

GENERAL NOTES:  
1. All measurements to be checked and controlled against the drawings on site before any work commences  
2. Comply with the drawings. Any irregularities and discrepancies must immediately be pointed out to the consulting engineer.  
3. All work done should be in accordance with latest SANS standards, relevant codes and municipal by-laws.  
4. CONTRACTOR IS ADVISED TO READ ALL THE NOTES CAREFULLY PRIOR TO COMMENCEMENT WITH WORKS.

GENERAL ELECTRICAL INSTALLATION NOTES:  
1. The contractor shall comply with the requirements of latest SANS 10142-1, SANS1816, SANS1974.  
2. The contractor shall verify quantity and the feasibility of construction in order to determine conditions for cable routing, lengths, quantity of materials, space available for appliances and equipment.  
3. Inverter to be equipped with built-in by-pass switch.  
4. The contractor shall take own measurements of quantities for materials and lengths against the drawing.  
5. Any equipment shall be delivered to site without the written approval of the consulting engineer.  
6. Factory acceptance test (FAT) shall be carried out as per SANS 187, with the presence of the consulting engineer or his representative and/or the personnel from local supply authority before the power equipment is released to the manufacturer.  
7. Contractor shall coordinate with other service providers on final location of provided equipment, final cable tray routing and location of all equipment noted as "by others".  
8. Any work not done the satisfaction of the consulting engineer shall be remedied and to the Contractor's account.  
9. Cable joints shall be carried out by personnel who are certified to do so.  
10. Where there is a need to re-route any part of a circuit, the contractor shall issue details of that particular section including a wiring diagram.  
11. An investigation shall be carried out to determine the cause of a defect prior to the work being undertaken.  
12. All power circuits to appliances shall be tested and commissioned including the respective switchgear. Such tests shall be conducted in the presence of the Consulting Engineer or his representative and test results shall be submitted to his office within 3 calendar days.  
13. Contractor to supply all documentation relating to the major power equipment including wiring diagrams.  
14. The Contractor shall make arrangements for training at least one qualified member of staff on the use, operation and maintenance of the electrical installation.  
15. Equipment shall be housed in a shipping container. Container shall be fully airconditioned and ventilated.

NOTE A3: ANNOTATIONS:  
1. None.

NOTE A4: NOTES PERTAINING REVISIONS TO THIS DRAWING:  
1. See cladded areas.

NOTE A5: APPLICABLE SPECIFICATIONS (OBTAINABLE FROM CONSULTING ENGINEER'S OFFICE):  
1. Standard Quality Specification for general electrical installations.  
2. Standard Quality Specification for Electrical Material and Equipment.  
3. Detailed Specification for Electrical Installations

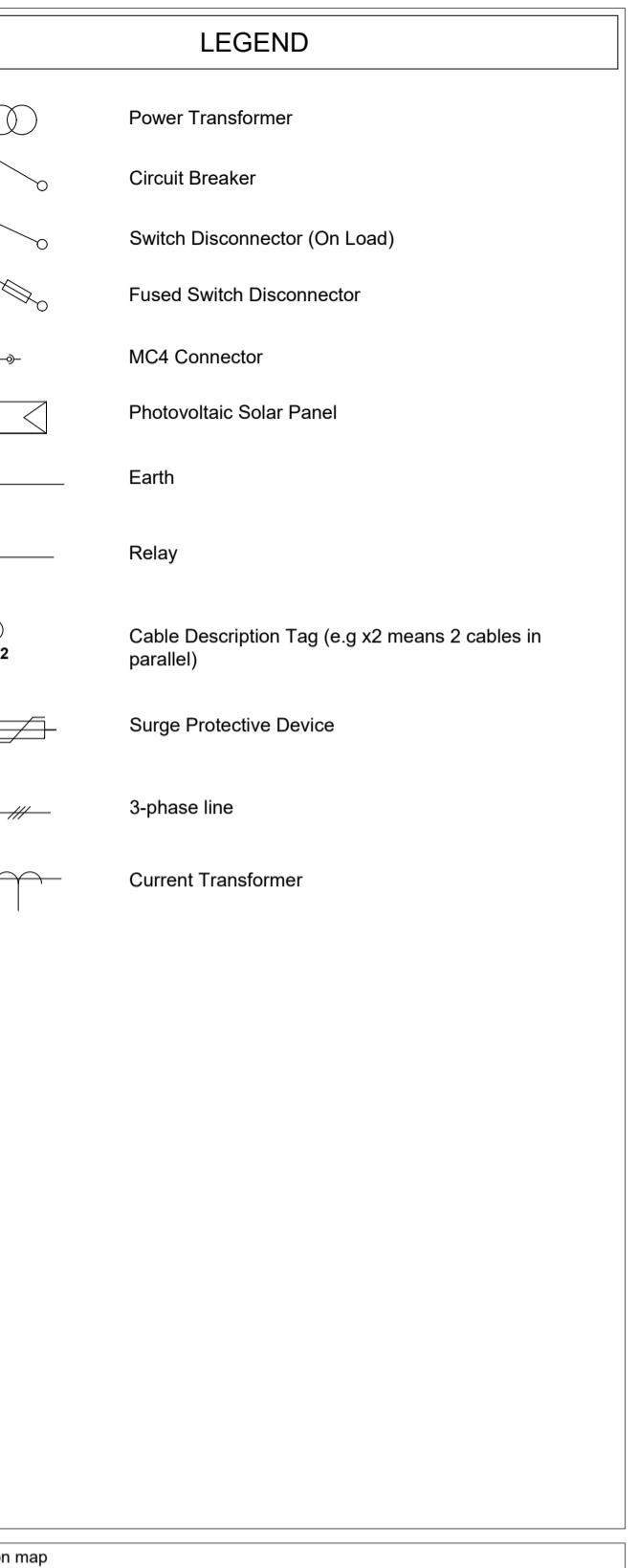
NOTE A6: ADDITIONAL NOTES:  
1. The connecting devices shown on this drawing shall not be construed as exact cable routes between source and devices/appliances. These are tentative and it is the responsibility of the contractor to provide the most effective and efficient routes in accordance with regulations and industry best practices.  
2. The contractor will be required to indicate all cable routes on the "as-built" drawings.  
3. This drawing is limited in scope to specific components of a complete system and is thus a single line representation of the system.  
4. Works classified as "removal and reinstatement" shall ONLY be executed upon a written site instruction.  
5. Works classified as "omitted and decommissioned" shall ONLY be executed upon a written site instruction.

NOTE A7: ACRONYMS (SELECTIVE):  
1. DB - Distribution Board  
2. DC - Direct Current  
3. AC - Alternating Current  
4. LV - Low Voltage  
5. MV - Medium Voltage  
6. RMU - Ring Main Unit  
7. MCB - Miniature Circuit Breaker  
8. MCCB - Moulded Case Circuit Breaker  
9. SWA - Steel Wire Armour  
10. PVC - Polyvinyl Chloride  
11. BCEW - Bare Copper Earth Wire  
12. SPD - Surge Protective Device  
13. PV - Photovoltaic

	TYPE	TOTAL LENGTH (m)
C1 - 35mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 16mm <sup>2</sup> BCEW	AC	
C2 - 50mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 25mm <sup>2</sup> BCEW	AC	
C3 - 70mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 35mm <sup>2</sup> BCEW	AC	
C4 - 95mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 50mm <sup>2</sup> BCEW	AC	
C5 - 120mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 70mm <sup>2</sup> BCEW	AC	
C6 - 150mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 95mm <sup>2</sup> BCEW	AC	
C7 - 185mm <sup>2</sup> 4-core SWA/PVC/PVC Cu. cable + 120mm <sup>2</sup> BCEW	AC	
C8 - 240mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 185mm <sup>2</sup> BCEW	AC	
C9 - 300mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 240mm <sup>2</sup> BCEW	AC	
D2 - 6mm <sup>2</sup> single core class 5 PVC Cu. cable (Red+Black)	DC	
D6 - 35mm <sup>2</sup> single core PVC/PVC Cu. cable (2 cables)	DC	
D7 - 50mm <sup>2</sup> single core PVC/PVC Cu. cable (2 cables)	DC	
D8 - 95mm <sup>2</sup> single core class 5 PVC Cu. cable (Red+Black)	DC	
D10 - 240mm <sup>2</sup> single core PVC/PVC Cu. cable (2 cables)	DC	
E2 - 4mm <sup>2</sup> BCEW	PE	
E3 - 6mm <sup>2</sup> BCEW	PE	
E4 - 10mm <sup>2</sup> BCEW	PE	
T1 - RS485 Connection/CAN	DATA	
T2 - Cat6 Connection	DATA	

Module Specifications	
360 x Solar JAM72530-555/MR (1500V)	
STC Rating	555 W
Vmp	42.11 V
Imp	13.18 A
Voc	50.02 V
Isc	14.07 A

Inverter Specifications	
2x HPS100	
Max AC Power Rating	100 kW
Max Input Voltage	1,000 V
Min AC Power Rating	0 W
Min Input Voltage	480 V



drawing approval

owner's signature engineer's signature architect's signature  
name Registration No. Registration No.

ISSUED FOR CLIENT APPROVAL

file location paper size A 1

revision details

B 16.05.2025 N.D. W.H. Detailed Design  
A 16.04.2025 N.D. W.H. Concept Block Diagram

No DATE DRW CHK DESCRIPTION

client  
SOUTH AFRICAN NATIONAL SPACE AGENCY KRUGERSDORP

principal agent  
62 Van Ryneveld Ave., Pierre Van Ryneveld Pretoria, 0045

Telefax: (012) 862-3611 e-mail: admin@khulacon.com website: www.khulacon.com

KHULANDE CONSULTING ENGINEERS SA CC

agent  
62 Van Ryneveld Ave., Pierre Van Ryneveld Pretoria, 0045

Telefax: (012) 862-3611 e-mail: admin@khulacon.com website: www.khulacon.com

KHULANDE CONSULTING ENGINEERS SA CC

discipline ELECTRICAL  
service POWER DISTRIBUTION

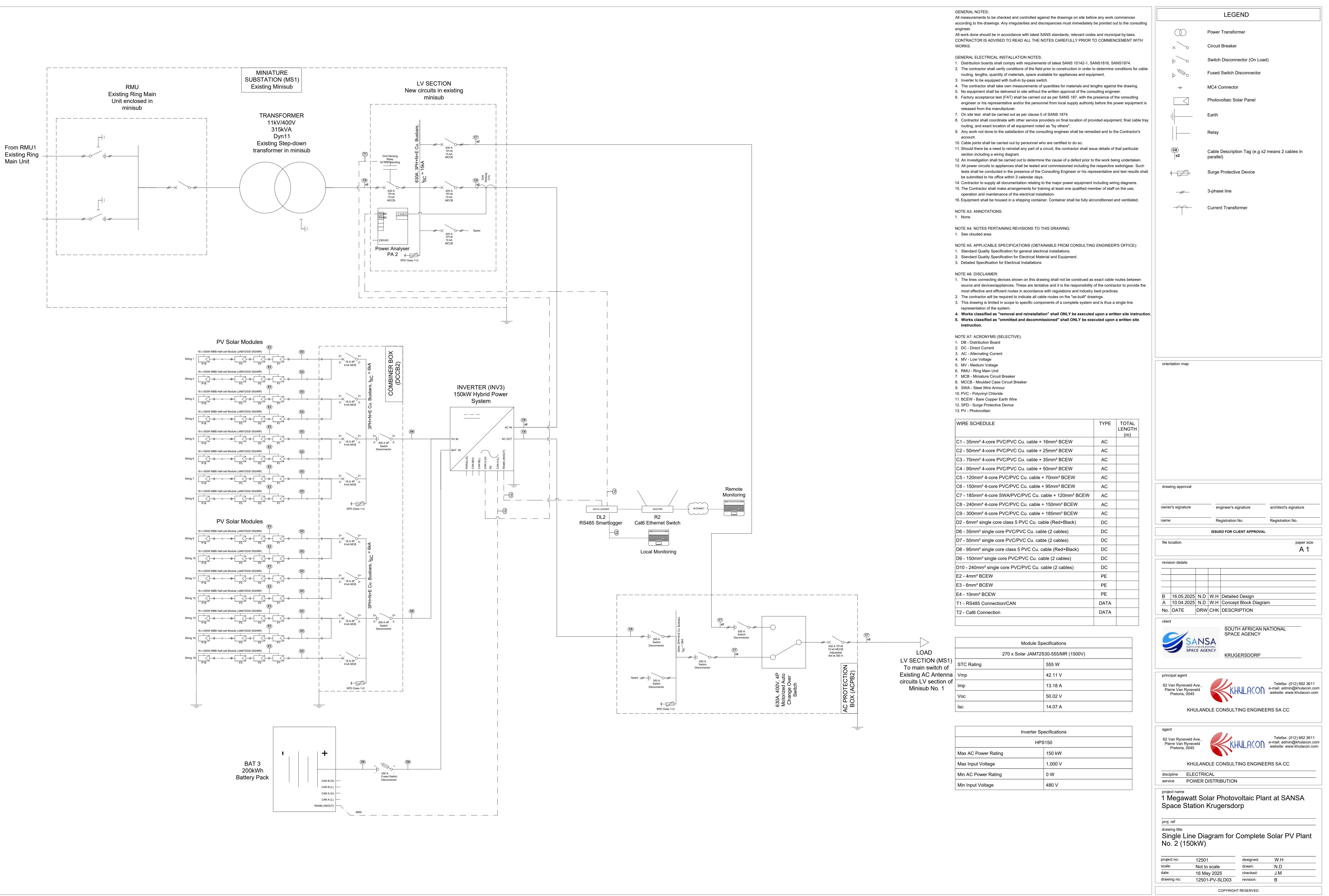
project name 1 Megawatt Solar Photovoltaic Plant at SANSA Space Station Krugersdorp

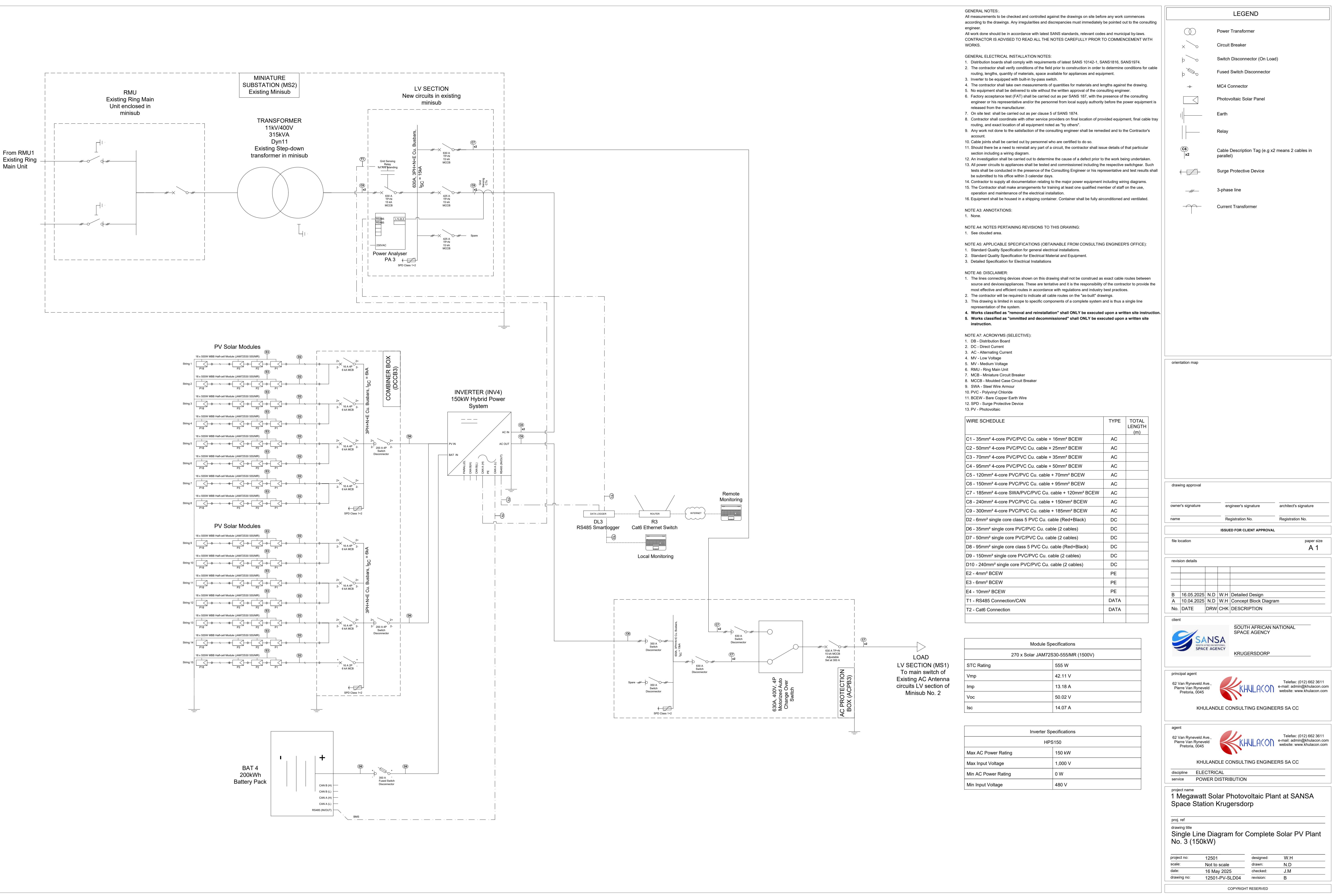
proj. ref

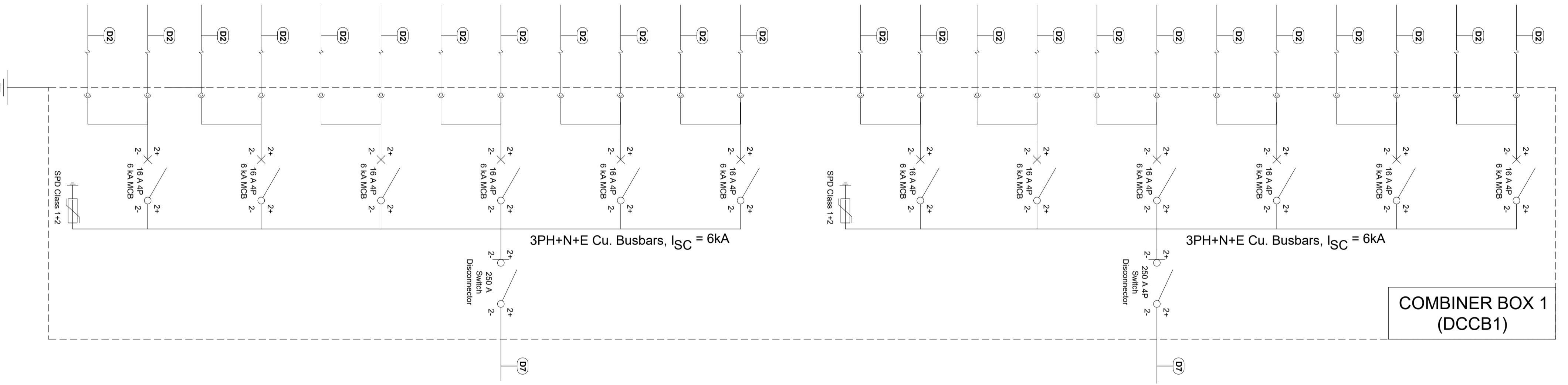
drawing title Single Line Diagram for Complete Solar PV Plant No. 1 (200kW)

project no. 12501 designed: W.H.  
scale: Not to scale drawn: N.D.  
date: 16 May 2025 checked: J.M.  
drawing no. 12501-PV-SLD02 revision: B

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GENERAL ELECTRICAL INSTALLATION NOTES:

1. Distribution boards shall comply with requirements of latest SANS 10142-1, SANS1816, SANS1974.
2. The contractor shall verify conditions of the field prior to construction in order to determine conditions for cable routing, lengths, quantity of materials, space available for appliances and equipment.
3. The contractor shall take own measurements of quantities for materials and lengths against the drawing.
4. No equipment shall be delivered to site without the written approval of the consulting engineer.
5. Factory acceptance test (FAT) shall be carried out as per SANS 187, with the presence of the consulting engineer or his representative and/or the personnel from local supply authority before the power equipment is released from the manufacturer.
6. On site test shall be carried out as per clause 5 of SANS 1874.
7. Contractor shall coordinate with other service providers on final location of provided equipment, final cable tray routing, and exact location of all equipment noted as "by others".
8. Any work not done to the satisfaction of the consulting engineer shall be remedied and to the Contractor's account.
9. Cable joints shall be carried out by personnel who are certified to do so.
10. Should there be a need to reinstall any part of a circuit, the contractor shall issue details of that particular section including a wiring diagram.
11. An investigation shall be carried out to determine the cause of a defect prior to the work being undertaken.
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NOTE A3: ANNOTATIONS:  
1. None.

NOTE A4: NOTES PERTAINING REVISIONS TO THIS DRAWING:  
1. See clouded area.

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5. **Works classified as "omitted and decommissioned" shall ONLY be executed upon a written site instruction.**

**NOTE A7: ACRONYMS (SELECTIVE):**

1. DB - Distribution Board
2. DC - Direct Current
3. AC - Alternating Current
4. MV - Low Voltage
5. MV - Medium Voltage
6. RMU - Ring Main Unit
7. MCB - Miniature Circuit Breaker
8. MCCB - Moulded Case Circuit Breaker
9. SWA - Steel Wire Armour
10. PVC - Polyvinyl Chloride
11. BCEW - Bare Copper Earth Wire
12. SPD - Surge Protective Device
13. PV - Photovoltaic

WIRE SCHEDULE	TYPE	TOTAL LENGTH (m)
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C3 - 70mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 35mm <sup>2</sup> BCEW	AC	
C4 - 95mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 50mm <sup>2</sup> BCEW	AC	
C5 - 120mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 70mm <sup>2</sup> BCEW	AC	
C6 - 150mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 95mm <sup>2</sup> BCEW	AC	
C7 - 185mm <sup>2</sup> 4-core SWA/PVC/PVC Cu. cable + 120mm <sup>2</sup> BCEW	AC	
C8 - 240mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 150mm <sup>2</sup> BCEW	AC	
C9 - 300mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 185mm <sup>2</sup> BCEW	AC	
D2 - 6mm <sup>2</sup> single core class 5 PVC Cu. cable (Red+Black)	DC	
D6 - 35mm <sup>2</sup> single core PVC/PVC Cu. cable (2 cables)	DC	
D7 - 50mm <sup>2</sup> single core PVC/PVC Cu. cable (2 cables)	DC	
D8 - 95mm <sup>2</sup> single core class 5 PVC Cu. cable (Red+Black)	DC	
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D10 - 240mm <sup>2</sup> single core PVC/PVC Cu. cable (2 cables)	DC	
E2 - 4mm <sup>2</sup> BCEW	PE	
E3 - 6mm <sup>2</sup> BCEW	PE	
E4 - 10mm <sup>2</sup> BCEW	PE	
T1 - RS485 Connection/CAN	DATA	
T2 - Cat6 Connection	DATA	

#### PANEL CONSTRUCTION DETAILS:

PANEL CONSTRUCTION DETAILS.	
Panel Name:	DCCB1
Purpose:	DC Combiner Box
Construction:	Surface mount
Access:	Front
Material:	Mild steel (1.6mm)
Panels:	Steel escutcheon removable panels with locking pins and square key catches
Doors:	With latch type lockable doors
Exposure:	IP44
Finish:	White powder coated exterior body, white interior painted body, white powder coated panels
Dimensions:	TBC
Labeling:	Exterior - Engraved ivorine/trafolyte installed at front. Danger warning sign Interior - Engraved ivorine/trafolyte, printed legend card, legend card holder on door
Cable Entry:	Bottom & Top
Circuits/Ways	2 x [12 Input/1 Output]
Location:	Inside custom made shipping container/Inverter section
Supplied from:	PV Modules
General:	Allow 40 % spare space capacity for future expansion

## LEGEND

Signature	engineer's signature	architect's signature	
	Registration No.	Registration No.	
<b>ISSUED FOR CLIENT APPROVAL</b>			
on	paper size		
	A 1		
details			
05.2025	N.D	W.H	Refined Detailed Design
05.2025	N.D	W.H	Detailed Design
ATE	DRW	CHK	DESCRIPTION



# SOUTH AFRICAN NATIONAL SPACE AGENCY

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## KRUGERSDORP

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agent

Ryneveld Ave.,  
Van Ryneveld  
oria, 0045



Telefax: (012) 662 3611  
e-mail: [admin@khulacon.com](mailto:admin@khulacon.com)  
website: [www.khulacon.com](http://www.khulacon.com)

**KHULANDLE CONSULTING ENGINEERS SA CC**

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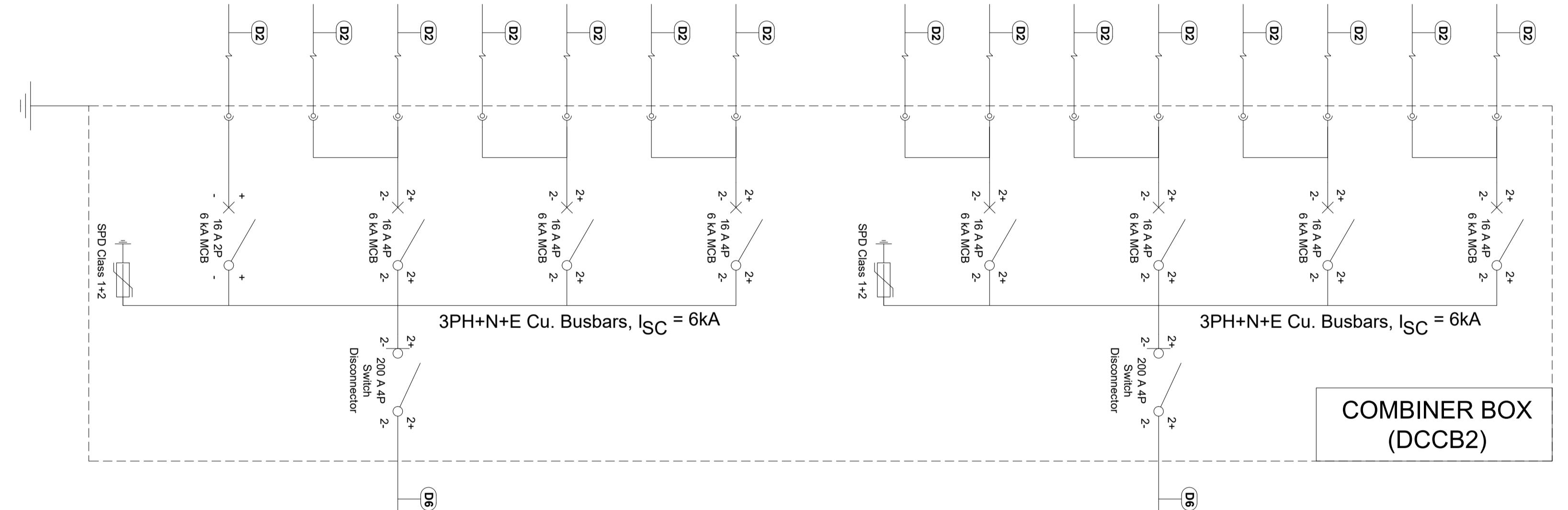
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**ELECTRICAL**

ame	gawatt Solar Photovoltaic Plant at SANSA	
te Station Krugersdorp		
title	Combiner Box (DCCB1) Single Line Diagram	
o:	12501	designed: W.H
	Not to scale	drawn: N.D
	19 May 2025	checked: J.M
o:	12501-PV-SLD05	revision: B

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**GENERAL ELECTRICAL INSTALLATION NOTES:**  
1. Dimensional standards shall be in accordance with SANS 1014-4, SANS1818, SANS1974.  
2. The contractor to verify conditions of the field prior to commencing work to determine conditions for cable routing, lengths, quantity of materials, space available for appliances and equipment.  
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6. On site test shall be carried out as per clause 8 of SANS 1874.  
7. The contractor shall liaise with other service providers on final location of provided equipment, final cable tray routing, and exact location of all equipment noted as "by others".  
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1. None.

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1. See clodded area.

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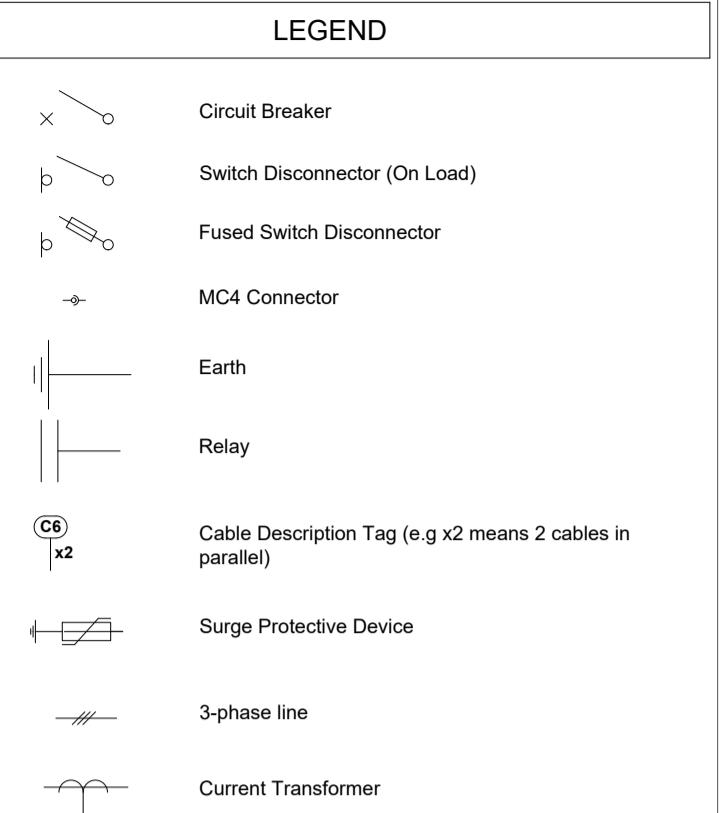
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C4 - 95mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 50mm <sup>2</sup> BCEW	AC	
C5 - 120mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 70mm <sup>2</sup> BCEW	AC	
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T1 - RS485 Connection/CAN	DATA	
T2 - Cat6 Connection	DATA	

**PANEL CONSTRUCTION DETAILS:**

Panel Name: DCCB2  
Construction: DC Combiner Box  
Access: Front  
Material: Mild steel (1.6mm)  
Panels: Steel escutcheon removable panels with locking pins and square key catches  
Doors: With latch type lockable doors  
Exposure: IP44  
Finish: White powder coated exterior body, white interior painted  
Dimensions: TBC  
Labeling: Exterior - Engraved iron/trafolite installed at front.  
Interior - Engraved iron/trafolite, printed legend card, legend card holder on door  
Cable Entry: Bottom & Top  
Ways: 2 x [8 Input/1 Output]  
Location: Inside the panel made shipping container/inverter section  
Supplied from: PV Modules  
General: Allow 40 % spare space capacity for future expansion.



orientation map

drawing approval

owner's signature	engineer's signature	architect's signature
name	Registration No.	Registration No.

ISSUED FOR CLIENT APPROVAL

file location

paper size  
A 1

revision details

B 19.05.2025 N.D. W.H. Refined Detailed Design  
A 16.05.2025 N.D. W.H. Detailed Design  
No DATE DRW CHK DESCRIPTION

client  
 SOUTHERN AFRICAN NATIONAL SPACE AGENCY KRUGERSDORP

principal agent  
62 Van Ryneveld Ave.,  
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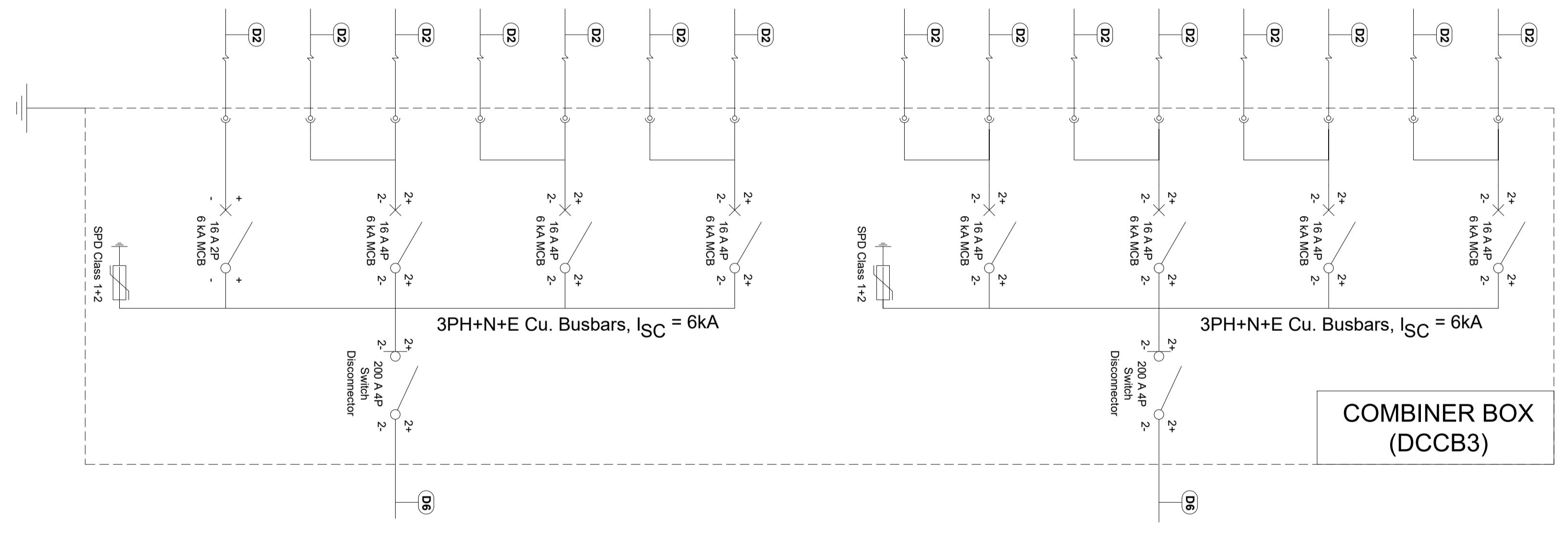
KHULANDLE CONSULTING ENGINEERS SA CC

agent  
62 Van Ryneveld Ave.,  
Pty Ltd  
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KHULANDLE CONSULTING ENGINEERS SA CC  
discipline ELECTRICAL  
service POWER DISTRIBUTION

project name  
1 Megawatt Solar Photovoltaic Plant at SANSA Space Station Krugersdorp  
proj. ref  
drawing title  
DC Combiner Box (DCCB2) Single Line Diagram  
project no.  
12501  
scale: Not to scale  
date: 19 May 2025  
drawing no.: 12501-PV-SLD06  
designed: W.H.  
drawn: N.D.  
checked: J.M.  
revision: B

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**NOTE A3: ANNOTATIONS:**

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3. Detailed Specification for Electrical Installations

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1. The contractor shall serve on the drawings and to the customer as exact cable routes between source and devices/appliances. These are tentative and it is the responsibility of the contractor to provide the most effective and efficient routes in accordance with regulations and industry best practices.
2. The contractor will be required to indicate all cable routes on the "as-built" drawings.
3. This drawing is limited in scope to specific components of a complete system and is thus a single line representation of the system.
4. Works classified as "removal and reinstatement" shall ONLY be executed upon a written site instruction.
5. Works classified as "committed and decommissioned" shall ONLY be executed upon a written site instruction.

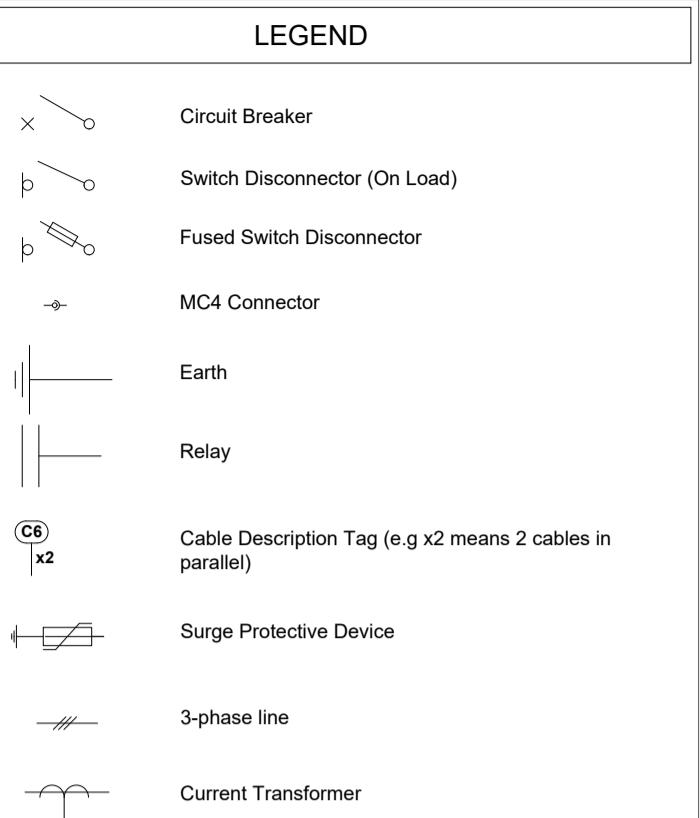
**NOTE A7: ACRONYMS (SELECTIVE):**

1. DB - Distribution Board
2. DC - Direct Current
3. AC - Alternating Current
4. MV - Medium Voltage
5. LV - Low Voltage
6. RML - Ring Main Unit
7. MCB - Miniature Circuit Breaker
8. MCCB - Moulded Case Circuit Breaker
9. SWA - Steel Wire Armour
10. PVC - Polyvinyl Chloride
11. BCEW - Bare Copper Earth Wire
12. SPD - Surge Protective Device
13. PV - Photovoltaic

WIRE SCHEDULE	TYPE	TOTAL LENGTH (m)
C1 - 35mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 16mm <sup>2</sup> BCEW	AC	
C2 - 50mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 25mm <sup>2</sup> BCEW	AC	
C3 - 70mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 35mm <sup>2</sup> BCEW	AC	
C4 - 95mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 50mm <sup>2</sup> BCEW	AC	
C5 - 120mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 70mm <sup>2</sup> BCEW	AC	
C6 - 150mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 95mm <sup>2</sup> BCEW	AC	
C7 - 185mm <sup>2</sup> 4-core SWA/PVC/PVC Cu. cable + 120mm <sup>2</sup> BCEW	AC	
C8 - 240mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 150mm <sup>2</sup> BCEW	AC	
C9 - 300mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 185mm <sup>2</sup> BCEW	AC	
D2 - 6mm <sup>2</sup> single core class 5 PVC Cu. cable (Red+Black)	DC	
D6 - 35mm <sup>2</sup> single core PVC/PVC Cu. cable (2 cables)	DC	
D7 - 50mm <sup>2</sup> single core PVC/PVC Cu. cable (2 cables)	DC	
D8 - 95mm <sup>2</sup> single core class 5 PVC Cu. cable (Red+Black)	DC	
D9 - 150mm <sup>2</sup> single core PVC/PVC Cu. cable (2 cables)	DC	
D10 - 240mm <sup>2</sup> single core PVC/PVC Cu. cable (2 cables)	DC	
E2 - 4mm <sup>2</sup> BCEW	PE	
E3 - 6mm <sup>2</sup> BCEW	PE	
E4 - 10mm <sup>2</sup> BCEW	PE	
T1 - RS485 Connection/CAN	DATA	
T2 - Cat6 Connection	DATA	

**PANEL CONSTRUCTION DETAILS:**

Panel Name: DCCB3  
Purpose: DC Combiner Box  
Construction: Surface mount  
Access: Front  
Material: Mild steel (1.6mm)  
Panels: Steel sheet/steel removable panels with locking pins and square key catches  
Doors: With latch type lockable doors  
Exposure: IP44  
Finish: White powder coated exterior body, white interior painted body, white powder coated panels  
Dimensions: 1800mm x 600mm x 100mm  
Labeling: Exterior - Engraved ionvine/trafolyte installed at front. Danger warning sign  
Interior - Engraved ionvine/trafolyte, printed legend card, legend card holder on door  
Cable Entry: Bottom/Top  
Circuit/Ways: 3 x (8 Input/Output)  
Location: Inside custom made shipping container/inverter section  
Supplied from: PV Modules  
General: Allow 40% spare space capacity for future expansion.



orientation map

drawing approval

owner's signature	engineer's signature	architect's signature
name	Registration No.	Registration No.

ISSUED FOR CLIENT APPROVAL

file location	paper size
	A 1

revision details

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B 19.05.2025 N.D. W.H. Refined Detailed Design

A 16.05.2025 N.D. W.H. Detailed Design

No DATE DRW CHK DESCRIPTION

client

**SANS**  
SOUTH AFRICAN NATIONAL  
SPACE AGENCY

KRUGERSDORP

principal agent

62 Van Ryneveld Ave.,  
Pty Ltd  
Pretoria, 0045

**KHULACON**  
e-mail: admin@khulacon.com  
website: www.khulacon.com

KHULANDLE CONSULTING ENGINEERS SA CC

agent

62 Van Ryneveld Ave.,  
Pty Ltd  
Pretoria, 0045

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e-mail: admin@khulacon.com  
website: www.khulacon.com

KHULANDLE CONSULTING ENGINEERS SA CC

discipline ELECTRICAL  
service POWER DISTRIBUTION

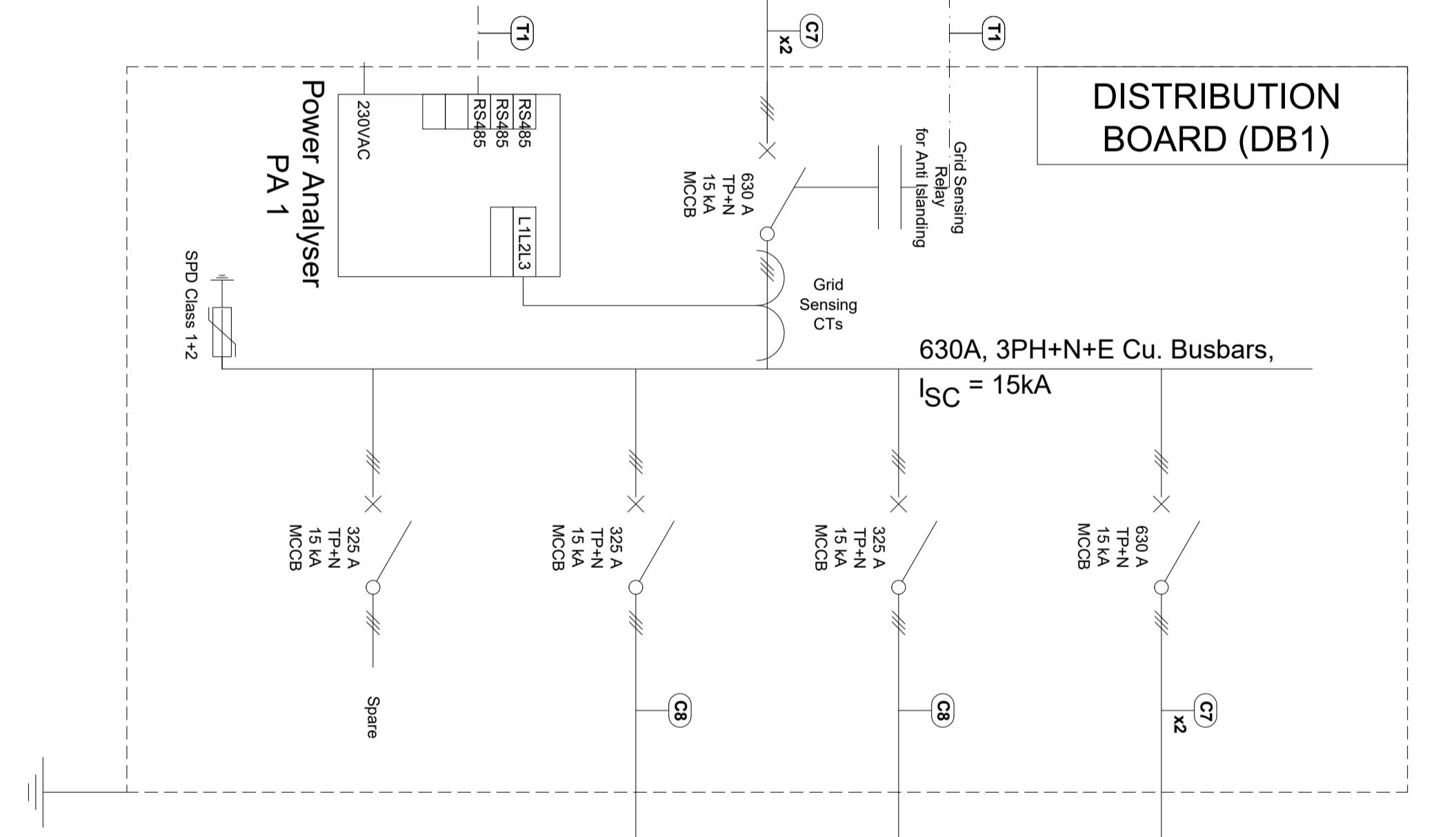
project name 1 Megawatt Solar Photovoltaic Plant at SANSA Space Station Krugersdorp

proj. ref

drawing title DC Combiner Box (DCCB3) Single Line Diagram

project no. 12501 designed: W.H.  
scale: Not to scale drawn: N.D.  
date: 19 May 2025 checked: J.M.  
drawing no: 12501-PV-SLD07 revision: B

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**GENERAL NOTES:**  
All measurements to be checked and controlled against the drawings on site before any work commences according to the drawings. Any irregularities and discrepancies must immediately be pointed out to the consulting engineer.  
All work done should be in accordance with latest SANS standards, relevant codes and municipal by-laws.  
**CONTRACTOR IS ADVISED TO READ ALL THE NOTES CAREFULLY PRIOR TO COMMENCEMENT WITH WORKS.**

GENERAL ELECTRICAL INSTALLATION NOTES:

1. Distribution boards shall comply with requirements of latest SANS 10142-1, SANS1816, SANS1974.
2. The contractor shall verify conditions of the field prior to construction in order to determine conditions for cable routing, lengths, quantity of materials, space available for appliances and equipment.
3. The contractor shall take own measurements of quantities for materials and lengths against the drawing.
4. No equipment shall be delivered to site without the written approval of the consulting engineer.
5. Factory acceptance test (FAT) shall be carried out as per SANS 187, with the presence of the consulting engineer or his representative and/or the personnel from local supply authority before the power equipment is released from the manufacturer.
6. On site test shall be carried out as per clause 5 of SANS 1874.
7. Contractor shall coordinate with other service providers on final location of provided equipment, final cable tray routing, and exact location of all equipment noted as "by others".
8. Any work not done to the satisfaction of the consulting engineer shall be remedied and to the Contractor's account.
9. Cable joints shall be carried out by personnel who are certified to do so.
10. Should there be a need to reinstall any part of a circuit, the contractor shall issue details of that particular section including a wiring diagram.
11. An investigation shall be carried out to determine the cause of a defect prior to the work being undertaken.
12. All power circuits to appliances shall be tested and commissioned including the respective switchgear. Such tests shall be conducted in the presence of the Consulting Engineer or his representative and test results shall be submitted to his office within 3 calendar days.
13. Contractor to supply all documentation relating to the major power equipment including wiring diagrams.
14. The Contractor shall make arrangements for training at least one qualified member of staff on the use, operation and maintenance of the electrical installation.
15. Equipment shall be housed in a shipping container. Container shall be fully airconditioned and ventilated.

NOTE A3: ANNOTATIONS:  
1. None.

NOTE A4: NOTES PERTAINING REVISIONS TO THIS DRAWING:  
1. See clouded area.

NOTE A5: APPLICABLE SPECIFICATIONS (OBTAINABLE FROM CONSULTING ENGINEER'S OFFICE):

1. Standard Quality Specification for general electrical installations.
2. Standard Quality Specification for Electrical Material and Equipment.
3. Detailed Specification for Electrical Installations

**NOTE A6: DISCLAIMER:**

1. The lines connecting devices shown on this drawing shall not be construed as exact cable routes between source and devices/appliances. These are tentative and it is the responsibility of the contractor to provide the most effective and efficient routes in accordance with regulations and industry best practices.
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13. PV - Photovoltaic

WIRE SCHEDULE	TYPE	TOTAL LENGTH (m)
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C2 - 50mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 25mm <sup>2</sup> BCEW	AC	
C3 - 70mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 35mm <sup>2</sup> BCEW	AC	
C4 - 95mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 50mm <sup>2</sup> BCEW	AC	
C5 - 120mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 70mm <sup>2</sup> BCEW	AC	
C6 - 150mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 95mm <sup>2</sup> BCEW	AC	
C7 - 185mm <sup>2</sup> 4-core SWA/PVC/PVC Cu. cable + 120mm <sup>2</sup> BCEW	AC	
C8 - 240mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 150mm <sup>2</sup> BCEW	AC	
C9 - 300mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 185mm <sup>2</sup> BCEW	AC	
D2 - 6mm <sup>2</sup> single core class 5 PVC Cu. cable (Red+Black)	DC	
D6 - 35mm <sup>2</sup> single core PVC/PVC Cu. cable (2 cables)	DC	
D7 - 50mm <sup>2</sup> single core PVC/PVC Cu. cable (2 cables)	DC	
D8 - 95mm <sup>2</sup> single core class 5 PVC Cu. cable (Red+Black)	DC	
D9 - 150mm <sup>2</sup> single core PVC/PVC Cu. cable (2 cables)	DC	
D10 - 240mm <sup>2</sup> single core PVC/PVC Cu. cable (2 cables)	DC	
E2 - 4mm <sup>2</sup> BCEW	PE	
E3 - 6mm <sup>2</sup> BCEW	PE	
E4 - 10mm <sup>2</sup> BCEW	PE	
T1 - RS485 Connection/CAN	DATA	
T2 - Cat6 Connection	DATA	

#### PANEL CONSTRUCTION DETAILS:

Panel Construction Details:	
Panel Name:	DCCB3
Purpose:	DC Combiner Box
Construction:	Surface mount
Access:	Front
Material:	Mild steel (1.6mm)
Panels:	Steel escutcheon removable panels with locking pins and square key catches
Doors:	With latch type lockable doors
Exposure:	IP44
Finish:	White powder coated exterior body, white interior painted body, white powder coated panels
Dimensions:	TBC
Labeling:	Exterior - Engraved ivorine/trafolyte installed at front. Danger warning sign Interior - Engraved ivorine/trafolyte, printed legend card, legend card holder on door
Cable Entry:	Bottom & Top
Circuits/Ways	2 x [8 Input/1 Output]
Location:	Inside custom made shipping container/Inverter section
Supplied from:	PV Modules
General:	Allow 40 % spare space capacity for future expansion.

LEGEND	
	Circuit Breaker
	Switch Disconnector (On Load)
	Fused Switch Disconnector
	MC4 Connector
	Earth
	Relay
	Cable Description Tag (e.g x2 means 2 cables in parallel)
	Surge Protective Device
	3-phase line
	Current Transformer

11. **What is the primary purpose of the *Journal of Clinical Endocrinology and Metabolism*?**

ing approval		
er's signature	engineer's signature	architect's signature
	Registration No. _____	Registration No. _____

ISSUED FOR CLIENT APPROVAL			
Location	paper size <b>A 1</b>		
ion details			
16.05.2025	N.D	W.H	Detailed Design
DATE	DRW	CHK	DESCRIPTION



**SANSA**  
SOUTH AFRICAN NATIONAL  
SPACE AGENCY

ipal agent  
an Ryneveld Ave.,  
tre Van Ryneveld  
Pretoria, 0045



Telefax: (012) 662 3611  
e-mail: admin@khulacon.com  
website: www.khulacon.com

**KHULANDLE CONSULTING ENGINEERS SA CC**

an Ryneveld Ave.,  
ttee Van Ryneveld  
Pretoria, 0045



Telefax: (012) 662 3611  
e-mail: [admin@khulacon.com](mailto:admin@khulacon.com)  
website: [www.khulacon.com](http://www.khulacon.com)

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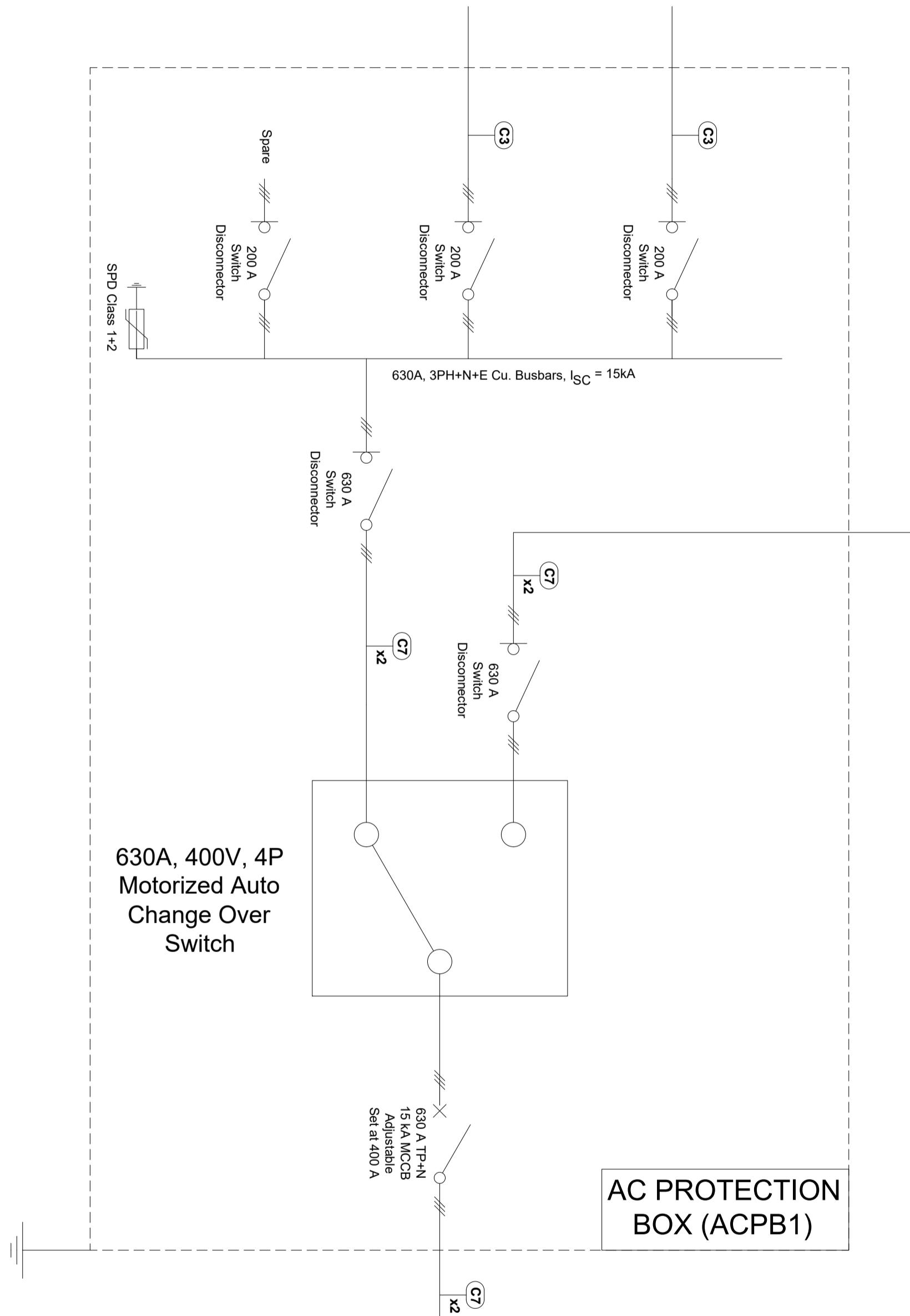
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oline	<b>ELECTRICAL</b>
ce	<b>POWER DISTRIBUTION</b>

ct name	Megawatt Solar Photovoltaic Plant at SANSA ace Station Krugersdorp		
ref			
ng title	ains Distribution Board (MDB1) Single Line agram		
ct no:	12501	designed:	W.H
	Not to scale	drawn:	N.D
	16 May 2025	checked:	J.M
ng no:	12501-PV-SLD11	revision:	A

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**GENERAL NOTES:**

All measurements to be checked and controlled against the drawings on site before any work commences according to the drawings. Any irregularities and discrepancies must immediately be pointed out to the consulting engineer.

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- On site test shall be carried out as per clause 5 of SANS 1874.
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- The Contractor shall make arrangements for training at least one qualified member of staff on the use, operation and maintenance of the electrical installation.
- Equipment shall be housed in a shipping container. Container shall be fully airconditioned and ventilated.

NOTE A3: ANNOTATIONS:

**NOTE M: NOTES PERTAINING REVISIONS TO THIS DRAWING:**

- See clouded area.

OTE A5: APPLICABLE SPECIFICATIONS (OBTAINABLE FROM CONSULTING ENGINEER'S OFFICE):

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- Detailed Specification for Electrical Installations

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- **Works classified as "omitted and decommissioned" shall ONLY be executed upon a written site instruction.**

#### OTE A7: ACRONYMS (SELECTIVE):

WIRE SCHEDULE	TYPE	TOTAL LENGTH (m)
C1 - 35mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 16mm <sup>2</sup> BCEW	AC	
C2 - 50mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 25mm <sup>2</sup> BCEW	AC	
C3 - 70mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 35mm <sup>2</sup> BCEW	AC	
C4 - 95mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 50mm <sup>2</sup> BCEW	AC	
C5 - 120mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 70mm <sup>2</sup> BCEW	AC	
C6 - 150mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 95mm <sup>2</sup> BCEW	AC	
C7 - 185mm <sup>2</sup> 4-core SWA/PVC/PVC Cu. cable + 120mm <sup>2</sup> BCEW	AC	
C8 - 240mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 150mm <sup>2</sup> BCEW	AC	
C9 - 300mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 185mm <sup>2</sup> BCEW	AC	
D2 - 6mm <sup>2</sup> single core class 5 PVC Cu. cable (Red+Black)	DC	
D6 - 35mm <sup>2</sup> single core PVC/PVC Cu. cable (2 cables)	DC	
D7 - 50mm <sup>2</sup> single core PVC/PVC Cu. cable (2 cables)	DC	
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E2 - 4mm <sup>2</sup> BCEW	PE	
E3 - 6mm <sup>2</sup> BCEW	PE	
E4 - 10mm <sup>2</sup> BCEW	PE	
T1 - RS485 Connection/CAN	DATA	
T2 - Cat6 Connection	DATA	

#### PANEL CONSTRUCTION DETAILS

PANEL CONSTRUCTION DETAILS:	
Panel Name:	ACPB1
Purpose:	AC Protection Box + Bypass/Changeover
Construction:	Surface mount
Access:	Front
Material:	Mild steel (1.6mm)
Panels:	Steel escutcheon removable panels with locking pins and square key catches
Doors:	With latch type lockable doors
Exposure:	IP44
Finish:	Orange powder coated exterior body, white interior painted body, white powder coated panels
Dimensions:	TBC
Labeling:	Exterior - Engraved ivorine/trafolyte installed at front. Danger warning sign Interior - Engraved ivorine/trafolyte, printed legend card, legend card holder on door
Cable Entry:	Bottom
Location:	Inside custom made shipping container/Inverter section
Supplied from:	Inverter 1 & 2, DB1
General:	Allow 30 % spare space capacity. Changeover switch to be in a separate compartment,

LEGEND	
	Circuit Breaker
	Switch Disconnector (On Load)
	Fused Switch Disconnector
	MC4 Connector
	Earth
	Relay
	Cable Description Tag (e.g x2 means 2 cables in parallel)
	Surge Protective Device
	3-phase line
	Current Transformer

in map

approval	engineer's signature	architect's signature
signature		
Registration No.		Registration No.

<b>ISSUED FOR CLIENT APPROVAL</b>			
on	paper size <b>A 1</b>		
details			
05.2025	N.D	W.H	Detailed Design
TE	DRW	CHK	DESCRIPTION

**SOUTH AFRICAN NATIONAL  
SPACE AGENCY**

**KRUGERSDORP**

agent

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Van Ryneveld  
oria, 0045

**KHULACON**

Telefax: (012) 662 3611  
e-mail: admin@khulacon.com  
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website: www.khulacon.com

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**KHULANDLE CONSULTING ENGINEERS SA CC**

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**ELECTRICAL**

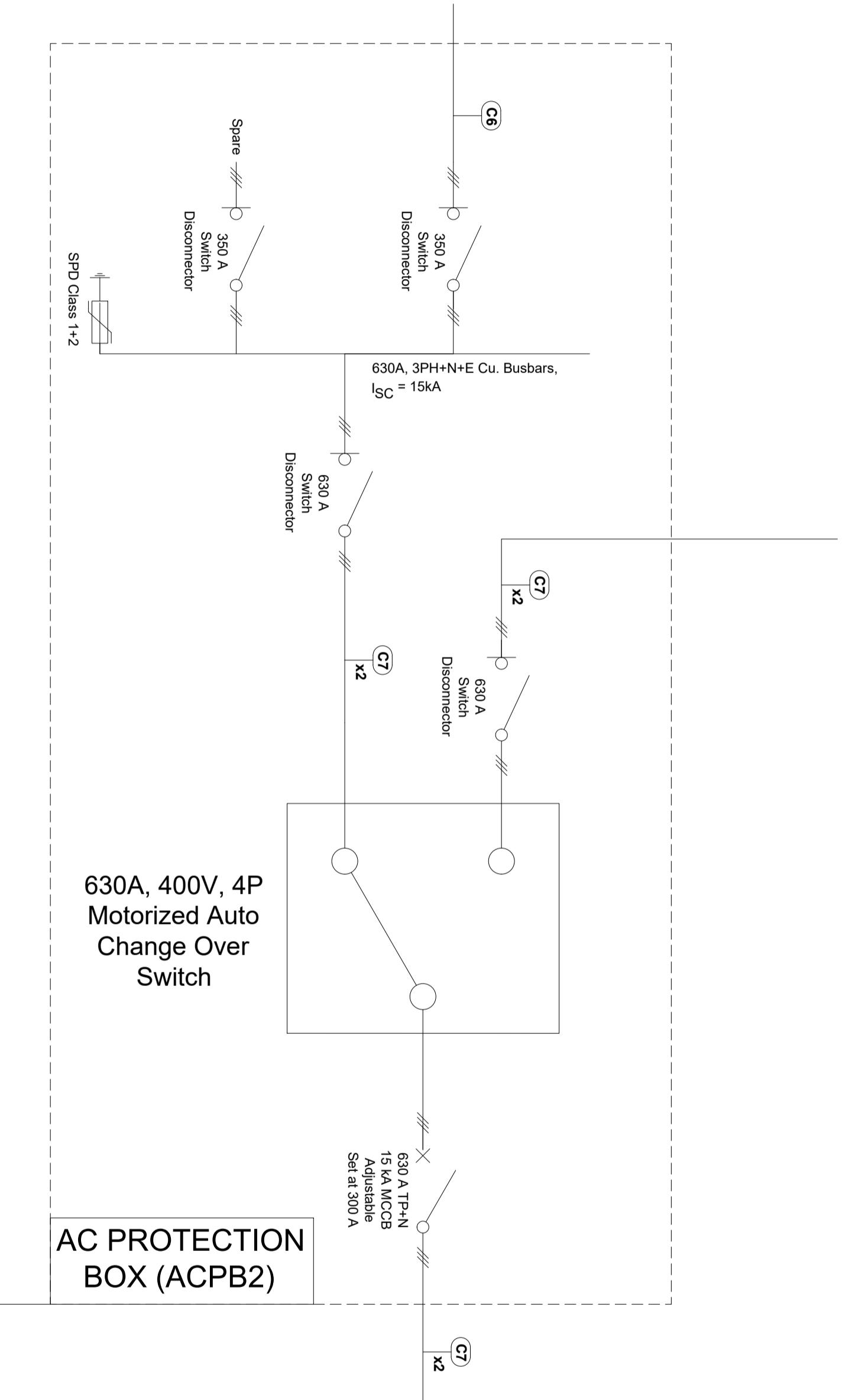
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**POWER DISTRIBUTION**

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title			
protection Box (ACPB1) Single Line Diagram			
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o:	12501	designed:	W.H
	Not to scale	drawn:	N.D
	16 May 2025	checked:	J.M
	12501-PV-SLD12	revision:	A
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**GENERAL ELECTRICAL INSTALLATION NOTES:**

1. Dimension and spacing of equipment to be in accordance with SANS 1014-4, SANS1818, SANS1974.
2. The contractor to verify conditions of the field prior to commencement of work to determine conditions for cable routing, lengths, quantity of materials, space available for appliances and equipment.
3. The contractor shall take own measurements of quantities for materials and lengths against the drawing.
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5. Factory acceptance test (FAT) shall be carried out as per SANS 187, with the presence of the consulting engineer or his representative and/or the personnel from local supply authority before the power equipment is released from the manufacturer.
6. On site test shall be carried out as per clause 8 of SANS 1874.
7. The contractor shall liaise with other service providers on final location of provided equipment, final cable tray routing, and exact location of all equipment noted as "by others".
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**NOTE A3: ANNOTATIONS:**

1. None.

**NOTE A4: NOTES PERTAINING REVISIONS TO THIS DRAWING:**

1. See clodded area.

**NOTE A5: APPLICABLE SPECIFICATIONS (OBTAINABLE FROM CONSULTING ENGINEER'S OFFICE):**

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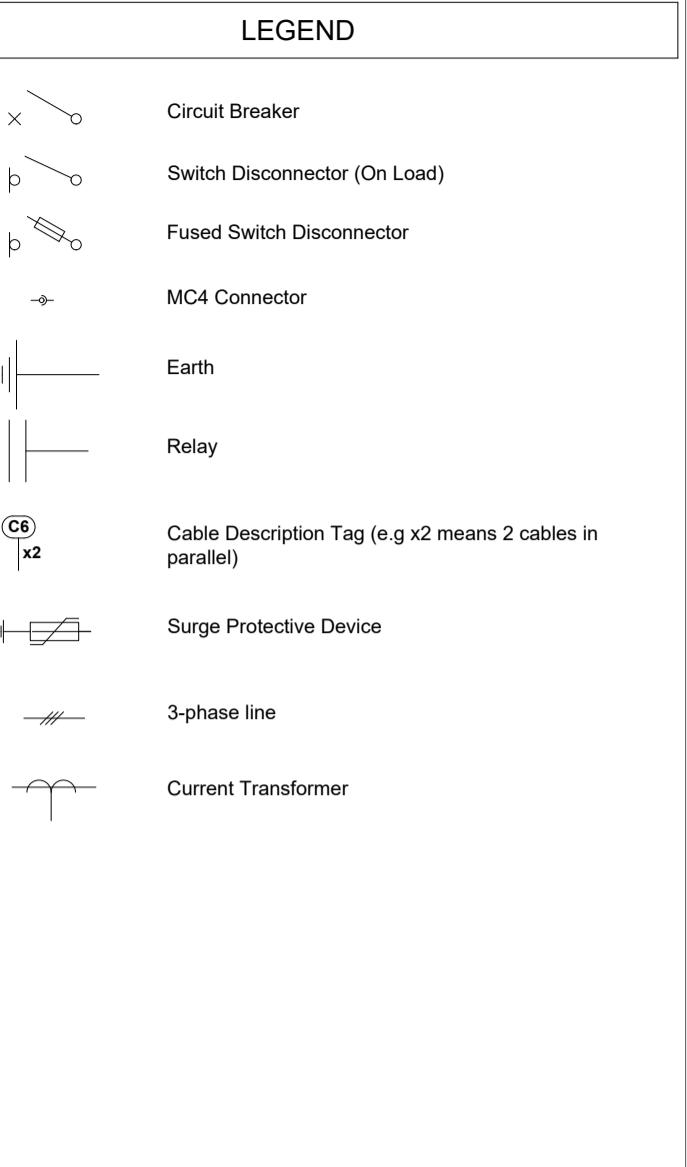
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C5 - 120mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 70mm <sup>2</sup> BCEW	AC	
C6 - 150mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 95mm <sup>2</sup> BCEW	AC	
C7 - 185mm <sup>2</sup> 4-core SWA/PVC/PVC Cu. cable + 120mm <sup>2</sup> BCEW	AC	
C8 - 240mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 150mm <sup>2</sup> BCEW	AC	
C9 - 300mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 185mm <sup>2</sup> BCEW	AC	
D2 - 6mm <sup>2</sup> single core class 5 PVC Cu. cable (Red+Black)	DC	
D6 - 35mm <sup>2</sup> single core PVC/PVC Cu. cable (2 cables)	DC	
D7 - 50mm <sup>2</sup> single core PVC/PVC Cu. cable (2 cables)	DC	
D8 - 95mm <sup>2</sup> single core class 5 PVC Cu. cable (Red+Black)	DC	
D9 - 150mm <sup>2</sup> single core PVC/PVC Cu. cable (2 cables)	DC	
D10 - 240mm <sup>2</sup> single core PVC/PVC Cu. cable (2 cables)	DC	
E2 - 4mm <sup>2</sup> BCEW	PE	
E3 - 6mm <sup>2</sup> BCEW	PE	
E4 - 10mm <sup>2</sup> BCEW	PE	
T1 - RS485 Connection/CAN	DATA	
T2 - Cat6 Connection	DATA	

**PANEL CONSTRUCTION DETAILS:**

Panel Name: ACPB2  
Function: AC Protection Box + Bypass/Changeover  
Construction: Surface mount  
Access: Front  
Material: Mild steel (1.6mm)  
Panels: Steel escutcheon removable panels with locking pins and square key catches  
Doors: With latch type lockable doors  
Exposure: IP44  
Finish: Orange powder coated exterior body, white interior painted body, white powder coated panels  
Dimensions: 1800x1000x150  
Labeling: Exterior - Engraved ivorine/trafolyte installed at front.  
Interior - Engraved ivorine/trafolyte, printed legend card, legend card holder on door  
Cable Entry: Bottom  
Location: Inside custom made shipping container/inverter section  
Supplied from: Inverter 3, LV Section of MS1  
General: Allow 30% spare space capacity.  
Changeover switch to be in a separate compartment, padlockable, basemount



orientation map

drawing approval

owner's signature	engineer's signature	architect's signature
name	Registration No.	Registration No.

ISSUED FOR CLIENT APPROVAL

file location	paper size			
	A 1			
revision details				
A 16.05.2025	N.D.	W.H.	Detailed Design	
No.	DATE	DRW	CHK	DESCRIPTION

client

SOUTH AFRICAN NATIONAL SPACE AGENCY
KRUGERSDORP

principal agent

62 Van Ryneveld Ave., Pretoria 0045	Telefax: (012) 862-3611 e-mail: admin@khulacon.com website: www.khulacon.com
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KHULANDLE CONSULTING ENGINEERS SA CC

agent

62 Van Ryneveld Ave., Pretoria 0045	Telefax: (012) 862-3611 e-mail: admin@khulacon.com website: www.khulacon.com
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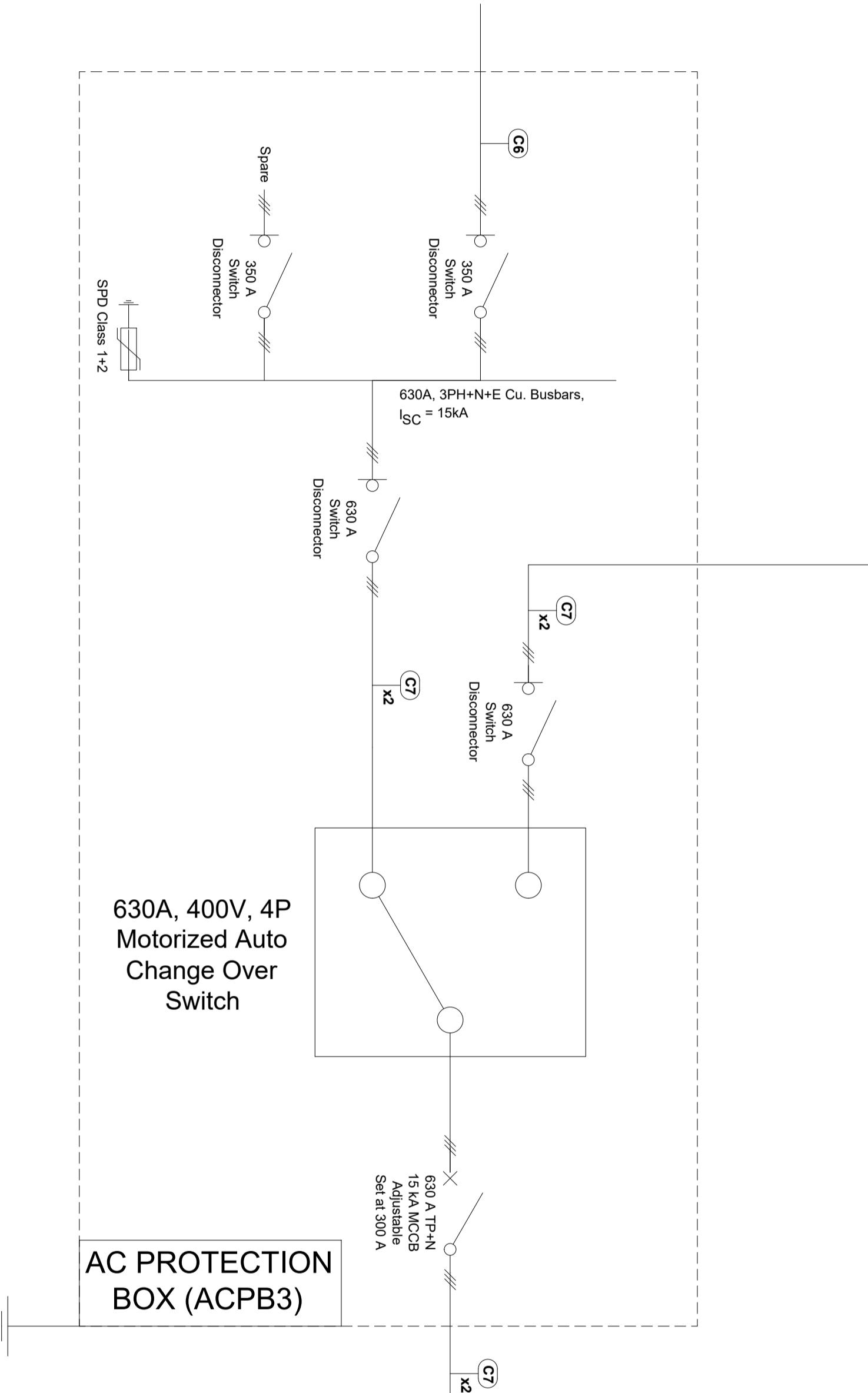
project name: 1 Megawatt Solar Photovoltaic Plant at SANSA Space Station Krugersdorp

proj. ref:

drawing title: AC Protection Box (ACPB2) Single Line Diagram

project no:	12501	designed:	W.H.
scale:	Not to scale	drawn:	N.D.
date:	16 May 2025	checked:	J.M.
drawing no:	12501-PV-SDL13	revision:	A

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**GENERAL NOTES:**  
All measurements to be checked and controlled against the drawings on site before any work commences and to the drawings. Any irregularities and discrepancies must immediately be pointed out to the consulting engineer.  
All work done should be in accordance with latest SANS standards, relevant codes and municipal by-laws.  
**CONTRACTOR IS ADVISED TO READ ALL THE NOTES CAREFULLY PRIOR TO COMMENCEMENT WITH WORKS.**

**GENERAL ELECTRICAL INSTALLATION NOTES:**

1. Dimensional details shall be in accordance with SANS 1014-2, SANS1818, SANS1974.
2. The contractor to verify conditions of the field prior to commencement, prior to determine conditions for cable routing, lengths, quantity of materials, space available for appliances and equipment.
3. The contractor shall take own measurements of quantities for materials and lengths against the drawing.
4. No equipment shall be delivered to site without the written approval of the consulting engineer.
5. Factory acceptance test (FAT) shall be carried out as per SANS 187, with the presence of the consulting engineer or his representative and/or the personnel from local supply authority before the power equipment is released from the manufacturer.
6. On site test shall be carried out as per clause 8 of SANS 1874.
7. The contractor shall liaise with other service providers on final location of provided equipment, final cable tray routing, and exact location of all equipment noted as "by others".
8. Any work not done to the satisfaction of the consulting engineer shall be remedied and to the Contractor's account.
9. Cable joints shall be carried out by personnel who are certified to do so.
10. Should there be a need to reinstall any part of a circuit, the contractor shall issue details of that particular circuit to the consulting engineer.
11. An investigation shall be carried out to determine the cause of a defect prior to the work being undertaken.
12. All power circuits to appliances shall be tested and commissioned including the respective switchgear. Such tests shall be conducted in the presence of the Consulting Engineer or his representative and test results shall be submitted to his office within 3 calendar days.
13. Contractor to supply all documentation relating to the major power equipment including wiring diagrams.
14. The Contractor shall make arrangements for training at least one qualified member of staff on the use, operation and maintenance of the electrical installation.
15. Equipment shall be housed in a shipping container. Container shall be fully airconditioned and ventilated.

**NOTE 43: ANNOTATIONS:**  
1. None.

**NOTE 44: NOTES PERTAINING REVISIONS TO THIS DRAWING:**  
1. See clodded area.

**NOTE 45: APPLICABLE SPECIFICATIONS (OBTAINABLE FROM CONSULTING ENGINEER'S OFFICE):**  
1. Standard Quality Specification for general electrical installations.  
2. Standard Quality Specification for Electrical Material and Equipment.  
3. Detailed Specification for Electrical Installations

**NOTE 46: DISCLAIMER:**

1. The contractor shall be responsible for the design and to commence as soon as practicable as soon as all cable routes between source and devices/appliances. These are tentative and it is the responsibility of the contractor to provide the most effective and efficient routes in accordance with regulations and industry best practices.
2. The contractor will be required to indicate all cable routes on the "as-built" drawings.
3. This drawing is limited in scope to specific components of a complete system and is thus a single line representation of the system.
4. Works classified as "removal and reinstatement" shall ONLY be executed upon a written site instruction.
5. Works classified as "committed and decommissioned" shall ONLY be executed upon a written site instruction.

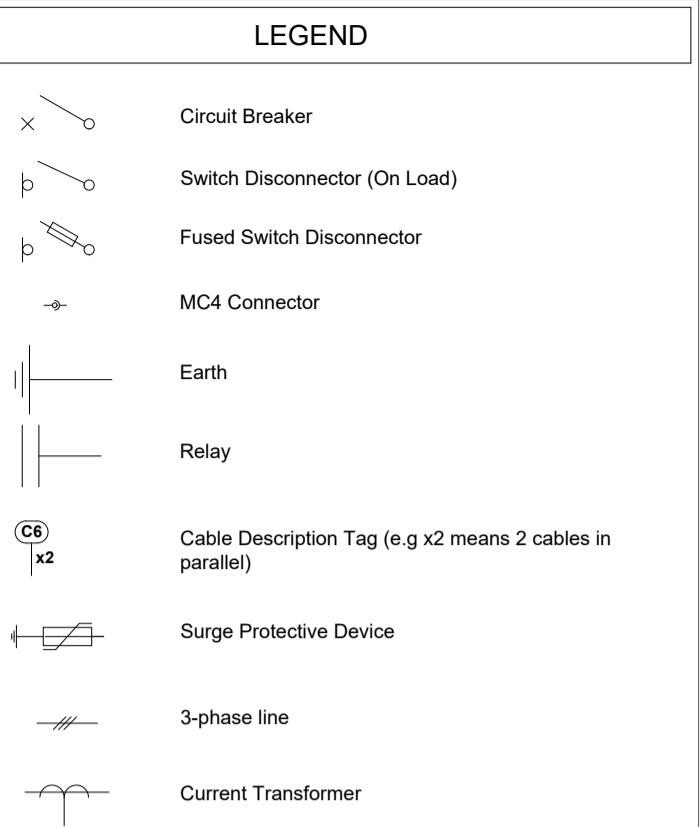
**NOTE 47: ACRONYMS (SELECTIVE):**

1. DB - Distribution Board
2. DC - Direct Current
3. AC - Alternating Current
4. MV - Medium Voltage
5. LV - Low Voltage
6. RML - Ring Main Unit
7. MCB - Miniature Circuit Breaker
8. MCCB - Moulded Case Circuit Breaker
9. SWA - Steel Wire Armour
10. PVC - Polyvinyl Chloride
11. BCEW - Bare Copper Earth Wire
12. SPD - Surge Protective Device
13. PV - Photovoltaic

WIRE SCHEDULE	TYPE	TOTAL LENGTH (m)
C1 - 35mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 16mm <sup>2</sup> BCEW	AC	
C2 - 50mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 25mm <sup>2</sup> BCEW	AC	
C3 - 70mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 35mm <sup>2</sup> BCEW	AC	
C4 - 95mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 50mm <sup>2</sup> BCEW	AC	
C5 - 120mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 70mm <sup>2</sup> BCEW	AC	
C6 - 150mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 95mm <sup>2</sup> BCEW	AC	
C7 - 185mm <sup>2</sup> 4-core SWA/PVC/PVC Cu. cable + 120mm <sup>2</sup> BCEW	AC	
C8 - 240mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 150mm <sup>2</sup> BCEW	AC	
C9 - 300mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 185mm <sup>2</sup> BCEW	AC	
D2 - 6mm <sup>2</sup> single core class 5 PVC Cu. cable (Red+Black)	DC	
D6 - 35mm <sup>2</sup> single core PVC/PVC Cu. cable (2 cables)	DC	
D7 - 50mm <sup>2</sup> single core PVC/PVC Cu. cable (2 cables)	DC	
D8 - 95mm <sup>2</sup> single core class 5 PVC Cu. cable (Red+Black)	DC	
D9 - 150mm <sup>2</sup> single core PVC/PVC Cu. cable (2 cables)	DC	
D10 - 240mm <sup>2</sup> single core PVC/PVC Cu. cable (2 cables)	DC	
E2 - 4mm <sup>2</sup> BCEW	PE	
E3 - 6mm <sup>2</sup> BCEW	PE	
E4 - 10mm <sup>2</sup> BCEW	PE	
T1 - RS485 Connection/CAN	DATA	
T2 - Cat6 Connection	DATA	

**PANEL CONSTRUCTION DETAILS:**

Panel Name: ACPB3  
Purpose: Protection Box + Bypass/Changeover  
Construction: Surface mount  
Access: Front  
Material: Mild steel (1.6mm)  
Panels: Steel escutcheon removable panels with locking pins and square key catches  
Doors: White latch type lockable doors  
Exposure: IP44  
Finish: Orange powder coated exterior body, white interior painted body, white powder coated panels  
Dimensions: TBC  
Labeling: Exterior - Engraved iron/tafolyte installed at front.  
Interior - Engraved iron/tafolyte, printed legend card, legend card holder on door  
Cable Entry: Bottom  
Location: Inside custom made shipping container/Inverter section  
Supplied from: TBC  
General: Allow 30% spare space capacity.  
Changeover switch to be in a separate compartment, padlockable, basemount



orientation map

drawing approval

owner's signature	engineer's signature	architect's signature
name	Registration No.	Registration No.

ISSUED FOR CLIENT APPROVAL

file location	paper size
	A 1

revision details

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A	16.05.2025	N.D.	W.H.	Detailed Design
No	DATE	DRW	CHK	DESCRIPTION

client

SOUTH AFRICAN NATIONAL SPACE AGENCY

KRUGERSDORP

principal agent

62 Van Ryneveld Ave.,  
Pretoria 0045  
e-mail: admin@khulacon.com  
website: www.khulacon.com

KHULANDLE CONSULTING ENGINEERS SA CC

agent

62 Van Ryneveld Ave.,  
Pretoria 0045  
e-mail: admin@khulacon.com  
website: www.khulacon.com

KHULANDLE CONSULTING ENGINEERS SA CC

discipline ELECTRICAL  
service POWER DISTRIBUTION

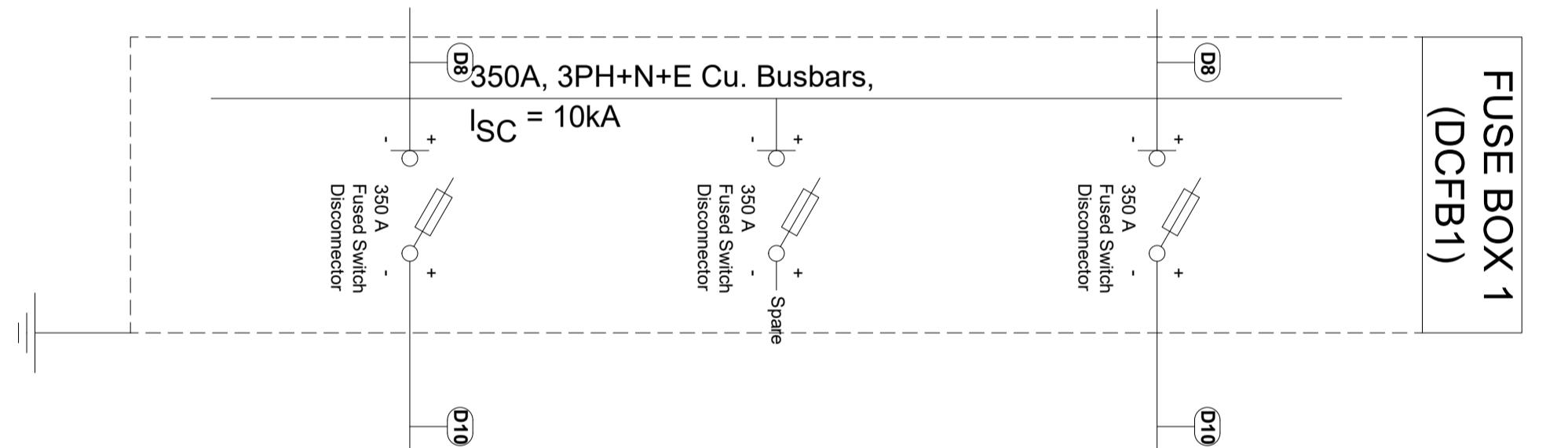
project name 1 Megawatt Solar Photovoltaic Plant at SANSA Space Station Krugersdorp

proj. ref

drawing title AC Protection Box (ACPB3) Single Line Diagram

project no:	12501	designed:	W.H.
scale:	Not to scale	drawn:	N.D.
date:	16 May 2025	checked:	J.M.
drawing no:	12501-PV-SLD14	revision:	A

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FUSE BOX 1  
(DCFB1)

**GENERAL NOTES:**  
All measurements to be checked and controlled against the drawings on site before any work commences and to the drawings. Any irregularities and discrepancies must immediately be pointed out to the consulting engineer.  
All work done should be in accordance with latest SANS standards, relevant codes and municipal by-laws.  
**CONTRACTOR IS ADVISED TO READ ALL THE NOTES CAREFULLY PRIOR TO COMMENCEMENT WITH WORKS.**

**GENERAL ELECTRICAL INSTALLATION NOTES:**

1. Dimension and spacing of equipment to be in accordance with SANS 1014-4, SANS1818, SANS1974.
2. The contractor to verify conditions of the field prior to commencement of work to determine conditions for cable routing, lengths, quantity of materials, space available for appliances and equipment.
3. The contractor shall take own measurements of quantities for materials and lengths against the drawing.
4. No equipment shall be delivered to site without the written approval of the consulting engineer.
5. Factory acceptance test (FAT) shall be carried out as per SANS 187, with the presence of the consulting engineer or his representative and/or the personnel from local supply authority before the power equipment is released from the manufacturer.
6. On site test shall be carried out as per clause 8 of SANS 1874.
7. The contractor shall liaise with other service providers on final location of provided equipment, final cable tray routing, and exact location of all equipment noted as "by others".
8. Any work not done to the satisfaction of the consulting engineer shall be remedied and to the Contractor's account.
9. Cable joints shall be carried out by personnel who are certified to do so.
10. Should there be a need to rewire any part of a circuit, the contractor shall issue details of that particular circuit to the consulting engineer.
11. An investigation shall be carried out to determine the cause of a defect prior to the work being undertaken.
12. All power circuits to appliances shall be tested and commissioned including the respective switchgear. Such tests shall be conducted in the presence of the Consulting Engineer or his representative and test results shall be submitted to his office within 3 calendar days.
13. Contractor to supply all documentation relating to the major power equipment including wiring diagrams.
14. The Contractor shall make arrangements for training at least one qualified member of staff on the use, operation and maintenance of the electrical installation.
15. Equipment shall be housed in a shipping container. Container shall be fully airconditioned and ventilated.

**NOTE A3: ANNOTATIONS:**

1. None.

**NOTE A4: NOTES PERTAINING REVISIONS TO THIS DRAWING:**

1. See clodded area.

**NOTE A5: APPLICABLE SPECIFICATIONS (OBTAINABLE FROM CONSULTING ENGINEER'S OFFICE):**

1. Standard Quality Specification for general electrical installations.
2. Standard Quality Specification for Electrical Material and Equipment.
3. Detailed Specification for Electrical Installations

**NOTE A6: DISCLAIMER:**

1. The contractor shall be responsible for the drawings and to determine as exact cable routes between source and devices/appliances. These are tentative and it is the responsibility of the contractor to provide the most effective and efficient routes in accordance with regulations and industry best practices.
2. The contractor will be required to indicate all cable routes on the "as-built" drawings.
3. This drawing is limited in scope to specific components of a complete system and is thus a single line representation of the system.
4. Works classified as "removal and reinstatement" shall ONLY be executed upon a written site instruction.
5. Works classified as "committed and decommissioned" shall ONLY be executed upon a written site instruction.

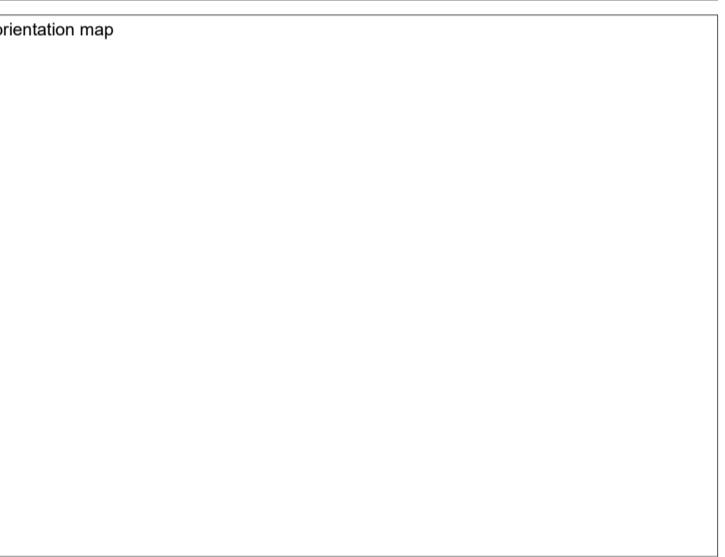
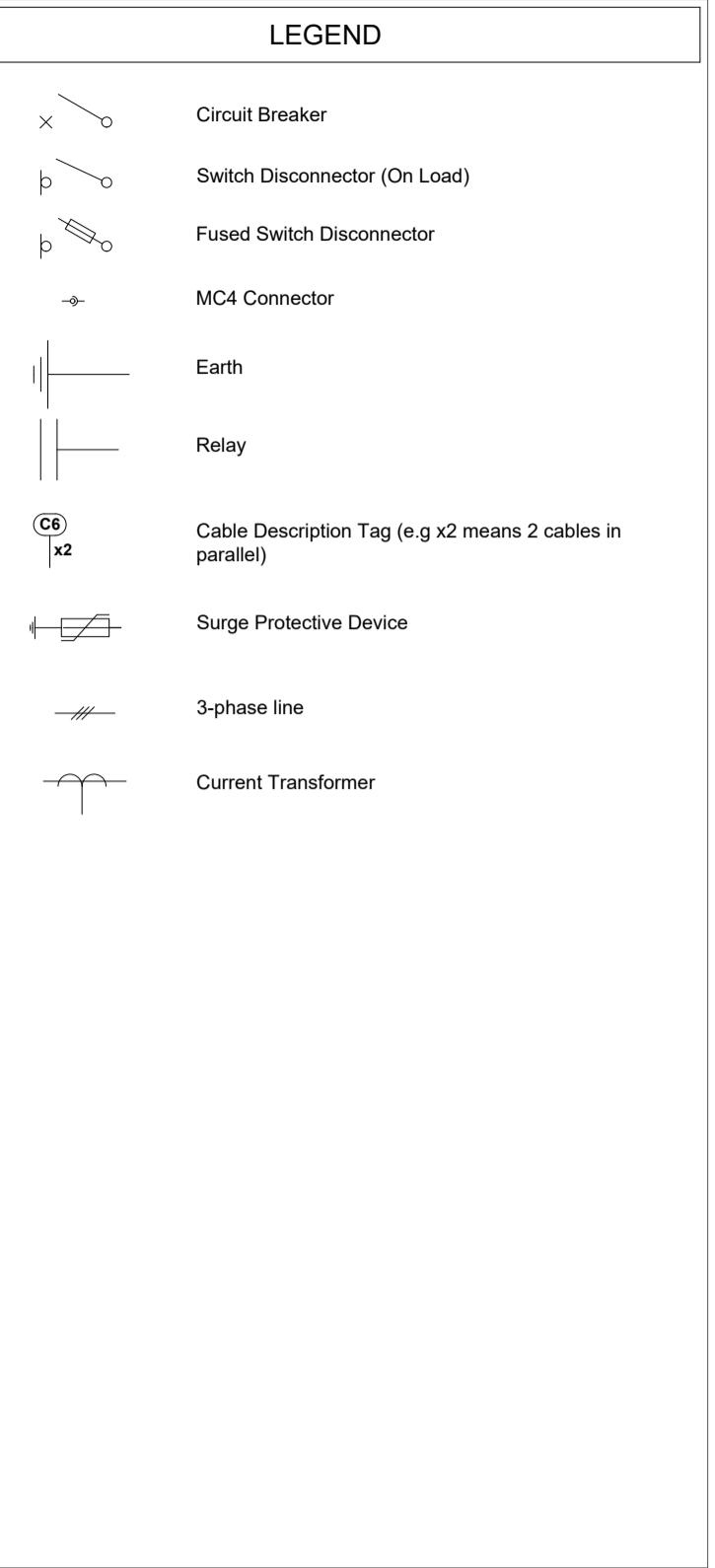
**NOTE A7: ACRONYMS (SELECTIVE):**

1. DB - Distribution Board
2. DC - Direct Current
3. AC - Alternating Current
4. MV - Medium Voltage
5. LV - Low Voltage
6. RMU - Ring Main Unit
7. MCB - Miniature Circuit Breaker
8. MCCB - Moulded Case Circuit Breaker
9. SWA - Steel Wire Armour
10. PVC - Polyvinyl Chloride
11. BCEW - Bare Copper Earth Wire
12. SPD - Surge Protective Device
13. PV - Photovoltaic

WIRE SCHEDULE	TYPE	TOTAL LENGTH (m)
C1 - 35mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 16mm <sup>2</sup> BCEW	AC	
C2 - 50mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 25mm <sup>2</sup> BCEW	AC	
C3 - 70mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 35mm <sup>2</sup> BCEW	AC	
C4 - 95mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 50mm <sup>2</sup> BCEW	AC	
C5 - 120mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 70mm <sup>2</sup> BCEW	AC	
C6 - 150mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 95mm <sup>2</sup> BCEW	AC	
C7 - 185mm <sup>2</sup> 4-core SWA/PVC/PVC Cu. cable + 120mm <sup>2</sup> BCEW	AC	
C8 - 240mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 150mm <sup>2</sup> BCEW	AC	
C9 - 300mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 185mm <sup>2</sup> BCEW	AC	
D2 - 6mm <sup>2</sup> single core class 5 PVC Cu. cable (Red+Black)	DC	
D6 - 35mm <sup>2</sup> single core PVC/PVC Cu. cable (2 cables)	DC	
D7 - 50mm <sup>2</sup> single core PVC/PVC Cu. cable (2 cables)	DC	
D8 - 95mm <sup>2</sup> single core class 5 PVC Cu. cable (Red+Black)	DC	
D9 - 150mm <sup>2</sup> single core PVC/PVC Cu. cable (2 cables)	DC	
D10 - 240mm <sup>2</sup> single core PVC/PVC Cu. cable (2 cables)	DC	
E2 - 4mm <sup>2</sup> BCEW	PE	
E3 - 6mm <sup>2</sup> BCEW	PE	
E4 - 10mm <sup>2</sup> BCEW	PE	
T1 - RS485 Connection/CAN	DATA	
T2 - Cat6 Connection	DATA	

**PANEL CONSTRUCTION DETAILS:**

Panel Name: DCFB1  
Panel Type: Battery Fuse Box  
Construction: Surface mount  
Access: Front  
Material: Mild steel (1.6mm)  
Panels: Steel escutcheon removable panels with locking pins and square key catches  
Doors: With latch type lockable doors  
Exposure: IP44  
Finish: White powder coated exterior body, white interior painted body, white powder coated panels  
Dimensions: TBC  
Labeling: Exterior - Engraved ionvine/trafolyte installed at front.  
Interior - Engraved ionvine/trafolyte, printed legend card, legend card holder on door  
Cable Entry: Bottom  
Terminals: 3 Input/3 Output  
Location: Inside custom made shipping container/Battery section  
Supplied from: Battery Pack  
General: Allow 20% spare space capacity for future expansion.



**drawing approval**

owner's signature	engineer's signature	architect's signature
name	Registration No.	Registration No.

**ISSUED FOR CLIENT APPROVAL**

file location \_\_\_\_\_ paper size A 1

**revision details**  
A 16.05.2025 N.D. W.H. Detailed Design  
No DATE DRW CHK DESCRIPTION

**client**  
**SOUTH AFRICAN NATIONAL SPACE AGENCY**  
KRUGERSDORP

**principal agent**  
62 Van Ryneveld Ave.,  
Pty Ltd  
Pretoria, 0045  
**KHULACON** e-mail: admin@khulacon.com  
website: www.khulacon.com

**KHULANDLE CONSULTING ENGINEERS SA CC**

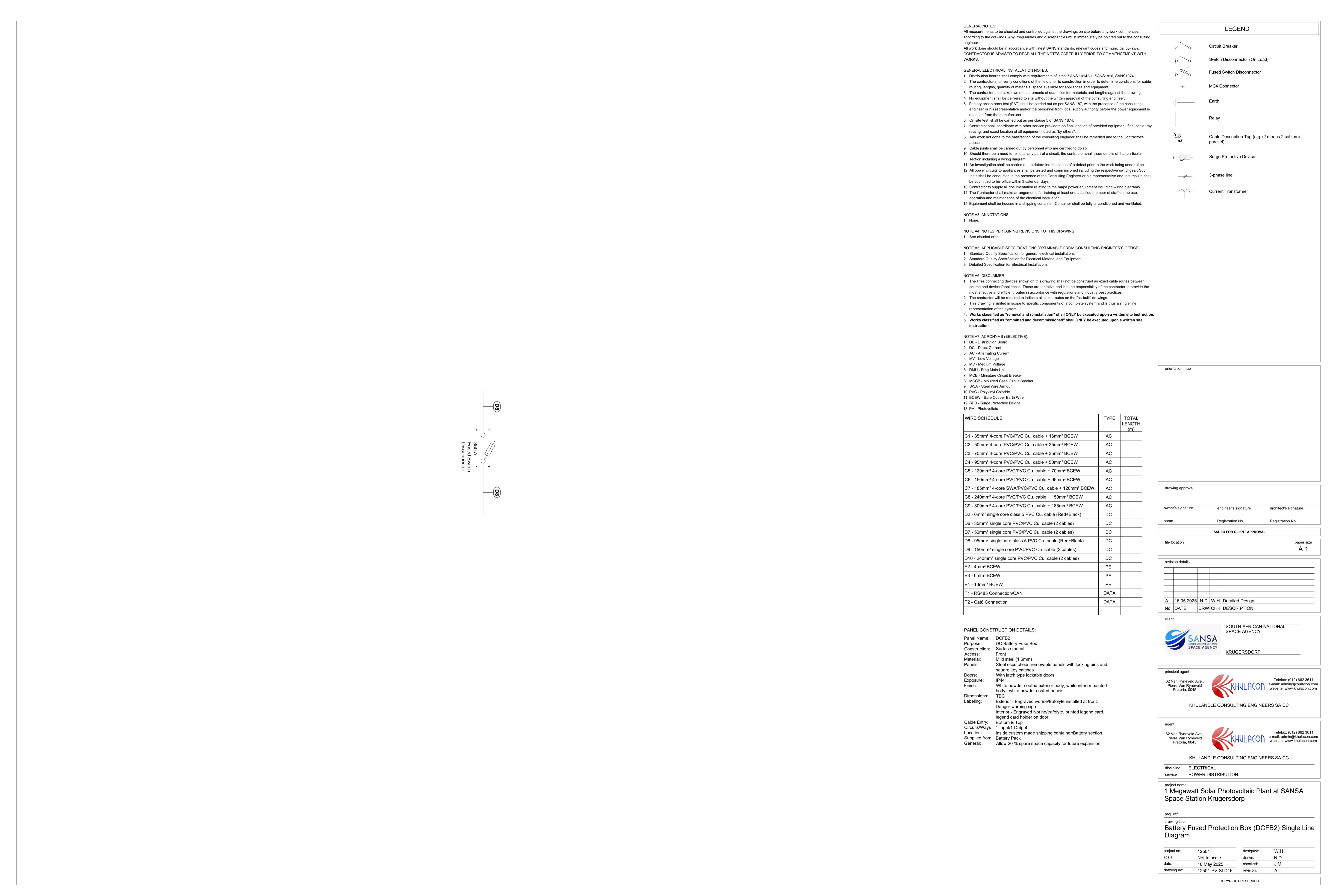
**agent**  
62 Van Ryneveld Ave.,  
Pty Ltd  
Pretoria, 0045  
**KHULACON** e-mail: admin@khulacon.com  
website: www.khulacon.com


**KHULANDLE CONSULTING ENGINEERS SA CC**

**discipline** ELECTRICAL  
**service** POWER DISTRIBUTION

**project name** 1 Megawatt Solar Photovoltaic Plant at SANSA Space Station Krugersdorp  
**proj. ref**  
**drawing title** Battery Fused Protection Box (DCFB1) Single Line Diagram  
**project no.** 12501 **designed** W.H.  
**scale** Not to scale **drawn** N.D.  
**date** 16 May 2025 **checked** J.M.  
**drawing no.** 12501-PV-SDL15 **revision** A

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**GENERAL NOTES:**  
All measurements to be checked and controlled against the drawings on site before any work commences  
according to the drawings. Any irregularities and discrepancies must immediately be pointed out to the consulting  
engineer.  
All work done should be in accordance with latest SANS 15401:1, SANS 10401:1, SANS 10794  
CONTRACTOR IS ADVISED TO READ ALL THE NOTES CAREFULLY PRIOR TO COMMENCEMENT WITH WORKS

**GENERAL ELECTRICAL INSTALLATION NOTES:**

- Distribution boards shall comply with requirements of latest SANS 15401:1, SANS 10401:1, SANS 10794
- Routing, quantity of materials, space available for appliances and equipment.
- Contractor shall be responsible for the construction of the cables.
- The contractor shall take all measurements of quantities for materials and lengths against the drawing.
- Contractor shall supply all trenching and conduit as per technical specification.
- Contractor shall supply all cables.
- The contractor shall obtain all permits required by the public authority and landowner having jurisdiction, including a right-of-way permit.
- Contractor shall ensure that construction shall be secured and submitted to the Engineer for recording prior to commencement of work. No work which requires an assessment shall proceed until this is complete.
- Contractor shall supply all cables and equipment required for the connection to the grid.
- Factory acceptance test (FAT) shall be carried out as per SANS 10794, with the presence of the consulting engineer or his representative and/or the personnel from local supply authority before the power equipment is delivered.
- Road surface recovery: Prepare Asphalt materials or Paving etc, according to the original standard to recover the road surface.
- CPR, Geoscan, Utility locating in-need services, and existing reticulation shall be carried out to any excavation.
- Contractor shall supply all coordinates for route, manholes, plinths etc, and shall be verified with a Land Surveyor prior to any excavation.
- Excavation shall be carried out in per classes of SANS 10794.
- Contractor shall coordinate with other service providers on the location of provided equipment, final cable tray routing, and exact location of all equipment noted as "by others".
- Contractor shall supply all cables and equipment required for the connection to the grid.
- Contractor shall be responsible for the connection to the grid and shall be remedied and the Contractor's account.
- Contractor shall be carried out by personnel who are certified to do so.
- Contractor and enclosures shall conform to approved manufacturer as per the Technical Specifications and according to Municipal requirements.
- Contractor shall be responsible for the connection to the grid part of a circuit, the contractor shall issue details of that particular section including a wiring diagram.
- Investigation shall be carried out to determine the cause of a defect prior to the work being undertaken.
- Contractor's equipment shall be tested and commissioned including the respective watchdog. Such tests shall be conducted in the presence of the Consulting Engineer or his representative and test results shall be recorded.
- Contractor to supply all documentation relating to the major power equipment including wiring diagrams.
- The Contractor shall make arrangements for training at least one qualified member of staff on the use, operation and maintenance of the equipment.
- Equipment shall be housed in a shipping container. Container shall be fully airconditioned and ventilated.

**NOTE AS ANNOTATIONS:**

- None.

**NOTE AA: NOTES PERTAINING REVISIONS TO THIS DRAWING:**

- See shaded areas.

**NOTE AS: APPLICABLE SPECIFICATIONS DERIVABLE FROM CONSULTING ENGINEERS OFFICE:**

- Standard Quality Specification for general electrical installations.
- Standard Quality Specification for Electrical Material and Equipment.
- Detail Specification for Electrical Installations

**NOTE AE: DISCLAIMER:**

- The dimensions and locations of devices shown on the drawing shall not be construed as exact cable routes between source and devices/placements. These are tentative and it is the responsibility of the contractor to provide the most effective and efficient routes in accordance with regulations and industry best practices.
- This drawing is limited in scope to specific components of a complex system and is thus a single line drawing.
- Investigation shall be carried out to determine the cause of a defect prior to the work being undertaken.
- Contractor's equipment shall be tested and commissioned including the respective watchdog. Such tests shall be conducted in the presence of the Consulting Engineer or his representative and test results shall be recorded.
- Works classified as "removal and reinstatement" shall ONLY be executed upon a written site instruction.
- Works classified as "committed and decommissioned" shall ONLY be executed upon a written site instruction.

**NOTE BB: ACRONYMS (SELECTIVE):**

- DB - Distribution Board
- DC - Direct Current
- DCB - Direct Current Breaker
- MV - Low Voltage
- AC - Alternating Current
- RMU - Ring Main Unit
- MCB - Miniature Circuit Breaker
- ACB - Automatic Circuit Breaker
- SWA - Steel Wire Armour
- PC - Polyethylene
- BCEW - Buried Copper Earth Wire
- SPD - Surge Protective Device
- VOD - Voltage Drop
- MD - Manhole
- HDPE - High Density Polyethylene
- UG - Underground
- BFG - Below Finished Ground Level

**WIRE SCHEDULE**

	TYPE	TOTAL LENGTH (m)
C1 - 35mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 16mm <sup>2</sup> BCEW	AC	
C2 - 50mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 25mm <sup>2</sup> BCEW	AC	
C3 - 70mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 35mm <sup>2</sup> BCEW	AC	
C4 - 95mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 50mm <sup>2</sup> BCEW	AC	
C5 - 120mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 70mm <sup>2</sup> BCEW	AC	
C6 - 150mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 95mm <sup>2</sup> BCEW	AC	
C7 - 185mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 120mm <sup>2</sup> BCEW	AC	
C8 - 240mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 150mm <sup>2</sup> BCEW	AC	
C9 - 300mm <sup>2</sup> 4-core PVC/PVC Cu. cable + 185mm <sup>2</sup> BCEW	AC	
D2 - 6mm <sup>2</sup> single core class 5 PVC Cu. cable (Red+Black)	DC	
D6 - 35mm <sup>2</sup> single core class 5 PVC Cu. cable (Red+Black)	DC	
D7 - 50mm <sup>2</sup> single core class 5 PVC Cu. cable (Red+Black)	DC	
D8 - 95mm <sup>2</sup> single core class 5 PVC Cu. cable (Red+Black)	DC	
D9 - 150mm <sup>2</sup> single core class 5 PVC Cu. cable (Red+Black)	DC	
D10 - 240mm <sup>2</sup> single core class 5 PVC Cu. cable (Red+Black)	DC	
E2 - 4mm <sup>2</sup> BCEW	PE	
E3 - 6mm <sup>2</sup> BCEW	PE	
E4 - 10mm <sup>2</sup> BCEW	PE	
T1 - RS485 Connection/CAN	DATA	
T2 - Call Connection	DATA	

Modules: 270

DC Nameplate: 149.8 kW<sub>0</sub>

AC Nameplate: 150 kW<sub>p</sub>

Modules per string: 18

Number of Strings: 15

Azimuth: 0°

**orientation map**

**drawing approval**

owner's signature engineer's signature architect's signature  
name Registration No. Registration No.

**ISSUED FOR CLIENT APPROVAL**

Site location paper size A0

revision details

B 01.07.2025 N.D. W.H Revised Offset  
A 16.05.2025 N.D. W.H Detailed Design  
No. DATE DRW.CHK DESCRIPTION

client  
SOUTH AFRICAN NATIONAL SPACE AGENCY  
KRUGERSDORP

principal agent  
62 Van Ryneveld Ave, Parys Van Ryneveld, Pretoria, 0045  
Fax: (012) 662 3611  
e-mail: admin@khulacon.com  
website: www.khulacon.com

agent  
62 Van Ryneveld Ave, Parys Van Ryneveld, Pretoria, 0045  
Fax: (012) 662 3611  
e-mail: admin@khulacon.com  
website: www.khulacon.com

discipline ELECTRICAL  
service POWER DISTRIBUTION

project name 1 Megawatt Solar Photovoltaic Plant at SANSA Space Station Krugersdorp

proj. ref drawing title Site Electrical Reticulation Layout of DC/LV Power for Complete Solar PV Plant No. 3 (150kW)

scale: 1:150 designed: N.D.  
date: 01 July 2025 checked: J.D.  
drawing no: 12501-PV-EL04 revision: B

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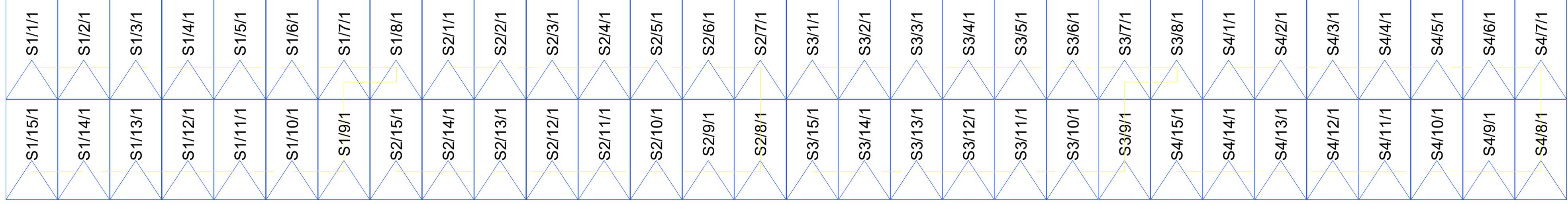


TABLE 1  
(2X30 Modules)

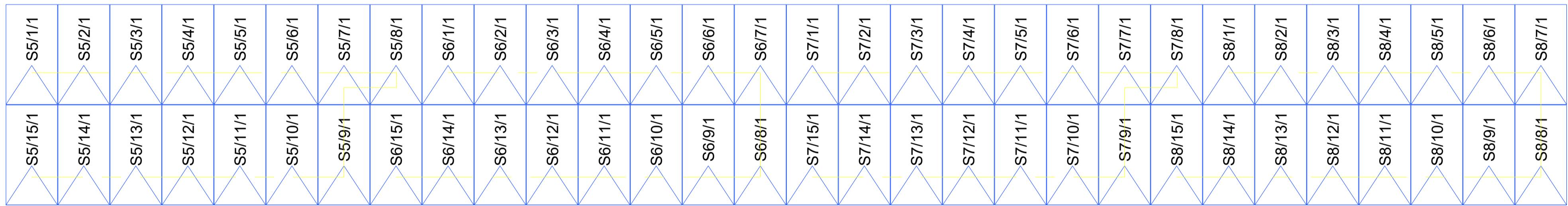


TABLE 2  
(2X30 Modules)

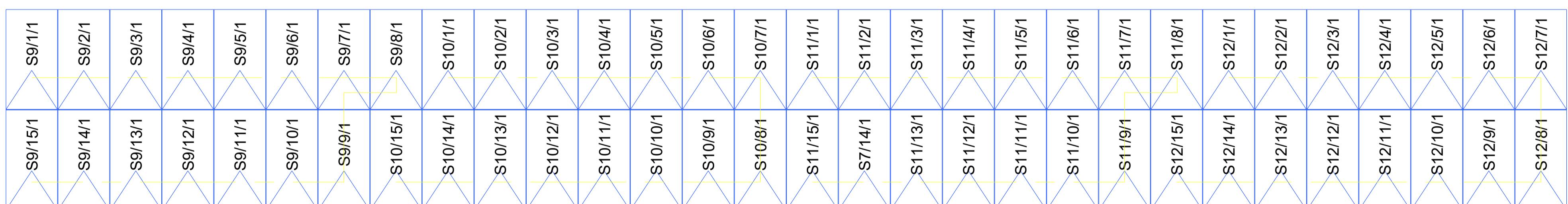


TABLE 3  
(2X30 Modules)

GENERAL NOTES:  
All measurements to be checked and controlled against the drawings on site before any work commences  
and to the drawings. Any irregularities and discrepancies must immediately be pointed out to the consulting  
engineer.  
All work done should be in accordance with latest SANS standards, relevant codes and municipal by-laws.  
**CONTRACTOR IS ADVISED TO READ ALL THE NOTES CAREFULLY PRIOR TO COMMENCEMENT WITH  
WORKS.**

GENERAL ELECTRICAL INSTALLATION NOTES:  
1. Voltage of modules shall comply with requirements of latest SANS 10142-1, SANS1016, SANS1974.  
2. The contractor will verify conditions on the site prior to construction in order to determine conditions for cable  
routing, lengths, quantity of materials, space available for appliances and equipment.  
3. Inverter to be equipped with built-in bypass switch.  
4. The contractor shall take own measurements of quantities for materials and lengths against the drawing.  
5. No equipment shall be delivered to site without the written approval of the consulting engineer.  
6. Factory acceptance test (FAT) shall be carried out as per SANS 187, with the presence of the consulting  
engineer or his representative and/or the personnel from local supply authority before the power equipment is  
released to the manufacturer.  
7. The test shall be carried out as per clause 5 of SANS 1074.  
8. Contractor shall coordinate with other service providers on final location of provided equipment, final cable tray  
routing, and exact location of all equipment noted as "by others".  
9. Any work not done to the satisfaction of the consulting engineer shall be remedied and to the Contractor's  
account.  
10. MC4 connectors shall be connected out by personnel who are certified to do so.  
11. Should there be a need to replace any part of a circuit, the contractor shall issue details of that particular  
section including a wiring diagram.  
12. An investigation shall be carried out to determine the cause of a defect prior to the work being undertaken.  
13. All power circuits to appliances shall be tested and commissioned including the respective switchgear. Such  
tests shall be conducted in the presence of the Consulting Engineer or his representative and test results shall  
be submitted to his office within 3 calendar days.  
14. Contractor to supply all documentation relating to the major power equipment including wiring diagrams.  
15. The Contractor shall make arrangements for training at least one qualified member of staff on the use,  
operation and maintenance of the electrical installation.  
16. Equipment shall be housed in a shipping container. Container shall be fully air-conditioned and ventilated.

NOTE A3: ANNOTATIONS:

- None.

NOTE A4: NOTES PERTAINING REVISIONS TO THIS DRAWING:

- See clodded area.

NOTE A5: APPLICABLE SPECIFICATIONS (OBTAINABLE FROM CONSULTING ENGINEER'S OFFICE):  
1. Standard Quality Specification for general electrical installations.  
2. Standard Quality Specification for Electrical Material and Equipment.  
3. Detailed Specification for Electrical Installations

NOTE A6: DRAWING NOTES:

- The line connecting devices shown on this drawing shall not be construed as exact cable routes between  
source and devices/appliances. These are tentative and it is the responsibility of the contractor to provide the  
most effective and efficient routes in accordance with regulations and industry best practices.
- The contractor will be required to indicate all cable routes on the "as-built" drawings.
- This drawing is limited in scope to specific components of a complete system and is thus a single line  
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Works classified as "omission and decommissioned" shall ONLY be executed upon a written site  
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NOTE A7: ACRONYMS (SELECTIVE):

- DB - Distribution Board
- DC - Direct Current
- AC - Alternating Current
- LV - Low Voltage
- MV - Medium Voltage
- RMU - Ring Main Unit
- MCB - Miniature Circuit Breaker
- MCCB - Moulded Case Circuit Breaker
- SWA - Steel Wire Armour
- PVC - Polyvinyl Chloride
- BCEW - Bare Copper Earth Wire
- SPD - Surge Protective Device
- PV - Photovoltaic

CIRCUIT NUMBER REPRESENTATION:

String 1: S1 [String No. 1/1 or P1] [Module No. 1/1] [Inverter 1]

String Parameters:

- S1: 631.65 V, 8.33kW, 13.18A
- S2: 631.65 V, 8.33kW, 13.18A
- S3: 631.65 V, 8.33kW, 13.18A
- S4: 631.65 V, 8.33kW, 13.18A
- S5: 631.65 V, 8.33kW, 13.18A
- S6: 631.65 V, 8.33kW, 13.18A
- S7: 631.65 V, 8.33kW, 13.18A
- S8: 631.65 V, 8.33kW, 13.18A
- S9: 631.65 V, 8.33kW, 13.18A
- S10: 631.65 V, 8.33kW, 13.18A
- S11: 631.65 V, 8.33kW, 13.18A
- S12: 631.65 V, 8.33kW, 13.18A
- S13: 631.65 V, 8.33kW, 13.18A
- S14: 631.65 V, 8.33kW, 13.18A
- S15: 631.65 V, 8.33kW, 13.18A
- S16: 631.65 V, 8.33kW, 13.18A
- S17: 631.65 V, 8.33kW, 13.18A
- S18: 631.65 V, 8.33kW, 13.18A
- S19: 631.65 V, 8.33kW, 13.18A
- S20: 631.65 V, 8.33kW, 13.18A
- S21: 631.65 V, 8.33kW, 13.18A
- S22: 631.65 V, 8.33kW, 13.18A
- S23: 631.65 V, 8.33kW, 13.18A
- S24: 631.65 V, 8.33kW, 13.18A
- S25: 631.65 V, 8.33kW, 13.18A
- S26: 631.65 V, 8.33kW, 13.18A
- S27: 631.65 V, 8.33kW, 13.18A
- S28: 631.65 V, 8.33kW, 13.18A
- S29: 631.65 V, 8.33kW, 13.18A
- S30: 631.65 V, 8.33kW, 13.18A
- S31: 631.65 V, 8.33kW, 13.18A
- S32: 631.65 V, 8.33kW, 13.18A
- S33: 631.65 V, 8.33kW, 13.18A
- S34: 631.65 V, 8.33kW, 13.18A
- S35: 631.65 V, 8.33kW, 13.18A
- S36: 631.65 V, 8.33kW, 13.18A
- S37: 631.65 V, 8.33kW, 13.18A
- S38: 631.65 V, 8.33kW, 13.18A
- S39: 631.65 V, 8.33kW, 13.18A
- S40: 631.65 V, 8.33kW, 13.18A
- S41: 631.65 V, 8.33kW, 13.18A
- S42: 631.65 V, 8.33kW, 13.18A
- S43: 631.65 V, 8.33kW, 13.18A
- S44: 631.65 V, 8.33kW, 13.18A
- S45: 631.65 V, 8.33kW, 13.18A
- S46: 631.65 V, 8.33kW, 13.18A
- S47: 631.65 V, 8.33kW, 13.18A
- S48: 631.65 V, 8.33kW, 13.18A
- S49: 631.65 V, 8.33kW, 13.18A
- S50: 631.65 V, 8.33kW, 13.18A
- S51: 631.65 V, 8.33kW, 13.18A
- S52: 631.65 V, 8.33kW, 13.18A
- S53: 631.65 V, 8.33kW, 13.18A
- S54: 631.65 V, 8.33kW, 13.18A
- S55: 631.65 V, 8.33kW, 13.18A
- S56: 631.65 V, 8.33kW, 13.18A
- S57: 631.65 V, 8.33kW, 13.18A
- S58: 631.65 V, 8.33kW, 13.18A
- S59: 631.65 V, 8.33kW, 13.18A
- S60: 631.65 V, 8.33kW, 13.18A
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- S62: 631.65 V, 8.33kW, 13.18A
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- S64: 631.65 V, 8.33kW, 13.18A
- S65: 631.65 V, 8.33kW, 13.18A
- S66: 631.65 V, 8.33kW, 13.18A
- S67: 631.65 V, 8.33kW, 13.18A
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- S69: 631.65 V, 8.33kW, 13.18A
- S70: 631.65 V, 8.33kW, 13.18A
- S71: 631.65 V, 8.33kW, 13.18A
- S72: 631.65 V, 8.33kW, 13.18A
- S73: 631.65 V, 8.33kW, 13.18A
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- S75: 631.65 V, 8.33kW, 13.18A
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- S77: 631.65 V, 8.33kW, 13.18A
- S78: 631.65 V, 8.33kW, 13.18A
- S79: 631.65 V, 8.33kW, 13.18A
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- S87: 631.65 V, 8.33kW, 13.18A
- S88: 631.65 V, 8.33kW, 13.18A
- S89: 631.65 V, 8.33kW, 13.18A
- S90: 631.65 V, 8.33kW, 13.18A
- S91: 631.65 V, 8.33kW, 13.18A
- S92: 631.65 V, 8.33kW, 13.18A
- S93: 631.65 V, 8.33kW, 13.18A
- S94: 631.65 V, 8.33kW, 13.18A
- S95: 631.65 V, 8.33kW, 13.18A
- S96: 631.65 V, 8.33kW, 13.18A
- S97: 631.65 V, 8.33kW, 13.18A
- S98: 631.65 V, 8.33kW, 13.18A
- S99: 631.65 V, 8.33kW, 13.18A
- S100: 631.65 V, 8.33kW, 13.18A
- S101: 631.65 V, 8.33kW, 13.18A
- S102: 631.65 V, 8.33kW, 13.18A
- S103: 631.65 V, 8.33kW, 13.18A
- S104: 631.65 V, 8.33kW, 13.18A
- S105: 631.65 V, 8.33kW, 13.18A
- S106: 631.65 V, 8.33kW, 13.18A
- S107: 631.65 V, 8.33kW, 13.18A
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- S109: 631.65 V, 8.33kW, 13.18A
- S110: 631.65 V, 8.33kW, 13.18A
- S111: 631.65 V, 8.33kW, 13.18A
- S112: 631.65 V, 8.33kW, 13.18A
- S113: 631.65 V, 8.33kW, 13.18A
- S114: 631.65 V, 8.33kW, 13.18A
- S115: 631.65 V, 8.33kW, 13.18A
- S116: 631.65 V, 8.33kW, 13.18A
- S117: 631.65 V, 8.33kW, 13.18A
- S118: 631.65 V, 8.33kW, 13.18A
- S119: 631.65 V, 8.33kW, 13.18A
- S120: 631.65 V, 8.33kW, 13.18A
- S121: 631.65 V, 8.33kW, 13.18A
- S122: 631.65 V, 8.33kW, 13.18A
- S123: 631.65 V, 8.33kW, 13.18A
- S124: 631.65 V, 8.33kW, 13.18A
- S125: 631.65 V, 8.33kW, 13.18A
- S126: 631.65 V, 8.33kW, 13.18A
- S127: 631.65 V, 8.33kW, 13.18A
- S128: 631.65 V, 8.33kW, 13.18A
- S129: 631.65 V, 8.33kW, 13.18A
- S130: 631.65 V, 8.33kW, 13.18A
- S131: 631.65 V, 8.33kW, 13.18A
- S132: 631.65 V, 8.33kW, 13.18A
- S133: 631.65 V, 8.33kW, 13.18A
- S134: 631.65 V, 8.33kW, 13.18A
- S135: 631.65 V, 8.33kW, 13.18A
- S136: 631.65 V, 8.33kW, 13.18A
- S137: 631.65 V, 8.33kW, 13.18A
- S138: 631.65 V, 8.33kW, 13.18A
- S139: 631.65 V, 8.33kW, 13.18A
- S140: 631.65 V, 8.33kW, 13.18A
- S141: 631.65 V, 8.33kW, 13.18A
- S142: 631.65 V, 8.33kW, 13.18A
- S143: 631.65 V, 8.33kW, 13.18A
- S144: 631.65 V, 8.33kW, 13.18A
- S145: 631.65 V, 8.33kW, 13.18A
- S146: 631.65 V, 8.33kW, 13.18A
- S147: 631.65 V, 8.33kW, 13.18A
- S148: 631.65 V, 8.33kW, 13.18A
- S149: 631.65 V, 8.33kW, 13.18A
- S150: 631.65 V, 8.33kW, 13.18A
- S151: 631.65 V, 8.33kW, 13.18A
- S152: 631.65 V, 8.33kW, 13.18A
- S153: 631.65 V, 8.33kW, 13.18A
- S154: 631.65 V, 8.33kW, 13.18A
- S155: 631.65 V, 8.33kW, 13.18A
- S156: 631.65 V, 8.33kW, 13.18A
- S157: 631.65 V, 8.33kW, 13.18A
- S158: 631.65 V, 8.33kW, 13.18A
- S159: 631.65 V, 8.33kW, 13.18A
- S160: 631.65 V, 8.33kW, 13.18A
- S161: 631.65 V, 8.33kW, 13.18A
- S162: 631.65 V, 8.33kW, 13.18A
- S163: 631.65 V, 8.33kW, 13.18A
- S164: 631.65 V, 8.33kW, 13.18A
- S165: 631.65 V, 8.33kW, 13.18A
- S166: 631.65 V, 8.33kW, 13.18A
- S167: 631.65 V, 8.33kW, 13.18A
- S168: 631.65 V, 8.33kW, 13.18A
- S169: 631.65 V, 8.33kW, 13.18A
- S170: 631.65 V, 8.33kW, 13.18A
- S171: 631.65 V, 8.33kW, 13.18A
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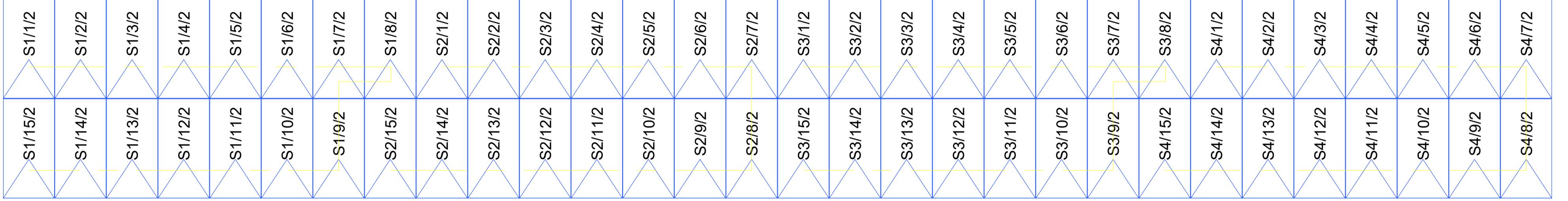


TABLE 4  
(2X30 Modules)

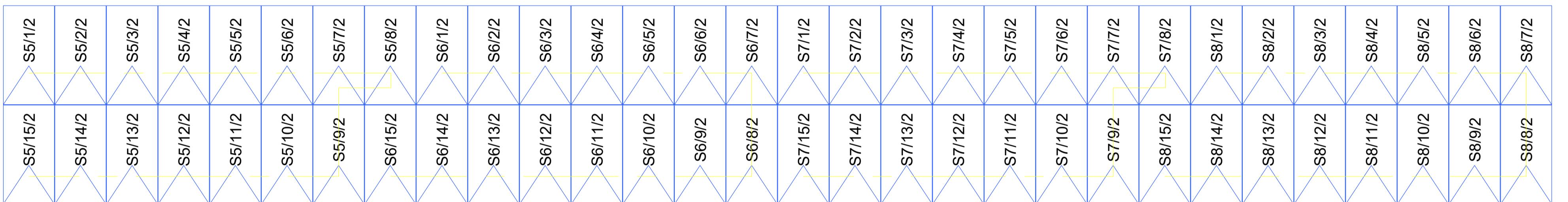


TABLE 5  
(2X30 Modules)

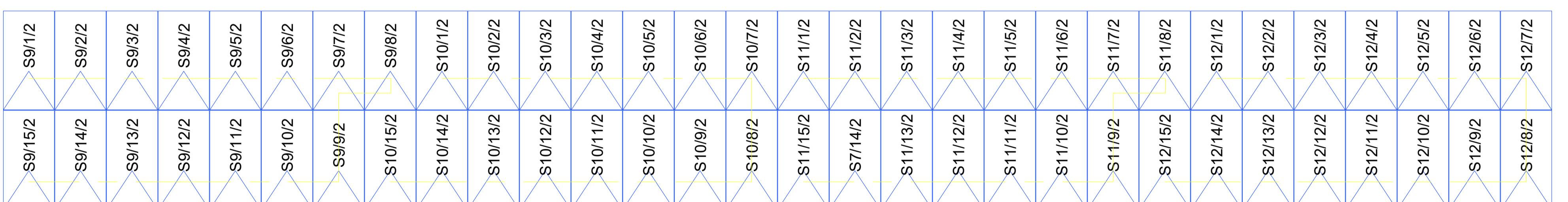


TABLE 6  
(2X30 Modules)

GENERAL NOTES:  
All measurements to be checked and controlled against the drawings on site before any work commences  
according to the drawings. Any irregularities and discrepancies must immediately be pointed out to the consulting  
engineer.  
All work done should be in accordance with latest SANS standards, relevant codes and municipal by-laws.  
**CONTRACTOR IS ADVISED TO READ ALL THE NOTES CAREFULLY PRIOR TO COMMENCEMENT WITH  
WORKS.**

GENERAL ELECTRICAL INSTALLATION NOTES:  
1. Voltage of modules shall comply with requirements of latest SANS 10142-1, SANS1816, SANS1974.  
2. The contractor will verify conditions on the site before the start of construction in order to determine conditions for cable  
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3. Inverter to be equipped with built-in bypass switch.  
4. The contractor shall take own measurements of quantities for materials and lengths against the drawing.  
5. No equipment shall be delivered to site without the written approval of the consulting engineer.  
6. Factory acceptance test (FAT) shall be carried out as per SANS 187, with the presence of the consulting  
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11. If there shall be a need to re-route any part of a circuit, the contractor shall issue details of that particular  
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14. Contractor to supply all documentation relating to the major power equipment including wiring diagrams.  
15. The Contractor shall make arrangements for training at least one qualified member of staff on the use,  
operation and maintenance of the electrical installation.  
16. Equipment shall be housed in a shipping container. Container shall be fully air-conditioned and ventilated.

NOTE A3: ANNOTATIONS:

1. None.

NOTE A4: NOTES PERTAINING REVISIONS TO THIS DRAWING:

1. See clodded area.

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3. AC - Alternating Current
4. LV - Low Voltage
5. MV - Medium Voltage
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7. MCB - Miniature Circuit Breaker
8. MCCB - Moulded Case Circuit Breaker
9. SWA - Steel Wire Armour
10. PVC - Polyvinyl Chloride
11. BCEW - Bare Copper Earth Wire
12. SPD - Surge Protective Device
13. PV - Photovoltaic

CIRCUIT NUMBER REPRESENTATION:

String 1: S1 [String No. 1/1 or P1 [Module No. 1/1] [Inverter 1]]

String Parameters:

1. S1: 631.65 V, 8.33kW, 13.18A
2. S2: 631.65 V, 8.33kW, 13.18A
3. S3: 631.65 V, 8.33kW, 13.18A
4. S4: 631.65 V, 8.33kW, 13.18A
5. S5: 631.65 V, 8.33kW, 13.18A
6. S6: 631.65 V, 8.33kW, 13.18A
7. S7: 631.65 V, 8.33kW, 13.18A
8. S8: 631.65 V, 8.33kW, 13.18A
9. S9: 631.65 V, 8.33kW, 13.18A
10. S10: 631.65 V, 8.33kW, 13.18A
11. S11: 631.65 V, 8.33kW, 13.18A
12. S12: 631.65 V, 8.33kW, 13.18A
13. S13: 631.65 V, 8.33kW, 13.18A
14. S14: 631.65 V, 8.33kW, 13.18A
15. S15: 631.65 V, 8.33kW, 13.18A
16. S16: 631.65 V, 8.33kW, 13.18A
17. S17: 631.65 V, 8.33kW, 13.18A
18. S18: 631.65 V, 8.33kW, 13.18A
19. S19: 631.65 V, 8.33kW, 13.18A
20. S20: 631.65 V, 8.33kW, 13.18A
21. S21: 631.65 V, 8.33kW, 13.18A
22. S22: 631.65 V, 8.33kW, 13.18A
23. S23: 631.65 V, 8.33kW, 13.18A
24. S24: 631.65 V, 8.33kW, 13.18A
25. S25: 631.65 V, 8.33kW, 13.18A
26. S26: 631.65 V, 8.33kW, 13.18A
27. S27: 631.65 V, 8.33kW, 13.18A
28. S28: 631.65 V, 8.33kW, 13.18A
29. S29: 631.65 V, 8.33kW, 13.18A
30. S30: 631.65 V, 8.33kW, 13.18A

String 2: S2 [String No. 2/1 or P2 [Module No. 2/1] [Inverter 2]]

LEGEND		
 Photovoltaic Solar Panel		
 orientation map		
 drawing approval		
owner's signature	engineer's signature	architect's signature
name	Registration No.	Registration No.
ISSUED FOR CLIENT APPROVAL		
file location	paper size A 1	
revision details		
A 16.05.2025 N.D. W.H. Detailed Design No. DATE DRW CHK DESCRIPTION		
client	SOUTH AFRICAN NATIONAL SPACE AGENCY KRUGERSDORP	
principal agent	KHULACON 62 Van Ryneveld Ave., Pretoria, 0045 e-mail: admin@khulacon.com website: www.khulacon.com	
agent	KHULACON 62 Van Ryneveld Ave., Pretoria, 0045 e-mail: admin@khulacon.com website: www.khulacon.com	
discipline service	ELECTRICAL POWER DISTRIBUTION	
project name	1 Megawatt Solar Photovoltaic Plant at SANSA Space Station Krugersdorp	
proj. ref		
drawing title	Module Stringing Arrangement for Inverter 2	
scale	W.H. N.D.	
date	16 May 2025 checked: J.D.	
drawing no.	12501-PV-AV06 revision: A	
COPRIGHT RESERVED		

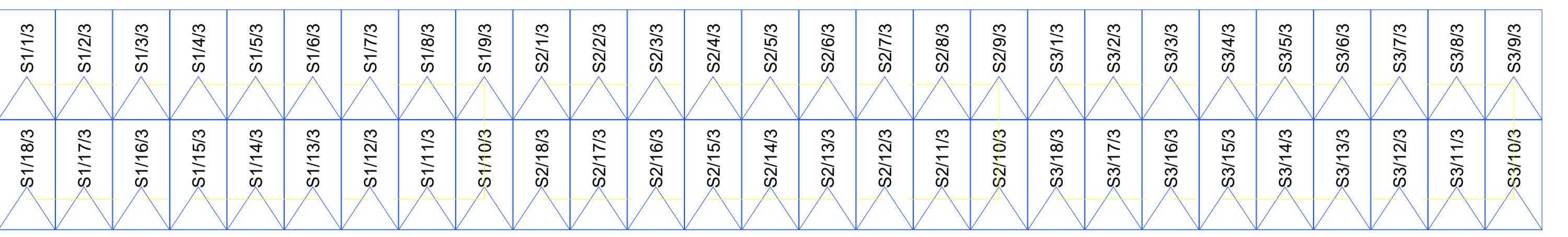


TABLE 7  
(2X27 Modules)

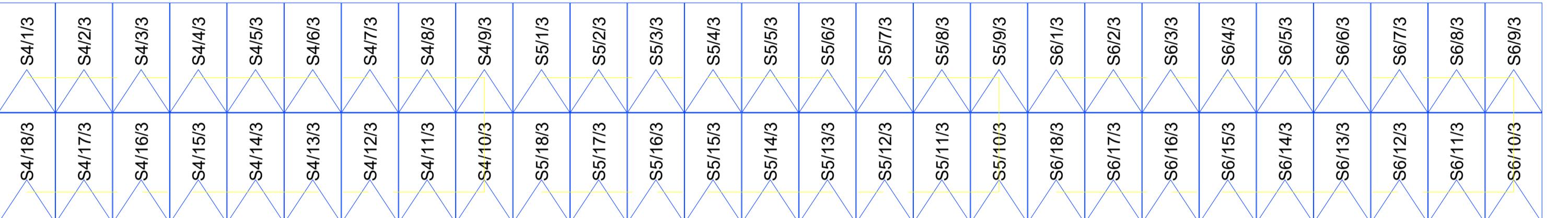


TABLE 8  
(2X27 Modules)

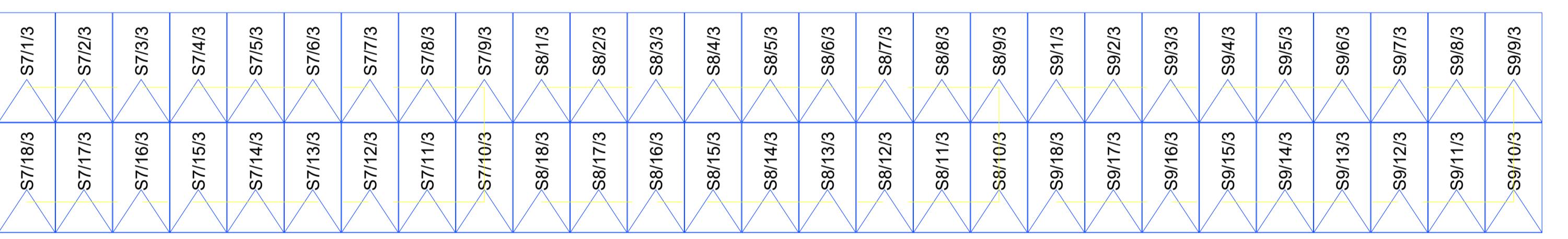


TABLE 9  
(2X27 Modules)

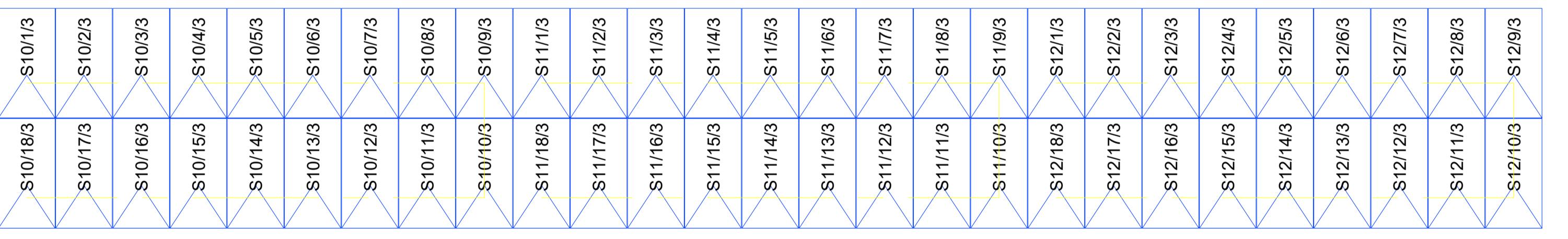


TABLE 10  
(2X27 Modules)

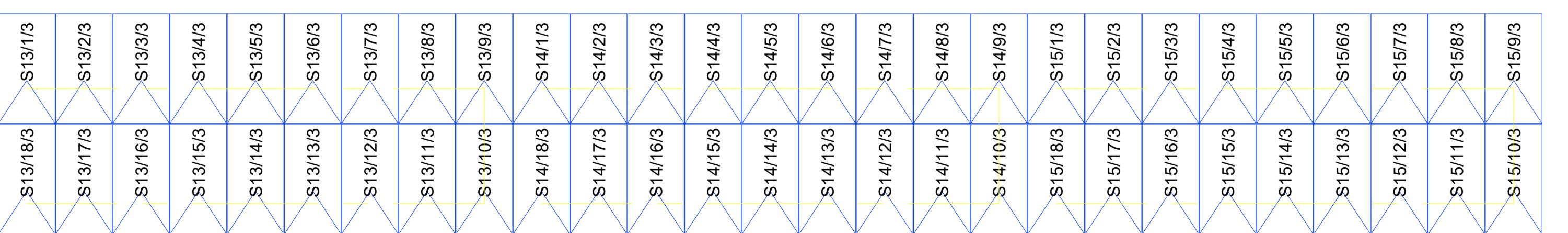


TABLE 11  
(2X27 Modules)

GENERAL NOTES:  
All measurements to be checked and controlled against the drawings on site before any work commences  
pertaining to the drawings. Any irregularities and discrepancies must immediately be pointed out to the consulting  
engineer.  
All work done should be in accordance with latest SANS standards, relevant codes and municipal by-laws.  
**CONTRACTOR IS ADVISED TO READ ALL THE NOTES CAREFULLY PRIOR TO COMMENCEMENT WITH  
WORKS.**

GENERAL ELECTRICAL INSTALLATION NOTES:  
1. Voltage of modules shall comply with requirements of latest SANS 10142-1, SANS1616, SANS1974.  
2. The contractor shall verify conditions of the site prior to construction in order to determine conditions for cable  
routing, lengths, quantity of materials, space available for appliances and equipment.  
3. Inverter to be equipped with built-in bypass switch.  
4. The contractor shall take own measurements of quantities for materials and lengths against the drawing.  
5. No equipment shall be delivered to site without the written approval of the consulting engineer.  
6. Factory acceptance test (FAT) shall be carried out as per SANS 187, with the presence of the consulting  
engineer or his representative and/or the personnel from local supply authority before the power equipment is  
released to the manufacturer.  
7. The test shall be carried out as per clause 5 of IEC 61747.  
8. Contractor shall coordinate with other service providers on final location of provided equipment, final cable tray  
routing and exact location of all equipment noted as "by others".  
9. Any work not done the satisfaction of the consulting engineer shall be remedied and to the Contractor's  
account.  
10. MC4 connectors shall be connected out by personnel who are certified to do so.  
11. Should there be a need to remove any part of a circuit, the contractor shall issue details of that particular  
section including a wiring diagram.  
12. An investigation shall be carried out to determine the cause of a defect prior to the work being undertaken.  
13. All power circuits to appliances shall be tested and commissioned including the respective switchgear. Such  
tests shall be conducted in the presence of the Consulting Engineer or his representative and test results shall  
be submitted to his office within 3 calendar days.  
14. Contractor to supply all documentation relating to the major power equipment including wiring diagrams.  
15. The Contractor shall make arrangements for training at least one qualified member of staff on the use,  
operation and maintenance of the electrical installation.  
16. Equipment shall be housed in a shipping container. Container shall be fully air-conditioned and ventilated.

NOTE A3: ANNOTATIONS:

1. None.

NOTE A4: NOTES PERTAINING REVISIONS TO THIS DRAWING:

1. See clodded area.

NOTE A5: APPLICABLE SPECIFICATIONS (OBTAINABLE FROM CONSULTING ENGINEER'S OFFICE):  
1. Standard Quality Specification for general electrical installations.  
2. Standard Quality Specification for Electrical Material and Equipment.  
3. Detailed Specification for Electrical Installations

NOTE A6: DRAWING NOTES:

1. The connecting devices shown on this drawing shall not be construed as exact cable routes between source and devices/appliances. These are tentative and it is the responsibility of the contractor to provide the most effective and efficient routes in accordance with regulations and industry best practices.
2. The contractor will be required to indicate all cable routes on the "as-built" drawings.
3. This drawing is limited in scope to specific components of a complete system and is thus a single line representation of the system.

4. Works classified as "removal and reinstatement" shall ONLY be executed upon a written site instruction.

5. Works classified as "omitted and decommissioned" shall ONLY be executed upon a written site instruction.

NOTE A7: ACRONYMS (SELECTIVE):

1. DB - Distribution Board
2. DC - Direct Current
3. AC - Alternating Current
4. LV - Low Voltage
5. MV - Medium Voltage
6. RMU - Ring Main Unit
7. MCB - Miniature Circuit Breaker
8. MCCB - Moulded Case Circuit Breaker
9. SWA - Steel Wire Armour
10. PVC - Polyvinyl Chloride
11. BCEW - Bare Copper Earth Wire
12. SPD - Surge Protective Device
13. PV - Photovoltaic

CIRCUIT NUMBER REPRESENTATION:

S1 [String No. 1/1 or P1] [Module No. 1/1] [Inverter 1]

String Parameters:

- S1: 757.98 V, 9.99kW, 13.18A
- S2: 757.98 V, 9.99kW, 13.18A
- S3: 757.98 V, 9.99kW, 13.18A
- S4: 757.98 V, 9.99kW, 13.18A
- S5: 757.98 V, 9.99kW, 13.18A
- S6: 757.98 V, 9.99kW, 13.18A
- S7: 757.98 V, 9.99kW, 13.18A
- S8: 757.98 V, 9.99kW, 13.18A
- S9: 757.98 V, 9.99kW, 13.18A
- S10: 757.98 V, 9.99kW, 13.18A
- S11: 757.98 V, 9.99kW, 13.18A
- S12: 757.98 V, 9.99kW, 13.18A
- S13: 757.98 V, 9.99kW, 13.18A
- S14: 757.98 V, 9.99kW, 13.18A
- S15: 757.98 V, 9.99kW, 13.18A
- S16: 757.98 V, 9.99kW, 13.18A
- S17: 757.98 V, 9.99kW, 13.18A
- S18: 757.98 V, 9.99kW, 13.18A
- S19: 757.98 V, 9.99kW, 13.18A
- S20: 757.98 V, 9.99kW, 13.18A
- S21: 757.98 V, 9.99kW, 13.18A
- S22: 757.98 V, 9.99kW, 13.18A
- S23: 757.98 V, 9.99kW, 13.18A
- S24: 757.98 V, 9.99kW, 13.18A
- S25: 757.98 V, 9.99kW, 13.18A
- S26: 757.98 V, 9.99kW, 13.18A
- S27: 757.98 V, 9.99kW, 13.18A
- S28: 757.98 V, 9.99kW, 13.18A
- S29: 757.98 V, 9.99kW, 13.18A
- S30: 757.98 V, 9.99kW, 13.18A
- S31: 757.98 V, 9.99kW, 13.18A
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- S33: 757.98 V, 9.99kW, 13.18A
- S34: 757.98 V, 9.99kW, 13.18A
- S35: 757.98 V, 9.99kW, 13.18A
- S36: 757.98 V, 9.99kW, 13.18A
- S37: 757.98 V, 9.99kW, 13.18A
- S38: 757.98 V, 9.99kW, 13.18A
- S39: 757.98 V, 9.99kW, 13.18A
- S40: 757.98 V, 9.99kW, 13.18A
- S41: 757.98 V, 9.99kW, 13.18A
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- S43: 757.98 V, 9.99kW, 13.18A
- S44: 757.98 V, 9.99kW, 13.18A
- S45: 757.98 V, 9.99kW, 13.18A
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