

# National Occupational Standard Power Station Operator

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

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## Our Vision

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

## Our Mission

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

## Our Values

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

### **Collaboration**

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

### **Trust**

Forging relationships and products built on unwavering integrity.

### **Innovation**

Leading the industry to be future-ready.

# National Occupational Standards (NOS)

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

## How are NOS used?

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

- Support personnel certification or accreditation programs.
- Inform curricula for colleges and apprenticeships.
- Assist recruitment by informing job descriptions and providing a benchmark for employee appraisals.
- Identify career paths in order to promote employee retention.
- Help employers evaluate and determine 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](http://electricityhr.ca) for more information.

## Key Terms within the National Occupational Standard:

<b>Major Category</b>	A general functional area within the industry
<b>Competency Area</b>	A specific area of responsibility within a Major Category
<b>Competency Unit</b>	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: Power Station Operator

This Chart outlines the competencies (also known as skills and knowledge) that are performed by Power Station Operators.

KEY: Tasks performed by all Operators	KEY: Tasks performed by Hydro Station Operators	KEY: Tasks performed by Thermal/Fossil Fuel Station Operators
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Major Category	Competency Area	Competency Unit						
Power Generation	Perform Power Station Routine Operation Duties	Inspect power generation equipment and systems	Perform operations-based tests	Respond to abnormalities				
	Operate Major Power Station Components	Operate power boilers and auxiliaries	Operate turbines, internal combustion engines and auxiliaries	Operate generators and auxiliaries	Operate hydro systems and auxiliaries			
	Operate Power Station Environmental Protection Systems	Operate station exhaust systems	Operate wastewater systems	Operate sump and dewatering systems	Operate aquatic life protection systems			
	Operate Power Station Auxiliary Systems and Equipment	Operate station service systems	Operate engineered safety systems	Operate auxiliary pressurized systems	Operate domestic and potable water systems	Operate chemical systems	Operate heating, ventilation and air conditioning (HVAC) systems	
	Operate Power Station Emergency and Standby Power Systems	Operate standby power generating systems	Operate uninterruptible power supply (UPS) system					
	Respond to Unplanned Events/Incidents	Respond to unplanned events/incidents						
Construction and Installation	Assist with Commissioning of Power Generation Equipment and Systems	Assist with commissioning of power generation equipment and systems						
Transmission and Distribution	Operate Transmission System	Complete transmission switching	Operate switch yard					
	Operate Distribution System	Complete distribution switching						
Asset Maintenance	Maintain Generating, Distribution and Service Equipment	Perform preventative maintenance on power generation equipment						
	Assist with Power Generation Equipment Maintenance	Assist with power generation equipment maintenance						
Safety	Maintain a Safe Working Environment	Follow safe work practices	Use personal protective equipment (PPE)	Participate in safety meetings and emergency drills	Isolate component, equipment or system	Perform lock-out, tag-out procedures	Handle, transport and store hazardous materials	Work in confined spaces
		Use fall arrest equipment						
	Maintain a Sustainable Environment	Follow sustainable work practices	Contribute to wildlife mitigation practices					
	Respond to Emergencies	Respond to chemical spills and leaks	Respond to non-electrical emergencies	Participate in high-angle rescue	Participate in incident and accident investigations			
Security	Follow Security Practices	Follow security practices for physical work environment	Follow cybersecurity procedures					
Organizational Policies and Procedures	Follow Organizational Policies and Procedures	Follow organizational policies and procedures						
Information/Record Management	Complete Information/Record Management Tasks	Maintain technical information and data	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 Trades Skills	Perform Routine Trade Tasks	Use hand and power tools	Use electrical measuring and testing equipment	Use access equipment and work platforms	Operate vehicles and motorized equipment	Lubricate equipment and components	Perform 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

# Occupational Definition:

Power Station Operators operate power generating equipment such as boilers, turbines and generators to convert the power created from primary energy sources (e.g. coal, natural gas, and water) into electricity. Power station operators monitor and control equipment and auxiliary systems from both the station floor (aka field) and control room(s) to ensure the equipment and systems are operating safely, efficiently, reliably and within the prescribed limits to meet regulatory requirements, achieve productivity and efficiency goals, and provide reliable electricity.

## Purpose

Inspecting power generation equipment and systems ensures that risks to the safety of the public, environment and organization's assets are mitigated. It also ensures regulatory compliance and that production is maximized and losses are minimized.

## Performance/Abilities

- P1** Identify operating and standby equipment, auxiliaries and systems to be inspected
- P2** Use relevant procedures and checklist(s), e.g. pre-startup, post-startup, environmental, safety
- P3** Consult information/records about equipment or system, as needed, for example:
  - status information
  - history
  - trend data
  - logs
- P4** Follow asset management plan for inspection
- P5** Prepare equipment and processes for testing, e.g. work protection
- P6** Inspect condition using senses, e.g. hearing, smell, touch, sight
- P7** Perform tests on equipment components e.g. vibration test
- P8** Identify inspection abnormalities
- P9** Document inspection results and regulatory compliance:
  - communicate/file information, as required

## Knowledge

- K1** Applicable regulations, e.g. pressure vessel safety, environmental compliance requirements, record keeping, posting of employee qualifications
- K2** Manufacturer's specifications and recommendations
- K3** Digital documentation, e.g. mechanical and electrical schematics and diagrams
- K4** Standard operating procedures (SOP), e.g. pre-startup checklists, safe work procedures
- K5** Asset management plan
- K6** Information/record management system
- K7** Fundamental knowledge of work protection processes, e.g. lockout/tagout, isolation, switching
- K8** Principles of electricity and power generation, e.g. circuits, voltage, AC systems, DC systems, frequency, voltage, control, protection
- K9** Components and characteristics of different types of equipment and systems to be inspected
- K10** Interrelatedness of equipment and systems and impact on operations
- K11** High voltage switching and substation components
- K12** Circuit breakers and disconnects
- K13** Monitoring applications, e.g. SCADA, DCS
- K14** Normal operating conditions of equipment and systems, e.g. fluid levels, temperatures, noises, vibrations, pressures, connections, voltages, frequency, flow rates

**K15** Abnormal conditions that indicate problems with equipment and systems, e.g. cavitations, excessive vibration, change in noises, leaks, change in pressure, hand switches in wrong position, indicator light on

**K16** Procedures for different types of tests, e.g. nondestructive tests, electrical current tests

**K17** Consequences of not inspecting equipment and systems

## Glossary

- **Abnormalities:** information gathered from monitoring and inspections of equipment and systems that indicate existing or potential problems; equipment and systems that are operating outside of desired parameters.
- **Asset management plan:** a planning document that details inspection, maintenance and capital replacement strategies as well as service level targets for customers.
- **Auxiliaries:** equipment and systems that support the function and safety of major power station components; a failure of auxiliary equipment or system does not shut down production as there is redundancy built in.
- **Cavitation:** when forces acting on a liquid form small bubbles or vapour cavities; when subjected to higher pressure, the cavities can collapse and generate shock waves, which can damage equipment.
- **Control:** to start, load, adjust and stop systems' equipment, auxiliaries and process loops from both in-side and outside the control room.
- **Distributed control system (DCS):** a control system that regulates a process from a series of strategic positions in the processing plant, as opposed to from a single, centralized control unit.
- **Inspect:** to observe the condition of equipment and systems using human senses, e.g. sight, hearing, touch, smell. Inspections may be routine or conducted as part of the troubleshooting process when issues arise to determine the cause of unplanned events.
- **Nondestructive testing (NDT):** process of inspecting, testing, or evaluating materials, components or assemblies for discontinuities or differences in characteristics without destroying the serviceability of the part or system, i.e. when the inspection or test is completed the part can still be used.
- **Power generation equipment:** machines that are part of the power generation system.
- **Power generation system:** machines and processes used to convert primary energy (e.g. fossil fuels, hydro power) to electricity.
- **Supervisory control and data acquisition (SCADA) system:** a process automation system consisting of software and programmable logic controllers (PLCs) that collects data from instruments and sensors in remote locations (e.g. substations) and transmits it to a control centre for monitoring or controlling purposes.
- **Test:** to examine specific characteristics of equipment, materials and substances to ensure they meet required performance standards or desired characteristics, e.g. strength of materials, percentage of substances' components, thickness of a component in equipment.

## Contextual Variables

### Range of Context

- The currency, complexity and automation level of equipment and systems found in stations varies, combinations of new and legacy equipment requires a broad range of knowledge and skills.
- In some cases, Power Station Operators coordinate the work of other practitioners performing the required tests.
- Equipment and systems are located in a variety of locations (e.g., indoors or outdoors, in confined spaces or high above ground) resulting in work environments with varying degrees of risk, temperature and cleanliness.
- The more technically complex and higher risk power generating processes, such as nuclear fission, require greater understanding of the science involved so practitioners understand the sources of risk. In these cases, inspections may be specialized, and assigned to specialists.

## 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)

- Monitoring and control applications, e.g. SCADA, DCS
- Required documentation, e.g. manufacturer's specifications, inspection procedures and checklists, operating/station logbook, operating and run orders, standards, parameters, process flow diagrams, single-line electrical diagrams, schematics
- Testing equipment, e.g. radiation monitors, thermal imaging

## Major Category

## Power Generation

## Competency Area

## Perform Power Station Routine Operation Duties

## Competency Unit

## Perform operations-based tests

## Purpose

Performing operations-based tests verifies that power generation equipment and auxiliary systems are operating normally. These tests, often done as part of an inspection, are performed to verify results of other monitoring activities and devices, and to check the condition of systems or components that cannot be monitored by human senses or electronic sensors. Testing power generation and auxiliary systems ensures regulatory compliance regarding public safety, environmental protection and safe plant operations.

## Performance/Abilities

- P1** Identify equipment and systems to be tested:
  - perform routine/proactive tests based on scheduled work orders and best practices
  - perform non-routine reactive tests based on notifications, requisitions and field observations
- P2** Participate in pre-test briefing:
  - obtain required documentation, e.g. job plans
  - clarify responsibilities and coordination of tasks with required parties, e.g. control room operators, tradespeople, external agencies
  - review contingency and blackout plans
  - communicate safety issues/concerns
- P3** Prepare testing equipment, as required, e.g. calibrate monitors
- P4** Conduct pre-use inspection of testing equipment:
  - verify calibration
- P5** Complete visual inspection to ensure system or component is available
- P6** Shut down system or component
- P7** Follow testing procedures as specified, for example:
  - take samples
  - test samples
  - analyze test data
- P8** Test standby/back up equipment to verify integrity:
  - review history of component
  - consult with control room operator or mechanical engineer
  - retest
- P9** Document test results:
  - communicate/file information, as required
- P10** Restore system or component
- P11** Verify system or component is operating to normal operating sequence, e.g. take samples, conduct visual inspection, conduct post-maintenance testing
- P12** Participate in post-test briefing:
  - document change requests for testing procedures
  - communicate new safety issues/concerns

## Knowledge

- K1** Applicable regulations, e.g. safety, environmental compliance requirements, required documentation
- K2** Manufacturer's specifications and recommendations
- K3** Standard operating procedures, e.g. testing procedures, changeover procedures
- K4** Information/record management system
- K5** Planned events, e.g. planned outages, energy isolations
- K6** Principles of electricity and power generation, e.g. circuits, voltage, AC systems, DC systems, frequency, voltage, control and protection
- K7** High voltage and low voltage switching
- K8** Protection systems, e.g. circuit breakers and disconnects, system control logic
- K9** Types of systems tested, e.g. safety systems, backup systems, emergency power systems
- K10** Types of tests performed, e.g. nondestructive testing, pre- and post-maintenance testing, regulatory testing
- K11** Types of changeovers required, e.g. pumps, compressors, HVAC
- K12** Required documentation, e.g. detailed specifications, checklists and records

## Glossary

- **Blackout:** when the grid or power plant loses all support power
- **Changeover:** to remove equipment from a system to give it downtime (often when maintenance work is performed) and put different equipment in its place; this is done in a manner that avoids risk to safety of people, environment, production and without disruption of service; changeovers are done more often on auxiliary systems than major components.
- **HVAC:** heating, ventilation, and air conditioning.
- **Job plan (aka work order):** description of the work to be completed, inclusive of job steps, aspect risk assessment, barriers, documentation requirements, and hazard assessment.
- **Nondestructive testing (NDT):** process of inspecting, testing, or evaluating materials, components or assemblies for discontinuities or differences in characteristics without destroying the serviceability of the part or system, i.e. when the inspection or test is completed the part can still be used.
- **Switching:** a safety sensitive task which manipulates components of an electrical transmission system that disconnect and connect a part of an electrical network; network components are disconnected at times to allow for testing and maintenance work on equipment and systems.

## Contextual Variables

### Range of Context

- Tests vary in complexity from simple tasks done by one operator as part of routine inspections to complex tasks such as tests performed on turbine generator's overspeed safety lock which require a team of practitioners and detailed specifications, checklists and records.

### 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)

- Testing equipment, e.g. radiation monitors, meters, thermal imaging camera
- Required documentation, e.g. manufacturer's detailed specifications, operating policies and procedures, checklists, operating/station logbook, contingency and backout plans

## Major Category

## Power Generation

## Competency Area

## Perform Power Station Routine Operation Duties

## Competency Unit

## Respond to abnormalities

### Purpose

By responding to and resolving abnormalities, practitioners mitigate threats to safety, the environment and production and prevent risks from becoming unplanned events or incidents, such as power outages or worker injuries.

### Performance/Abilities

- P1** Identify abnormalities, e.g. observe monitoring devices, listen for alarms
- P2** Keep supervisor informed of unusual conditions that might affect station operations
- P3** Troubleshoot abnormalities, e.g. check relay targets, perform tests, review alarm summary:
  - identify underlying root cause, if possible
- P4** Make adjustments immediately, if possible
- P5** Prioritize response activities:
  - assign level of risk, e.g. first priority (safety risk), second priority (environmental risk), and third priority (production risk)
- P6** Communicate problem and identified cause(s) to appropriate personnel, e.g. resident experts
- P7** Answer telephone calls from general public, maintenance personnel, regulatory authorities and other department personnel
- P8** Dispatch resources as required, e.g. assemble team and direct activities
- P9** Remedy or mitigate undesired conditions, e.g. perform minor maintenance
- P10** Identify any additional action required, e.g. schedule maintenance
- P11** Assist maintenance and technical personnel, for example:
  - locate site/source of abnormalities within physical plant
  - verify isolation
  - assist in shut-down and start-up
- P12** Document abnormality and actions taken:
  - communicate/file information, as required

### Knowledge

- K1** Applicable regulations, e.g. safety, environmental compliance requirements, record keeping
- K2** Licensing requirements, i.e. operating parameters related to environmental protection
- K3** Reliability criteria and standards of local, regional and continental bodies, e.g. North American Electric Reliability Corporation (NERC)
- K4** Digital documentation, e.g. mechanical and electrical schematics and diagrams
- K5** Operating policies and procedures, e.g. alarm response procedures
- K6** Information/record management system
- K7** Principles of electricity and power generation, e.g. circuits, voltage, AC systems, DC systems, frequency, voltage, control and protection
- K8** Characteristics and components of different types of equipment and systems being monitored, e.g. boilers, generators, turbines, reactors, environmental systems, relay rooms, equipment protection systems, data collection systems, annunciator systems, automatic generation control system

- K9** Interrelatedness of equipment and systems and impact on operations
- K10** Protection systems, e.g. relays, overcurrent distances
- K11** Operating permissives, e.g. prestart, start and shutdown
- K12** Monitoring and control applications, e.g. SCADA, DCS
- K13** Types, characteristics and operation monitoring devices, e.g. meters, level indicators, manometers, flow indicators, pressure indicators, charts
- K14** Normal operating parameters of equipment and systems, e.g. fluid levels, temperatures, noises, vibrations, pressures, connections, voltages, frequency, flow rates
- K15** Abnormal conditions, e.g. cavitation, excessive vibration, different noises, leaks, change in pressure, hand switches in wrong position, indicator light(s) on
- K16** Meaning of different types of alarms
- K17** Criticality of different types of problems
- K18** Corrective responses for specific problems, e.g. type and amount/quantity of adjustments to make

## Glossary

- **Abnormalities:** information gathered from monitoring and inspections of equipment and systems that indicate existing or potential problems; equipment and systems that are operating outside of desired parameters.
- **Manometer:** an instrument for measuring the pressure acting on a column of fluid.
- **Permissive:** a type of Interlock used to prevent actions taking place until pre-defined criteria have been satisfied, e.g. prevents a pump starting until the suction valve is open.
- **Relay:** a low-powered device used to activate a high-powered device; relays are used to trigger circuit breakers and other switches in substations and transmission and distribution systems.
- **Relay target:** a component on a relay that indicates what caused a circuit breaker to trip.
- **Unplanned events/incidents:** situations that pose a threat or cause loss of power to customers, or situations that threaten the safety of people, the environment, or components of the power generation, transmission and distribution systems; unplanned events that pose a high level of risk to safety, the environment, or production are treated as emergencies.

## Contextual Variables

### Range of Context

- The number and severity of abnormalities that occur have a direct impact on how the operator will respond and who will be involved in the process.
- The nature of the abnormality (e.g. environmental contamination) will dictate response time and action taken.

### 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)

- Monitoring and control applications, e.g. SCADA, DCS
- Required documentation, e.g. manufacturer's specifications
- Communication systems, e.g. telephone, radio

## Major Category

Power Generation

## Competency Area

Operate Major Power Station Components

## Competency Unit

Operate power boilers and auxiliaries

### Purpose

Power boilers and auxiliaries generate high-pressure and low-pressure steam to turn turbines and are key components of power generating units. Practitioners monitor, inspect and control them to ensure they operate safely, efficiently, reliably and within the prescribed limits.

### Performance/Abilities

- P1** Monitor equipment from control room and field:
  - check operating parameters, e.g. flows, temperatures, water chemistry, levels and pressures
  - analyze system configuration and stability
  - continuously assess equipment status:
    - read monitoring devices, e.g. interface with distributed control systems (DSC) and programmable logic controllers (PLCs)
    - interpret readings, e.g. graphic displays
    - verify readings and indicators
    - ensure boiler water levels are adequate/correct at all times
    - manipulate information, e.g. integrate information from multiple platforms:
  - consult records as needed, e.g. equipment history and trends, entries in operating log
- P2** Control boilers and auxiliaries:
  - use control and monitoring systems (e.g. DCS, SCADA) to start, adjust or shut down boilers and auxiliaries, as required
  - adjust boiler controls to provide steam at specified temperature and pressure for turbine loads according to power demands
  - adjust blowdown rates and chemical input to meet water chemistry program guidelines
  - maintain parameters within prescribed limits
  - consider these factors when making adjustments:
    - plant availability
    - service condition
    - loading limits
    - steam temperature
    - facility output schedule
    - environment impact
- P3** Follow up to determine how adjustments impact overall system
- P4** Inspect power boilers and auxiliaries, if required
- P5** Perform tests, e.g. low/high water cut-off tests, trip tests
- P6** Resolve abnormalities, e.g. manually control process loops
- P7** Respond to unplanned events, e.g. emergency shutdown
- P8** Initiate or assist with maintenance, as appropriate
- P9** Document malfunctions and operational changes:
  - communicate/file information, as required

## Knowledge

- K1** Applicable regulations, e.g. safety, environmental compliance, record keeping
- K2** Tasks that require trades certification or other specialized expertise
- K3** Manufacturers' specifications and recommendations
- K4** Operating policies and procedures related to boiler and auxiliaries, e.g. inspections, start-up, shut-down, boiling out, maintenance, cleaning
- K5** Information/record management system
- K6** Digital documentation, e.g. mechanical and electrical schematics and diagrams
- K7** Interrelatedness of equipment and systems and impact on operations
- K8** Monitoring and control applications, e.g. SCADA, DSC
- K9** Control instrumentation, e.g. differential pressure flow meters, boiler feedwater control systems, control valves
- K10** Key components of power boilers, e.g. feed water system, steam system, fuel system, pumps
- K11** Capabilities of power boilers
- K12** Methods to maximize boilers' efficiency and minimize energy loss
- K13** Burning characteristics of fuel source, e.g. coal versus natural gas
- K14** Principles of applied mechanics, thermodynamics, metallurgy, combustion and corrosion applicable to boilers
- K15** Types of auxiliaries and process support systems for power boilers, e.g. fan sets, feed water system, compressed air system, fuel storage tanks, piping and valves, fuel delivery systems and heating sets, air/gas dampers
- K16** Normal operating conditions of power boilers and auxiliaries, and abnormal conditions that indicate problems with power boilers and auxiliaries

## Contextual Variables

### Range of Context

- The currency, complexity and automation level of equipment and systems found in stations may vary, presenting challenges to practitioners. This combination of new and legacy equipment requires a broad range of knowledge and skills.

### Level of Practice

- Frontline
- Supervisor
- Manager/Executive

### Adapted Bloom's Taxonomy

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

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

- Monitoring and control applications, e.g. SCADA, DCS
- Required documents, e.g., manufacturer's specifications, standard operating procedures, checklists

## Major Category

## Power Generation

## Competency Area

## Operate Major Power Station Components

## Competency Unit

## Operate turbines, internal combustion engines and auxiliaries

### Purpose

Turbines and internal combustion engines are workhorses in the power generating system. They convert the potential and kinetic energy of a moving fluid or gas such as steam or air into mechanical energy to drive generators. Operation of these machines and auxiliaries ensure that energy is being produced safely, efficiently, reliably and within the prescribed limits.

### Performance/Abilities

- P1** Inspect turbines, internal combustion engines and auxiliaries
- P2** Perform tests, e.g. overspeed tests, trip tests, back-up AC/DC system tests
- P3** Monitor equipment and systems from control room and field:
  - check operating parameters, e.g. flows, temperatures, levels and pressures
  - analyze system configuration and stability
  - continuously assess equipment status:
    - read monitoring devices, e.g. interface with distributed control systems (DSC) and programmable logic controllers (PLCs)
    - interpret readings, e.g. graphic displays
    - verify readings and indicators
    - manipulate information, e.g. integrate information from multiple platforms
  - consult records as needed, e.g. equipment history and trends, entries in information/record and asset management systems
- P4** Control turbines, combustion engines and auxiliaries:
  - use control and monitoring systems (e.g. DCS, SCADA) to start, adjust or shut down, as required:
    - adjust controls to regulate speed, voltage, and phase of incoming turbines to coincide with voltage and phase of power being generated, i.e. synchronization
  - maintain parameters within prescribed limits
  - consider these factors when planning adjustments:
    - plant availability
    - service condition
    - resource consent
    - loading limits
    - facility output schedule
    - impact
    - options
    - switch yard configuration
    - internal and external operations and stakeholders, e.g. customer power supply, environmental protection, water sources/contamination
- P5** Follow up to see how adjustments impact overall system
- P6** Resolve abnormalities
- P7** Respond to planned and unplanned events:
  - attempt to respond to unplanned events before incidents occur
- P8** Initiate or assist with maintenance, as appropriate
- P9** Document malfunctions and operational changes:
  - communicate/file information, as required



## Knowledge

- K1** Applicable regulations, e.g. safety, environmental compliance, record keeping
- K2** Tasks that require trades certification or other specialized expertise
- K3** Impacts of operations on external stakeholders, e.g. environmental impacts, water management plans, customer power supply
- K4** Reliability criteria and standards of local, regional and continental bodies, including North American Electric Reliability Corporation (NERC)
- K5** Manufacturers' specifications and recommendations
- K6** Operating policies and procedures related to turbines and internal combustion engines, e.g. start-up, operation, shutdown, cooling, maintenance, cleaning
- K7** Information/record and asset management system
- K8** Digital documentation, e.g. mechanical and electrical schematics and diagrams
- K9** Principles of electricity and power generation, e.g. current, voltage, AC systems, DC systems, frequency, voltage, control and protection
- K10** Principles of applied mechanics, thermodynamics, metallurgy, combustion and corrosion applicable to turbines, internal combustion engines and auxiliaries
- K11** Interrelatedness of equipment and systems and impact on operations
- K12** Monitoring and control applications, e.g. SCADA, DCS
- K13** Control instrumentation, e.g. differential pressure flow meters, boiler feedwater control systems, control valves
- K14** Types of internal combustion engines including diesel, natural gas and propane
- K15** Features and characteristics of internal combustion engines, e.g. applications, fuels, cooling systems, lubrication systems
- K16** Normal operating conditions of internal combustion engines and auxiliaries, e.g. fluid levels, temperatures, noises, vibrations, pressures
- K17** Abnormal conditions that indicate problems with internal combustion engines and auxiliaries, e.g. change in temperature, vibration, gland leaks, loss of vacuum, change in pressure
- K18** Types of turbines, e.g. steam, gas, wind, hydro-electric
- K19** Features and characteristics of turbines and auxiliaries, e.g. hydraulic head, impulse, reaction, horizontal or vertical shaft, efficiency of energy transformation, critical speed, governor systems, condensing equipment, piping systems, feedwater systems, fuel systems
- K20** Normal operating conditions of turbines and auxiliaries, e.g. fluid levels, temperatures, noises, vibrations, pressures
- K21** Abnormal conditions that indicate problems with turbines and auxiliaries, e.g. off specifications, under performance

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

- Monitoring and control applications, e.g. SCADA, DCS
- Required documents, e.g., manufacturer's specifications, operating policies and procedures, checklists

## Contextual Variables

### Range of Context

- The currency, size, complexity and automation level of the turbines and internal combustion engines found in stations vary, presenting challenges to practitioners. The combination of new and legacy equipment requires a broad range of knowledge and skills.

### Level of Practice

- Frontline
- Supervisor
- Manager/Executive

### Adapted Bloom's Taxonomy

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

## Purpose

Generators are crucial to power generation as they convert mechanical power into electrical power. Practitioners keep generators and their auxiliaries operating safely, efficiently, reliably and within the prescribed limits to meet regulatory requirements, achieve productivity and efficiency goals, and provide reliable electricity.

## Performance/Abilities

- P1** Inspect generators and auxiliaries
- P2** Assist in performing tests, when required e.g. trip tests
- P3** Monitor operation of generators from control room and field:
- check operating parameters, e.g. flows, temperatures, voltage, current, reactive power, levels and pressures
  - analyze system configuration and stability
  - continuously assess equipment status:
    - read monitoring devices, e.g. interface with distributed control systems (DSC) and programmable logic controllers (PLCs)
    - interpret readings, e.g. graphic displays
    - verify readings and indicators
    - manipulate information, e.g. integrate information from multiple platforms
  - consult records as needed, e.g. equipment history and trends, entries in operating log
- P4** Monitor facility output:
- adjust to agree with schedule, e.g. NERC Reliability Guidelines
- P5** Control generators:
- use control and monitoring systems (e.g. DCS, SCADA) to start, adjust, synchronize, load, and shut down generators, as required
  - maintain parameters within prescribed limits:
    - respond to demand, e.g. adjust generator output to match phase, frequency, or voltage of electricity supplied to panels
    - follow up to see how adjustments impact overall system
  - consider these factors when planning adjustments:
    - plant availability
    - service condition
    - resource consent
    - capability curve, e.g. power factor of generator
    - loading limits
    - mechanisms of failure
    - facility output schedule
    - impact of adjustment
- P6** Identify any generating units or availability limitations on real and reactive power outputs or other system-imposed requirements:
- provide feedback to balancing authority and transmission operations
- P7** Monitor status of generating units online:
- adjust real and reactive power outputs based on needs of host balancing authority and transmission operator

- P8** Monitor generator voltage to maintain voltage schedules:
- ensure common point of measurement with host transmission operator
- P9** Maintain generation dispatch plan for current day and next day:
- identify generator limitations
  - monitor reliability of required fuel for dispatch plans
  - identify potential impact of weather forecast to dispatch plan or generator preparation
- P10** Maintain communications with host balancing authority and transmission operator:
- be prepared to coordinate actions after system events, e.g. unit tripping offline, expected load shedding, transmission system failure and restoration, blackstart initiation
- P11** Follow up to see how adjustments impact overall system
- P12** Operate output (step-up) transformer:
- operate switch yard, if required
- P13** Resolve abnormalities
- P14** Respond to unplanned and planned events
- P15** Initiate or assist with maintenance, as appropriate
- P16** Document malfunctions and operational changes:
- communicate/file information, as required

## Knowledge

- K1** Applicable regulations, e.g. safety, environmental compliance, record keeping
- K2** Reliability criteria and standards of local, regional and continental bodies, e.g. North American Electric Reliability Corporation (NERC)
- K3** Components of bulk electrical system, e.g. power plants, substations
- K4** Operating policies and procedures, e.g. generator start-up, operation and shutdown
- K5** Principles of electricity and power generation, e.g. circuits, voltage, AC systems, DC systems, frequency, voltage, control, protection
- K6** Monitoring and control applications, e.g. SCADA, DCS
- K7** Protection systems, e.g. circuit breakers and disconnects, system control logic, protection relays
- K8** IEEE Power and Energy Society standards
- K9** Generator components and their function, e.g. stator core and windings, rotor poles and windings, shaft couplings, excitor, slip rings, bearings
- K10** Types of generator auxiliaries, e.g. lube oil, hydrogen cooling, stator water, purification, purging, excitation, fire protection
- K11** Normal operating conditions of generators and auxiliaries, e.g. fluid levels, temperatures, noises, vibrations, pressures, voltages, frequency, flow rates
- K12** Abnormal conditions that indicate problems with generators and auxiliaries, e.g. hydrogen leaks, seal oil leaks, lube oil leaks, internal faults, stator temperatures

## Glossary

- **Abnormalities:** information gathered from monitoring and inspections of equipment and systems that indicate existing or potential problems; equipment and systems that are operating outside of desired parameters.
- **Auxiliaries:** equipment and systems that support the function and safety of major power station components; a failure of auxiliary equipment or system does not shut down production as there is redundancy built in.
- **Distributed Control System (DCS):** a control system that regulates a process from a series of strategic positions in the processing plant, as opposed to from a single, centralized control unit.
- **Inspect:** to observe the condition of equipment and systems using human senses, e.g. sight, hearing, touch, smell. Inspections may be routine or conducted as part of the troubleshooting process when issues arise to determine the cause of unplanned events.

- **Monitor:** to observe the condition of equipment and systems using data that is displayed on equipment or computer monitors.
- **Operate:** to monitor (e.g. SCADA, data, alarms, video), inspect (e.g., touch, sight, smell, sound) and control when necessary (e.g., start/stop and adjust) generating station equipment and auxiliaries.
- **Power generation equipment:** machines that are part of the power generation system.
- **Power generation systems:** machines and processes used to convert primary energy (e.g. fossil fuels, hydro power) to electricity.
- **Supervisory control and data acquisition (SCADA) system:** a process automation system consisting of software and programmable logic controllers (PLCs) that collects data from instruments and sensors in remote locations (e.g. substations) and transmits it to a control centre for monitoring or controlling purposes.

## Contextual Variables

### Range of Context

- The currency, size, complexity and automation level of generators and auxiliaries found in stations vary, presenting challenges to practitioners. The combination of new and legacy equipment requires a broad range of knowledge and skills.

### Level of Practice

- Frontline
- Supervisor
- Manager/Executive

### Adapted Bloom's Taxonomy

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

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

- Monitoring and control applications, e.g. SCADA, DCS
- Required documents, e.g., manufacturer's specifications, operating policies and procedures, checklists

## Major Category

## Power Generation

## Competency Area

## Operate Major Power Station Components

## Competency Unit

## Operate hydro systems and auxiliaries

### Purpose

Operating hydro systems and auxiliaries ensures they function safely, efficiently, reliably and within prescribed limits. Monitoring and controlling hydro systems and auxiliaries mitigate risks that threaten safety, environment, production and the organization's assets.

### Performance/Abilities

- P1** Inspect hydro systems and auxiliaries
- P2** Perform tests, e.g. tests on performance of components
- P3** Monitor equipment and systems from control room and field:
  - check operating parameters, e.g. flows, temperatures, levels, dam safety, pressures
  - analyze system configuration and stability
  - continuously assess equipment status:
    - read monitoring devices, e.g. interface with distributed control systems (DSC) and programmable logic controllers (PLCs)
    - interpret readings, e.g. graphic displays
    - verify readings and indicators
    - manipulate information, e.g. integrate information from multiple platforms
  - consult records as needed, e.g. equipment history and trends, entries in operating log
- P4** Control hydro systems and auxiliaries:
  - use control and monitoring systems (e.g. SCADA, DCS) to start, load, adjust and shut down equipment, as required
  - consider operating orders or parameters when planning adjustments, for example:
    - plant availability and service condition
    - resource consent
    - loading limits
    - environmental impact
  - maintain parameters within prescribed limits
  - control output power to dispatch
  - manage water source:
    - use resources efficiently
    - observe resource consent limits
    - observe levels of water storage
- P5** Follow up to see how adjustments impact overall system
- P6** Initiate or assist with maintenance, as appropriate
- P7** Document details about station status, malfunctions and operational changes:
  - communication/file information, as required

### Knowledge

- K1** Applicable regulations, e.g. environmental compliance, record keeping, treaties with Indigenous groups
- K2** Manufacturer's specifications and recommendations

- K3** Reliability criteria and standards of local, regional and continental bodies, including North American Electric Reliability Corporation (NERC)
- K4** Operating policies and procedures, e.g. pre-startup checklists
- K5** Information/record management system
- K6** Digital documentation, e.g. mechanical and electrical schematics and diagrams
- K7** Principles of electricity and power generation, e.g. AC systems, DC systems, frequency, voltage, control, protection
- K8** Interrelatedness of equipment and systems and impact on operations
- K9** Monitoring and control applications, e.g. SCADA, DCS
- K10** Types of hydropower plants, e.g. impoundment or storage (with dam), pumped storage (with upper and lower reservoirs), diversion or run-of-river (with channel or penstock), offshore (using power of tidal currents or waves)
- K11** Components of hydro systems, e.g. reservoir or stored energy, intake, wicket gates, penstock, turbines, transformers, outflow, tailraces, control structures
- K12** Principles of mechanical and hydraulic energy, e.g. potential and kinetic energy, moment of inertia, rotational energy
- K13** Principles of efficient resource use, e.g. turbine efficiency curves, generator capability diagrams, resource consent obligations and limitations, storage
- K14** Principles of water management, e.g. flow velocity, pressure, hydraulic storage, flood control, hydraulic dispatch
- K15** Parameters monitored in hydro systems, e.g. water use, water flows, water storage, dispatched generation
- K16** Methods of controlling hydro systems, e.g. spill, generate, store, and pump
- K17** Normal operation conditions of equipment and systems, e.g. water levels, pressure, connections, voltages, frequency, flow rates
- K18** Abnormal conditions that indicate problems with hydro systems and auxiliaries, e.g. leaks in pipes, erosion, ice jams, flooding

## Glossary

- **Abnormalities:** information gathered from monitoring and inspections of equipment and systems that indicate existing or potential problems; equipment and systems that are operating outside of desired parameters.
- **Auxiliaries:** equipment and systems that support the function and safety of major power station components; a failure of auxiliary equipment or system does not shut down production as there is redundancy built in.
- **Control:** to start, load, adjust and stop systems' equipment, auxiliaries and process loops from both in-side and outside the control room.
- **Distributed control system (DCS):** a control system that regulates a process from a series of strategic positions in the processing plant, as opposed to from a single, centralized control unit.
- **Inspect:** to observe the condition of equipment and systems using human senses, e.g. sight, hearing, touch, smell. Inspections may be routine or conducted as part of the troubleshooting process when issues arise to determine the cause of unplanned events.
- **Monitor:** to observe the condition of equipment and systems using data that is displayed on equipment or computer monitors.
- **Operate:** to monitor (e.g. SCADA, data, alarms, video), inspect (e.g., touch, sight, smell, sound) and control when necessary (e.g., start/stop and adjust) generating station equipment and auxiliaries.
- **Supervisory control and data acquisition (SCADA) system:** a process automation system consisting of software and programmable logic controllers (PLCs) that collects data from instruments and sensors in remote locations (e.g. substations) and transmits it to a control centre for monitoring or controlling purposes.
- **Test:** to examine specific characteristics of equipment, materials and substances to ensure they meet required performance standards or desired characteristics, e.g. strength of materials, percentage of substances' components, thickness of a component in equipment.

## Contextual Variables

### Range of Context

- The type of water source used (e.g. lakes, reservoirs, rivers, canal systems) influences type of process and equipment used and thereby impacts the knowledge and abilities required by practitioners.

### 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)

- Monitoring and control applications, e.g. SCADA, DCS
- Required documents, e.g. manufacturer's specifications, operating policies and procedures, checklists, water management plans, orders and procedures related to government regulations

## Purpose

Power stations' exhaust systems are monitored, inspected and controlled to ensure that exhaust is being treated properly to comply with emissions regulations restricting pollutants. Exhaust systems also enable stations to meet sound level requirements, fire prevention requirements, and engine performance standards.

## Performance/Abilities

- P1** Inspect station exhaust systems, e.g. pollutant levels, temperatures, leaks in duct work, corrosion
- P2** Perform tests, e.g. continuous emissions monitoring system (CEMS) accuracy testing
- P3** Use monitoring and control systems, e.g. DCS, SCADA
- P4** Monitor station exhaust systems from control room and field:
- check operating parameters, e.g. temperatures, levels and pressures
  - analyze systems' configuration and stability
  - continuously assess systems' status:
    - read monitoring devices, e.g. interface with distributed control systems (DSC) and programmable logic controllers (PLCs)
    - interpret readings, e.g. graphic displays
    - verify readings and indicators
    - manipulate information, e.g. integrate information from multiple platforms
  - consult records as needed, e.g. system history and trends, entries in operating log
- P5** Control exhaust systems:
- maintain parameters within prescribed limits
  - consider these factors when making adjustments to system:
    - service condition
    - impact on environment, public and production
- P6** Follow up to see how adjustments impact overall system
- P7** Respond to abnormalities
- P8** Initiate or assist with maintenance, as appropriate
- P9** Document test results, malfunctions and operational changes:
- report environmental releases, if applicable
  - communicate/file information, as required

## Knowledge

- K1** Applicable regulations, e.g. safety, environmental compliance
- K2** Manufacturers' specifications and recommendations
- K3** Standard operating procedures, e.g. taking samples, conducting tests, maintenance
- K4** Quality control documents for continuous emissions monitoring system (CEMS)
- K5** Information/record management system
- K6** Digital documentation, e.g. mechanical and electrical schematics and diagrams
- K7** Monitoring and control applications, e.g. SCADA, DCS
- K8** Interrelatedness of equipment and systems and impact on operations

- K9** Fundamentals of combustion, filtration and flue gas desulfurization (FGD)
- K10** Components of station exhaust systems, e.g. electrostatic precipitator, bag filter separation, reduction catalysts, oxidation catalysts, flues, diffusers, stacks, noise control baffles, flow control vanes, mufflers
- K11** Types of station exhaust systems, e.g. combustion gases (stack, diesel stacks), powerhouse ventilation
- K12** Normal operating conditions of station exhaust system, e.g. opacity, temperature, concentration level of contaminants such as carbon monoxide (CO), sulfur dioxide (SO<sub>2</sub>), nitrogen oxide (NOX), oxygen (O<sub>2</sub>), noble gases, radioiodine, tritium
- K13** Abnormal conditions that indicate problems with station exhaust systems, e.g. high concentration levels of contaminants, equipment malfunctions

## Glossary

- **Electrostatic precipitators:** a device that removes suspended dust particles from combustion gases or exhaust by applying a high-voltage electrostatic charge and collecting the particles on charged plates.
- **Inspect:** to observe the condition of equipment and systems using human senses, e.g. sight, hearing, touch, smell. Inspections may be routine or conducted as part of the troubleshooting process when issues arise to determine the cause of unplanned events.
- **Monitor:** to observe the condition of equipment and systems using data that is displayed on equipment or computer monitors.
- **Operate:** to monitor (e.g. SCADA, data, alarms, video), inspect (e.g., touch, sight, smell, sound) and control when necessary (e.g., start/stop and adjust) generating station equipment and auxiliaries.
- **Operating log (aka station log):** a paper or electronic logbook that provides narrative context detailing the history of an organization's daily operations and/or events.
- **Supervisory control and data acquisition (SCADA) system:** a process automation system consisting of software and programmable logic controllers (PLCs) that collects data from instruments and sensors in remote locations (e.g. substations) and transmits it to a control centre for monitoring or controlling purposes.

## Contextual Variables

### 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)

- Monitoring and control applications, e.g. SCADA, DCS
- Required documents, e.g. manufacturer's specifications, operating policies and procedures, checklists

## Purpose

Wastewater systems (which include lagoons, separation systems and sumps) treat effluent resulting from the power generating process. Treating wastewater before it is released allows stations to reduce their environmental impact and meet compliance requirements.

## Performance/Abilities

- P1** Inspect wastewater systems, e.g. turbidity, pH, conductivity, ORP oxygen reduction potential, tank levels
- P2** Perform tests, e.g. take sample to test for turbidity
- P3** Use monitoring and control systems, e.g. DCS, SCADA, oil detection system
- P4** Monitor wastewater systems from control room and field:
  - review station's discharge permit requirements to identify required samples, location and frequency
  - track weather
  - check operating parameters, e.g. temperatures, levels, pressures
  - analyze systems' configuration and stability
  - continuously assess systems' status:
    - read monitoring devices, e.g. interface with distributed control systems (DSC) and programmable logic controllers (PLCs)
    - interpret readings, e.g. graphic displays
    - verify readings and indicators
    - manipulate information, e.g. integrate information from multiple platforms
  - consult records as needed, e.g. system history and trends, entries in operating log and asset management system
- P5** Control wastewater systems:
  - maintain parameters within prescribed limits, e.g. treat wastewater:
    - follow procedures and licensing requirements
  - consider these factors when making adjustments, for example:
    - impact on environment, public and production
    - plant availability
    - equipment condition
    - loading limits
    - output schedule
- P6** Follow up to see how adjustments impact overall system
- P7** Respond to abnormalities
- P8** Initiate or assist with maintenance, as appropriate, for example:
  - clean pipelines, diversion boxes and screens
  - maintain grass on dikes
  - maintain mechanical equipment such as pumps and aerators
  - repair leaks
  - repair fence
  - perform isolation for maintenance
- P9** Document test results, deficiencies and operational changes:
  - communicate/file information, as required
  - report deficiencies to internal and external authorities

## Knowledge

- K1** Applicable regulations and licensing requirements, e.g. safety, environmental compliance
- K2** Manufacturer's specifications and recommendations
- K3** Standard operating procedures, e.g. taking samples, wastewater treatment, discharge procedures, scheduled maintenance
- K4** Information/record management system
- K5** Digital documentation, e.g. mechanical and electrical schematics and diagrams
- K6** Monitoring and control applications, e.g. SCADA, DCS
- K7** Interrelatedness of equipment and systems and impact on operations
- K8** Types of wastewater systems, e.g. lagoons, phosphate removal systems, separation systems
- K9** Components of wastewater systems, e.g. separator tanks, filters, pumps, lagoon, sump, monitoring equipment, oil purifiers, centrifuges, bag-houses, electrostatic precipitators, wet scrubbers
- K10** Normal operating conditions of wastewater systems, e.g. temperatures, pressures, flows, purity levels, pH levels, odours
- K11** Abnormal conditions that indicate problems with wastewater systems, e.g. high concentration levels of contaminants, high seepage rates, spills

## Glossary

- **Abnormalities:** information gathered from monitoring and inspections of equipment and systems that indicate existing or potential problems; equipment and systems that are operating outside of desired parameters.
- **Bag-houses:** large filters that trap particulates.
- **Distributed Control System (DCS):** a control system that regulates a process from a series of strategic positions in the processing plant, as opposed to from a single, centralized control unit.
- **Effluent:** by-products of power generation process that are released according to environmental operating license and requirements.
- **Electrostatic precipitators:** a device that removes suspended dust particles from combustion gases or exhaust by applying a high-voltage electrostatic charge and collecting the particles on charged plates.
- **Inspect:** to observe the condition of equipment and systems using human senses, e.g. sight, hearing, touch, smell. Inspections may be routine or conducted as part of the troubleshooting process when issues arise to determine the cause of unplanned events.
- **Lagoon (aka tailing pond, retention pond):** a man-made structure used to retain, control and monitor waste material; usually often consist of ponds, liners and drainage systems; material is sometimes released into the environment if it meets environmental specifications.
- **Monitor:** to observe the condition of equipment and systems using data that is displayed on equipment or computer monitors.
- **Operate:** to monitor (e.g. SCADA, data, alarms, video), inspect (e.g., touch, sight, smell, sound) and control when necessary (e.g., start/stop and adjust) generating station equipment and auxiliaries.
- **Separation system:** a system to remove pollutants such as dust particles from process outputs to reduce amount released into environment; they also remove elements such as water, abrasive materials and impurities from the process to maximize the life of system components.
- **Wet Scrubbers:** a liquid solution that removes particulate matter from combustion gases; used to lower emissions to meet environmental limits.

## Contextual Variables

### Level of Practice

- Frontline
- Supervisor
- Manager/Executive

### Adapted Bloom's Taxonomy

- |   |   |
|---|---|
| <input type="checkbox"/> Recall, Remember | <input checked="" type="checkbox"/> Analyze |
| <input type="checkbox"/> Understand       | <input type="checkbox"/> Evaluate           |
| <input type="checkbox"/> Apply            | <input type="checkbox"/> Create/Transform   |

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

- Monitoring and control applications, e.g. SCADA, DCS
- Required documents, e.g. manufacturer's specifications, operating policies and procedures, checklists

Major Category

Power Generation

Competency Area

Operate Power Station Environmental Protection Systems

Competency Unit

Operate sump and dewatering systems

### Purpose

Dewatering allows for maintenance and inspections of turbines. Sumps are used to capture oil to comply with environmental requirements.

### Performance/Abilities

- P1** Inspect sumps, e.g. check water levels, ensure skimmers are removing oil
- P2** Perform tests, e.g. test thickness of oil that is captured, test for hydrocarbons, test soil
- P3** Use monitoring and control systems, e.g. DCS, SCADA
- P4** Monitor station dewatering systems:
  - coordinate timing of dewatering with watering, i.e. do not do at same time
  - check operating parameters, e.g. temperatures, levels and pressures
  - continuously assess systems' status:
    - read monitoring devices, e.g. interface with distributed control systems (DSC) and programmable logic controllers (PLCs)
    - interpret readings, e.g. graphic displays
    - verify readings and indicators
    - manipulate information, e.g. integrate information from multiple platforms
- P5** Consult records as needed, e.g. system history and trends, entries in operating log
- P6** Monitor station sumps, e.g. hour meter, levels
- P7** Control sump and dewatering systems:
  - maintain parameters within prescribed limits, e.g. use containment barriers and oil skimmers
  - consider these factors when making adjustments:
    - impact on environment
    - plant availability
    - service condition
    - loading limits
- P8** Follow up to see how adjustments impact overall system
- P9** Respond to abnormalities
- P10** Initiate or assist with maintenance, as appropriate, e.g. isolate for maintenance team
- P11** Document test results, abnormalities and operational changes:
  - communicate/file information, as required

### Knowledge

- K1** Applicable regulations and licensing requirements, e.g. safety, environmental compliance
- K2** Manufacturer's specifications and recommendations
- K3** Operating policies and procedures, e.g. taking samples, conducting tests, maintenance
- K4** Information/record management system
- K5** Digital documentation, e.g. mechanical and electrical schematics and diagrams
- K6** Monitoring and control applications, e.g. SCADA, DCS
- K7** Interrelatedness of equipment and systems and impact on operations

- K8** Components of sumps and dewatering systems, e.g. drainage, dewatering pumps, dewatering gallery, dewatering sump
- K9** Types of sump and dewatering systems, e.g. pumps, valves
- K10** Composition of liquids being contained, e.g. amount of corrosive media, chemicals, solids
- K11** Normal operating conditions of sumps and dewatering systems, e.g. levels, flows, purity
- K12** Abnormal conditions that indicate problems with sumps and dewatering systems, e.g. high water levels, high oil concentration, blocked screens

## Glossary

- **Abnormalities:** information gathered from monitoring and inspections of equipment and systems that indicate existing or potential problems; equipment and systems that are operating outside of desired parameters.
- **Dewatering:** the removal of water from sludge to reduce its volume and convert it from a liquid to a solid.
- **Distributed Control System (DCS):** a control system that regulates a process from a series of strategic positions in the processing plant, as opposed to from a single, centralized control unit.
- **Inspect:** to observe the condition of equipment and systems using human senses, e.g. sight, hearing, touch, smell. Inspections may be routine or conducted as part of the troubleshooting process when issues arise to determine the cause of unplanned events.
- **Monitor:** to observe the condition of equipment and systems using data that is displayed on equipment or computer monitors.
- **Operate:** to monitor (e.g. SCADA, data, alarms, video), inspect (e.g., touch, sight, smell, sound) and control when necessary (e.g., start/stop and adjust) generating station equipment and auxiliaries.
- **Sump:** collection and treatment basins for waste liquids, e.g. storm water runoff, make-up water.
- **Supervisory control and data acquisition (SCADA) system:** a process automation system consisting of software and programmable logic controllers (PLCs) that collects data from instruments and sensors in remote locations (e.g. substations) and transmits it to a control centre for monitoring or controlling purposes.

## Contextual Variables

### 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)

- Monitoring and control applications, e.g. SCADA, DCS
- Required documents, e.g. manufacturer's specifications, operating policies and procedures, checklists

## Major Category

## Power Generation

## Competency Area

## Operate Power Station Environmental Protection Systems

## Competency Unit

## Operate aquatic life protection systems

### Purpose

Operating aquatic life protection systems reduces the negative impacts of a power generating station on aquatic life in water bodies that service and are impacted by the station.

### Performance/Abilities

- P1** Inspect aquatic life protection systems
- P2** Perform tests, e.g. DO<sub>2</sub> and chlorine levels
- P3** Use monitoring and control systems, e.g. DCS, SCADA
- P4** Monitor aquatic life protection systems from field:
  - check operating parameters, for example:
    - count fish and shellfish
    - check water levels in spillway and control structures
    - check water temperature
  - continuously assess systems' status:
    - observe monitoring devices, e.g. cameras
    - verify indicators, e.g. pressure, level
  - consult records as needed, e.g. system history and trends, entries in operating log, regulations
- P5** Control aquatic life protections systems:
  - maintain parameters within prescribed limits, e.g. adjust flow of source water
  - consider these factors when planning adjustments:
    - plant availability
    - service condition
    - loading limits
    - facility output schedule
    - environmental Impact
- P6** Follow up to see how adjustments impact overall system
- P7** Respond to abnormalities
- P8** Initiate or assist with maintenance, as appropriate, e.g. install screens, clean debris off screens, adjust system components with seasons
- P9** Document fish counts, malfunctions and operational changes:
  - communicate/file information, as required

### Knowledge

- K1** Applicable regulations, e.g. safety, environmental compliance
- K2** Manufacturers' specifications and recommendations
- K3** Operating policies and procedures, e.g. conducting tests, sampling, models for estimating impacts
- K4** Information/record management system
- K5** Digital documentation, e.g. mechanical and electrical schematics and diagrams
- K6** Monitoring and control applications, e.g. SCADA, DCS
- K7** Structures used to reduce negative impacts on aquatic life, e.g. fish ladders, fish baskets, troughs, weirs, fine-mesh screens



- K8** Strategies used to reduce negative impacts on aquatic life, e.g. design of cooling system, use of diversion systems, use of multiple or variable-speed pumps, altering intake locations, modifying operational parameters
- K9** Normal operating conditions of aquatic life protection systems, e.g. water velocity, impingement time
- K10** Abnormal conditions that indicate problems with aquatic life protection systems, e.g. high counts of captured fish

## Glossary

- **Abnormalities:** information gathered from monitoring and inspections of equipment and systems that indicate existing or potential problems; equipment and systems that are operating outside of desired parameters.
- **Base data:** information that is gathered for future reference and comparisons, e.g. to identify changes in the status of fish populations and water bodies.
- **Distributed Control System (DCS):** a control system that regulates a process from a series of strategic positions in the processing plant, as opposed to from a single, centralized control unit.
- **Impingement:** to interfere with the natural travel patterns of aquatic life.
- **Inspect:** to observe the condition of equipment and systems using human senses, e.g. sight, hearing, touch, smell. Inspections may be routine or conducted as part of the troubleshooting process when issues arise to determine the cause of unplanned events.
- **Monitor:** to observe the condition of equipment and systems using data that is displayed on equipment or computer monitors.
- **Operate:** to monitor (e.g. SCADA, data, alarms, video), inspect (e.g., touch, sight, smell, sound) and control when necessary (e.g., start/stop and adjust) generating station equipment and auxiliaries.

## Contextual Variables

### Level of Practice

- Frontline
- Supervisor
- Manager/Executive

### Adapted Bloom's Taxonomy

- |   |   |
|---|---|
| <input type="checkbox"/> Recall, Remember | <input checked="" type="checkbox"/> Analyze |
| <input type="checkbox"/> Understand       | <input type="checkbox"/> Evaluate           |
| <input type="checkbox"/> Apply            | <input type="checkbox"/> Create/Transform   |

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

- Required documents, e.g. manufacturer's specifications, operating policies and procedures, checklists

Major Category

Power Generation

Competency Area

Operate Power Station Auxiliary Systems and Equipment

Competency Unit

Operate station service system

## Purpose

Operating power stations' service system ensures that electricity is available to run critical components and systems that support the power generating process and the practitioners working in that environment. Proper operation of the station service system is critical to ensure power production.

## Performance/Abilities

- P1** Monitor station service system from control room and field:
  - ensure system is energized
  - monitor current and voltage levels, e.g. loading
  - respond to alarms, e.g. under-voltage, over-current, gas alarms, temperatures
  - inspect service systems, e.g. station service transformers:
    - conduct visual inspection, as required
  - perform tests on service systems, e.g. auto-transfer scheme testing, DC/back-up generator set tests
  - observe information from monitoring and control applications
  - consult records as needed, e.g. system history and trends, entries in operating log
- P2** Resolve deficiencies, e.g. switching power supply, racking breakers, switching transformer taps
- P3** Respond to planned and unplanned events:
  - switch station service supply/feed, e.g. internal or external feed
  - manually operate breakers, as required
- P4** Initiate or assist with maintenance, as appropriate, e.g. swapping feeds, racking, initiating breaker testing
- P5** Document deficiencies and action taken:
  - communicate/file information, as required

## Knowledge

- K1** Applicable regulations, e.g. safety, electrical code
- K2** Tasks that require trades certification or other specialized expertise
- K3** Manufacturers' specifications and recommendations
- K4** Operating policies and procedures, e.g. work orders
- K5** Information/record management system
- K6** Digital documentation, e.g. mechanical and electrical schematics and diagrams
- K7** Monitoring and control applications, e.g. SCADA, DCS
- K8** Principles of electricity and power generation, e.g. circuits, voltage, AC systems, DC systems, frequency, voltage, control and protection
- K9** Components of service system, e.g. system logic, permissives, interlocks, transformer specifications
- K10** Types of tests performed on service system, e.g. auto-transfer scheme testing, DC/back-up generator set tests, automatic transfer switches
- K11** Normal operating conditions of service system, e.g. voltage, transformer loads, currents
- K12** Abnormal conditions that indicate deficiencies in service system, e.g. high current, high temperatures, transformer oil leaks, abnormal smells/sounds

## Glossary

- **Inspect:** to observe the condition of equipment and systems using human senses, e.g. sight, hearing, touch, smell. Inspections may be routine or conducted as part of the troubleshooting process when issues arise to determine the cause of unplanned events.
- **Monitor:** to observe the condition of equipment and systems using data that is displayed on equipment or computer monitors.

## Contextual Variables

### Level of Practice

- Frontline
- Supervisor
- Manager/Executive

### Adapted Bloom's Taxonomy

- |   |   |
|---|---|
| <input type="checkbox"/> Recall, Remember | <input type="checkbox"/> Analyze          |
| <input type="checkbox"/> Understand       | <input type="checkbox"/> Evaluate         |
| <input checked="" type="checkbox"/> Apply | <input type="checkbox"/> Create/Transform |

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

- Required documents, e.g. electrical blueprints, manufacturers' specifications and recommendations, operating policies and procedures, checklists
- Testing tools (for example, sampling test kits)
- PPE, e.g. arc flash clothing

## Major Category

## Power Generation

## Competency Area

## Operate Power Station Auxiliary Systems and Equipment

## Competency Unit

## Operate engineered safety systems

### Purpose

There are many workplace hazards in power generating stations. Practitioners ensure engineered safety systems are poised to prevent harm to people, environment, equipment and property, and are prepared to operate them when necessary.

### Performance/Abilities

- P1** Monitor engineered safety systems from control room and field:
  - inspect engineered safety systems daily, e.g. emergency shutdowns, confined spaces retrieval systems, fire suppression systems
- P2** Perform tests on engineered safety systems, e.g. emergency horn testing, deluge testing, backup generators, fire pumps, evacuation system testing:
  - observe information from monitoring and control applications
  - consult records as needed, e.g. system history and trends, entries in information/record and asset management systems
  - follow operator preventative maintenance (PM) orders for testing frequency and procedures
- P3** Document deficiencies and adjustments, e.g. loss of power, loss of pressure, heads broken off fire system :
  - communicate/file information, as required
- P4** Initiate or assist with maintenance, as appropriate, e.g. valve replacement, pump oil changes :
  - prepare equipment for maintenance, e.g. taking system out of service, notifying insurance company, hanging a tag
- P5** Ensure deficiencies are addressed, e.g. resolved, repaired, replaced
- P6** Communicate that equipment is back in service, e.g. upper management, insurance, on-site personnel

### Knowledge

- K1** Applicable regulations, e.g. occupational health and safety, reporting requirements
- K2** Manufacturer's specifications and recommendations
- K3** Operating policies and procedures, e.g. work orders
- K4** Information/record management system
- K5** Digital documentation, e.g. mechanical and electrical schematics and diagrams
- K6** Monitoring and control applications, e.g. SCADA, DCS
- K7** Safety information sources, e.g. emergency preparedness plan
- K8** Types of safety systems, for example:
  - fire protection, e.g. fire water, inert gas system, fire extinguishers, sprinklers, deluge
  - electrical standby power supplies
  - powerhouse emergency venting (PEV)
  - emergency lighting
  - safety interlocks
  - safety showers, eyewash station
- K9** Components of different types of safety systems and how they work

**K10** Normal operating conditions of safety systems

**K11** Abnormal conditions that indicate deficiencies in safety systems, e.g. loss of emergency fire pump

**K12** Types of tests performed on safety systems, e.g. air quality, shutdown system tests, test flow alarms

## Glossary

- **Inspect:** to observe the condition of equipment and systems using human senses, e.g. sight, hearing, touch, smell. Inspections may be routine or conducted as part of the troubleshooting process when issues arise to determine the cause of unplanned events.
- **Monitor:** to observe the condition of equipment and systems using data that is displayed on equipment or computer monitors.

## Contextual Variables

### Range of Context

- Frequency of testing depends upon legislated, manufacturer's and regulatory requirements.

### 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. electrical blueprints, manufacturers' specifications and recommendations, operating policies and procedures, checklists
- Testing tools (for example, sampling test kits)

## Major Category

## Power Generation

## Competency Area

## Operate Power Station Auxiliary Systems and Equipment

## Competency Unit

## Operate auxiliary pressurized systems

### Purpose

Auxiliary pressurized systems serve many pieces of equipment, such as hydraulic governors, oil pumps, and breakers, as well as systems such as, brake-air, service air, compressed gas, natural gas, auxiliary steam, and water. They are monitored and adjusted to ensure they are operating safely, efficiently and reliably. Auxiliary pressurized systems may pose safety risks and need to be operated with strict adherence to operating policies and procedures and regulations.

### Performance/Abilities

- P1** Monitor auxiliary pressurized systems from control room and field:
  - inspect pressurized systems, e.g. temperature, flow, leaks, pressure
  - perform scheduled tests on pressurized systems, e.g. back-up pump tests, equipment rotation, integrity management
  - observe information from monitoring and control applications
  - consult records as needed, e.g. system history and trends, entries in operating log
- P2** Correct deficiencies, e.g. changeout filters, adjust pressure regulators, isolate leaks
- P3** Initiate or assist with maintenance, as appropriate, e.g. isolate system, remove and recertify safety valves
- P4** Document deficiencies and adjustments:
  - communicate/file information, as required

### Knowledge

- K1** Applicable regulations, e.g. transportation of dangerous goods (TDG), WHMIS, safety data sheets (SDS), lockout and tagout, pressure vessels, environmental
- K2** Manufacturer's specifications and recommendations
- K3** Operating policies and procedures, e.g. work orders
- K4** Information/record and asset management system
- K5** Digital documentation, e.g. mechanical and electrical schematics and diagrams
- K6** Monitoring and control applications, e.g. SCADA, DCS
- K7** Types of pressurized systems, e.g. steam, compressed air, compressed gases, liquid nitrogen, hydrogen systems, lube oil, breathing air, air oil systems, hydraulics, water, fuel oil systems, hydraulic pressure units
- K8** Types of tests done on pressurized systems, e.g. back-up pump tests, equipment rotation, hydro tests, integrity management
- K9** Components of different types of pressurized systems and how they work
- K10** Normal operating conditions of pressurized systems
- K11** Abnormal conditions that indicate deficiencies in pressurized systems

### Glossary

- **Inspect:** to observe the condition of equipment and systems using human senses, e.g. sight, hearing, touch, smell. Inspections may be routine or conducted as part of the troubleshooting process when issues arise to determine the cause of unplanned events.
- **Monitor:** to observe the condition of equipment and systems using data that is displayed on equipment or computer monitors.

## 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. electrical blueprints, manufacturers' specifications and recommendations, operating policies and procedures, checklists
- Testing tools (for example, sampling test kits)

## Major Category

## Power Generation

## Competency Area

## Operate Power Station Auxiliary Systems and Equipment

## Competency Unit

## Operate domestic and potable water systems

### Purpose

Operating domestic/potable water systems involves monitoring and controlling them to ensure they function safely, efficiently and reliably. It is important that water systems are ultra clean, so they are safe for human consumption and do not contaminate nor harm the equipment and systems they feed.

### Performance/Abilities

- P1** Monitor domestic and potable water systems from control room and field:
  - inspect water treatment equipment, e.g. filters, clarifiers, chlorine injection, UV
  - perform routine tests on water systems, e.g. residual chlorine, turbidity, pH, UV transmissivity, heavy metals, e-coli
  - observe information from monitoring and control applications
  - consult records as needed, e.g. system history and trends, entries in operating log
- P2** Correct deficiencies, e.g. change filters, shock the system, backflush out of service filters
- P3** Initiate or assist with maintenance, as appropriate, e.g. isolate system
- P4** Document deficiencies and adjustments:
  - communicate/file information, as required

### Knowledge

- K1** Applicable regulations, e.g. environmental compliance, treatment guidelines for domestic/potable water, water testing
- K2** Manufacturer's specifications and recommendations
- K3** Operating policies and procedures, e.g. testing procedures
- K4** Information/record management system
- K5** Digital documentation, e.g. mechanical and electrical schematics and diagrams
- K6** Monitoring and control applications, e.g. SCADA, DCS
- K7** Types of tests performed on domestic/potable water systems, e.g. water samples
- K8** Components of domestic/potable water systems and how they work, e.g. pumping stations, distillation, reverse osmosis and ion exchange
- K9** Normal operating conditions of domestic/potable water systems
- K10** Abnormal conditions that indicate deficiencies in domestic/potable water systems

### Glossary

- **Domestic water:** water used for indoor and outdoor household purposes, e.g. drinking, preparing food, bathing, washing clothes and dishes, watering garden (also see potable water).
- **Inspect:** to observe the condition of equipment and systems using human senses, e.g. sight, hearing, touch, smell. Inspections may be routine or conducted as part of the troubleshooting process when issues arise to determine the cause of unplanned events.
- **Monitor:** to observe the condition of equipment and systems using data that is displayed on equipment or computer monitors.
- **Potable water:** water that is safe to drink or to use for food preparation.

## Contextual Variables

### Range of Context

- In some cases, certification as a water system/environmental operator is required to operate the domestic and potable water system. Failure to attain this certification can result in fines and/or the shutdown of the system.
- In most plant environments, power station operators are involved in the treatment of water to ensure potability, however, the majority of operators would not have the required provincial certification to verify potability. Operators who actively test water samples must have water plant operator certification that is issued by the province/territory. These operators must follow all provincial/territorial legislation, as well as applicable national legislation (set by Environment Canada and the Department of Fisheries and Oceans) when collecting water samples and conducting water tests.

### 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. electrical blueprints, manufacturers' specifications and recommendations, operating policies and procedures, checklists
- Testing tools (for example, sampling test kits)

Major Category

Power Generation

Competency Area

Operate Power Station Auxiliary Systems and Equipment

Competency Unit

Operate chemical systems

### Purpose

Operating chemical systems ensures they are functioning safely, efficiently, reliably and within prescribed limits. Chemical systems need to be handled and used with care because they can cause damage to people, the environment, property, and processes if not used according to specifications and safety procedures.

### Performance/Abilities

- P1** Receive chemicals
- P2** Add chemicals to specified systems in specified amounts
- P3** Monitor chemical systems from control room and field:
  - inspect chemical systems, e.g. check for leaks
  - conduct drawdowns
  - calibrate metering pumps
  - perform tests on safety systems, e.g. test concentration levels of chemicals
  - conduct water tests for pH, phosphate, conductivity, total dissolved solids, Na, Si
  - observe information from monitoring and control applications
  - consult records as needed, e.g. system history and trends, entries in operating log
- P4** Correct deficiencies, e.g. adjust feed rates and concentrations, adjust blowdown
- P5** Initiate or assist with maintenance, as required, e.g. clean and flush tanks, isolation
- P6** Document deficiencies and adjustments:
  - communicate/file information, as required

### Knowledge

- K1** Applicable regulations, e.g. transportation of dangerous goods (TDG)
- K2** Safety Data Sheets (SDS)
- K3** Water chemistry guidelines
- K4** Electric Power Research Institute (EPRI) recommendations
- K5** Manufacturer's instructions and recommendations for handling and using each chemical
- K6** Required PPE
- K7** Information/record management system
- K8** Operating policies and procedures, e.g. chemical testing
- K9** Monitoring and control applications, e.g. SCADA, DCS
- K10** Purpose of each chemical used and risks it poses
- K11** Types of chemicals used in systems, e.g. hydrazine, ammonia, acid, sodium bisulphate, hypochlorite, hydrogen peroxide, chlorine, flocculants, morpholine, carbonylhydrazide
- K12** Tests performed on chemical systems
- K13** Where chemical systems exist in process
- K14** Locations of emergency showers/eyewash stations
- K15** Normal operating conditions of chemical systems
- K16** Abnormal conditions that indicate deficiencies in water systems

## Glossary

- **Inspect:** to observe the condition of equipment and systems using human senses, e.g. sight, hearing, touch, smell. Inspections may be routine or conducted as part of the troubleshooting process when issues arise to determine the cause of unplanned events.
- **Monitor:** to observe the condition of equipment and systems using data that is displayed on equipment or computer monitors.

## Contextual Variables

### Range of Context

- Types of chemicals used in nuclear plants differ from other types of power generating plants and include, for example, lithium, gadolinium, boron.

### 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. electrical blueprints, manufacturer's specifications and recommendations, standard operating procedures, checklists
- Testing tools (for example, sampling test kits)
- Chemical monitors, e.g. hydrazine monitors
- PPE, e.g. respirators, rubber gloves, non-combustible materials
- Emergency showers/eyewash stations

## Major Category

## Power Generation

## Competency Area

## Operate Power Station Auxiliary Systems and Equipment

## Competency Unit

## Operate heating, ventilation and air conditioning (HVAC) systems

### Purpose

Operating heating, ventilation and air conditioning (HVAC) systems regulates the temperature, humidity and air quality to maintain ideal operating conditions for power generating equipment and auxiliary systems and for workers' comfort.

### Performance/Abilities

- P1** Monitor heating, ventilation and air conditioning systems:
  - observe information from monitoring and control applications
  - consult records as needed, e.g. system history and trends, entries in operating log
- P2** Correct deficiencies, e.g. adjust feed rates and concentrations, adjust blowdown
- P3** Initiate or assist with maintenance, as required, e.g. clean and flush tanks, isolation
- P4** Document deficiencies and adjustments:
  - communicate/file information, as required

### Knowledge

- K1** Applicable regulations, e.g. occupational health and safety, record keeping
- K2** Manufacturer's instructions and recommendations
- K3** Operating policies and procedures, e.g. testing of redundant equipment such as fans
- K4** Information/record management system
- K5** Components of different HVAC systems and how they work, e.g. thermostat, furnace, condenser, filters, dampers, fans, louvers
- K6** Normal operating conditions of HVAC systems, e.g. temperature, humidity, purity, flow, pressure, efficiency
- K7** Abnormal conditions that indicate deficiencies in HVAC systems, e.g. unusual noise, ambient temperature is too low or high

### Glossary

- **HVAC:** heating, ventilation and air conditioning.
- **Inspect:** to observe the condition of equipment and systems using human senses, e.g. sight, hearing, touch, smell. Inspections may be routine or conducted as part of the troubleshooting process when issues arise to determine the cause of unplanned events.
- **Monitor:** to observe the condition of equipment and systems using data that is displayed on equipment or computer monitors.

## 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. electrical blueprints, manufacturer's specifications and recommendations, standard operating procedures, checklists
- Monitoring and control programs, e.g. SCADA, DCS

Major Category

Power Generation

Competency Area

Operate Power Station Emergency and Standby Power Systems

Competency Unit

Operate standby power generating systems

### Purpose

Standby power generating systems mitigate the threat of outages to power generating stations and their customers. Power generating organizations and regulating authorities rely on these systems to keep the station and all its sections operating. By meeting emergency requirements, the station provides safety for workers and first responders as well as protecting the environment, production and the facility.

### Performance/Abilities

- P1** Monitor standby power generating systems:
- inspect standby power generating systems, e.g. fluid levels, operating temperatures, battery levels
  - observe information from monitoring and control applications, e.g. check system indicator
  - consult records as needed, e.g. system history and trends, entries in operating log
- P2** Correct abnormalities
- P3** Initiate or assist with maintenance, as appropriate
- P4** Document abnormalities and adjustments:
- communicate/file information, as required

### Knowledge

- K1** Applicable regulations and licensing requirements, e.g. safety, environmental
- K2** Manufacturer's specifications and recommendations
- K3** Operating policies and procedures, e.g. work orders
- K4** Information/record management system
- K5** Components of standby power generating systems, e.g. batteries, cabling, generators, fuel storage tanks
- K6** Types of standby generators, e.g. reciprocating or turbine engine generators, diesel or other fuels
- K7** Types of tests done on standby power generating systems, e.g. load tests
- K8** Normal operating condition of standby power generating system, i.e. armed
- K9** Abnormal conditions that indicate deficiencies in standby power generating systems, e.g. battery or charger alarm, leaks

### Glossary

- **Armed (aka poised):** ready for operation.
- **Standby power supply:** a backup system that provides electric energy for the station when the normal power supply is not available; standby power is not instantaneous.

## 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. manufacturer's specifications and recommendations, operating policies and procedures, checklists
- Testing tools, e.g. multimeter, portable load bank testers

## Major Category

Power Generation

## Competency Area

Operate Power Station Emergency and Standby Power Systems

## Competency Unit

Operate uninterruptible power supply (UPS) system

### Purpose

Uninterruptible power supply (UPS) systems provide instantaneous protection against process interruptions and safety hazards presented by outages in the normal power supply system.

### Performance/Abilities

- P1** Monitor uninterruptible power supply (UPS) systems:
- inspect UPS power generating systems, e.g. water level in batteries, voltages, currents, charges, temperatures,
  - check ventilation systems
  - perform tests to ensure redundant equipment is functional, e.g. test battery voltage levels
  - observe information from monitoring and control applications, e.g. check system indicators using internal system monitoring functions and supplement with external monitoring devices
  - consult records as needed, e.g. system history and trends, entries in operating log
- P2** Correct abnormalities
- P3** Initiate or assist with maintenance, as appropriate
- P4** Document abnormalities and adjustments:
- communicate/file information, as required

### Knowledge

- K1** Applicable regulations, e.g. safety, environmental
- K2** Manufacturer's specifications and recommendations
- K3** Standard operating procedures, e.g. testing
- K4** Information/record management system
- K5** Types of UPS systems, e.g. battery, rotary
- K6** Components of UPS systems and how they work, e.g. batteries, rectifiers, invertors, chargers
- K7** Normal operating conditions of UPS systems and their auxiliaries, e.g. battery voltage levels, ambient air temperature
- K8** Abnormal conditions that indicate abnormalities in UPS systems, e.g. ground faults, burning smell, fire alarm, battery acid smell, local monitoring alarms

### Glossary

- **Uninterruptable power supply (UPS):** systems that provide instantaneous protection against process interruptions and safety hazards presented by outages in the normal power supply system.

## 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. manufacturer's specifications and recommendations, standard operating procedures, checklists
- Testing tools, e.g. multimeter, portable load bank testers
- PPE, e.g. eye wash station, shower, gloves, grounding strap

## Major Category

## Power Generation

## Competency Area

## Respond to Unplanned Events/Incidents

## Competency Unit

## Respond to unplanned events/incidents

### Purpose

Responding to unplanned events/incidents helps to prevent harm to persons, property and environment. It also contributes to maintaining the system's performance, making efficient use of resources, and complying with regulatory and license requirements.

### Performance/Abilities

- P1** Analyze situation:
  - identify cause of situation, e.g. review maintenance management systems and log
  - identify options to remedy or mitigate situation
- P2** Follow emergency plans and procedures
- P3** Take corrective action:
  - follow contingency plan
  - stabilize system, e.g. restart unit, provide certified black start facilities according to NERC, re-synchronize back to grid
  - remedy or mitigate undesired conditions, e.g. initiate work repair notices, adjust system configuration
- P4** Identify any additional action required, e.g. schedule maintenance
- P5** Use information/record management system:
  - describe unplanned event/incident and action taken
  - direct revisions to maintenance plans, as needed

### Knowledge

- K1** Applicable regulations, e.g., safety, environmental
- K2** Reliability criteria and standards of local, regional and continental bodies, e.g. North American Electric Reliability Corporation (NERC)
- K3** Safety procedures, e.g. power isolation procedures, lockout and tagout procedures, restricted areas
- K4** Monitoring and control applications, e.g. SCADA, DCS
- K5** Digital documentation, e.g. mechanical and electrical schematics and diagrams
- K6** Monitoring devices, e.g. meters, level indicators, manometers, flow indicators, pressure indicators
- K7** Principles of electricity and power generation, e.g. circuits, voltage, AC systems, DC systems, frequency, voltage, control and protection
- K8** Protection systems, e.g. circuit breakers and disconnects, system control logic
- K9** Types of unplanned events/incidents experienced in systems, e.g. cascading power outages
- K10** Emergency preparedness plans
- K11** Contingency plans
- K12** Emergency response information including evacuation codes, emergency contact information, location of emergency equipment
- K13** Emergency response operational procedures, e.g. shutting down, backup power, flooding, terrorism

## Glossary

- **Unplanned events/incidents:** situations that pose a threat or cause loss of power to customers, or situations that threaten the safety of people, the environment, or components of the power generation, transmission and distribution systems; unplanned events that pose a high level of risk to safety, the environment, or production are treated as emergencies.
- **Protection system:** devices (e.g. residual current circuit breakers, single-break, fuses) used in power generating and transmission and distribution systems to isolate a faulty section of electrical power system from rest of live system.

## 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)

- Monitoring and control applications, e.g. SCADA, DCS
- Required documentation, e.g. emergency response procedures manual, emergency response contact lists

## Major Category

## Construction and Installation

## Competency Area

## Assist with Commissioning of Power Generation Equipment and Systems

## Competency Unit

## Assist with commissioning of power generation equipment and systems

### Purpose

It is important that an organization's interests and operational expertise are represented during the commissioning of new or modified equipment to ensure the functionality of the entire system before it is placed in service.

### Performance/Abilities

- P1** Follow instructions of organization's lead representative for commissioning
- P2** Assist with verification of equipment/system functionality
- P3** Assist with documentation of equipment and system performance
- P4** Participate in equipment demonstrations and training sessions for handover, including:
  - functionality and performance
  - maintenance procedures
  - diagnostic procedures
- P5** Assist with start-up of equipment:
  - conduct field verification
- P6** Update or approve equipment and system documents, including:
  - flowsheets
  - operating procedures
  - design manuals

### Knowledge

- K1** Documents for commissioning equipment and systems
- K2** Start-up sequence and other operational procedures for power generation equipment and systems
- K3** Tasks that require trade certification or other specialized expertise
- K4** Procedures for re-commissioning after major outages

## 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)

- Equipment and system documents, including operating procedures, flowsheets, design manuals

Major Category

Transmission and Distribution

Competency Area

Operate Transmission System

Competency Unit

Complete transmission switching

### Purpose

Transmission lines are switched in and out of the network to maximize economic efficiency of generation dispatch on a bulk electric network. Utilities control the flow of power under normal and emergency conditions through the use of switching and protection equipment at strategic points on the grid to avoid disruptions in service. Switching may be required to protect equipment or to maintain system reliability. Transmission switching also allows maintenance work to be carried out and system enhancements done to allow improved reliability and load growth.

### Performance/Abilities

- P1** Develop switching plan:
  - specify permitting process
  - specify parties involved, e.g. neighboring utilities
  - specify communication process with field personnel, i.e. three-way communication
  - coordinate switching with system control center and/or other substations
  - calculate load currents
  - identify protection equipment
  - identify isolation points
  - identify system limitations, e.g. conduct simulation of switching plan to test outcomes
  - confirm switching plan has been verified
- P2** Coordinate switching plans/orders with engineers, planners, field personnel and neighbouring utilities:
  - communicate intent and effects with stakeholders, e.g. post effects of outages on OASIS
  - provide or request required permissions and approvals
- P3** Adjust planned transmission facility outages in service area based on current transmission system conditions and unplanned events:
  - assess own service area's contingency plans for unplanned events ranging from voltage coordination to full transmission system restoration
  - prepare to implement mitigation strategies as required
- P4** Conduct reliability analysis
- P5** Posture system, e.g. switch capacitor banks, adjust generation
- P6** Execute switching procedure:
  - direct field personnel to complete switching procedure
  - execute remote commands
- P7** Monitor transmission facility outage plan and generation dispatch plan
- P8** Document details of switching activities in information/record management system:
  - file and share as required
  - maintain technical information and data

### Knowledge

- K1** Relevant legislation and standards, e.g. Canadian Standards Association (CSA) standards
- K2** Reliability criteria and standards of local, regional and continental bodies, e.g. North American Electric Reliability Corporation (NERC)

- K3** Standard operating procedures
- K4** Safe work practices, e.g. safe isolation of substation equipment, fault current protection for substations, lockout/tagout
- K5** Principles of electricity and transmission, e.g. voltage, circuits, amperages
- K6** Communication protocol, e.g. three-way communication
- K7** Required digital documents, e.g. single line diagrams
- K8** Information/record management system
- K9** Energy management system and integrated applications, e.g. SCADA, OASIS, displays, communications
- K10** Electrical switching and isolation procedures
- K11** Switching technologies for higher to middle voltages
- K12** Emergency restoration procedures
- K13** Required approvals and permissions
- K14** Equipment and system capabilities and limitations
- K15** Planned transmission facility outages
- K16** Protection equipment

### Glossary

- **Open access same-time information system (OASIS):** a public, Internet-based system used for selling, buying and monitoring power transmission services in North America's bulk electrical system.
- **Transmission:** transmission lines and transmission substations operate at high voltage and carry large amounts of electricity from centralized generation plants to lower voltage distribution lines and substations that supply local areas. Transmission lines use poles or structures, have long wire spans between poles and usually traverse fairly straight paths across large distances. Typical transmission voltages include 345-kV and 115 kV and generally all are above 100 kV.
- **Subtransmission:** power lines that typically operate at a voltage of 34,000 to 70,000 volts and are generally below 100 kV.
- **Switching:** controlling the flow of power under normal and emergency conditions through the use of switching and protection equipment that can disconnect or connect a part of the electrical grid network at strategic points; switching is performed to allow for maintenance work, to maximize economic efficiency of generation dispatch, to control the flow of power under normal and emergency conditions, and to compensate for overloaded sections of the grid and shut down certain connections to prevent the spread of disturbances.

### 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)

- Energy management system and integrated applications, e.g. SCADA, OASIS, displays, communications
- Communication devices, e.g. telephones
- Permitting software
- Digital documentation, e.g. single-line diagrams, schematics, symbols, transmission maps

## Purpose

Operating the switch yard impacts the safe, reliable and efficient routing of power from the generating station to the switch yard, to substations or back to the generating station.

## Performance/Abilities

- P1** Gain approval to enter switch yard from control centre, if applicable
- P2** Ensure security of switch yard:
  - check for damage
  - notify security personnel of breach
- P3** Use appropriate PPE, e.g. gloves, hardhat, ground mats
- P4** Identify relevant equipment using unique identifiers for disconnects and breakers
- P5** Inspect switch yard equipment, e.g. breakers, transformers, switches, disconnects, synchronous condensers
- P6** Perform tests, e.g. switching tests
- P7** Monitor switch yard control boards:
  - visually check protection relays
- P8** Follow electrical switching and isolation procedures, with permission from system control, as applicable:
  - follow North American Electric Reliability Corporation (NERC) protocols
- P9** Document deficiencies and action taken:
  - communicate/file information as required

## Knowledge

- K1** Applicable regulations, e.g. safety, electrical code
- K2** Work protection procedures, e.g. lock-out/tag-out
- K3** Electrical switching and isolation procedures
- K4** Reliability criteria and standards of local, regional and continental regulatory bodies, including NERC
- K5** Policies and procedures, e.g. work orders, switching order to operate, routing procedures, bus feedlines
- K6** Manufacturer's specifications and recommendations
- K7** Information/record management system
- K8** Digital documentation, e.g. mechanical and electrical schematics and diagrams
- K9** Monitoring and control applications, e.g. SCADA, DCS
- K10** Principles of electricity and power generation and transmission, e.g. circuits, voltage, AC systems, DC systems, frequency, voltage, control and protection
- K11** Components of switch yard, e.g. system logic, permissives, interlocks, transformer specifications, synchronous condensers, breaker specifics, protection
- K12** Unique identifiers for disconnects and breakers
- K13** Normal operating conditions of switch yard system, e.g. voltage, frequency, transformer loads, currents
- K14** Abnormal conditions that indicate deficiencies in switch yard, e.g. high current, high temperatures, transformer oil leaks, gas leaks, abnormal smells/sounds,

## Glossary

- **Switch yard (aka switching substation):** a substation without transformers that is located at connections and interconnections and operates at a single voltage level; its primary purpose is to deliver power to the grid.

## Contextual Variables

### Range of Context

- Not all Power Station Operators will be required to operate the switch yard. Who carries out these duties depends upon the size of the organization, geographical location, availability of personnel, and labour guidelines/collective agreements for various trade groups and workers.

### 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)

- Monitoring and control applications, e.g. SCADA, DCS
- Required documents, e.g. manufacturer's specifications, operating policies and procedures, checklists
- Voltage tester, e.g. Modiewark
- Communication devices, e.g. radios, mobile phones
- Personal protective equipment (PPE)

## Purpose

Switching is carried out in distribution systems to allow for maintenance, construction, commissioning and restoration activities on lines and substations. Switching also protects substations against potential fault conditions and allows protective devices to be used for switching purposes. The key to successful switching is to do the right things, in the right order, with the devices that have the right capabilities.

## Performance/Abilities

- P1** Prepare switching plan:
- use maps and drawings (e.g. within SCADA system) to confirm system status
  - identify circuits involved
  - identify system limitations, e.g. conduct simulation of switching plan to test outcomes
  - specify steps for substation switching operation, e.g. operate reclosers, switches and fused disconnects in sequence
  - specify steps required for restoration
  - ensure specific switching standards have been met
  - confirm switching plan has been verified
- P2** Communicate intent and effects with stakeholders, e.g. power station generators, major customers:
- use commonly accepted terms to ensure understanding of directions given and actions taken
  - avoid slang and casual conversation
- P3** Dispatch field crew
- P4** Conduct periodic communication checks with field crew to ensure reliable communication
- P5** Communicate with field crew throughout process, including when:
- crew is requesting permits and switching plans
  - dispatching crew
  - switch is being executed
  - responding to inadvertent outcomes
  - initial switch is completed
  - just before system is switched back to normal
  - after switching is completed and permits surrendered
- P6** Provide required permits and authorizations
- P7** Posture system, e.g. make tap adjustments
- P8** Execute switching procedure:
- follow safe work practices
  - use three-way communication
  - direct switching for isolation and restoration
  - operate equipment
  - apply virtual tags in energy management system (EMS)
  - respond to inadvertent events
- P9** Verify completion of switching operations
- P10** Document details of switching activities in information/record management system:
- file and share as required
  - maintain technical information and data
  - complete incident reports for unexpected events, human error

## Knowledge

- K1** Relevant legislation and standards, e.g. Canadian Standards Association (CSA) standards, Occupational Health and Safety regulations
- K2** Local and regional reliability criteria and standards
- K3** Standard work protection code (WPC)
- K4** Standard operating procedures, e.g. work permits required
- K5** Safe work practices, e.g. safe isolation of substation equipment, appropriate testing equipment, grounding methods, fault current protection for substations, lockout/tagout
- K6** Principles of electricity and power distribution, e.g. voltage, circuits, amperages, electrical power flow, how electricity is distributed from source to load
- K7** Communication protocols, e.g. three-way communication
- K8** Digital documentation, e.g. single-line diagrams, schematics, symbols, distribution maps
- K9** Information/record management system
- K10** Energy management system and integrated applications, e.g. distribution management system (DMS), supervisory control and data acquisition (SCADA), communications system, real-time contingency analysis (RTCA), alarm management
- K11** Components of distribution system and their function, e.g. substations, lines, transformers, capacitors, circuit breakers, reclosers, substation batteries, fuses, poles, insulators, cables, duct systems, disconnects, switches
- K12** Switching procedure for middle to lower voltages, e.g. sequence for isolating, testing and inspection of substation breakers

## Glossary

- **Distribution system:** distribution lines and substations that operate at lower voltage than transmission systems that feed them; they carry electricity from the transmission system to local customers; distribution systems typically operate in a voltage range of 4KV to 46KV.
- **Distribution management system (DMS):** a collection of applications designed to monitor and control a distribution network in order to reduce outages, minimize outage time, and maintain acceptable frequency and voltage levels.
- **Energy management system (EMS):** a collective suite of applications that allows operators to plan, monitor and control electricity generation, transmission and distribution.
- **Real-time contingency analysis (RCTA):** an application used to predict electrical system conditions after simulating specific contingencies (e.g. different types of equipment failures in area and neighboring areas) every few minutes; it alerts operators to potential distribution system problems sooner, which allows them more time to take preventive actions to ensure reliability.
- **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.
- **Supervisory control and data acquisition (SCADA) system:** a process automation system consisting of software and programmable logic controllers (PLCs) that collects data from instruments and sensors in remote locations (e.g. substations) and transmits it to a control centre for monitoring or controlling purposes.
- **Three-way communication:** sharing a message in three steps: 1. sender states message, 2. receiver repeats message, 3. sender confirms that receiver has repeated message correctly or corrects any misunderstandings.

## Contextual Variables

### Range of Context

- Operators may control switching from the control centre or direct field worker through switching plan while tracking worker's progress on EMS screen.
- EMS may provide information to operators about whether proposed switching plan will work or not.

## 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 documentation, e.g. single-line diagrams, schematics, symbols, distribution maps, standards
- Communication devices and systems, e.g. mobile phones, two-way radio, websites
- Energy management system and integrated applications, for example:
  - Advanced distribution management system (ADMS)
  - Advanced metering infrastructure (AMI)
  - Distribution management system (DMS)
  - Outage management system (OMS)
  - Real-time contingency analysis (RTCA)
  - Supervisory control and data acquisition (SCADA) system
  - Load flow software

## Major Category

## Asset Maintenance

## Competency Area

## Maintain Generating, Distribution and Service Equipment

## Competency Unit

## Perform preventative maintenance on power generation equipment

## Purpose

Preventative maintenance, also referred to as service, is carried out to meet warranty requirements, to reduce the risk of unexpected system and equipment failures, and to decrease the likelihood of costly unscheduled downtime.

## Performance/Abilities

- P1** Review required maintenance activities in context of preventative maintenance plan:
  - assess plan to ensure appropriateness of required activities, e.g. maintenance recall times, scheduled outages
  - ensure required parties are available to perform work
  - ensure redundant systems are available
  - discuss maintenance plans with stakeholders
- P2** Obtain required documentation, e.g. Job Safety Analysis (JSA), lock-out/tag-out (LOTO) procedures, confined space entry permit
- P3** Identify other minor corrective tasks that could be completed at same time
- P4** Wear appropriate PPE
- P5** Isolate all forms of energy, as required
- P6** Perform required preventative maintenance activities, for example:
  - inspect transformers, bus systems and back-up power supplies
  - grease bearings
  - refill and test lubrication systems
  - check fluid levels, e.g. oil, hydraulic and cooling fluids
  - take fluid samples
  - check for leaks, e.g. oil, hydraulic and cooling fluids
  - check proper operation of instruments
- P7** Repair or replace components, if issues identified:
  - follow manufacturers' specifications
  - verify functionality of replaced components, if required
- P8** Document maintenance results:
  - communicate/file information, as required

## Knowledge

- K1** Organization's policies and procedures, e.g. standard operating procedures (SOP), safe work practices, lock-out tag-out procedures, isolation procedures
- K2** Applicable regulations, e.g. confined space, working at heights
- K3** Tasks that require trades certification or other specialized expertise
- K4** Maintenance manuals
- K5** Organizational information/record management system
- K6** Principles of electricity, e.g. AC and DC
- K7** Principles of mechanics and hydraulics, e.g. friction, pressure, torque, gravity
- K8** Impact of environmental conditions on wind turbines, e.g. wind speed, icing
- K9** Power generation equipment components, their functions and characteristics
- K10** Rigging, hoisting/lifting and moving procedures

## Contextual Variables

### Range of Context

- In some organizations, Power Station Operators will not be expected to perform preventative maintenance.
- The currency, complexity and automation level of equipment and systems found in stations vary, presenting challenges to practitioners. The combination of new and legacy equipment requires a broad range of knowledge and skills.

### Level of Practice

- Frontline
- Supervisor
- Manager/Executive

### Adapted Bloom's Taxonomy

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

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

- PPE, e.g. helmet, eye protection, gloves
- Diagnostic and testing equipment, e.g. multimeter, megger, phase rotation meter, oscilloscope, high voltage tester
- Tools, e.g. hand tools, torquing equipment, grease guns
- Documentation, e.g. schematics, diagrams, manufacturers' specifications

Major Category

Asset Maintenance

Competency Area

Assist with Power Generation Equipment Maintenance

Competency Unit

Assist with power generation equipment maintenance

### Purpose

Maintenance keeps power generation equipment and systems in optimal condition and prevents breakdowns which are problematic and expensive to correct. Proper isolation of equipment for maintenance work is crucial to the safety of personnel and equipment.

### Performance/Abilities

- P1** Maintain communication with maintenance crew throughout pre-maintenance, maintenance and post-maintenance activities
- P2** Issue work and test permits to electrical and mechanical maintenance personnel
- P3** Perform pre-maintenance activities:
  - provide work protection (isolation and de-energization) for qualified workers:
    - first operator prepares switching order for designated equipment and components, e.g. breakers, auxiliary equipment
    - second operator checks switching order
    - any operator on shift performs switching duties according to switching order
  - conduct walk through and hazard assessment with parties involved
  - isolate all forms of energy, e.g. mechanical, hydraulic
  - depressurize units
  - perform changeover
- P4** Reconfigure plant equipment to allow for maintenance:
  - operate switch gear to regulate and transfer power loads to standby equipment
  - ensure equipment is shut down
  - perform energy isolation
  - lock-out/tag-out equipment
  - complete required checklists
- P5** Assist in completion of scope of work, e.g. test operations
- P6** Perform post-maintenance activities:
  - inspect equipment to ensure it is ready for service, e.g. conduct flowsheet checks
  - remove lock-out tags and locks, if required
  - test run equipment to ensure in good working order
  - complete pre-startup checklist
  - restore equipment to operating state, if required
  - monitor equipment to identify abnormalities after start up
  - communicate unit availability to system operator and other appropriate personnel
- P7** Document maintenance results:
  - communicate/file information, as required

### Knowledge

- K1** Applicable regulations, e.g. energy isolation process, record keeping
- K2** Tasks that require trades certification or other specialized expertise
- K3** Digital documentation, e.g. mechanical and electrical system schematics and diagrams

- K4** Operating policies and procedures, e.g. changeover procedures, procedures for restoring equipment to service
- K5** Information/record management system
- K6** Principles of electricity and power generation, e.g. circuits, AC systems, DC systems, frequency, voltage, control and protection
- K7** Characteristics of different types of equipment and systems being maintained
- K8** Protection systems, e.g. relays, overcurrent distances
- K9** Interrelatedness of equipment and systems and impact on operations
- K10** Maintenance strategies and practices, e.g. condition-based, preventative
- K11** Equipment and system condition, position or configuration requirements
- K12** Normal operating parameters of power generating equipment, systems and auxiliaries
- K13** Parties involved in switching operation (e.g. operations manager, electrical engineer, operator in charge, quality utility employee) and their responsibilities
- K14** Parties involved in maintenance task (e.g. electricians, millwrights, line crew, power protection and control technicians) and their responsibilities
- K15** Switching order for maintenance task, e.g. action required, equipment involved, location, who will be executing switching operation
- K16** Scope of maintenance work to be performed

## Glossary

- **Changeover:** to remove equipment from a system to give it downtime (often when maintenance work is performed) and put different equipment in its place; this is done in a manner that avoids risk to safety of people, environment, production and without disruption of service; changeovers are done more often on auxiliary systems than major components.
- **Condition-based maintenance:** when maintenance is performed based on the condition of equipment as opposed to a schedule.
- **Energy isolation:** to remove energy and potential energy from equipment and processes in order to perform routine maintenance or repairs; common sources of energy in power stations include pressure, electrical, rotation, springs, and nuclear fission.
- **Preventative maintenance:** (aka planned maintenance) scheduled maintenance aimed at optimizing station assets by keeping them efficient and making repairs before assets fail.
- **Work protection:** ensuring equipment and systems are safe to work on by isolating and de-energizing them.

## Contextual Variables

### Range of Context

- Breakdown maintenance may be unexpected and present suddenly, which can result in changes in priorities, fluctuations in production, and impacts on the operation of other equipment.
- For complex systems or equipment, this competency may be more challenging and involve specialized tasks/tools or the assistance of specialists.
- The age of equipment and level of system automation may vary. This combination of new and legacy equipment requires a broad range of knowledge and skills.
- The position responsible for preparing the switching order may vary among employers. For example, in some organizations it is the shift engineer or designate who is responsible and in others it is the senior station operator.

### 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)

- Monitoring and control applications, e.g. SCADA, DCS
- Required documentation, e.g. pre-start up checklists, manufacturers' specifications, mechanical and electrical diagrams, changeover procedures, procedures for restoring equipment to service
- Lock-out locks and tags



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. lock-out tag-out, 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

- |   |   |
|---|---|
| <input type="checkbox"/> Recall, Remember | <input type="checkbox"/> Analyze          |
| <input type="checkbox"/> Understand       | <input type="checkbox"/> Evaluate         |
| <input checked="" type="checkbox"/> Apply | <input type="checkbox"/> 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

- |   |   |
|---|---|
| <input type="checkbox"/> Recall, Remember | <input type="checkbox"/> Analyze          |
| <input type="checkbox"/> Understand       | <input type="checkbox"/> Evaluate         |
| <input checked="" type="checkbox"/> Apply | <input type="checkbox"/> Create/Transform |

## Purpose

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

## Performance/Abilities

- P1** Identify all sources of hazardous energy that may be encountered when performing work on component, equipment or system
- P2** Disconnect each hazardous energy source in component, equipment or system, e.g. disconnect linkages, open breakers, open disconnect switch
- P3** De-energize component, equipment or system, if required:
- release stored or residual energy, for example:
    - ground electrical devices, e.g. capacitors, batteries/UPS, accumulators
    - release hydraulic liquid
    - vent air pressure
    - brake mechanical movement
- P4** Perform lock-out tag-out procedures
- P5** Verify isolation using one of following methods:
- activate controls to ensure no response:
    - complete visual inspection, ensure electrical connections are open
  - test component, equipment or system to ensure zero potential energy, for example:
    - test circuitry
    - check pressure gauges to ensure energy removed
    - check temperature gauges to ensure thermal energy discharged
- P6** Document, as required
- P7** Return component, equipment or system to normal configuration
- P8** Ensure component, equipment or system can be safely re-energized, e.g. phase testing, Megger testing
- P9** Re-energize component, equipment or system, if no other locks on equipment or system:
- coordinate re-energization with controlling authority
- P10** Test component, equipment or system to ensure operating properly
- P11** Document, as required

## Knowledge

- K1** Relevant regulations, e.g. work protection, grounding and bonding code
- K2** Organization's policies and procedures, e.g. electrical safety, arc-flash policies, hazard assessment, lock-out tag-out procedures
- K3** Type and rating of PPE required for isolation
- K4** Testing procedures

- K5** Electrical and mechanical principles, e.g. AC and DC, pressure
- K6** Primary energy sources (i.e. electrical, mechanical, hydraulic, chemical, thermal and gravitational) in components, equipment and systems
- K7** Safety tests to ensure zero energy state
- K8** Electrical and mechanical control systems and components, e.g. SCADA, program logic controllers (PLC), breakers, fuses, disconnects

## Glossary

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

## Contextual Variables

### Range of Context

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

### Level of Practice

- Frontline
- Supervisor
- Manager/Executive

### Adapted Bloom's Taxonomy

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

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

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

Major Category

Safety

Competency Area

Maintain a Safe Working Environment

Competency Unit

Perform lock-out tag-out procedures

## Purpose

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

## Performance/Abilities

- P1** Ensure required training is up to date
- P2** Plan lock-out tag-out with relevant personnel:
  - clarify scope of work to be done
  - identify potential energy sources that must be controlled
  - identify equipment and/or system to be locked-out tagged-out:
    - refer to panel schedules, drawings, single-line diagrams, cable and equipment tags
  - confirm details:
    - when lock-out tag-out will begin
    - how long it will continue
    - authorized person responsible for applying locks and tags
    - affected persons to inform of lock-out tag-out
- P3** Inform affected persons of lock-out tag-out
- P4** Select appropriate PPE
- P5** Isolate component, equipment or system:
  - de-energize component, equipment or system, if required
  - coordinate with controlling authority, if required
- P6** Apply locking mechanisms or approved devices (e.g. locking pins, rotor locks), on component, equipment or system, as required
- P7** Apply approved tag with required information, including:
  - tag number
  - name of component, equipment or system that is locked out
  - why lock-out is required
  - time component, equipment or system was locked out
  - name of authorized person who attached tag and lock
- P8** Verify component, equipment or system is locked out and tagged out properly:
  - conduct visual inspection, e.g. tag filled out correctly
- P9** Remove lock-out devices and tags when maintenance or repair activities are completed

## Knowledge

- K1** Organizational safety policies and procedures, including lock-out tag-out procedures
- K2** Relevant legislation
- K3** Training renewal requirements for lock-out tag-out

**K4** Hazards associated with lock-out tag-out

**K5** Energy potential in components, equipment and systems

**K6** Procedures for potential energy testing

**K7** Safety checks to ensure zero energy state

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

**K9** Types of locking devices and their applications

**K10** Types of tags and their applications

## Glossary

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

## CONTEXTUAL VARIABLES

### Range of Context

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

### Level of Practice

- Frontline
- Supervisor
- Manager/Executive

### Adapted Bloom's Taxonomy

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

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

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

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

## Purpose

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

## Performance/Abilities

- P1** Ensure WHMIS training is up to date
- P2** Ensure transportation of dangerous goods (TDG) training is up to date, if applicable
- P3** Review information provided on Safety Data Sheets (SDS) for each material to be handled
- P4** Review manufacturer's instructions for each material to be handled, if applicable
- P5** Follow handling and disposal guidelines for hazardous materials, for example:
  - do not combine chemical products, as some combinations can be hazardous
  - use designated containers when transferring chemical products
  - label all chemical products/hazardous materials
- P6** Store chemicals in designated, ventilated area away from danger, e.g. heat source
- P7** Transport hazardous materials according to guidelines and legislation
- P8** Document activities, as required

## Knowledge

- K1** Relevant legislation
- K2** WHMIS, including hazard symbols, Safety Data Sheets (SDS)
- K3** Organizational safety policies and procedures
- K4** Location of first aid stations and procedures
- K5** Location of safety equipment, e.g. eye-wash stations, spill containment

## Glossary

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

## CONTEXTUAL VARIABLES

### Range of Context

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

## 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)

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

<b>Major Category</b>	<b>Safety</b>
<b>Competency Area</b>	<b>Maintain a Safe Working Environment</b>
<b>Competency Unit</b>	<b>Work in confined spaces</b>

## Purpose

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

## Performance/Abilities

- P1** Ensure confined space training is up to date
- P2** Preplan entry:
  - identify hazards, e.g. gases, multiple power sources
  - discuss with team members
  - review rescue procedures
- P3** Select appropriate personal protective equipment (PPE)
- P4** Erect barriers and warning signs, as necessary
- P5** Gather tools and equipment before entering space
- P6** Use confined space equipment according to manufacturer's instructions
- P7** Verify entry permit
- P8** Monitor and document atmospheric conditions:
  - evacuate space, as necessary
- P9** Maintain constant communication with team members outside of confined space
- P10** Secure confined space during inactivity

## Knowledge

- K1** Relevant legislation, including Occupational Health & Safety (OH&S)
- K2** Organizational safety policies and procedures
- K3** Manufacturer's instructions and recommendations
- K4** Location of first aid stations and procedures
- K5** Definition of confined space, e.g. locations that require care and monitoring
- K6** Types of confined space monitoring equipment and their operation
- K7** Hazards associated with confined spaces
- K8** Types of gasses and their properties
- K9** Rescue procedures for confined spaces

## CONTEXTUAL VARIABLES

### Range of Context

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

### 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)

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

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

### Purpose

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

### Performance/Abilities

- P1** Ensure fall arrest training is up to date
- P2** Use fall arrest equipment only for intended purpose
- P3** Ensure ladders, scaffolding and lift equipment are appropriate for task
- P4** Select appropriate personal protective equipment (PPE)
- P5** Inspect fall arrest equipment before use:
  - check expiry dates, if applicable
  - document condition
  - tag and remove defective equipment from service
- P6** Ensure fall arrest equipment is properly fitted and adjusted
- P7** Ensure safety harnesses are attached to rated anchor points
- P8** Communicate issues to relevant personnel, e.g. co-workers, supervisor
- P9** Clean fall arrest equipment after use:
  - store in designated location

### Knowledge

- K1** Relevant legislation, including Occupational Health and Safety (OH&S)
- K2** Organizational safety policies and procedures, including OH&S
- K3** Manufacturer's specifications and recommendations for use and care
- K4** Types of safety hazards on site that impact fall arrest
- K5** PPE required for specific environments
- K6** Use of anchor points

## CONTEXTUAL VARIABLES

### Range of Context

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

### Level of Practice

- Frontline
- Supervisor
- Manager/Executive

### Adapted Bloom's Taxonomy

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

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

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

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

- |   |   |
|---|---|
| <input type="checkbox"/> Recall, Remember | <input type="checkbox"/> Analyze          |
| <input type="checkbox"/> Understand       | <input type="checkbox"/> Evaluate         |
| <input checked="" type="checkbox"/> Apply | <input type="checkbox"/> Create/Transform |

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

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

Major Category

Safety

Competency Area

Maintain a Sustainable Environment

Competency Unit

Contribute to wildlife mitigation practices

### 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       Analyze  
 Understand             Evaluate  
 Apply                         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

Safety

### Competency Area

Respond to Emergencies

### Competency Unit

Respond to chemical spills and leaks

### Purpose

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

### Performance/Abilities

- P1** Initiate Emergency Response Plan, if required, e.g. notify internal and external authorities
- P2** Assess level of hazard, e.g. potential for fire or explosion:
- do not touch spilled materials
  - identify chemical, if possible
  - remove or extinguish ignition sources, if possible
- P3** Contain spills and leaks, if possible:
- use tools and equipment appropriate to chemical, e.g. corrosion-resistant
  - prevent chemicals from reaching sewers, drains and confined spaces
  - increase ventilation to spill area, if possible
  - contain with earth, sand or absorbent material that does not react with spilled material
  - soak up spilled liquid with absorbent material
  - scoop/shovel spilled material into suitable, covered, labeled containers
- P4** Perform clean-up, as required:
- wear personal protective equipment (PPE) appropriate to the chemicals being handled
  - flush spill area with water, if safe
  - contain runoff for disposal
  - handle contaminated absorbent material same as hazardous materials
  - ensure clothing, equipment and tools are decontaminated
- P5** Communicate spills and leaks to appropriate personnel, e.g. co-workers, supervisor:
- document issues, as required, e.g. note in logbook
  - estimate quantity of unrecovered chemicals

### Knowledge

- K1** Relevant legislation
- K2** Emergency Response Plan
- K3** Organizational safety policies and procedures, including Occupational Health & Safety (OH&S)
- K4** Workplace Hazardous Materials Information System (WHMIS)
- K5** Transportation of Dangerous Goods (TDG)
- K6** Types of chemicals that may be encountered
- K7** Importance of handling chemical spills and leaks correctly and in timely manner
- K8** Available emergency response services and their contact information
- K9** Procedures for safe evacuation, if required
- K10** Safety reporting procedures

## CONTEXTUAL VARIABLES

### Range of Context

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

### Level of Practice

- Frontline
- Supervisor
- Manager/Executive

### Adapted Bloom's Taxonomy

- |   |   |
|---|---|
| <input type="checkbox"/> Recall, Remember | <input checked="" type="checkbox"/> Analyze |
| <input type="checkbox"/> Understand       | <input type="checkbox"/> Evaluate           |
| <input type="checkbox"/> Apply            | <input type="checkbox"/> Create/Transform   |

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

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

## Major Category

Safety

## Competency Area

Respond to Emergencies

## Competency Unit

Respond to non-electrical emergencies

### Purpose

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

### Performance/Abilities

- P1** Remain calm
- P2** Initiate Emergency Response Plan for type of risk, if required, for example:
  - notify internal and external authorities
  - evacuate
  - follow direction of emergency authority
  - assist emergency authorities
  - secure area
- P3** Assess level of hazard:
  - determine what is exposed to risk, e.g. unit, station, site, field operations
- P4** Record details of emergency, for example:
  - date and time
  - nature of emergency
  - time authorities were contacted
  - time authorities arrived
  - action taken
  - names and contact information for witnesses
- P5** Follow up, as required, for example:
  - take action to prevent recurrence

### Knowledge

- K1** Relevant legislation
- K2** Emergency Response Plan
- K3** Organizational safety policies and procedures, including Occupational Health & Safety (OH&S)
- K4** Workplace Hazardous Materials Information System (WHMIS)
- K5** Available emergency response services and their contact information
- K6** Procedures for safe evacuation, if required
- K7** Emergency reporting procedures

## CONTEXTUAL VARIABLES

### Range of Context

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

## Level of Practice

- Frontline
- Supervisor
- Manager/Executive

## Adapted Bloom's Taxonomy

- |   |   |
|---|---|
| <input type="checkbox"/> Recall, Remember | <input checked="" type="checkbox"/> Analyze |
| <input type="checkbox"/> Understand       | <input type="checkbox"/> Evaluate           |
| <input type="checkbox"/> Apply            | <input type="checkbox"/> Create/Transform   |

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

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

## Major Category

Safety

## Competency Area

Respond to Emergencies

## Competency Unit

Participate in high-angle rescue

## Purpose

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

## Performance/Abilities

- P1** Maintain certification for high-angle rescue
- P2** Participate in high-angle rescue training exercises
- P3** Prepare for potential rescue:
  - inspect equipment on regular basis
  - replace equipment, as necessary
  - store rescue kit in designated location
- P4** Assess level of hazard
- P5** Initiate Emergency Response Plan, if required, for example:
  - notify internal and external authorities
  - secure area
- P6** Follow legislated procedures for high-angle rescue
- P7** Communicate issues to appropriate personnel, e.g. co-workers, supervisor:
  - document actions, as required

## Knowledge

- K1** Relevant legislation
- K2** Emergency Response Plan
- K3** Organizational safety policies and procedures, including Occupational Health & Safety (OH&S)
- K4** Certification/training needed for high-angle rescue
- K5** Inspection requirements for equipment
- K6** Available emergency response services and their contact information
- K7** First aid training
- K8** Procedures for safe evacuation, if required
- K9** Emergency reporting procedures

## CONTEXTUAL VARIABLES

### Range of Context

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

## Level of Practice

- Frontline
- Supervisor
- Manager/Executive

## Adapted Bloom's Taxonomy

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

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

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

## Major Category

Safety

## Competency Area

Respond to Emergencies

## Competency Unit

Participate in incident and accident investigations

## Purpose

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

## Performance/Abilities

- P1** Survey scene, as required:
  - make the scene safe
  - secure the scene, as necessary
  - tag relevant equipment or materials
  - photograph environment, as necessary
- P2** Gather information, as required, for example:
  - people directly and indirectly involved
  - relevant equipment or material
  - site
  - process, i.e. work procedures, instructions, training, safety records
- P3** Participate in interviews with relevant parties, e.g. emergency authority, Worker's Compensation Board (WCB), supervisor:
  - describe events in own words
- P4** Document events, as necessary, e.g. write witness report
- P5** Participate in root-cause analysis, as required

## Knowledge

- K1** Relevant legislation
- K2** Safe work procedures
- K3** Incident investigation and reporting requirements
- K4** Types of safety hazards on site

## Glossary

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

## CONTEXTUAL VARIABLES

### Range of Context

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

### Level of Practice

- Frontline
- Supervisor
- Manager/Executive

### Adapted Bloom's Taxonomy

- |   |   |
|---|---|
| <input type="checkbox"/> Recall, Remember | <input checked="" type="checkbox"/> Analyze |
| <input type="checkbox"/> Understand       | <input type="checkbox"/> Evaluate           |
| <input type="checkbox"/> Apply            | <input type="checkbox"/> Create/Transform   |

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

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

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

- |   |   |
|---|---|
| <input type="checkbox"/> Recall, Remember | <input checked="" type="checkbox"/> Analyze |
| <input type="checkbox"/> Understand       | <input type="checkbox"/> Evaluate           |
| <input type="checkbox"/> Apply            | <input type="checkbox"/> 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

- |   |   |
|---|---|
| <input type="checkbox"/> Recall, Remember | <input type="checkbox"/> Analyze          |
| <input type="checkbox"/> Understand       | <input type="checkbox"/> Evaluate         |
| <input checked="" type="checkbox"/> Apply | <input type="checkbox"/> 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

- |   |   |
|---|---|
| <input type="checkbox"/> Recall, Remember | <input type="checkbox"/> Analyze          |
| <input type="checkbox"/> Understand       | <input type="checkbox"/> Evaluate         |
| <input checked="" type="checkbox"/> Apply | <input type="checkbox"/> 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

## 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

### Lubricate equipment and components

## Purpose

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

## Performance/Abilities

- P1** Wear appropriate personal protective equipment (PPE), e.g. safety glasses, gloves, masks
- P2** Determine lubricant requirements:
  - refer to manufacturer's specifications for lubricant and equipment
  - comply with applicable regulations
- P3** Select appropriate lubricant, e.g. oil, grease, dry solid, water
- P4** Select appropriate application tools and equipment, e.g. grease gun, hand tool
- P5** Identify points requiring lubricants according to manufacturer's specifications and engineered drawings
- P6** Maintain lubricant levels, as required
- P7** Remove lubricants, as required:
  - follow procedures for recycling or disposal
  - replace lubricants, as required
- P8** Respond to spills and leaks, as required
  - report spills to supervisor
- P9** Communicate issues to relevant personnel, e.g. co-workers, supervisor
- P10** Clean tools after use, as required
- P11** Store tools and remaining lubricants in designated approved location

## Knowledge

- K1** Relevant legislation and documents, e.g. WHMIS
- K2** Manufacturer's specifications and engineered drawings of equipment
- K3** Organizational safety policies and procedures, including Occupational Health & Safety
- K4** Manufacturer's safety data sheets (SDS) and other lubricant specifications, e.g. PPE, first aid measures, characteristics
- K5** Types of safety hazards on site and associated with lubrication, e.g. pinch points
- K6** PPE required for specific tasks
- K7** Consequences of using incorrect lubricant or not following application instructions

## CONTEXTUAL VARIABLES

### Range of Context

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



## 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, goggles, masks, gloves
- Hand tools, e.g. grease guns
- Lubricants, e.g. oil, grease, dry solid, water

## Major Category

## Foundational Trades Skills

## Competency Area

## Perform Routine Trade Tasks

## Competency Unit

## Perform rigging, hoisting/lifting and moving tasks

## Purpose

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

## Performance/Abilities

- P1** Ensure training is up to date
- P2** Wear appropriate personal protective equipment (PPE), e.g. high visibility equipment, hard hat, gloves, safety boots, safety glasses
- P3** Determine load and lift points:
  - reference nameplates, shipping information and manufacturer's specifications
  - scale load using measuring devices, as required
  - calculate load considering:
    - size
    - material type
    - whether environment is wet or dry
    - centre of gravity
    - added components and weight of rigging
- P4** 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
- P5** Identify load ratings for sling arrangements, as required
- P6** Confirm rigging capacity considering working load limit (WLL), design factors and weight of load
- P7** Ensure equipment will not be overloaded throughout duration of task, e.g. refer to load charts
- P8** Ensure equipment is certified
- P9** Inspect equipment:
  - ensure equipment meets site requirements, manufacturer's specifications and jurisdictional regulations
  - check for damage and wear
- P10** Document condition of equipment, as required
- P11** Tag defective equipment:
  - turn in to relevant personnel or department
- P12** Secure area, as required:
  - assess site, ground, environmental conditions
  - plan route
  - remove hazards, obstructions and other anomalies
  - determine lift radius:
    - secure area of lift radius
  - confirm location of personnel

- P13** Determine scheduling of activities based on environmental conditions, e.g. weather
- P14** Communicate issues to relevant personnel, e.g. co-workers, supervisor
- P15** Communicate clearly before, during and after hoist/lift/move:
  - ensure direct communication (i.e. direct line of sight or radio communication) between operator and signal person
  - use hand signals and verbal communication

## Knowledge

- K1** Relevant legislated requirements, e.g. 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:
  - Calculation procedures, including factors to consider
  - Sling angles for hoisting/lifting
  - Types of knots, hitches, splices and bends, how to create them and what they are used for
- K8** Types of moving equipment (e.g. crane, boom or forklift), their components, accessories, applications and procedures for use
- K9** Inspection procedures for hoisting, lifting and moving equipment
- K10** Procedures for rigging, hoisting/lifting and moving, including factors to be considered
- K11** Procedures to ensure work area is safe for lifting and moving

## 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

- |   |   |
|---|---|
| <input type="checkbox"/> Recall, Remember | <input type="checkbox"/> Analyze          |
| <input type="checkbox"/> Understand       | <input type="checkbox"/> Evaluate         |
| <input checked="" type="checkbox"/> Apply | <input type="checkbox"/> 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

- |   |   |
|---|---|
| <input type="checkbox"/> Recall, Remember | <input checked="" type="checkbox"/> Analyze |
| <input type="checkbox"/> Understand       | <input type="checkbox"/> Evaluate           |
| <input type="checkbox"/> Apply            | <input type="checkbox"/> 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

- |   |   |
|---|---|
| <input type="checkbox"/> Recall, Remember | <input type="checkbox"/> Analyze          |
| <input type="checkbox"/> Understand       | <input type="checkbox"/> Evaluate         |
| <input checked="" type="checkbox"/> Apply | <input type="checkbox"/> 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

- |   |   |
|---|---|
| <input type="checkbox"/> Recall, Remember | <input checked="" type="checkbox"/> Analyze |
| <input type="checkbox"/> Understand       | <input type="checkbox"/> Evaluate           |
| <input type="checkbox"/> Apply            | <input type="checkbox"/> 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 systems, 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 confirms 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

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.