INTERNATIONAL INSTITUTE FOR ADVANCED TRAINING ON CONTROL & AUTOMATION

A PROJECT ON

MINI CEMENT PLANT

PREPARED BY

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REGISTRATION NO.

QA143941

INTRODUCTION

The concerned project is based on Mini Cement Plant operation. In this project various operations performed in a cement plant, from loading of gypsum and clinker in respectable hoppers to packing of cement and finally truck loading, are logically designed ladder logic.

In this project the following software and hardware are used.

Software:

# Operating System	: Microsoft Windows XP Professional Version 2002 Service Pack 3
# PLC programming	: RSLogix 500 English 7.00.00 (CPR7)
# SCADA Designing	: RSView 32 7.20.00 (CPR 7)
# Simulation	: RSLogix Emulate 500
# Communication Software	: RSLinx Classic 2.51.00 (CPR 7)
# Communication Protocol	: DH-485; [DH- Data Highway]
# Communication Driver (with PLC)	: AB_DF1-1
# Communication Driver (without PLC)	: EMU-500
# Drawing	: AutoCAD 2008
# Documentation	: Microsoft Office 2010
# Others	: a) Rockwell Automation USB CIP driver package b) PDF Creator c) Adobe Reader 11.0.1

PLC DESCRIPTION

MicroLogix-1200; 1762-L24BWA

Input Power	:	120/240V ac
Inputs	:	(10) 24V dc; (4) fast 24V dc
Outputs	:	(10) relay
Enhancement	:	The trim pots (trimming potentiometers) on the controller operated in reverse of the ladder logic.

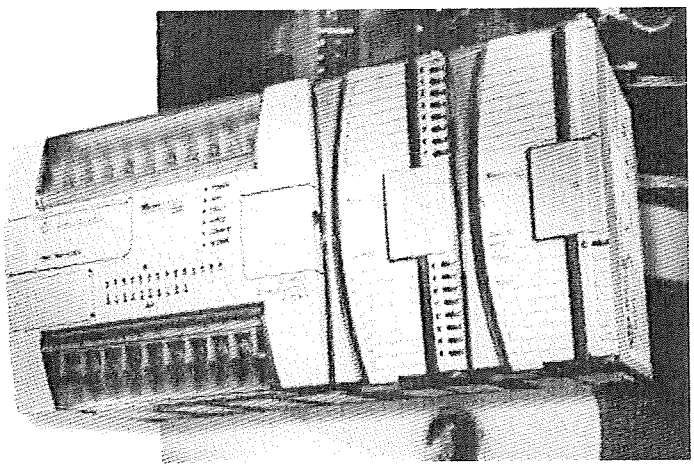
MicroLogix 1200 controllers now offer:
- Full ASCII (read/write)
- PTO Controlled Stop
- PWM Ramping
- RTC and String Messaging
- Static Data File Protection
- Comms Reset Pushbutton Bit
- Floating Point (F) Data File for use with:
  compare instructions (EQU, GEQ, GRT, LEQ, LES, LIM, NEQ); math instructions (ABS, ADD, CLR, DIV, MUL, NEG, SQR, SUB); move instruction (MOV); file instructions (CPW, FLL); and the message (MSG) instruction
- Programmable Limit Switch (PLS) File for use with HSC
- RTA - Real Time Clock Adjust
- GCD - Gray Code
- CPW - Copy Word
- ABS - Absolute Value

For 1762-L24BWA controllers: The COM of the sensor supply is also connected to chassis ground internally. The 24V dc sensor power source should not be used to power output circuits. It should only be used to power input devices.

16-Point AC/DC Relay O/P Module; 1762-OW16

Voltage Category	:	AC/DC normally open relay
Operating Voltage Range	:	5 to 265V ac; 5 to 125V dc
Number of Outputs	:	16
Bus Current Draw (max.)	:	120 mA at 5V dc (0.60 W); 140 mA at 24V dc (3.36 W)
Heat Dissipation (max.)	:	5.6 Watts
Signal Delay (max.) – resistive load	:	On Delay: 10 ms; Off Delay: 10 ms
Off-State Leakage (max.)	:	0 mA
On-State Current (min.)	:	10 mA
Continuous Current per Point (max.)	:	2.5A
Continuous Current per Common (max.)	:	8 A
Continuous Current per Module (max.)	:	16 A

MicroLogix-1200 With Expansion I/O Module



SYSTEM DESCRIPTION

At first the gypsum from the gypsum mine filled in a tank, this process is called Gypsum Feed. After feeding the gypsum clinker is also feed in four tanks, this process is called Clinker Feed. When the five tanks are filled with gypsum and clinker (one for gypsum and four for clinker) the mixture of this two feed to the cement mill where cement is produced. This process is called Mill Feed. After producing this cement, the cement is feed for two SILOs, this process is called Mill Discharge. After discharging this cement it stores in Packing MCs for packing, this process is called Packing. After packing the packets are loaded into trucks for supply to market. This process is called Truck Loading.

The PLC panel consisting of the PLC-CPU itself along with its power supply and extension modules, interposing relays, push buttons, LEDs and toggle switches for the necessary control action and annunciation. The PLC panel is conceived to be a part of the main control room component, operated as a remote terminal to the local control station which is essentially panel housing with all the necessary switch gears, control equipment's, relays and pushbutton switches. Options for the auto-manual / remote-local are included in the system as a practical necessity for such applications.

The hopper and SILO control mechanism which consists of the mechanical arrangements of the motorized hatches, and door and level sensing devices (capacitive level sensors).

In the project I have not considered the dust recycling part. One of the important requirements of the program developed for this project to let the belt conveyor for some more time after the hoppers have discharged their load in order to avoid a heap forming from residual discharge from the hoppers.

CONTROL PHILOSOPHY

This Project shows a MINI CEMENT PLANT controlled with the help of ALLEN BRADLEY make PLC via SCADA interface.

There are all in all seven types of operations that govern the whole process.

The steps are as follows:

1. **Gypsum Feed**
2. **Clinker Feed**
3. **Mill Feed**
4. **Mill Feed Extra**
5. **Mill Discharge Extra**
6. **Packing**
7. **Truck Loading**

The Control Philosophy are explained in step by step as follows:

1. Gypsum Feed:

This is the 1st step of the whole process. In this step, the input materials are poured into the DUMP HOPPER. Then those materials are passed through to the CRUSHER. This is done with the help of MOTOR (M1). Then with the help of Conveyor Belt 2 and Bucket Elevator 1, the materials are poured into the GYPSUM HOPPER. In this process the GYPSUM extracted from mine are feed in the GYPSUM TANK through the DUMP HOPPER, CRUSHER (for crushing). The motor used for crushing is M1. Then this crushed gypsum is feed to the tank for conveyor and elevator for this Gypsum Feed is M2, M3 and M5. In this whole process motors M1, M2, M3 and M5 are ON and the others remain OFF. When the tank is completely filled the motors are OFF. This operation takes a duration of 20 seconds to complete.

2. Clinker Feed:

In this step, within 20 seconds the pouring of input material to the DUMP HOPPER and then to the CRUSHER is allowed to continue and this is done with the help of MOTOR (M1). Then with the help of Conveyor Belt 1, the materials are poured into four CLINKER HOPPERS. In this process the clinker extracted from mine are feed in the CLINKER TANKS through DUMP HOPPER, CRUSHER (for crushing). The motor used for crushing is M1. Then this crushed clinker is feed to the tanks (CLH1, CLH2, CLH3 and CLH4) by Conveyor Belts 2 & 1 and Bucket Elevators 2 & 3. Motor used for conveyor and elevator for this Clinker Feed is M2 & M4 and M6 & M7 are ON and the others remain OFF. When the tanks are fully loaded the motors M1, M2, M4, M6 & M7 are OFF.

7. Truck Loading:

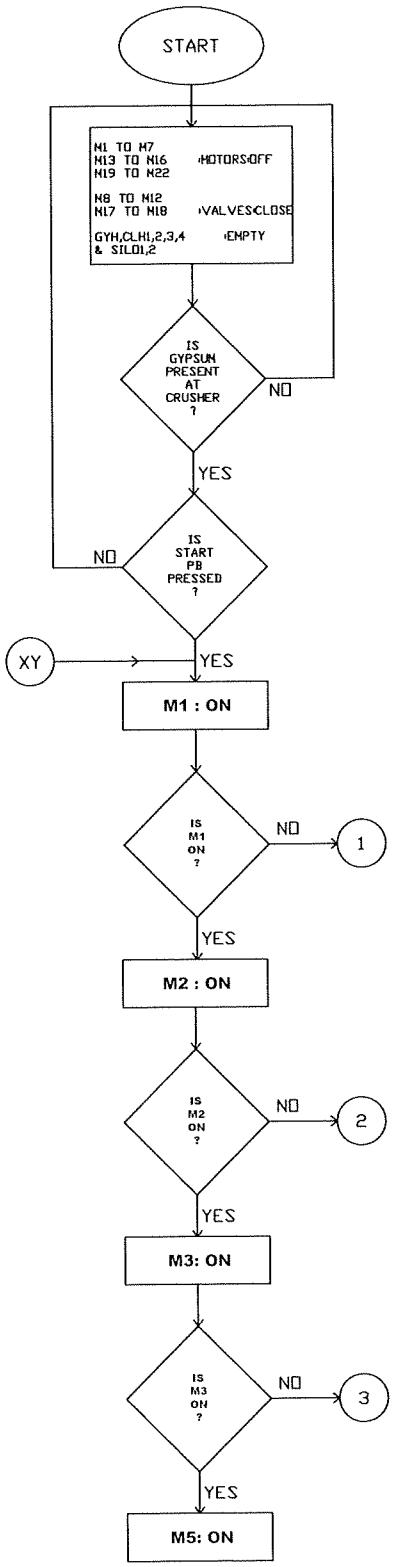
This is the last step of the entire process. This operation takes 10 seconds to complete. In this period, the packed cement is located in the truck. The packaged cement is unloading by the motors M19, M20 and cements are loaded into the truck by two Belt Conveyors (BELT CONVEYOR FOR TRUCK LOADING 1, BELT CONVEYOR FOR TRUCK LOADING 2) with two motors M21 and M22 and these packaged cements are transferred to shops. Motor M21 and M22 are ON at that time for loading the truck.

Like this way, the whole process will continue in cyclic order until stop button is pressed.

System Fault:

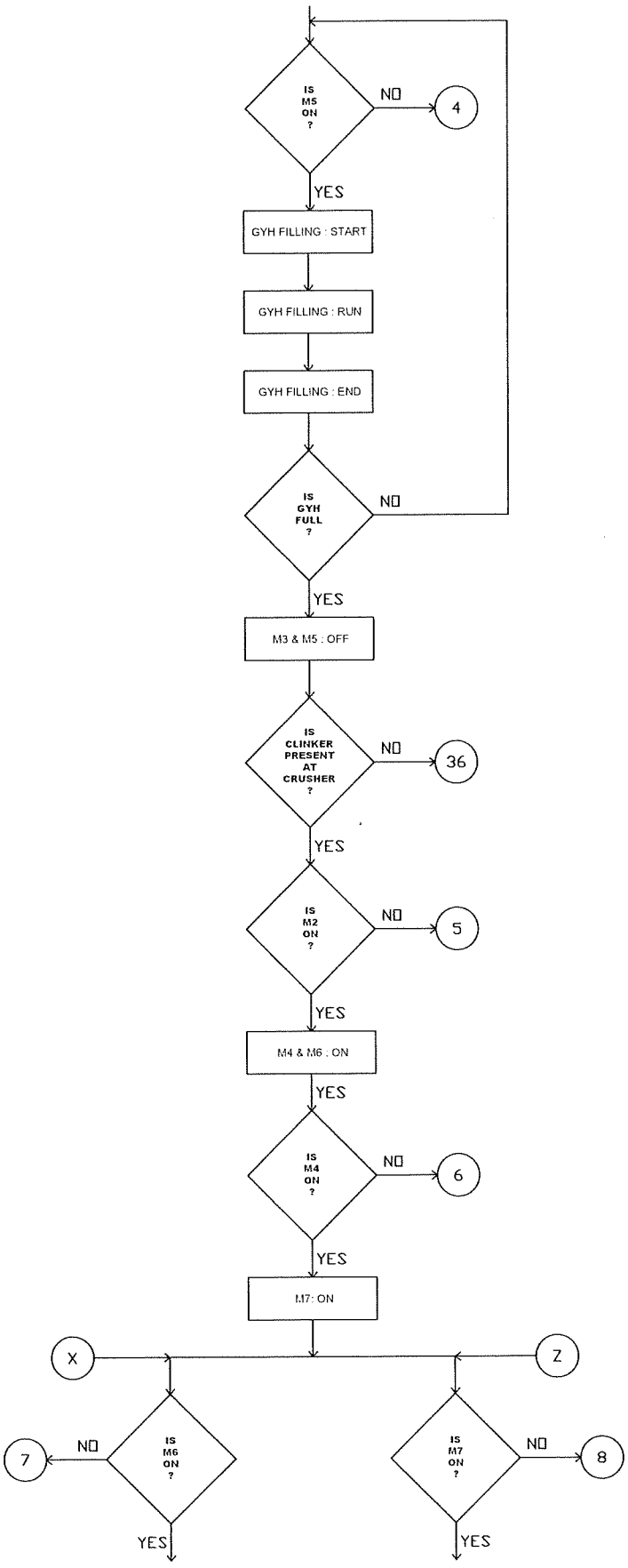
System Fault is the phenomenon that occurs mainly if any of the motors or valves gets faulty as per the ladder logic e.g. if input has given but motor (M1) gets faulty, then there will be a system fault generated within 2 seconds at the beginning and in this way it may continue to further faults as per the logic given.

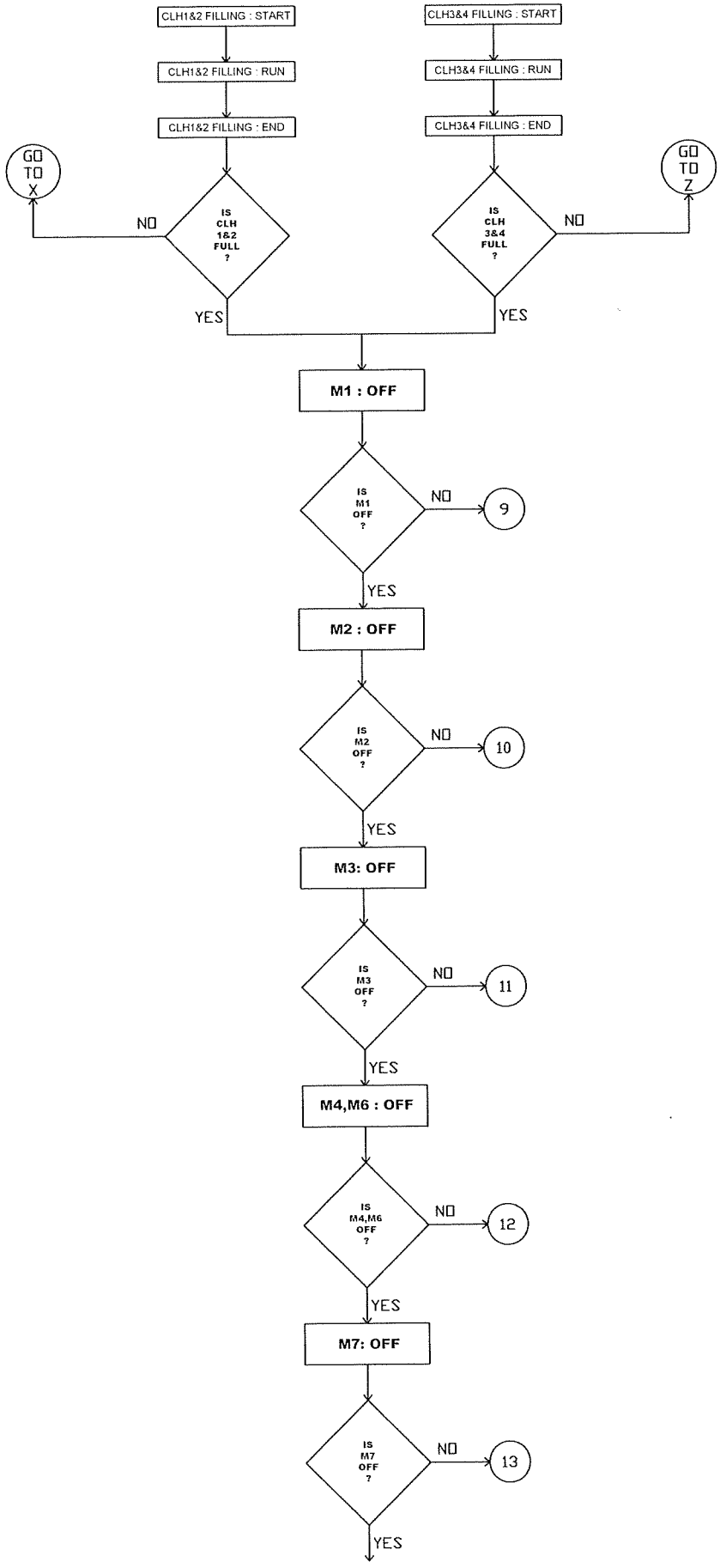
PROCESS FLOW CAHRT OF MINI CEMENT PLANT

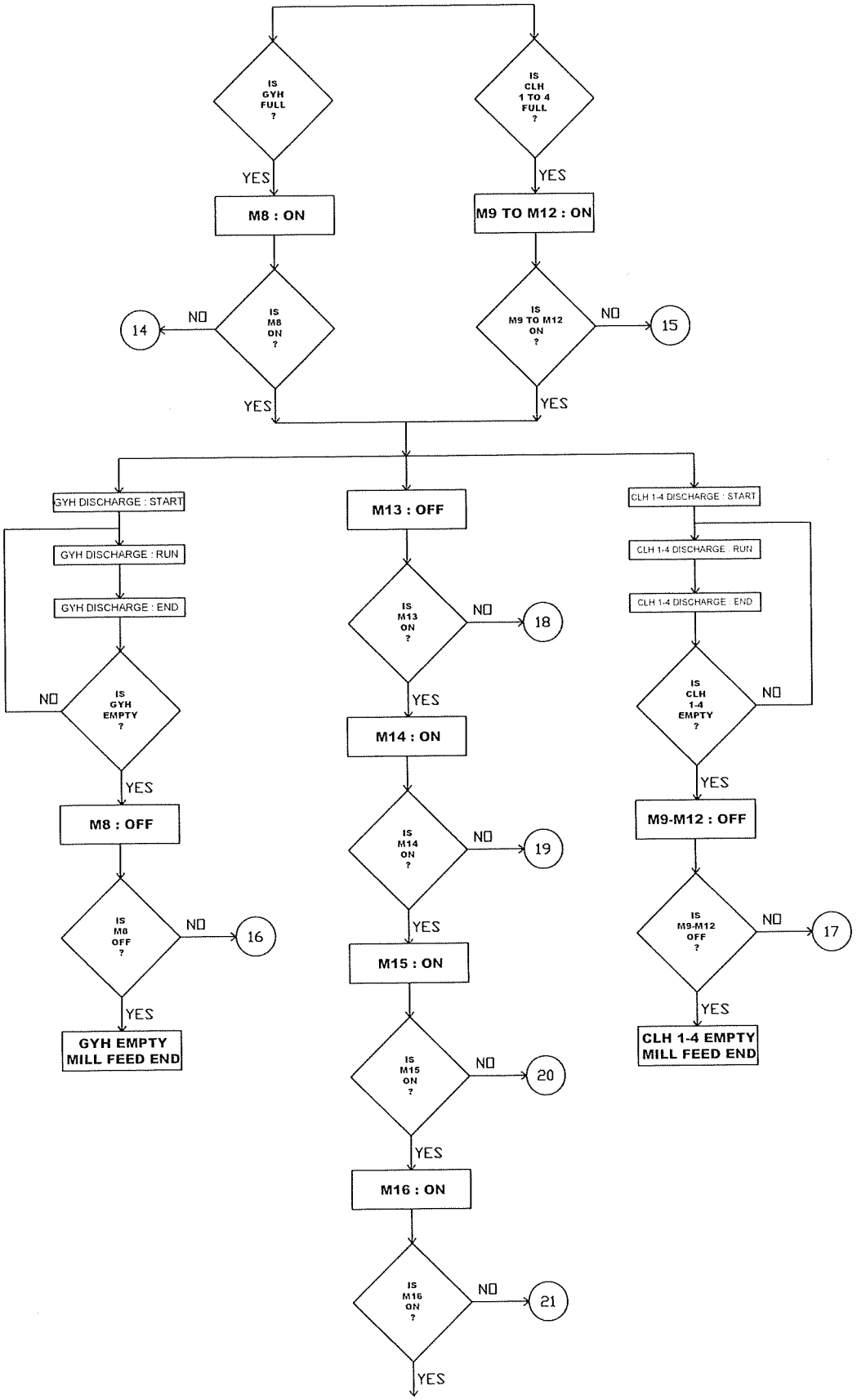


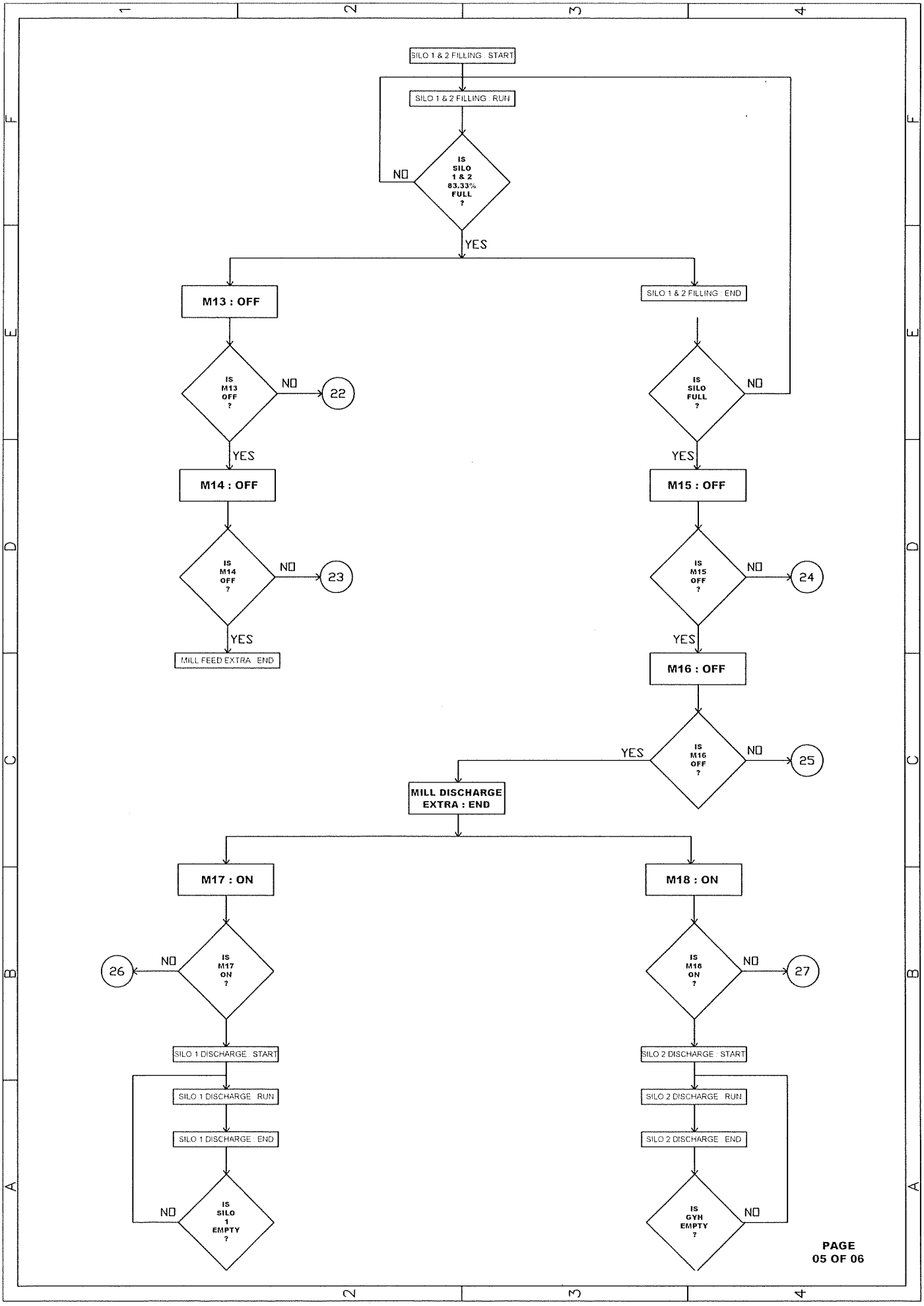
SYSTEM FAULT

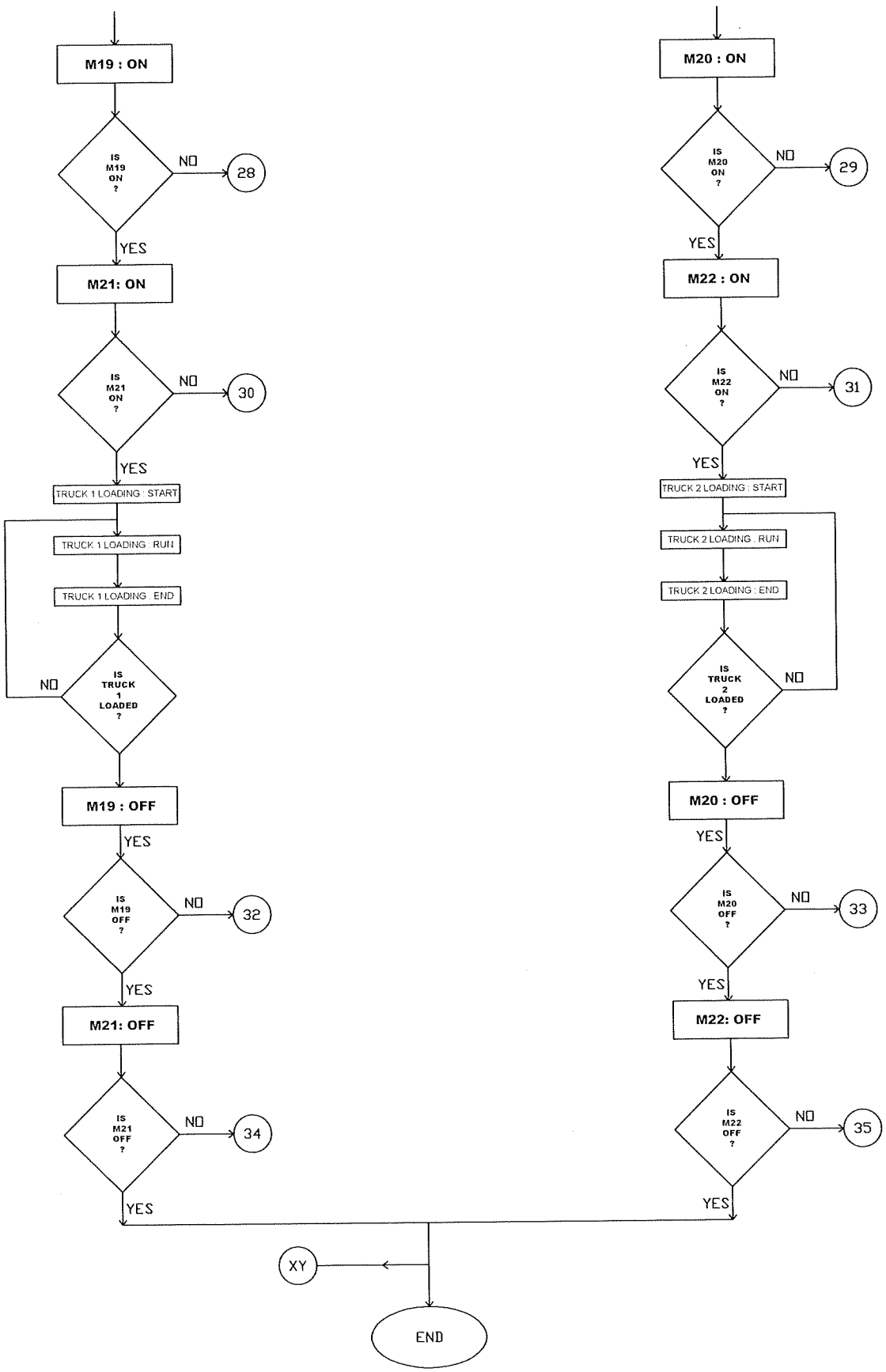
1 2 3 _____ 36

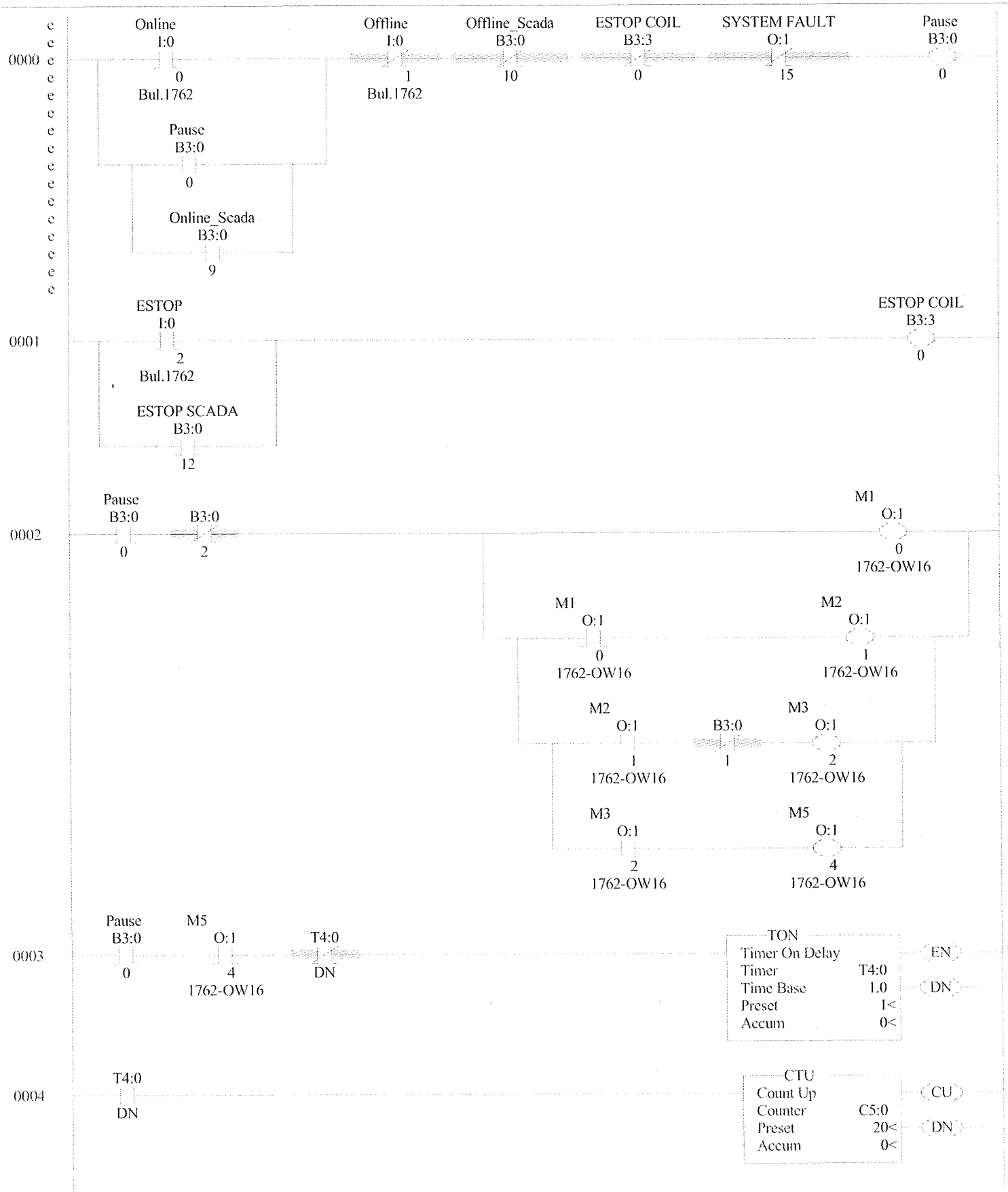

IS M5 ON ?
NO
4
YES
GYH FILLING : START
GYH FILLING : RUN
GYH FILLING : END
IS GYH FULL ?
NO
YES
M3 & M5 : OFF
IS CLINKER PRESENT AT CRUSHER ?
NO
36
YES
IS M2 ON ?
NO
5
YES
M4 & M6 : ON
YES
IS M4 ON ?
NO
6
YES
M7: ON
X
Z
IS M6 ON ?
NO
7
YES
IS M7 ON ?
NO
8
YES

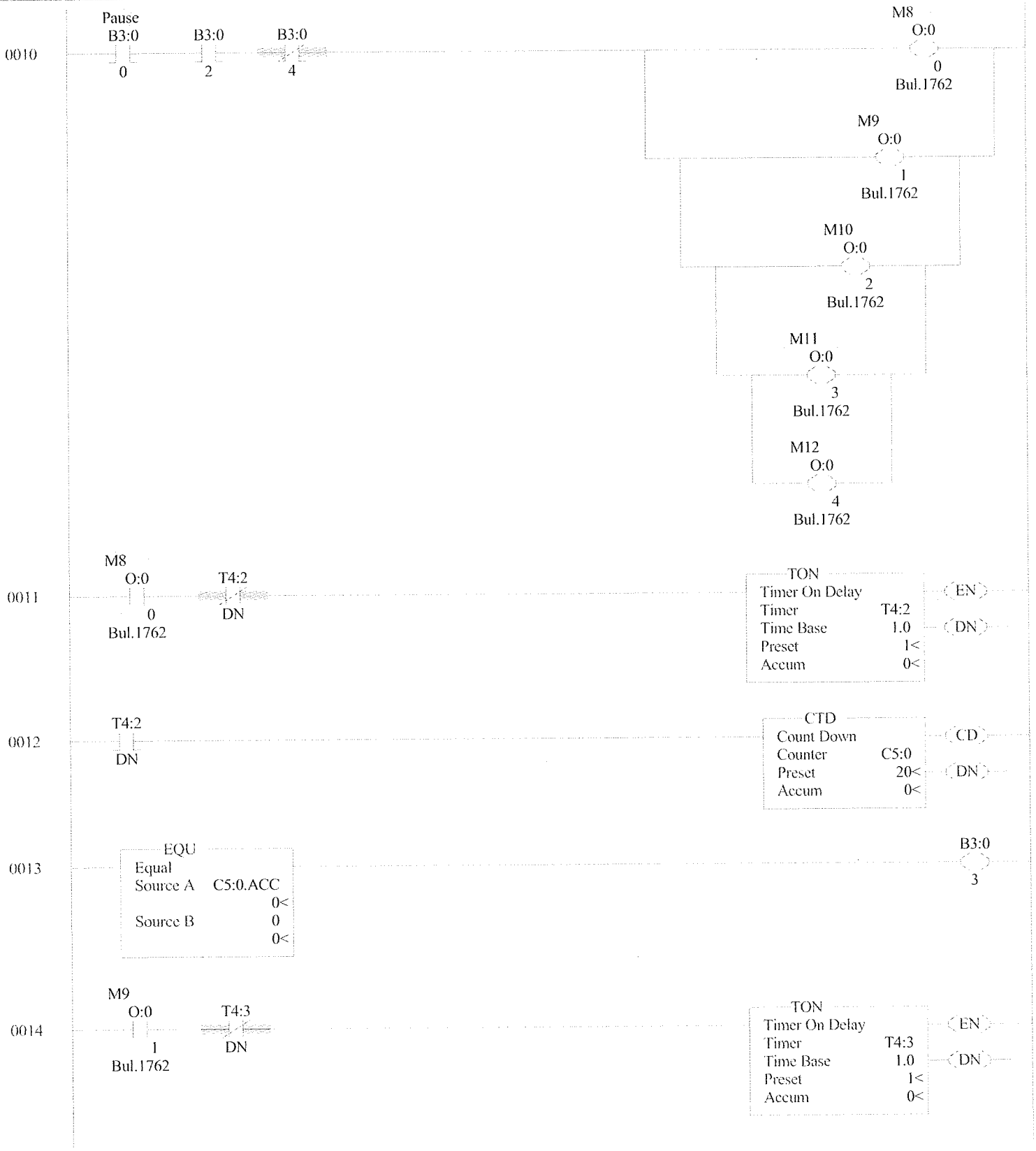

CLH1&2 FILLING : START
CLH1&2 FILLING : RUN
CLH1&2 FILLING : END
CLH3&4 FILLING : START
CLH3&4 FILLING : RUN
CLH3&4 FILLING : END
GO TO X
GO TO Z
IS CLH 1&2 FULL ?
IS CLH 3&4 FULL ?
NO
YES
M1 : OFF
IS M1 OFF ?
M2 : OFF
IS M2 OFF ?
M3: OFF
IS M3 OFF ?
M4,M6 : OFF
IS M4,M6 OFF ?
M7: OFF
IS M7 OFF ?
9
10
11
12
13

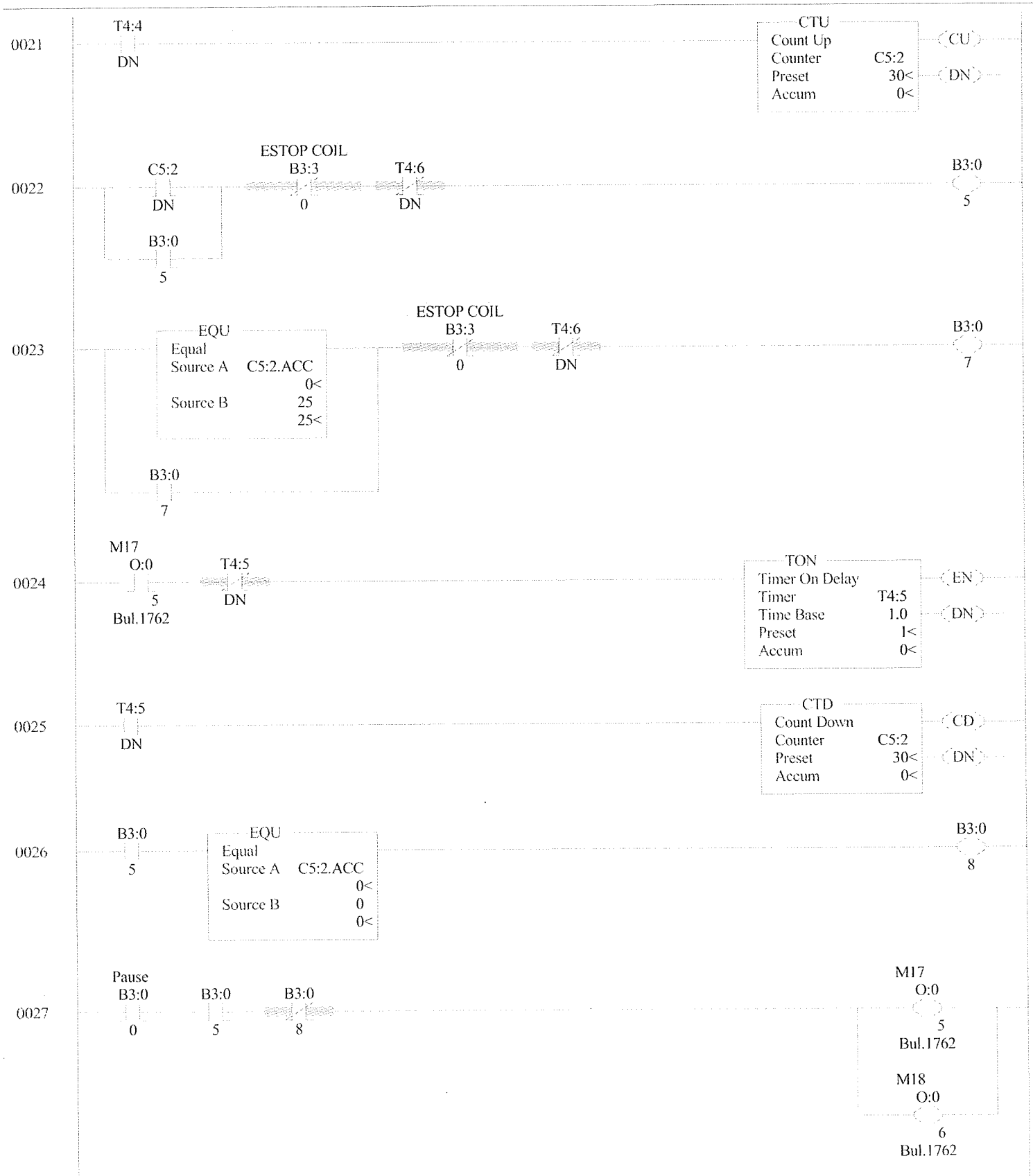

IS GYH FULL ?
YES
M8 : ON
IS M8 ON ?
NO
14
YES
IS CLH 1 TO 4 FULL ?
YES
M9 TO M12 : ON
IS M9 TO M12 ON ?
NO
15
YES
GYH DISCHARGE : START
GYH DISCHARGE : RUN
GYH DISCHARGE : END
IS GYH EMPTY ?
NO
YES
M8 : OFF
IS M8 OFF ?
NO
16
YES
GYH EMPTY MILL FEED END
M13 : OFF
IS M13 ON ?
NO
18
YES
M14 : ON
IS M14 ON ?
NO
19
YES
M15 : ON
IS M15 ON ?
NO
20
YES
M16 : ON
IS M16 ON ?
NO
21
YES
CLH 1-4 DISCHARGE : START
CLH 1-4 DISCHARGE : RUN
CLH 1-4 DISCHARGE : END
IS CLH 1-4 EMPTY ?
NO
YES
M9-M12 : OFF
IS M9-M12 OFF ?
NO
17
YES
CLH 1-4 EMPTY MILL FEED END

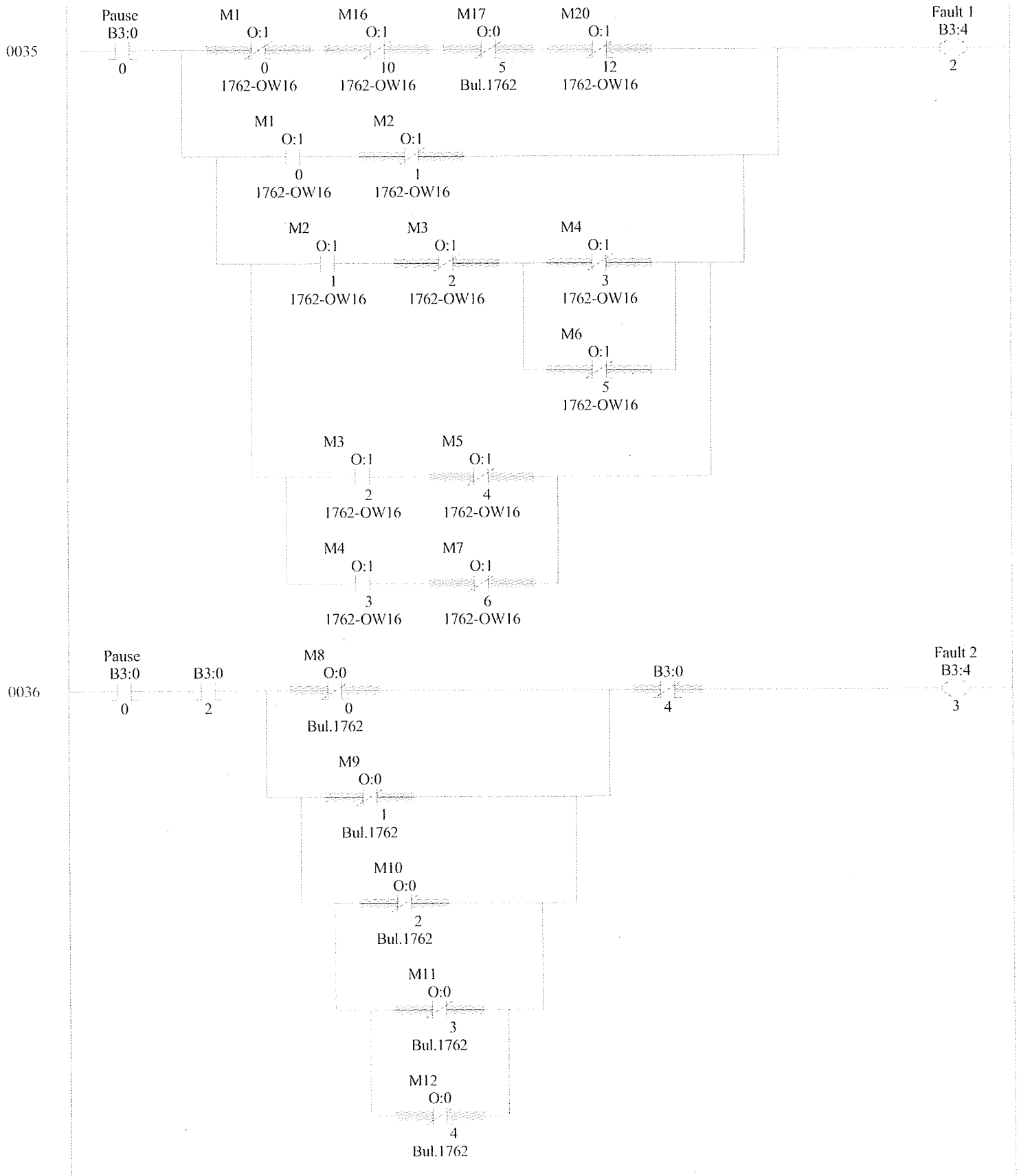

SILO 1 & 2 FILLING : START
SILO 1 & 2 FILLING : RUN
IS SILO 1 & 2 83.33% FULL ?
NO
YES
M13 : OFF
IS M13 OFF ?
NO
22
YES
M14 : OFF
IS M14 OFF ?
NO
23
YES
MILL FEED EXTRA : END
SILO 1 & 2 FILLING : END
IS SILO FULL ?
NO
YES
M15 : OFF
IS M15 OFF ?
NO
24
YES
M16 : OFF
IS M16 OFF ?
YES
NO
25
MILL DISCHARGE EXTRA : END
M17 : ON
IS M17 ON ?
NO
26
SILO 1 DISCHARGE : START
SILO 1 DISCHARGE : RUN
SILO 1 DISCHARGE : END
IS SILO 1 EMPTY ?
NO
M18 : ON
IS M18 ON ?
NO
27
SILO 2 DISCHARGE : START
SILO 2 DISCHARGE : RUN
SILO 2 DISCHARGE : END
IS GYH EMPTY ?
NO

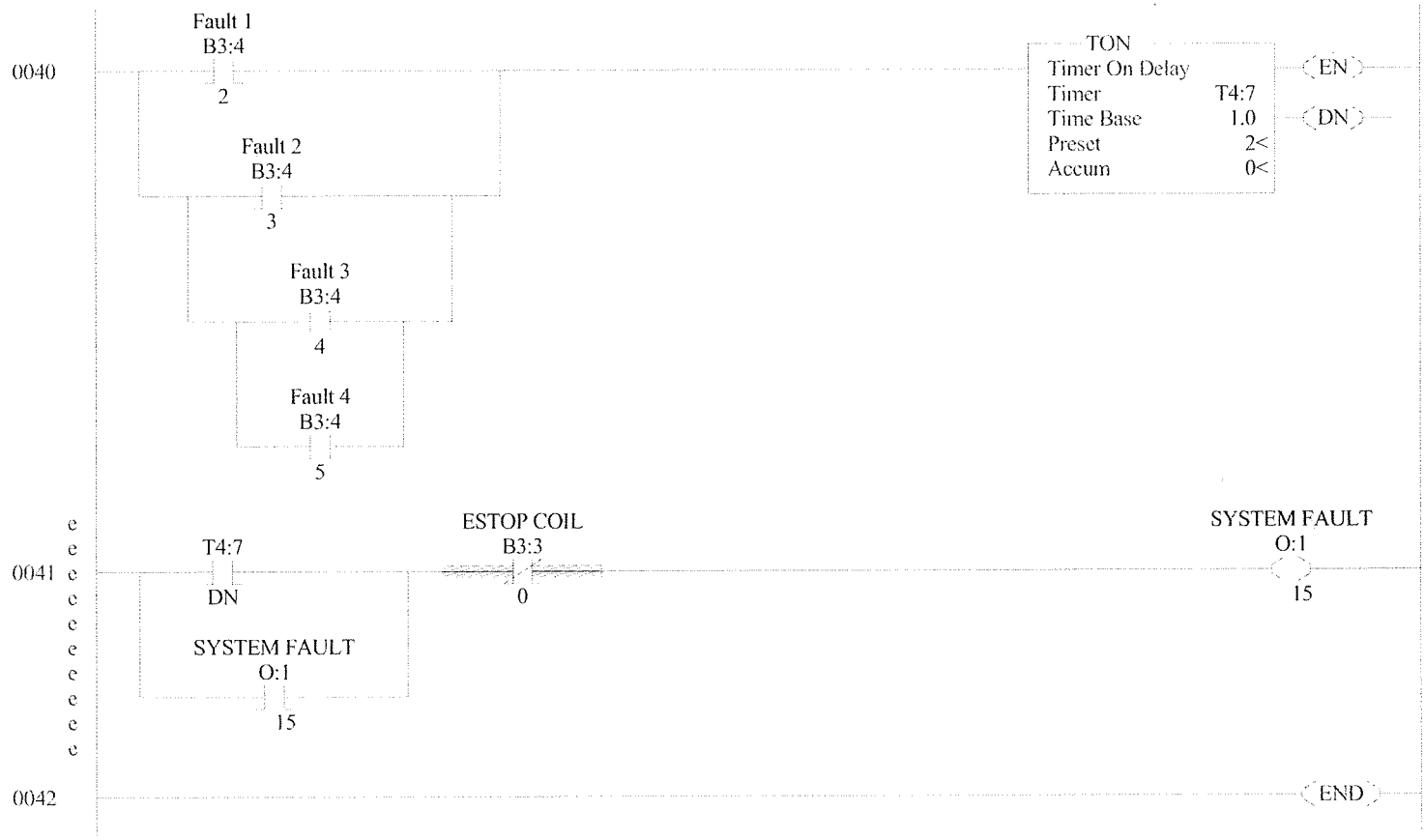

M19 : ON
IS M19 ON ?
NO
28
YES
M21: ON
IS M21 ON ?
NO
30
YES
TRUCK 1 LOADING : START
TRUCK 1 LOADING : RUN
TRUCK 1 LOADING : END
NO
IS TRUCK 1 LOADED ?
M19 : OFF
YES
IS M19 OFF ?
NO
32
YES
M21: OFF
IS M21 OFF ?
NO
34
YES
M20 : ON
IS M20 ON ?
NO
29
YES
M22 : ON
IS M22 ON ?
NO
31
YES
TRUCK 2 LOADING : START
TRUCK 2 LOADING : RUN
TRUCK 2 LOADING : END
IS TRUCK 2 LOADED ?
NO
M20 : OFF
YES
IS M20 OFF ?
NO
33
YES
M22: OFF
IS M22 OFF ?
NO
35
YES
XY
END

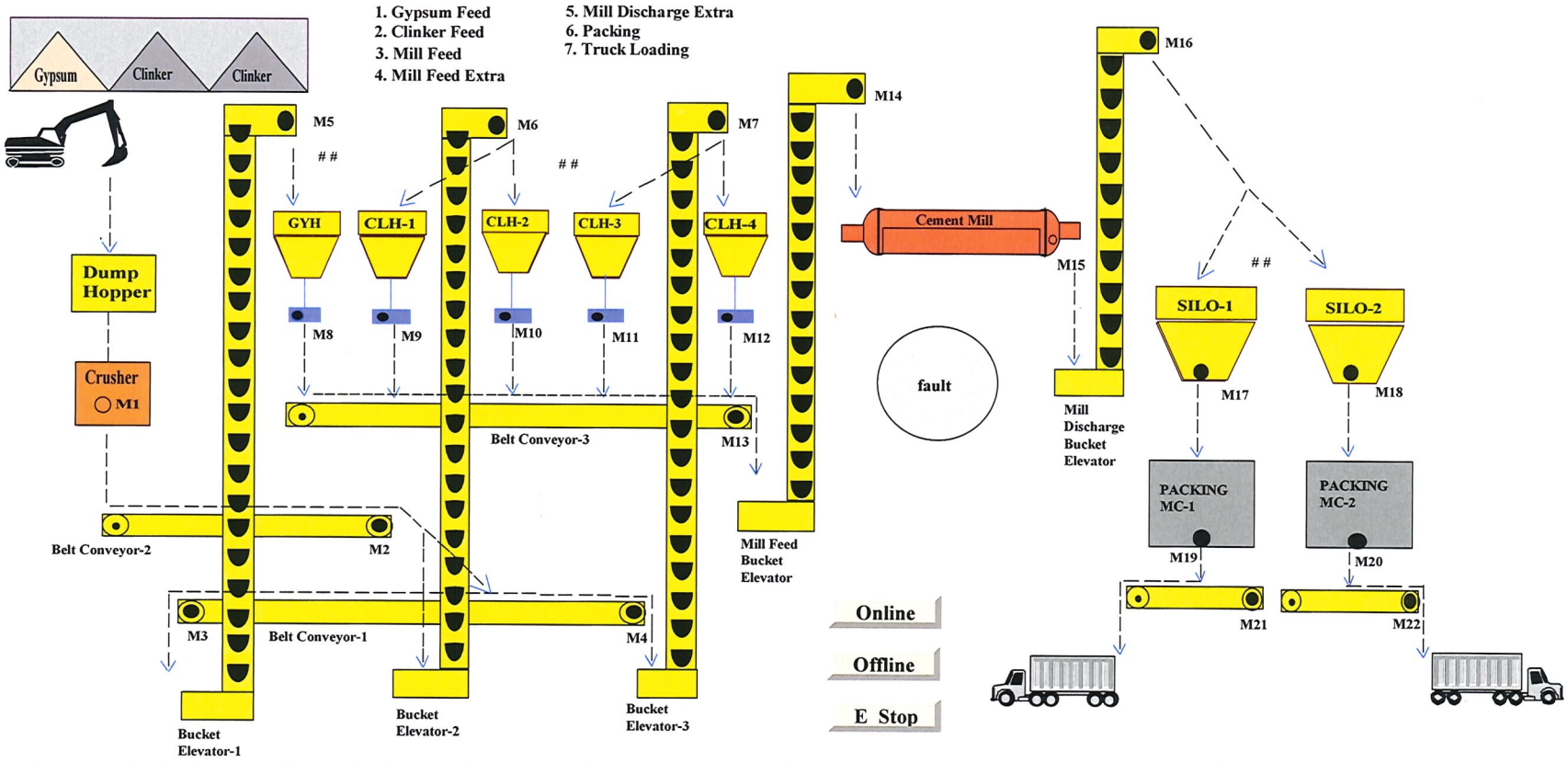

0000
Online
I:0
0
Bul.1762
Offline
I:0
1
Bul.1762
Offline_Scada
B3:0
10
ESTOP COIL
B3:3
0
SYSTEM FAULT
O:1
15
Pause
B3:0
0
Pause
B3:0
0
Online_Scada
B3:0
9
0001
ESTOP
I:0
2
Bul.1762
ESTOP SCADA
B3:0
12
ESTOP COIL
B3:3
0
0002
Pause
B3:0
0
B3:0
2
M1
O:1
0
1762-OW16
M1
O:1
0
1762-OW16
M2
O:1
1
1762-OW16
M2
O:1
1
1762-OW16
B3:0
1
M3
O:1
2
1762-OW16
M3
O:1
2
1762-OW16
M5
O:1
4
1762-OW16
0003
Pause
B3:0
0
M5
O:1
4
1762-OW16
T4:0
DN
TON
Timer On Delay
Timer T4:0
Time Base 1.0
Preset 1<
Accum 0<
EN
DN
0004
T4:0
DN
CTU
Count Up
Counter C5:0
Preset 20<
Accum 0<
CU
DN


0010
Pause
B3:0
0
B3:0
2
B3:0
4
M8
O:0
0
Bul.1762
M9
O:0
1
Bul.1762
M10
O:0
2
Bul.1762
M11
O:0
3
Bul.1762
M12
O:0
4
Bul.1762
0011
M8
O:0
0
Bul.1762
T4:2
DN
TON
Timer On Delay
Timer T4:2
Time Base 1.0
Preset 1<
Accum 0<
EN
DN
0012
T4:2
DN
CTD
Count Down
Counter C5:0
Preset 20<
Accum 0<
CD
DN
0013
EQU
Equal
Source A C5:0.ACC
0<
Source B 0
0<
B3:0
3
0014
M9
O:0
1
Bul.1762
T4:3
DN
TON
Timer On Delay
Timer T4:3
Time Base 1.0
Preset 1<
Accum 0<
EN
DN

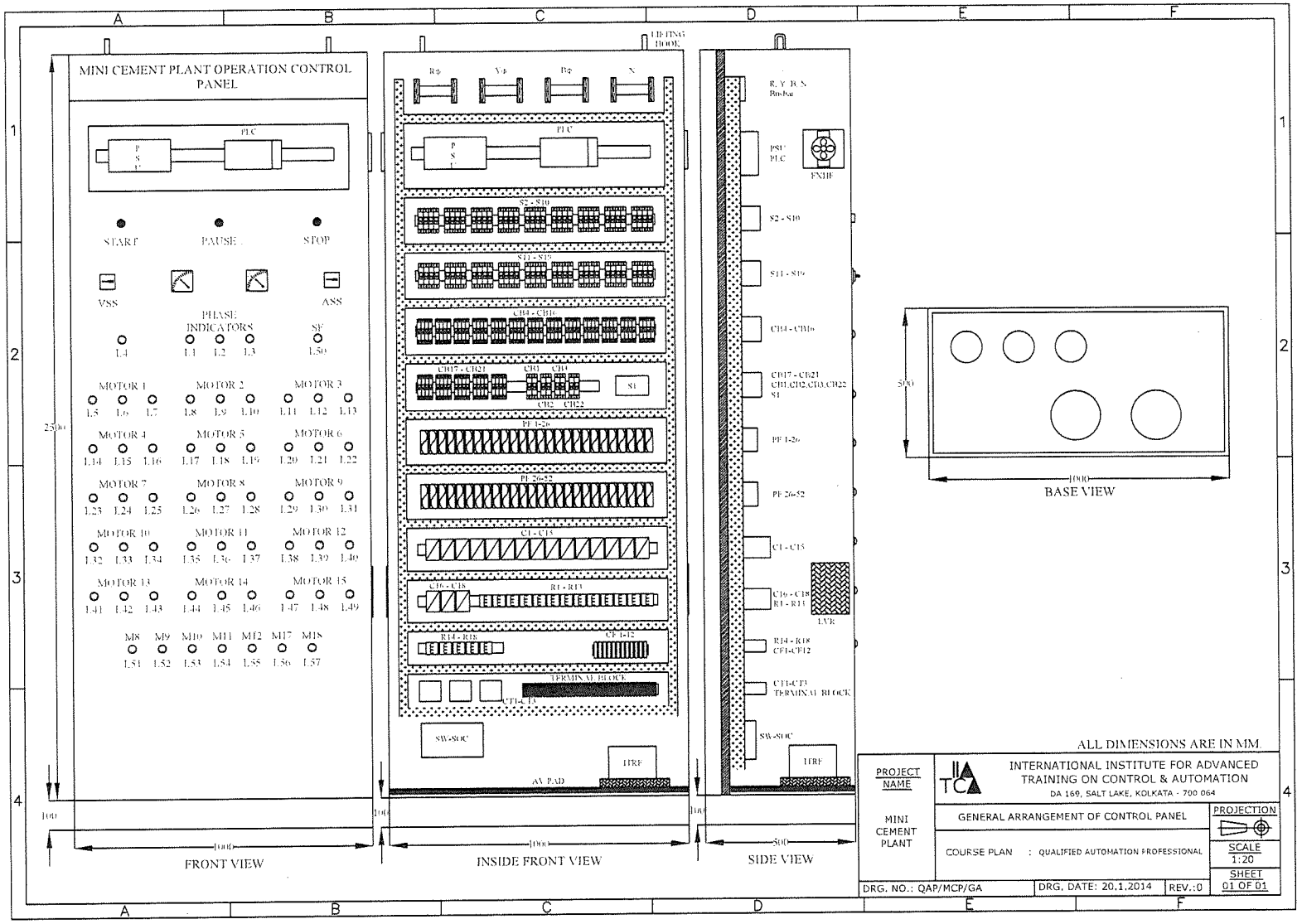

0021
T4:4
DN
CTU
Count Up
Counter C5:2
Preset 30<
Accum 0<
CU
DN
0022
C5:2
DN
B3:0
5
ESTOP COIL
B3:3
0
T4:6
DN
B3:0
5
0023
EQU
Equal
Source A C5:2.ACC
0<
Source B 25
25<
B3:0
7
ESTOP COIL
B3:3
0
T4:6
DN
B3:0
7
0024
M17
O:0
5
Bul.1762
T4:5
DN
TON
Timer On Delay
Timer T4:5
Time Base 1.0
Preset 1<
Accum 0<
EN
DN
0025
T4:5
DN
CTD
Count Down
Counter C5:2
Preset 30<
Accum 0<
CD
DN
0026
B3:0
5
EQU
Equal
Source A C5:2.ACC
0<
Source B 0
0<
B3:0
8
0027
Pause
B3:0
0
B3:0
5
B3:0
8
M17
O:0
5
Bul.1762
M18
O:0
6
Bul.1762


0035
Pause
B3:0
0
M1
O:1
0
1762-OW16
M16
O:1
10
1762-OW16
M17
O:0
5
Bul.1762
M20
O:1
12
1762-OW16
Fault 1
B3:4
2
M1
O:1
0
1762-OW16
M2
O:1
1
1762-OW16
M2
O:1
1
1762-OW16
M3
O:1
2
1762-OW16
M4
O:1
3
1762-OW16
M6
O:1
5
1762-OW16
M3
O:1
2
1762-OW16
M5
O:1
4
1762-OW16
M4
O:1
3
1762-OW16
M7
O:1
6
1762-OW16
0036
Pause
B3:0
0
B3:0
2
M8
O:0
0
Bul.1762
B3:0
4
Fault 2
B3:4
3
M9
O:0
1
Bul.1762
M10
O:0
2
Bul.1762
M11
O:0
3
Bul.1762
M12
O:0
4
Bul.1762


0040
Fault 1
B3:4
2
Fault 2
B3:4
3
Fault 3
B3:4
4
Fault 4
B3:4
5
TON
Timer On Delay
Timer T4:7
Time Base 1.0
Preset 2<
Accum 0<
EN
DN
0041
T4:7
DN
SYSTEM FAULT
O:1
15
ESTOP COIL
B3:3
0
SYSTEM FAULT
O:1
15
0042
END

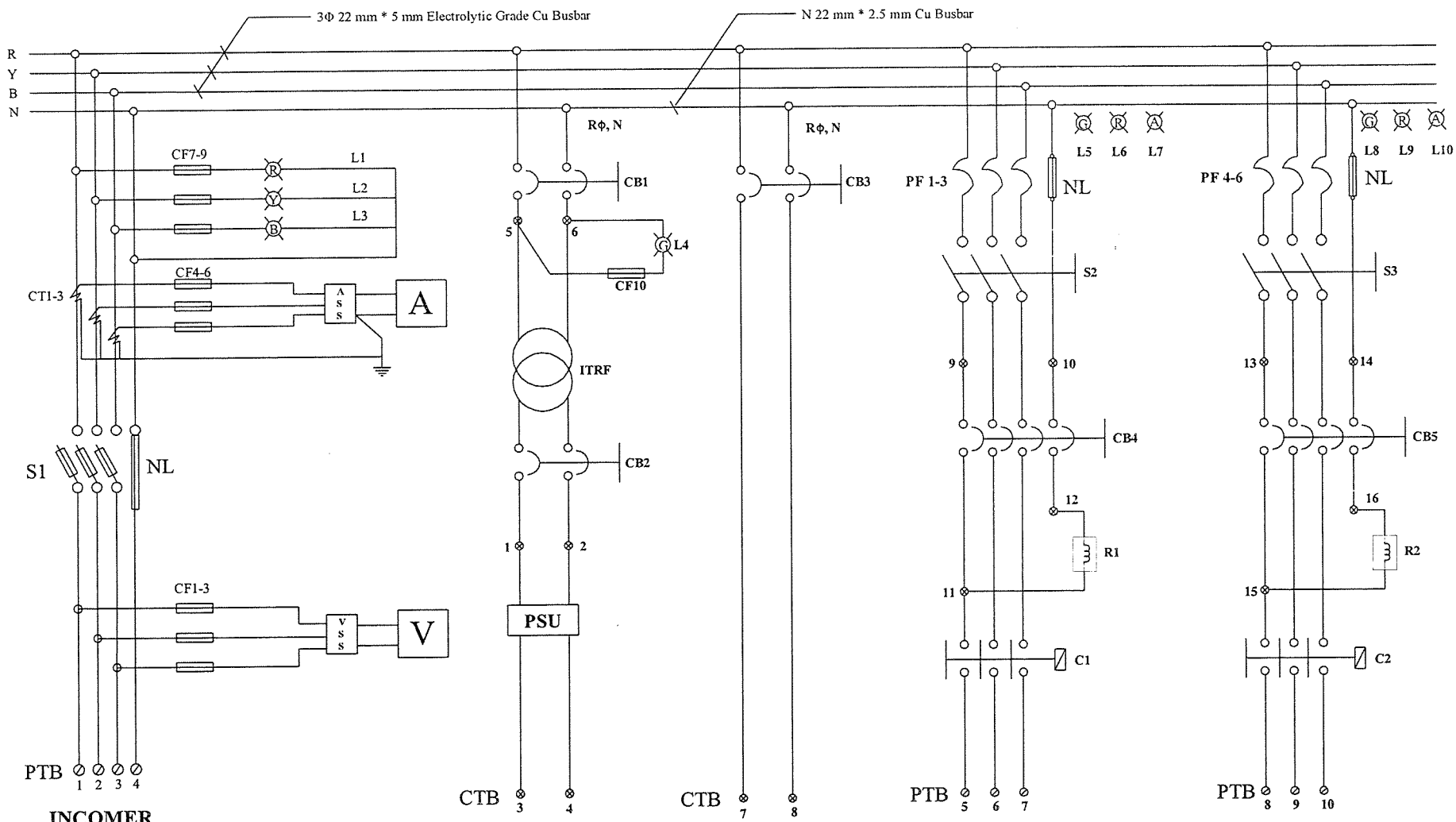


SCADA DESIGN OF MINI CEMENT PLANT PROJECT USING RSVIEW32 WORKS SCADA SOFTWARE(ROCKWELL AUTOMATION)

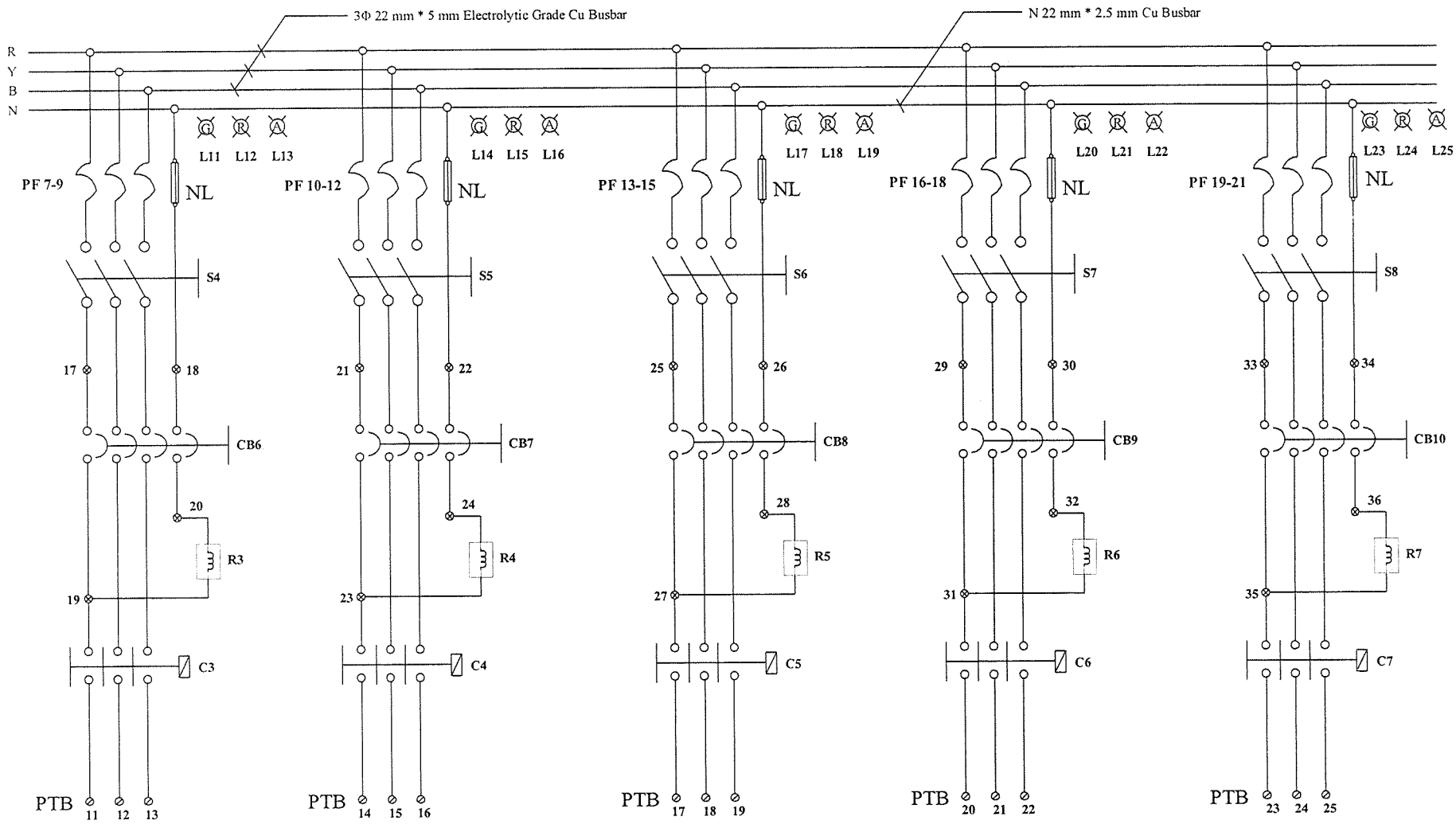

MINI CEMENT PLANT OPERATION CONTROL PANEL
PLC
START
PAUSE
STOP
VSS
ASS
PHASE INDICATORS
SF
MOTOR 1
MOTOR 2
MOTOR 3
MOTOR 4
MOTOR 5
MOTOR 6
MOTOR 7
MOTOR 8
MOTOR 9
MOTOR 10
MOTOR 11
MOTOR 12
MOTOR 13
MOTOR 14
MOTOR 15
2500
100
1000
FRONT VIEW
LIFTING HOOK
PLC
S2 - S10
S11 - S19
CB4 - CB16
CB17 - CB21
CB3
CB20
CB22
S1
PF 1-26
PF 26-52
C1 - C15
C16 - C18
R1 - R13
R14 - R15
CF1-12
TERMINAL BLOCK
CT1-CT3
SW-SOC
TFRF
AV PAD
INSIDE FRONT VIEW
R, Y, B, N Bus Bar
PSU PLC
PXHF
LVR
CT1-CT3 TERMINAL BLOCK
500
SIDE VIEW
BASE VIEW
ALL DIMENSIONS ARE IN MM
PROJECT NAME
MINI CEMENT PLANT
INTERNATIONAL INSTITUTE FOR ADVANCED TRAINING ON CONTROL & AUTOMATION
DA 169, SALT LAKE, KOLKATA - 700 064
GENERAL ARRANGEMENT OF CONTROL PANEL
PROJECTION
COURSE PLAN : QUALIFIED AUTOMATION PROFESSIONAL
SCALE 1:20
SHEET 01 OF 01
DRG. NO.: QAP/MCP/GA
DRG. DATE: 20.1.2014
REV.:0

LEGEND DETAILS

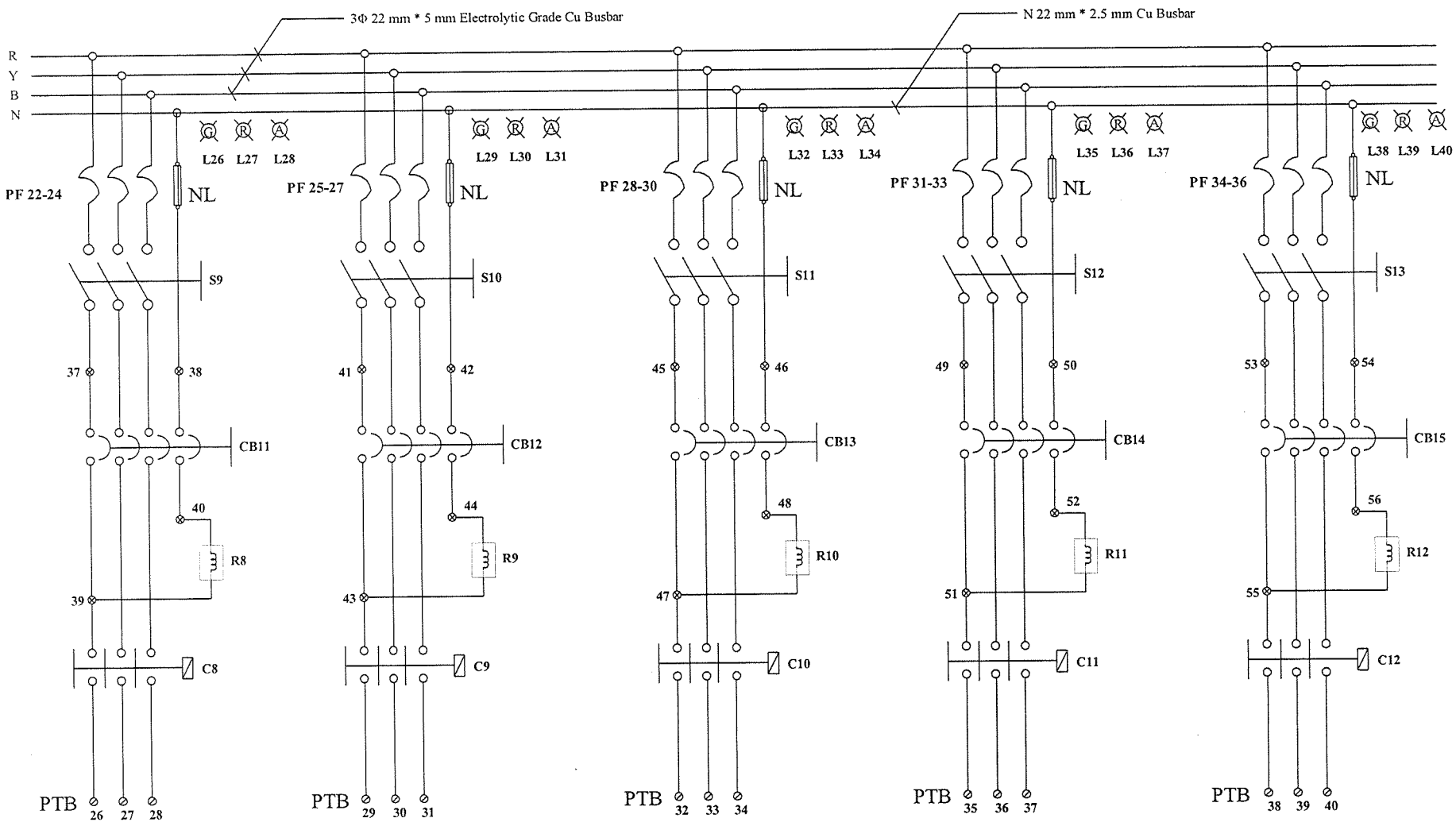
SL.NO	TAG	MATERIAL DESCRIPTION	RANGE,RATING & TYPE	MAKE	QTY.
1	PLC	PROGRAMMABLE LOGIC CONTROLLER	MICROLOGIX 1200,1762-L24-BWA,I/P:14 pts. 24V DC,O/P:10pts. RELAY TYPE	ALLEN BRADLEY	1
2		PC-PLC COMM. PORT	1761-CBL-PM02,SERIES C	ALLEN BRADLEY	1
3	EXT. MODULE	EXTERNAL DIGITAL O/P MODULE	1762-OW16,O/P:16 pts. RELAY TYPE	ALLEN BRADLEY	1
4	PSU	POWER SUPPLY UNIT	I/P:110V/220V AC,O/P:24 V DC, 5A	MEANWELL	1
5	C1-C18	TP CONTACTOR	12A,AC3 DUTY,230V AC,1NO+1NC AUX. CONTACT	TELEMECANIQUE	18
6	S1	TPN SFU	220 A	HAVELLS	1
7	S2-S19	ICTP SWITCH	32A	HAVELLS	18
8	CB1-CB3,CB22	DP MCB	10A, C CURVE	HAVELLS	4
9	CB4-CB21	TPN MCB	16A, C CURVE	HAVELLS	18
10	PF1-PF52	POWER FUSE	32A, HRC,WITH MTG. BASE	GEC	52
11	CF1-CF12	CONTROL FUSE	2A, WITH MTG. BASE	GEC	12
12	R1-R18	CONTROL RELAY	230V AC,2C/O,2NO+2NC AUX. CONTACT,5A	PLA	18
13	L1-L57	INDICATING LAMP	230V AC,24V DC,(RED,YELLOW,BLUE, GREEN,AMBER)	SIEMENS	57
14	A	AMMETER	0-500A,76mm^2,ANALOG TYPE,5A	MECO	1
15	ASS	AMMETER SELECTOR SWITCH	6A,4 POSITION WITH OFF	KAYCEE	1
16	V	VOLTMETER	0-500V,76mm^2,ANALOG TYPE,5A	MECO	1
17	VSS	VOLTMETER SELECTOR SWITCH	6A,4 POSITION WITH OFF	KAYCEE	1
18	ITRF	ISOLATION TRANSFORMER	CTR:1:1,I/P:110VAC/220VAC, O/P:110VAC,220VAC, 5VA,CENTER TAPPED	GUPTA ENGG.	1



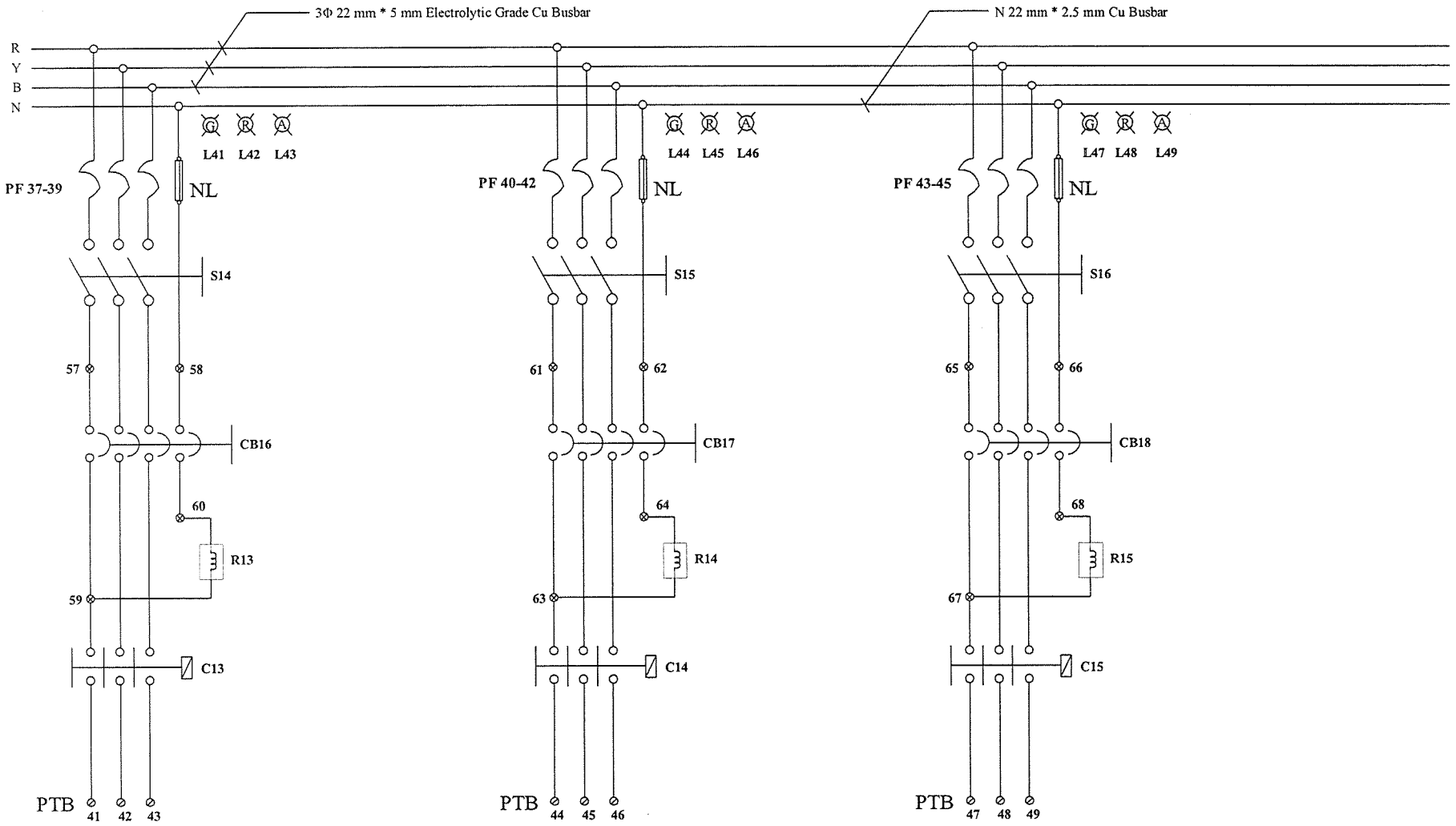
PROJECT NAME: MINI CEMENT PLANT	INTERNATIONAL INSTITUTE FOR ADVANCED TRAINING ON CONTROL & AUTOMATION, DA 169, SALT LAKE, KOLKATA - 700 064		PROJECTION
	POWER CIRCUIT OF MOTOR		SCALE N.T.S
	NAME : MD. SALMAN AZIM COURSE PLAN : QUALIFIED AUTOMATION PROFESSIONAL REG. No. : QA143941		SHEET 01 OF 01
DRG. NO.: QAP/MCP/PC_M	DRG. DATE: 08.08.2014	REV.:0	



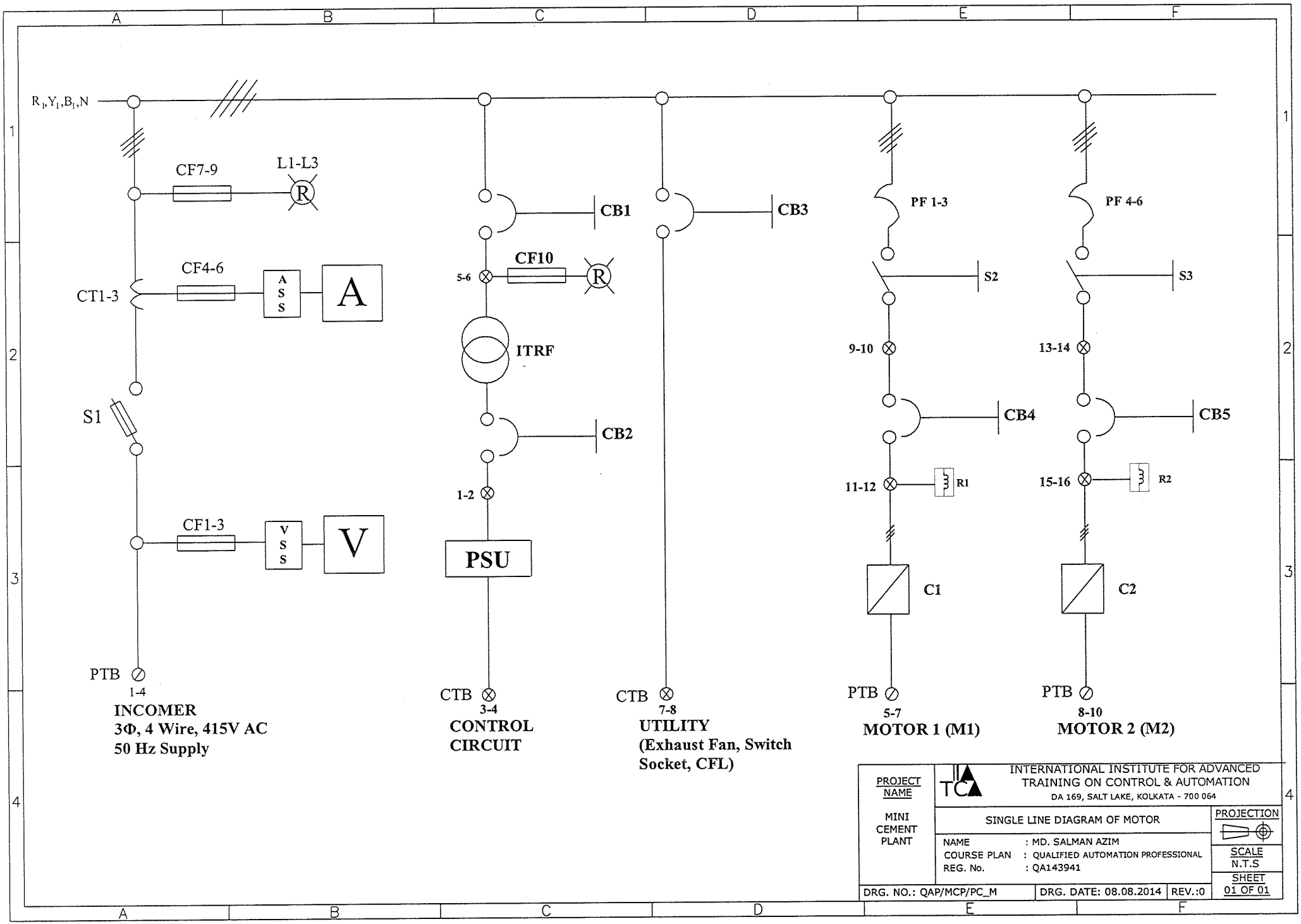
PROJECT NAME: MINI CEMENT PLANT	INTERNATIONAL INSTITUTE FOR ADVANCED TRAINING ON CONTROL & AUTOMATION DA 169, SALT LAKE, KOLKATA - 700 064	
	POWER CIRCUIT OF MOTOR	PROJECTION
	NAME : MD. SALMAN AZIM COURSE PLAN : QUALIFIED AUTOMATION PROFESSIONAL REG. No. : QA143941	SCALE N.T.S
DRG. NO.: QAP/MCP/PC_M	DRG. DATE: 08.08.2014 REV.:0	SHEET 01 OF 01

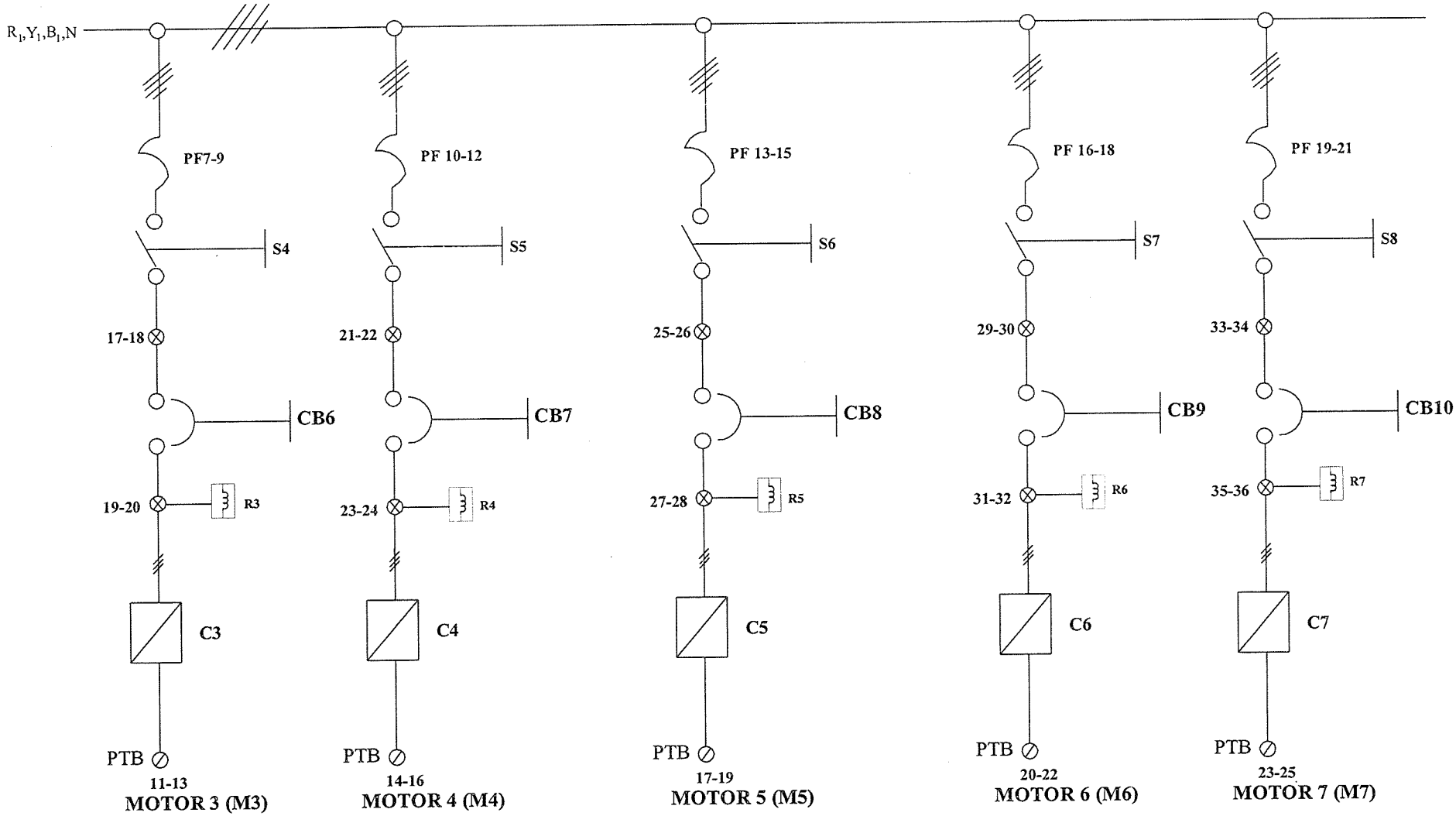


PROJECT NAME: MINI CEMENT PLANT	INTERNATIONAL INSTITUTE FOR ADVANCED TRAINING ON CONTROL & AUTOMATION, DA 169, SALT LAKE, KOLKATA - 700 064	PROJECTION
	POWER CIRCUIT OF MOTOR	
	NAME : MD. SALMAN AZIM COURSE PLAN : QUALIFIED AUTOMATION PROFESSIONAL REG. No. : QA143941	SCALE N.T.S
DRG. NO.: QAP/MCP/PC_M	DRG. DATE: 08.08.2014 REV.:0	SHEET 01 OF 01

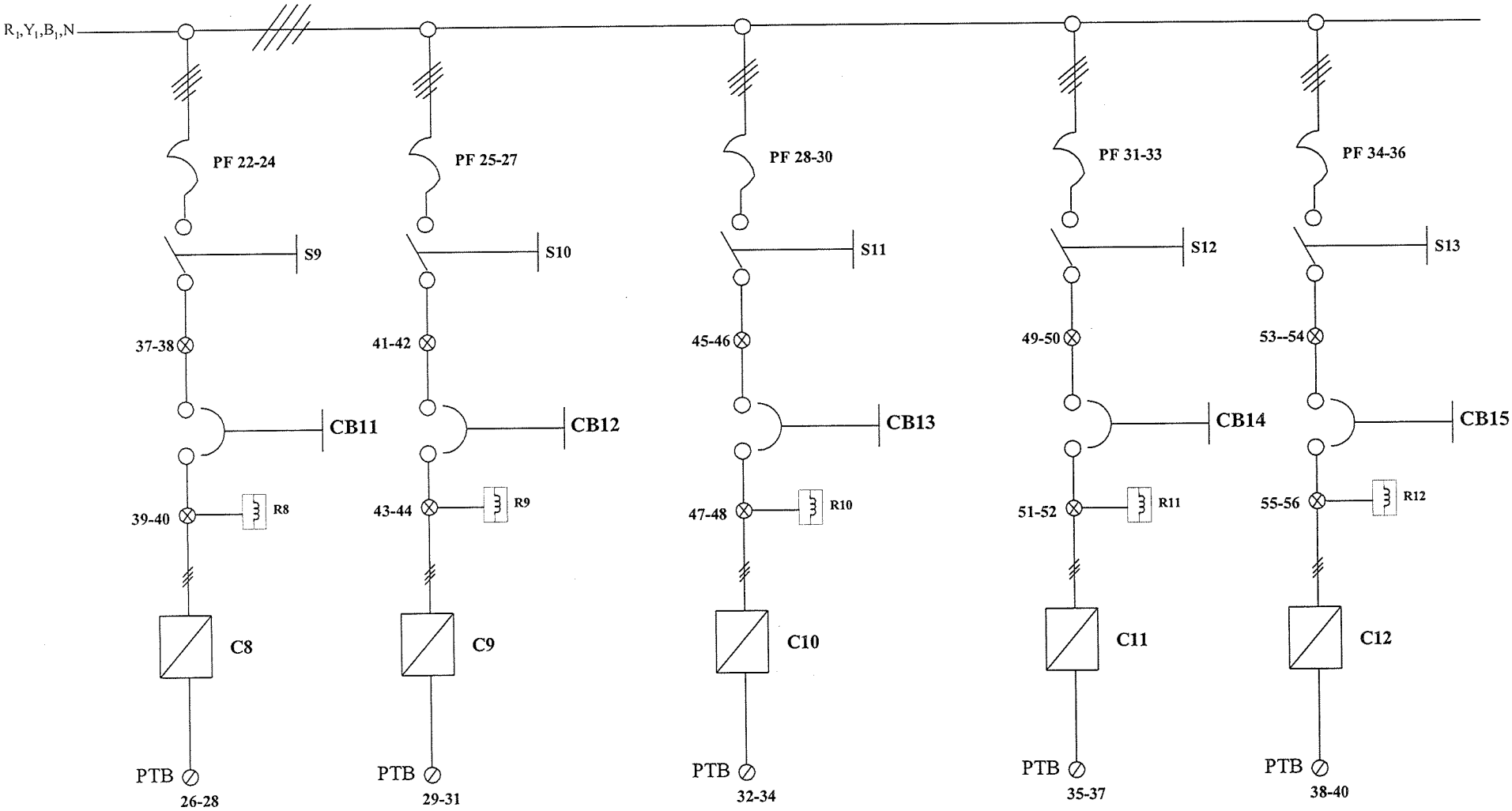


PROJECT NAME: MINI CEMENT PLANT	INTERNATIONAL INSTITUTE FOR ADVANCED TRAINING ON CONTROL & AUTOMATION, DA 169, SALT LAKE, KOLKATA - 700 064	PROJECTION
	POWER CIRCUIT OF MOTOR	
	NAME : MD. SALMAN AZIM COURSE PLAN : QUALIFIED AUTOMATION PROFESSIONAL REG. No. : QA143941	SCALE N.T.S
DRG. NO.: QAP/MCP/PC_M	DRG. DATE: 08.08.2014 REV.:0	SHEET 01 OF 01

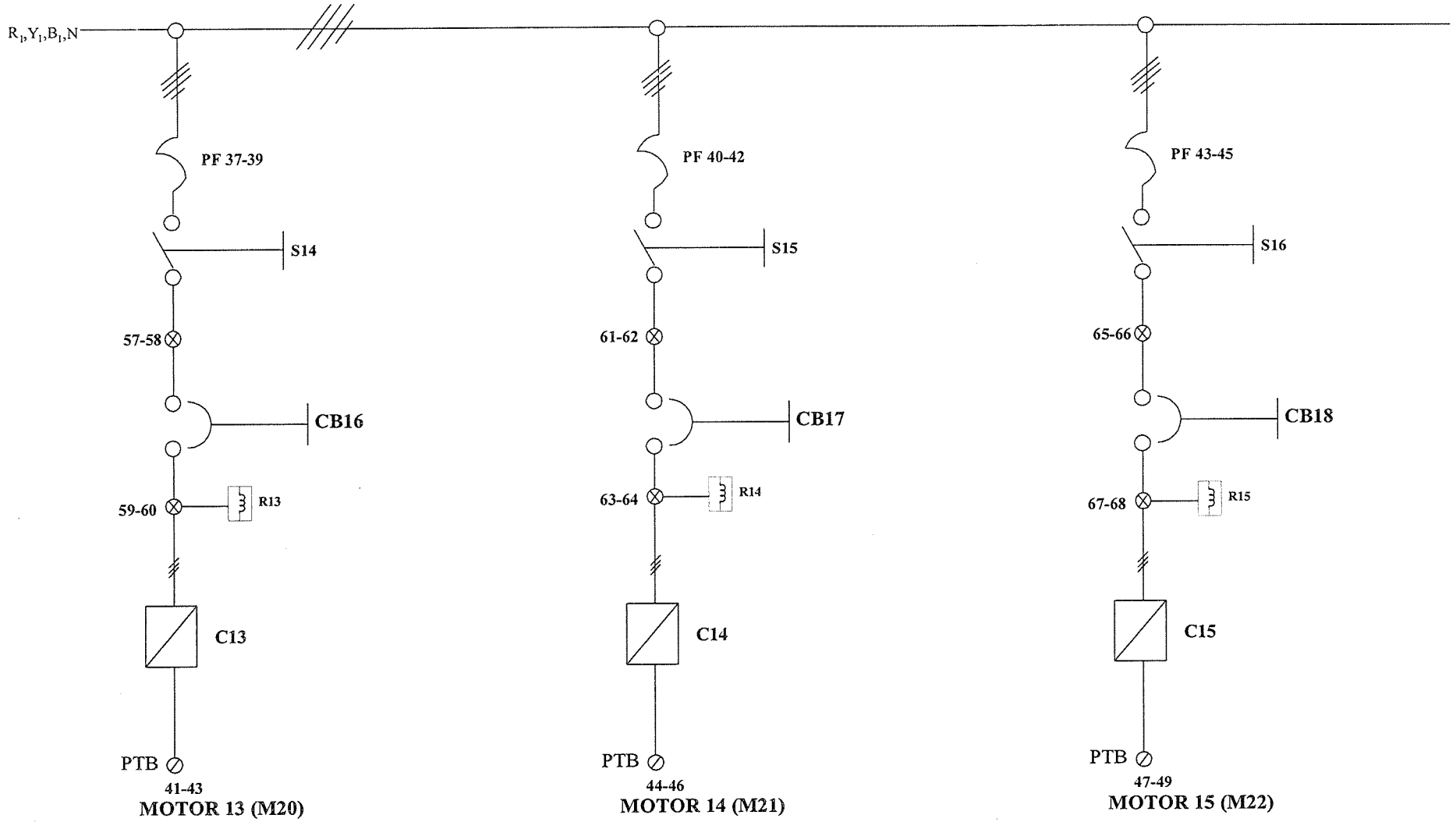

R1,Y1,B1,N
CF7-9
L1-L3
R
CF4-6
CT1-3
A S S
A
S1
CF1-3
V S S
V
PTB
1-4
INCOMER
3Φ, 4 Wire, 415V AC
50 Hz Supply
CB1
CF10
5-6
R
ITRF
CB2
1-2
PSU
CTB
3-4
CONTROL
CIRCUIT
CB3
CTB
7-8
UTILITY
(Exhaust Fan, Switch
Socket, CFL)
PF 1-3
S2
9-10
CB4
11-12
R1
C1
PTB
5-7
MOTOR 1 (M1)
PF 4-6
S3
13-14
CB5
15-16
R2
C2
PTB
8-10
MOTOR 2 (M2)
PROJECT NAME
MINI CEMENT PLANT
INTERNATIONAL INSTITUTE FOR ADVANCED TRAINING ON CONTROL & AUTOMATION
DA 169, SALT LAKE, KOLKATA - 700 064
SINGLE LINE DIAGRAM OF MOTOR
PROJECTION
NAME : MD. SALMAN AZIM
COURSE PLAN : QUALIFIED AUTOMATION PROFESSIONAL
REG. No. : QA143941
SCALE N.T.S
SHEET 01 OF 01
DRG. NO.: QAP/MCP/PC_M
DRG. DATE: 08.08.2014
REV.:0



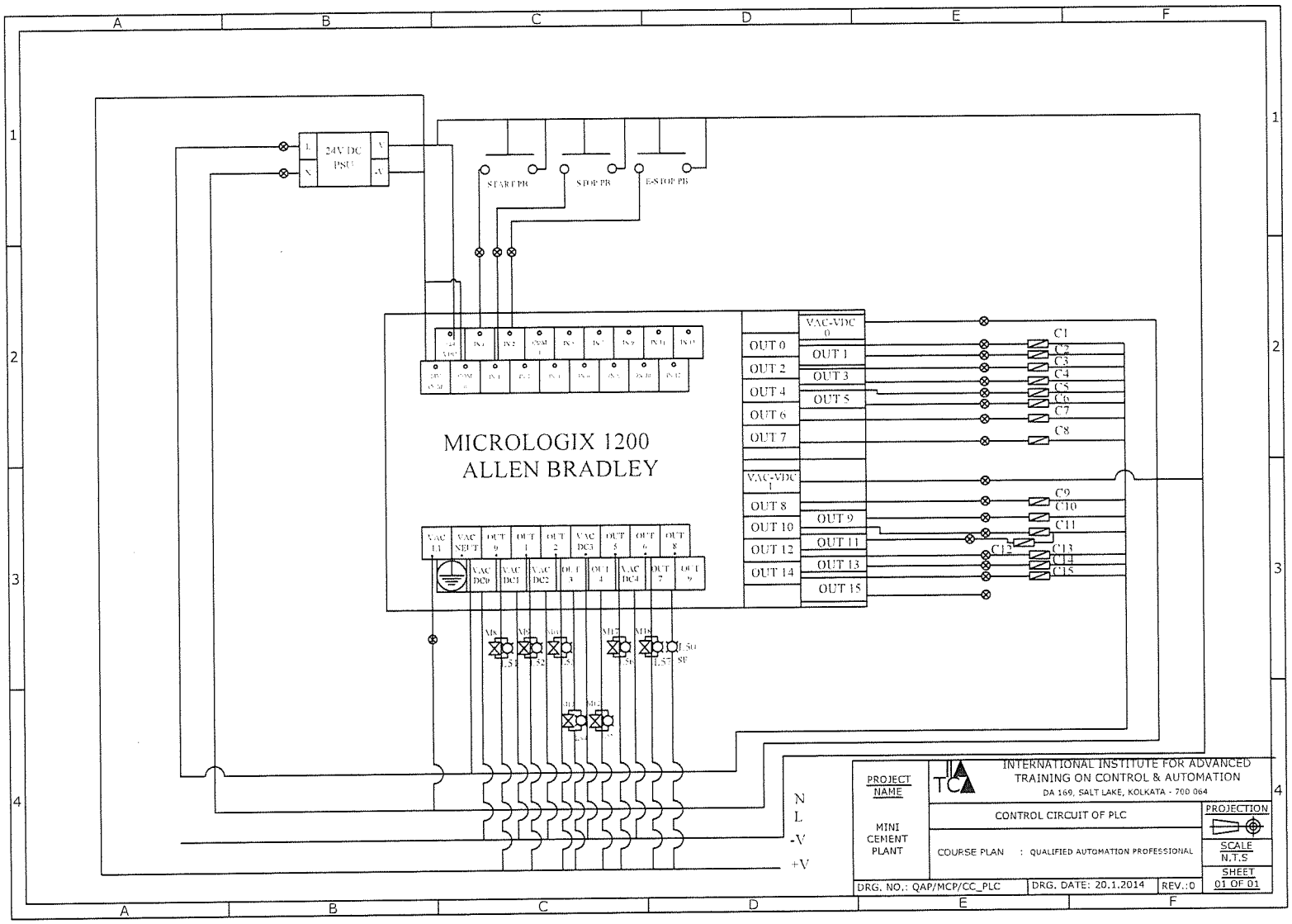
PROJECT NAME: MINI CEMENT PLANT	INTERNATIONAL INSTITUTE FOR ADVANCED TRAINING ON CONTROL & AUTOMATION, DA 169, SALT LAKE, KOLKATA - 700 064	
	SINGLE LINE DIAGRAM OF MOTOR	PROJECTION
	NAME : MD. SALMAN AZIM COURSE PLAN : QUALIFIED AUTOMATION PROFESSIONAL REG. No. : QA143941	SCALE N.T.S
DRG. NO.: QAP/MCP/PC_M	DRG. DATE: 08.08.2014 REV.:0	SHEET 01 OF 01

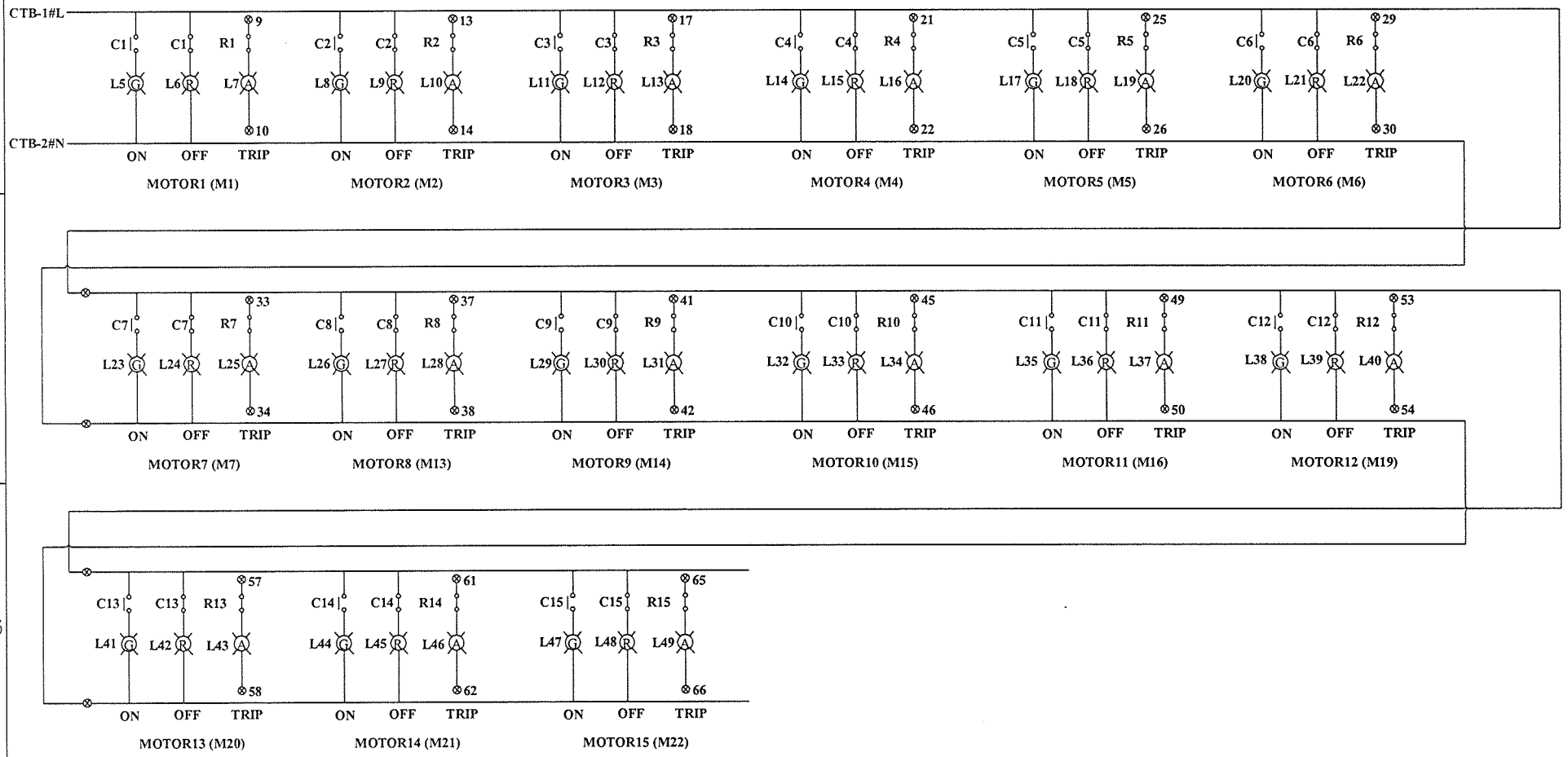


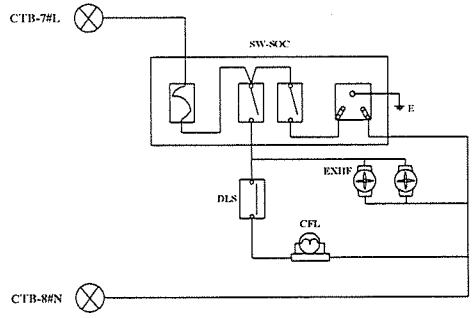
PROJECT NAME: MINI CEMENT PLANT	INTERNATIONAL INSTITUTE FOR ADVANCED TRAINING ON CONTROL & AUTOMATION, DA 169, SALT LAKE, KOLKATA - 700 064	PROJECTION
	SINGLE LINE DIAGRAM OF MOTOR	
	NAME : MD. SALMAN AZIM COURSE PLAN : QUALIFIED AUTOMATION PROFESSIONAL REG. No. : QA143941	SCALE N.T.S
DRG. NO.: QAP/MCP/PC_M	DRG. DATE: 08.08.2014 REV.:0	SHEET 01 OF 01



PROJECT NAME: MINI CEMENT PLANT	INTERNATIONAL INSTITUTE FOR ADVANCED TRAINING ON CONTROL & AUTOMATION, DA 169, SALT LAKE, KOLKATA - 700 064	PROJECTION
	SINGLE LINE DIAGRAM OF MOTOR	
	NAME : MD. SALMAN AZIM COURSE PLAN : QUALIFIED AUTOMATION PROFESSIONAL REG. No. : QA143941	SCALE N.T.S
DRG. NO.: QAP/MCP/PC_M	DRG. DATE: 08.08.2014 REV.:0	SHEET 01 OF 01


24V DC PSU
START PB
STOP PB
E-STOP PB
MICROLOGIX 1200
ALLEN BRADLEY
OUT 0
OUT 1
OUT 2
OUT 3
OUT 4
OUT 5
OUT 6
OUT 7
OUT 8
OUT 9
OUT 10
OUT 11
OUT 12
OUT 13
OUT 14
OUT 15
C1
C2
C3
C4
C5
C6
C7
C8
C9
C10
C11
C12
C13
C14
C15
N
L
-V
+V
INTERNATIONAL INSTITUTE FOR ADVANCED TRAINING ON CONTROL & AUTOMATION
DA 169, SALT LAKE, KOLKATA - 700 064
PROJECT NAME
MINI CEMENT PLANT
CONTROL CIRCUIT OF PLC
COURSE PLAN : QUALIFIED AUTOMATION PROFESSIONAL
PROJECTION
SCALE N.T.S
SHEET 01 OF 01
DRG. NO.: QAP/MCP/CC_PLC
DRG. DATE: 20.1.2014
REV.:0





PROJECT NAME: MINI CEMENT PLANT	INTERNATIONAL INSTITUTE FOR ADVANCED TRAINING ON CONTROL & AUTOMATION, DA 169, SALT LAKE, KOLKATA - 700 064		PROJECTION
	TYPICAL CONTROL CIRCUIT OF LED's		
	NAME : MD. SALMAN AZIM COURSE PLAN : QUALIFIED AUTOMATION PROFESSIONAL REG. No. : QA143941		SCALE N.T.S
	DRG. NO.: QAP/MCP/PC_M	DRG. DATE: 08.08.2014 REV.:0	SHEET 01 OF 01

BILL OF MATERIAL

SL.NO	MATERIAL DESCRIPTION	RANGE,RATING & TYPE	MAKE	QTY.
1	PROGRAMMABLE LOGIC CONTROLLER	MICROLOGIX 1200,1762-L24-BWA,I/P:14 pts. 24V DC,O/P:10pts. RELAY TYPE	ALLEN BRADLEY	1
2	PC-PLC COMM. PORT	1761-CBL-PM02,SERIES C	ALLEN BRADLEY	1
3	EXTERNAL DIGITAL O/P MODULE	1762-OW16,O/P:16 pts. RELAY TYPE	ALLEN BRADLEY	1
4	POWER SUPPLY UNIT	I/P:110V/220V AC,O/P:24 V DC, 5A	MEANWELL	1
5	TP CONTACTOR	12A,AC3 DUTY,230V AC,1NO+1NC AUX. CONTACT	TELEMECANIQUE	18
6	TPN SFU	220 A	HAVELLS	1
7	ICTP SWITCH	32A	HAVELLS	18
8	DP MCB	10A, C CURVE	HAVELLS	4
9	TPN MCB	16A, C CURVE	HAVELLS	18
10	POWER FUSE	32A, HRC,WITH MTG. BASE	GEC	52
11	CONTROL FUSE	2A, WITH MTG. BASE	GEC	12
12	CONTROL RELAY	230V AC,2C/O,2NO+2NC AUX. CONTACT,5A	PLA	18
13	INDICATING LAMP	230V AC,24V DC,(RED,YELLOW,BLUE, GREEN,AMBER)	SIEMENS	57
14	AMMETER	0-500A,76mm^2,ANALOG TYPE,5A	MECO	1
15	AMMETER SELECTOR SWITCH	6A,4 POSITION WITH OFF	KAYCEE	1
16	VOLTMETER	0-500V,76mm^2,ANALOG TYPE,5A	MECO	1
17	VOLTMETER SELECTOR SWITCH	6A,4 POSITION WITH OFF	KAYCEE	1
18	ISOLATION TRANSFORMER	CTR:1:1,I/P:110VAC/220VAC, O/P:110VAC,220VAC, 5VA,CENTER TAPPED	GUPTA ENGG.	1
19	CURRENT TRANSFORMER	CTR:100:1,5VA,CLASS 1	KAPPA	3
20	Cu. BUSBAR	3Φ:22.5mmX8mm ELECTROLYTIC GRADE. N:22.5mmX4mm Cu. BUSBAR	REPUTED	AS REQD.
21	Cu. WIRES	2.5mm,FRP FLEXIBLE	FINOLEX	AS REQD.
22	SWITCH SOCKET OUTLET	230V AC,5A/15A,STANDARD	ANCHOR	1 SET
23	EXHAUST FAN	230V AC,VENTILATION TYPE,20Watt.	PHILIPS	2
24	LOUVER	150mm^2, MESH TYPE	KEYMAN	2
25	CLEAR PERSPEX SHEET	950mmX350mm	SAINT-GOBAIN	1

COST ANALYSIS

SL.NO	MATERIAL DESCRIPTION	RANGE,RATING & TYPE	MAKE	QTY.	COST/UNIT	TOTAL COST
1	PROGRAMMABLE LOGIC CONTROLLER	MICROLOGIX 1200,1762-L24-BWA,I/P:14 pts. 24V DC,O/P:10pts. RELAY TYPE	ALLEN BRADLEY	1	25,000.00	25,000.00
2	PC-PLC COMM. PORT	1761-CBL-PM02,SERIES C	ALLEN BRADLEY	1	1,200.00	1,200.00
3	EXTERNAL DIGITAL O/P MODULE	1762-OW16,O/P:16 pts. RELAY TYPE	ALLEN BRADLEY	1	15,000.00	15,000.00
4	POWER SUPPLY UNIT	I/P:110V/220V AC,O/P:24 V DC, 5A	MEANWELL	1	2,500.00	2,500.00
5	TP CONTACTOR	12A,AC3 DUTY,230V AC,1NO+1NC AUX. CONTACT	TELEMECANIQUE	18	650.00	11,700.00
6	TPN SFU	220 A	HAVELLS	1	2,500.00	2,500.00
7	ICTP SWITCH	32A	HAVELLS	18	650.00	11,700.00
8	DP MCB	10A, C CURVE	HAVELLS	4	250.00	1,000.00
9	TPN MCB	16A, C CURVE	HAVELLS	18	650.00	11,700.00
10	POWER FUSE	32A, HRC,WITH MTG. BASE	GEC	52	200.00	10,400.00
11	CONTROL FUSE	2A, WITH MTG. BASE	GEC	12	25.00	300.00
12	CONTROL RELAY	230V AC,2C/O,2NO+2NC AUX. CONTACT,5A	PLA	18	150.00	2,700.00
13	INDICATING LAMP	230V AC,24V DC,(RED,YELLOW,BLUE, GREEN,AMBER)	SIEMENS	57	100.00	5,700.00
14	AMMETER	0-500A,76mm^2,ANALOG TYPE,5A	MECO	1	650.00	650.00
15	AMMETER SELECTOR SWITCH	6A,4 POSITION WITH OFF	KAYCEE	1	150.00	150.00
16	VOLTMETER	0-500V,76mm^2,ANALOG TYPE,5A	MECO	1	650.00	650.00
17	VOLTMETER SELECTOR SWITCH	6A,4 POSITION WITH OFF	KAYCEE	1	150.00	150.00
18	ISOLATION TRANSFORMER	CTR:1:1,I/P:110VAC/220VAC, O/P:110VAC,220VAC, 5VA,CENTER TAPPED	GUPTA ENGG.	1	1,250.00	1,250.00
19	CURRENT TRANSFORMER	CTR:100:1,5VA,CLASS 1	KAPPA	3	300.00	900.00

SHEET METAL CALCULATION

Dimensions of the Control Panel Body:

Height = 2.5m, Width = 1m, Depth = 0.5m.

Dimensions of the Mounting Plate:

Height = 2.4m, Width = 0.95m.

Dimensions of the Channel Base:

Height = 0.1m, Width = 0.1m, Depth = 0.06m

Material of Construction: CRCA Sheet, TISCO.

Sheet metal required for the outside body of the control panel

$= 2\ [2.5 \times 1 + 1 \times 0.5 + 0.5 \times 2.5]\ m^2$

$= 2\ [2.5 + 0.5 + 1.25]\ m^2 = 8.5\ m^2$

Sheet metal required for the mounting plate

$= (2.4 \times 0.95)\ m^2 = 2.28\ m^2$

Sheet metal required for the channel base

Length of the channel base required = 2 (1m + 0.5m) = 3m

Breadth of the channel base is = 0.2m

Thus, area of the sheet metal required = $3m \times 0.2m = 0.6m^2$

Thus, the total weight of sheet metal used

$= (8.5 \times 16 + 2.28 \times 20 + 0.6 \times 48)\ kg = 210.4\ kg$

[Since weight of the sheet metal for:

- Body of the Control Panel (2mm thickness) = 16 kg/m^2
- Mounting Plate (2.5mm thickness) = 20 kg/m^2
- Channel Base (6mm thickness) = 48 kg/m^2]

Price of sheet metal = Rs.120/kg

Cost of sheet metal required

= Rs. (210.4 x 120) = Rs. 25248/-

Total Cost required

= **Rs. 35000/-** (Including Fabrication & Transportation charge)

CONCLUSION

Completing this project I have got a clear picture about Automated processes for Mini Cement Plant.

An overview of this project is in my knowledge now; Functions of various components and different steps involved in producing cement are very clear to me. I have learned several topics with this project; for example selection of particular PLC module, I/O requirements, external I/O module etc. In PLC programming part use of NO or NC contacts, pulse generation, use of timers, counters, timer or counter reset become very clear than before. Not only that I am now conceptually strong than earlier with the idea of associated control components selection based on the needs of the application (contactors, relays, cables, fuses, circuit breakers etc.), evaluation the project costing including Bill of Material(B.O.M) by collecting the market prices of the selected items used in the total process etc. I have cultured AutoCAD 2008 to design general arrangement of panel, schematic wiring diagram. This very software was totally unknown to me. But at present I am little bit familiar with AutoCAD. I got this superb opportunity with this project.

My greetings to the IIATCA authorities who structured the Qualified Automation Professional course plan with this project. It gave me great pleasure to introduce with Mini Cement Plant Automation process.