electricity
HUMAN RESOURCES CANADA

National Occupational Standard
PV System Designer

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.

Canada
This project is funded by the Government of Canada's Sectoral Initiatives Program.

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: **PV System Designer**

This Chart outlines the competencies (also known as skills and knowledge) that are performed by PV System Designers.

Note: 'small'= 30 kW and under

Occupational Definition:

PV System Designers (30 kW and under) create electrical three-line diagrams for solar electric systems using computer-aided design software, develop design specifications and requirements for solar energy systems, perform computer simulations of solar PV generation system performance to optimize efficiency, provide technical support to installation teams, and perform a variety of analyses for solar systems.

Major Category	Competency Area	Competency Unit					
Design	**Conduct Pre-Design Activities**	Consult with external/ internal client	Consult with stakeholders	Coordinate site visit	Conduct site visit		
	Design Small PV System	Determine installation location and orientation of system components	Size PV system	Configure PV electrical components for grid-tie design	Configure PV electrical components for stand-alone design		
	Produce Design Drawings and Construction Documentation	Produce construction/installation drawings and diagrams	Produce materials lists of suppliers and pricing based on system specifications				
	Produce Quote for Client	Produce quote for client					
	Provide Post-Design Support	Provide technical expertise	Assist with utility and regulatory permitting applications				
	Provide Construction and Installation Support	Troubleshoot design and construction issues in the field					
Safety	**Maintain a Safe Working Environment**	Follow safe work practices	Use personal protective equipment (PPE)	Participate in safety meetings and emergency drills			
	Maintain a Sustainable Environment	Follow sustainable work practices	Contribute to wildlife mitigation practices				
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	Use information/record management system for generation, transmission and distribution operations				
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	Assist with rigging, hoisting/lifting and moving tasks	
Personal Competencies	**Demonstrate Professionalism**	Work as a 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	Conduct meetings and presentations
		Exchange information with internal and external stakeholders					

Major Category	**Design**
Competency Area	**Conduct Pre-Design Activities**
Competency Unit	**Consult with external/internal client**

Purpose

Understanding the client's concept requirements, scope and limitations is necessary to inform the project design. Consultation with the client may occur several times over the course of the design process in order to keep the client informed and to obtain decisions on options and strategies.

Performance/Abilities

P1 Conduct research on client, if applicable, for example:
- access website to identify corporate history and philosophy
- review previous project outcomes provided by client

P2 Set up meeting time, date and location

P3 Prepare for meeting:
- obtain documents related to project, e.g. topographical maps, legal maps, site plan
- visit site, if applicable

P4 Meet with client:
- meet on site, if required
- include project engineer or project manager, as required

P5 Discuss project, including:
- goal/purpose of project
- uses
- scope
- budget
- financing, if applicable
- activities completed to date, e.g. zoning, land acquisition, purchase of water rights, approvals
- timelines for completion, e.g. start and finish dates

P6 Provide advice and guidance, e.g. suitability of client's concept for end use

P7 Request follow up information from client based on discussions, e.g. historic utility costs

P8 Document client discussion and decisions

P9 Inform client of project requirements for approvals based on previous experience with similar projects, e.g. hydrology assessment, soil testing, environmental assessment:
- confirm when approvals and permits will be obtained
- confirm who will be responsible for meeting approval requirements and obtaining permits

P10 Inform clients of potential costs, e.g. cost of permits, required deposits, costs of consultants

P11 Consult with client and project manager throughout design process to address issues, changes, and obtain approvals

Knowledge

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

K2 Organizational document management system

K3 Jurisdictional and regulatory requirements based on location, scope and type of project

K4 Government incentive programs for energy producers and consumers

K5 Organizational customer credit/grant programs

Contextual Variables

Range of Context

- Pre-design activities may be combined and may occur several times.
- Consultation meetings with clients may also include other stakeholders.
- Size and scope of project may impact role and responsibilities of practitioner.
- Individual completing the actual design may or may not consult with the client. Client information may be provided to person completing the design by an intermediary such as a sales representative.

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)

- Relevant project documentation, e.g. maps

Major Category	**Design**
Competency Area	**Conduct Pre-Design Activities**
Competency Unit	**Consult with stakeholders**

Purpose

Consultation with other stakeholders, including external stakeholders (e.g. regulatory agencies, architects, contractors, suppliers) and internal stakeholders (e.g. finance and asset maintenance departments) is necessary to identify issues and requirements that may need to be considered during the design process. It is important to ensure the design process meets stakeholder requirements, mitigates issues, and realizes the client's concept. Stakeholder consultations may occur several times during the design process.

Performance/Abilities

P1 Identify relevant stakeholders based on:
- previous experience with similar projects
- client requirements

P2 Set up meeting time and location with stakeholders, e.g. project site

P3 Meet with stakeholders:
- individually or as group
- on site, if appropriate

P4 Present project to stakeholders:
- use document(s) from client meeting, if appropriate
- describe relevant client information, e.g. historic utility costs, current transmission loads, zoning applications

P5 Discuss project requirements or issues with stakeholders, e.g. permitting, access, agreements, zoning, approvals

P6 Determine requirements for specialized assessment/testing, for example:
- geological testing, e.g. geophysical, geotechnical assessments
- hydrological assessment, e.g. hydrogeological testing, water quality, flow rates, water temperature
- soil testing
- meteorological assessment, e.g. solar aspects, prevailing winds, wind speed, temperature and temperature fluctuations
- archeological/paleontological assessments, e.g. indigenous sacred sites, fossils

P7 Document stakeholders' comments and required follow-up

P8 Obtain relevant information for client, e.g. costs and return on investment, required assessment/testing

P9 Inform client and project manager of stakeholders' discussions for example:
- issues and testing/assessment requirements
- information required by stakeholders from client

P10 Update project documentation, as required

P11 Consult with project manager to determine when specialized assessment/testing reports will be available, as required

Knowledge

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

K2 Organizational document management system

K3 Client concept

K4 Potential stakeholders, e.g. neighbourhood associations, provincial/territorial, federal agencies, First Nations

K5 Regulatory requirements for approvals

Contextual Variables

Range of Context

- Pre-design activities may be combined and may occur several times.
- Initial meetings with stakeholders may also include clients.
- Stakeholders may be aware of client's intentions, based on preliminary work carried out by client.
- Stakeholders may have supporting approval documentation that may be required for design, e.g. geotechnical reports.
- Individual completing the actual design may or may not consult with the stakeholders. Stakeholder information may be provided to person completing the design by an intermediary such as a sales representative.

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)

- Contact information for stakeholders
- Relevant project documentation, e.g. client concept, maps

Major Category	Design
Competency Area	Conduct Pre-Design Activities
Competency Unit	Coordinate site visit

Purpose

Depending on the scope and location of the project, it may be necessary to organize site visits to ensure the client is kept informed of project activities and to maximize the use of resources.

Performance/Abilities

P1 Obtain permission for visits to site on specified dates:
- inform client of who will be on site and type of activity that will occur

P2 Arrange to meet with client or stakeholders, if required

P3 Schedule visits of specialized consultants, e.g. biologist, hydrologist, geologist, as required, for example:
- sequence visits based on types of activities, e.g. environmental assessment before drilling
- allow required time between visits to complete assessment activities
- provide information on access to site, e.g. access location, roadways

P4 Collect relevant documentation:
- provide to stakeholders, as required

Knowledge

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

K2 Organizational document management system

K3 Site location and access information

Contextual Variables

Range of Context

- Different testing/assessments may require a specific sequence to provide accurate data that may inform design.
- Sites may be remote, requiring coordination to ensure best use of transportation resources, e.g. ATVs, helicopters.
- Responsibility for this competency may be assigned to another person on behalf of the design practitioner.

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)

- Relevant project documentation, e.g. maps
- Documentation from client and/or stakeholder consultation
- Site access information if required, e.g. lock keys/codes
- Specialist consultants' contact information

Major Category	Design
Competency Area	Conduct Pre-Design Activities
Competency Unit	Conduct site visit

Purpose

It is important to visit the site with the client and relevant stakeholders to ensure that critical information related to the site can be identified and addressed in the project design.

Performance/Abilities

P1 Conduct pre-visit research, e.g. previous and current uses, for example, access:
- archival records
- cadastral/legal maps
- land lease(s)
- land title, e.g. availability of easements
- water rights license

P2 Organize materials to bring to site, e.g. maps, notebook, measuring tools, camera

P3 Wear appropriate PPE, e.g. sturdy boots, reflective vest

P4 Access site using appropriate protocols, e.g. communicate arrival, use passcode

P5 Identify relevant aspects of site, for example:
- location of existing utilities, e.g. electrical power, gas, sewer, water, irrigation lines
- site safety hazards, e.g. buried and overhead utility lines, slumping terrain
- condition and features of existing structures, e.g. occupied buildings, abandoned mine or well shafts, archeological sites
- location of significant stands of vegetation, e.g. large trees
- elevations/topography
- location of site access points
- available footprint for construction, as required

P6 Take measurements, e.g. structure dimensions, depth of water body, sun shadow path and tracking

P7 Ask questions of on-site individuals, as required, e.g. client, project manager

P8 Document observations, e.g. take photographs, make notations on maps, take field notes

Knowledge

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

K2 Organizational document management system

K3 Sources for research documentation, e.g. Land Titles office

K4 Information provided by different types of documents

K5 Client's design concept

K6 Site features that impact design feasibility, requirements and safety

K7 Types of measurements for different site features, measuring procedures and required calculations

K8 Use and care of measurement tools and equipment

Glossary

- **Cadastral map:** a graphic representation of a parcel of land that describes property boundaries, and may include other information such as building footprints, public easements, ownership, rights, restrictions and other responsibilities. Each parcel of property has a unique identifier, address and coordinates and is part of a larger system of mapping of a given region. May be considered a legal document.

CONTEXTUAL VARIABLES

Range of Context

- Pre-design activities may be combined and may occur several times.
- Location of site varies which could impact how this competency is conducted, e.g. access limitations, public scrutiny.
- Type, size, and scope of project may impact what needs to be identified and measured for the design process and document management.
- Site features are variable and may or may not be able to be ignored, used, or mitigated by design.

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)

- Relevant project documentation, e.g. maps identifying existing assets, letter of permission to be on-site, site survey
- Digital camera or video recorder with extra battery
- Measuring equipment, e.g. survey tape, tape measure/measuring wheel, azimuth measuring tool
- Writing materials, e.g. field notebook, pencil
- PPE for site
- Computer and relevant software, e.g. GIS

Major Category	**Design**
Competency Area	**Design Small PV System**
Competency Unit	**Determine installation location and orientation of system components**

Purpose

Determining the location and orientation of the array is important to ensure the optimal operation of the system, to ensure the safety of persons, equipment and structures, and to meet client's expectations.

Performance/Abilities

P1 Review intended design outcome, e.g. client's desire for net-zero, requirements for seasonal or full-time use

P2 Review information collected from site visit

P3 Analyze required array surface area using specified peak power output rating, considering:
- individual module dimensions
- module spacing in array
- array spacing for service access, as required
- mechanical protection, e.g. rodent guard
- inverter load ratio, e.g. AC/DC ratio

P4 Analyze sun position and solar window, as required:
- use sun path chart or sun position diagram
- access published weather data

P5 Analyze shade:
- identify obstructions, e.g. buildings, trees
- determine potential for accumulating dirt/matter on module surfaces, e.g. pollen-producing trees, excessive dust conditions
- consider future construction, when possible
- simulate potential shading problems, e.g. use software tools

P6 Determine optimal location for array:
- ensure chosen location will be unshaded at least six hours mid-day
- comply with applicable fire safety codes
- ensure wind and snow loads are acceptable
- ensure location is accessible

P7 Determine optimal array orientation, considering:
- amount of solar radiation
- location of true south
- tilt-angle, if applicable

P8 Determine array mounting method, e.g. ballasted mounting, integral mounting, flush mounting, pole mounting:
- consider operating temperatures
- identify attachments and penetrations
- ensure existing structures, if identified to be used, are appropriate and in good condition
- identify if structural engineering approval is required by local authority having jurisdiction

P9 Determine optimal location of Balance of System (BOS) components, considering:
- accessibility for installation and maintenance
- need for weather-resistant or rain-tight enclosures
- potential exposure to high temperature or direct sunlight

P10 Consult stakeholders regarding issues or concerns, e.g. project manager, client

Knowledge

K1 Organization policies, procedures and plans, e.g. communication protocols
K2 Organizational document management system
K3 Relevant CSA Standards, e.g. Canadian Electrical Code (CE Code), STANDATAs
K4 Jurisdictional requirements, including permit requirements, e.g. fire code, engineering review
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 designing/installing the PV system
K8 Fundamentals of solar radiation
K9 Physical principles that affect PV technologies
K10 PV system types (e.g. integrated, hybrid, grid-tied) and their specific climates and applications
K11 Equipment used for grid-tie and stand-alone systems, including certifications required and how it is used, e.g. micro inverter, string inverter, hybrid
K12 Roof types and how they impact installation
K13 Wind and snow loads
K14 Shade analysis and optimization
K15 Array mounting methods, their characteristics, advantages and disadvantages
K16 Array orientation, including optimal angles
K17 Terminology related to photovoltaics, e.g. solar irradiance, solar noon, solar declination, solar altitude, solar azimuth, solar window, kinetic storage, fixed tilt array, Balance of System (BOS) terms

Glossary

- **Balance of system (BOS):** all components of a PV system other than the modules. In addition to inverters and racking, this includes the cables/wires, switches, enclosures, fuses, ground fault detectors, and more.
- **True south:** in most places in Canada, true south is 10-20° off of magnetic south.

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

- Canadian Electrical Code (CE Code)
- STANDATAs
- Manufacturer's specifications
- Solar Pathfinder
- Sun path or sun position diagram
- PV system design software
- Smart phone/tablet/camera

CONTEXTUAL VARIABLES

Range of Context

- Job specifications and on-site conditions can vary the way this competency is performed.
- Analysis may be performed manually or through the use of specific software.
- Complexity of this competency will vary with type and size of system being installed and on-site conditions.
- System may be grid-tied or stand-alone which will vary the complexity of this competency.
- Location options for stand-alone systems may be more numerous and flexible than grid-tied installations, e.g. ground or pole-mounted rather than exclusively roof-mounted.

Level of Practice

- [x] Frontline
- [ ] Supervisor
- [ ] Manager/Executive

Adapted Bloom's Taxonomy

- [ ] Recall, Remember
- [ ] Understand
- [ ] Apply
- [ ] Analyze
- [x] Evaluate
- [ ] Create/Transform

Major Category	**Design**
Competency Area	**Design Small PV System**
Competency Unit	**Size PV system**

Purpose

Sizing a PV system correctly is critical to ensure optimal operation of the system, to ensure the safety of persons, equipment and structures, and to meet client's expectations. An incorrectly sized system is dangerous and can cause loss of life or property, production downtime, and impact power purchase agreements. Sizing a stand-alone system requires additional attention to energy demand and product selection pairing. Stand-alone systems represent an ever-present risk to life and property and require additional attention during design, installation, labelling and ongoing maintenance.

Performance/Abilities

P1 Review intended design outcome, e.g. client's desire for net-zero, requirements for seasonal or full-time use

P2 Review information collected from site visit

P3 Estimate load:
- review previous power bills, if available
- review PV production charts
- identify expected power consumption
- consider future consumption, as required, e.g. addition of appliance such as hot tub
- assess quality of existing infrastructure, e.g. line loss, inefficiencies, existing equipment/ratings

P4 Identify required days of autonomy for stand-alone system

P5 Consider other aspects of installation, for example:
- existing facility construction
- existing wiring
- proposed electrical installation methods
- integrated wind turbine or back-up generators for stand-alone system

P6 Document system information:
- circulate for input, as required

P7 Consult stakeholders regarding questions, issues or concerns, e.g. project manager, client

Knowledge

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

K2 Organizational document management system

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

K4 Jurisdictional requirements, including permit requirements, e.g. fire code, engineering review

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 designing/installing the PV system, e.g. obtain drawing approvals from engineer or journeyman electrician

K8 Fundamentals of solar radiation

K9 Physical principles that affect PV technologies

K10 Principles of solar radiation, solar resource and its units of measurement

K11 PV array and module performance fundamentals, e.g. response to temperature, effects of changing solar radiance

K12 PV system types (e.g. integrated, hybrid, grid-tied) and their specific climates, applications, advantages and disadvantages

K13 Equipment used for grid-tie and stand-alone systems, including certifications required, e.g. micro inverter, string inverter, hybrid

K14 Energy clipping and its effect on PV systems

K15 Shade analysis and optimization

K16 Terminology related to photovoltaics, e.g. solar declination, solar altitude, solar azimuth, solar window, kinetic storage, Balance of System (BOS) terms, air mass

Glossary

- **Balance of system (BOS):** all components of a PV system other than the modules. In addition to inverters and racking, this includes the cables/wires, switches, enclosures, fuses, ground fault detectors, and more.
- **Days of autonomy:** number of days of energy that must be available if weather does not allow for sufficient solar production.

CONTEXTUAL VARIABLES

Range of Context

- Job specifications and on-site conditions can vary the way this competency is performed.
- Analysis may be performed manually or through the use of specific software.
- Complexity of this competency will vary with type and size of system being installed and on-site conditions.
- Sizing may be done for grid-tie or stand-alone systems. Stand-alone systems have additional requirements that must be considered.
- In most cases, system capabilities are rounded off to match available equipment.

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)

- Canadian Electrical Code (CE Code)
- STANDATAs
- Manufacturer's specifications
- PV system design software
- Calculator

Major Category	**Design**
Competency Area	**Design Small PV System**
Competency Unit	**Configure PV electrical components for grid-tie design**

Purpose

Configuring the grid-tie electrical design correctly is critical to ensure the optimal operation of the system, to ensure the safety of persons, equipment and structures, and to meet client's expectations. Incorrect electrical design configuration can result in equipment damage, fires, and loss of life and property.

Performance/Abilities

P1 Select appropriate type and number of inverters, considering:
- product certification, e.g. CSA, ULc
- voltage and frequency operating ranges
- power rating
- maximum current
- power conversion efficiency
- location environment rating
- physical characteristics, e.g. size, weight
- nominal DC input and AC output voltages
- limits of operation
- safety features
- warranties
- costs
- availability

P2 Select appropriate type and number of PV modules, considering:
- selected inverters
- product certification, e.g. CSA, ULc
- electrical specifications, e.g. open-circuit voltage (Voc), guaranteed power output
- maximum circuit voltage, e.g. 600, 1000 or 1500 VDC
- physical characteristics, e.g. dimensions, weight, connector types
- warranties
- reputation of manufacturer
- costs
- availability

P3 Select appropriate type and number of batteries for battery bank, if applicable, considering:
- inverter output
- product certification, e.g. CSA, ULc
- location temperatures
- ventilation requirements
- charge requirements
- days of autonomy
- storage capacity
- consumption requirements
- compatibility with other components, e.g. inverter, charge controller
- physical characteristics, e.g. dimension, weight
- warranties
- reputation of manufacturer
- costs
- availability

P4 Size conductors and conduits:
- identify correct temperature and voltage ratings for all conductors
- determine circuit currents, including:
  - PV source maximum current
  - PV output circuit maximum current
  - inverter output circuit maximum current
  - battery circuit current
- calculate required ampacity of conductors, including:
  - maximum circuit current
  - size of overcurrent protection device
  - ambient temperature of conductors
  - type of conductors and insulation
  - conduit fill of conductors
  - limitations that terminals place on conductors, as required
- calculate voltage drop for circuits

P5 Refer to CE Code to size equipment grounding conductor for each circuit

P6 Select conduit type and fittings based on application, e.g. temperature extremes, corrosion-resistance

P7 Select conduit size based on type and conductor fill

P8 Select expansion joints based on type, temperature and fixed distance

P9 Select overcurrent protection according to conditions and Canadian Electrical Code (CE Code)

P10 Document draft/preliminary design:
- circulate for input, as required

P11 Consult stakeholders regarding issues or concerns, e.g. project manager, client

Knowledge

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

K2 Organizational document management system

K3 Relevant CSA Standards, e.g. Canadian Electrical Code (CE Code), CAN/CSA-22.2 No. 107, STANDATAs

K4 Jurisdictional requirements, including permit requirements, e.g. fire code, engineering review

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 designing/installing the PV system

K8 Fundamentals of solar radiation

K9 Physical principles that affect PV technologies

K10 Principles of solar radiation, solar resource and its units of measurement

K11 PV array and module performance fundamentals, e.g. response to temperature, effects of changing solar radiance, degradation

K12 Sizing formulas and calculations, e.g. AC circuit sizing, DC circuit sizing, string size calculations

K13 Equipment used for grid-tie systems, including certifications required

K14 Roof types and how they impact installation

K15 Wind and snow loads

K16 Shade analysis and optimization

K17 Array mounting methods, their characteristics, advantages and disadvantages

K18 Array orientation, including optimal angles

K19 Terminology related to photovoltaics, e.g. solar declination, solar altitude, solar azimuth, solar window, kinetic storage, Balance of System (BOS) terms, air mass

Glossary

- **Balance of system (BOS):** all components of a PV system other than the modules. In addition to inverters and racking, this includes the cables/wires, switches, enclosures, fuses, ground fault detectors, and more.
- **Open Circuit Voltage (Voc):** maximum DC voltage on an I-V curve, and is operating point for a PV device with no connected load.

CONTEXTUAL VARIABLES

Range of Context

- Job specifications and on-site conditions can vary the way this competency is performed.
- Analysis may be performed manually or through the use of specific software.
- Complexity of this competency will vary with type and size of system being installed and on-site conditions.
- Some systems may include both grid-tie and back-up energy storage system, so are 'hybrid systems' which will increase the complexity of this competency.
- In most cases, system capabilities are rounded off to match available equipment.

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)

- Canadian Electrical Code (CE Code)
- STANDATAs
- Manufacturer's specifications
- PV system design software outputs, e.g. PV modelling
- Calculator

Purpose

Configuring the stand-alone electrical design correctly is critical to ensure the optimal operation of the system, to ensure the safety of persons, equipment and structures, and to meet client's expectations. A stand-alone system that is not sized and designed correctly is extremely dangerous. Sizing a stand-alone system requires additional attention to energy demand and product selection pairing. Stand-alone systems represent an ever-present risk to life and property and require additional attention during design, installation, labelling and ongoing maintenance.

Performance/Abilities

P1 Select appropriate type and number of batteries for battery bank, considering:

- product certification
- location temperatures
- ventilation requirements
- charge requirements
- days of autonomy
- storage capacity
- consumption requirements
- compatibility with other components, e.g. inverter, charge controller
- physical characteristics, e.g. dimension, weight
- type and rating of racking construction
- warranties
- reputation of manufacturer
- costs
- availability

P2 Select appropriate type and number of stand-alone inverters (e.g. modified sine wave, high/low-frequency pure sine), considering:

- product certification, i.e. UL/CSA according to CSA 22.2
- power rating
- maximum current
- power conversion efficiency
- location environment rating
- physical characteristics, e.g. size, weight
- nominal DC input and AC output voltages
- limits of operation
- safety features
- warranties
- costs
- availability

P3 Select appropriate type and number of PV modules (e.g. Automatic Generator Start (AGS)) considering:

- selected inverters
- electrical specifications, e.g. open-circuit voltage (Voc), guaranteed power output
- physical characteristics, e.g. dimensions, weight
- warranties
- reputation of manufacturer
- certification to quality standards
- costs
- availability

P4 Select appropriate charge controller, considering:
- production capabilities
- storage requirements
- range of voltages solar module will apply to controller in differing conditions
- product certification, i.e. UL/CSA according to CSA 22.2
- power rating
- maximum current
- power conversion efficiency
- location environment rating
- physical characteristics, e.g. size, weight
- nominal DC input output voltages
- limits of operation
- safety features
- warranties
- costs
- availability
- compatibility with other components, e.g. batteries

P5 Select back-up system, as required, considering:
- fuel type, e.g. propane, diesel, gasoline
- storage/transport conditions, e.g. temperature, proximity

P6 Ensure chosen batteries have C-ratings appropriate for chosen generator, charge controller and inverter output

P7 Size conductor and conduit:
- identify correct temperature and voltage ratings for all conductors
- ensure usage of conductors is allowable as per CE Code
- determine circuit currents, including:
  - PV source maximum current
  - PV output circuit maximum current
  - inverter output circuit maximum current
  - battery circuit current
- calculate required ampacity of conductors, including:
  - maximum circuit current
  - size of overcurrent protection device
  - ambient temperature of conductor
  - type of conductor and insulation
  - conduit fill of conductor
  - limitations terminals place on conductor, as required
- calculate voltage drop for circuits

P8 Refer to CE Code to size equipment grounding conductor for each circuit

P9 Select conduit and fitting type based on application, e.g. temperature extremes, corrosion-resistance

P10 Select conduit size based on type and conductor fill

P11 Select expansion joints based on type, temperature and fixed distance

P12 Select overcurrent protection according to conditions and CE Code

P13 Determine required and appropriate additional labelling for the system, e.g. for operation, for information, for warning

P14 Document draft/preliminary design:
- circulate for input, as required

P15 Consult stakeholders regarding issues or concerns, e.g. project manager, client

Knowledge

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

K2 Organizational document management system

K3 Relevant CSA Standards, e.g. Canadian Electrical Code (CE Code), CAN/CSA-22.2 No. 107, STANDATAs

K4 Jurisdictional requirements, including permit requirements, e.g. fire code, engineering review

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 designing/installing the PV system

K8 Fundamentals of solar radiation

K9 Physical principles that affect PV technologies

K10 Principles of solar radiation, solar resource and its units of measurement

K11 PV array and module performance fundamentals, e.g. response to temperature, effects of changing solar radiance

K12 PV system types (e.g. integrated, hybrid) and their specific climates, applications, advantages and disadvantages

K13 Equipment used for grid-tie and stand-alone systems, including certifications required and how it is used, e.g. micro inverter, string inverter, hybrid

K14 Sizing formulas and calculations, e.g. AC circuit sizing, DC circuit sizing, string size calculations

K15 Types of batteries, their applications, advantages and disadvantages

K16 Energy clipping and its effect on PV systems

K17 Roof types and how they impact installation

K18 Wind and snow loads

K19 Shade analysis and optimization

K20 Array mounting methods, their characteristics and pros/cons

K21 Array orientation, including optimal angles

K22 Terminology related to photovoltaics, e.g. solar declination, solar altitude, solar azimuth, solar window, kinetic storage, Balance of System (BOS) terms, air mass

Glossary

- **Balance of system (BOS):** all components of a PV system other than the modules. In addition to inverters and racking, this includes the cables/wires, switches, enclosures, fuses, ground fault detectors, and more.
- **Days of autonomy:** number of days of energy that must be available if weather does not allow for sufficient solar production.
- **Open Circuit Voltage (Voc):** maximum dc voltage on an I-V curve, and is operating point for a PV device with no connected load.

CONTEXTUAL VARIABLES

Range of Context

- Job specifications and on-site conditions can vary the way this competency is performed.
- Analysis may be performed manually or through the use of specific software.
- Complexity of this competency will vary with type and size of system being installed and on-site conditions.
- In most cases, system capabilities are rounded off to match available equipment.
- The risk to life and property with stand-alone systems is high and may increase with the specific design/installation.

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)

- Canadian Electrical Code (CE Code)
- STANDATAs
- Manufacturer's specifications
- PV system design software outputs e.g. PV modelling
- Load data/site load information
- Calculator

Major Category	**Design**
Competency Area	**Produce Design Drawings and Construction Documentation**
Competency Unit	**Produce construction/installation drawings and diagrams**

Purpose

Construction and installation drawings direct the work of builders and installers to ensure that the design is carried out to the clients' specifications. They accurately translate what the design is and how it should be built. Incorrect construction and installation drawings can result in issues throughout a construction process, including incorrect materials lists and inaccurate estimates of cost and timelines.

Performance/Abilities

P1 Identify required equipment components

P2 Determine:
- installation steps
- construction phases, as required
- required construction equipment and components

P3 Determine types of shop drawings required by project, e.g. mechanical, electrical, plumbing

P4 Determine regulatory requirements for construction drawings, for example:
- scale
- standardized symbols
- format
- types of drawings
- number of drawings

P5 Use standardized architectural symbols and drawing views

P6 Ensure drawings contain accurate measurements for:
- dimensions of required components
- dimensions of existing components
- placement of components
- runs and placement of materials
- specifications, e.g. type or size of component, type of material

P7 Submit drawings to regulatory agency for approval, if required:
- provide supporting documentation
- respond to questions from agency

P8 Provide drawings to relevant personnel, e.g. installers, project manager, client, contractors

P9 Follow organizational document management protocols for naming and storage of drawings and diagrams

Knowledge

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

K2 Organizational document management system

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

K4 Jurisdictional requirements including permit requirements, e.g. Building Code

K5 Construction document standards

K6 Design drawings and specifications

K7 Construction/installation process

K8 End use of drawings e.g. tender process, in-house build, permit approval

K9 Standardized symbols for construction components
K10 Common issues with installations and construction documentation
K11 Manufacturer's specifications for equipment and system being installed

CONTEXTUAL VARIABLES

Range of Context

- Construction drawings for tender bids may have different requirements.
- Construction drawing types will vary depending on type and scope of project.

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)

- Documentation relevant to jurisdictional requirements, e.g. Canadian Electrical Code, Building Code
- Design drawings
- Approving authority drawing standards
- Drafting software, e.g. AutoCAD

Major Category	**Design**
Competency Area	**Produce Design Drawings and Construction Documentation**
Competency Unit	**Produce materials lists of suppliers and pricing based on system specifications**

Purpose

The materials list is important in the development of a final cost estimate for the construction/installation of a project. An accurate materials list ensures that the correct type and amount of equipment and materials are ordered to prevent project delays, waste and extra cost.

Performance/Abilities

P1 Review construction/installation drawings, to identify required:
- equipment, e.g. PV panels, wood poles, heat pump
- equipment components, e.g. fasteners, brackets, valves, switches
- construction materials, e.g. grout, concrete

P2 Calculate required quantities, for example:
- number of 4x8 plywood sheets required for specified roof area
- number of bags of grout required for 4 - 10ft deep x 8" diameter bore holes
- length of cable for distance from building to power pole

P3 Develop itemized list of materials based on construction/installation drawings:
- specify items in descriptive terms, e.g. lumber 2x4s, 2x2s, 2.0 inch-diameter high density polyethylene hose
- specify quantity relevant to material, for example:
  - length requirement, e.g. lumber, cable, hose, pipe
  - volume, e.g. concrete, grout
  - square footage, e.g. panels
  - simple count for prefabricated items, e.g. number of switches

P4 Add to estimated quantities to account for wastage

P5 Select suppliers for each item, as required, for example:
- reference list of preferred suppliers
- research suppliers as needed, check:
  - prices
  - reviews
  - proximity to project site
  - availability of required quantities
- issue request for bids from materials vendors

P6 Develop corresponding cost list:
- check suppliers' lists for latest prices
- estimate potential future cost estimates, as required

P7 Compile materials, suppliers and costs into single document, e.g. spreadsheet, table, as required

P8 Provide list to others, as required, e.g. client:
- answer questions
- provide supporting documentation, if requested

Knowledge

K1 Organization policies, procedures and plans, e.g. communication protocols
K2 Organizational document management system
K3 Sources of supplier price lists
K4 Measurement conversions, e.g. length, volume, area
K5 Construction/installation process
K6 Preferred suppliers
K7 Client's design concept

CONTEXTUAL VARIABLES

Range of Context

- Depending on size and scope of project, materials list can be prepared digitally using construction takeoff software, which can read construction and installation documentation, generate lists and make calculations to generate required materials and quantities. This software may also be integrated with construction cost estimating software which accesses multiple databases to determine material prices of suppliers in general location of project. Digital materials list generation is much faster than lists generated manually.
- Depending on the size of the project and the organization, an estimator may be used to generate the materials list.

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)

- Supplier price lists
- Construction/installation drawings
- Equipment and component specifications
- Computer and relevant software, may include construction takeoff software

Major Category	**Design**
Competency Area	**Produce Quote for Client**
Competency Unit	**Produce quote for client**

Purpose

Producing the quote helps to ensure expectations are clear for all stakeholders involved in a project. If this competency is performed poorly or incorrectly, it can cause project delays, client dissatisfaction and financial loss.

Performance/Abilities

P1 Refer to design drawings and diagrams
P2 Determine all activities needed to complete the project
P3 Review previous similar projects' outcomes and lessons learned, as applicable
P4 Refer to material lists of suppliers/supplies, as required
P5 Estimate time required to complete each activity
P6 Estimate labour required to complete each activity
P7 Estimate contingency, as required
P8 Assign resources to activities:
- define resources needed, e.g. internal human resources, contractors, materials and equipment
- consider availability of each required resource
- consider constraints and restraints, e.g. weather, site availability

P9 Assign dollar amounts to resources
P10 Create draft quote:
- use organizational templates, as required
- include terms and conditions

P11 Circulate draft quote to other relevant parties, as required, e.g. team members, management, contractors:
- facilitate consensus, as required
- obtain approval, as required

P12 Finalize quote:
- communicate to client and other all relevant parties, e.g. contractors, team members, management

Knowledge

K1 Organization policies, procedures and plans
K2 Organization/project goals, vision and status
K3 Organizational document management system
K4 Skills and abilities of project personnel
K5 Contract strategy, e.g. internal versus external as required
K6 Procurement strategy, as required

Glossary

- **Lessons learned:** learning gained from the process of performing the project. Formally conducted lessons learned sessions are traditionally held during project close-out, near the completion of the project. However, lessons learned may be identified and documented at any point during the project's life cycle.

CONTEXTUAL VARIABLES

Range of Context

- Number and types of resources required will vary with size/scope of the project.
- Tender work breakdown structure, including detailed project requirements, may be provided to contractors as part of a request for a quote for tender.

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)

- Word processing software
- Proprietary project management software
- Design drawings and diagrams
- Material lists of suppliers, supplies and costs

Major Category	**Design**
Competency Area	**Provide Post-Design Support**
Competency Unit	**Provide technical expertise**

Purpose

Providing technical expertise after the design process provides the opportunity for stakeholders to confirm design components and resolve potential construction issues. The expertise of all stakeholders is an important safeguard to prevent minor errors or oversights from becoming costly mistakes.

Performance/Abilities

P1 Confirm source of request for assistance, for example:
- client
- project manager
- contractor/technician
- regulatory authority

P2 Determine purpose of request, for example:
- understanding equipment selections
- implications of making changes to an existing design
- potential for future expansion/flexibility of an existing design

P3 Ask questions to clarify purpose of request, if required

P4 Conduct site visit, if requested

P5 Provide advice:
- state assumptions
- provide technical advice
- provide reasoning for advice

P6 Document request and provided advice

P7 Provide documentation to client and other relevant stakeholders, if requested

Knowledge

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

K2 Organizational document management system

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

K4 Jurisdictional requirements, e.g. fire code, building code

K5 Principles of electrical/power system design

K6 Design process

K7 Construction process

K8 Regulatory permitting and approval processes

K9 Stakeholders involved in permitting and approval processes

K10 Role of stakeholders in permitting and approval processes

CONTEXTUAL VARIABLES

Range of Context

- Type, size, and scope of project may impact to whom design practitioners provide technical expertise.

Level of Practice

- [x] Frontline
- [ ] Supervisor
- [ ] Manager/Executive

Adapted Bloom's Taxonomy

- [ ] Recall, Remember
- [ ] Understand
- [ ] Apply
- [ ] Analyze
- [x] Evaluate
- [ ] Create/Transform

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

- Relevant project documentation, e.g. design plans, construction and installation drawings, materials lists, equipment and materials specifications
- Site visit tools and PPE, e.g. digital camera, measuring tape/wheel, writing materials, reflective vest

Major Category	**Design**
Competency Area	**Provide Post-Design Support**
Competency Unit	**Assist with utility and regulatory permitting applications**

Purpose

Assisting with the client's permitting application processes is important to ensure that projects can move ahead without unnecessary delays and that no work proceeds without the required permits in place.

Performance/Abilities

P1 Identify permits or regulatory requirements required to move forward with project, for example:
- approvals from provincial/territorial government departments, e.g. department/ministry of Transportation
- permits from municipal building departments
- existing agreements, e.g. use of public easements
- approvals from utilities, e.g. right of ways
- regulatory amendments

P2 Review approval processes for each stakeholder, for example:
- application process
- submission process
- approval process
- appeal process
- requirements
- time frames
- cost, if applicable

P3 Determine sequence for application submissions, if applicable, e.g. approval from department of transportation before applying for municipal permit

P4 Provide client with required documents, e.g. construction drawings

P5 Assist client with completing applications, ensuring:
- wording is appropriate
- information is complete
- required documentation is attached

P6 Direct client to file applications or file applications on behalf of clients to appropriate authorities/agencies, ensuring:
- applications and relevant documentation are submitted within required time frame
- permits are submitted in required order

P7 Keep up to date with permitting process changes

Knowledge

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

K2 Jurisdictional requirements, e.g. bylaws, zoning

K3 Organizational document management system

K4 Sources of permitting process information

K5 Documentation required for applications

K6 Stakeholders involved in permitting and approval processes

K7 Role of stakeholders in permitting and approval processes

CONTEXTUAL VARIABLES

Range of Context

- Type, size and scope of project, and type of client (e.g. internal or external client), will impact the responsibilities involved in the permitting and approval processes.
- Size and structure of the organization providing design services will impact who is responsible for assisting with the permitting process.

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)

- Documentation relevant to jurisdictional requirements, e.g. bylaws, CSA codes, application forms
- Relevant project documentation, e.g. design plans, construction and installation drawings

Major Category	**Design**
Competency Area	**Provide Construction and Installation Support**
Competency Unit	**Troubleshoot design and construction issues in the field**

Purpose

It may be necessary to make design changes due to construction and installation issues in the field. These issues can have a cascading effect on other aspects of the design. It is important to address these issues immediately or to present options that meet the original design's goals. Not resolving these issues properly may impact timelines and result in additional costs in terms of personnel, materials and equipment.

Performance/Abilities

P1 Determine parameters of design issue, for example:
- permitting issue
- unanticipated site condition
- structural changes that cannot be reversed

P2 Determine ability to provide solution, for example:
- determine if other expertise is required, e.g. geologist, hydrologist, engineer
- determine level of authority to direct or suggest changes

P3 Review current drawings and documentation, for example:
- review manufacturer's installation instructions/manual
- compare as-built drawings to original construction/installation drawings
- review requirements for installation, e.g. building and electrical code

P4 Visit site:
- wear appropriate PPE
- take required tools and equipment, e.g. tape measure, camera
- inspect installation to verify current condition
- suggest corrections, if able, e.g. re-orientation or relocation of piece of equipment

P5 Determine implications of current as-built construction/installation on other aspects of project's design:
- compare original construction/installation plan with as-builts
- determine aspects of design that need to be changed as result of construction/installation issue
- consult other resources, as necessary, e.g. project manager, engineer

P6 Determine potential design change options, for example:
- replacement of equipment
- relocation of installation
- re-orientation of equipment
- different type or size of equipment
- changes to infrastructure, e.g. building, supports

P7 Determine viability of options, e.g. availability of other equipment, required regulatory approvals, additional cost

P8 Obtain approval from client or other stakeholders to make design changes, if required:
- present potential options, including:
  - impact on project, e.g. changes to functionality, extra costs, personnel
  - impact on permits, e.g. additional costs, changes in scope
  - impact on schedule, e.g. delay to order and receive new equipment, additional time to change installation location
- make recommendations, if appropriate
- ensure approval is documented, if required

P9 Confirm issue is resolved with relevant stakeholders

P10 Document troubleshooting solution and action taken:
- ensure design changes are documented accurately in as-built drawings

P11 Revise existing construction/installation drawings for remaining build out of project, if required:
- comply with drawing protocols for revisions

P12 Provide revised drawings to stakeholders, e.g. client, project manager, regulatory authorities, as necessary

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 Construction and installation processes
K6 Design process
K7 Safety hazards
K8 Equipment suppliers
K9 Order of operations
K10 Foundational knowledge for type of system, as required, e.g. photovoltaic, GeoExchange, electrical
K11 Foundational knowledge for type of construction/installation, as required, e.g. building construction, mechanical, hydronic, hydraulic, HVAC

CONTEXTUAL VARIABLES

Range of Context

- The scope, size and complexity of the project, the stage of construction and installation, and the type and scope of issue will affect whether the practitioner can implement a quick fix or only provide recommendations. This is especially relevant for solutions that will impact budget, scheduling and completion dates.
- The role of the person performing this competency within the project will vary, which can affect the authority to assess and make decisions.

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, prints, including as-builts, materials lists, materials and equipment specifications, manufacturer's manuals and specifications
- Documentation relevant to jurisdictional requirements, e.g. Canadian Electrical Code (CE Code), Building Code
- PPE
- Equipment, e.g. measuring equipment, camera

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
Competency Area	Maintain a Safe Working Environment
Competency Unit	Use personal protective equipment (PPE)

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

Major Category	Safety
Competency Area	Maintain a Safe Working Environment
Competency Unit	Participate in safety meetings and emergency drills

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 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)

Purpose

Practitioners are encouraged to respect wildlife and minimize their negative impact on them. They are also encouraged to contribute to the efforts of their organization and other parties to improve environmental sustainability.

Performance/Abilities

P1 Respect wildlife, for example:
- observe wildlife from a distance
- never feed wildlife
- avoid wildlife habitat during sensitive times, e.g. mating, nesting, raising young
- avoid disturbing sediment in streams and rivers

P2 Monitor wildlife as directed by supervisor, for example:
- count wildlife observed in area
- report dead and injured animals to appropriate authority, e.g. wildlife officer, supervisor
- take measurements of dead animals

P3 Monitor organization's wildlife mitigation efforts at work site, for example:
- observe indicators of how well mitigation efforts are working
- note recommendations for improvements

P4 Record data:
- note own observations and those shared by co-workers and local residents, trappers, hunters, and fishers as appropriate

P5 Share data with appropriate individuals, e.g. supervisor, wildlife officer, researcher, environmental monitor

Knowledge

K1 Organization's commitments to wildlife protection, e.g. environmental standards, permits,

K2 Organization's policies, procedures and plans, e.g. environmental protection plan, collaborative studies with wildlife officers and researchers

K3 Information/record management system

K4 Organization's structures and activities that impact wildlife, for example:
- air or water pollutants
- electrocution
- changes in water level and temperature in lakes, rivers and streams
- improper waste disposal
- decreases in quantity and quality of soils
- destruction of wildlife habitat
- impedance of wildlife travel and reproduction patterns
- noise, vibration, illumination and vehicular movement
- use of land for fuel production, power generation, and transmission and distribution lines
- bird incineration and blinding from solar technology

K5 Organization's impact mitigation activities, for example:
- building temporary bridges over streams
- stabilizing and revegetating banks after crossing is complete

- leaving low growing plants undisturbed
- reducing noise generated by equipment
- avoiding calving and nesting areas
- creating buffer zones around sensitive habitat
- providing nesting platforms on transmission line towers
- washing and refueling equipment away from bodies of water
- installing markers and flight diverters
- altering wind turbine cut-in speeds
- separating energized lines from grounded objects by distance greater than span of birds
- scheduling activities at times when they will have least impact on wildlife
- building fences around structures to minimize accidental electrocution of wildlife

K6 Importance of contributing to organization's and other parties' efforts to understand and reduce negative impacts on wildlife

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)

- Paper or digital document for recording data
- Camera for taking photos
- Tape measure or ruler for measurements

Major Category	Security
Competency Area	Follow Security Practices
Competency Unit	Follow security practices for physical work environment

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

Major Category	**Security**
Competency Area	**Follow Security Practices**
Competency Unit	**Follow cybersecurity procedures**

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

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

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

- CAD software
- Mobile workforce technology

Major Category	**Information/Record Management**
Competency Area	**Complete Information/Record Management Tasks**
Competency Unit	**Use information/record management system for generation, transmission and distribution operations**

Purpose

Using the information/record management system keeps oneself and others up to date on the condition of equipment, systems and auxiliaries. The information/record management system provides information for operating decisions, compliance requirements, and allows for smooth shift changes. It also serves as an organizational record of information and instructions for managing protection, energy storage, generation, transmission, distribution and dispatch. In addition, the reporting system provides a history of operating events for post-fault analysis and reflects the long-term efficiency of power generation, transmission and distribution systems.

Performance/Abilities

P1 Review information recorded during previous shift(s):

- analyze information relevant to shift tasks, e.g. outstanding authorizations, unresolved faults, generation status, abnormal circuit or plant configurations, imposed load constraints, shift-transfer sheets, customer outage information
- determine action required, e.g. how to resolve faults depending on type and frequency, follow-up with engineering groups

P2 Record information during shift in required format and timeframe:

- record status of systems including abnormalities and corrections made
- record information immediately upon receipt
- note information source, e.g. other operators, SCADA, contractors, members of public, operating forms, industry codes
- use abbreviations and terminology according to industry and organizational practice
- use 24-hour clock when recording times
- consider time zones for reporting energy transactions, if required
- keep operating log up to date throughout shift
- sign or initial log entries at beginning and end of shift
- ensure regulatory logging requirements are met

P3 Keep uncompleted actions in view for supervision:

- communicate status updates and other important information (verbally and/or in documents) to co-workers at shift change

Knowledge

K1 Applicable regulations, e.g. reporting requirements, privacy, security

K2 Reliability criteria and standards of local, regional and continental bodies, e.g. North American Electric Reliability Corporation (NERC)

K3 Reporting system procedures, e.g. access, use, filing, distribution, turnover, information security

K4 Types of information documented in information/record management, for example:

- operating events
- relevant non-operating events, e.g. lightning, bird strikes, accidents, unauthorized entries into restricted areas
- changes in status and abnormal conditions
- corrective actions
- exact time of sending or receiving operational instructions and messages
- energy storage, generation, transmission, distribution and dispatch

- asset management activities
- switching instructions
- operation of circuit breakers and disconnectors
- auto-reclose operations
- work orders
- relay flaggings
- protection limitations
- incidents reported to the control centre
- switching schedules, shift handover information, operational constraints

K5 Shift change procedures, e.g. report abnormal situations, complete shift change report

K6 Types of reporting documents and their purpose, e.g. fault logs, status reports, shift change reports, asset management

K7 Industry terminology and abbreviations

K8 24-hour clock

K9 Time zones

Glossary

- **Information/record management system:** collection of manual or electronic logs, sheets, completed authorization forms and other records, which together form a complete record of operating events in a station or operating area.

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)

- Required documents, e.g. fault logs, status reports, shift change reports
- Shift reporting software and applications
- Electronic job order system
- Voice logs

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**
Competency Area	**Use Digital Technology**
Competency Unit	**Use common software 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
- ☐ Understand
- ☒ Apply
- ☐ Analyze
- ☐ Evaluate
- ☐ Create/Transform

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

- Computer
- Tablet
- Cell phone
- Common software applications

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

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

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

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

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

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

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 access equipment used varies according to 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)

- 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

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

Purpose

Correctly operating vehicles and motorized 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

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

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**

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.

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

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**

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.

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	Manage stress

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.

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

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**

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.

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

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

Major Category	Personal Competencies
Competency Area	Communicate Effectively
Competency Unit	Use hand signals

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

Major Category	Personal Competencies
Competency Area	Communicate Effectively
Competency Unit	Use writing skills

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	**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	**Conduct meetings and presentations**

Purpose

Conducting meetings and presentations effectively allows the sharing of information and ideas, which results in positive and solution-focused working relationships and working environments.

Performance/Abilities

P1 Determine if meeting or presentation is required:
- identify what message needs to be conveyed and within what timeframe
- identify best type of meeting/presentation for the purpose

P2 Determine who needs to be:
- participant at meeting
- in audience at presentation

P3 Prepare for meeting/presentation:
- confirm availability of key persons
- prepare outline or agenda
- make room arrangements, as required
- determine resources or materials required

P4 Inform participants/audience of location, start time and duration

P5 Conduct meeting/presentation:
- stay on topic
- allow time for questions and feedback

P6 Adjourn according to schedule

P7 Document event, as necessary:
- distribute documentation, as necessary
- file according to organizational/project protocol

P8 Complete any follow-up required, e.g. find answer to question asked during session

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 Sector and project terminology and common abbreviations

K7 Software applications for building visual presentations

CONTEXTUAL VARIABLES

Range of Context

- Stakeholders involved in meetings and presentations 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. Powerpoint, project management software, video chat, virtual meeting
- Communication tools, e.g. email, telephone, projectors, flip charts

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

electricity
HUMAN RESOURCES CANADA

Electricity Human Resources Canada would like to acknowledge all of the industry subject matter experts from across Canada who were involved in drafting, reviewing and validating this National Occupational Standard.

Canada

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