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Wind Turbine Technician
Profile Outline

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About the Electricity Sector Council

Approximately 100,000 Canadians are involved in the generation, transmission and distribution of one of our country's essential utilities: electricity. Their work powers homes and businesses across the country, fuelling everything from light bulbs, cell phones and refrigerators to water treatment plants and road vehicle assembly lines.

The Electricity Sector Council provides support to this dedicated team by working with industry employers and other stakeholders to research and resolve human resource and workplace development issues.

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Disclaimer: Please note that some of the tasks detailed in this document will require the services of a registered tradesperson depending upon the province of work. Provincial regulations change from time to time, Employers and employees should consult your provincial appropriate licensing authority for clarification regarding which tasks may be affected. It is the responsibility of the individual employer/employee to ensure they act within the regulation for their jurisdiction.

Introduction

Wind Turbine Technicians perform routine repetitive maintenance and service work to maintain wind turbines and related generating equipment. They are employed by electric power generation, transmission and distribution companies, electrical contractors, wind turbine manufacturers and public utility commissions.

The most important Essential Skills for Wind Turbine Technicians are:

- Document Use
- Thinking Skills – Problem Solving
- Thinking Skills – Critical Thinking

A. Reading Text

Reading Text refers to reading material that is in the form of sentences or paragraphs. *Reading Text* generally involves reading notes, letters, memos, manuals, specifications, regulations, books, reports or journals. *Reading Text* includes:

- forms and labels if they contain at least one paragraph;
- print and non-print media such as computer screen and microfiche text; and
- paragraph-length text within charts, tables and graphs.

The Reading Text Complexity Rating Scale ranges from Level 1 (least complex) to Level 5 (most complex). The typical text reading tasks of Wind Turbine Technicians are at complexity Levels 1 to 3. Their most complex text reading tasks are at Complexity Level 3.

Examples

Wind Turbine Technicians:

- read e-mail messages from co-workers and customers. For example, they may read messages from managers which describe upcoming scheduled maintenance and outages. (1)

- read short text entries in forms. For example, they read entries in work orders and repair checklists to learn about the maintenance histories of turbines and turbine components and to locate information about past inspections and repairs. (2)

- read turbine manufacturers' service bulletins and notes. For example, they may read service bulletins to learn about new parameter changes in turbines they maintain and repair. (2)

- may read incident and accident reports to familiarize themselves with the factors leading to workplace accidents and to learn about updated safety procedures put in place to protect workers. (2)

- may read Workplace Hazardous Materials Information System (WHMIS) handbooks, labels and Material Safety Data Sheets (MSDS) to learn the hazards of products such as lubricating greases and compressed and pressurized gases. (2)

- read manuals. For example, they may read turbine service manuals which describe step-by-step troubleshooting and testing steps and maintenance techniques such as optimal lubrication and torquing procedures. (3)

- read detailed work instructions and memos which describe procedures for atypical and unusual repair tasks. For example, they may read diagnostic instructions sent by manufacturers' technical support staff which detail abnormal electrical and mechanical faults. They familiarize themselves with the instructions and read any other pertinent information included in the instructions and memos. (3)

Reading Text Summary

Type of Text	Purpose for Reading			
	To scan for specific information/ To locate information	To skim for overall meaning, to get the 'gist'.	To read the full text to understand or to learn.	To read the full text to critique or to evaluate.
Forms	✓	✓		
Labels	✓	✓		
Notes, Letters, Memos		✓	✓	
Manuals, Specifications, Regulations	✓	✓	✓	
Reports, Books, Journals		✓	✓	

B. Document Use

Document Use refers to tasks that involve a variety of information displays in which words, numbers, icons and other visual characteristics (e.g., line, colour, shape) are given meaning by their spatial arrangement. Workplace examples of documents include graphs, lists, tables, blueprints, schematics, drawings, signs and labels.

If a document includes a paragraph of text, as may be the case on a label or a completed form, it is also included in ***Reading Text***. Documents requiring the entry of words, phrases, sentences and paragraphs are also included in ***Writing***.

The Document Use Complexity Rating Scale ranges from Level 1 (least complex) to Level 5 (most complex). The typical document reading tasks of Wind Turbine Technicians are at Complexity Levels 1 to 3. Their most complex document reading tasks are at Complexity Level 3.

Examples

Wind Turbine Technicians:

- locate data on labels. For example, they may scan serial numbers and part numbers on equipment and check WHMIS labels on lubricants, oils and other chemicals to identify health risks. (1)
- locate data in signs. For example, they scan directional and safety signs posted throughout their workplaces for wayfinding purposes and to maintain their personal safety. (1)
- enter data into forms. For example, they may complete service notes by ticking boxes and writing short descriptions to record changes in turbine parameters for other technicians and their supervisors. (2)
- locate data in completed forms. For example, they scan work orders to identify repair and maintenance tasks to be performed on wind turbines and check for supervisor instructions, sign-offs and other work protection information. (2)
- locate data in lists. For example, they read lists of repair instructions and step-by-step procedures to follow exactly when performing various maintenance tasks. (2)
- locate data in tables and schedules. For example, they may review tables in manufacturers' manuals to find optimal turbine performance data and scan work schedules which outline shift complements and workers' vacations. (2)
- may interpret scale drawings in work instructions. For example, they may review assembly drawings of turbine components such as gearboxes and hydraulic couplings to better understand the associated repair and maintenance instructions. They use the drawings to support repair instructions and further verify testing and repair procedures. (3)

- scan schematic drawings and circuit diagrams. For example, they may scan schematic drawings of wind turbines and their mechanisms to locate and troubleshoot faults in various electrical components and devices. They may interpret circuit diagrams to understand currents and flows between turbine controls and paths from generating equipment to transmission infrastructure. (3)

- locate data in graphs. For example, they may review power curves to determine wind turbines' power outputs and varying rotating speeds. They may plot wind speed and power data on graphs to assist engineers in their efforts to trend generation capacities. (3)

Examples of Creating Documents

Wind Turbine Technicians:

- may create diagrams and sketches. For example, they may sketch turbine parts and components they dismantle such as coloured wires, lights and sensors to provide visual orientation to their proper re-placement within turbine systems.

- may create lists to organize job tasks and component and equipment inventories. For example, they may create lists of scheduled maintenance tasks they must perform within the next quarter year. They may create lists of turbines and components which require repair or overhaul.

Document Use Summary

Wind Turbine Technicians:

- Read signs, labels or lists.
- Complete forms by marking check boxes, recording numerical information or entering words, phrases, sentences or texts of a paragraph or more.
- Read completed forms containing check boxes, numerical entries, phrases, addresses, sentences or texts of a paragraph or more.
- Read tables, schedules or other table-like text.
- Create tables, schedules or other table-like text.
- Enter information on tables, schedules or other table-like text.
- Plot information on graphs (e.g., line, pie, and bar).
- Obtain specific information from graphs or charts.
- Interpret information on graphs or charts.
- Recognize common angles such as 15º, 30º, 45º, and 90º.
- Draw, sketch or form common shapes such as circles, triangles, spheres, rectangles, squares, etc.
- Interpret scale drawings (e.g., blueprints or maps).
- Read assembly drawings (e.g., those found in service and parts manuals).
- Read schematic drawings (e.g., electrical schematics).
- Make sketches.

C. Writing

Writing includes:

- ***text writing and writing in documents such as filling in forms; and***
- ***non-***paper-based writing such as typing on a computer.

The Writing Complexity Rating Scale ranges from Level 1 (least complex) to Level 5 (most complex). The typical writing tasks of Wind Turbine Technicians are at Complexity Level 1 to 3. Their most complex writing tasks are at Complexity Level 3.

Examples

Wind Turbine Technicians:

- write short text entries in logbooks and on work checklists. For example, they record maintenance and repair tasks they have completed and may note their observations and any step-by-step procedures they use to complete their tasks. (1)

- may write e-mail messages to co-workers and supervisors. For example, they may write e-mail messages to other technicians to provide shift-change instructions, updates about repair and maintenance progress and any significant observations they make during visual inspections of wind turbines and equipment. (2)

- may write reports. For example, they may write narrative service reports which document their daily routines including their observations, repair tasks and reasons for repairing and changing components. They may write incident and accident reports which detail events leading up to workplace accidents and document changes to safety procedures to prevent similar incidents. (2)

- may write service protocols and maintenance instructions for unique and unusual faults and breakdowns. For example, they may record the procedures they used for identifying and analyzing unexplained electrical failures and the thought processes they used to diagnose the faults. They carefully record the steps they use to repair the faults for future identification. (3)

Writing Summary

Length	Purpose for Writing						
	To organize/to remember	To keep a record/to document	To inform/to request information	To persuade/to justify a request	To present an analysis or comparison	To present an evaluation or critique	To entertain
Texts requiring less than one paragraph of new text.	✓	✓					
Texts rarely requiring more than one paragraph	✓	✓	✓				
Longer texts	✓	✓	✓		✓		

D. Numeracy Task

Numeracy refers to the use of numbers by workers and their requirement to think in quantitative terms in order to complete tasks. Two aspects of ***Numeracy*** have complexity ratings: *Numerical Calculation;* and, *Numerical Estimation*.

Numerical Calculation is rated within four different application settings as specific knowledge of concepts or procedures are exclusive to each setting:

- ***Money Math*** - financial transactions, such as handling cash, preparing bills or making payments;
- ***Scheduling or Budgeting and Accounting Math*** - managing time and money as resources, planning and monitoring their use, assessing best value, reducing waste;
- ***Measurement and Calculation Math*** - measuring and describing the physical world; and,
- ***Data Analysis Math*** - analysis of numerical data such as extrapolation of information and determination of trends or statistically significant effects.

Numerical Estimation refers to tasks involving any estimation (i.e., an approximation based on judgement) that results in a number.

Numerical Calculation

The Numerical Calculation Rating Scale ranges from Level 1 (least complex) to Level 5 (most complex). The numerical calculation tasks of Wind Turbine Technicians involve:

- Money Math at Complexity Level 2.
- Scheduling or Budgeting and Accounting Math at Complexity Level 2.
- Measurement & Calculation Math at Complexity Levels 1 to 3.
- Data Analysis at Complexity Levels 2 to 3.

Examples

Wind Turbine Technicians:

- may calculate amounts for travel expense reimbursements. They calculate amounts for travel in personal vehicles using per kilometre rates. They may add amounts for per diem allowances and meals. (Money Math) (2)

- may monitor repair and maintenance expenditures against corporate or departmental budgets to identify surpluses and overruns. For example, they may monitor the costs of consumable supplies and fuel associated with travel to turbine sites to ensure these costs are within operating budgets. (Scheduling or Budgeting and Accounting Math) (2)

- may prepare and monitor work schedules. For example, they may create preventative maintenance schedules for wind turbines by assigning technicians' labour hours to maintenance and repair tasks and separating individual tasks into smaller units of work. (Scheduling or Budgeting and Accounting Math) (2)

- measure physical properties using gauges and common measuring tools. For example, they may measure oil pressures and temperatures by reading gauges and measure voltages and currents using voltmeters and multimeters. (Measurement and Calculation Math) (1)

- make calculations using quantitative data. For example, they may calculate generation outputs for various wind turbines in kilowatt hours and wind speeds in kilometres per hour. (Measurement and Calculation math) (2)

- measure precise dimensions and distances between wind turbine parts and systems to ensure safe and ideal operation. For example, they may align turbine gearboxes on exact horizontal axes by measuring distances between reference points. They carefully calculate the amount of material required to raise or lower gearboxes to maintain specified alignments to make sure couplings and associated components do not vibrate and are not stressed to points of failures which may cause shutdowns and worker injuries. (Measurement and Calculation math) (3)

- compare calculations, measurements and data from gauges and instruments to electrical and mechanical specifications. For example, they may calculate turbines' outputs in kilowatt hours and compare their calculations to manufacturers' functional standards. They use comparisons to identify unacceptable operating ranges and to schedule repairs or overhauls. (Data Analysis Math) (2)

- may record quantitative data to analyze turbine efficiencies. For example, they may record turbines' generated megawatts over periods of time and compare these readings to budgeted or scheduled megawatts to determine if turbines are working at maximum capacity and at desired efficiencies. They may record generation data for groups of turbines to compare low-generation turbines to high-generation turbines and analyze why some turbines cannot match efficiencies of others. (Data Analysis Math) (3)

Numerical Estimation

The Numerical Estimation Rating Scale ranges from Level 1 (least complex) to Level 4. The numerical estimation tasks of Wind Turbine Technicians are at Complexity Level 2.

- may estimate daily wind speeds and weather conditions using weather data and their knowledge of local weather patterns. (Numerical Estimation) (2)

- estimate the durations of maintenance and repairs required for common turbine faults. For example, they may estimate how long it will take to identify and troubleshoot faults, shut down turbines, complete repairs and replacements and re-commission wind turbines. They use their experience in related repair tasks to improve the reliability of their estimates. (Numerical Estimation) (2)

Math Skills Summary

a) Mathematical Foundations Used

Number Concepts	
Whole Numbers	Read and write; count; round off; add or subtract; multiply or divide whole numbers. For example, reading and writing inventory quantities; adding parts to inventories.
Integers	Read and write; add or subtract; multiply or divide integers. For example, reading positive and negative values on gauges.
Rational Numbers – Fractions	Read and write; add or subtract fractions; multiply or divide by a fraction; multiply or divide fractions. For example, taking measurements in fractions of inches.
Rational Numbers - Decimals	Read and write; round off; add or subtract decimals; multiply or divide by a decimal; multiply or divide decimals. For example, reading and writing decimals to express pressures in vars.
Rational Numbers - Percent	Read and write percents; calculate the percent one number is of another; calculate a percent of a number. For example, calculating turbine operations and outputs in percents of total capacities.
Equivalent Rational Numbers	Convert between fractions and decimals or percentages. For example, converting measurements in fractions of inches to millimetres expressed in decimals.

Patterns and Relations	
Equations and Formulae	Use formulae by inserting quantities for variables and solving. For example, inserting values into Ohm's law formulas to calculate voltages, currents and resistances.
Use of Rate, Ratio and Proportion	Use a rate showing comparison between two quantities with different units. Use a ratio showing comparison between two quantities with the same units. Use a proportion showing comparison between two ratios or rates in order to solve problems. For example, calculating turbine output in kilowatts per hour; using ratios to describe power, current and voltage gains and losses; expressing RPM versus generator RPM as proportions of 100:1
See Document Use for information on using scale drawings.	

Shape and Spatial Sense	
Measurement Conversions	Perform measurement conversions. For example, converting measurements in inches to millimetres.
Geometry	Use geometry. For example, using geometry to align gearboxes on parallel lines and to recognize guy wire angles.
Trigonometry	Use trigonometry. For example, calculating reactive power in vars.
See Document Use for information on drawing, sketching and forming common forms and figures	

Statistics and Probability	
Summary Calculations	Calculate averages. Calculate rates other than percentages. For example, calculating average turbine outputs over time; calculating rotating rates of turbine blades in RPM.
Statistics and Probabilities	Use descriptive statistics (e.g., collecting, classifying, analyzing and interpreting data). For example, collecting data about turbines' generated megawatts and scheduled or projected megawatts to analyze operating capacities.
See Document Use for information on using tables, schedules or other table-like text.	

b) How Calculations Are Performed

- In their heads
- Using a pen and paper
- Using a calculator
- Using a computer

c) Measurement Instruments Used

- **Time** – For example, using clocks and watches.
- **Distance or dimension** – For example, using measuring tapes and rulers.
- **Temperature** – For example, using digital thermometers.
- **Pressure** – For example, using gauges.
- **Electrical Potential (Volt)** – For example, using voltmeters.
- **Wattage** – For example, using kilowatt meters.
- **Amperage** – For example, using ammeters.
- **Wind speed** – For example, using anemometers.

They use the:

- System International (Metric) measuring system, and
- Imperial measuring system

E. Oral Communication

> ***Oral Communication*** pertains primarily to the use of speech to give and exchange thoughts and information.

The Oral Communication Complexity Rating Scale ranges from Level 1 (least complex) to Level 4 (most complex). The typical oral communication tasks of Wind Turbine Technicians are at Complexity Levels 2 to 3. Their most complex oral communication tasks are at Complexity Level 3.

Examples

Wind Turbine Technicians:

- discuss ongoing work with co-workers. For example, they discuss the progress of repairs and equipment overhauls with other technicians and may ask administrative workers for documentation and customer contacts. (2)

- may provide demonstrations and presentations to public visitors. For example, they may explain turbine operation in general terms to visiting schoolchildren and describe environmental impacts to residents of nearby communities. (2)

- talk to their supervisors and managers about maintenance and repair practices and to provide feedback to their current workloads. They may talk about changes to their shift scheduling and discuss training and skill upgrading opportunities. (2)

- may participate in staff meetings. For example, they may attend weekly meetings to review past and ongoing work and to co-ordinate various job tasks with co-workers, supervisors and managers. (2)

- discuss recurring electrical and mechanical breakdowns and faults with engineers and technical support workers. For example, they may discuss unfamiliar and unusual faults with electrical engineers or contact turbine manufacturers' technical advisors to learn about potential causes of the faults and to obtain identification assistance. (3)

- may discuss turbine operating capacities and frequent turbine repair and maintenance tasks with turbine manufacturers' representatives. For example, they may provide input to common and uncommon faults they have witnessed and identified and offer insights to solutions they have used with positive results. They provide hands-on, anecdotal information and details to manufacturers. (3)

Modes of Communication Used

- **In person** – For example, talking to other technicians during repair and maintenance tasks.
- **Using a telephone** – For example, calling systems operators to co-ordinate scheduled outages for maintenance.
- **Using a two-way radio** – For example, talking to their supervisors from the top of wind turbines to receive instructions or provide status reports.

Environmental Factors Affecting Communication

Wind turbines are often situated in areas of high winds which may affect communication. Wind Turbine Technicians working with partners or in teams must ensure they hear each others' instructions.

Oral Communication Summary

Type	Purposes of Oral Communication (Part 1)					
	To greet	To take messages	To provide/ receive information, explanation, direction	To seek, obtain information	To co-ordinate work with that of others	To reassure, comfort
Interact with co-workers			✓	✓	✓	
Interact with supervisor/ manager			✓	✓	✓	
Interact with peers and colleagues from other organizations			✓	✓		
Interact with customers/clients /public			✓	✓		
Interact with suppliers, servicers			✓	✓		
Participate in group discussion			✓	✓	✓	
Present information to a small group			✓			

Type	Purposes of Oral Communication (Part 2)					
	To discuss (exchange information, opinions)	To persuade	To facilitate, animate	To instruct, instil under-standing, knowledge	To negotiate, resolve conflict	To entertain
Interact with co-workers	✓					
Interact with supervisor/ manager	✓					
Interact with peers and colleagues from other organizations	✓					
Interact with customers/ clients/public	✓			✓		
Interact with suppliers, servicers	✓			✓		
Participate in group discussion	✓					
Present information to a small group	✓			✓		

F. Thinking Skills

Thinking Skills differentiate among five different types of cognitive functions. However, these functions are interconnected and include:

1. ***Problem Solving***
2. ***Decision Making***
3. ***Critical Thinking***
4. ***Job Task Planning and Organizing***
5. ***Significant Use of Memory***
6. ***Finding Information***

1. Problem Solving

Problem solving involves problems that require solutions. For example, a mechanic solves problems, e.g., the car shakes when driven over 80 km./hr., by eliminating probable causes until the correct one is identified and remedied. Most problems concern mechanical challenges, people or situations.

The Problem Solving Complexity Rating Scale ranges from Level 1 (least complex) to Level 4 (most complex). The typical problem solving tasks of Wind Turbine Technicians are at Complexity Levels 2 to 3. Their most complex problem solving tasks are at Complexity Level 3.

Examples

Wind Turbine Technicians:

- may discover that they cannot immediately complete repairs due to equipment breakdowns and lack of required parts. They inform their supervisors about potential delays, inquire about alternate solutions and re-organize their job tasks to accommodate emergencies. (2)

- may experience computer and software malfunctions which prevent them from completing repair and maintenance tasks. They try to identify the sources of the malfunctions and may contact supervisors and managers to investigate if faults are affecting power systems and transmission networks to troubleshoot potential causes. (2)

- may encounter complex electrical and mechanical faults which do not have prescribed troubleshooting and maintenance procedures. They visually inspect turbine areas to look for unusual and remarkable signs of friction, improper installation of turbine components and disconnected cables and wires. They call turbine manufacturers and may ask other technicians for advice to adequately identify and isolate the faults. (3)

2. Decision Making

Decision making refers to making a choice among options.

Decision making occurs during problem solving, but not all decision making is part of problem solving. It is, therefore, presented as a separate thinking skill. For example, buyers for retail outlets regularly make decisions about which suppliers to buy from, i.e., they select from the options for particular types of merchandise. This is not problem solving.

The Decision Making Complexity Rating Scale ranges from Level 1 (least complex) to Level 4 (most complex). The typical decision making tasks of Wind Turbine Technicians, are at Complexity Levels 2 to 3. Their most complex decision making tasks are at Complexity Level 3.

Examples

Wind Turbine Technicians:

- choose when to complete repair and maintenance tasks. For example, they may choose to replace oils inside the turbine housing during inclement weather and complete outdoor visual inspections during pleasant weather. They consider the associated accuracy and safety of completing each task during these weather conditions when making their decisions. (2)

- decide which instruments, devices and tools to use during troubleshooting, maintenance and repair tasks. For example, they may choose measuring and diagnostic devices and tools by checking the locations of the faults and the types of repair tasks they may have to perform. If they choose inappropriate instruments, devices and tools they may not adequately and immediately identify and repair faults and malfunctions. (2)

- choose to repair, restore or replace wind turbine parts and components. They review manufacturers' specifications and consider past maintenance reports, repair logbook entries, work orders and recommendations from their supervisors and managers when making their decisions. Poor decisions may lead to costly turbine breakdowns and unscheduled outages. (3)

3. Critical Thinking

Critical Thinking is the process of evaluating ideas or information, using a rational, logical thought process, and referring to objective criteria, to reach a rational judgement about value, or to identify strengths and weaknesses.

Critical Thinking may be an element in other thinking skills. For example, judgement is sometimes required to evaluate the choices offered during the course of ***Decision Making*** and to evaluate solutions proposed as a result of ***Problem Solving***. In other cases, Critical Thinking is an independent job task.

The Critical Complexity Rating Scale ranges from Level 1 (least complex) to Level 4 (most complex). The typical critical thinking tasks of Wind Turbine Technicians are at Complexity Levels 2 to 3. Their most complex critical thinking tasks are at Complexity Level 3.

Examples

Wind Turbine Technicians:

- evaluate the severity of faults and malfunctions by examining the locations of the problem components, the types of apparent deficiencies and the effects these faults will have on the total performance of turbines. For example, they may evaluate the effects of friction between couplings and moving turbine parts to determine impacts to total turbine efficiency. (2)

- may evaluate the safety of work processes and inherent safety of their workplaces. To assess potential risks, they review previous repair and maintenance work orders and associated reports to see if hazards have been reported. They may verify details of repair and maintenance procedures with safety personnel and supervisors. (2)

- assess the quality of data they obtain through diagnostic tests and measurements. To confirm that data is accurate and sufficient, they may compare diagnostic results to data from previous tests and repairs, read operating manuals and equipment specifications and ask co-workers for their opinions. (3)

- may evaluate the quality and adequacy of repairs they complete. For example, they may evaluate their own repair and maintenance tasks by reviewing step-by-step isolation and repair procedures, examining the results of post-repair and re-commissioning tests and considering the degree to which they followed proper repair and test protocols. (3)

4. Job Task Planning and Organizing

There are two aspects to ***Planning and Organizing: Job Task Planning and Organizing*** and ***Organizational Planning***.

Job Task Planning and Organizing refers to the extent to which the workers plan and organize their own tasks.

Organizational Planning refers to the job incumbent's involvement in the organization's broader planning and organizing tasks (i.e., planning and organizing the work of others, operational planning, strategic planning).

The Job Task Planning and Organizing Rating Scale ranges from Level 1 (least complex) to Level 4 (most complex). Wind Turbine Technicians plan and organize their job tasks at Complexity Level 2.

Own Job Planning and Organizing

Wind Turbine Technicians plan their daily work tasks within scheduled and unscheduled maintenance and repair frameworks. Their work is typically repetitive with some variation due to the range of turbine equipment and system faults they troubleshoot and repair. They are able to prioritize tasks provided by their supervisors and must accommodate emergency work arising from unscheduled outages, major electrical and mechanical faults and electrical storms. (2)

Planning and Organizing for Others

Wind Turbine Technicians generally do not plan and organize the work of others. They may plan job tasks for administrative or junior workers regarding scheduled outages and major equipment overhauls.

5. Significant Use of Memory

Significant Use of Memory includes any significant or unusual use of memory for workers in the occupational group. It does not include normal memory use that is a requirement for every occupation.

Examples

Wind Turbine Technicians:

- remember optimal operating outputs as well as common faults' troubleshooting and repair steps for wind turbines they repair and maintain.
- may remember the various sounds created by friction, malfunctions and faults when diagnosing causes of electrical and mechanical failures.

6. Finding Information

Finding Information involves using any of a variety of sources including text, people, computerized databases or information systems.

Finding Information is highlighted in this section as an essential job skill. However, workers' use of various information sources may be referred to in other sections such as *A. Reading Text, B. Use of Documents, E. Oral Communication* and *H. Computer Use*.

The Finding Information Complexity Rating Scale ranges from Level 1 (least complex) to Level 4 (most complex). Wind Turbine Technicians, tasks that involve finding information are at Complexity Level 2.

Examples

Wind Turbine Technicians:

- find information about anomalous testing data and unusual faults with new wind turbines by contacting manufacturers' troubleshooting and maintenance hotlines. (2)
- find information about generation and transmission networks by searching utilities' web sites and corporate publications. (2)
- may find information on turbines' past maintenance history by referring to logbooks, work orders and other documentation. (2)

G. Working with Others

The Essential Skill of ***Working with Others*** examines the extent to which employees work with others to carry out their tasks. Do they have to work co-operatively with others? Do they have to have the self-discipline to meet work targets while working alone?

The Working with Others Complexity Rating Scale ranges from Level 1 (least complex) to Level 4 (most complex). Wind Turbine Technicians, work with others at Complexity Level 3.

Description

Wind Turbine Technicians work independently to identify, troubleshoot and repair electrical, mechanical and computer-related faults in wind turbines. They co-ordinate their job tasks with electrical generation and transmission teams that include other skilled tradespeople and maintain regular communication with other utility workers such as power systems operators and reliability co-ordinators. (3)

Participation in Supervisory or Leadership Activities

Wind Turbine Technicians:

- participate in formal discussions about work processes or product improvement.
- have opportunities to make suggestions on improving work processes.
- assign routine tasks to other workers.
- identify training that is required by, or would be useful for, other workers.

H. Computer Use

Computer Use indicates the variety and complexity of computer use within the occupational group

The Computer Use Rating Scale ranges from Level 1 (least complex) to Level 5 (most complex). The Computer Use tasks of Wind Turbine Technicians, are at Complexity Levels 2 and 3.

Examples

Wind Turbine Technicians:

- use word processing software. For example, they may use basic formatting functions of word processing software to write letters to utility managers and to write inspection and maintenance reports. (2)
- may use database software. For example, they may use equipment and component databases to identify recurring mechanical faults and refer back to historical maintenance functions when troubleshooting unusual errors. (2)
- may use spreadsheet software. For example, they may use advanced functions of Excel to enter and analyze downloaded fault information. They may create formulas to perform immediate calculations from fault data to determine wind speeds and power outputs during major faults. (3)
- may use communication software. For example, they may send and receive e-mail messages and file attachments to co-ordinate job tasks with co-workers and share information about work processes. (2)
- may use the Internet. For example, they may browse weather web sites to obtain wind speed and direction forecasts and information about potential electrical storms. (2)
- may use other computer and software applications. For example, they use supervisory control and data acquisition (SCADA) systems to monitor, adjust and assess wind turbines' output and generation status. (3)

I. Continuous Learning

Continuous Learning examines the requirement for workers in an occupational group to participate in an ongoing process of acquiring skills and knowledge.

Continuous Learning tests the hypothesis that more and more jobs require continuous upgrading, and that all workers must continue learning in order to keep or to grow with their jobs. If this is true then the following will become Essential Skills:

- knowing how to learn;
- understanding one's own learning style; and
- knowing how to gain access to a variety of materials, resources and learning opportunities.

The Continuous Learning Complexity Rating Scale ranges from Level 1 (least complex) to Level 4 (most complex). Wind Turbine Technicians perform Continuous Learning tasks at Complexity Level 3.

Description

Wind Turbine Technicians are required to keep abreast of developments in their occupation and must learn continuously to maintain and expand their skills. They obtain technical training from wind turbine manufacturers and their employers and may attend seminars, workshops and other training sessions offered by their employers in other areas such as safe turbine climbing, high angle rescue, fall arrest systems training, site evacuation and other health and safety training. They read manufacturers' equipment and component manuals, employers' policy manuals and other materials such as newsletters, reports and articles on electrical utilities' web sites. (3)

How Learning Occurs

- as part of regular work activity.
- from co-workers.
- through training offered in the workplace.
- through reading or other forms of self-study:
  - at work,
  - on worker's own time,
  - using materials available through work,
  - using materials obtained through a professional association or union,
  - using materials obtained on worker's own initiative,
- through off-site training:
  - during working hours at no cost to the worker,
  - partially subsidized.

J. Other Information

Other Information summarizes additional information collected during interviews with job incumbents and focus groups with occupational experts.

In addition to collecting information for this Essential Skills Profile, our interviews with job incumbents also asked about the following topics.

1. Physical Aspects

Wind Turbine Technicians often stand, crouch and climb to inspect, repair and maintain wind turbines located high above the ground. They use multiple limb co-ordination to climb tall ladders safely and position themselves in small workspaces and use hand-eye co-ordination to manipulate diagnostic tools and equipment. They may be required to lift and carry heavy tools and equipment over 25 kilograms while climbing. Wind Turbine Technicians may use their sense of hearing to diagnose mechanical faults with turbine components such as friction between moving parts.

2. Attitudes

Wind Turbine Technicians must be motivated, confident and positive to be successful in their occupation. They must be attentive to detail and diligent in their diagnostic skills and be willing to learn as advances in computer technology may demand sophisticated knowledge and skills.

3. Future Trends Affecting Essential Skills

In the future, Wind Turbine Technicians will require advanced problem solving skills and computer skills to understand automated processes and programs designed to enhance wind turbine efficiency. They must apply advanced problem-solving skills to effectively resolve complex mechanical faults and utilize highly developed computer use skills to competently identify potential computer errors with advancing wind generation technology.

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