National Occupational Standard
Solar Thermal Hydronic Installer

Electricity Human Resources Canada is a non-profit organization supporting the human resources needs of the Canadian electricity sector.

Our Vision

Keeping the lights on in Canada by preparing and empowering a world-class workforce for the entire electricity industry.

Our Mission

Working to strengthen the ability of the Canadian electricity industry in meeting current and future needs for their workforce—one that is safety-focused, highly skilled, diverse and productive.

Our Values

We are a values-driven organization, committed to the improvement of our sector, the growth of Canada's economy, and the stability of our power grid. Our core values are:

Collaboration
Working with all stakeholders in Canada's electricity sector for our mutual benefit.

Trust
Forging relationships and products built on unwavering integrity.

Innovation
Leading the industry to be future-ready.

National Occupational Standards (NOS)

NOS are voluntary guidelines that have been developed to provide businesses, educators, trainers, and job seekers with practical guidance.

How are NOS used?

Employers, employees, and educational institutions can put NOS to a wide variety of uses supporting effective workforce planning:

- Support personnel certification or accreditation programs.
- Inform curricula for colleges and apprenticeships.
- Assist recruitment by informing job descriptions and providing a benchmark for employee appraisals.
- Identify career paths in order to promote employee retention.
- Help employers evaluate and determined the competencies of potential employees, including Internationally Trained Workers (ITWs).

Electricity Human Resources Canada has developed National Occupational Standards for a range of in-demand occupations.

Visit **electricityhr.ca** for more information.

Key Terms within the National Occupational Standard:

Major Category	A general functional area within the industry
Competency Area	A specific area of responsibility within a Major Category
Competency Unit	A specific task that contains a description of the knowledge and performance components that are needed for successful, safe and effective completion

Each Competency within the National Occupational Standard is made up of (some or all of) the following elements:

- **Purpose:** A statement that describes what the competency is, and why it is important.
- **Performance:** What a job incumbent must be able to do to perform the competency.
- **Knowledge:** What a job incumbent must know to perform the competency.
- **Glossary:** Definitions for key terms used in the competency.
- **Range of Context:** Specific variables or situations that may impact the way that the competency is performed.
- **Level of Practice:** The level of job incumbent that typically performs the competency.
- **Adapted Bloom's Taxonomy:** The level of cognitive performance required for the competency (of particular interest to trainers/educators).
- **RWATEM:** The Requisite Work Aids, Tools, Equipment and Materials used by job incumbents to perform the competency.

Chart of Competency: Solar Thermal Hydronic Installer

This Chart outlines the competencies (also known as skills and knowledge) that are performed by Solar Thermal Hydronic Installers.

Occupational Definition:

Solar Thermal Hydronic Installers install customized systems that collect radiant heat from the sun at low, medium, or high temperatures for a variety of heating purposes in residential, commercial or light industrial settings. The solar thermal collectors may be mounted on the ground or built on the roof or walls of buildings. The heat is transferred from the collectors throughout the system using a heat transfer fluid.

Key: Overlap with trades – Tasks included in trade national occupational analyses (i.e. Industrial and Construction Electricians) that are also performed or sub-contracted by Solar Thermal Hydronic Installers

Major Category	Competency Area	Competency Unit					
Construction and Installation	Plan Installation	Organize materials and equipment for installation	Coordinate installation activities	Examine site conditions			
	Perform Foundational Electrical Tasks	Fabricate support structures	Install brackets, hangers and fasteners	Install conductors and cables	Install conduit, tubings and fittings	Install raceways	Install boxes and enclosures
	Install Solar Thermal System	Install solar collector mounting system	Install solar collectors	Install piping	Install mechanical and plumbing equipment, and solar storage tanks	Install controls, sensor wires and sensors	Charge solar thermal hydronic system
		Install insulation					
	Install Control Systems	Install discrete input/output (I/O) devices	Install analog input/output (I/O) devices	Install automated control systems	Program automated control systems		
	Install Wiring Systems	Install HVAC controls	Install cathodic protection systems				
	Complete Installation Process	Troubleshoot installation issues	Install operation and identification tags				
	Commission Equipment and Systems	Verify equipment/system operation and functionality	Document equipment/system performance	Perform site cleanup	Demonstrate system to client/end-user		
Safety	Maintain a Safe Working Environment	Follow safe work practices	Use Personal Protective Equipment (PPE)	Participate in safety meetings and emergency drills	Isolate component, equipment or system	Perform lock-out tag-out procedures	Handle, transport and store hazardous materials
		Use fall arrest equipment	Work in confined spaces				
	Maintain a Sustainable Environment	Follow sustainable work practices					
	Respond to Emergencies	Respond to chemical spills and leaks	Respond to non-electrical emergencies	Participate in high-angle rescue	Participate in incident and accident investigations		
Security	Follow Security Practices	Follow security practices for physical work environment	Follow cybersecurity procedures				
Organizational Policies and Procedures	Follow Organizational Policies and Procedures	Follow organizational policies and procedures					
Information/Record Management	Complete Information/Record Management Tasks	Maintain technical information and data					
Information and Communication Technology Foundations	Use Digital Technology	Use communication applications	Use common software applications	Use navigation and mapping applications	Use digital mobile radios		
	Use Organization's ICT System	Use organization's ICT system					
Foundational Trade Skills	Perform Routine Trade Tasks	Use hand and power tools	Use electrical measuring and testing equipment	Use access equipment and work platforms	Operate vehicles and motorized equipment	Lubricate equipment and components	Assist with rigging, hoisting/lifting and moving tasks
Personal Competencies	Demonstrate Professionalism	Work as member of a team	Develop professionally	Demonstrate professional and ethical conduct	Mentor/coach others	Manage stress	Manage time
	Communicate Effectively	Use active listening skills	Use speaking skills	Use hand signals	Use writing skills	Negotiate with internal and external stakeholders	Exchange information with internal and external stakeholders

Major Category	Construction and Installation
Competency Area	Plan Installation
Competency Unit	Organize materials and equipment for installation

Purpose

Organizing material and equipment for an installation is important to ensure everything is ready to begin the installation. This helps to ensure that the installation is completed efficiently and safely.

Performance/Abilities

P1 Determine materials and equipment needed, for example:
- analyze technical drawings and specifications
- reference job plan
- size equipment and components
- access material lists of suppliers and pricing based on system specifications

P2 Ensure availability of materials and equipment for installation:
- use inventory/procurement system, i.e. ordering and purchasing procedures
- schedule delivery, as required

P3 Coordinate delivery of materials and equipment on site, as required:
- verify delivery matches order, e.g. type, quantity
- document delivery
- inspect materials and equipment for damage
- contact purchasing department or suppliers for replacements, as required

P4 Stage materials and equipment on site:
- coordinate with other tradespeople
- secure materials and equipment

P5 Stock vehicle(s)/equipment, as required:
- ensure standard stocking levels are met, if required
- ensure required site-specific materials and equipment are in vehicle(s)/equipment
- organize materials and equipment within vehicle(s)/equipment

P6 Communicate issues with obtaining materials and equipment to appropriate personnel, e.g. project manager, general contractor, client, supplier

Knowledge

K1 Organization policies, procedures and plans, e.g. purchasing procedures, emergency plan
K2 Relevant CSA Standards, e.g. Canadian Electrical Code (CE code)
K3 Jurisdictional requirements, including permit requirements, e.g. OH&S
K4 Manufacturer's specifications for equipment and system being installed
K5 Other documents relevant to the installation, e.g. technical drawings, client requirements
K6 Organizational document management system
K7 Inspection procedures for materials and equipment, including common issues with materials and equipment
K8 Site/installation requirements
K9 Sensitive areas/areas to be avoided on-site, e.g. first nations, archeological

Contextual Variables

Range of Context

- Number and types of materials and equipment will vary with size/scope of the project. For example, commercial installation has more complexity, different types of material used, and more individuals to coordinate with. The scope of commercial work is larger than residential.
- Job specifications and on-site conditions can vary the way this skill is performed.

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☐ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☐ Apply
- ☒ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Manufacturer's specifications
- Technical drawings, specifications and equipment lists
- Software, e.g. identification and documentation of equipment on site
- Clipboard/paper

Major Category	Construction and Installation
Competency Area	Plan Installation
Competency Unit	Coordinate installation activities with others

Purpose

Coordinating installation activities is important to ensure that all involved with the installation are aware of their roles and responsibilities. This helps to ensure that the installation is completed efficiently and safely.

Performance/Abilities

P1 Review installation plan with sub-trades, customers, contractors, and suppliers, as required:
- provide own qualifications, as required
- reference technical drawings and specifications, as required
- reference job plan, as required

P2 Modify installation plan based on discussions, as required

P3 Coordinate activities with co-workers

P4 Coordinate activities with General Contractor (GC) and sub-trades, as required:
- follow established communication protocols

P5 Coordinate activities with suppliers:
- consider logistics and timing requirements of goods and services
- confirm arrival of goods and services

P6 Coordinate activities with homeowner/building operator, as required:
- consider impact of installation on surrounding environment and properties

P7 Interact with inspectors, as required

P8 Complete documentation, for example:
- make notes on paper or app
- modify plan
- obtain email confirmation
- record changes to calendar

Knowledge

K1 Organization policies, procedures and plans, e.g. communication protocols

K2 Organization/project goals, vision and status

K3 Relevant CSA Standards, e.g. Canadian Electrical Code (CE code)

K4 Relevant qualifications/certifications for the installation

K5 Jurisdictional requirements, including permit requirements

K6 Manufacturer's specifications for system being installed

K7 Organizational document management system

K8 Documents relevant to the installation, e.g. technical drawings, client requirements, scope of work

K9 Roles and responsibilities of all involved in installation, for example:
- client
- sub-trades
- contractors
- suppliers

- co-workers
- inspectors

K10 Applicable regulatory agencies responsible for inspections

K11 Inspection stages of installation

Contextual Variables

Range of Context

- Types of individuals and number of individuals involved with an installation will vary with the size and complexity of the work.
- More coordination may be required for large projects or for installations that encounter unusual conditions.
- Commercial installation has more complexity, different types of material used, and more individuals to coordinate with. The scope of work is larger than residential.

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☒ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☒ Apply
- ☐ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Communication tools, e.g. email, telephone
- Cell phone apps
- Calendars

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Major Category	Construction and Installation
Competency Area	Plan Installation
Competency Unit	Examine site conditions

Purpose

Examining site conditions is important to ensure the installation proceeds safely and efficiently. If this is not performed correctly, it can cause considerable project delays.

Performance/Abilities

P1 Wear appropriate PPE for site, e.g. steel-toed boots, hard hat

P2 Verify that appropriate permits have been obtained for the installation, e.g. building

P3 Verify location of utilities, as required:
- contact appropriate utilities and jurisdictional authorities to obtain locates or clearance number
- lay out location on site map

P4 Confirm existence of other buried services with client, if required, e.g. septic field, communication lines, cistern

P5 Verify property lines, easements and boundaries, if required:
- refer to legal maps

P6 Verify other relevant approvals have been obtained, as required, e.g. homeowners' association, right of way

P7 Verify location(s) of existing equipment and services, as required, e.g. refrigeration lines, hydronic lines, cable runs, electrical service interface

P8 Discuss installation with client/representative to confirm installation plan

P9 Coordinate installation activities with others, e.g. location of equipment

P10 Inspect site environmental conditions, e.g. dampness, temperature, ice, wind, snow:
- analyze against plans and specifications
- ensure situation is safe to proceed

P11 Communicate changes to designer, as required:
- modify design documents and submit for approval, as required
- justify need for modifications, e.g. provide data

P12 Ensure work is ready to begin on installation, including:
- potential hazards identified
- traffic areas identified
- required materials and equipment on site
- barricades and signage around work zone
- access control on work site and storage areas, e.g. locked gate, as required
- sufficient lighting and ventilation, as required

P13 Document site conditions, as required:
- note deficiencies

Knowledge

K1 Organization policies, procedures and plans, e.g. safety protocols

K2 Relevant CSA Standards, e.g. Canadian Electrical Code (CE code)

K3 Jurisdictional requirements, including permit requirements

K4 Manufacturer's specifications for equipment and system being installed

K5 Other documents relevant to the installation, e.g. technical drawings, client requirements, scope of work

K6 Industry best practices for specific installation

K7 Organizational document management system

K8 Roles and responsibilities of all involved in installation, for example:
- client
- sub-trades
- contractors
- suppliers
- co-workers
- inspectors

K9 Potential safety hazards and mitigation strategies

Glossary

- **Locates:** ground markings identifying the position of utility lines based on records or electronic locating equipment.

Contextual Variables

Range of Context

- This competency may be simple or complex depending upon the type and size of installation, and specific installation site.

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☐ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☐ Apply
- ☒ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Manufacturer's specifications
- Site maps
- Technical drawings

Major Category	Construction and Installation
Competency Area	Perform Foundational Electrical Installation Tasks
Competency Unit	Fabricate support structures

Purpose

Fabricating support structures is important to protect and support equipment and components. Properly fabricated support structures reduce damage to equipment and structures, as well as injury to persons.

Performance/Abilities

P1 Wear appropriate PPE, e.g. safety glasses, hard hat, fall arrest equipment

P2 Select appropriate tools according to task, manufacturers' specifications, engineered drawings, and site

P3 Identify support structure requirements and materials according to task, manufacturers' specifications, engineered drawings, and site conditions

P4 Confirm capacity of equipment to ensure it meets requirements of support structure size, strength and weight

P5 Verify plans for support structure

P6 Confirm presence of required materials for support structure and their appropriateness by comparing to:
- job specifications and plans
- environment
- strength and durability ratings

P7 Review installation location:
- review installation plan
- measure installation site
- plan how to avoid obstructions

P8 Prepare material for support structure, for example:
- cut to size
- drill holes

P9 Assemble material to create structure:
- ensure structure is straight and free of sharp edges

P10 Install support structure according to industry best practices, ensuring they are:
- level
- square
- following building lines

P11 Inspect finished support structure to ensure it meets requirements

P12 Communicate issues to relevant personnel, e.g. co-workers, project manager

P13 Clean tools after use, as required

P14 Store tools and supplies in designated location

Knowledge

K1 Organization's policies, procedures and plans, e.g. safety protocols

K2 Relevant standards and regulations, e.g. Canadian Standards Association standards, Underwriters Laboratories of Canada standards, Canadian Electrical Code (CE code), building code

K3 Required permits

K4 Manufacturer's specifications for equipment and system being installed

K5 Other documents relevant to installation, e.g. technical drawings, client requirements

K6 Industry best practices for fabricating support structures

K7 Organization's information/record management system

K8 Types of safety hazards on site

K9 Types of safety hazards associated with fabricating support structures, for example:
- grinding
- cutting
- power tools
- solvents
- ballasts

K10 PPE required for specific tasks

K11 Types of material, e.g. wood, steel, aluminum

K12 Types of brackets, hangers and fasteners, e.g. their characteristics and applications

K13 Characteristics of different materials, e.g. weight, hardness, conductivity

K14 Types of shop equipment and tools and their applications, e.g. grinders, power metal saws, drills

K15 Terminology related to shop equipment and tools

K16 Measurement and layout techniques

K17 Procedures used to fabricate support structures

K18 Hoisting and lifting techniques

K19 Different types of roof configurations and materials and their impact on safety and installation procedures

K20 Torqueing and tensioning techniques, e.g. pneumatics, mechanical means

Glossary

- **Industry best practices:** methods that meet or exceed jurisdictional requirements, e.g. Canadian Electrical Code (CE code), bylaws.

CONTEXTUAL VARIABLES

Range of Context

- Materials used to create support structures will vary, e.g. steel, wood, aluminum.
- Tools used to create support structures will vary.
- Weather and site conditions can affect the way this skill is performed.

Level of Practice

- ☒ Frontline
- ☐ Supervisor
- ☐ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☐ Apply
- ☐ Analyze
- ☐ Evaluate
- ☒ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- PPE, e.g. safety glasses, hard hat, fall arrest equipment
- Shop equipment, tools and attachments, e.g. hand saws, drills, chop saws, grinders, screw drivers, wrenches
- Materials for support structure, e.g. wood, steel aluminum, brackets, hangers
- Fasteners, e.g. anchors, nuts, bolts, screws
- Sealants, e.g. tar products, silicone
- Hoisting and lifting equipment

Major Category	Construction and Installation
Competency Area	Perform Foundational Electrical Installation Tasks
Competency Unit	Install brackets, hangers and fasteners

Purpose

Installing brackets, hangers and fasteners correctly is important to protect and support equipment and components.
This reduces hazards including the risk of damage to equipment and structures, as well as the risk of injury to persons.

Performance/Abilities

P1 Wear appropriate PPE, e.g. safety glasses, hard hat, fall arrest equipment

P2 Select appropriate tools to install or remove fastening and retaining devices

P3 Select brackets, hangers and fasteners according to task, manufacturer's specifications, engineered drawings, and site conditions

P4 Review installation location:
  • review installation plan
  • measure installation site
  • plan how to avoid obstructions

P5 Secure brackets, hangers and fasteners to structure according to industry best practices, ensuring they are:
  • level
  • square
  • following building lines

P6 Communicate issues to relevant personnel, e.g. co-workers, project manager

P7 Clean tools after use, as required

P8 Store tools and supplies in designated location

Knowledge

K1 Organization policies, procedures and plans, e.g. safety protocols

K2 Relevant standards and regulations, e.g. Canadian Standards Association standards, Underwriters Laboratories of Canada standards, Canadian Electrical Code (CE code), building code

K3 Required permits

K4 Manufacturer's specifications for system being installed

K5 Other documents relevant to installation, e.g. technical drawings, client requirements

K6 Industry best practices for installing brackets, hangers and fasteners

K7 Organizational document management system

K8 Types of safety hazards on site

K9 Types of safety hazards associated with brackets, hangers and fasteners

K10 Types of brackets, hangers and fasteners, their characteristics and applications

K11 Measurement and layout techniques

K12 Consequences of using incorrect brackets, hangers and fasteners, or installing them incorrectly

K13 PPE required for specific tasks

K14 Terminology related to brackets, hangers and fasteners

K15 Hoisting and lifting techniques

K16 Different types of roof configurations and materials and their impact on safety and installation procedures

K17 Torquing and tensioning techniques, e.g. pneumatics, mechanical means

Glossary

• **Industry best practices:** methods that meet or exceed jurisdictional requirements, e.g. Canadian Electrical Code (CE code), bylaws.

CONTEXTUAL VARIABLES

Range of Context

• Weather and site conditions can affect the way this skill is performed.
• Brackets can be installed with support structures or conductors and cables.

Level of Practice

☒ Frontline
☐ Supervisor
☐ Manager/Executive

Adapted Bloom's Taxonomy

☐ Recall, Remember   ☐ Analyze
☐ Understand   ☐ Evaluate
☒ Apply   ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

• PPE, e.g. safety glasses, hard hat, fall arrest equipment
• Site plans and drawings
• Hangers, e.g. trapezes, pipe clamps, beam clamps
• Brackets, e.g. angle brackets, T-brackets, L-brackets, floor brackets, ceiling brackets
• Fasteners, e.g. spring nuts, bolts, screws, concrete anchors
• Hand and power tools, e.g. measuring tape, screwdriver, power drill, wrenches
• Hoisting and lifting equipment

Major Category	Construction and Installation
Competency Area	Perform Foundational Electrical Installation Tasks
Competency Unit	Install conductors and cables

Purpose

Installing conductors and cables correctly is important to ensure proper operation and safety of equipment.

Performance/Abilities

P1   Wear appropriate PPE, for example:
- safety glasses
- hard hat
- fall arrest equipment
- arc flash clothing
- rubber gloves

P2   Select appropriate tools for installing conductors and cables

P3   Select correct size, type and number of conductors and cables for task, considering:
- Canadian Electrical Code (CE code) requirements
- site-specific conditions
- jurisdictional requirements
- drawings and technical specifications
- organization and client requirements

P4   Install conductors, cables and associated components (e.g. fittings, supports, plates) according to industry best practices, site conditions and CE code

P5   Prepare conductors and cables for termination:
- clean, as required

P6   Terminate conductors and cables according to industry best practices

P7   Update documentation, as required, e.g. as-builts, warning labels, fire plan

P8   Remove existing conductors, cables and associated components, as required:
- dispose of components according to organization's policy

P9   Label conductors, cables and associated components and all parts integral to system

P10 Communicate issues to relevant personnel, e.g. co-workers, project manager

P11 Clean tools after use, as required

P12 Store tools and supplies in designated location

P13 Types of conductors, cables and associated components, their characteristics and applications

Knowledge

K1   Organization policies, procedures and plans, e.g. safety protocols

K2   Relevant standards and regulations, e.g. Canadian Standards Association standards, Underwriters Laboratories of Canada standards, Canadian Electrical Code (CE code), building code

K3   Required permits

K4   Manufacturers' specifications for equipment and system being installed

K5   Other documents relevant to the installation, e.g. technical drawings, client requirements

K6   Tasks that require trades certification

K7   Industry best practices for installing conductors and cables

K8   Organization's information/record management system

K9   Types of safety hazards on site

K10 Color-coding used to identify conductors and cables

K11 Installation procedures for conductors and cables

K12 Consequences of incorrectly installing conductors and cables

K13 PPE required for specific tasks

K14 Terminology related to conductors and cables

Glossary

- **Industry best practices:** methods that meet or exceed jurisdictional requirements, e.g. Canadian Electrical Code (CE code), bylaws.

CONTEXTUAL VARIABLES

Range of Context

- Weather, site and installation conditions (e.g. hazardous, wet, underground) can affect the way this competency is performed.
- **In some jurisdictions, performance of some tasks in this competency may require certification in the electrical trade.**

Level of Practice

- ☒ Frontline
- ☐ Supervisor
- ☐ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☒ Apply
- ☐ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- PPE, e.g. safety glasses, hard hat, fall arrest equipment, arc flash clothing, rubber gloves
- Conductors and cables
- Components for conductor and cable installation, e.g. mechanical fittings, compression fittings, supports, straps, connectors, hangers, heat shrink, anti-oxidant compounds, non-ferrous and/or non-conductive plates and connectors
- Tools, e.g. drills, pipe bender, hammer drill
- Documentation, e.g. schematics, panel schedules, log sheets, shop drawings, terminal identification, warning labels, as-builts

Major Category	Construction and Installation
Competency Area	Perform Foundational Electrical Installation Tasks
Competency Unit	Install conduit, tubings and fittings

Purpose

Installing conduit, tubings and fittings correctly is important to protect wiring and to prevent damage to property, personal injury, or death.

Performance/Abilities

P1 Wear appropriate PPE, e.g. gloves, eye protection, hard hat, high visibility vest

P2 Select appropriate tools for installing conduit and tubing

P3 Select correct size and type of conduit, tubing and fittings for task, considering:
- Canadian Electrical Code (CE code) requirements
- site-specific conditions
- jurisdictional requirements
- drawings and technical specifications
- organization and client requirements

P4 Determine routing of conduit and tubing, considering:
- suitability for application
- other tradesperson's activities

P5 Measure conduit and tubing according to industry best practices:
- size for installation, as required e.g. cut, thread, bend conduit or tubing

P6 Assemble conduit, tubing and fittings according to industry best practices

P7 Install conduit, tubing and fittings according to industry best practices and site conditions:
- position conduit and tubing
- mount conduit and tubing, e.g. ensure support is provided

P8 Update documentation, as required, e.g. as-builts

P9 Remove existing conduit and tubing, as required:
- dispose of according to organizational policy

P10 Communicate issues to relevant personnel, e.g. co-workers, project manager

P11 Clean tools after use, as required

P12 Store tools and supplies in designated location

Knowledge

K1 Organization policies, procedures and plans, e.g. safety protocols

K2 Relevant CSA Standards, e.g. Canadian Electrical Code (CE code)

K3 Jurisdictional requirements, including permit requirements

K4 Manufacturer's specifications for equipment and system being installed

K5 Client requirements

K6 Industry best practices for installing conduit and tubing

K7 Organizational information/record management system

K8 Types of safety hazards on site

K9 Types of conduit and tubing, their characteristics and applications

K10 Installation procedures for conduit and tubing

K11 Consequences of incorrectly installing conduit and tubing

K12 PPE required for specific tasks

K13 Terminology related to conduit and tubing

Glossary

- **Industry best practices:** methods that meet or exceed jurisdictional requirements, e.g. Canadian Electrical Code (CE code), bylaws.

CONTEXTUAL VARIABLES

Range of Context

- Weather, site and installation conditions (e.g. hazardous, wet, underground, indoor) can affect the way this competency is performed.
- Types of conduit and tubing vary (e.g. rigid metal, rigid Poly Vinyl Chloride (PVC), electrical metallic tubing (EMT), coated rigid, non-metallic flex) and this affects the performance of this competency, i.e. procedures for sizing.
- **In some jurisdictions, performance of some tasks in this competency may require certification in the electrical trade.**

Level of Practice

- ☒ Frontline
- ☐ Supervisor
- ☐ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☒ Apply
- ☐ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- PPE, e.g. gloves, eye protection, hard hat, high visibility vest, as site requires
- Required conduit and tubing
- Fittings
- Tools, e.g. drills, hand tools, explosive-actuated tools
- Documentation, e.g. schematics, technical drawings, prints, manufacturer's specifications

Major Category	Construction and Installation
Competency Area	**Perform Foundational Electrical Installation Tasks**
Competency Unit	**Install raceways**

Purpose

Installing raceways correctly is important to protect wiring and to prevent damage to property and personal injury or death.

Performance/Abilities

P1 Wear appropriate PPE, e.g. gloves, hard hat, eye protection

P2 Select appropriate tools for installing raceways

P3 Select correct size and type of raceway for task, considering:
  • Canadian Electrical Code (CE code) requirements
  • site-specific conditions
  • jurisdictional requirements
  • drawings and technical specifications
  • organization and client requirements

P4 Determine routing of raceways, considering:
  • suitability for application
  • other tradesperson's activities

P5 Measure raceways according to industry best practices:
  • size for installation, as required e.g. cut or form raceway

P6 Assemble raceways according to industry best practices

P7 Install raceways according to industry best practices and site conditions:
  • position raceways
  • mount raceways, e.g. ensure support is provided

P8 Update documentation, as required, e.g. as-builts

P9 Remove existing raceways, as required:
  • dispose of according to organizational policy

P10 Communicate issues to relevant personnel, e.g. co-workers, project manager

P11 Clean tools after use, as required

P12 Store tools and supplies in designated location

Knowledge

K1 Organization policies, procedures and plans, e.g. safety protocols

K2 Relevant CSA Standards, e.g. Canadian Electrical Code (CE code)

K3 Jurisdictional requirements, including permit requirements

K4 Manufacturer's specifications for equipment and system being installed

K5 Client requirements

K6 Industry best practices for installing raceways

K7 Organizational information/record management system

K8 Types of safety hazards on site

K9 Types of raceways, their characteristics and applications

K10 Installation procedures for raceways

K11 Consequences of incorrectly installing raceways

K12 PPE required for specific tasks

K13 Terminology related to raceways

Glossary

• **Industry best practices:** methods that meet or exceed jurisdictional requirements, e.g. Canadian Electrical Code (CE code), bylaws.

CONTEXTUAL VARIABLES

Range of Context

• Weather, site and installation conditions (e.g. hazardous, wet, underground, indoor) can affect the way this competency is performed.
• Types of raceways vary (e.g. cable-tray wireways, underfloor raceways, busways, cellular raceways, surface raceways), which affects the performance of this competency, i.e. procedures for sizing.
• **In some jurisdictions, performance of some tasks in this competency may require certification in the electrical trade.**

Level of Practice

- ☒ Frontline
- ☐ Supervisor
- ☐ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☒ Apply
- ☐ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

• PPE, e.g. gloves, hard hat, eye protection, as site requires
• Required raceways
• Raceway components, e.g. fittings, supports
• Tools, e.g. drills, hand tools
• Documentation, e.g. schematics, as-builts, technical drawings, manufacturer's specifications

Major Category	**Construction and Installation**
Competency Area	**Perform Foundational Electrical Installation Tasks**
Competency Unit	**Install boxes and enclosures**

Purpose

Installing boxes and enclosures correctly is important to protect wiring, connections and controls. Properly installed boxes and enclosures can prevent damage to property and personal injury or death.

Performance/Abilities

P1   Wear appropriate PPE, e.g. hard hats, eye protection, gloves

P2   Select appropriate tools for installing boxes and enclosures

P3   Select correct size and type of box/enclosure for task, considering:

- Canadian Electrical Code (CE code) requirements
- site-specific conditions
- jurisdictional requirements
- drawings and technical specifications
- organization and client requirements

P4   Determine installation location of boxes and enclosures, considering:

- suitability for application
- other tradesperson's activities

P5   Assemble boxes and enclosures according to industry best practices

P6   Install boxes and enclosures according to industry best practices and site conditions:

- position boxes and enclosures
- mount boxes and enclosures, e.g. ensure support is provided

P7   Update documentation, as required e.g. as-builts

P8   Remove existing boxes and enclosures, as required:

- dispose of according to organizational policy

P9   Communicate issues to relevant personnel, e.g. co-workers, project manager

P10 Clean tools after use, as required

P11 Store tools and supplies in designated location

Knowledge

K1   Organization policies, procedures and plans, e.g. safety protocols

K2   Relevant CSA Standards, e.g. Canadian Electrical Code (CE code)

K3   Jurisdictional requirements, including permit requirements

K4   Manufacturer's specifications for equipment and system being installed

K5   Client requirements

K6   Industry best practices and procedures for installing boxes and enclosures

K7   Organizational information/record management system

K8   Types of safety hazards on site

K9   Types of boxes and enclosures, their characteristics and applications

K10 Consequences of incorrectly installing boxes and enclosures

K11 PPE required for specific tasks

K12 Terminology related to boxes and enclosures

Glossary

- **Industry best practices:** methods that meet or exceed jurisdictional requirements, e.g. Canadian Electrical Code (CE code), bylaws.

CONTEXTUAL VARIABLES

Range of Context

- Weather, site and installation conditions (e.g. hazardous, wet, underground, indoor) can affect the way this competency is performed.
- **In some jurisdictions, performance of some tasks in this competency may require certification in the electrical trade.**

Level of Practice

- ☒ Frontline
- ☐ Supervisor
- ☐ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☒ Apply
- ☐ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- PPE, e.g. hard hats, eye protection, gloves
- Required boxes and enclosures
- Fittings/supports for boxes and enclosures
- Tools, e.g. drills, hand tools, explosive-actuated tools
- Documentation, e.g. schematics, technical drawings, manufacturer's specifications

Major Category	Construction and Installation
Competency Area	Install Solar Thermal Hydronic System
Competency Unit	Install solar collector mounting system

Purpose

Installing the solar collector mounting system correctly is important to ensure the safety of persons, equipment and structures. Incorrect installation of the mounting system can cause damage to equipment and structures and injury to persons.

Performance/Abilities

P1 Wear appropriate PPE, e.g. steel-toe boots, hard hat, fall arrest equipment, safety glasses

P2 Verify placement of mounting system on roof, ground or structure, if required:
- review plans and specifications
- review site plan, e.g. amount of shade, site topography
- confirm roof type and pitch for roof mounts
- confirm soil conditions and stability for ground mounts
- identify location of existing rafters/supports, as required, e.g. visually inspect, use stud finder, use echo location
- measure roof or structure
- mark placement of assembly to be installed, e.g. use chalk line
- refer to manufacturer's specifications for mounting zones

P3 Install mounting system according to industry best practices on roof, ground or structure:
- use roofing procedures for specific roof type, as required, e.g. shingles
- ensure installation area is free of debris, e.g. nails, screws
- assemble components, as required by design and manufacturers' specifications, e.g. torque nuts to manufacturers' specifications
- attach to anchor points, e.g. rafters, screw pile

P4 Communicate issues to appropriate personnel, e.g. project manager, manufacturer's representative

Knowledge

K1 Organization's policies, procedures and plans, e.g. communication protocols

K2 Organization's information/record management system

K3 Relevant standards and regulations, e.g. Canadian Standards Association standards, Underwriters Laboratories of Canada standards, Canadian Electrical Code (CE code), building code

K4 Required permits

K5 Manufacturer's specifications for system being installed, i.e. operational function and installation requirements of solar thermal hydronic systems

K6 Other documents relevant to installation, e.g. technical drawings, client requirements

K7 Industry best practices for installing solar collector mounting system, for example:
- stand-off
- rack
- lag-bolt
- j-bolt
- ground mounts
- wall mounts
- roof mounts

K8 Assembly procedures for mounting systems

K9 Fundamentals of solar radiation

K10 Structural principles that affect solar thermal hydronic technologies

K11 Roof types and how they impact installation

K12 Wind and snow loads

K13 Impacts of soil conditions on types of support structures

K14 Footings or piles used for solar thermal hydronic installations

Glossary

- **Hydronic:** a heating or cooling system in which heat is transported using circulating heat transfer fluid, e.g. water, glycol.
- **Industry best practices:** methods that meet or exceed jurisdictional requirements, e.g. Canadian Electrical Code (CE code), bylaws.

CONTEXTUAL VARIABLES

Range of Context

- Older buidings or structures may not be strong or straight enough, or have rafters or supports that are not strong or straight enough, to support the weight of a solar system. Such situations could affect the performance of this competency.
- Complexity of this task will vary with type and size of system being installed and on-site conditions.
- When installing ground installations, soil conditions may affect how this competency is performed.

Level of Practice / Adapted Bloom's Taxonomy

Level of Practice	Adapted Bloom's Taxonomy	
☒ Frontline	☐ Recall, Remember	☒ Analyze
☐ Supervisor	☐ Understand	☐ Evaluate
☐ Manager/Executive	☐ Apply	☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Manufacturers' specifications
- PPE, e.g. steel-toe boots, hard hat, fall arrest equipment, safety glasses
- Measuring tools, e.g. tape measure, level
- Hand and power tools, e.g. drill, wrenches
- Solar thermal hydronic mounting assembly, e.g. railings, brackets
- Hoisting and lifting equipment
- Compass

Major Category	Construction and Installation
Competency Area	Install Solar Thermal Hydronic System
Competency Unit	Install solar collectors

Purpose

Solar collectors are essential to the performance of the system as they collect radiant heat from the sun and transfer it via liquid to a storage medium. Installing the solar collectors correctly is important to ensure the safety of persons, equipment and structures.

Performance/Abilities

P1 Wear appropriate PPE, e.g. steel-toe boots, hard hat, fall arrest equipment

P2 Verify multi-collector piping strategy, including configuring and balancing

P3 Lift collector(s) to installation area:
- set up to move collectors, e.g. calculate load, determine equipment needs
- lift load, e.g. communicate clearly, assess stability, monitor environmental conditions
- perform post-lift activities, e.g. remove hazards or barriers, inspect equipment

P4 Attach mounting bracket and struts to previously installed brackets

P5 Secure collector(s) to mounting device

P6 Connect collector(s) to piping and interconnections

P7 Connect control wiring

P8 Communicate installation issues to appropriate personnel, e.g. project manager, manufacturer's representative

Knowledge

K1 Organization policies, procedures and plans, e.g. communication protocols

K2 Organization's information/record management system

K3 Relevant standards and regulations, e.g. Canadian Standards Association standards, Underwriters Laboratories of Canada standards, Canadian Electrical Code (CE code), building code

K4 Required permits

K5 Manufacturers' specifications for equipment and system being installed, i.e. operational function and installation requirements of solar thermal hydronic systems

K6 Other documents relevant to the installation, e.g. technical drawings, client requirements

K7 Industry best practices for installing solar collectors

K8 Fundamentals of solar radiation

K9 Physical principles that affect solar thermal hydronic technologies

K10 Types and designs of solar collectors used in thermal systems, including unglazed solar collectors, glazed flat collectors and evacuated tubes

K11 Collector and roof-mounted equipment dead load requirements

K12 Roof types (i.e. different configuration and materials) and how they impact installation

K13 Wind and snow loads

K14 Thermal hydronic systems and their suitability to specific climates and applications

K15 Components of active (mechanical) and passive (nonmechanical) indirect and direct solar systems

Glossary

- **Active system:** requires a mechanical method to collect solar radiation and then store it.
- **Direct solar systems:** transfers heat directly to target; no transfer medium is used.
- **Hydronic:** a heating or cooling system in which heat is transported using circulating heat transfer fluid, e.g. water, glycol.
- **Passive system:** contains no mechanical components and relies only on design features to capture heat.
- **Indirect solar systems:** transfers heat via fluid such as glycol.
- **Industry best practices:** methods that meet or exceed jurisdictional requirements, e.g. Canadian Electrical Code (CE code), bylaws.
- **Solar collectors - Types 1, 2 and 3:**
  - **unglazed solar collector** (Type 1) – a collector with an absorber pipe made of rubber or metal that is exposed to the sun and connected to the solution being heated.
  - **glazed flat collector** (Type 2) – a box-type collector containing the piping and solution used in heat transfer; the box has a glazed glass sheet to aid in the transfer of energy to the solution that flows through the piping.
  - **evacuated tube** (Type 3) – a double-walled glass tube built with a vacuum between the walls; the evacuated tubes absorb UV radiation, converting it to heat, and then transfer the heat through a metal rod in the middle of the evacuated tube to a header pipe.

CONTEXTUAL VARIABLES

Range of Context

- Complexity of this competency will vary with the type and size of system being installed and on-site conditions.

Level of Practice

- ☒ Frontline
- ☐ Supervisor
- ☐ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☐ Apply
- ☒ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Manufacturers' specifications
- PPE, e.g. steel-toe boots, hard hat, fall arrest equipment, safety glasses
- Rigging, hoisting/lifting and moving equipment and tools, e.g. chain hoists, rope blocks, cable winches, web hoists, levers, slings, ropes, cables
- Communication tools, e.g. two-way radio, cell phone
- Mobile devices with digital documents, e.g tablet

electricity
HUMAN RESOURCES CANADA

Major Category	Construction and Installation
Competency Area	Install Solar Thermal Hydronic System
Competency Unit	Install piping

Purpose

Installing piping is important to ensure that the solar thermal hydronic system operates correctly when activated. It also protects the safety of persons, equipment and structures. Incorrect installation can cause damage to equipment and structures and injury to persons.

Performance/Abilities

P1 Wear appropriate PPE, e.g. steel-toe boots, hard hat, fall arrest equipment, safety glasses

P2 Confirm type of piping to be used, considering:
- application, e.g. potable, non-potable, drainage, process, pool
- quality of water to be used
- temperature of fluid
- type of fluid and additives
- proper piping configuration

P3 Confirm type and frequency of piping supports (e.g. hangers, fasteners) according to industry best practices, considering:
- installation site
- application
- purpose
- plumbing and building code requirements and hydronic industry standards

P4 Install pipe and fittings according to industry best practices, e.g. threading, soldering, gluing

P5 Install piping system components according to industry best practices, including:
- temperature wells
- air eliminators
- isolation valves
- control and thermostatic metering valves
- check valves
- heat dump, as required
- bypass valve assembly, as required

P6 Create penetrations in building, as required, considering:
- water-proofing
- pipe slope
- roof boots
- size of opening
- fire stop
- pipe flashing

P7 Communicate installation issues to appropriate personnel, e.g. project manager, manufacturer's representative

Knowledge

K1 Organization's policies, procedures and plans, e.g. communication protocols

K2 Organization's information/record management system

K3 Relevant standards and regulations, e.g. Canadian Standards Association standards, Underwriters Laboratories of Canada standards, Canadian Electrical Code (CE code), building code

K4 Required permits

K5 Manufacturers' specifications for equipment and system being installed, i.e. piping requirements

K6 Other documents relevant to installation, e.g. technical drawings, client requirements

K7 Tasks that require trades certification

K8 Industry best practices for installing piping systems

K9 Fundamentals of solar radiation

K10 Fundamentals of hydronic systems

K11 Types of solar thermal hydronic systems, e.g. drainback, closed-loop

K12 Various types of fluids used in hydronic thermal systems, e.g. water, glycol, additives

K13 Types (e.g. copper, plastic) and sizes of piping used in thermal hydronic systems

K14 Pipe connection methods, e.g. solder, compression fittings, brazing, fusion, glue

K15 Slope strategies for piping

K16 Pipe expansion and its effect on hangers and integrity of pipe

K17 Underground piping methods

Glossary

- **Bypass valve assembly:** assembly that allows solar system to be bypassed, making the conventional heater the primary water heater.
- **Closed-loop:** a pressurized active system that circulates heat transfer fluid through solar collectors and indirectly or directly into storage tanks.
- **Drainback:** a nonpressurized active system with a reservoir tank for fluid to drain into when pumps are turned off.
- **Hydronic:** a heating or cooling system in which heat is transported using circulating heat transfer fluid, e.g. water, glycol.
- **Industry best practices:** methods that meet or exceed jurisdictional requirements, e.g. Canadian Electrical Code (CE code), bylaws.

CONTEXTUAL VARIABLES

Range of Context

- Complexity of this competency will vary with type and size of system being installed and on-site conditions.
- This competency applies to residential and commercial applications.
- **In some jurisdictions, some tasks in this competency may require certification in the plumbing trade in order to be carried out.**

Level of Practice

- ☒ Frontline
- ☐ Supervisor
- ☐ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☐ Apply
- ☒ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Manufacturers' specifications
- PPE, e.g. steel-toe boots, hard hat, fall arrest equipment, safety glasses
- Hand and power tools, e.g. drill, wrenches, torches, soldering or fusion tools
- Pipes
- Fittings
- Pipe hangers
- Materials, e.g. glue

Major Category	Construction and Installation
Competency Area	Install Solar Thermal Hydronic System
Competency Unit	Install mechanical and plumbing equipment, and solar storage tanks

Purpose

Installing mechanical and plumbing equipment and solar storage tanks is important to ensure the safety of persons, equipment and structures. Incorrect installation can cause damage to equipment and structures and injury to persons.

Performance/Abilities

P1 Wear appropriate PPE, e.g. steel-toe boots, hard hat, fall arrest equipment, safety glasses

P2 Ensure all equipment has proper housekeeping pads and isolation prior to equipment placement

P3 Select tank ports to be used for plumbing lines based on type of system being installed

P4 Select port fittings based on system design:
- consider corrosion issues

P5 Install port fittings

P6 Select plumbing retrofit method based on type of system being installed, if applicable:
- remove and dispose of existing conventional water heater according to local regulations

P7 Install drain pan for solar storage tank

P8 Install tank valves, including temperature and pressure (T&P) valve, drain valves, isolation valves, as necessary:
- ensure proper drain for T&P valve

P9 Install expansion tanks, pumps, heat exchangers, air separators and additional components and materials as required by industry standards and project design:
- install heat dump or mass storage as required

P10 Ensure cold water goes to bottom of tank

P11 Place solar and auxiliary tanks:
- consider weight and service access

P12 Inspect installation:
- ensure tank and fittings are secure, i.e. no leaks
- ensure valves are installed in proper flow direction

P13 Communicate installation issues to appropriate personnel, e.g. project manager, manufacturer's representative

Knowledge

K1 Organization's policies, procedures and plans, e.g. communication protocols

K2 Organization's information/record management system

K3 Relevant standards and regulations, e.g. Canadian Standards Association standards, Underwriters Laboratories of Canada standards, Canadian Electrical Code (CE code), building codes

K4 Required permits

K5 Manufacturer's specifications for equipment and system being installed, i.e. operational function and installation requirements of solar thermal hydronic systems

K6 Other documents relevant to installation, e.g. technical drawings, client requirements

K7 Tasks that require trades certification

K8 Industry best practices for installing water heater and storage tank components
K9 Fundamentals of solar radiation
K10 Fundamentals of hydronic systems
K11 Types of storage tanks used in thermal storage systems
K12 Fundamentals of heat transfer fluids

Glossary

- **Heat transfer fluid:** a liquid used to transfer thermal energy that generally has a low boiling point and a high heat capacity; used for heating, storing thermal energy, and preventing overheating.
- **Hydronic:** a heating or cooling system in which heat is transported using circulating heat transfer fluid, e.g. water, glycol.
- **Industry best practices:** methods that meet or exceed jurisdictional requirements, e.g. Canadian Electcical Code (CE code), bylaws.

CONTEXTUAL VARIABLES

Range of Context

- Complexity of this competency will vary with type and size of system being installed and on-site conditions.
- **In some jurisdictions, some tasks in this competency may require certification in the plumbing trade in order to be carried out.**

Level of Practice

- ☒ Frontline
- ☐ Supervisor
- ☐ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☐ Apply
- ☒ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Manufacturer's specifications
- PPE, e.g. steel-toe boots, hard hat, fall arrest equipment, safety glasses
- Hand and power tools, e.g. drills, wrenches

Major Category	Construction and Installation
Competency Area	Install Solar Thermal Hydronic System
Competency Unit	Install controls, sensor wires and sensors

Purpose

Installing electrical controls and sensors correctly ensures that solar thermal hydronic systems operate properly when activated. Proper installation also protects the safety of persons, equipment and structures. Incorrect installation can cause damage to equipment and structures and injury to persons.

Performance/Abilities

P1 Obtain line voltage for all power supply requirements from qualified electrician

P2 Wear appropriate PPE, e.g. steel-toe boots, hard hat, fall arrest equipment, safety glasses

P3 Ensure all proper raceway(s) and hangers are installed prior to installation of control wire

P4 Install sensors according to industry best practices, considering:
- installation site
- environment
- sensor type
- design
- manufacturers' specifications

P5 Install controls (e.g. system controller, zone controller, relay, remote display) according to industry best practices and manufacturers' specifications

P6 Connect low-voltage wiring according to industry best practices, considering:
- installation site
- environment
- type of wiring
- grounding
- shielding

P7 Connect line voltage to all pumps and power relays, as required

P8 Oversee installation of line voltage wiring according to industry best practices:
- ensure line voltage wiring installation is completed by qualified electrician

P9 Communicate installation issues to appropriate personnel, e.g. project manager, electrician, manufacturer's representative

Knowledge

K1 Organization's policies, procedures and plans, e.g. communication protocols

K2 Organization's information/record management system

K3 Relevant standards and regulations, e.g. Canadian Standards Association standards, Underwriters Laboratories of Canada standards, Canadian Electrical Code (CE code), building code

K4 Required permits

K5 Manufacturer's specifications for equipment and system being installed, i.e. wiring requirements

K6 Other documents relevant to the installation, e.g. technical drawings, client requirements

K7 Tasks that require trades certification

K8 Industry best practices for installing controls and sensors

K9 Fundamentals of electrical systems, e.g. wiring, sizing of loads

K10 Fundamentals of solar radiation

K11 Fundamentals of hydronic systems

K12 Physical principles that affect solar thermal hydronic technologies

K13 Types of controls and sensors used in thermal systems

K14 Function and installation requirements of differential controllers and associated sensors

K15 Function and installation requirements of system monitoring components

K16 Low-voltage wiring installation methods

K17 Line loss for control wiring and sensors

K18 Control systems, including types of controllers and sensors used in solar thermal hydronic systems and testing requirements

K19 Importance of tracking controller menus and their reactions

K20 Importance of understanding terminology used by different manufacturers

Glossary

- **Hydronic:** a heating or cooling system in which heat is transported using circulating heat transfer fluid, e.g. water, glycol.
- **Industry best practices:** methods that meet or exceed jurisdictional requirements, e.g. Canadian Electrical Code (CE code), bylaws.
- **Low voltage:** under 50 volts DC.
- **Line voltage:** 110 volts AC and above.

CONTEXTUAL VARIABLES

Range of Context

- Complexity of this competency will vary with type and size of system being installed and on-site conditions.
- **In some jurisdictions, some tasks in this competency may require certification in the electrical trade in order to be carried out.**

Level of Practice

- ☒ Frontline
- ☐ Supervisor
- ☐ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☐ Apply
- ☒ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Manufacturer's specifications
- PPE, e.g. steel-toe boots, hard hat, fall arrest equipment, safety glasses
- Hand and power tools, e.g. drills, wrenches, wire strippers, butt slice connectors
- Materials, e.g. sensors, controls, wiring, butt slice connectors, marrettes

Major Category	Construction and Installation
Competency Area	Install Solar Thermal Hydronic System
Competency Unit	Charge solar thermal hydronic system

Purpose

Properly charging a solar thermal hydronic system is important to verify that it operates correctly when activated.

Performance/Abilities

P1 Wear appropriate PPE, e.g. steel-toe boots, hard hat, fall arrest equipment, safety glasses

P2 Pressure-test solar thermal hydronic system using air:
- consider manufacturers' specifications for piping and equipment
- consider safety, e.g. current outdoor air temperature or sun conditions
- check for leaks

P3 Pressure-test solar thermal hydronic system using water:
- consider manufacturers' specifications for piping and equipment
- consider safety, e.g. current outdoor air temperature or sun conditions
- check for leaks

P4 Select appropriate cleaning solution for piping system

P5 Clean and flush system using appropriate sized purge pump, i.e. do not use system pump

P6 Pre-charge expansion tank, as required:
- monitor operating pressure

P7 Prepare heat transfer fluid:
- confirm type of heat transfer fluid with system design
- determine required concentration and volume

P8 Charge solar thermal hydronic system with heat transfer fluid:
- follow fill procedures according to industry best practices
- confirm air has been extracted from system

P9 Communicate installation issues to appropriate personnel, e.g. project manager, manufacturer's representative

Knowledge

K1 Organization's policies, procedures and plans, e.g. communication protocols

K2 Organization's information/record management system

K3 Relevant standards and regulations, e.g. Canadian Standards Association standards, Underwriters Laboratories of Canada standards, Canadian Electrical Code (CE code), building code

K4 Required permits

K5 Manufacturer's specifications for equipment and system being installed, e.g. operating pressures

K6 Other documents relevant to the installation, e.g. technical drawings, client requirements

K7 Tasks that require trades certification

K8 Industry best practices for commissioning of systems

K9 Fundamentals of solar radiation

K10 Fundamentals of hydronic systems

K11 Physical principles that affect solar thermal hydronic technologies

K12 Types of fluids used in thermal systems for cleaning and flushing

K13 Types of heat-transfer fluids used to charge the solar thermal hydronic system

K14 Safety considerations when charging solar thermal hydronic systems, e.g. high temperatures and pressure

K15 Freeze protection methods for solar thermal hydronic systems

Glossary

- **Heat transfer fluid:** a liquid used to transfer thermal energy that generally has a low boiling point and a high heat capacity; used for heating, storing thermal energy and preventing overheating.
- **Hydronic:** a heating or cooling system in which heat is transported using circulating heat transfer fluid, e.g. water, glycol.
- **Industry best practices:** methods that meet or exceed jurisdictional requirements, e.g. Canadian Electrical Code (CE code), bylaws.

CONTEXTUAL VARIABLES

Range of Context

- Complexity of this competency will vary with type and size of system being installed and on-site conditions.
- **In some jurisdictions, some tasks in this competency may require certification in the plumbing trade in order to be carried out.**

Level of Practice

- ☒ Frontline
- ☐ Supervisor
- ☐ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☐ Apply
- ☒ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Manufacturers' specifications
- PPE, e.g. steel-toe boots, hard hat, fall arrest equipment, safety glasses
- Equipment and tools, e.g. air compressor, purge pump, refractometer, pH meter
- Materials, e.g. cleaning and flushing fluids, heat transfer fluid, appropriate additives

Major Category	Construction and Installation
Competency Area	**Install Solar Thermal Hydronic System**
Competency Unit	**Install insulation**

Purpose

Installing insulation is important because it ensures that the solar thermal hydronic system operates correctly when activated. Properly installed insulation protects equipment and structures and does not trap water or bring water into the building envelope.

Performance/Abilities

P1 Wear appropriate PPE, e.g. steel-toe boots, hard hat, fall arrest equipment

P2 Select appropriate type of insulation required, considering:
- temperature rating
- thickness
- UV protection

P3 Size insulation to correct parameters, as required:
- use cutting tool and adhesive material

P4 Install insulation over all exposed piping according to industry best practices, design specifications and manufacturer's specifications:
- ensure insulation does not trap water or bring water into building envelope

P5 Seal ends by mitering or gluing, as required

P6 Protect insulation from ultraviolet degradation, mechanical or physical damage

P7 Communicate installation issues to appropriate personnel, e.g. project manager, manufacturer's representative

Knowledge

K1 Organization's policies, procedures and plans, e.g. communication protocols

K2 Organization's information/record management system

K3 Relevant standards and regulations, e.g. Canadian Standards Association standards, Underwriters Laboratories of Canada standards, Canadian Electrical Code (CE code), building code

K4 Required permits

K5 Manufacturer's specifications for equipment and system being installed

K6 Other documents relevant to the installation, e.g. technical drawings, client requirements

K7 Industry best practices for installing insulation, e.g. install insulation after system is commissioned

K8 Fundamentals of solar radiation

K9 Physical principles that affect solar thermal hydronic technologies

K10 Function of insulation in solar thermal hydronic system

K11 Types of insulation used in thermal hydronic systems and their function

K12 Sizing methods for insulation

K13 Sealing processes for insulation

K14 Effects of ultraviolet degradation, mechanical and physical damage on insulation

K15 Protection materials and methods for solar thermal hydronic systems, e.g. UV protection, rubber versus plastic, protection for piping, water heaters and heat exchangers

Glossary

- **Hydronic:** a heating or cooling system in which heat is transported using circulating heat transfer fluid, e.g. water, glycol.
- **Industry best practices:** methods that meet or exceed jurisdictional requirements, e.g. Canadian Electrical Code (CE code), bylaws.

CONTEXTUAL VARIABLES

Range of Context

- Complexity of this competency will vary with type and size of system being installed and on-site conditions.

Level of Practice

- ☒ Frontline
- ☐ Supervisor
- ☐ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☐ Apply
- ☒ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Manufacturer's specifications
- PPE, e.g. steel-toe boots, hard hat, fall arrest equipment, safety glasses
- Hand and power tools, e.g. cutting tools
- Materials, e.g. insultation, adhesive

Major Category	Construction and Installation
Competency Area	Install Control Systems
Competency Unit	Install discrete input/output (I/O) devices

Refer to the following task within the *Red Seal Occupational Standard (RSOS) for Industrial Electrician* for more details on how to perform this Competency:

Industrial Electrician

Block F: INSTALLS AND MAINTAINS PROCESS CONTROL SYSTEMS
Task 29: Installs and maintains input/output (I/O devices
Skill 1: Installs discrete input/output (I/O) devices

Major Category	Construction and Installation
Competency Area	Install Control Systems
Competency Unit	Install analog input/output (I/O) devices

Refer to the following task within the *Red Seal Occupational Standard (RSOS) for Industrial Electrician* for more details on how to perform this Competency:

Industrial Electrician

Block F: INSTALLS AND MAINTAINS PROCESS CONTROL SYSTEMS
Task 29: Installs and maintains input/output (I/O devices
Skill 3: Installs analog input/output (I/O) devices

Major Category	Construction and Installation
Competency Area	Install Control Systems
Competency Unit	Install automated control systems

Refer to the following task within the *Red Seal Occupational Standard (RSOS) for Industrial Electrician* and *Red Seal Occupational Standard (RSOS) for Construction Electrician* for more details on how to perform this Competency:

Industrial Electrician

Block F: INSTALLS AND MAINTAINS PROCESS CONTROL SYSTEMS
Task 30: Installs, programs and maintains automated control systems
Skill 1: Installs automated control systems

Construction Electrician

Block D: INSTALLS, SERVICES AND MAINTAINS MOTORS AND CONTROL SYSTEMS
Task 25: Installs, programs, services and maintains automated control systems
Skill 1: Installs automated control systems

Major Category	Construction and Installation		Major Category	Construction and Installation
Competency Area	Install Control Systems		Competency Area	Install Wiring Systems
Competency Unit	Program automated control systems		Competency Unit	Install HVAC controls

Refer to the following task within the *Red Seal Occupational Standard (RSOS) for Industrial Electrician* and *Red Seal Occupational Standard (RSOS) for Construction Electrician* for more details on how to perform this Competency:

Industrial Electrician

Block F: INSTALLS AND MAINTAINS PROCESS CONTROL SYSTEMS
Task 30: Installs, programs and maintains automated control systems
Skill 3: Programs automated control systems

Construction Electrician

Block D: INSTALLS, SERVICES AND MAINTAINS MOTORS AND CONTROL SYSTEMS
Task 25: Installs, programs, services and maintains automated control systems
Skill 3: Programs and configures automated control systems

Refer to the following task within the *Red Seal Occupational Standard (RSOS) for Industrial Electrician* and *Red Seal Occupational Standard (RSOS) for Construction Electrician* for more details on how to perform this Competency:

Industrial Electrician

Block C: INSTALLS AND MAINTAINS WIRING SYSTEMS
Task 18: Installs and maintains heating, ventilation and air-conditioning (HVAC) electrical components
Skill 2: Installs HVAC controls

Construction Electrician

Block C: INSTALLS, SERVICES AND MAINTAINS WIRING SYSTEMS
Task 18: Installs, services and maintains heating, ventilating and air-conditioning (HVAC) systems
Skill 2: Installs HVAC controls

Major Category	Construction and Installation
Competency Area	Install Wiring Systems
Competency Unit	Install cathodic protection systems

Refer to the following task within the *Red Seal Occupational Standard (RSOS) for Industrial Electrician* and *Red Seal Occupational Standard (RSOS) for Construction Electrician* for more details on how to perform this Competency:

Industrial Electrician

Block C: INSTALLS AND MAINTAINS WIRING SYSTEMS
Task 21: Installs and maintains cathodic protection systems
Skill 1: Installs cathodic protection systems

Construction Electrician

Block C: INSTALLS, SERVICES AND MAINTAINS WIRING SYSTEMS
Task 21 Installs, services and maintains cathodic protection systems
Skill 1: Installs cathodic protection systems

Major Category	Construction and Installation
Competency Area	Complete Installation Process
Competency Unit	Troubleshoot installation issues

Purpose

Construction and installation issues can vary in scope, from a piece of equipment not working correctly to structural changes that impact original installation plans. It is important to be able to address these issues, either immediately or to present options that can still meet the original plan's goals, or to provide options based on professional expertise and industry best practices. Consideration must be given to additional resource requirements, e.g. time, cost, personnel.

Performance/Abilities

P1 Determine cause of installation issue, (e.g. equipment operation, structural changes), for example:
- review manufacturer's installation instructions/manual
- review as-builts to original drawings installation was based on
- review requirements for installation, e.g. building and electrical code
- contact technical support, if necessary

P2 Inspect installation to identify any potential errors:
- wear appropriate PPE
- make corrections to equipment, if able, using industry best practices

P3 Consult other professionals, as necessary, e.g. co-worker, supervisor, engineer

P4 Determine potential adjustment options, for example:
- replacement of equipment
- relocation of installation
- re-orientation of equipment
- different type or size of equipment

P5 Determine viability of options, e.g. availability of other equipment, required regulatory approvals

P6 Present potential options, including:
- impact on project, e.g. changes to functionality, extra cost, personnel
- impact on further work, e.g. other trades
- impact on schedule, e.g. delays to order new equipment, additional time for change installation location
- make recommendations

P7 Obtain approval to make adjustments, if required:
- ensure approval is documented, if required

P8 Document troubleshooting solution:
- ensure changes are in as-builts

Knowledge

K1 Organization's policies and procedures, e.g. record management system

K2 Relevant CSA Standards, e.g. Canadian Electrical Code (CE code)

K3 Jurisdictional requirements, including installation requirements and codes

K4 Different types of equipment systems, components, characteristics and operation

K5 Industry best practices for installation

K6 Safety hazards

K7 Equipment suppliers

K8 Order of operations

K9 Project overview, including overall design

K10 Foundational electrical knowledge, as required for type of installation

K11 Foundational hydronic knowledge, as required for type of installation

K12 Foundational hydraulic knowledge, as required for type of installation

K13 Foundational mechanical knowledge, as required for type of installation

K14 Foundational construction knowledge, as required for type of installation

K15 Foundational GeoExchange knowledge, as required for type of installation

K16 Foundational process control knowledge, as required for type of installation

Glossary

- **Industry best practices:** methods that meet or exceed jurisdictional requirements, e.g. Canadian Electrical Code (CE code), bylaws.

CONTEXTUAL VARIABLES

Range of Context

- Complexity of this competency will vary with type and size of system being installed and on-site conditions.

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☐ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☐ Apply
- ☐ Analyze
- ☒ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Drawings and prints, including as-builts
- Manufacturer's manuals, specifications
- PPE
- Testing equipment, e.g. voltmeter, pressure gauge
- Hand and power tools, e.g. drills, screwdrivers, pliers

Major Category	Construction and Installation
Competency Area	Complete Installation Process
Competency Unit	Install operation and identification tags

Level of Practice

- ☒ Frontline
- ☐ Supervisor
- ☐ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☒ Apply
- ☐ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- PPE
- Label maker
- Labels and tags
- Schematic drawings/prints
- Permanent marker

Purpose

Tagging and labelling system equipment and components helps to foster the client's understanding of the system and its operation. It provides a common language when discussing the system and makes it easier for technicians when called in for repairs or maintenance. Incomplete or incorrect tags and labels can lead to miscommunication about issues, unnecessary repair or maintenance costs, and potentially dangerous conditions.

Performance/Abilities

P1 Wear appropriate PPE

P2 Determine components that require labelling, e.g. inverters, controls, supply and return pipes, grounding equipment, valves:
- review CSA/Canadian Electrical Code (CE code) requirements
- review prints, drawings and manufacturer's specifications

P3 Use industry-accepted markings for equipment tags and labels

P4 Install tags and labels:
- ensure printing is legible and permanent
- ensure tags and labels are visible
- ensure tags and labels are secure
- ensure tags and labels are oriented correctly, i.e. arrows in correct direction
- sign off on tags and labels, if required

P5 Identify markings on any drawings or instructions provided to clients, as required

Knowledge

K1 Organization's policies and procedures, e.g. PPE, client documentation

K2 CSA/ Canadian Electrical Code (CE code) requirements for tags and labels

K3 Jurisdictional requirement for tags and labels

K4 System, components, and operation

Glossary

- **Industry best practices:** methods that meet or exceed jurisdictional requirements, e.g. Canadian Electrical Code (CE code), bylaws.

CONTEXTUAL VARIABLES

Range of Context

- Proprietary equipment may have specific terminology that may differ from industry terminology.

Major Category	Construction and Installation
Competency Area	Commission Equipment and Systems
Competency Unit	Verify equipment/system operation and functionality

Purpose

As part of the commissioning process it is important that all equipment, systems and other infrastructure are inspected, test results reviewed, deficiencies addressed, and functionality of the entire system tested before making the system operational. This ensures that clients can be confident of the system's capabilities when they take over its operation. Failure to verify the system's functionality could result in extraneous costs, damage to equipment and injury to personnel.

Performance/Abilities

P1   Wear appropriate PPE, e.g. steel-toe boots, safety glasses, gloves

P2   Review installation prints, as-builts, test results

P3   Inspect installed components for deficiencies:
- in workmanship, e.g. leaks, lines are straight, control wiring is correctly installed
- In materials, e.g. required number of units, free of visual defects

P4   Troubleshoot deficiencies, according to industry best practices:
- correct issue, e.g. repair, replace
- document actions

P5   Inspect installed mechanical components, e.g. ensure fasteners are properly secured to system

P6   Inspect installed electrical components:
- review electrical test results
- verify deficiencies have been addressed
- conduct spot checks

P7   Inspect system plumbing, if applicable:
- compare to schematics
- check for visible leaks or issues

P8   Document inspection results

P9   Verify system operation:
- make note of operating conditions, e.g. weather conditions, instrument readings
- energize system or notify appropriate personnel to energize system, if required
- observe system operation
- use controls to check operation and performance
- determine if there are issues or deficiencies
- shut down system

P10 Troubleshoot deficiencies:
- correct issue, e.g. repair, service
- document actions

P11 Update prints:
- create or ensure as-builts are accurate, e.g. verify drawing revisions match field wiring

P12 Complete equipment database, if applicable:
- list equipment by type (e.g. relays, meters), including serial numbers, make, model
- document equipment settings, e.g. dates, controller set points, volumes, pressures
- document test results

Knowledge

K1   Organization policies, procedures and plans, e.g. testing and commissioning protocols, safety

K2   Organizational information/record management system

K3   Relevant standards and regulations, e.g. Canadian Standards Association standards, Underwriters Laboratories of Canada standards, Canadian Electrical Code (CE code), building code

K4   Required permits

K5   Principles of electricity

K6   Principles of fluid flow, if applicable

K7   Principles of protection and control

K8   Principles of Process Control (PID Control) if applicable

K9   Scope and limitations of electrical testing

K10 Tasks that require trades certification

K11 Industry best practices for inspecting system for commissioning

K12 Manufacturer's equipment, specifications, characteristics, and operation

K13 Safety hazards associated with commissioning

Glossary

- **Industry best practices:** methods that meet or exceed jurisdictional requirements, e.g. Canadian Electrical Code (CE code), bylaws.

CONTEXTUAL VARIABLES

Range of Context

- Scope, size, complexity and type of installation may affect what has to be inspected and how long it takes to perform this competency.
- **In some jurisdictions, some of the tasks in this competency may require certification in the electrical, HVAC, or plumbing trades in order to be carried out.**

Level of Practice

- ☒ Frontline
- ☐ Supervisor
- ☐ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☐ Apply
- ☒ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Manufacturer's manuals and specifications for installed equipment
- Installation prints and as-builts
- PPE, e.g. hard hat, safety glasses
- Hand tools, e.g. pressure and temperature gauge, multimeter, flow meters

Major Category	Construction and Installation
Competency Area	Commission Equipment and Systems
Competency Unit	Document equipment/system performance

Purpose

The commissioning report represents the due diligence taken through the construction and installation of a project. This applies to every aspect of a project, including all the components of the electrical system. Failure to provide required information could lead to potential liability for damage and injury.

Performance/Abilities

P1 Compile testing results, including:
- results and methods of control testing, if applicable
- results and methods of function testing
- results of protection testing, e.g. relay and meter test results

P2 Complete equipment database, if applicable:
- list equipment by type, e.g. relays, meters
- document serial numbers, make, model style
- document equipment settings, e.g. dates, controller set points, volumes, pressures
- document test results

P3 Write equipment evaluation reports, if applicable:
- review equipment test results
- analyze results, considering manufacturer's specifications, industry standards
- provide maintenance requirements based on manufacturer's and designer's recommendations

P4 Prepare training materials:
- develop training materials e.g. based on manufacturer's equipment manuals, blueprints, bench testing experience
- present training, if required

P5 Write fault analysis report, if applicable:
- review relay test results e.g. determine targets, identify fault records
- check Supervisory Control and Data Acquisition (SCADA) alarm records
- obtain Sequence of Events Recorder (SER) documentation
- develop report based on pre-operational testing

P6 Submit documentation and database for commissioning report to appropriate personnel

Knowledge

K1 Organization policies, procedures and plans, e.g. testing and commissioning protocols, safety

K2 Organizational information/record management system

K3 Relevant standards and regulations, e.g. Canadian Standards Association standards, Underwriters Laboratories of Canada standards, Canadian Electrical Code (CE code), building code

K4 Required permits

K5 Principles of electricity

K6 Principles of fluid flow, if applicable

K7 Principles of protection and control

K8 Scope and limitations of electrical testing

K9 Interpretation of test results

K10 Industry best practices for inspecting systems for commissioning

K11 Manufacturer's equipment, specifications, characteristics, and operation

K12 Safety hazards associated with commissioning

Glossary

- **Industry best practices:** methods that meet or exceed jurisdictional requirements, e.g. Canadian Electrical Code (CE code), bylaws.
- **Sequence of Events Recorder (SER):** as a system, it records events and time stamps them as they happen. As an application, the software gathers and stores this data for analysis; often used for root-cause analysis.
- **Supervisory control and data acquisition (SCADA) system:** a process automation system consisting of software and programmable logic controllers (PLCs) that collects data from instruments and sensors in remote locations (e.g. substations) and transmits it to a control centre for monitoring or controlling purposes.

CONTEXTUAL VARIABLES

Range of Context

- The scope, size and complexity of the project could impact the scope and the level of detail required for the commissioning report.

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☐ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☐ Apply
- ☒ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Manufacturer's manuals and specifications
- Equipment test results, e.g. relay, metering, control system, communication system
- Record keeping device or document, e.g. tablet, computer, Toughbook, applicable testing results form

Major Category	Construction and Installation
Competency Area	Commission Equipment and Systems
Competency Unit	Perform site cleanup

Level of Practice

- ☒ Frontline
- ☐ Supervisor
- ☐ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☒ Apply
- ☐ Analyze
- ☐ Evaluate
- ☐ Create/Transform

Purpose

When preparing to hand off a new system to a client, it is important restore the site to as close as possible to what it was before the work was done or to what was agreed upon with the client. It presents a professional image of the personnel doing the work and the organization they represent.

Performance/Abilities

P1 Wear appropriate PPE

P2 Remove work debris:
- clean up refuse from installation, e.g. packaging, leftover hardware
- dispose of unwanted materials in waste bin for appropriate disposal
- dispose of hazardous material as required, e.g. follow WHMIS guidelines, use specified disposal site

P3 Ensure sub-trades perform site cleanup after their work

P4 Verify site is in acceptable condition:
- meet terms as agreed upon with client
- use before and after photographs, if available or work order description, if applicable

P5 Have client sign-off on acceptable site condition, if required

Knowledge

K1 Organization policies, procedures and plans, e.g. client handover procedures, safety, information/record management system

K2 Relevant standards and regulations, e.g. Canadian Standards Association standards, Underwriters Laboratories of Canada standards, Canadian Electrical Code (CE code), building code

K3 Required permits

K4 Workplace Hazardous Material Information System (WHMIS) and Safety Data Sheets (SDS) guidelines for appropriate hazardous material handling and disposal

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Garbage bags or bins
- Vehicle to haul debris to disposal sites
- Hazardous material storage containers, if required
- Required PPE, e.g. hard hat, safety boots, safety glasses
- Client agreement, or pre-construction photos, if applicable

Glossary

- **Workplace Hazardous Material Information System (WHMIS):** a federal government mandated program that provides information on the safe use, storage, handling, and disposal of hazardous materials that may be in the workplace.
- **Safety Data Sheets (SDS):** part of WHMIS program, these sheets contain comprehensive information on sixteen aspects of a hazardous material, including handling and storage, disposal consideration, and transport information.

CONTEXTUAL VARIABLES

Range of Context

- The size and scope of the project could impact the amount of debris to be removed to bring the site to an acceptable condition.

Major Category	Construction and Installation
Competency Area	Commission Equipment and Systems
Competency Unit	Demonstrate system to client/end-user

Purpose

A responsible demonstration of the installation to the client and/or end-user is the final step in commissioning. Providing clients and end-users with thorough instructions on how to operate and maintain their new system results in less call-backs and greater client satisfaction. Failure to provide a demonstration to clients may in result in unintentional damage to system by client or end-user.

Performance/Abilities

P1 Wear appropriate PPE, e.g. safety boots, safety glasses, hard hat, fall arrest protection

P2 Prepare for demonstration and handover:
   • gather relevant documentation, e.g. equipment manuals and specifications, permit and inspection reports

P3 Demonstrate start up and shut down procedures

P4 Demonstrate functionality and performance, according to industry best practices, including:
   • normal operation
   • emergency shut down procedures
   • by-pass mode
   • expected operating parameters
   • reset procedure

P5 Demonstrate simple, routine maintenance procedures

P6 Demonstrate basic diagnostic procedures

P7 Indicate markings and labels for all components

P8 Provide safety information

P9 Activate system, according to industry best practices

P10 Review system equipment warranties and requirements

P11 Provide relevant documentation to client or end-user

P12 Obtain client's sign-off on project

Knowledge

K1 Organization policies, procedures and plans, e.g. commissioning protocols, safety

K2 Organizational information/record management system

K3 Relevant standards and regulations, e.g. Canadian Standards Association standards, Underwriters Laboratories of Canada standards, Canadian Electrical Code (CE code), building code

K4 Required permits

K5 Principles of electricity

K6 Principles of fluid flow, if applicable

K7 Principles of protection and control

K8 Industry terminology

K9 Manufacturer's equipment, specifications, characteristics, and operation

K10 Industry-accepted practices for demonstration and client handover

K11 Documents to be handed over to client/end-user, e.g. as-builts, system design, warranties, commissioning documents, operation manuals, maintenance documents

Glossary

• **Industry best practices:** methods that meet or exceed jurisdictional requirements, e.g. Canada Electrical Code (CE code), bylaws.

CONTEXTUAL VARIABLES

Range of Context

• Scope, size, complexity and type of installation may affect the level of detail required and the time it takes to complete this competency.

Level of Practice

☒ Frontline
☒ Supervisor
☐ Manager/Executive

Adapted Bloom's Taxonomy

☐ Recall, Remember
☐ Understand
☒ Apply

☐ Analyze
☐ Evaluate
☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

• PPE, e.g. gloves, safety glasses, hard hat
• Documentation, e.g. manufacturer's manuals and specifications, inspection reports
• Online monitoring platform, e.g. log in credentials, review functions

Major Category	Safety
Competency Area	Maintain a Safe Working Environment
Competency Unit	Follow safe work practices

Purpose

Following safe work practices is critical to protect employees, contractors, customers and the general public against injury or death, and to protect the organization and its assets from loss and liability.

Performance/Abilities

P1 Participate in safety orientations and training

P2 Complete safety certifications, as required, e.g. confined space

P3 Identify locations of:
- first aid kit
- emergency equipment
- emergency access routes

P4 Participate in daily safety meeting/tail-board meetings

P5 Follow safety policies and procedures on site, e.g. limits of approach

P6 Respect physical limitations of self and others

P7 Use protection systems, as required, e.g. lockout/tagout, card system

P8 Inspect safety systems, as required, e.g. guards, emergency stops

P9 Perform tests, as required, e.g. test voltage level

P10 Establish exclusion zones, when required, e.g. around open trench or working heavy equipment:
- place barriers and/or signage

P11 Identify hazards on site, e.g. personal safety, work site, environmental:
- monitor weather conditions, as necessary

P12 Minimize or remove hazards, as necessary, for example:
- protect self from weather-related conditions, e.g. wear sunscreen and sunglasses, keep hydrated, wear warm clothing

P13 Use equipment only as intended/classified:
- ensure equipment is appropriate for work site conditions

P14 Maintain clean, orderly work area

P15 Dispose of waste materials, as required:
- dispose of hazardous materials (e.g. chemicals, batteries) according to legislation and organizational policies

P16 Store materials and equipment in designated areas

P17 Communicate issues to relevant personnel, e.g. co-workers, project manager:
- document work safety issues, as required

Knowledge

K1 Relevant legislation, including Occupational Health and Safety (OH&S)

K2 Safety Management Plan

K3 Organizational safety policies and procedures, including OH&S

K4 Workplace Hazardous Materials Information System (WHMIS)

K5 Required training and certifications for specific work, e.g. confined space

K6 Required personal protective equipment (PPE)

K7 Types of safety hazards on site

K8 Available emergency response services and their contact information

K9 Available equipment on worksite/in vehicles, e.g. first aid, containment equipment

K10 Procedures for safe excavation, if required

K11 Safety reporting procedures

CONTEXTUAL VARIABLES

Range of Context

- Quantity and type of safety hazards varies with type of work and work location.

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☒ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☒ Apply
- ☐ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- First aid kits
- Safety equipment, e.g. spill kit, fire extinguisher
- Safety features on equipment
- Personal protective equipment (PPE)
- Rated tools, e.g. screwdriver rated for particular voltage

Major Category	Safety	Major Category	Safety
Competency Area	**Maintain a Safe Working Environment**	**Competency Area**	**Maintain a Safe Working Environment**
Competency Unit	**Use personal protective equipment (PPE)**	**Competency Unit**	**Participate in safety meetings and emergency drills**

Purpose

Using PPE correctly protects employees against injury or death, and protects the organization and its assets from loss and liability.

Performance/Abilities

P1 Ensure required training is up to date, e.g. fall arrest equipment training

P2 Select equipment appropriate to task and work environment

P3 Inspect/test PPE before use:
- check expiry dates, if applicable
- document condition

P4 Ensure PPE is properly fitted and adjusted

P5 Use PPE only for intended purpose

P6 Communicate issues with PPE to relevant personnel, e.g. co-workers, supervisor

P7 Tag defective equipment:
- turn in to relevant personnel or department

P8 Clean PPE after use:
- store in designated location

Knowledge

K1 Relevant legislation, including Occupational Health and Safety (OH&S)

K2 Organizational safety policies and procedures, including OH&S

K3 Potential safety hazards on site

K4 PPE required for specific tasks, equipment and environments

CONTEXTUAL VARIABLES

Range of Context

- Quantity and type of PPE varies with type of work and work location.

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☒ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☒ Apply
- ☐ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- PPE, e.g. hard hats, safety glasses, safety boots, rubber gloves, fall arrest and restraint equipment, fire-retardant clothing, shock hazard PPE, arc flash hazard PPE, hearing protection, respiratory protection equipment

Purpose

Participating in safety meetings and emergency drills is important to ensure employees, contractors and customers work in a safe manner and are prepared for unexpected events. This also protects the organization and its assets against loss and liability.

Performance/Abilities

P1 Attend meetings and drills at scheduled times

P2 Identify role of self and team members in meetings and drills

P3 Share knowledge and skills with co-workers

P4 Communicate work issues to the group

P5 Participate in emergency drills, e.g. evacuation, fire, environmental, sabotage/terrorist/bomb threat, electrical restoration

P6 Debrief drills and exercises:
- provide feedback

P7 Take notes, if applicable

Knowledge

K1 Relevant legislation

K2 Organizational safety policies and procedures, including communication protocols

K3 Own and others' roles and responsibilities during emergencies

K4 Contact information for emergency services

K5 Types of safety hazards on site

CONTEXTUAL VARIABLES

Range of Context

- Types of meetings and emergency drills will vary with organization, type of work and work location.

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☐ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☒ Apply
- ☐ Analyze
- ☐ Evaluate
- ☐ Create/Transform

Major Category	Safety
Competency Area	Maintain a Safe Working Environment
Competency Unit	Isolate component, equipment or system

Purpose

Isolation procedures must be performed correctly to protect self and others (e.g. other employees, contractors, customers and the public) in preparation for work on powered components, equipment or systems. Performing this task incorrectly can lead to serious injury or death. This task also protects the organization and its assets against loss and liability.

Performance/Abilities

P1 Identify all sources of hazardous energy that may be encountered when performing work on component, equipment or system

P2 Disconnect each hazardous energy source in component, equipment or system, e.g. disconnect linkages, open breakers, open disconnect switch

P3 De-energize component, equipment or system, if required:
- release stored or residual energy, for example:
  - ground electrical devices, e.g. capacitors, batteries/UPS, accumulators
  - release hydraulic liquid
  - vent air pressure
  - brake mechanical movement

P4 Perform lock-out tag-out procedures

P5 Verify isolation using one of following methods:
- activate controls to ensure no response:
  - complete visual inspection, ensure electrical connections are open
- test component, equipment or system to ensure zero potential energy, for example:
  - test circuitry
  - check pressure gauges to ensure energy removed
  - check temperature gauges to ensure thermal energy discharged

P6 Document, as required

P7 Return component, equipment or system to normal configuration

P8 Ensure component, equipment or system can be safely re-energized, e.g. phase testing, Megger testing

P9 Re-energize component, equipment or system, if no other locks on equipment or system:
- coordinate re-energization with controlling authority

P10 Test component, equipment or system to ensure operating properly

P11 Document processes, as required

Knowledge

K1 Relevant regulations, e.g. work protection, grounding and bonding code

K2 Organization's policies and procedures, e.g. electrical safety, arc-flash policies, hazard assessment, lock-out tag-out procedures

K3 Type and rating of PPE required for isolation

K4 Testing procedures

K5 Electrical and mechanical principles, e.g. AC and DC, pressure

K6 Primary energy sources (i.e. electrical, mechanical, hydraulic, chemical, thermal and gravitational) in components, equipment and systems

K7 Safety tests to ensure zero energy state

K8 Electrical and mechanical control systems and components, e.g. SCADA, program logic controllers (PLC), breakers, fuses, disconnects

Glossary

- **De-energize (aka depressurize):** a process used to remove residual or stored energy from isolated component, equipment or system to eliminate the chance that residual or stored energy could accidentally harm workers
- **Isolate:** a process used to disconnect component, equipment or system from a primary source of energy to eliminate the chance that the primary source of energy in component, equipment or system could accidentally harm workers
- **Lock-out tag-out (LOTO):** a safety procedure used to ensure that components, equipment or systems are locked off and not able to be started up again prior to the completion of maintenance or repair work. It requires that hazardous energy sources be isolated and rendered inoperative before work is started on the component, equipment or system in question.
- **Tag-out:** a labelling process that is always used when lock-out is required; the process involves attaching or using an information tag or indicator (typically a standardized label) that includes tag #, name of component, equipment or system that has been isolated or re-configured, why lockout is required, the time of application, and the name of the authorized person who attached lock and tag.

CONTEXTUAL VARIABLES

Range of Context

- A multi-point isolation procedure requires more than one lock and may need more than one worker to execute.

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☒ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☐ Apply
- ☒ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- PPE, e.g. arc flash protection equipment, safety glasses, steel-toed boots, hard hats
- Lock-out tag-out devices, e.g. breaker lock, multi-lock, lock box, tag, hold cards
- Energy testing equipment, e.g. voltmeters, pressure gauges
- Energy removal devices, e.g. ground straps
- Locking devices, e.g. rotor pins

Major Category	Safety
Competency Area	Maintain a Safe Working Environment
Competency Unit	Perform lock-out tag-out procedures

Purpose

Lock-out tag-out procedures are performed for self-protection and as part of work protection procedures. These safety procedures eliminate the chance that equipment or systems could harm people through the unintended release of energy or the unintended start-up or motion of equipment or components. Not following proper lock-out tag-out procedures can lead to serious injury or death. These procedures also protect the organization and its assets against loss and liability.

Performance/Abilities

P1 Ensure required training is up to date

P2 Plan lock-out tag-out with relevant personnel:
- clarify scope of work to be done
- identify potential energy sources that must be controlled
- identify equipment and/or system to be locked-out tagged-out:
  - refer to panel schedules, drawings, single-line diagrams, cable and equipment tags
- confirm details:
  - when lock-out tag-out will begin
  - how long it will continue
  - authorized person responsible for applying locks and tags
  - affected persons to inform of lock-out tag-out

P3 Inform affected persons of lock-out tag-out

P4 Select appropriate PPE

P5 Isolate component, equipment or system:
- de-energize component, equipment or system, if required
- coordinate with controlling authority, if required

P6 Apply locking mechanisms or approved devices (e.g. locking pins, rotor locks), on component, equipment or system, as required

P7 Apply approved tag with required information, including:
- tag number
- name of component, equipment or system that is locked out
- why lock-out is required
- time component, equipment or system was locked out
- name of authorized person who attached tag and lock

P8 Verify component, equipment or system is locked out and tagged out properly:
- conduct visual inspection, e.g. tag filled out correctly

P9 Remove lock-out devices and tags when maintenance or repair activities are completed

Knowledge

K1 Organizational safety policies and procedures, including lock-out tag-out procedures

K2 Relevant legislation

K3 Training renewal requirements for lock-out tag-out

K4 Hazards associated with lock-out tag-out

K5 Energy potential in components, equipment and systems

K6 Procedures for potential energy testing

K7 Safety checks to ensure zero energy state

K8 Types of lock-out procedures, e.g. individual, group, and complex

K9 Types of locking devices and their applications

K10 Types of tags and their applications

Glossary

- **De-energize (aka depressurize):** a process used to remove residual or stored energy from isolated component, equipment or system to eliminate the chance that residual or stored energy could accidentally harm workers.
- **Isolate:** a process used to disconnect component, equipment or system from a primary source of energy to eliminate the chance that the primary source of energy in component, equipment or system could accidentally harm workers.
- **Lock-out tag-out (LOTO):** a safety procedure used to ensure that components, equipment or systems are locked off and not able to be started up again prior to the completion of maintenance or repair work. It requires that hazardous energy sources be isolated and rendered inoperative before work is started on the component, equipment or system in question.
- **Tag-out:** a labelling process that is always used when lock-out is required; the process involves attaching or using an information tag or indicator (typically a standardized label) that includes tag #, name of component, equipment or system that has been isolated or re-configured, why lock-out is required, the time of application, and the name of the authorized person who attached lock and tag.

CONTEXTUAL VARIABLES

Range of Context

- Types of systems that may be locked out vary, e.g. electrical, mechanical, hydraulic, pneumatic.
- Approved devices used to lock-out equipment/systems vary depending on the types of energy involved.
- Types of approved devices and voltage-rated equipment used to perform this task vary.
- A multi-point isolation procedure requires more than one lock and may need more than one worker to execute.
- The procedures for lock-out and tag-out may vary when provided as part of work protection.

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☒ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☐ Apply
- ☒ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Locking mechanisms or devices, e.g. locking pins, rotor locks, bars, cribbing, chains
- Tag devices, e.g. test and operate cards, hold cards
- Approved safety devices, e.g. arc flash protection equipment, energy removal devices, PPE
- Potential energy testing equipment, e.g. voltmeters, pressure gauges

Major Category	Safety
Competency Area	Maintain a Safe Working Environment
Competency Unit	Handle, transport and store hazardous materials

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☐ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☒ Apply
- ☐ Analyze
- ☐ Evaluate
- ☐ Create/Transform

Purpose

Handling, transporting and storing hazardous materials must be performed correctly to ensure the safety of employees, contractors, customers the public, and the environment. Performing this task incorrectly can lead to serious injury or death. This task also protects the organization and its assets against loss and liability.

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Safety Data Sheets (SDS)
- Approved containers for chemicals/hazardous materials
- Safety equipment, e.g. chemical aprons, goggles, spill containment

Performance/Abilities

P1 Ensure WHMIS training is up to date

P2 Ensure transportation of dangerous goods (TDG) training is up to date, if applicable

P3 Review information provided on Safety Data Sheets (SDS) for each material to be handled

P4 Review manufacturer's instructions for each material to be handled, if applicable

P5 Follow handling and disposal guidelines for hazardous materials, for example:
- do not combine chemical products, as some combinations can be hazardous
- use designated containers when transferring chemical products
- label all chemical products/hazardous materials

P6 Store chemicals in designated, ventilated area away from danger, e.g. heat source

P7 Transport hazardous materials according to guidelines and legislation

P8 Document activities, as required

Knowledge

K1 Relevant legislation

K2 WHMIS, including hazard symbols, Safety Data Sheets (SDS)

K3 Organizational safety policies and procedures

K4 Location of first aid stations and procedures

K5 Location of safety equipment, e.g. eye-wash stations, spill containment

Glossary

- **Workplace Hazardous Material Information System (WHMIS):** a federal government mandated program that provides information on the safe use, storage, handling, and disposal of hazardous materials that may be in the workplace.

CONTEXTUAL VARIABLES

Range of Context

- Types of hazardous materials stored and handled varies depending upon type of work and work location.

Major Category	Safety
Competency Area	**Maintain a Safe Working Environment**
Competency Unit	**Use fall arrest equipment**

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Fall arrest equipment, e.g. harness, lanyard
- Anchors

Purpose

Fall arrest equipment must be used correctly to ensure the safety of employees and contractors. Performing this task incorrectly can lead to serious injury or death. This task also protects the organization against loss and liability.

Performance/Abilities

P1   Ensure fall arrest training is up to date

P2   Use fall arrest equipment only for intended purpose

P3   Ensure ladders, scaffolding and lift equipment are appropriate for task

P4   Select appropriate personal protective equipment (PPE)

P5   Inspect fall arrest equipment before use:
- check expiry dates, if applicable
- document condition
- tag and remove defective equipment from service

P6   Ensure fall arrest equipment is properly fitted and adjusted

P7   Ensure safety harnesses are attached to rated anchor points

P8   Communicate issues to relevant personnel, e.g. co-workers, supervisor

P9   Clean fall arrest equipment after use:
- store in designated location

Knowledge

K1   Relevant legislation, including Occupational Health and Safety (OH&S)

K2   Organizational safety policies and procedures, including OH&S

K3   Manufacturer's specifications and recommendations for use and care

K4   Types of safety hazards on site that impact fall arrest

K5   PPE required for specific environments

K6   Use of anchor points

CONTEXTUAL VARIABLES

Range of Context

- Types of fall arrest equipment and anchors may vary depending on job and environment.

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☐ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☒ Apply
- ☐ Analyze
- ☐ Evaluate
- ☐ Create/Transform

Major Category	Safety
Competency Area	Maintain a Safe Working Environment
Competency Unit	Work in confined spaces

Level of Practice

☒ Frontline
☒ Supervisor
☐ Manager/Executive

Adapted Bloom's Taxonomy

☐ Recall, Remember   ☒ Analyze
☐ Understand   ☐ Evaluate
☐ Apply   ☐ Create/Transform

Purpose

Working in confined spaces must be performed correctly to ensure the safety of employees and contractors. Performing this task incorrectly can lead to serious injury or death. This task also protects the organization against loss and liability.

Performance/Abilities

P1 Ensure confined space training is up to date

P2 Preplan entry:
- identify hazards, e.g. gases, multiple power sources
- discuss with team members
- review rescue procedures

P3 Select appropriate personal protective equipment (PPE)

P4 Erect barriers and warning signs, as necessary

P5 Gather tools and equipment before entering space

P6 Use confined space equipment according to manufacturer's instructions

P7 Verify entry permit

P8 Monitor and document atmospheric conditions:
- evacuate space, as necessary

P9 Maintain constant communication with team members outside of confined space

P10 Secure confined space during inactivity

Knowledge

K1 Relevant legislation, including Occupational Health & Safety (OH&S)

K2 Organizational safety policies and procedures

K3 Manufacturer's instructions and recommendations

K4 Location of first aid stations and procedures

K5 Definition of confined space, e.g. locations that require care and monitoring

K6 Types of confined space monitoring equipment and their operation

K7 Hazards associated with confined spaces

K8 Types of gasses and their properties

K9 Rescue procedures for confined spaces

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Equipment for communication, e.g. two-way radios, air horns, closed circuit video
- Equipment for securing confined spaces, e.g. signage, tape, barricades, barriers, locks, hole covers
- Personal protective equipment, e.g. safety harness, respirator
- Space conditioning equipment, e.g. fans, inert gas, pressurized air, sump pump
- Monitoring equipment
- Rescue equipment

CONTEXTUAL VARIABLES

Range of Context

- Types of confined spaces vary, e.g. trenches, tanks, stacks.
- Types of hazards vary, e.g. lack of ventilation, inert gas, oxygen deficiency, exceeding explosive limits.
- Types of gasses encountered in confined spaces vary, e.g. chlorine, carbon monoxide.

Major Category	Safety
Competency Area	Maintain a Sustainable Environment
Competency Unit	Follow sustainable work practices

Purpose

Following sustainable work practices is critical to protect the environment and to protect employees, contractors and the general public against personal injury. It creates a positive public impression of the organization and its commitment to social responsibility, and protects the organization from loss and liability.

Performance/Abilities

P1 Ensure required training is up to date, e.g. WHMIS

P2 Identify potential environmental hazards, including:
- contaminants of water, air and soil
- hazardous materials

P3 Identify locations of:
- first aid kit
- spill kits
- emergency access routes and personnel
- Safety Data Sheets (SDS)

P4 Monitor weather conditions, as necessary, e.g. consider direction of chemical drift

P5 Follow waste management practices:
- sort waste by type
- place waste in correct disposal container or area

P6 Use recycled products and materials when possible

P7 Store hazardous materials and equipment in designated areas

P8 Dispose of hazardous materials (e.g. chemicals, batteries) according to legislation and organizational policies

P9 Communicate issues to relevant personnel, e.g. co-workers, supervisor:
- document issues, as required

Knowledge

K1 Relevant legislation, including Occupational Health and Safety (OH&S)

K2 Organizational safety policies and procedures, including OH&S

K3 Sustainability plan and practices, e.g. energy and water conservation, commitment to low-carbon energy

K4 Importance of sustainable practices, e.g. controlled use of ozone depleting substances

K5 Safety Management Plan

K6 Workplace Hazardous Materials Information System (WHMIS)

K7 Types of hazardous materials associated with specific work activities

K8 Available emergency response services and their contact information

K9 Available equipment on site or in vehicles, e.g. first aid, containment equipment

K10 Procedures for safe evacuation, if required

K11 Procedures for containment, if required

K12 Safety reporting procedures

CONTEXTUAL VARIABLES

Range of Context

- Quantity and type of hazards vary with type of work and work location.

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☒ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☒ Apply
- ☐ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- First aid kits
- Spill kit
- Personal protective equipment
- Safety Data Sheets (SDS)

electricity
HUMAN RESOURCES CANADA

Major Category	Safety
Competency Area	**Respond to Emergencies**
Competency Unit	**Respond to chemical spills and leaks**

Purpose

Responding quickly and correctly to chemical spills and leaks reduces the chance of injury to employees, contractors, customers and the public, and protects the environment.

Performance/Abilities

P1 Initiate Emergency Response Plan, if required, e.g. notify internal and external authorities

P2 Assess level of hazard, e.g. potential for fire or explosion:
- do not touch spilled materials
- identify chemical, if possible
- remove or extinguish ignition sources, if possible

P3 Contain spills and leaks, if possible:
- use tools and equipment appropriate to chemical, e.g. corrosion-resistant
- prevent chemicals from reaching sewers, drains and confined spaces
- increase ventilation to spill area, if possible
- contain with earth, sand or absorbent material that does not react with spilled material
- soak up spilled liquid with absorbent material
- scoop/shovel spilled material into suitable, covered, labeled containers

P4 Perform clean-up, as required:
- wear personal protective equipment (PPE) appropriate to the chemicals being handled
- flush spill area with water, if safe
- contain runoff for disposal
- handle contaminated absorbent material same as hazardous materials
- ensure clothing, equipment and tools are decontaminated

P5 Communicate spills and leaks to appropriate personnel, e.g. co-workers, supervisor:
- document issues, as required, e.g. note in logbook
- estimate quantity of unrecovered chemicals

Knowledge

K1 Relevant legislation

K2 Emergency Response Plan

K3 Organizational safety policies and procedures, including Occupational Health & Safety (OH&S)

K4 Workplace Hazardous Materials Information System (WHMIS)

K5 Transportation of Dangerous Goods (TDG)

K6 Types of chemicals that may be encountered

K7 Importance of handling chemical spills and leaks correctly and in timely manner

K8 Available emergency response services and their contact information

K9 Procedures for safe evacuation, if required

K10 Safety reporting procedures

CONTEXTUAL VARIABLES

Range of Context

- Type of chemicals encountered will vary, e.g. chlorine, oil.
- Size of spill/amount of chemicals spilled may vary the approach to handling the spill/leak.

Level of Practice

- ☒ Frontline
- ☐ Supervisor
- ☐ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☒ Apply
- ☐ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- PPE, e.g. gloves, masks, eye protection
- Materials for containment, e.g. sand, earth
- Tools for containment, e.g. corrosion resistant shovel, disposal container
- Legal forms related to chemical spills and leaks

Major Category	Safety
Competency Area	Respond to Emergencies
Competency Unit	Respond to non-electrical emergencies

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☒ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☐ Apply
- ☒ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Communication equipment
- Emergency response equipment, e.g. first aid kits, fire extinguishers
- Notebook

Purpose

Responding quickly and correctly to non-electrical emergencies reduces the chance of injury or death to employees, contractors, customers and the public as well as minimizes damage to the environment. It also protects the organization and its assets against loss and liability.

Performance/Abilities

P1 Remain calm

P2 Initiate Emergency Response Plan for type of risk, if required, for example:
- notify internal and external authorities
- evacuate
- follow direction of emergency authority
- assist emergency authorities
- secure area

P3 Assess level of hazard:
- determine what is exposed to risk, e.g. unit, station, site, field operations

P4 Record details of emergency, for example:
- date and time
- nature of emergency
- time authorities were contacted
- time authorities arrived
- action taken
- names and contact information for witnesses

P5 Follow up, as required, for example:
- take action to prevent recurrence

Knowledge

K1 Relevant legislation

K2 Emergency Response Plan

K3 Organizational safety policies and procedures, including Occupational Health & Safety (OH&S)

K4 Workplace Hazardous Materials Information System (WHMIS)

K5 Available emergency response services and their contact information

K6 Procedures for safe evacuation, if required

K7 Emergency reporting procedures

CONTEXTUAL VARIABLES

Range of Context

- Type of emergencies encountered will vary, e.g. bomb threat, sabotage threat, natural disaster.
- Severity of emergency situation will vary.

Major Category	Safety
Competency Area	Respond to Emergencies
Competency Unit	Participate in high-angle rescue

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☐ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☒ Apply
- ☐ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- High-angle rescue kit
- High-angle rescue equipment, e.g. elevated work platform, ladder
- First aid kit

Purpose

Responding quickly and correctly to a situation in which individual(s) are in danger at height reduces the chance of injury and death to employees, contractors, customers and the public. It also protects the organization and its assets against loss and liability.

Performance/Abilities

P1 Maintain certification for high-angle rescue

P2 Participate in high-angle rescue training exercises

P3 Prepare for potential rescue:
- inspect equipment on regular basis
- replace equipment, as necessary
- store rescue kit in designated location

P4 Assess level of hazard

P5 Initiate Emergency Response Plan, if required, for example:
- notify internal and external authorities
- secure area

P6 Follow legislated procedures for high-angle rescue

P7 Communicate issues to appropriate personnel, e.g. co-workers, supervisor:
- document actions, as required

Knowledge

K1 Relevant legislation

K2 Emergency Response Plan

K3 Organizational safety policies and procedures, including Occupational Health & Safety (OH&S)

K4 Certification/training needed for high-angle rescue

K5 Inspection requirements for equipment

K6 Available emergency response services and their contact information

K7 First aid training

K8 Procedures for safe evacuation, if required

K9 Emergency reporting procedures

CONTEXTUAL VARIABLES

Range of Context

- Environmental conditions will vary, e.g. wind direction/speed.

Major Category	Safety
Competency Area	Respond to Emergencies
Competency Unit	Participate in incident and accident investigations

Purpose

Participating in the investigation of an incident or accident will help to determine what happened, why it occurred, and how to prevent similar events from occurring in the future.

Performance/Abilities

P1 Survey scene, as required:
- make the scene safe
- secure the scene, as necessary
- tag relevant equipment or materials
- photograph environment, as necessary

P2 Gather information, as required, for example:
- people directly and indirectly involved
- relevant equipment or material
- site
- process, i.e. work procedures, instructions, training, safety records

P3 Participate in interviews with relevant parties, e.g. emergency authority, Worker's Compensation Board (WCB), supervisor:
- describe events in own words

P4 Document events, as necessary, e.g. write witness report

P5 Participate in root-cause analysis, as required

Knowledge

K1 Relevant legislation

K2 Safe work procedures

K3 Incident investigation and reporting requirements

K4 Types of safety hazards on site

Glossary

- **Accident:** an accident is an unplanned, unwanted event that disrupts the orderly flow of the work process. It involves the motion of people, objects or substances.
- **Incident:** an accident or other occurrence which resulted in or had the potential to cause injury or occupational disease. The term incident includes "close-call" or "near-miss" events.
- **Worker's Compensation Board (WCB):** WCB is an insurance program that covers injuries in the workplace. It covers wage replacement for injured workers, healthcare costs and rehabilitation costs. It is paid for by employers and is no fault.

CONTEXTUAL VARIABLES

Range of Context

- Complexity of investigation and required reports will depend upon the accident/incident, type of work and work location.

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☒ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☒ Apply
- ☐ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Camera
- Notebook
- Computer software
- Legal forms related to incident/accident reporting
- Personal protective equipment (PPE)

Purpose

Following practices to protect the physical work environment is critical to protect project/organizational assets, employees, contractors, customers and the general public.

Performance/Abilities

P1 Adhere to security procedures, including:
- participate in NERC training, as required
- use tools and equipment, e.g. access cards
- identify situations that may cause security issues, e.g. door propped open, gate access point unmanned

P2 Update procedures/tools on regular basis, as required, e.g. use new codes

P3 Report unsafe or suspicious activity, e.g. unauthorized visitors, equipment being removed from site unexpectedly

P4 Document work security issues

Knowledge

K1 Relevant legislation
K2 NERC Standards
K3 Organizational/project security policies and procedures
K4 Types of security hazards on site
K5 Authorized access systems and their use

CONTEXTUAL VARIABLES

Range of Context

- Quantity and type of security hazards varies with type of work and work location.

Level of Practice
- ☒ Frontline
- ☒ Supervisor
- ☒ Manager/Executive

Adapted Bloom's Taxonomy
- ☐ Recall, Remember
- ☐ Understand
- ☐ Apply
- ☒ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Access tools and equipment, e.g. key cards, identification cards

Purpose

Along with Information and Communication Technology (ICT) security functions that are built into an organization's computer system, it is essential for users to follow cybersecurity protocols to prevent intentional damage to an organization through cyberattacks. Users following security protocols are another layer of protection from external threats.

Performance/Abilities

P1 Follow system log-in/out protocols:
- log out of system when work is completed

P2 Participate in organization's cybersecurity training

P3 Use passwords:
- change passwords when requested or required by organization's ICT procedures
- do not share passwords with others
- do not write passwords down in a visible place
- use a mix of characters, letters and numbers for passwords

P4 Operate organization's computer system in a secure manner, for example:
- use computers and smart mobile devices approved by organization
- do not leave computer equipment unattended, e.g. computer, smart phone, tablet, flash drives, hard drives
- do not plug unauthorized flash drives or smart phones into computer
- use organization's sites and applications for field devices
- comply with assigned permissions and access limits
- upload security updates as directed, and use newest versions of application software

P5 Carry out work on organization's computer system securely, for example:
- use approved web browsers and search engines
- check all URLs for indications of a phishing site, e.g. spelling errors, complete "https://" on secure sites
- avoid using links, when possible, even on secure websites
- do not download from unknown websites
- do not work using unsecured internet connections or public computers

P6 Use communication applications in a secure manner:
- do not accept or open mail or attachments from unknown senders
- use approved communication channels and protocols, especially when communicating with other organizations
- do not provide confidential work information to an unknown email source/caller:

P7 Do not upload personal applications or access personal websites on organization's devices

P8 Do not post unauthorized work information on social networks

P9 Back up files to specified drives and at specified times, as directed

P10 Contact ICT immediately when:
- computer device is unresponsive or is operating in odd manner
- windows or communications open with unusual messages, demands, or instructions, especially when system will not respond
- there are frequent information or data disruptions, misconfigurations, and gaps or unexplained changes

Knowledge

K1 Organization's cybersecurity protocols
K2 Approved applications
K3 Personal password for access to system
K4 Access permissions and restrictions
K5 Indicators of data corruption
K6 Potential risks to system, e.g. viruses, malware, ransomware
K7 Normal application operations
K8 Indicators of unsecured or fraudulent websites

Glossary

- **Cybersecurity:** the practice of protecting systems, networks, and programs from digital attacks that interrupt normal business operations. Digital or cyberattacks try to:
  - access confidential and/or sensitive information to use for illegal purposes, e.g. identity theft;
  - destroy or change confidential and/or sensitive information to disrupt business operations; or,
  - extort money from users by holding their systems hostage until some form of payment is received.
- **Malware:** software that is specifically designed to access and/or damage a computer without owner of the computer being aware of what is happening, e.g. viruses, worms, spyware.
- **Ransomware:** software that prevents users from accessing their own data until the user pays a ransom.
- **Phishing:** a scam to obtain personal information to commit fraud, often involving social engineering, e.g. email or phone calls from distant relative requesting money, phony websites with sign up forms, message from bank requiring confirmation of account information.
- **Social engineering:** attempts to obtain personal or confidential information or to get the user to perform certain tasks by what appears to be a legitimate source or person; a component of phishing.

CONTEXTUAL VARIABLES

Range of Context

- While many cybersecurity safeguards are built into the design of the system software, users working from home, working remotely in the field, or on personal devices, e.g. smart phones, may change the performance of this skill.

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☒ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☒ Apply
- ☐ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Passwords
- Computers, mobile devices
- Cybersecurity software
- Key fob, e.g. RSA SecurID token

Major Category	Organizational Policies and Procedures
Competency Area	Follow Organizational Policies and Procedures
Competency Unit	Follow organizational policies and procedures

Purpose

Following policies and procedures is important to create a consistent work environment for employees and to provide consistent service delivery to internal/external customers.

Performance/Abilities

P1 Review organizational policies and procedures
P2 Participate in orientation and on-the-job training
P3 Complete all work-related tasks according to organizational policies and procedures
P4 Identify opportunities for improvement to policies and procedures:
- communicate to team members and supervisors, as appropriate

P5 Keep up to date with changes to policies and procedures, e.g. access online library for updates

Knowledge

K1 Organization policies, procedures and plans, e.g. occupational health and safety, workplace health and wellness
K2 Organization/project goals, vision and status
K3 Organizational document management system, e.g. where to find latest policies and communication documents

CONTEXTUAL VARIABLES

Range of Context

- Number of policies and procedures to be followed will vary.

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☒ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☒ Apply
- ☐ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Organizational policies and procedures manual
- Documents associated with organizational policies and procedures, including forms, checklists

Major Category	Information/Record Management
Competency Area	Complete Information/Record Management Tasks
Competency Unit	Maintain technical information and data

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- CAD software
- Mobile workforce technology

Purpose

Maintaining technical information and data is important so that critical and up to date information is available. This data is the basis for setting goals and objectives for the short-, medium- and long-term. It also ensures that legislative requirements are met.

Performance/Abilities

P1   Identify types of information/records that are required, for example:
- operations and maintenance manual
- bill of material parts
- asset related information, e.g. type of equipment, location
- event and call logs
- drawings
- test results

P2   Provide information as required, e.g. fill out online or paper forms:
- ensure information is provided/records are completed within required timelines, e.g. daily, weekly, monthly

P3   Ensure information recorded is accurate and complete

P4   Complete field mark-ups, as required

P5   Verify that drawing revisions match field wiring, as required

P6   Update drawings or ensure drawings are sent for update, as required

P7   File revised drawings according to information/record management protocols

Knowledge

K1   Legislation, e.g. NERC Standards

K2   Organization policies, procedures and plans

K3   Organization/project goals, vision and status

K4   Organizational document management system

K5   Use of relevant software, e.g. CAD, GIS

CONTEXTUAL VARIABLES

Range of Context

- Work environment can make this skill challenging to perform, e.g. outdoors.

Level of Practice

- ☒ Frontline
- ☐ Supervisor
- ☐ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☐ Apply
- ☒ Analyze
- ☐ Evaluate
- ☐ Create/Transform

electricity
HUMAN RESOURCES CANADA

Major Category	Information and Communication Technology Foundations
Competency Area	Use Digital Technology
Competency Unit	Use communication applications

Purpose

Communication applications allow efficiencies when sending and receiving messages. This includes combinations of visual and audio communication and document sharing over distance which in turn allow for virtual meetings, educational webinars, and other communication formats that can save time and money.

Performance/Abilities

P1 Open desired communication application on system, online, or on cell phone e.g. email, text messaging

P2 Verify message before sending

P3 Select communication recipients:
- verify who will receive message, e.g. only include relevant parties

P4 Use email:
- follow email etiquette, e.g. do not use all uppercase, keep message professional in tone
- include purpose of message in subject line
- create concise and clear message
- add attachments following email application protocols, e.g. drop and click, select file using paperclip icon:
  - follow application instructions to make attachment smaller or use alternative document sharing applications if attachment is too large
- close message with appropriate salutation and sign-off, e.g. organization logo and contact information
- proofread message before sending
- manage mailboxes:
  - use settings to designate type of mail, if appropriate, e.g. check junk mail regularly, check auto rules to ensure up to date and correct
  - delete messages in trash and junk mail periodically

P5 Use text messaging:
- keep messages brief
- do not use texting abbreviations, e.g. lol, btw
- do not use emojis and animated images, e.g. GIFs

P6 Use conferencing applications authorized by organization:
- ensure appropriate documents are open and screen background is appropriate when screen sharing
- ensure quiet environment when using audio
- mute microphone when not speaking
- consider lag time when speaking and sharing documents
- announce name when entering conference and before speaking, if appropriate

Knowledge

K1 Organization's policies and procedures, e.g. cybersecurity, logging into applications

K2 Application functions and icons, e.g. trash can, flags, reply

K3 Purpose of communication

K4 Audience

K5 Writing protocols for email and text messages

K6 Communication considerations, e.g. background noise, time lag, pitch of voice

Glossary

- **Cybersecurity:** the practice of protecting systems, networks, and programs from digital attacks that interrupt normal business operations. Digital or cyberattacks try to:
  - access confidential and/or sensitive information to use for illegal purposes, e.g. identity theft;
  - destroy or change confidential and/or sensitive information to disrupt business operations; or,
  - extort money from users by holding their systems hostage until some form of payment is received.
- **Emoji:** a small digital icon used to express a feeling or idea.
- **GIF:** series of images encoded to automatically replay back as an animated sequence.

CONTEXTUAL VARIABLES

Range of Context

- Communication applications on mobile devices may differ from desktop system and clarity of communication may vary.
- Communication applications differ depending on system and device being used.

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☒ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☒ Apply
- ☐ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Computer
- Tablet
- Cell phone
- Communication software applications
- Headsets

Major Category	Information and Communication Technology Foundations	**Major Category**	Information and Communication Technology Foundations
Competency Area	Use Digital Technology	**Competency Area**	Use Digital Technology
Competency Unit	Use common software applications	**Competency Unit**	Use navigation and mapping applications

Purpose

Common computer software applications for word processing, data spreadsheets, and presentations help to increase the productivity and efficiency of the organization.

Performance/Abilities

P1 Select appropriate application for task, e.g. word processing, presentation, spreadsheets

P2 Use application's tools to create, enhance or customize content

P3 Save document to appropriate folder and drive

Knowledge

K1 Organizational policies and procedures, e.g. file naming, file sharing, cybersecurity

K2 Purpose and features of common applications

K3 Links between applications, e.g. cell phone camera photos are saved automatically in photo application

Glossary

• **Cybersecurity:** the practice of protecting systems, networks, and programs from digital attacks that interrupt normal business operations. Digital or cyberattacks try to:

  • access confidential and/or sensitive information to use for illegal purposes, e.g. identity theft;

  • destroy or change confidential and/or sensitive information to disrupt business operations; or,

  • extort money from users by holding their systems hostage until some form of payment is received.

CONTEXTUAL VARIABLES

Range of Context

• Applications will differ depending on device and operating systems.

Level of Practice

☒ Frontline
☒ Supervisor
☒ Manager/Executive

Adapted Bloom's Taxonomy

☐ Recall, Remember   ☐ Analyze
☐ Understand   ☐ Evaluate
☒ Apply   ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

• Computer
• Tablet
• Cell phone
• Common software applications

Purpose

Navigation and mapping applications are used to ensure accurate identification and documentation of asset and work locations, as well as ensure the safety of personnel in the field and the efficient use of resources.

Performance/Abilities

P1 Use global positioning system (GPS) and geographical information system (GIS) device required for tasks e.g. GPS receiver, truck tracker, cell phone

P2 Follow manufacturer's instructions

P3 Ensure correct types of maps of field work area are uploaded or correct views selected, for example:
  • street maps
  • topographical maps
  • satellite view

P4 Comply with GPS features in vehicles and personal tracking fob requirements when working in field

Knowledge

K1 Manufacturer's instructions

K2 Organization's policies and procedures, e.g. safety

K3 Capabilities and limitations of different types of devices and applications

K4 Types of maps

K5 Geographical coordinates

K6 Functions of navigation and mapping applications

Glossary

• **Geographic information system (GIS):** a computer application that captures, stores, checks and displays data related to positions on Earth's surface; may include cartographic data, photographic data, digital data, or data in spreadsheets.

• **Geographic coordinates:** a grid system consisting of lines of latitude (north-south) and lines of longitude (east-west) that allow users to define a precise location on the earth's surface. Expressed in degrees and minutes.

• **Global Positioning System (GPS):** a computer program that uses triangulation to determine a user's location on the earth by feedback received from at least three satellites orbiting the earth.

• **Waypoint:** is the marking of a location by obtaining the geographic coordinates with a GPS unit.

CONTEXTUAL VARIABLES

Range of Context

• Locating assets may require both GIS and GPS.

• There is generally no cellular or wireless service in remote destinations which may impact the type of GPS device that can be used.

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☐ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☒ Apply
- ☐ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- GPS receiver
- Cell phone
- Computer

Major Category	Information and Communication Technology Foundations
Competency Area	Use Digital Technology
Competency Unit	Use digital mobile radios

Purpose

Digital mobile radios (DMRs) are used for internal communications between departments and work groups for the purposes of primary and emergency backup communication.

Performance/Abilities

P1 Use digital mobile radios as required, for example:
- from field to office
- between work groups
- within own work group
- for emergency communications

P2 Follow manufacturer's instructions

P3 Comply with organization's policies and guidelines

P4 Comply with Industry Canada's radio communication regulations, e.g. licensing requirements

Knowledge

K1 Applicable legislation, e.g. Industry Canada's radio communication regulations

K2 Manufacturer's instructions and recommendations

K3 Organization's policies and procedures, e.g. safety, communication protocols

K4 Capabilities and limitations of different types of devices

CONTEXTUAL VARIABLES

Level of Practice

- ☒ Frontline
- ☐ Supervisor
- ☐ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☒ Apply
- ☐ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Digital mobile radio

Major Category	Information and Communication Technology Foundations
Competency Area	Use Organization's ICT System
Competency Unit	Use organization's ICT system

Purpose

Following the organization's protocols to enter and retrieve information in the computer system is essential to ensure the organized, accurate, and secure documentation of an organization's activities across various types of computerized equipment.

Performance/Abilities

P1 Follow organization's policies and procedures, e.g. data entry, cybersecurity

P2 Retrieve required information from saved files or databases, for example:
- access information from saved files or databases as permitted from:
  - computer hard drive
  - organization's shared drive(s)
- use appropriate search terms to find required information, e.g. file name, subject matter, customer name

P3 Enter/update information, for example:
- complete all data fields accurately
- check accuracy of manual data entry
- do not enter same data more than once
- do not edit or change data without appropriate permissions

P4 Upload information, e.g. files, photograph, prints, data:
- ensure information sources are secure

P5 Save work:
- use file naming protocol
- save in appropriate drive(s) and folder

Knowledge

K1 Organization's protocols, for example:
- cybersecurity
- access permissions
- file naming
- organization of shared drives
- printing
- file sharing

K2 Applications purposes and functions

K3 Consequences of inaccurate or incomplete data

K4 Different uses of data

K5 Allowable data requests

K6 Organization of shared drive(s)

K7 Uploading and downloading of documents, files, drawings and photos

Glossary

- **Computer Aided Design (CAD):** a computer application that is used to produce 2- and 3-dimensional drawings of an engineered design that details the physical components and layout.
- **Cybersecurity:** the practice of protecting systems, networks, and programs from digital attacks that interrupt normal business operations. Digital or cyberattacks try to:
  - access confidential and/or sensitive information to use for illegal purposes, e.g. identity theft;
  - destroy or change confidential and/or sensitive information to disrupt business operations; or,
  - extort money from users by holding their systems hostage until some form of payment is received.
- **Geographic Information Systems (GIS):** a computer application that manages geographic information, which can be manipulated to display aspects of geographical information in a map format.

CONTEXTUAL VARIABLES

Range of Context

- Organizations will have different levels of permissions and access to different applications and shared drives based on occupational requirements and responsibilities.
- Organizations may use proprietary closed computer systems and networks.
- Access to system and applications may differ if using a mobile device.
- Cybersecurity protocols may differ in levels of automation and auto-surveillance, e.g. audit trails.
- Organizations may use different purchased applications.

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☒ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☒ Apply
- ☐ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Computer or mobile device
- Software programs

Major Category	Foundational Trades Skills
Competency Area	Perform Routine Trade Tasks
Competency Unit	Use hand and power tools

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Personal protective equipment, e.g. safety glasses, gloves, safety boots, hearing protection
- Hand and power tools, e.g. standard hand tools, drill press, pneumatic wrenches

Purpose

Correctly using hand and power tools protects employees against injury or death and protects the organization from loss and liability.

Performance/Abilities

P1 Follow organization's policies and procedures, e.g. ensure required training is completed

P2 Follow manufacturer's instructions, e.g. inspection, preparation, cleaning

P3 Wear appropriate PPE, e.g. safety glasses

P4 Inspect hand and power tools before use

P5 Ensure hand or power tool is appropriate and rated for task

P6 Use tools for intended purpose only

P7 Communicate issues with tools to relevant personnel, e.g. co-workers, supervisor

P8 Tag defective tools:
- turn in to relevant personnel or department

P9 Clean tools after use:
- store in designated location

Knowledge

K1 Relevant legislation, e.g. Occupational Health and Safety (OH&S)

K2 Organizational safety policies and procedures, e.g. OH&S

K3 Types of safety hazards on site and mitigation methods, e.g. limits of approach, barriers

K4 Types of safety hazards associated with hand and power tools

K5 PPE required for specific tasks

K6 Types of hand and power tools, their components and procedures for use

K7 Manufacturer's instructions and recommendations, including ratings

CONTEXTUAL VARIABLES

Range of Context

- Types of hand and power tools vary with type of work and work location.

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☐ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☐ Apply
- ☒ Analyze
- ☐ Evaluate
- ☐ Create/Transform

Major Category	Foundational Trades Skills
Competency Area	Perform Routine Trade Tasks
Competency Unit	Use electrical measuring and testing equipment

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Personal protective equipment, e.g. gloves, safety glasses
- Electrical measuring and testing equipment, e.g. multi-meters, power level meters, frequency selective meters, hi-pot tester, non-contact tester, diagnostic test equipment

Purpose

Correctly using electrical measuring and testing equipment protects employees and contractors against injury or death and protects the organization from loss and liability. It also helps to ensure that data being analyzed is accurate.

Performance/Abilities

P1 Follow relevant legislation, e.g. Occupational Health & Safety

P2 Follow organization's policies and procedures, e.g. ensure required training is completed

P3 Follow manufacturer's instructions, e.g. inspection, preparation, calibration, grounding

P4 Wear appropriate personal protective equipment (PPE), e.g. safety glasses, gloves

P5 Inspect equipment before use

P6 Ensure equipment is appropriate and rated for task

P7 Use equipment for intended purpose only

P8 Communicate issues with equipment to relevant personnel, e.g. co-workers, supervisor

P9 Tag defective equipment:
- turn in to relevant personnel or department

P10 Clean equipment after use:
- store in designated location

Knowledge

K1 Relevant legislation, including Occupational Health and Safety (OH&S)

K2 Organizational safety policies and procedures, e.g. OH&S and training requirements

K3 Types of safety hazards on site and mitigation methods, e.g. limits of approach, barriers

K4 Types of safety hazards associated with electrical measuring and testing equipment

K5 PPE required for specific tasks

K6 Types of electrical measuring and testing equipment, their components and procedures for use

K7 Inspection procedures for electrical measuring and testing equipment

K8 Calibration procedures for electrical measuring and testing equipment

CONTEXTUAL VARIABLES

Range of Context

- Types of equipment will vary with type of work and work location.

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☐ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☐ Apply
- ☒ Analyze
- ☐ Evaluate
- ☐ Create/Transform

Major Category	Foundational Trades Skills
Competency Area	Perform Routine Trade Tasks
Competency Unit	Use access equipment and work platforms

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☐ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☒ Apply
- ☐ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Personal protective equipment, e.g. fall arrest equipment, hard hat, shepherd hooks
- Occupational Health & Safety documents, e.g. safe work procedures
- Access equipment and work platforms, e.g. portable and permanent ladders, diving boards, scissor-lifts, scaffolding, articulating boom

Purpose

Correctly using access equipment and work platforms protects employees against injury or death and protects the organization from loss and liability.

Performance/Abilities

P1 Follow organization's policies and procedures, e.g. ensure required training is up to date

P2 Wear appropriate personal protective equipment (PPE), e.g. fall arrest

P3 Identify traffic areas and potential site hazards

P4 Select access equipment according to site and task requirements

P5 inspect access equipment and installation location as per manufacturer's guidelines

P6 Use equipment only for intended purpose

P7 Secure access equipment, as required

P8 Use confined space monitoring equipment, as required

P9 Communicate issues with equipment to relevant personnel, e.g. co-workers, supervisor

P10 Tag defective equipment:
- turn in to relevant personnel or department

P11 Clean equipment after use:
- store in designated location

Knowledge

K1 Relevant legislation, e.g. Occupational Health and Safety (OH&S), required training

K2 Organizational safety policies and procedures, including OH&S

K3 Types of safety hazards on site

K4 Types of safety hazards associated with access equipment, e.g. ladder footing, trenches, confined spaces

K5 PPE required for specific tasks

K6 Types of access equipment, their components and procedures for use, e.g. ladders, scaffolding, aerial work platform

K7 Inspection procedures for access equipment

Glossary

- **Access equipment:** any equipment that is specially designed to help user to work safe in locations not readily accessible, e.g. above ground, below ground, confined space, at height.

CONTEXTUAL VARIABLES

Range of Context

- Types of equipment will vary with type of work and work location.

Major Category	Foundational Trades Skills
Competency Area	Perform Routine Trade Tasks
Competency Unit	Operate vehicles and motorized equipment

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Personal protective equipment, e.g. personal flotation device, helmet
- Vehicles and motorized equipment, e.g. trucks, quads, side-by-sides, boats, snowmobiles, bucket trucks

Purpose

Correctly operating motorized vehicles and equipment protects employees, contractors and members of the public against injury or death, and protects the organization from loss and liability.

Performance/Abilities

P1 Obtain correct training and licenses for vehicles and motorized equipment, as required

P2 Identify traffic areas and potential site hazards

P3 Select vehicles and motorized equipment according to site and task requirements

P4 Inspect vehicles and motorized equipment before use:
  - ensure fluid levels are acceptable
  - adjust controls and safety features, as required
  - document condition of equipment, as required

P5 Operate vehicles and motorized equipment according to legal requirements and organizational policies and procedures

P6 Communicate issues with vehicles and motorized equipment to relevant personnel, e.g. co-workers, supervisor

P7 Inform relevant personnel or department if vehicles and motorized equipment are defective or require maintenance

P8 Store vehicles and motorized equipment in designated location

Knowledge

K1 Relevant legislation, e.g. regulations for off-road equipment, highway traffic act

K2 Organizational safety policies and procedures, including Occupational Health & Safety

K3 Types of safety hazards on site

K4 Types of safety hazards associated with vehicles and motorized equipment

K5 Types of vehicles and motorized equipment, their components and procedures for use

K6 Inspection procedures for vehicles and motorized equipment

CONTEXTUAL VARIABLES

Range of Context

- Types of vehicles and motorized equipment will vary with type of work and work location.

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☐ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☒ Apply
- ☐ Analyze
- ☐ Evaluate
- ☐ Create/Transform

Major Category	Foundational Trades Skills
Competency Area	Perform Routine Trade Tasks
Competency Unit	Lubricate equipment and components

Level of Practice

☒ Frontline
☒ Supervisor
☐ Manager/Executive

Adapted Bloom's Taxonomy

☐ Recall, Remember
☐ Understand
☒ Apply

☐ Analyze
☐ Evaluate
☐ Create/Transform

Purpose

Lubricating equipment and components protects assets against damage and extends the lifespan of equipment and components. Completing this task effectively protects the environment and may also protect employees and contractors against injury.

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Personal protective equipment, e.g. safety glasses, goggles, masks, gloves
- Hand tools, e.g. grease guns
- Lubricants, e.g. oil, grease, dry solid, water

Performance/Abilities

P1 Wear appropriate personal protective equipment (PPE), e.g. safety glasses, gloves, masks

P2 Determine lubricant requirements:
- refer to manufacturer's specifications for lubricant and equipment
- comply with applicable regulations

P3 Select appropriate lubricant, e.g. oil, grease, dry solid, water

P4 Select appropriate application tools and equipment, e.g. grease gun, hand tool

P5 Identify points requiring lubricants according to manufacturer's specifications and engineered drawings

P6 Maintain lubricant levels, as required

P7 Remove lubricants, as required:
- follow procedures for recycling or disposal
- replace lubricants, as required

P8 Respond to spills and leaks, as required:
- report spills to supervisor

P9 Communicate issues to relevant personnel, e.g. co-workers, supervisor

P10 Clean tools after use, as required

P11 Store tools and remaining lubricants in designated approved location

Knowledge

K1 Relevant legislation and documents, e.g. WHMIS

K2 Manufacturer's specifications and engineered drawings of equipment

K3 Organizational safety policies and procedures, including Occupational Health & Safety

K4 Manufacturer's Safety Data Sheets (SDS) and other lubricant specifications, e.g. PPE, first aid measures, characteristics

K5 Types of safety hazards on site and associated with lubrication, e.g. pinch points

K6 PPE required for specific tasks

K7 Consequences of using incorrect lubricant or not following application instructions

CONTEXTUAL VARIABLES

Range of Context

- Types of lubricants vary with types of equipment and components, nature of the work and work location.
- Tools used to lubricate equipment and components will vary with the type of lubricant, equipment and components.

Major Category	Foundational Trades Skills
Competency Area	Perform Routine Trade Tasks
Competency Unit	Assist with rigging, hoisting/lifting and moving tasks

Purpose

Assisting with rigging, hoisting/lifting and moving equipment and materials protects employees, contractors and members of the general public against injury or death, and equipment from damage. It also protects the organization against loss and liability.

Performance/Abilities

P1 Wear appropriate personal protective equipment (PPE), e.g. high visibility equipment, hard hat, gloves, safety boots, safety glasses

P2 Determine equipment needs based on:
- characteristics of rigging, hoisting/lifting or moving task, e.g. headroom, environment, stability
- process to be used for rigging, hoisting/lifting or moving
- number of items being lifted/moved at one time
- weight of load
- location of taglines

P3 Identify load ratings for sling arrangements, as required

P4 Inspect equipment for damage and wear

P5 Secure area, as required:
- assess site, ground, environmental conditions
- assist with route planning
- remove hazards, obstructions and other anomalies
- secure area of lift radius
- confirm location of personnel

P6 Determine scheduling of activities based on environmental conditions, e.g. weather

P7 Communicate issues to relevant personnel, e.g. co-workers, supervisor

P8 Communicate clearly before, during and after hoist/lift/move:
- ensure direct communication between operator and signal person, i.e. direct line of sight or radio communication
- use hand signals and verbal communication

Knowledge

K1 Relevant legislated requirements, e.g. Occupational Health & Safety (OH&S)

K2 Organizational safety policies and procedures, e.g. OH&S

K3 Types of safety hazards on site

K4 Types of safety hazards associated with rigging, hoisting/lifting and moving

K5 Terminology, hand signals and flagging associated with rigging, hoisting/lifting and moving

K6 PPE required for specific tasks

K7 Types of hoisting and lifting equipment, their components, accessories, applications, ratings, limitations and procedures for use, including:
- sling angles for hoisting/lifting

K8 Types of moving equipment and their applications, e.g. crane, boom or forklift

K9 Procedures to ensure work area is safe for lifting

CONTEXTUAL VARIABLES

Range of Context

- Types of equipment and tools vary with type of work and work location.
- Environment and weather conditions can alter the way this task is performed.

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☐ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☒ Apply
- ☐ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Personal protective equipment, e.g. high visibility clothing, hard hat, gloves, safety glasses, safety footwear
- Rigging, hoisting/lifting and moving equipment and tools, e.g. chain hoists, rope blocks, cable winches, web hoists, levers, slings, ropes, cables, taglines, crane, forklift

Major Category	Personal Competencies
Competency Area	Demonstrate Professionalism
Competency Unit	Work as a member of a team

Purpose

Working as a member of a team helps to ensure that operations run smoothly, and allows project managers, supervisors, employees and contractors to be proactive before small issues become large problems.

Performance/Abilities

P1 Demonstrate respect and empathy towards others:

- respect diversity
- respect differing perspectives
- promote an inclusive work environment
- recognize changes in team members' behaviours, e.g. mental health strain

P2 Be accountable:

- report unexpected conditions
- be punctual
- comply with schedule
- take action when issues arise

P3 Initiate contact with other team members on regular basis:

- ask questions

P4 Share knowledge and skills

P5 Recognize others' contributions and success

P6 Accept and provide constructive feedback

P7 Ask for help, when needed

P8 Offer help to team members

P9 Respond to requests in a timely manner

P10 Be open to change

P11 Participate actively in team meetings

Knowledge

K1 Organization policies, procedures and plans

K2 Organization/project goals, vision and status

K3 Roles and responsibilities of team members, including own role

K4 Team members' contact information

K5 Sector and project terminology and common abbreviations

K6 Symptoms of psychological strain, e.g. decreased quality of work, withdrawal

CONTEXTUAL VARIABLES

Range of Context

- Team members will vary, for instance, there may be a range of small, temporary working groups and more permanent, long-term working groups.
- Physically locations may change the way this skill is performed, e.g. communication may have to occur via distance means.

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☒ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☒ Apply
- ☐ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Software, e.g. video chat, virtual meeting
- Communication tools, e.g. email, telephone

Major Category	Personal Competencies
Competency Area	Demonstrate Professionalism
Competency Unit	Develop professionally

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☒ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☐ Apply
- ☒ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Computer access
- Mentoring/coaching program
- Education grant program, if available
- Collective agreement

Purpose

Developing professionally is important to keep current with sector trends, products and services. It improves an individual's attitude, knowledge, self-confidence and skills.

Performance/Abilities

P1 Maintain qualifications and certifications, as required, e.g. trade license, professional designation, First Aid, CPR

P2 Assess own skills, knowledge and abilities:
- reflect on feedback from peers and supervisor
- identify areas for improvement

P3 Identify areas of interest where new skill and knowledge development might be useful, e.g. new methods/products used in the sector

P4 Upgrade skills and knowledge, for example:
- attend courses offered by equipment manufacturers
- read sector-specific publications
- conduct research
- enroll in educational and professional development courses and programs
- participate in mentorship programs
- ask for assistance or instruction

P5 Participate in local trade and business organizations, as applicable

P6 Network with professional peers, e.g. attend conferences or trade shows

P7 Join and participate in associations, as applicable

P8 Ensure professional development is documented in organization's record management system, as required

Knowledge

K1 Organization policies, procedures and plans

K2 Organization/project goals, vision and status

K3 Own skills, knowledge and abilities

K4 Roles and responsibilities of team members, including own role

K5 Where to find up-to-date and accurate information on the sector

K6 Relevant training providers and their offerings

CONTEXTUAL VARIABLES

Range of Context

- Access to resources may affect the way this skill is performed, e.g. organization's professional development budget, individuals may only attend provided professional development sessions during work time.
- Physical location may change the way this skill is performed, e.g. all professional development may have to be pursued via distance means.

Major Category	Personal Competencies
Competency Area	Demonstrate Professionalism
Competency Unit	Demonstrate professional and ethical conduct

Purpose

Demonstrating professional and ethical conduct is important to build trust and respect in relationships with others. It also helps to promote a positive image of the organization and the sector.

Performance/Abilities

P1 Participate in relevant training, e.g. conflict of interest, code of conduct, ethics

P2 Support high standards and practices that protect public and bring credibility to organization, sector, and community, for example:
- follow professional code of ethics/code of conduct, as applicable
- implement responsible policies
- avoid degrading or malicious discussion
- recognize potential conflict of interest

P3 Demonstrate professional attributes, including:
- approachability, e.g. be available to coworkers and clients
- composure, e.g. remain calm in emergency
- empathy, e.g. show concern for others' problems
- emotional intelligence, e.g. awareness of own and others' emotional states
- fairness, e.g. treat all equally
- flexibility, e.g. be open to new situations and approaches
- being proactive, e.g. address issues before they become large problems
- initiative
- QA/QC principles in relation to work, e.g. catching potential errors prior to issues
- trustworthiness, e.g. honour commitments
- social responsibility, e.g. report injured wildlife to appropriate authorities

P4 Ensure appearance is professional, e.g. wear uniform or organizational id/tag, ensure attire is in good repair

P5 Comply with legal requirements, e.g. high visibility clothing, NERC requirements, conflict of interest

P6 Maintain confidentiality of information, as required

P7 Maintain accurate records

P8 Show respect for organization's assets, e.g. take proper care of tools and equipment

Knowledge

K1 Relevant legislation, e.g. Freedom of Information and Protection of Privacy (FOIP), NERC Standards

K2 Organization policies, procedures and plans

K3 Organization/project goals, vision and status

K4 Code of conduct/Code of ethics

K5 Own skills, knowledge and abilities

K6 Roles and responsibilities of team members, including own role

K7 Where to find up-to-date and accurate information on standards and practices

CONTEXTUAL VARIABLES

Range of Context

- Formal codes of ethics may exist in some subsectors and not others.

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☒ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☒ Apply
- ☐ Analyze
- ☐ Evaluate
- ☐ Create/Transform

Major Category	Personal Competencies
Competency Area	Demonstrate Professionalism
Competency Unit	Mentor/coach others

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☒ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☐ Apply
- ☒ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Software, e.g. video chat, virtual meeting
- Communication tools, e.g. email, telephone

Purpose

Mentoring/coaching others is important to help create an environment of continuous learning within the organization. It helps to ensure consistency in the work being completed, and assists with building positive workplace relationships. It contributes to an improvement of both individual and team performance.

Performance/Abilities

P1 Initiate contact with other team members/learners on regular basis:
- ask questions

P2 Use positive approach to help team members/learners solve problems:
- ask questions to help focus on problem
- guide resolution/performance
- demonstrate patience

P3 Demonstrate tasks for others, as required:
- explain importance of and reasons for process/tasks
- link learning to other tasks and overall job

P4 Set up environment for learner to practice skills, as required:
- ensure safety of learning environment

P5 Recognize success, e.g. praise team member/learner

P6 Assess learners' progress, as appropriate

P7 Provide supportive and corrective feedback

P8 Ask for feedback on own performance as coach/mentor

Knowledge

K1 Organization policies, procedures and plans

K2 Organization/project goals, vision and status

K3 Roles and responsibilities of team members/learners, including own role

K4 Role of workplace mentor/coach

K5 Sector and project terminology and common abbreviations

K6 Different ways of learning/learning needs and strategies to address them, e.g. language proficiency, learning preference

K7 How to adjust to different learning styles

K8 Importance of, and techniques for, providing effective feedback

CONTEXTUAL VARIABLES

Range of Context

- Mentoring/coaching may be a formalized or informal process, which will affect how this skill is performed.

Major Category	Personal Competencies
Competency Area	Demonstrate Professionalism
Competency Unit	Manage stress

Level of Practice

☒ Frontline
☒ Supervisor
☒ Manager/Executive

Adapted Bloom's Taxonomy

☐ Recall, Remember
☐ Understand
☐ Apply

☒ Analyze
☐ Evaluate
☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

• Psychological health and wellness program

Purpose

Managing stress is important to improve one's own ability to balance personal and professional demands, perform one's job competently, and contribute to a harmonious workplace.

Performance/Abilities

P1 Attend to own physical, emotional, spiritual, family and financial needs:
  • ask for help, if needed

P2 Recognize own limitations and those of others, e.g. know when to say no

P3 Recognize how your stress affects others

P4 Manage time effectively:
  • prioritize tasks to be done
  • ensure schedule is realistic
  • negotiate or discuss with team members/supervisor, as required

P5 Delegate responsibilities, when appropriate

P6 Adapt to shift work, as required, for example:
  • prepare self for shifts
  • ensure proper rest/sleep
  • ensure proper nutrition

P7 Maintain open communication with others

P8 Identify coping strategies, e.g. maintain a sense of humour

Knowledge

K1 Organization policies, procedures and plans

K2 Organization/project goals, vision and status

K3 Organization's wellness program, e.g. available gym memberships, counselling programs

K4 Own skills, knowledge and abilities

K5 Roles and responsibilities of team members, including own role

K6 Symptoms of psychological strain, e.g. fatigue, irritability, difficulty concentrating, isolation

CONTEXTUAL VARIABLES

Range of Context

• Availability of an organization wellness program, and its associated offerings, may alter the way this skill is performed.

Major Category	Personal Competencies
Competency Area	Demonstrate Professionalism
Competency Unit	Manage time

Purpose

Managing time is important to support efficiency and productivity by allowing the required time to be spent on the areas/tasks of most importance, and ensures that all tasks can be completed according to schedule.

Performance/Abilities

P1 Set goals:
- ensure goals are realistic and relevant
- outline objectives to be achieved for each goal

P2 Identify tasks that need to be achieved for each objective:
- prioritize based on importance and urgency

P3 Determine amount of time each task will take, considering:
- previous experience
- available resources
- competing priorities
- possible delays

P4 Use time management system, e.g. electronic calendar, daytimer:
- record appointments, meetings and critical dates

P5 Create action plan:
- identify timelines and critical dates

P6 Schedule tasks:
- delegate tasks, as required

P7 Monitor progress of tasks and action plan:
- review/update timelines regularly

P8 Identify incomplete tasks:
- develop plan for completion

P9 Review goals and objectives periodically:
- review time management system
- evaluate own tasks
- evaluate progress toward goals
- make adjustments, as required

Knowledge

K1 Organization policies, procedures and plans
K2 Organization/project goals, vision and status
K3 Own skills, knowledge and abilities
K4 Roles and responsibilities of team members, including own role

CONTEXTUAL VARIABLES

Range of Context

- Complexity of time management will vary with job role and current tasks.
- Goals, objectives and action plans may be provided, depending upon job role and organization.
- Unplanned situations, including emergencies, can make it difficult to perform this skill.
- Collaboration may or may not be required, e.g. some activities need to be coordinated with others/other work teams.

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☒ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☐ Apply
- ☒ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Time management sytems, e.g. electronic calendar, daytimer
- Software, e.g. project management software

Major Category	Personal Competencies
Competency Area	Communicate Effectively
Competency Unit	Use active listening skills

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☒ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☐ Apply
- ☒ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Software, e.g. video chat, virtual meeting
- Communication tools, e.g. telephone

Purpose

Using active listening skills helps to ensure that all parties understand each other. This promotes effective teamwork, improves productivity and reduces stress.

Performance/Abilities

P1 Choose appropriate time and place to listen, if possible:
- remove distractions, as required

P2 Listen carefully to message:
- be open-minded
- use attentive body language, e.g. face speaker
- listen until message is complete, i.e. do not interrupt
- give speaker undivided attention

P3 Watch for nonverbal indicators that reinforce or contradict message, e.g. nod, rolling eyes

P4 Respond to message, for example:
- use nonverbal indicators, e.g. nod, smile
- offer comments
- use questions to seek additional information or clarify details
- paraphrase to confirm understanding

Knowledge

K1 Relevant legislation, e.g. Freedom of Information and Protection of Privacy

K2 Organization policies, procedures and plans

K3 Organization/project goals, vision and status

K4 Effective communication practices, e.g. verbal versus non-verbal, characteristics of respectful communication

K5 Sector, trade and project terminology and common abbreviations

K6 Question types, e.g. open-ended, closed, probing, mirror

K7 Communication that constitutes harassment and discrimination

CONTEXTUAL VARIABLES

Range of Context

- Physical location may change the way this skill is performed, e.g. all listening may have to occur via distance means.

Major Category	Personal Competencies
Competency Area	**Communicate Effectively**
Competency Unit	**Negotiate with internal and external stakeholders**

Purpose

Negotiating effectively with internal and external stakeholders helps to ensure all parties are satisfied with the resulting outcomes.

Performance/Abilities

P1 Determine who needs to be involved in negotiation

P2 Determine own position:
- represent project/organization's position, as required

P3 Identify what is flexible and what is not

P4 Present offer to other party

P5 Acknowledge position or offer of other party

P6 Discuss possible outcomes with other party:
- remain open, honest and flexible
- focus on positive outcomes
- clarify position, as required, e.g. provide supporting information, discuss ramifications
- focus on issue at hand
- suggest alternatives

P7 Analyze impacts of possible outcomes, e.g. schedule, resources/cost

P8 Facilitate agreement

P9 Confirm agreement in writing:
- File agreement according to project/organizational protocol

Knowledge

K1 Relevant legislation, e.g. Freedom of Information and Protection of Privacy

K2 Organization policies, procedures and plans

K3 Organization/project goals, vision and status

K4 Organizational document management system

K5 Effective communication practices, e.g. verbal versus non-verbal, characteristics of respectful communication

K6 Project stakeholders and their contact information

K7 Relevant government agencies and their contact information

K8 Sector and project terminology and common abbreviations

K9 Negotiation techniques and strategies

Glossary

- **Stakeholders:** individuals and groups who are impacted by the activities or decisions of others; the individuals and groups could be within (internal) or outside (external) of the organization or project, e.g. co-workers, supervisors, contractors, customers, the public, government, union, shareholders.

CONTEXTUAL VARIABLES

Range of Context

- Stakeholders involved in interactions will vary, e.g. tradespeople, team members, managers, agency representatives, and this may affect the tone of the communication, i.e. formal or informal.
- Physical location may change the way this skill is performed, e.g. all communication may have to occur via distance means.

Level of Practice

- ☐ Frontline
- ☒ Supervisor
- ☒ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☐ Apply
- ☐ Analyze
- ☒ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Software, e.g. video chat, virtual meeting, Microsoft Word, project management software
- Communication tools, e.g. email, telephone

Major Category	Personal Competencies
Competency Area	Communicate Effectively
Competency Unit	Use speaking skills

Purpose

Using speaking skills helps to ensure that all parties understand each other, and reduces errors due to misinterpretation. This promotes effective teamwork, improves productivity and reduces stress.

Performance/Abilities

P1 Identify purpose of message

P2 Consider needs and limitations of listeners

P3 Organize ideas before speaking

P4 Determine appropriate time and place to deliver message

P5 Determine appropriate format, e.g. formal/informal, group/individual

P6 Make final revisions to message

P7 Communicate message:
- be concise
- speak clearly
- use proper grammar
- vary tone, volume, inflection and rate of speech
- make eye contact
- use positive language whenever possible
- ensure that verbal and non-verbal communication convey same message

P8 Adjust message to listener, if appropriate, for example:
- simplify technical information
- use different question types to determine listener's needs
- avoid using slang, jargon, profanity or sarcasm
- consider impact of message on listener, e.g. time restrictions, emotional impact

P9 Confirm understanding:
- ask for questions and feedback
- review what was explained

P10 Encourage additional questions at later date, if appropriate

P11 Answer questions or know where to find answer:
- follow up with listener who asked question

Knowledge

K1 Relevant legislation, e.g. Freedom of Information and Protection of Privacy

K2 Organization policies, procedures and plans

K3 Organization/project goals, vision and status

K4 Organizational communication protocols, e.g. who needs what information, speaking to media

K5 Effective communication practices, e.g. verbal versus non-verbal, characteristics of respectful communication

K6 Sector, trade and project terminology and common abbreviations

K7 Question types, e.g. open-ended, closed, probing, mirror

K8 Communication that constitutes harassment and discrimination

CONTEXTUAL VARIABLES

Range of Context

- Physical location may change the way this skill is performed, e.g. speaking may have to occur via distance means.

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☒ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☐ Apply
- ☒ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Software, e.g. video chat, virtual meeting
- Communication tools, e.g. telephone

Purpose

Using hand signals helps to ensure that all parties understand each other, and reduces errors due to misinterpretation, especially in noisy environments or situations in which verbal communication is difficult. Using hand signals helps to reduce the risk of accidents and injury.

Performance/Abilities

P1 Communicate with team members prior to activity requiring hand signals, when possible:
- confirm signals with team members prior to beginning the activity
- identify procedures to be followed
- identify roles of each individual, including self
- discuss any potential hazards

P2 Ensure own visibility to operator/team members, e.g. wear high visibility vest:
- maintain eye contact, if possible
- never position self in a compromised location, e.g. behind moving vehicle or equipment, in a drop zone
- maintain situational awareness

P3 Use appropriate hand signals, e.g. emergency stop, distance to stopping point

P4 Finish task with planned stop signal

Knowledge

K1 Relevant legislation, e.g. Occupational Health and Safety

K2 Organization policies, procedures and plans

K3 Hand signals for different actions, e.g. proceed slowly, distance to stopping point, stop, turn

CONTEXTUAL VARIABLES

Range of Context

- Environmental conditions may alter the way this skill is performed.

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☒ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☒ Apply
- ☐ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Hand signal cards

Purpose

Using writing skills helps to ensure that all parties understand each other, and reduces errors due to misinterpretation. This promotes effective teamwork, improves productivity and reduces stress.

Performance/Abilities

P1 Determine purpose of message

P2 Identify target audience

P3 Provide accurate, complete and concise information

P4 Use format, tone, and style suited to purpose, e.g. email, business letter, report

P5 Consider reader's:
- perceptions
- reading ability
- needs
- technical understanding

P6 Write first draft, if required:
- arrange ideas logically
- be clear and concise

P7 Proofread message:
- correct errors

P8 Produce final copy:
- send to reader(s)/recipient(s)

P9 File copy according to organizational/project protocol

P10 Follow up, as required, e.g. ensure message was received

Knowledge

K1 Relevant legislation, e.g. Freedom of Information and Protection of Privacy

K2 Organization policies, procedures and plans

K3 Organization/project goals, vision and status

K4 Organizational document management system

K5 Organizational communication protocols, e.g. who needs what information

K6 Basic spelling and grammar

K7 Sector, trade and project terminology and common abbreviations

K8 Communication that constitutes harassment and discrimination

CONTEXTUAL VARIABLES

Range of Context

- Depending upon the message and audience, process may be formal or informal.

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☒ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☐ Apply
- ☒ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Software, e.g. Microsoft Word
- Communication tools, e.g. email

Major Category	Personal Competencies
Competency Area	Communicate Effectively
Competency Unit	Exchange information with internal and external stakeholders

Purpose

Interacting effectively and appropriately with internal and external stakeholders helps to ensure that operations run smoothly and allows managers, supervisors, co-workers, customers and other stakeholders to be proactive before small issues become large problems. Exchanging relevant and accurate information in a timely manner is essential for good performance and relations between individuals and stakeholder groups.

Performance/Abilities

P1 Determine what information needs to be shared and within what timeframe:
- respect confidentiality of sensitive information
- tailor message to audience
- collect information from stakeholders to make decisions or take action, e.g. communicate with host of co-generation station to meet their needs

P2 Determine who needs information, e.g. department head, team members, customers, government agency

P3 Determine best method for communicating information, e.g. conduct meeting, hold conference call, send email, share data analysis via SCADA

P4 Share information through best method, including:
- conduct or participate in face-to-face meetings
- communicate over distance, e.g. call department of environment about a log jam in dam, share video or photos of equipment and systems with maintenance team
- email information and updates to have permanent record of exchanges
- use specialized communication/reporting software, e.g. OASIS, Reliability Coordinator Information System
- use three-way communication to confirm understanding and ensure safety

P5 Monitor own communication devices frequently, e.g. smartphone, email

P6 Document communication, as necessary:
- file according to organization's information/record management system

Knowledge

K1 Relevant legislation, e.g. NERC Standards of Conduct, Freedom of Information and Protection of Privacy

K2 Organization policies, procedures and plans

K3 Organizational goals, vision and status

K4 Organizational information/record management system

K5 Effective communication practices, e.g. verbal versus non-verbal, characteristics of respectful communication, three-way communication

K6 Relevant stakeholders, e.g. team members, other departments, contractors, customers, government agencies,

K7 Information needs of stakeholders

K8 Industry terminology and common abbreviations

K9 Basics of how overall electricity system works and how components impact each other, e.g. how distribution and transmission affect generation

Glossary

- **Stakeholders:** individuals and groups who are impacted by the activities or decisions of others; the individuals and groups could be within (internal) or outside (external) of the organization or project, e.g. co-workers, supervisors, contractors, customers, the public, government, union, shareholders.
- **Three-way communication:** sharing a message in three steps: 1. sender states message, 2. receiver repeats message, 3. sender cofirms that receiver has repeated message correctly or corrects any misunderstandings.

CONTEXTUAL VARIABLES

Range of Context

- Stakeholders involved in interactions will vary, e.g. tradespeople, team members, managers, agency representatives, and this may affect the tone of the communication, i.e. formal or informal.
- Physical location may change the way this skill is performed, e.g. all communication may have to occur via distance means.
- Continuous training for proper communication, and monitoring of practice, is commonplace for many occupations within the industry.

Level of Practice

- ☒ Frontline
- ☒ Supervisor
- ☒ Manager/Executive

Adapted Bloom's Taxonomy

- ☐ Recall, Remember
- ☐ Understand
- ☐ Apply
- ☒ Analyze
- ☐ Evaluate
- ☐ Create/Transform

RWATEM (Requisite Work Aids, Tools, Equipment or Materials)

- Software, e.g. video chat, virtual meeting, OASIS, RCIS
- Communication devices, e.g. email, telephone

Notes