L.V. SINGLE LINE DIAGRAM

LEGEND

REV.	DESCRIPTION	PREP.	CHK.	APP.	DATE
00	ISSUED FOR REVIEW	M.K	H.A	A.M	25.Jun.2026

CLIENT: Tarazbitum BITUMEN.PRODUCTION

CONTRACTOR: GREENCUBEIDEA ENGINEERING & MINING CO.

PROJECT:

TARAZ
BITUMEN PLANT

DRAWING TITLE:

L.V. SINGLE LINE DIAGRAM

SCALE	SIZE	DOCUMENT NUMBER	SHEET	REV.
–	A3	TRZ–EL–DI–602	1 OF 10	00

ESSENTIAL PARAMETERS:

DESIGN TEMP.: 40C
IP : 42
CIRCUIT BREAKER: AIR CIRCUIT BREAKER (630A MORE), MCCB (UP TO 630A and 630A)
TYPE : METAL ENCLOSED, INDOOR, AIR INSULATED, EXTENDABLE ON BOTH ENDS.
FEEDERS : SEPARATED WITH BARRIERS (SEPARATION FORM 3b PER IEC 61439–1), FULLY FIXED TYPE.
FINISHED RAL : 7035
RATED INS. VOLT.: 1KV.
BUS RATING: 400 V +10%–15%–1600A, 50HZ ±2%, (MIN.) 36KA/1S.
BUS BARS: FULLY INSULATED.
KEY INTERLOCK: FOR EARTH SWITCHES.
LOGIC: UTILITY NETWORK IS THE PREFERRED SOURCE. UTILITY AND RAILWAY INCOMERS SHALL BE ELECTRICALLY AND MECHANICALLY INTERLOCKED. NO PARALLEL OPERATION PERMITTED. ONLY ONE TRANSFORMER FEEDER MAY BE ENERGIZED AT A TIME.

OPERATION: MANUAL / AUTOMATIC SOURCE TRANSFER PROVIDED.

NOTES:

1– TYPE TESTED SWITCHBOARD MODELS WITH A VALID REPORT ARE ACCEPTABLE.
2– CONSIDER INTER TRIP WITH UP STREAM FEEDERS.
3– NON MAGNETIZED REMOVABLE GLAND PLATE SHALL BE DESIGNED FOR ALL CABLE ENTRIES.
4– MICROPROCESSOR BASED DEVISED SHALL BE USED TO PROVIDE THE NECESSARY CONTROL, MONITORING AND PROTECTION FUNCTIONS.
5– ADEQUACY AND BURDEN OF CTs AND PTs SHALL BE VERIFIED AND CAL CALCULATED BY MANUFACTURER, THE MIN VALUES ARE:
5.1. MEASUREMENT CTs: .../1A, CLASS 0.5 – 10VA
5.2. MEASUREMENT PTs: 400/110V, CLASS 0.5 – 15VA
5.3. PROTECTION PTs: 400/110V, CLASS 3P – 15VA
5.4. PROTECTION CTs: .../1A, 5P20 – 15VA

6– CABLE SIZE IN THIS DOCUMENT ARE PRELIMINARY. AFTER THE CABLE SIZING CALCULATION, THE FINAL CABLE LIST DOCUMENT WILL BE ISSUED.
7– AUXILIARY VOLTAGES:
7.1 110VDC FOR SPRING CHARGING, TRIPPING COILS, LED INDICATION AND PROTECTION OF INCOMING AND AIR CIRCUIT BREAKERS.
7.2 FOR OUTGOING FEEDER THE AUXILIARY SUPPLY SHALL BE 230V AC CONTROL TRANSFORMER IN EACH FEEDER CUBICLE.
7.3 110VDC FOR NUMERIC PROTECTION RELAYS.
7.4 24VDC FOR INTERPOSING RELAYS I.E. REMOTE COMMANDS FROM CONTROL SYSTEM.(REFERRING TO I/O LIST AND TO BE CONFIRMED IN DETAIL DESIGN).
7.5 230VAC FOR ANTI–CONDENSATE HEATER AND CUBICLE LIGHTING AND SERVICE SOCKETS FROM EMERGENCY AC SUPPLY.

8. TWO DRY TRANSFORMERS 400/230VAC–RATING ON EACH BUS SHALL PROVIDE POWER SUPPLY FOR AUXILIARY CIRCUITS CONNECTED TO OPPOSITE BUS
11. THE VENDOR/MANUFACTURER SHALL CONSIDER ALL CABLE OPENINGS BASED ON FEEDERS, SPARES, PE, INCOMING, AND INTERFACES
12. THE NUMBER AND RATING OF CIRCUIT BREAKERS SHALL BE FINALIZED DURING THE DETAILED DESIGN PHASE .
13. A MAIN EARTHING BUS RUNS THROUGH LENGTH OF SWITCHGEAR AND CONNECTED TO MAIN GROUND GRID AT BOTH ENDS BY 2X70MM ^{2} EARTH CONDUCTORS AT BOTH ENDS
14. SECONDARY WINDINGS OF THE INSTRUMENT TRANSFORMERS, EARTHING TERMINALS IN THE LV COMPARTMENT, NEUTRAL POINT OF THE POTENTIAL TRANSFORMERS, CABLE SHEATHS OF THE CABLES, AND OTHER PARTS SHALL BE CONNECTED TO EARTHING BUS PANELS AND DOORS SHALL BE BONDED TO THE ENCLOSURE BY COPPER BRAID.
15. FEEDER NUMBERS ARE SHOWN FOR REFERENCE FEEDER PER CELL AND CELL NUMBER, SHALL BE FIXED IN DETAIL DESIGN PHASE BY MANUFACTURER
16. THE CONTRACTOR/VENDOR SHALL INCLUDE 10% (OF EACH SIZE) ADDITIONAL FREE SPACE BEYON THE SPARE FEEDERS TO ALLOW FOR THE FUTURE ADDITION OF NEW FEEDERS BUSBARS MUST ALSO BE DESIGNED TO BE EXTENDABLE FROM BOTH SIDES
17. SIGNAL LAMPS, SELECTOR SWITCHES, AND EMERGENCY PUSH BUTTONS, IN ADDITION TO THOSE INDICATED IN THE DRAWINGS, SHALL ALSO BE PROVIDED BY THE VENDOR FOR ALL CIRCUIT BREAKER POSITIONS, STATUS SIGNALS, FAULT INDICATIONS, AND OTHER FUNCTIONS REQUIRED FOP PROPER PANEL OPERATION
18. THE SIZE AND SPECIFICATIONS OF CTS AND PTS ARE LISTED AS MINIMUM TECHNICAL SPECIFICATIONS IN THIS DOCUMENT AND SHOULD BE FINALIZED BY THE VENDOR DURING THE DETAILED DESIGN
19. SWITCHBOARD INCOMING SHALL HAVE A LOCAL/REMOTE SELECTOR AND START/STOP PUSH BOTTOM ON ITS PANEL

AIR CIRCUIT BREAKERS:

1 MCCB'S SHALL BE USED EQUAL TO BELOW 630A AND AIR CIRCUIT BREAKERS FOR RATING AND ABOVE 630A THEY SHALL COMPLY WITH THE REQUIREMENTS AS SPECIFIED FOR SWITCHES AS FAR AS OPERATING ACCESSIBILITY, PADLOCKING AND PHASE AND NEUTRAL SWITCHING IS CONCERNED
2. CIRCUIT BREAKERS SHALL COMPLY WITH AND BE TYPE TESTED TO IEC 60947–2
3. AIR CIRCUIT BREAKER SHALL BE ELECTRICALLY OPERATED FIXED TYPE
4. CIRCUIT BREAKERS SHALL HAVE A RATED SHORT CIRCUIT MAKING AND BREAKING CAPACITY IN CONFORMITY WITH THE PROSPECTIVE SHORT CIRCUIT CURRENT
5. THE RATED ULTIMATE SHORT CIRCUIT BREAKING CAPACITY (ICU) AND RATED SERVICE SHORT CIRCUIT BREAKING CAPACITY (ICS) SHALL BE EQUAL IN ACBS AND MCCBS

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CONTRACTOR: GREENCUBEIDEA ENGINEERING & MINING CO.

PROJECT:
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SCALE	SIZE	DOCUMENT NUMBER	SHEET	REV.
–	A3	TRZ–EL–DI–602	2 OF 10	00

LEGEND

MOTORIZED AIR CIRCUIT BREAKER

MOULDED CASE CIRCUIT BREAKER

MOTORIZED MOULDED CASE
CIRCUIT BREAKER

POTENTIAL TRANSFORMER

CONTROL SUPPLY
TRANSFORMER

LOCAL/OFF/REMOTE SELECTOR SWITCH

SELECTOR SWITCH

FUSE /FUSED SWITCH

MINIATURE CIRCUIT BREAKER

LOAD CONTACTOR

AMMETER

VOLTMETER

TRANSDUCER (OUTPUT 4–20 mA DC)

CURRENT TRANSFORMER

ZERO SEQUENCE CURRENT TRANSFORMER

SUMMATION CURRENT TRANSFORMER
(5+5 /5A)

MULTI FUNCTION DIG METER
Ampere, Voltage, Active and Reactive Power,
Power factor Display with TCP/IP output

SIGNAL LAMP

PUSH BUTTON

CABLE

NOTE 1:
1– SUPPLY OF ALL LOW VOLTAGE VFDs (INCLUDING REQUIRED HARMONIC FILTERS ON THE INPUT /OUTPUT OF EACH "VFD") AND SOFT STARTERS ARE IN SWITCHGEAR MANUFACTURER SCOPE OF WORK.
2– CAPACITOR BANKS PROTECTIONS SUCH AS OVERLOAD, UNBALANCED AND OVER/UNDER VOLTAGE PROTECTION SHALL BE PROVIDED IN CAPACITOR BANK PANEL.
3– MOTOR PROTECTION FUNCTIONS, FOR VFD /SOFT STARTER FEEDERS, INCLUDED IN VFD /SS SYSTEM.
4– VFDs SHALL INCLUDE POWER SUPPLY FOR INTERNAL LOADS.

FUNCTION DESCRIPTION:

25	SYNCH CHECK
26	RTD INPUT ELEMENT
27*	UNDER VOLTAGE
27R	RESIDUAL UNDER VOLTAGE
46*	PHASE UNBALANCE
47	VOLTAGE UNBALANCE
49	THERMAL IMAGE OVER CURRENT
49G	STALLING PROTECTION
51L	LOCKED ROTOR
50	INSTANTANEOUS OVER CURRENT
51	REVERSE TIME OVER CURRENT
50N	INSTANTANEOUS GROUND OVER CURRENT
51N	INSTANTANEOUS GROUND OC NEUTRAL POINT
50G	REVERSE TIME GROUND OVER CURRENT
51G	REVERSE TIME GROUND OC NEUTRAL POINT
50BF	CIRCUIT BREAKER FAILURE PROTECTION
59	OVER VOLTAGE
64REF	REF RESTRICTED EARTH FAULT
64FL	FUSE LAILURE
66	FREQUENT START
67	DIRECTIONAL OVER CURRENT
67N	DIRECTIONAL EARTH OVER CURRENT
86**	LOCKOUT RELAY
87	DIFFERENTIAL PROTECTION
95	PT FUSE FALURE
49(O)	TR OIL TEMPERATURE HIGH
49(W)	TR WINDING TEMPERATURE HIGH
63	TR AUXILIARY RELAY
96	TR BUCHHOLZ RELAY
97	TR PRESSURE RELIEF DEVICE
98	TR OIL LEVEL DEVICE
TCS	TRIP CIRCUIT SUPERVISION

* 27 AND 46 MAY BE PART OF MULTIFUNCTION RELAY,
** RELAY 86 SHALL BE EXTERNAL, SPECIALLY WHEN TWO OR MORE RELAY ARE USED.

THE PROTECTIONS SHOWN ON THE DRAWINGS SHALL BE CONSIDERED AS THE MINIMUM REQUIREMENTS BY THE VENDORS. IN ADDITION, IMPLEMENTING ANY OTHER PROTECTIONS IN ACCORDANCE WITH THE RELEVANT STANDARDS SHALL ALSO BE THE RESPONSIBILITY OF THE CONTRACTOR/VENDOR.

VFD: VARIABLE FREQUENCY DRIVE,
SS: SOFT STARTER,

NORMAL OPERATION:

Transformer No.1 shall be the preferred power source.
Transformer No.2 incoming shall remain open.
Diesel Generator incoming shall remain open.

LOSS OF TRANSFORMER No.1:

Upon loss of Transformer No.1 supply, the load shall be automatically transferred to Transformer No.2, subject to source availability.
Transformer No.1 and Transformer No.2 parallel operation is not permitted.

LOSS OF BOTH TRANSFORMER SOURCES:

Diesel Generator shall start automatically.
Upon stabilization of generator voltage and frequency, essential loads shall be transferred to the Diesel Generator.
Parallel operation between utility sources and Diesel Generator is not permitted.

LOAD SHEDDING:

Air Compressor feeders shall be automatically disconnected during Diesel Generator operation.
Air Compressor feeders shall be restored only after utility power restoration.

PROVIDED BY THE CONTRACTOR

SIGNAL EXCHANGE (HARD WIRED AND MODBUS TCP/IP):

1. BUS INCOMERS:
- 1. 1 AUTO MANUAL SET COMMAND – 24VDC
- 1. 2 OPEN COMMAND – 24VDC
- 1. 3 CLOSE COMMAND – 24VDC
- 1. 4 LOCAL REMOTE SET (DRY CONTACT)
- 1. 5 OPEN / CLOSE STATUS (DRY CONTACT)
- 1. 6 GROUP ALARM (DRY CONTACT)
- 1. 7 FAULT (DRY CONTACT)
- 1. 8 CB (DRAW OUT –TEST – SERVICE) POSITION (DRY CONTACT)
- 1. 9 MULTIFUNCTION DIGITAL METER SHALL SHALL HAVE COMMUNICATION FACILITY TO INTERFACE DATA ON SERIAL NETWORK WITH PLANT DCS SYSTEM

.2 FEEDERS:
- .2. 1 OPEN COMMAND 24 –VDC (FOR DOL ,SS ,VFD)
- .2. 2 CLOSE COMMAND 24 –VDC (FOR DOL ,SS ,VFD)
- .2. 3 LOCAL REMOTE SET (DRY CONTACT( )FOR DOL ,SS ,VFD)
- .2. 4 OPEN /CLOSE STATUS (DRY CONTACT)
- .2. 5 GROUP ALARM (DRY CONTACT)
- .2. 6 FAULT (DRY CONTACT)

REFERENCE DRAWINGS:

1. OVERALL KEY ONE LINE DIAGRAM–TRZ–EL–DI–600
2. Electrical Load List–TRZ–EL–LI–617

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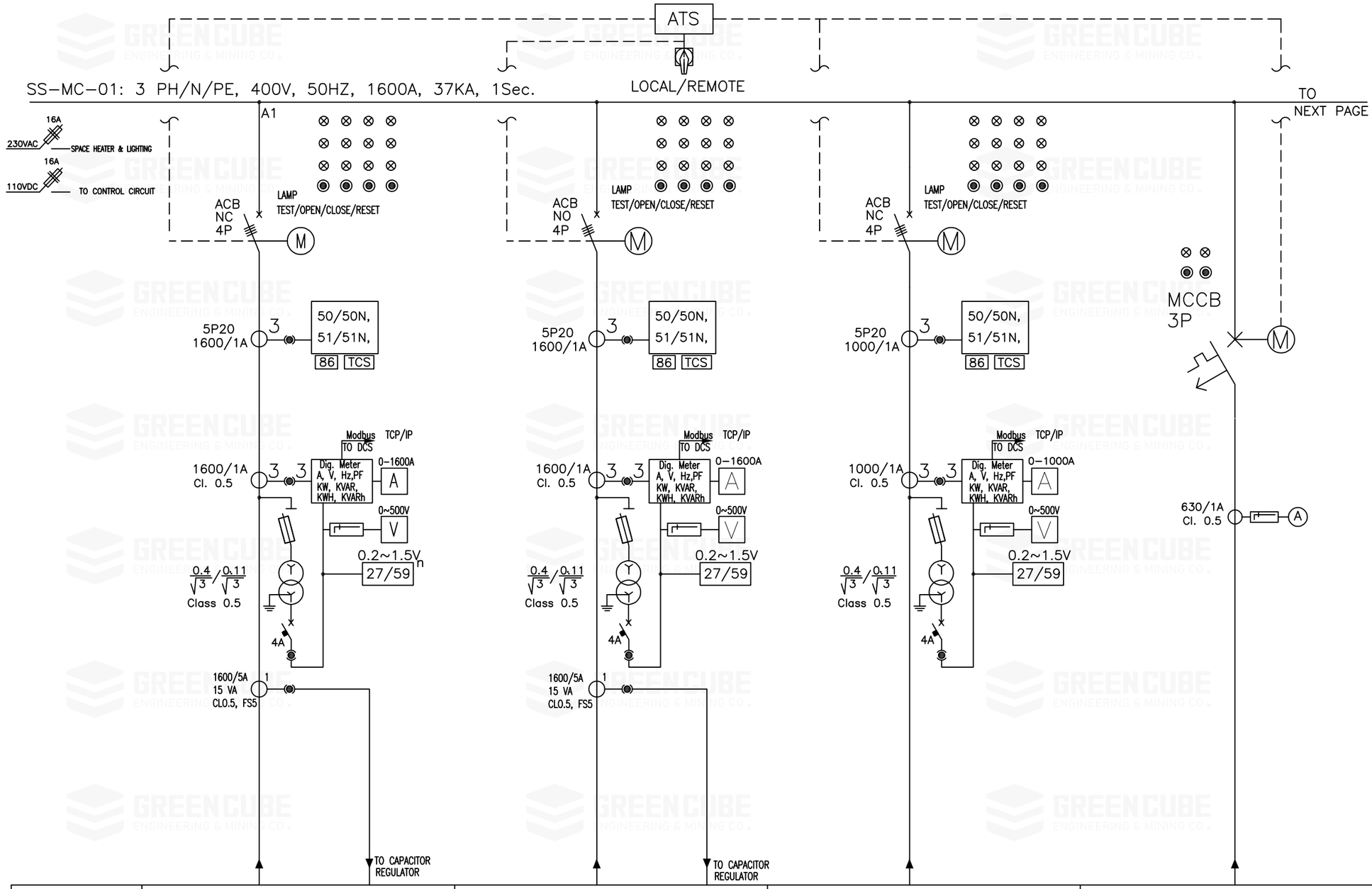

TAG:	IN–A	IN–B	IN–B	DP–CO–01
DESCRIPTION:	INCOMING A FROM TR–01	INCOMING B FROM TR–02	INCOMING B FROM TR–02	DISTRIBUTION PANEL FOR COMPRESSORS
POWER RATING:KW	1000kvA	1000kvA	500kvA	320KW
SCHEMATIC TYPE:	–	–	–	FEEDER
CB TYPE/SIZE(A):	ACB, 4P+M/1600A	ACB, 4P+M/1600A	ACB, 4P+M/1000A	MCCB/630A

LEGEND

- MOTORIZED AIR CIRCUIT BREAKER
- MOULDED CASE CIRCUIT BREAKER
- MOTORIZED MOULDED CASE CIRCUIT BREAKER
- POTENTIAL TRANSFORMER
- CONTROL SUPPLY TRANSFORMER
- LOCAL/OFF/REMOTE SELECTOR SWITCH
- SELECTOR SWITCH
- FUSE /FUSED SWITCH
- MINIATURE CIRCUIT BREAKER
- LOAD CONTACTOR
- AMMETER
- VOLTMETER
- TRANSDUCER (OUTPUT 4–20 mA DC)
- CURRENT TRANSFORMER
- ZERO SEQUENCE CURRENT TRANSFORMER
- SUMMATION CURRENT TRANSFORMER (5+5 /5A)
- SIGNAL LAMP
- PUSH BUTTON
- CABLE

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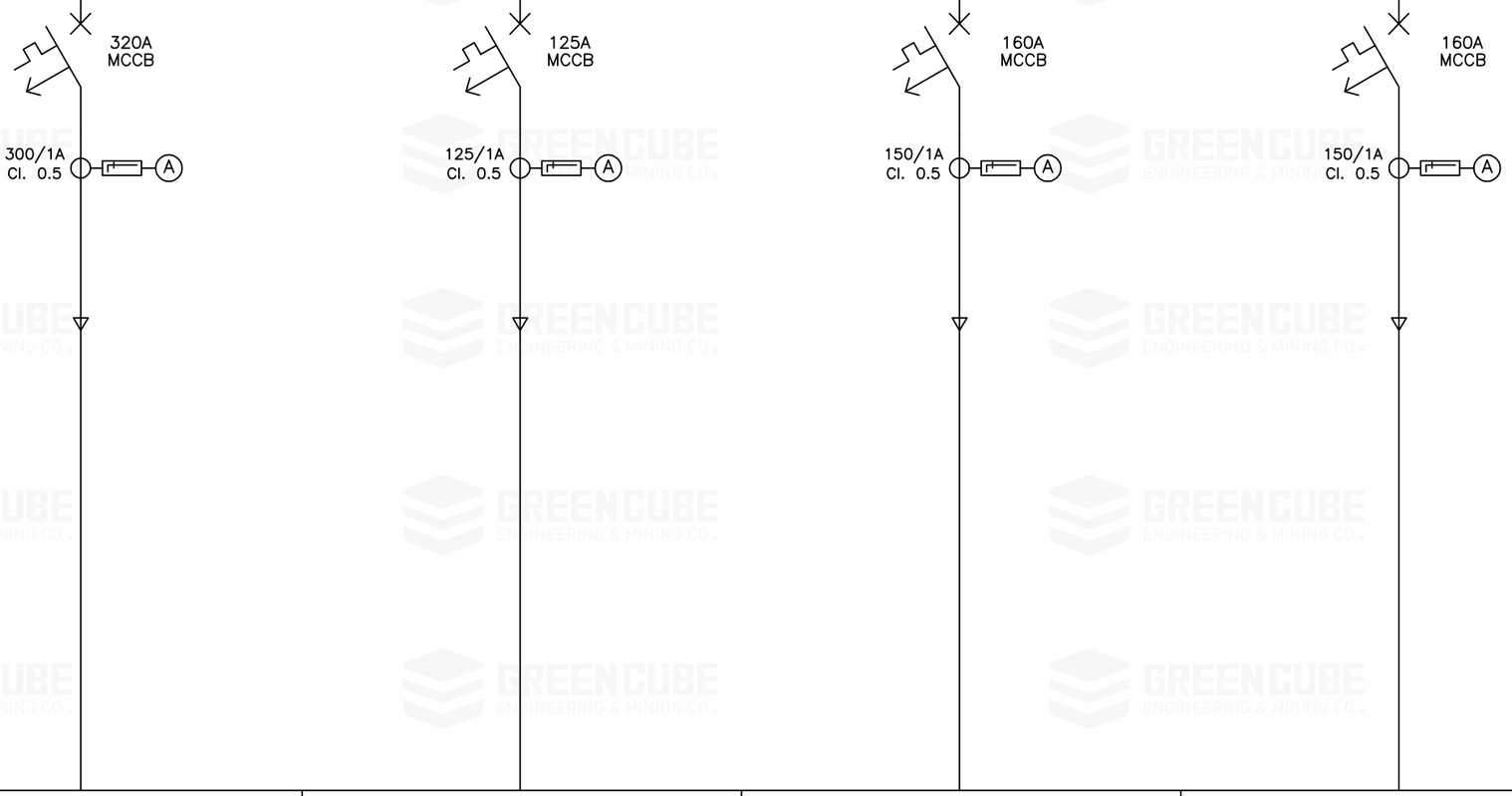

TAG:	CB–01	CB–01	HOP–01	FFP–01
DESCRIPTION:	CAPACITOR BANK	LIGHTING DISTRIBUTION PANEL	HOT OIL PACKAGE	FIRE FIGHTING PACKAGE
POWER RATING:KW	150kVAR	–	80kW	80kW
SCHEMATIC TYPE:	FEEDER	FEEDER	FEEDER	FEEDER
CB TYPE/SIZE(A):	MCCB/320A	MCCB/125A	MCCB/160A	MCCB/160A

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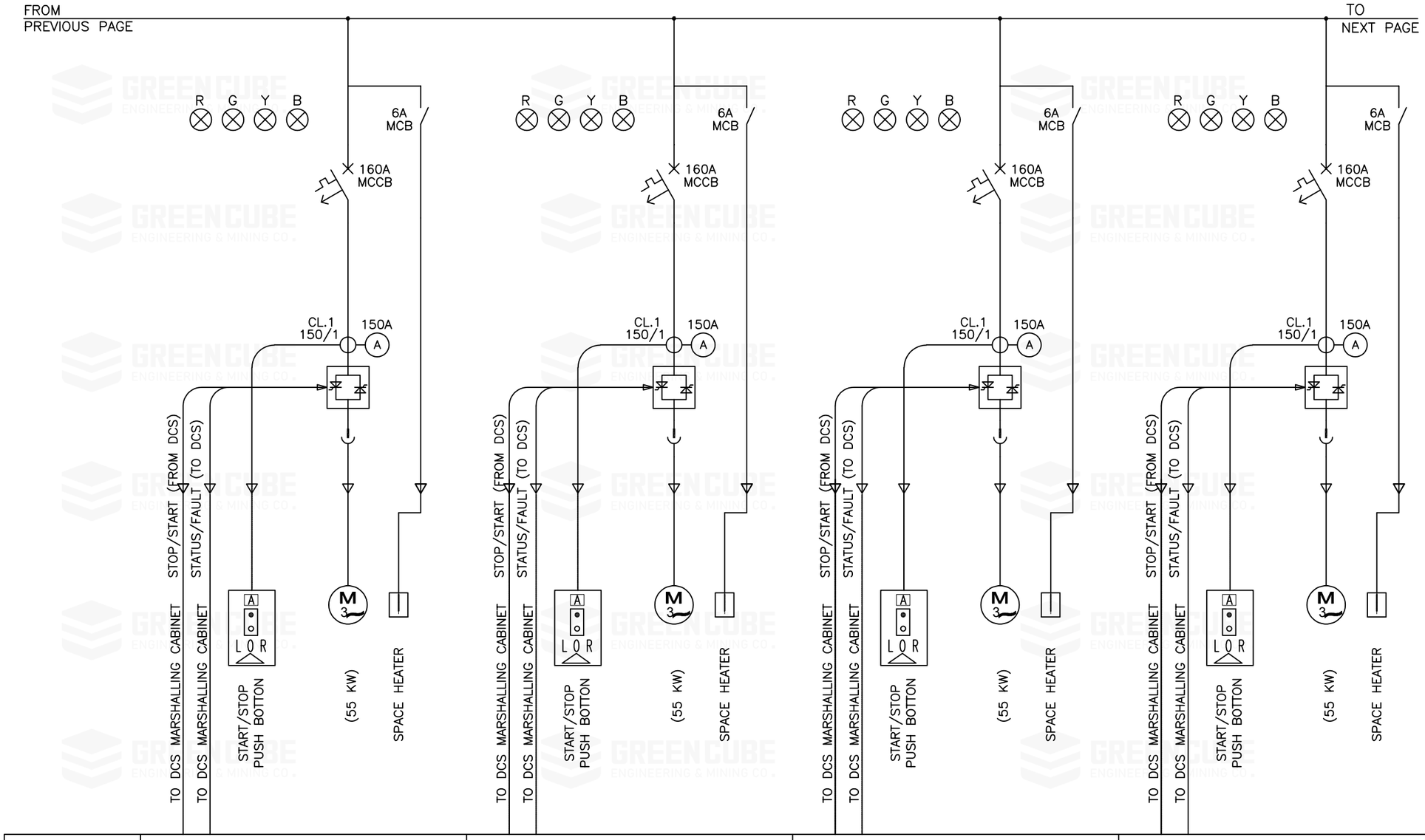

TAG:	P–201A	P–201B	P–202A	P–202B
DESCRIPTION:	BI / VB LOADING PUMP A	BI / VB LOADING PUMP B	BI / VB CIRCULATION PUMP A	BI / VB CIRCULATION PUMP B
POWER RATING:KW	55KW	55KW	55KW	55KW
SCHEMATIC TYPE:	MOTOR	MOTOR	MOTOR	MOTOR
CB TYPE/SIZE(A):	MCCB, 160A	MCCB, 160A	MCCB, 160A	MCCB, 160A

LEGEND

- MOTORIZED AIR CIRCUIT BREAKER
- MOULDED CASE CIRCUIT BREAKER
- MOTORIZED MOULDED CASE CIRCUIT BREAKER
- POTENTIAL TRANSFORMER
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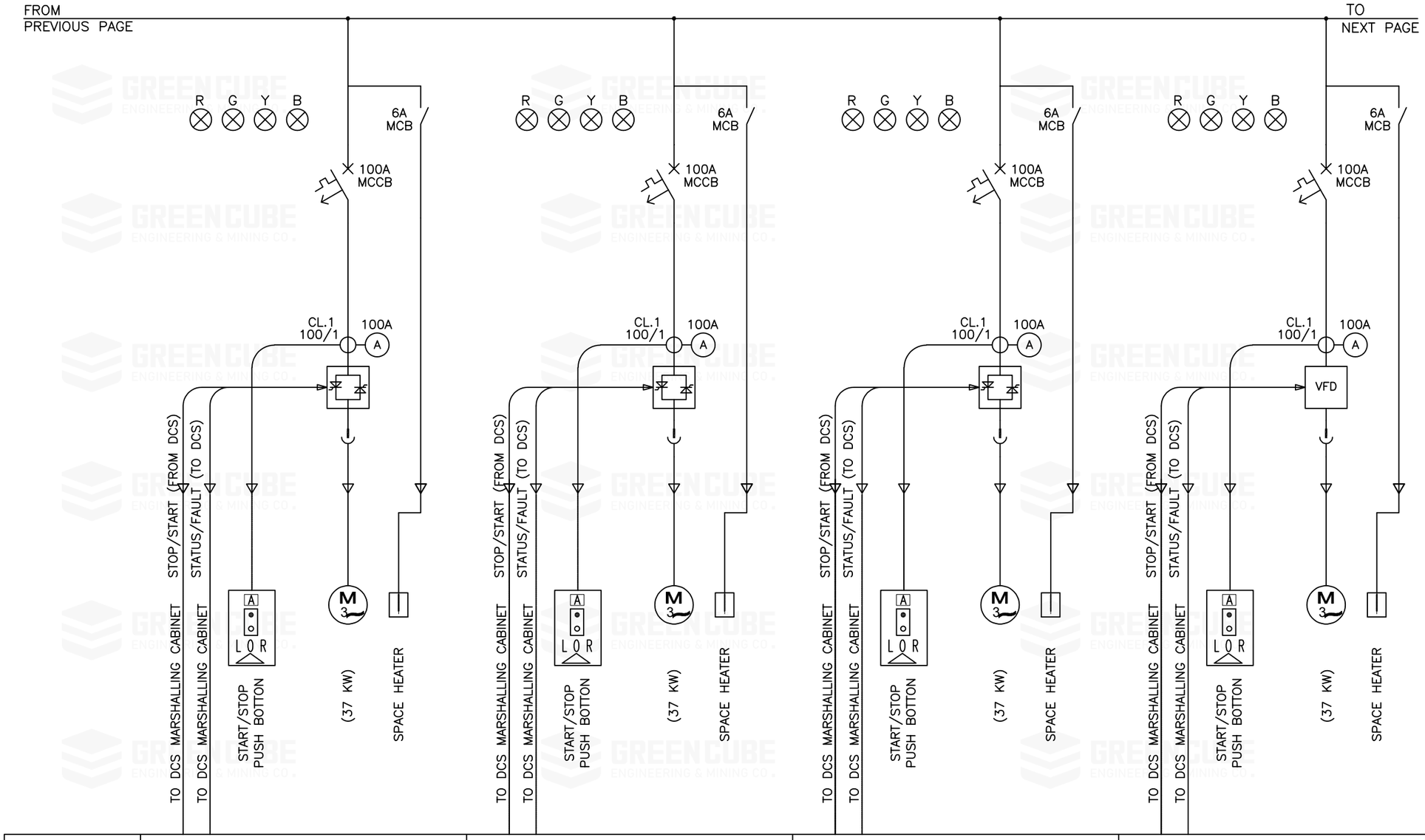

TAG:	P–101A	P–101B	P–101C	P–203A
DESCRIPTION:	UNLOADING PUMP A	UNLOADING PUMP B	UNLOADING PUMP C	REACTOR LOADING PUMP A
POWER RATING:KW	37KW	37KW	37KW	37KW
SCHEMATIC TYPE:	MOTOR	MOTOR	MOTOR	MOTOR
CB TYPE/SIZE(A):	MCCB, 100A	MCCB, 100A	MCCB, 100A	MCCB, 100A

LEGEND

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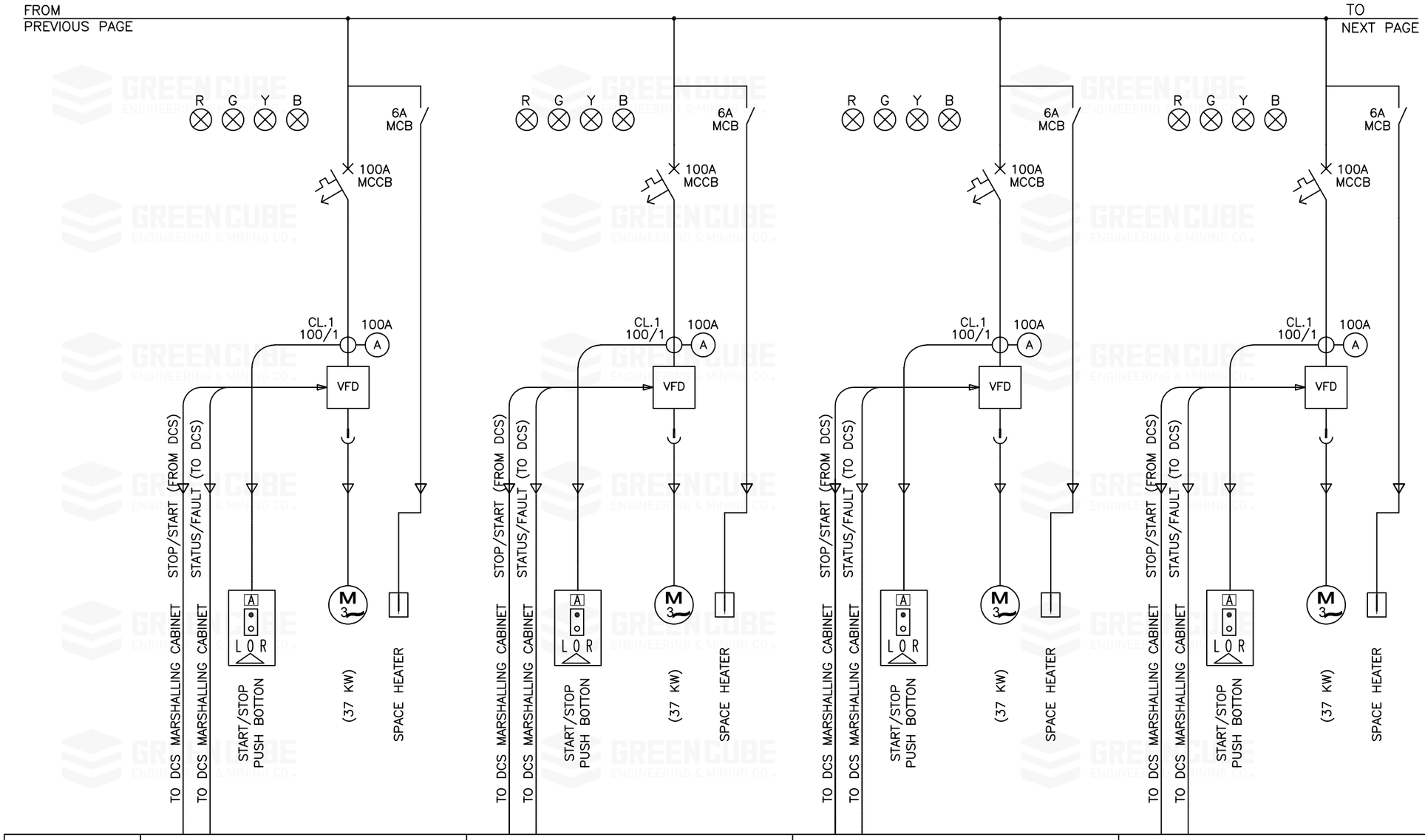

TAG:	P–203B	P–301A	P–301B	SPARE
DESCRIPTION:	REACTOR LOADING PUMP B	REACTOR UNLOADING PUMP A	REACTOR UNLOADING PUMP B	SPARE
POWER RATING:KW	37KW	37KW	37KW	37KW
SCHEMATIC TYPE:	MOTOR	MOTOR	MOTOR	MOTOR
CB TYPE/SIZE(A):	MCCB, 100A	MCCB, 100A	MCCB, 100A	MCCB, 100A

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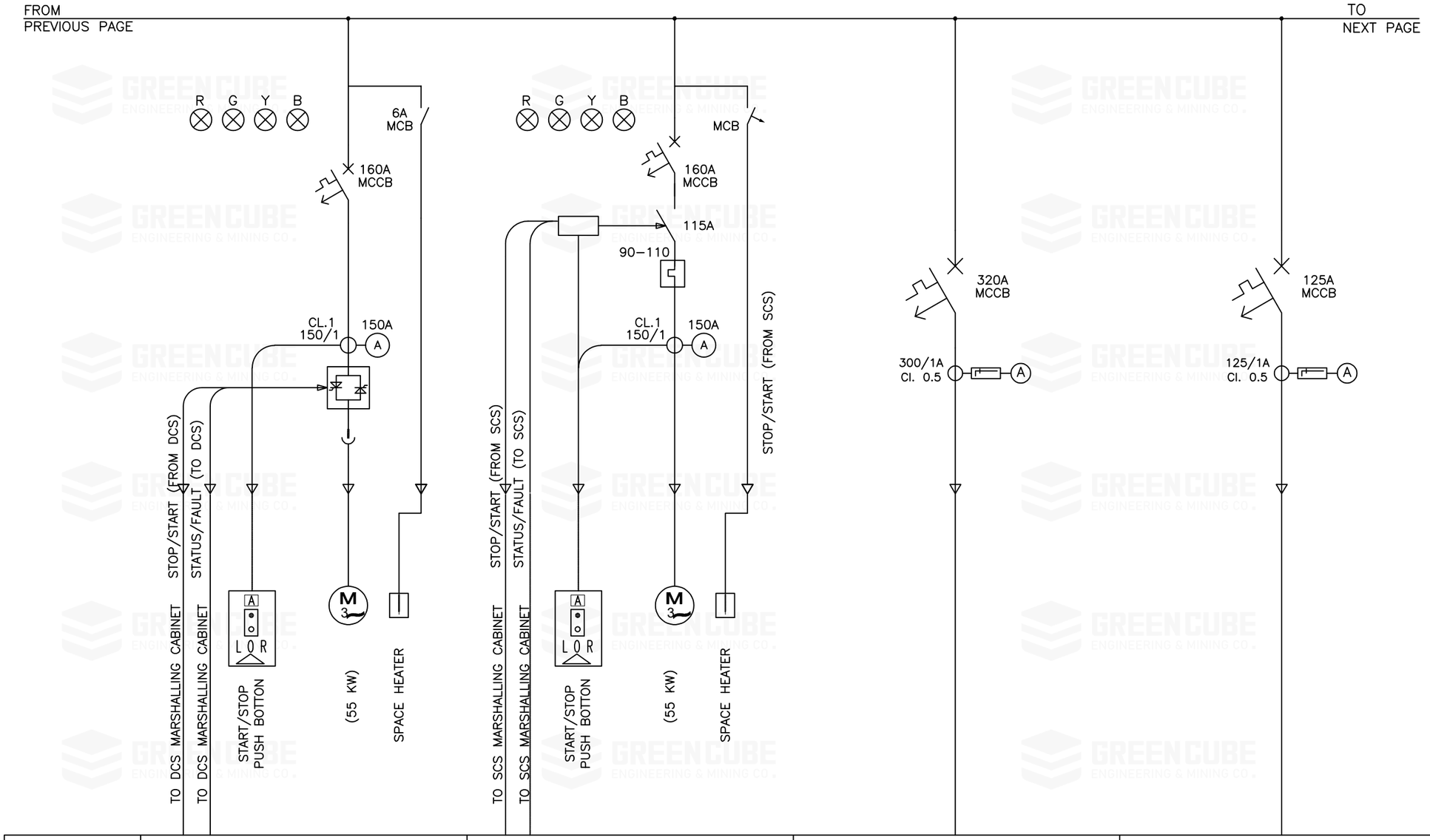

TAG:	SPARE	SPARE	SPARE	SPARE
DESCRIPTION:	SPARE	SPARE	SPARE	SPARE
POWER RATING:KW	55KW	55KW	SPARE	SAPRE
SCHEMATIC TYPE:	MOTOR	MOTOR	FEEDER	FEEDER
CB TYPE/SIZE(A):	MCCB, 160A	MCCB, 160A	MCCB, 160A	MCCB, 125A

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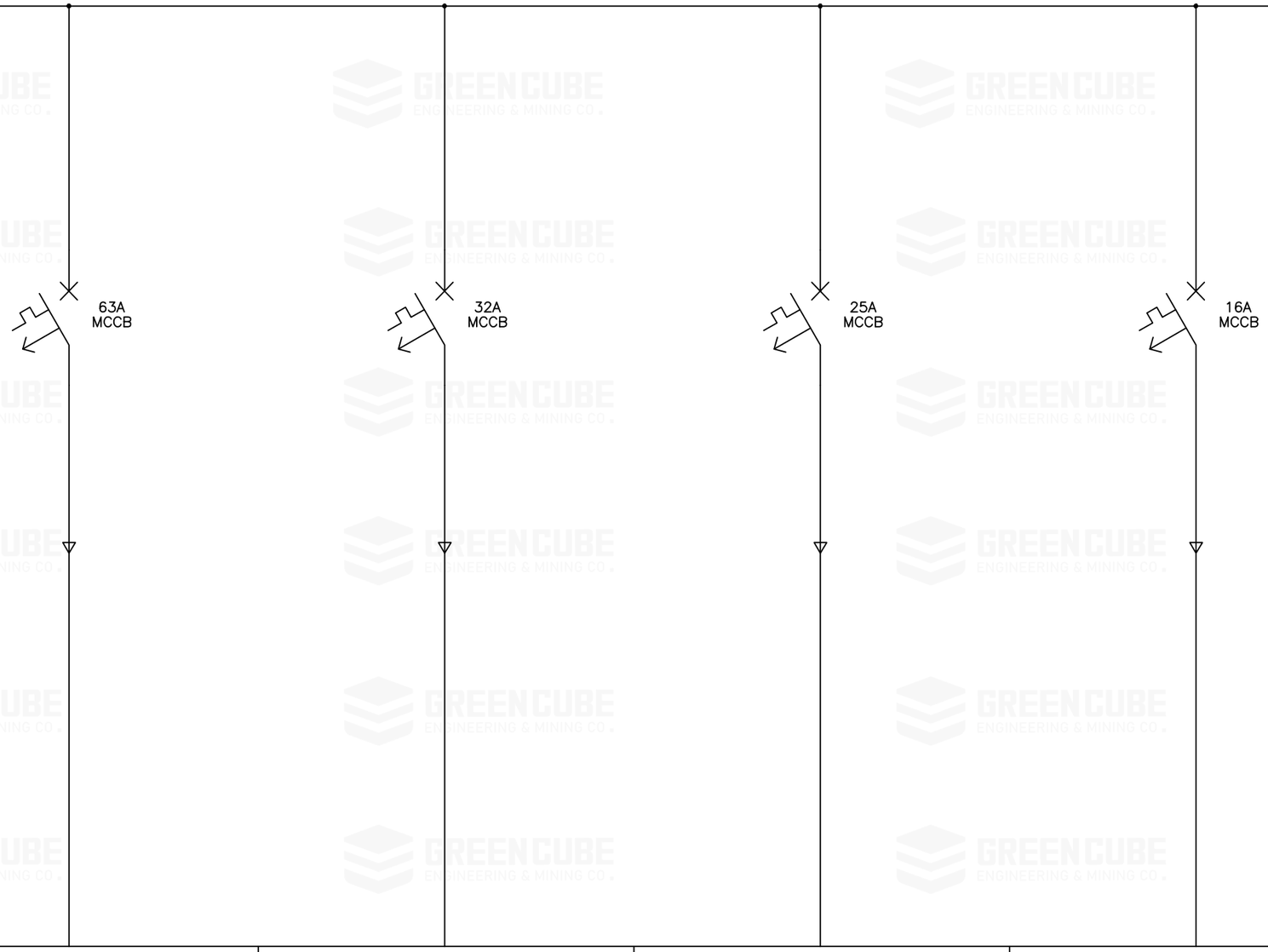

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DESCRIPTION:	SPARE	SPARE	SPARE	SPARE
POWER RATING:KW	SPARE	SPARE	SPARE	SPARE
SCHEMATIC TYPE:	FEEDER	FEEDER	FEEDER	FEEDER
CB TYPE/SIZE(A):	MCCB, 63A	MCCB, 32A	MCCB, 25A	MCCB, 16A

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L.V. SINGLE LINE DIAGRAM

SCALE	SIZE	DOCUMENT NUMBER	SHEET	REV.
–	A3	TRZ–EL–DI–602	10 OF 10	00