SHOWN.

DATE:

NORTH:

DRAWING NO:

S1 - 04



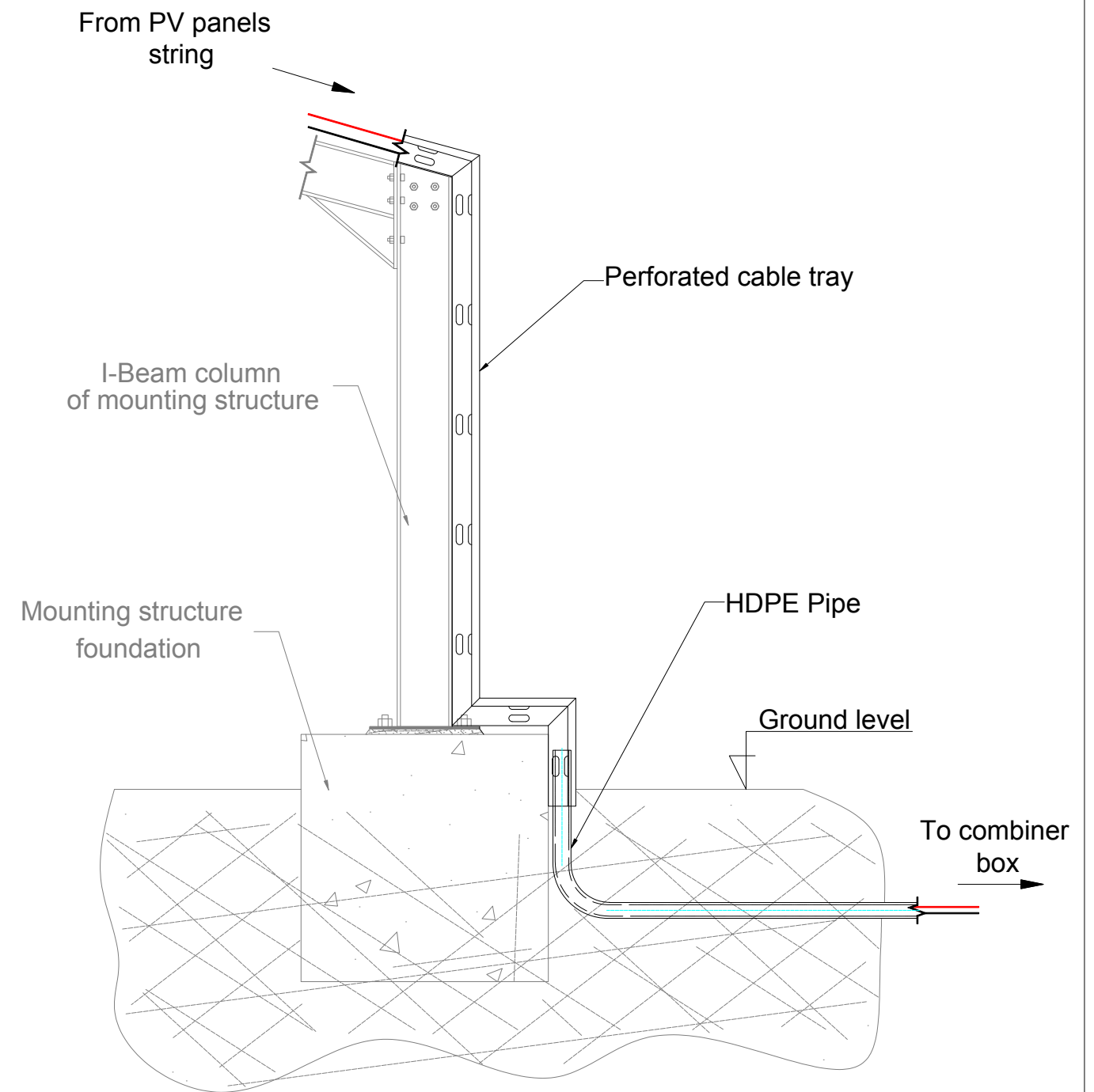
Notes :

1-The Frame shall be welded properly and according to welding best practice

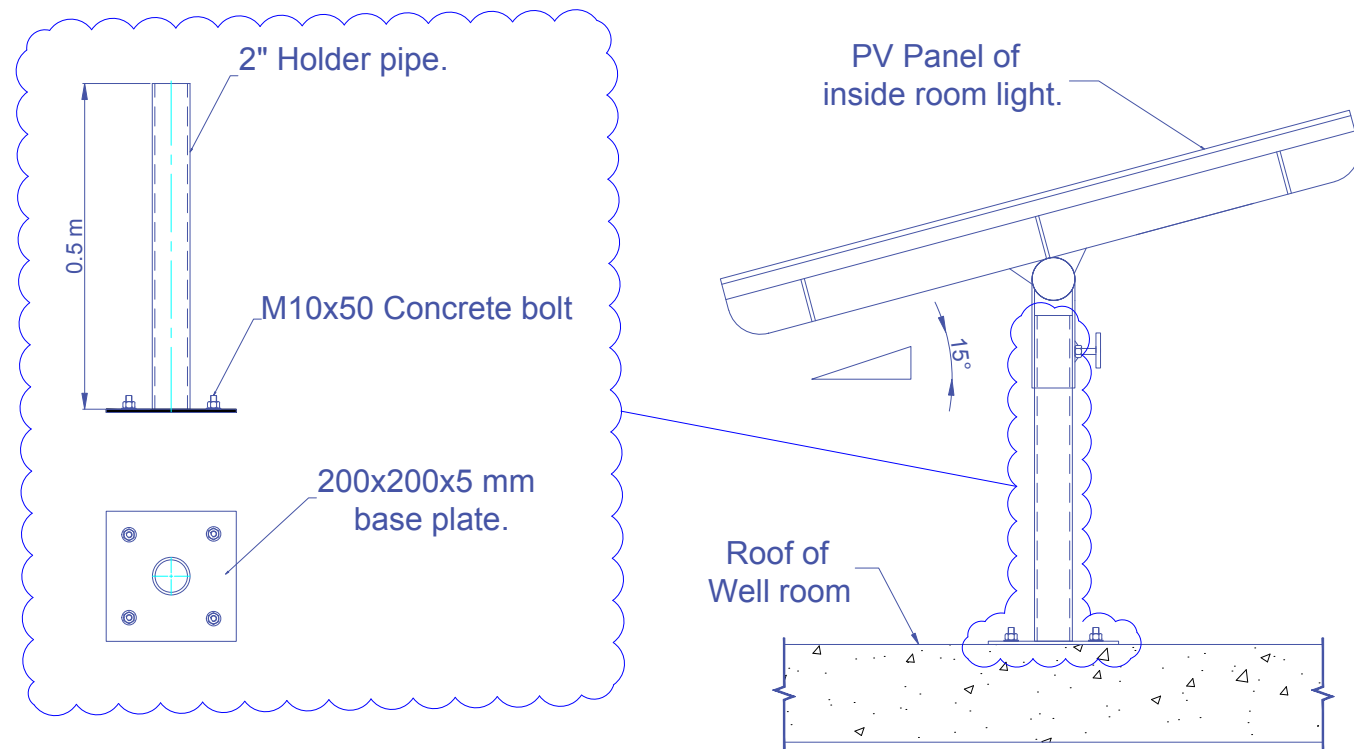
2- The frame shall painted by at least two layers of anti corrosion and synthetic enamel paint.

- 1- C channel 80x40 x 5mm
- 2- Angle 50x50x4mm
- 3- Cable Tray size will be according to the number of cables x 1.5 for future, shall be bolted on the frame
- 4- Concrete foundation 30cm depth x30cm width.

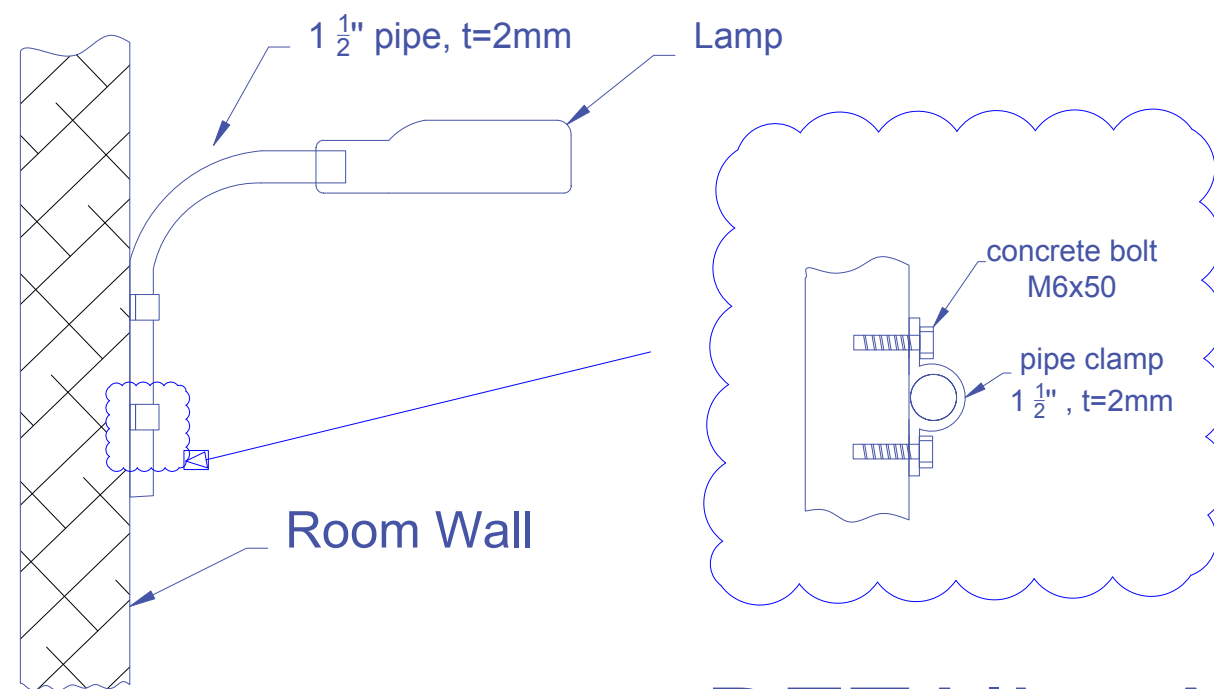
Combiner Box Frame Typical Installation



Perforated Cable Tray Typical Installation



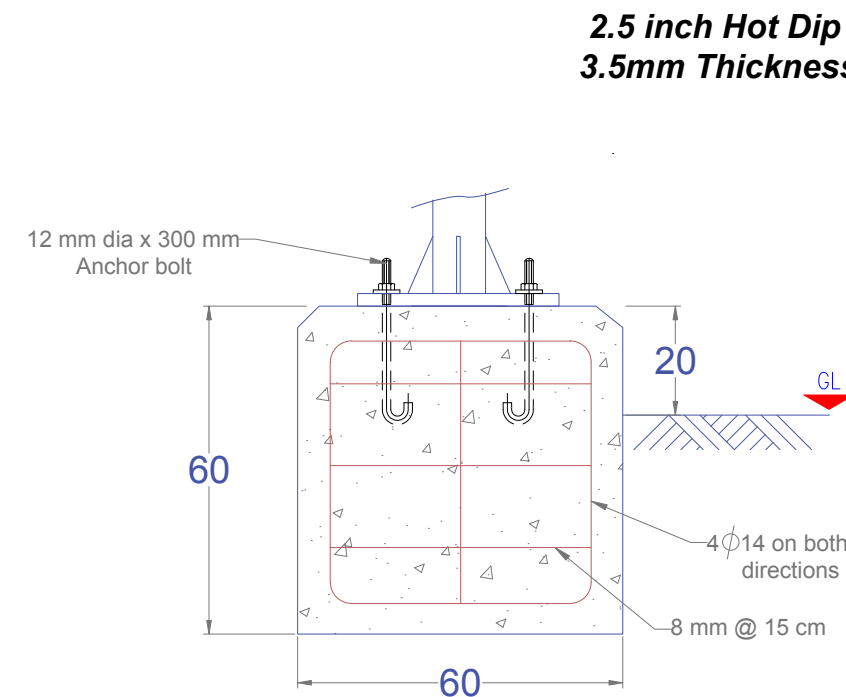
PV Panel of room lighting typical installation



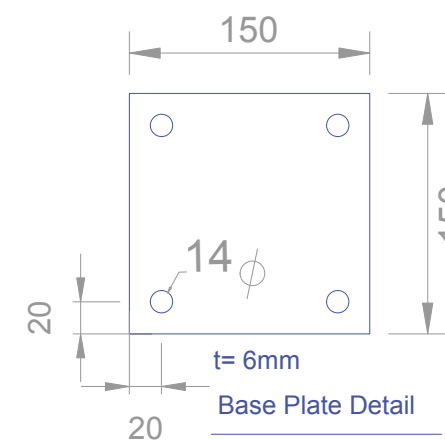
DETAIL - A

Note:
1- Shading of PV module of the street lighting lamp on the PV panels shall be avoided, so distance from the post to PV modules to be checked by contractor according to site adjustments and conditions.

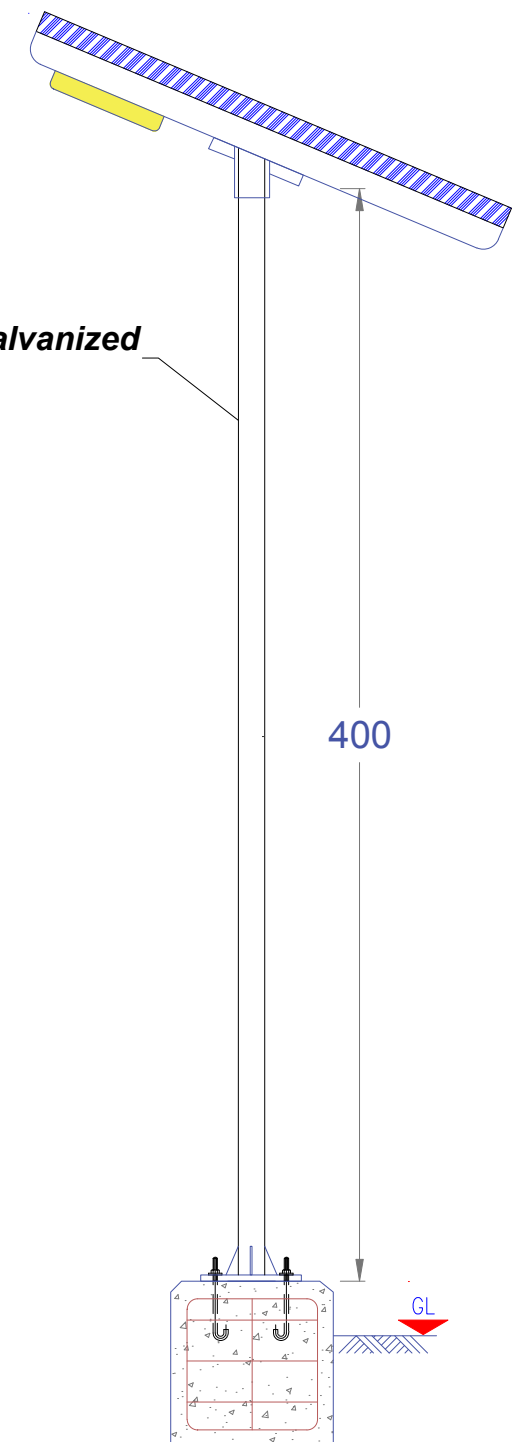
2- All dimensions in cm.



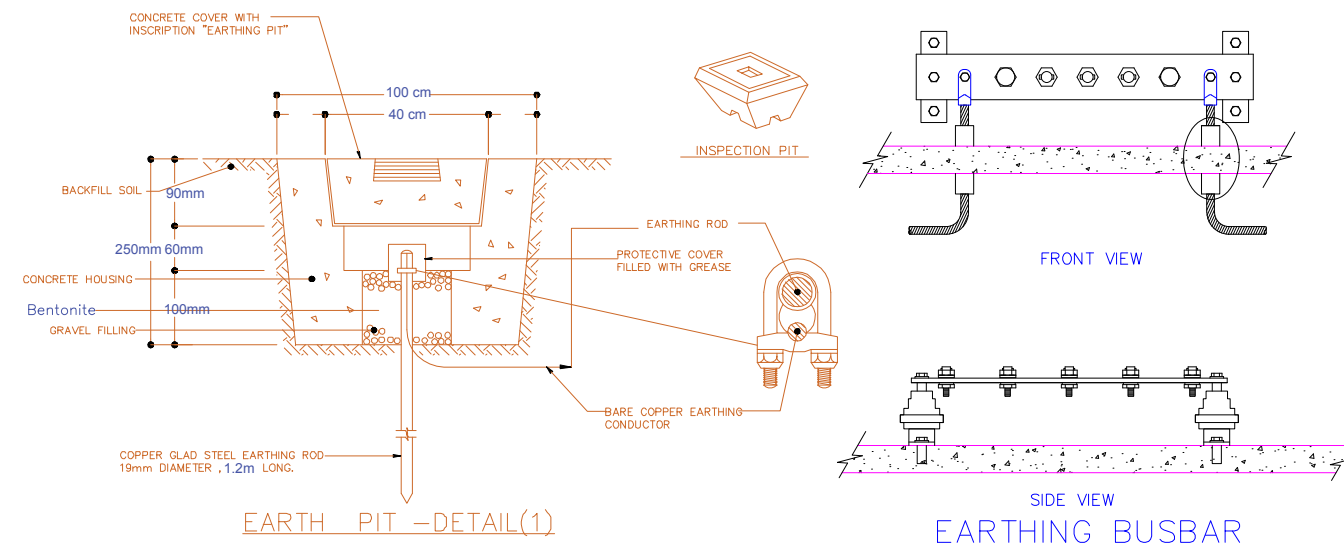
Pole Concrete Foundation Details



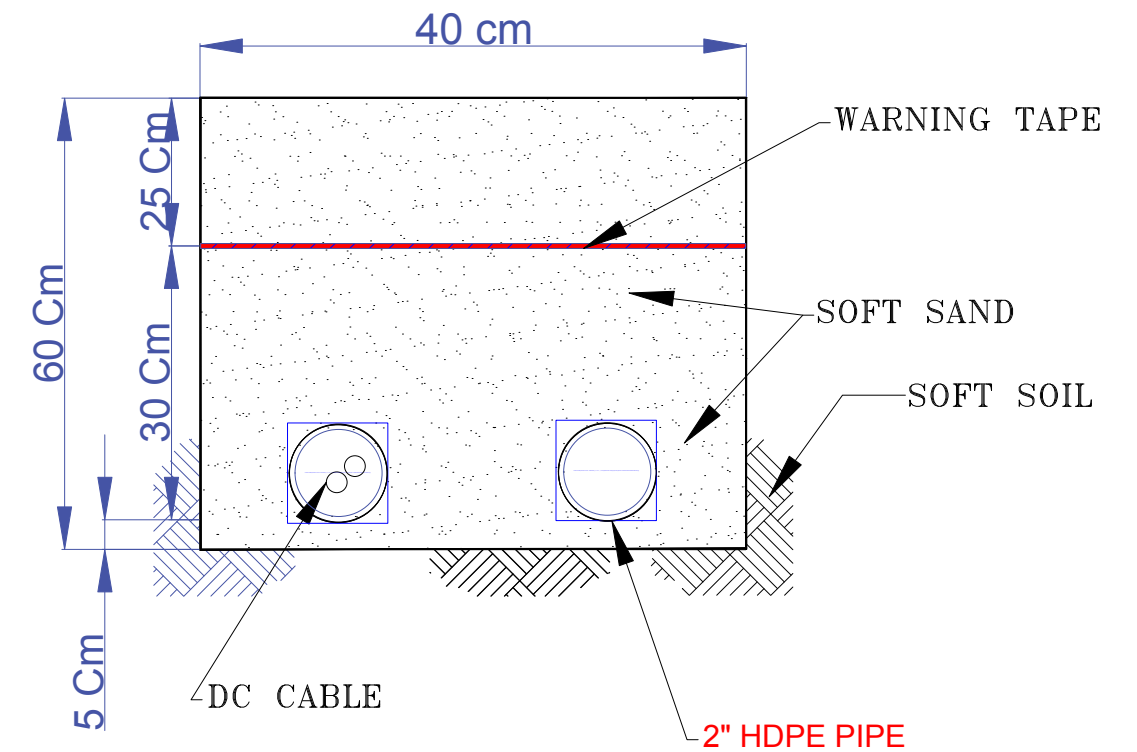
Base Plate Detail



DETAIL - B



EARTH PIT DETAILS



SECTION A-A

PREPARED BY:



SANAA YEMEN

FUNED BY:



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WORLD BANK GROUP

PROJECT TITLE:

YEMEN EMERGENCY HUMAN
CAPITAL PROJECT(YEHCP)

PROJECT LOCATION:

MATNAH - CITY-YEMEN

DRAWING TITLE:

EARTHING ELECTRICAL CABLES
TRENCHING DETAILS.

WELL CODE:

DESIGN BY:

CHECKED BY:

APPROVED BY:

UNOPS DESIGN REVIEW

PARTNER:

STATUS:

TENDER DOCUMENTS.

PROJECT NO:

EHC-AF-WS-SAN-008

DATE:

PAPER SIZE:

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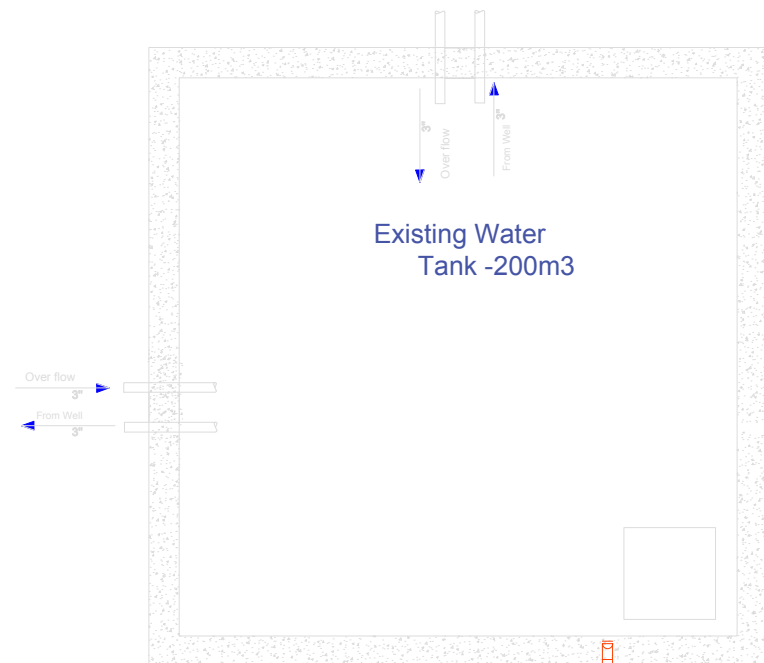
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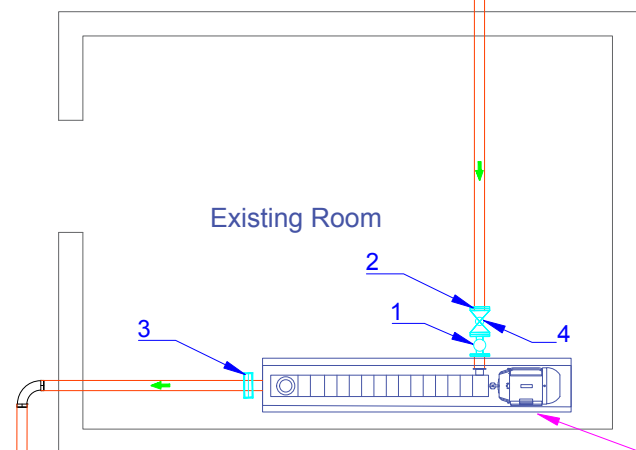
NORTH:

DRAWING NO:

D1- 03



NEW 6" INLET PIPE



- 1- Pump inlet Y Strainer, 6", Flanged type.
- 2- Flanges, threaded PN10, 6".
- 3- Flanges, threaded PN25, size according to the pump line size.
- 4- Isolation valve.

MULTISTAGE SURFACE PUMP TO BE INSTALLED

Note: Fixing of the pump on the ground should be according to manufacturer recommendations.

Typical Installation of The inline surface multistage Pump and piping equipment

EXISTING 6" PIPE TO SECOND STAGE TANK



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ADEN-YEMEN

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THE WORLD BANK

WORLD BANK GROUP

PROJECT TITLE:

YEMEN EMERGENCY HUMAN CAPITAL PROJECT(YEHCP)

PROJECT LOCATION:

MATNAH - CITY-YEMEN

DRAWING TITLE:

WATER PUMP AND PIPING EQUIPMENT TYPICAL ARRANGEMENT.

WELL CODE:

DESIGN BY:

CHECKED BY:

APPROVED BY:

UNOPS DESIGN REVIEW

PARTNER:

STATUS:

TENDER DOCUMENTS.

PROJECT NO:

EHC-AF-WS-SAN-008

DATE:

PAPER SIZE:

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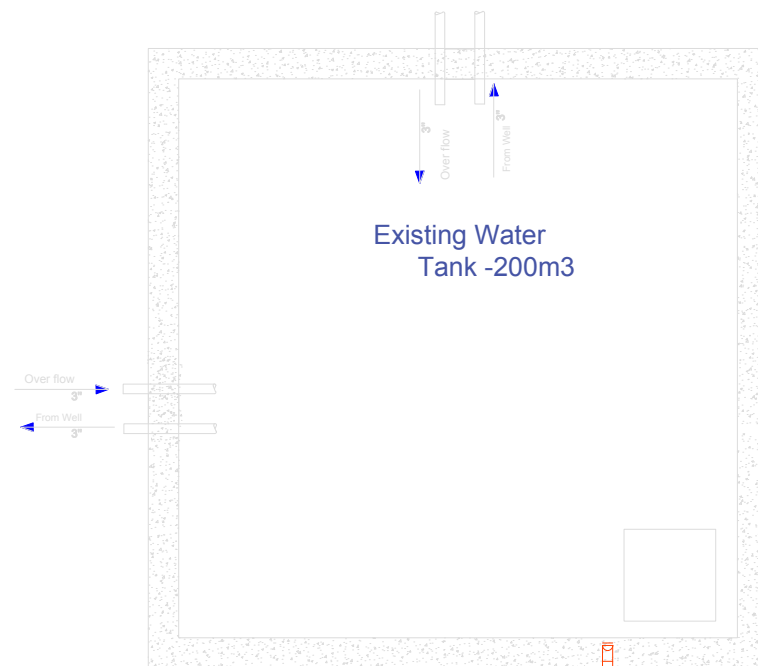
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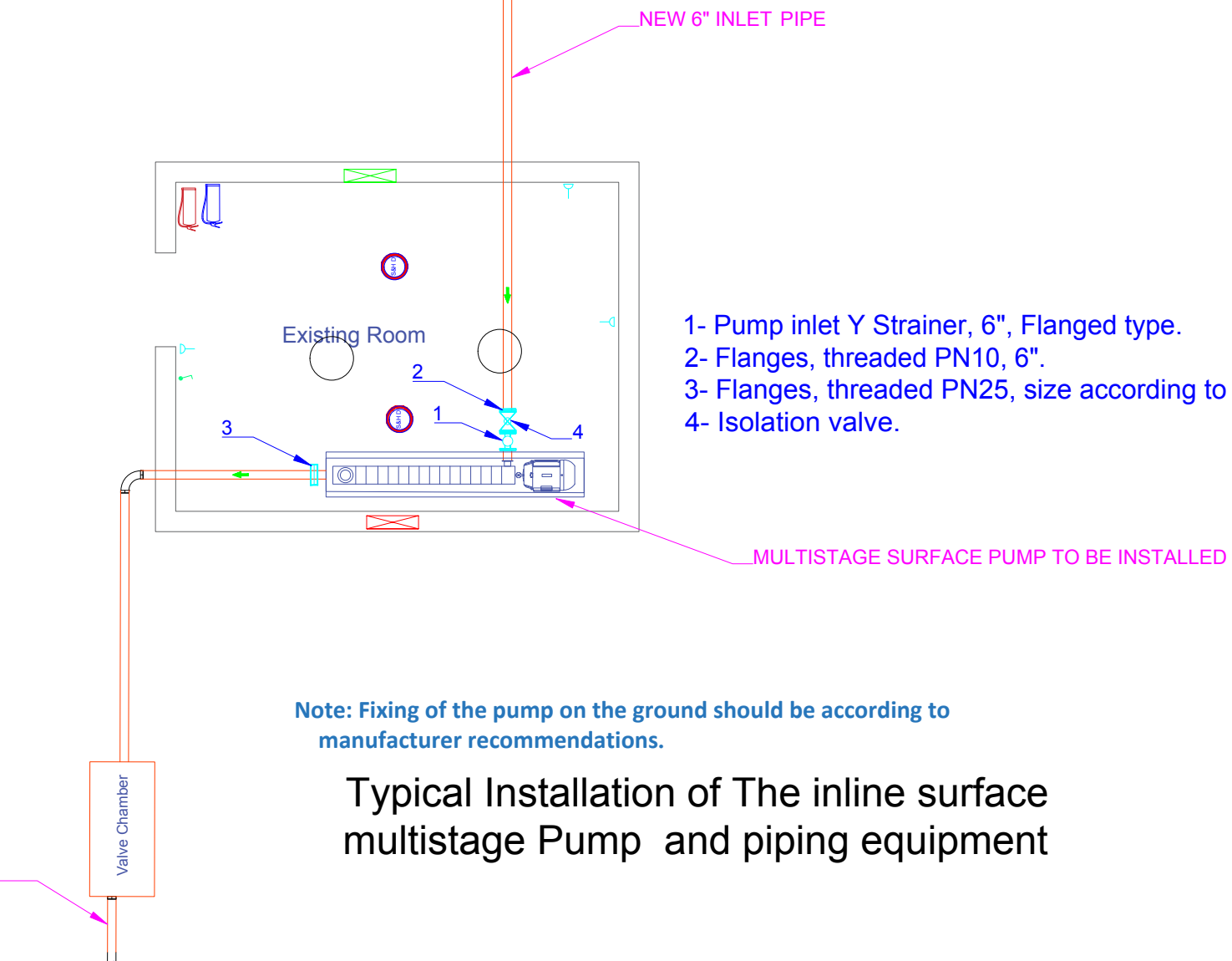
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DRAWING NO:

D1- 05




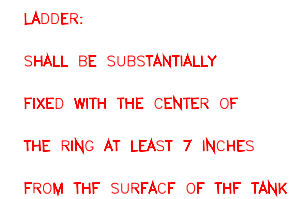
LEGEND	
	Exsiting LED
	Exsiting SOCKET
	EXSITING ONE GANG ONE POLE SWITCH
	EXSITING DISTRIBUTION BOARD
	Fire Extinguisher
	STAND ALONE BATTERY SMOKE & HEAT DETECTOR
	WATER PUMP INVERTER
	EXSITING EXHAUST FAN
	EXSITING INLET FAN
	FLAME DETECTOR
	New fuel tank



Typical Installation of The inline surface multistage Pump and piping equipment

1. ALL DIMENSIONS AND ELEVATIONS ARE IN CENTIMETERS AND METERS RESPECTIVELY, UNLESS OTHERWISE MENTIONED.
2. ALL DIMENSIONS TO BE CHECKED AND CONFIRMED ON SITE BEFORE COMMENCEMENT OF ANY WORK.
3. ANY DISCREPANCY TO BE REPORTED TO THE UNOPS SITE ENGINEER/ PROJECT MANAGER PROMPTLY BEFORE PROCEEDING.
4. ALL OUTDOOR OUTLETS, SOCKET OR WIRING ACCESSORIES SHALL BE WEATHER PROOF TYPE.

TANK DESIGN DATA					MATERIALS AND SPECS																																																																							
1	NUMBER REQUIRED	ONE (1)			1	SHELL AND BOTTOM	ASTM A 36.																																																																					
2	NOMNAL CAPACITY cu.m	5			2	ROOF	ASTM A 36.																																																																					
3	DESIGN AND FAB CODE	API 650			3	INTERNAL STEEL	ASTM A 36.																																																																					
4	SP GRAVITY OF PRODUCT	0.89			4	EXTERNAL STEEL	ASTM A 36.																																																																					
5	OP PRESSURE	FLUID FULL			5	PIPE NOZZLE	ASTM A106 Gr.B																																																																					
6	DESIGN PRESS INT/EXT	WATER FULL KG/m ²			6	NOZZLE FLANGES	ASTM A105																																																																					
7	OP TEMPERATURE °C	AMBIENT			7	MANHOLE NOZZLES	ASTM A 516 Gr.60																																																																					
8	DESIGN TEMPERATURE°C	50 DEG C			8	M/H FLG & COVER	ASTM A 516 Gr.60																																																																					
9	HYDROSTATIC TEST	WATER FILLING			9	BOLTS AND STUDS	ASTM A307/A193 Gr.B7																																																																					
10	STRESS RELIEF	NIL			10	NUTS	ASTM A307/A193 Gr.B7																																																																					
11	RADIOGRAPHY	JOINT EFFICIENCY		10 % 85 %	11	GASKETS	CAF 3mm THK.																																																																					
12	CORROSION ALLOWANCE	HEAD (TOP)	SHELL & BOTTOM	OTHERS	12	PAINTING	TWO EPOXY COATS (200 MICRON)																																																																					
		1.5	3.0	3.0	13	CONSTRUCTION	WELDED																																																																					
					14	INSPECTION	API 650																																																																					
					<h3>NOZZLE SCHEDULE</h3> <table border="1"> <thead> <tr> <th>NO.</th> <th>SIZE</th> <th>NOZZLE</th> <th>FLANGE</th> <th>EL.</th> <th>REMARKS</th> </tr> <tr> <th></th> <th></th> <th>THICK</th> <th>RATING</th> <th>TYP FACE</th> <th>FROM BOTTOM PL.</th> </tr> </thead> <tbody> <tr> <td>N1</td> <td>25</td> <td>150 S.O</td> <td>RF</td> <td>2.7</td> <td>DFO INLET</td> </tr> <tr> <td>N2</td> <td>65</td> <td>150 S.O</td> <td>RF</td> <td>0.2</td> <td>DFO OUTLET</td> </tr> <tr> <td>N3</td> <td>65</td> <td>150 S.O</td> <td>RF</td> <td>2.8</td> <td>OVER FLOW</td> </tr> <tr> <td>N4</td> <td>65</td> <td>150 S.O</td> <td>RF</td> <td>-0.2</td> <td>DRAIN</td> </tr> <tr> <td>N5</td> <td>80</td> <td>150 S.O</td> <td>RF</td> <td>-</td> <td>VENT (ROOF)</td> </tr> <tr> <td>N6</td> <td>60</td> <td colspan="3">AS PER API 650</td> <td>-</td> <td>ROOF MANHOLE</td> </tr> <tr> <td>N7</td> <td>80</td> <td>150 S.O</td> <td>RF</td> <td>-</td> <td>LEVEL SWITCH</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </tbody> </table>					NO.	SIZE	NOZZLE	FLANGE	EL.	REMARKS			THICK	RATING	TYP FACE	FROM BOTTOM PL.	N1	25	150 S.O	RF	2.7	DFO INLET	N2	65	150 S.O	RF	0.2	DFO OUTLET	N3	65	150 S.O	RF	2.8	OVER FLOW	N4	65	150 S.O	RF	-0.2	DRAIN	N5	80	150 S.O	RF	-	VENT (ROOF)	N6	60	AS PER API 650			-	ROOF MANHOLE	N7	80	150 S.O	RF	-	LEVEL SWITCH												
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<h3>ADDITIONAL ACCESSORIES</h3> <table border="1"> <tbody> <tr> <td>1</td> <td>LADDER & HAND RAIL</td> <td>YES</td> </tr> <tr> <td>2</td> <td>LEVEL INDICATOR</td> <td>YES</td> </tr> <tr> <td>3</td> <td>EARTHING DEVICE</td> <td>YES</td> </tr> <tr> <td>4</td> <td>INSULATION</td> <td>NO</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </tbody> </table>					1	LADDER & HAND RAIL	YES	2	LEVEL INDICATOR	YES	3	EARTHING DEVICE	YES	4	INSULATION	NO																																																												
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					4	INSULATION	NO																																																																					
<h3>NOTES</h3> <ol style="list-style-type: none"> DISTANCE OF FLANGE FACE FROM OUTER SURFACE OF TANK PLATE SHALL BE AS PER API:650. THE STIFFNERS USED SHALL BE CONTINUOUSLY WELDED TO THE TANK LADDER SHALL BE PROVIDED AS PER DETAILED 																																																																												
					<ol style="list-style-type: none"> VENT PIPE SHALL BE STRAIGHT NECK TYPE AND SHALL BE ADEQUATELY SUPPORTED AND PROVIDED WITH NON CORROSIVE METAL WIRE MESH OF NOT LESS THAN 11 OPENING TANK FABRICATOR SHALL PROVIDE 1.0m HIGH GAURD RAIL ON ROOF ALL ROUND THE TANK. TANK FABRICATOR SHALL PROVIDE SUITABLE COUNTER FLANGE,GASKETS, NUTS & BOLTS. 																																																																							
																																																																												

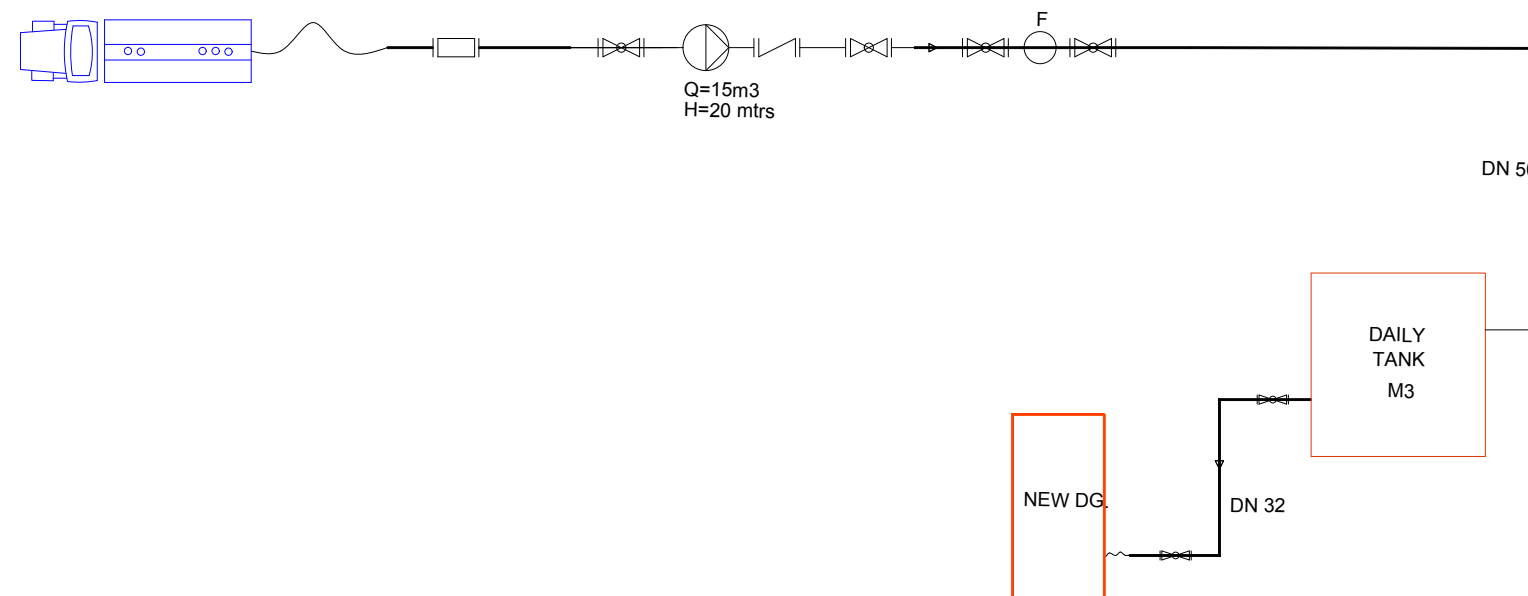


CAPACITY (LITTER)	L (in mm)	D (in mm)
5000	2500	1700

SCALE: AS SHOWN



G1-01



DIESEL TANK AND PIPE CONNECTION DETAILS.
SCALE: AS SHOWN5.

PREPARED BY:



CLNT-TTL



PROJECT TITLE:

Supply, Installation, Testing, and Commissioning of
Solar Pumping Systems STAGE # 03 (WATER TANK)
IN MATNAH CITY

PROJECT LOCATION:

SANA'A - YEMEN

DRAWING TITLE:

DRAWING TYPE:

SEC/TYPE

TTL-DSGN?BY

STATUS:

STATUS

PROJECT NO:

EHC-AF-WS-SAN-008

DATE:

JAN-2023

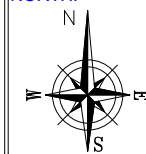
PAPER SIZE:

PPR-SIZE

SCALE:

SCALE

NORTH:



DRAWING NO:

G1-02