



9061

ADVANCED ELECTRICAL  
WIRING METHODS (12C)

40S/40E/40M

An Electrical Trades Technology Course



# 9061: ADVANCED ELECTRICAL WIRING METHODS (12C) 40S/40E/40M

## Course Description

Students will build on the knowledge and skills that they learned in Electrical Wiring Methods. Students will also be introduced to motor controls, PLCs, raceway calculations, voice data video (VDV) structured cabling, as well as retrofitting and/or upgrading existing electrical installations.

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### **Goal 1:** Describe and apply **health and safety** practices.

#### **GLO 1.1:** Describe and apply **health and safety** practices.

SLO 12C.1.1.1: Identify safety and health requirements. (A2.1)

- overview of *The Workplace Safety and Health Act* (“the Act”)
  - rights and responsibilities of employees under the *Act*
  - rights and responsibilities of employers under the *Act*
  - rights and responsibilities of supervisors under the *Act*
- fourteen (14) regulations
- codes of practice
- guidelines
- right to refuse
- Explanation of right to refuse process
  - rights and responsibilities of employees
  - rights and responsibilities of employers
  - rights and responsibilities of supervisors under the *Act*

SLO 12C.1.1.2: Describe the importance of using personal protective equipment (PPE), and identify PPE and procedures related to PPE. (A2.2) (TSA 16)

- employer and employee responsibilities as related to personal protective equipment.
- standards: Canadian Standards Association (CSA), American National Standards Institute (ANSI) and guidelines
- work protective clothing and danger if it fits poorly.
- gloves—Importance of proper glove selection (when handling chemicals, cold items, slivers, etc.)

- headwear—appropriate protective headwear when required and the approved type of headwear
- eye protection—comparison and distinction of everyday eyeglasses, industrial safety glasses and safety goggles
- foot protection—when required according to safety standards
- hearing protection
  - hazards of various noise levels (hearing protection must be worn)
  - laws
  - types of hearing protection
- respiratory protection—types, overview of proper selection
- fall protection—Manitoba requirements standards guidelines
  - ANSI (U.S.A. standards), etc.
- ladders and scaffolding
- safety principles for working with or around industrial trucks site-specific (forklifts, pallet trucks, etc.)

SLO 12C.1.1.3: Outline the safety principles for working on and around electrical equipment. (A2.3) (TSA 18)

- effects of electric current on the human body
- three factors that affect the severity of an electric shock
- the effects of arc and blast on the human body and equipment
- work with energized equipment

SLO 12C.1.1.4: Identify fire safety and outline workplace fire safety principles. (A2.4) (TSA 19)

- types of fires
- types of firefighting equipment
- classifications of fire extinguishers (A, B and C)
- location of fire extinguishers and fire exits
- fire alarms and drills

- SLO 12C.1.1.5: Recognize and control hazards. (A2.6)
- safe work practices
  - basic risk assessment
  - injury prevention and control measures
  - identification of hazards involved in pneumatic tool use and explanation of how to guard against them
- SLO 12C.1.1.6: Identify the hazards in confined spaces and the preparation needed to work in a confined space. (A2.7) (TSA 20)
- identification of a confined space
  - hazards of a confined space
    - physical
    - biological
  - working in a confined space
  - emergency response plan
  - self-contained breathing apparatus (SCBA)
- SLO 12C.1.1.7: Identify first aid/CPR. (A2.8)
- overview of first-aid regulation
  - obligations of employers regarding first aid
    - • Who is certified to provide first aid?
    - • What to do while waiting for help?
    - • Where is first-aid kit?
  - describe basic first-aid requirements and techniques
    - scope and limits of first-aid intervention
    - specific interventions (cuts, burns, abrasions, fractures, suffocation, shock, electrical shock, etc.)
    - What is it?
    - interface with other services and agencies (e.g. Workers Compensation claims)
  - Describe basic Cardiopulmonary Resuscitation (CPR) requirements and techniques
    - How do you get certified?
    - scope and limits of CPR intervention (include varieties of CPR certification)

- SLO 12C.1.1.8: Explain the Workplace Hazardous Material Information System (WHMIS), and identify the safety requirements as they apply to WHMIS. (A2.9) (TSA 13)
- WHMIS is a system
  - Provincial Regulation under The Workplace Safety and Health Act
  - Each province has a WHMIS regulation
  - Federal Hazardous Products Act
  - WHMIS generic training:
    - WHMIS defined and the format used to convey information about hazardous materials in the workplace
    - Information found on supplier and workplace labeling using WHMIS
    - Hazardous materials in accordance with WHMIS
    - Compliance with government safety standards and regulations
  - Description of WHMIS (include varieties of WHMIS Certification)
    - Typology of WHMIS labels, symbols, and classifications
    - Scope and use of Materials Safety Data Sheets (MSDS)
- SLO 12C.1.1.9: Identify and control hazards. (A2.10)
- basic control measures (injury prevention)
  - safe work procedures
  - explanation on the importance of industrial housekeeping
  - employer responsibilities
  - how and where to store materials
  - safety measures related to walkways, stairs and floor openings
  - explanation of how to protect the worker and others when working in traffic paths
- SLO 12C.1.1.10: Create and maintain a safe and organized working environment.
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**GLO 1.2:** Demonstrate awareness of electrical safety as it pertains to the ***Trade Safety Awareness Manual***.

- SLO 12C.1.2.1: Explain the importance of trade safety and health in reducing injuries and fatalities to young employees in Manitoba. (TSA 1)
  - SLO 12C.1.2.2: Describe the rights and responsibilities of employees, employers, and supervisors under the *Workplace Safety and Health Act*. (TSA 2)
  - SLO 12C.1.2.3: Describe the steps to use in the Right to Refuse process. (TSA 3)
  - SLO 12C.1.2.4: Explain how and where to find information on workplace safety and health. (TSA 4)
  - SLO 12C.1.2.5: Demonstrate how to handle a potentially dangerous work situation. (TSA 5)
  - SLO 12C.1.2.6: Explain the S.A.F.E. acronym. (TSA 6)
  - SLO 12C.1.2.7: Define workplace safety and health hazards. (TSA 7)
  - SLO 12C.1.2.8: Give examples of trade-specific workplace safety and health hazards. (TSA 8)
  - SLO 12C.1.2.9: Give examples of five types of safety and health hazards. (TSA 9)
  - SLO 12C.1.2.10: Define workplace safety and health risk. (TSA 10)
  - SLO 12C.1.2.11: Give examples of trade-specific workplace safety and health risks. (TSA 11)
  - SLO 12C.1.2.12: Explain the principles of hazard recognition and control as they apply to the electrical trades. (TSA 12)
  - SLO 12C.1.2.13: Match the WHMIS hazardous materials symbols and their meanings. (TSA 14)
  - SLO 12C.1.2.14: Describe the importance of the Material Safety Data Sheets (MSDS). (TSA 15)
  - SLO 12C.1.2.15: Demonstrate proper selection and use of a variety of personal protective equipment and fall protection systems. (TSA 17)
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**Goal 2:** Demonstrate the safe and appropriate **identification, selection, operation, maintenance, and management of equipment and tools.**

**GLO 2.1:** Demonstrate the safe and appropriate **identification, selection, operation, maintenance, and management of equipment and tools.**

SLO 12C.2.1.1: Demonstrate the safe and appropriate identification, selection, and operation of equipment and tools associated with motor controls.

SLO 12C.2.1.2: Demonstrate the safe and appropriate identification, selection, and operation of equipment and tools associated with various types of raceways.

SLO 12C.2.1.3: Demonstrate the safe and appropriate identification, selection, and operation of equipment and tools associated with retrofitting or upgrading existing electrical installations.

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**Goal 3:** Demonstrate the safe and appropriate **identification, selection, installation, maintenance, and management of devices and materials.**

**GLO 3.1:** Demonstrate the safe and appropriate **identification, selection, installation, maintenance, and management of devices and materials.**

SLO 12C.3.1.1: Demonstrate the safe and appropriate identification, selection, installation, maintenance, and management of motor controls.

SLO 12C.3.1.2: Demonstrate the safe and appropriate identification, selection, installation, maintenance, and management of raceways-associated boxes and devices.

SLO 12C.3.1.3: Demonstrate the safe and appropriate identification, selection, installation, maintenance, and management of retrofitting or upgrading existing electrical installations.

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**Goal 4:** Demonstrate an understanding of **electrical theory**.

**GLO 4.1:** Demonstrate an understanding of **electrical theory**.

- SLO 12C.4.1.1: Demonstrate an understanding of the theory associated with motor controls and PLCs.
- SLO 12C.4.1.2: Demonstrate an understanding of the theory associated with raceways-associated boxes and devices.
- SLO 12C.4.1.3: Demonstrate an understanding of the theory associated with retrofitting or upgrading existing electrical installations.

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**Goal 5:** Demonstrate an understanding of the **design, layout, and interpretation of branch circuits and systems**.

**GLO 5.1:** Demonstrate an understanding of the **design, layout, and interpretation of branch circuits and systems**.

- SLO 12C.5.1.1: Design, lay out, and/or interpret motor controls.
- SLO 12C.5.1.2: Incorporate raceways-associated boxes and devices into an electrical installation.
- SLO 12C.5.1.3: Design, lay out, and/or interpret a retrofit or upgrade to existing electrical installations.

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**Goal 6:** Demonstrate the procedures used to **install and terminate branch circuits and systems**.

**GLO 6.1:** Demonstrate the procedures used to **install and terminate branch circuits and systems**.

- SLO 12C.6.1.1: Install and terminate motor controls.
  - SLO 12C.6.1.2: Install and terminate electrical installations incorporating raceways-associated boxes and devices.
  - SLO 12C.6.1.3: Retrofit or upgrade existing electrical installations.
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**Goal 7:** Demonstrate an understanding of the **testing, troubleshooting, and documentation of branch circuits and systems.**

**GLO 7.1:** Demonstrate an understanding of the **testing, troubleshooting, and documentation of branch circuits and systems.**

SLO 12C.7.1.1: Test, troubleshoot, and document motor controls.

SLO 12C.7.1.2: Test, troubleshoot, and document electrical installations incorporating raceways-associated boxes and devices.

SLO 12C.7.1.3: Test, troubleshoot, and document retrofits or upgrades to existing electrical installations.

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**Goal 8:** Describe and demonstrate the transferable **cross-curricular** knowledge and skills.

**GLO 8.1: Read, interpret, and communicate** information.

No applicable SLOs.

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**GLO 8.2:** Apply the knowledge and skills from **mathematics.**

SLO 12C.8.2.1: Demonstrate the mathematical skills required to bend, cut, and fabricate conduit.

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**GLO 8.3:** Apply the knowledge and skills from the **sciences.**

No applicable SLOs.

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**GLO 8.4:** Apply the knowledge and skills from **information and communication technology.**

No applicable SLOs.

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**Goal 9:** Understand **career opportunities and working conditions.**

**GLO 9.1:** Describe **apprenticeship, education, career opportunities, professional organizations, and working conditions** related to electrical trades technology and associated fields.

SLO 12C.9.1.1: Demonstrate an awareness of the professional organizations related to electrical trades technology and associated fields.

SLO 12C.9.1.2: Demonstrate an awareness of the process for becoming a Red Seal journeyman electrician.

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**Goal 10:** Demonstrate awareness of **sustainability**.

**GLO 10.1:** Describe the impact of **human sustainability** on the health and well-being of tradespersons working in the electrical trades and those who use their services.

SLO 12C.10.1.1: Demonstrate an awareness of the contributions of electricity to contemporary life.

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**GLO 10.2:** Describe the electrical trade's **sustainability practices and impact on the environment**.

SLO 12C.10.2.1: Minimize wastage of materials.

SLO 12C.10.2.2: Participate in a material recycling program.

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**GLO 10.3:** Describe **sustainable business practices** within the electrical trades.

SLO 12C.10.3.1: Demonstrate an understanding of the importance of pricing jobs in order to maximize profits.

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**Goal 11:** Demonstrate awareness of **ethical and legal standards** as they pertain to the electrical trades.

**GLO 11.1:** Demonstrate awareness of **ethical and legal standards**.

SLO 12C.11.1.1: Demonstrate an awareness of the importance of following contract agreements (verbal and written), including quality of work and materials used.

SLO 12C.11.1.2: Demonstrate an awareness of the legal requirements related to the electrical trades, including the installation of non-CSA approved equipment.

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**GLO 11.2:** Demonstrate an understanding of **electrical codes**.

No applicable SLOs.

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**Goal 12: Demonstrate **employability skills**.****GLO 12.1: Demonstrate **fundamental employability skills**.**

- SLO 12C.12.1.1: Demonstrate regular and punctual attendance.
  - SLO 12C.12.1.2: Demonstrate the ability to communicate respectfully and effectively with teachers, supervisors, co-workers, and students.
  - SLO 12C.12.1.3: Demonstrate accountability by taking responsibility for their actions.
  - SLO 12C.12.1.4: Demonstrate adaptability, initiative, and effort.
  - SLO 12C.12.1.5: Demonstrate teamwork skills.
  - SLO 12C.12.1.6: Demonstrate the ability to stay on task and effectively use time in class and work environments.
  - SLO 12C.12.1.7: Demonstrate the responsible use of wireless communication devices.
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**GLO 12.2: Demonstrate an awareness of **cultural competence** and its importance in the workplace.**

- SLO 12C.12.2.1: Demonstrate an awareness of the principles of cultural proficiency.
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**GLO 12.3: Demonstrate an understanding of the **business operation** of an electrical trades facility.**

- SLO 12C.12.3.1: Estimate time required to complete assigned task.
  - SLO 12C.12.2.2: Demonstrate basic estimating techniques.
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**GLO 12.4: Demonstrate **critical thinking skills** in planning, procedures, analysis, and diagnosis.**

- SLO 12C.12.4.1: Demonstrate critical-thinking skills.
  - SLO 12C.12.4.2: Use a variety of strategies in order to diagnose and solve problems.
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**Goal 13: Understand the **evolution, technological progression, and emerging trends** in the electrical trades.****GLO 13.1: Understand the **evolution, technological progression, and emerging trends** in the electrical trades.**

- SLO 12C.13.1.1: Demonstrate an awareness of the evolution, technological progression, and emerging trends in alternative wiring methods.
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