Industrial Control

Trade 19

SkillsCanada Alberta

May 2025

Provincial Skills Competition

Day 1

Test Project

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1 - Introduction

General

With this project, we will assess your abilities in the following criteria:

- Ability to analyze technical data
- Quality of wiring and installation
- Capacity to implement and automated process
- Troubleshooting

Installation of Electrical Raceways and Components

Part of all process type projects is the installation of the raceways and components that function as inputs and outputs. We will assess the quality of your installation, interpretation of site drawings, and precision of equipment placement.

Wiring an automated process within a panel

As a technician, you should have the ability to completely wire a system and make the necessary modifications. We will assess the quality of your manual work, the organization of components, and the use of materials provided.

Programming the automated process

You are provided with a function, and you must program the automated process with your PLC. The system must be functional and adhere to the instructions. The Day 2 document will provide details on the automated process.

Commissioning, Start-up and Troubleshooting

Your ability to validate the safety of your installation prior to power up and/or detect and solve problems will be assessed. You will be tasked with completing the 4.5 - Commissioning Sheet with a PTC member present before energizing your system.

2 - Project Description

2.1 - Process Description

Alberta is a major producer of local craft beer, a process which includes transporting grain and hops using large bins. This simulated process simulates filling grain bins from a large storage hopper. After a preset number of bins are filled, the hopper must be refilled before more bins can be filled for distribution.

2.2 - Equipment Description

The system consists of the following components:

Control Panel

- Main Power Disconnect
- Stack Lights
    - Red (L1)
    - Amber (L2)
    - Green (L3)
- Emergency Stop Button (ES1)
- Pilot Devices
    - Green Push Button (PB1)
    - Amber Push Button (PB2)
    - 3-pos Maintained Selector Switch (SS1)
    - 3-pos Momentary Selector Switch (SS2)
    - Blue Pilot Light (L4)

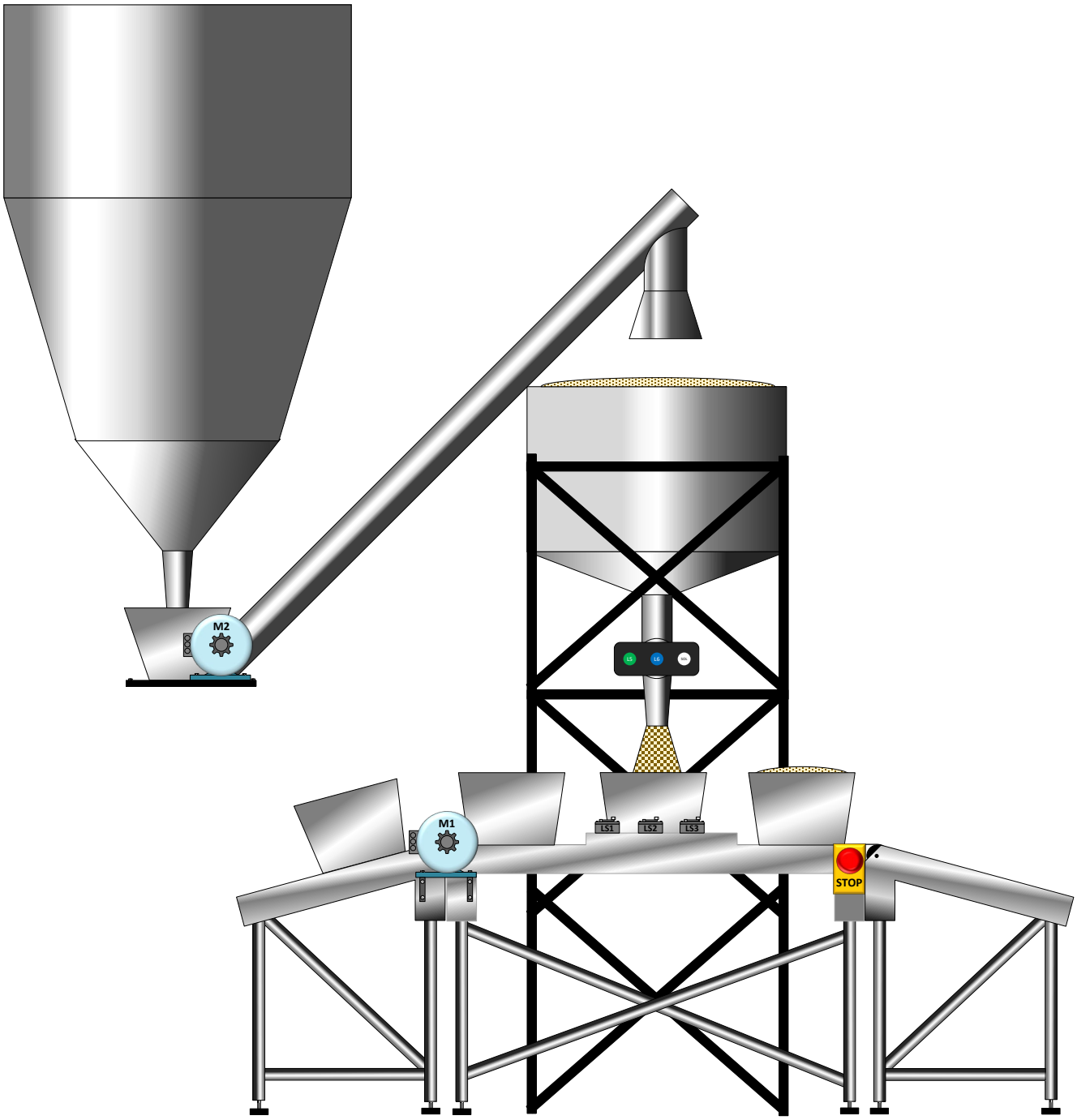
Conveyor

- FWD-REV Conveyor Belt (M1)
- Positioning Limit Switches (LS1 – LS2 – LS3)
- Emergency Stop Button (ES2)

Hopper

- Screw Conveyor (M2)
- Solenoid (Indicated by White pilot light) (SOL)
- Green Pilot Light (L5)
- Blue Pilot Light (L6)

2.3 - Process Diagram



4 - Technical Details

4.1 - Emergency Stop Circuit

The system is equipped with a general Emergency Stop push-pull button.

The Emergency Stop button mounted on the Control Panel Door will be used in conjunction with a 24 VDC relay (non-PLC) to create a Master Control Relay (MCR)/Emergency Stop Circuit. The 24 VDC relay will be equipped with both normally-open (NO) and normally-closed (NC) contacts, as required.

When the Emergency Stop button is depressed, The Master Control Relay/Emergency Stop Circuit will de-energize all the PLC's outputs.

All the PLC's outputs shall remain de-energized until the Emergency Stop button is reset (pulled).

4.2 - Conductor Size and Use

1. Power connections must be 14 AWG
2. DC Input/Output single conductors must be blue 18 AWG
3. DC Input/Output cables must be 18 AWG, 2-conductor
4. Ground conductors must be 14 AWG green conductors
5. Any size exceptions will be specifically mentioned on the drawings

Conductor Colour Code Table

Single Phase Power	Line (L2) Identified	Black White
Three Phase Power	Line 1 Line 2 Line 3	Red Black Blue
DC Control	Input/0utput 18/2 Cable	Blue Black/White

4.3 - Input Table

The following table lists the required PLC inputs for the process. The PLC input assignments are suggested and may need changes to accommodate your PLC.

Input	Symbol	Contact Type	PLC Input Assignments
Master Control Relay / Emergency Stop Circuit	MCR	NO	I0
Push Button - Green	PB1	NO	I1
Push Button - Amber	PB2	NC	I2
Selector Switch 1 (Maintained) - Left Position	SS1_1	NO	I3
Selector Switch 1 (Maintained) - Right Position	SS1_3	NO	I4
Selector Switch 2 (Momentary) - Left Position	SS2_1	NO	I5
Selector Switch 2 (Momentary) - Right Position	SS2_3	NO	I6
Limit Switch 1	LS1	NO	I7
Limit Switch 2	LS2	NO	I8
Limit Switch 3	LS3	NO	I9

4.4 - Output Table

The following table lists the required PLC outputs for the process. The PLC Output assignments are suggested and may need changes to accommodate your PLC.

Output	Symbol	PLC Output Assignments
Stack Light - Red	L1	Q0
Stack Light - Amber	L2	Q1
Stack Light - Green	L3	Q2
Panel Pilot Light - Blue	L4	Q3
Hopper Pilot Light - Green	L5	Q4
Hopper Pilot Light - Blue	L6	Q5
Solenoid (Indicated by Pilot Light - White)	SOL	Q6
Contactor M1 Forward	M1_F	Q7
Contactor M1 Reverse	M1_R	Q8
Contactor M2 Forward	M2	Q9