Skills Compétences Canada

CONTEST DESCRIPTION

Mechatronics

POST-SECONDARY

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1 THE SKILLS FOR SUCCESS FOR CAREERS IN THE SKILLED TRADES AND TECHNOLOGY

In response to the evolving labour market and changing skill needs, the Government of Canada has launched the new Skills for Success *(former Essential Skills)* model defining nine key skills needed by Canadians to participate in work, in education and training, and in modern society more broadly. SCC is currently working with Employment and Social Development Canada (ESDC) to bring awareness of the importance of these skills that are crucial for success in Trade and Technology careers. Part of this ongoing initiative requires the integration and identification of the Skills for Success in contest descriptions, projects, and project documents. The next phase and very important aspect of our Skills for Success (SfS) initiative is to provide a *Skills Report Card* to each competitor at the Skills Canada National Competition. The purpose of the report card is to inform the competitor about their current level of nine identified Skills for Success based on their competition scores. With this knowledge, the competitor will be made aware which skill may require improvement. Full implementation is expected in the next Skills Canada National Competition.
The following 9 skills have been identified and validated as key skills for success for the workplace in the legend below:
[1]Numeracy, [2]Communication, [3]Collaboration, [4]Adaptability, [5]Reading, [6]Writing, [7]Problem Solving, [8]Creativity and Innovation, [9]Digital

These Skills for Success have been identified in section 2.4 and/or 3.2 (to be completed by SCC) of your Contest Description and if applicable, in your Project and supporting documents.

2 CONTEST INTRODUCTION

2.1 Description of the associated work role(s) or occupation(s)

https://www.skillscompetencescanada.com/en/skill_area/mechatronics/

2.2 Purpose of the Challenge

- The goal is to provide competitors with the opportunity to demonstrate certain skills and knowledge that every technician must have in the field of Manufacturing, Automation and Technology.
- Mechatronics skills will be judged on a practical demonstration of abilities to complete the mechanical, electrical and pneumatic assembly of a manufacturing production system as well as creating and commissioning the controls based on a documented working sequence using Programmable Logic Controllers (PLC). Team of two participants.
- Open to Mechatronics, Industrial Automation & Robotics, Instrumentation, Electro-Mechanical or related Technologies sectors.

2.3 Duration of contest

12 hours (6 hours a day for 2 days)

2.4 Skills and Knowledge to be tested.

- General Electrical and Mechanical knowledge
- Interpret and use electronic, electrical or mechanical schematics[5]
- Render operational and modify sequential mechanisms that have a PLC[1]
- Commissioning electrical, pneumatic and mechanical systems.
- Programming PLCs[9]
- Skillful troubleshooting techniques[7]
- Speed of execution
- Wiring skills
- System Optimization (increasing the system performance)
- Professional workmanship
- Professional practices
- Know-how to look for information efficiently in industrial equipment[5]

Skills for Success – [1]Numeracy, [5]Reading, [7]Problem Solving, [9]Digital

3 CONTEST DESCRIPTION

3.1 List of documents produced and timeline for when competitors have access to the documents on the Skills/Compétences Canada website.

DOCUMENT	DATE OF DISTRIBUTION
Previous years documents	Available on our Website
Professional Practice	December 2023
PLC Wiring	December 2023

3.2 Tasks that may be performed during the contest.

- Unpacking and preparation of components including cutting cables to length, stripping of insulation and crimping of ferrules[1]
- Install mechanical modules with proper alignment[1]
- Wire solenoid valves and sensors according to schematics[5]
- Pneumatic tubing for cylinders, valves terminals and service unit according to schematics[5]
- Write PLC programs according to instructions[5, 6]
- Conduct maintenance task by replacing various components in the system
- Debug and troubleshoot the assembly to operate according to instructions[7]
- Optimize the system performance [7]

Skills for Success – [1]Numeracy, [5]Reading, [6]Writing, [7]Problem Solving

4 EQUIPMENT, MATERIAL, CLOTHING

4.1 Equipment and material provided by Skills/Compétences Canada and its partners

- Manufacturing Production Stations (MPS®): A model of a real production system from Festo Didactic.
- Pneumatic Tubing
- Wires
- Ferrules
- Tie-wraps
- Compressed Air
- A 120 VAC power bar will be provided to each team complete with electrical power (15 amps).
- Tubing cutter
- Work pieces (Cylinder and Meter Bodies)

All the equipment and infrastructures provided by Skills/Compétences Canada must be left in the competitor's workspace during the competition.

COMPETITORS WILL BE REQUIRED TO USE THE MATERIAL AND EQUIPMENT PROVIDED BY SCC. ALL OTHER MATERIAL AND EQUIPMENT WILL BE REMOVED FROM THE SKILL AREA.

4.2 Equipment and material provided by the competitor.

- A PLC Programming Computer with PLC programming software. Preprogramed software (software/hardware macros, add-on instructions libraries, any code/files that are not created during the competition, etc.) cannot be used. Only PLC/HMI software, CAD Viewer and Windows will be allowed on this computer. Computers may be inspected by Judges at any time.
- A CAD Viewer Computer (can be the same computer as the PLC programming Computer) with AutoDesk Design Review software (free software) for viewing project 3D files provided at the competition. Preprogramed software (software/hardware macros, add-on instructions libraries, any code/files that are not created during the competition, etc.) cannot be used.
- 2x PLCs with a total of 48 digital inputs and 48 digital outputs (maximum 32 Inputs and 32 Outputs per PLC) and other necessary cables and tools. One PLC will be used for each or multiple MPS Workstations. PLCs must be able to pass tag or data information over a network connection. One of the two PLCs can be replaced with remote IO module.
- A power supply (120 VAC to 24VDC) rated at least 4.5 amps should be used to power each PLC and the MPS station.

- All PLC inputs shall be sinking inputs. The sensors and buttons shall switch (source) +24VDC to each PLC input. Sensors are PNP type and shall source the current and the PLC input module will sink the current.
- All PLC outputs shall be sourcing outputs. The output shall switch (source) +24VDC to turn an individual load on. The load shall sink the current to 0VDC (Ground).
- The PLC outputs should be at least 400 mA. All I/Os are 24VDC.
- Each team will have their own table. Mounting the PLC on a back-plate is recommended.
- See PLC Wiring document posted on the Skills/Compétences Canada web site for more information.
- SysLink cable connectors (IEEE 488) will be connected to the PLCs (6 cables in total)
- Each cable will connect 8 Inputs and 8 Outputs to the PLC: One cable will connect from the PLC to the MPS station containing sensors and actuators. The other cable will connect from the PLC to the control panel, which contains operator devices such as pushbuttons, switches and pilot lights. These cables must be connected to the PLCs before the competition.
- Multimeter (VOM)
- Set of Screwdrivers - recommended:
  - Pozi Drive PZ0, PZ1
  - Philips #0, #1
  - Flat 1.2, 1.6, 2.5, 6 mm
  - Torx T8, T10, T12
- Set of Hex metric keys.
  - Recommended Sizes: 1.5, 2, 2.5, 3, 4, 5, 6, 8, 10 mm
- Set of Open-ended metric wrenches
  - Recommended sizes: 7, 8, 9, 10, 19 mm
- Metric Socket wrenches and/or nut drivers
- Adjustable wrench
- Wire strippers
  - $0.25mm^2$ to $1.5mm^2$ (AWG 24 – 16)
- Side and flush cutters
- Measuring tape or ruler (metric)
- Ferrule crimping tool
- Dustpan and a broom

Note: No Internet connection will be allowed on any computer and no cell phone or tablet can be used during the competition.

4.2.1 Toolboxes Guidelines

One of the objectives of SCC is the sustainability of the Competition. As a result, the toolboxes brought by Competitors will be restricted to the following maximum specifications.
The Competitor toolbox must not exceed 1.6 meters^3 in volume. It can be multiple toolboxes, but the total of all toolboxes must not exceed the maximum volume indicated. There is no exception to this rule. If the Competitor toolbox is larger than what is indicated, the Competitor with the guidance of the NTC, will need to remove items from the toolbox and those items will not be used during the competition. All tools must fit inside one or more toolboxes. Tools outside of a toolbox will not be permitted.

4.3 Required clothing provided by the competitor.

- Competitors are to be dressed in a clean and appropriate manner. The Mechatronics contest recommends that you wear long pants, belt, socks, and must wear close toe shoes
- Jewellery such as rings, bracelets and necklaces or any deemed unsafe by competition judges shall be removed
- Proper shop attire is to be worn (no loose straps, baggy sleeves etc.). Or any item deemed unsafe by competition judges

5 HEALTH AND SAFETY

5.1 Safety program

SCC has implemented a comprehensive safety program as health and safety is an integral part of our competitions. Our safety program includes guidelines and procedures to make the work environment in each skill area safer.

5.1.1 Safety manual

As part of our program a safety manual has been created to monitor and document health and safety within each skill area. It includes a definite plan of action designed to prevent accidents. The safety manual will be provided for every skill and these instructions must be followed and respected by all participants and officials at the SCNC.

5.1.2 Safety workshop

During orientation, Competitors will participate in a Safety workshop and they will be expected to work and maintain a safe working area during the competition. Any Competitor breaking any health, safety, and environmental rules, may be required to undertake a second safety workshop, this will not affect the Competitor's competition time.

5.2 List of required personal protective equipment (PPE) provided by Skills/Compétences Canada

- Safety Glasses

Note: Competitors who do not have the required protective equipment will not be allowed to participate in the competition

5.3 List of required personal protective equipment (PPE) provided by the competitor.

- n/a

6 ASSESSMENT

6.1 Point breakdown

Note: This list is subject to change.

TASKS	/100
Professional Practice	30
Time Evaluation	10
I/O Check and Allocation	30
Expected functionality	30

7 CONTEST SPECIFIC RULES

Contest specific rules cannot contradict or take priority over the Competition Rules. They do provide specific details and clarity in areas that may vary from contest to contest. Any additional contest rules will be reviewed during the competitor orientation.

TOPIC/TASK	CONTEST SPECIFIC RULE
Use of technology - personal laptops, tablets and mobile phones	• Competitors are not allowed to bring personal laptops tablets or mobile phones into the skill area, only the PLC programming computers and the CAD viewing computers will be allowed in the skill area and will remain in the skill area for the duration of the competition • National Technical Committee (NTC) members, Interpreters and judges are allowed to use personal devices in the skill area
Use of technology - Internet	• Competitors are not allowed to use internet in the skill area

Safety	• At the discretion of the National Technical Committee any competitor can be removed from the skill area for not having the proper safety equipment and/or not acting in a safe manner
Second-chance Voucher	• One second chance vouchers will be provided for the complete competition time. • The voucher allows the competitors to get a second evaluation for PLC programs evaluation. They will be allowed to do minor adjustments (2 minutes maximum) to the stations or PLC programs. • In the case where the second chance voucher is used, the first evaluation time will be added to the time used to complete the task.

8 ADDITIONAL INFORMATION

8.1 Interpreter

If a competitor requires the help of an interpreter once onsite during the competition, the Skills/Compétences Canada Provincial/Territorial offices must advise Skills/Compétences Canada National Secretariat a minimum of 1 month prior to the competition or this service may not be guaranteed.

8.2 Ties

- Tiebreaker #1: In the event of a tie, the team with the highest score in “Expected Functionality” over the two days will be declared the winner.
- Tiebreaker #2: If a second tie occurs, the team with the highest score in “Time Evaluation” over the two days will be declared the winner.
- Tiebreaker #3: If a third tie occurs, the team with highest score in “Professional Practices” over the two days will be declared the winner.

8.3 Competition rules

Refer to the competition rules of the Skills Canada National Competition which can be found on our website.

9 NATIONAL TECHNICAL COMMITTEE MEMBERS

MEMBER ORGANIZATION	NAME
Newfoundland and Labrador	Rajendra Jani
Quebec	François-Xavier Bélisle – Co-Chair
Ontario	Josh Hamilton - Chair
Alberta	Jason Kent
British Columbia	Avner Bachar
Nova Scotia	Jean-Guy Dube

Contact the Skills/Compétences Canada national secretariat for any questions or concerns: Nathalie Maisonneuve (nathaliem@skillscanada.com).