Industrial Mechanics (Millwrights)

NOC 7311

Introduction

Construction millwrights and industrial mechanics install, maintain, troubleshoot and repair stationary industrial machinery and mechanical equipment. Construction millwrights are employed by millwrighting contractors. Industrial mechanics are employed in manufacturing plants, utilities and other industrial establishments.

The most important Essential Skills for Industrial Mechanics (Millwrights) are:

- Document Use
- Numeracy
- Critical Thinking

Document Sections

- Reading Text
- Document Use
- Writing
- Numeracy
- Oral Communication
- Thinking Skills
    - Problem Solving
    - Decision Making
    - Critical Thinking
    - Job Task Planning and Organizing
    - Significant Use of Memory
    - Finding Information
- Working with Others
- Computer Use
- Continuous Learning
- Notes

A. Reading Text

Reading Text

Tasks	**Complexity Level**	**Examples**
Typical	1 to 3	Industrial Mechanics (Millwrights) • read handwritten notes from co-workers and text entries on forms. For example, they read short descriptions of work completed and trouble encountered on maintenance forms. They read logbook entries written by machine operators and other industrial mechanics. (1) • read directions on labels for products such as cleaning fluid and glues for details of safe handling, usage and first aid procedures. (2) • may read e-mail from supervisors, co-workers and suppliers. For example, they may read co-workers' responses to questions about ongoing work. They may read details of process designs and project schedules in e-mail messages from supervisors. They may read suppliers' clarifications of machine specifications. (2) • read memos and notices from supervisors, union representatives and co-workers. For example, they may read memos from supervisors about scheduled power shutdowns, proposed meetings and upcoming health and safety workshops. Industrial mechanics working for larger organizations may read notices from head office personnel about new procedures such as ordering emergency repair parts. (2) • read bulletins from regulatory organizations. For example, they may read bulletins from the Technical Safety Standards Association, Transport Canada and federal and provincial environment ministries to learn about changes to standards, regulations and code requirements which affect their work. (3) • read various manuals when operating, troubleshooting and repairing tools and equipment. For example, they may read operating manuals to obtain assembly and operating instructions for pumps, transmissions and other equipment. They may read service manuals to review guidelines for preventive maintenance. They may also read safety manuals to verify the procedures for shutting down power transmission, hydraulic and other systems prior to servicing. (3)
Most Complex	3	

Reading Summary

The symbol √ is explained in the Use of Symbols section.

	Purpose for Reading			
Type of Text	**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

Tasks	**Complexity Level**	**Examples**
Typical	1 to 3	Industrial Mechanics (Millwrights) • observe warning signs. For example, they scan phrases and icons on caution and warning signs to identify hazards in work areas. (1) • scan labels for data. For example, they may scan icons on fire extinguisher labels to identify the appropriate types for different classes of fires. They may examine labels on parts and equipment to locate part, model and serial numbers, manufacturers' names and service dates. They may also scan 'red tags' indicating a need for repairs, on pumps and compressors to locate details of malfunctions. (2) • locate data in lists, tables and schedules. For example, construction millwrights may scan lists to identify tools and parts needed to assemble machinery. Maintenance mechanics may read equipment maintenance schedules to locate types and dates of repairs and to review maintenance performed. (2) , (daily) • may interpret graphs. For example, maintenance mechanics may interpret line graphs of volume outputs when monitoring the functioning of equipment such as pumps and compressors. Industrial mechanics may interpret line graphs of voltage supply on multimeters at varying machine operating speeds. (2) • complete forms. For example, they may complete purchase orders and stock removal forms for parts and supplies. They may complete periodic maintenance forms, logbooks and work orders. They may check off items and enter details of work completed, test results, parts replaced and equipment status. They may have to combine data from several sources to complete such forms. (3) , (daily) • locate data on forms. For example, millwrights and industrial mechanics scan Material Safety Data Sheets to locate information about the compositions, handling hazards and first aid, storage and disposal procedures of materials such as oils and solvents for lubricating and cleaning parts. They review contracts and work orders to identify job requirements. They may search different sections of the forms to locate tool and material specifications, target completion dates, work schedules and late penalties. (3)
Most Complex	3	

		• interpret schematic drawings. For example, they may review schematic drawings of mechanical, structural, pneumatic and hydraulic systems to understand their operation and identify malfunctions. (3) • retrieve data from scale drawings. For example, they may scan technical drawings to identify the locations of machinery to be installed and serviced. They may also take measurements from scale drawings to check that new machinery can be set up in the available space. They study assembly drawings of equipment such as pulley systems to identify the locations, orientations and sizes of bearings, bushings, belts and chains. (3)

Examples

- create lists, tables and schedules. For example, construction millwrights may create lists of tools and supplies needed for machinery installations. Industrial mechanics may create tables to enter servicing data for new equipment.
- make sketches to illustrate dimensions, placements and orientations of parts in repairs and improvements. For example, an industrial mechanic may sketch a modified motor mount showing the placement of the nuts and bolts.
- may create technical drawings. For example, a millwright may create plan, elevation and sectional drawings to describe machinery modifications.

Document Use Summary

- Read signs, labels or lists.
- Complete forms by marking check boxes, recording numerical information or entering words, phrases, sentences or text of a paragraph or more. The list of specific tasks varies depending on what was reported.
- Read completed forms containing check boxes, numerical entries, phrases, addresses, sentences or text of a paragraph or more. The list of specific tasks varies depending on what was reported.
- Read tables, schedules or other table-like text (e.g., read work shift schedules).
- Create tables, schedules or other table-like text.
- Enter information on tables, schedules or other table-like text.
- Obtain specific information from graphs or charts.
- Interpret information on graphs or charts.
- Recognize common angles such as 15, 30, 45 and 90 degrees.
- Draw, sketch or form common shapes such as circles, triangles, spheres, rectangles, squares, etc.
- Interpret scale drawings (e.g. blueprints or maps).
- Take measurements from scale drawings.
- Draw to scale.
- Read assembly drawings (e.g. those found in service and parts manuals).
- Create assembly drawings.
- Read schematic drawings (e.g. electrical schematics).
- Create schematic drawings.
- Make sketches.
- Obtain information from sketches, pictures or icons (e.g., computer toolbars).

C. Writing

Writing

Tasks	Complexity Level	Examples
Typical	1	Industrial Mechanics (Millwrights) • write brief text entries in entry forms and logbooks. They make observations of equipment performance and write reminders about tasks which need to be carried out in logbooks. They describe malfunctions, challenges encountered and work completed in work orders and maintenance sheets. (1) , (daily) • may write e-mail to supervisors, co-workers and suppliers. For example, they may write e-mail to co-workers to ask and answer questions about ongoing work. They may also write e-mail messages to suppliers to discuss equipment specifications. (2) • may write incident reports in forms. They describe the malfunctions, breakdowns and accidents which occurred and the repairs performed. They identify possible causes and effects. They write precisely and accurately as the information may be used during investigations and legal actions. (3) • may write maintenance and repair procedures. For example, a stationary equipment mechanic writes repair and servicing procedures for a mine hoisting system so that the mine's owners can plan maintenance tasks and equipment use. (3)
Most Complex	2 to 3	

Writing Summary

The symbol √ is explained in the Use of Symbols section.

	Purpose for Writing						
Length	**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**
Text requiring less than one paragraph of new text	√	√	√				
Text rarely requiring more than one paragraph	√	√	√				
Longer text		√	√				

D. Numeracy

The symbol √ is explained in the Use of Symbols section.

Numeracy

Tasks	Complexity Level	Examples
√ Money Math √ Scheduling, Budgeting & Accounting Math √ Measurement and Calculation Math √ Data Analysis Math √ Numerical Estimation	2 2 1 to 4 1 to 3 1 to 2	Industrial Mechanics (Millwrights) • calculate expense claims for tools and supplies they purchase and for travel to remote worksites, workshops and courses. They calculate charges for using personal vehicles by multiplying distances travelled by per kilometre rates. They add amounts for meals, hotel rooms, supplies and other applicable expenses. (Money Math), (2) • may schedule tasks for construction, repair and maintenance projects. For example, construction mechanics may draw up timelines and schedule activities for equipment installation projects. They adjust project schedules to accommodate disruptions at work sites and delays in deliveries of equipment and completion of subcontractors' work. Industrial mechanics create schedules for the maintenance of equipment in manufacturing plants. (Scheduling, Budgeting & Accounting Math), (2) • measure various physical properties using common measuring tools such as rulers, tapes, thermometers and scales. For example, they measure the width of plates and the length of pipes using measuring tapes when replacing parts on machinery. (Measurement and Calculation Math), (1) , (daily) • calculate distances, totals, maximums and minimums and quantities required. For example, they calculate the maximum end play allowed in a bearing by adding a tolerance to a specified distance. They calculate finished dimensions for parts that have to be powder coated. They also calculate where to drill two equidistant holes in a bracket. (Measurement and Calculation Math), (2) , (daily) • use specialized measuring tools such as vernier callipers, micrometers, angle finders, feeler gauges and dial indicators. For example, they use feeler gauges to measure clearances between volutes and impellers on pumps. They measure the wear on housings with micrometers and the outside diameters of hoisting cables to thousandths of an inch using vernier callipers. A construction mechanic measures the speed of rollers using a strobe when fabricating new fittings for a printing press. (Measurement and Calculation Math), (3)

		• adjust and align machinery and equipment according to specifications. For example, they align drive shafts, belts and chains in conveyor systems using levelling tools, shims and spacers. A stationary equipment mechanic resets the drum shell assembly on a production hoist after a major overhaul using geometry to find centres and align parts. (Measurement and Calculation Math), (3) • calculate loads, capacities and dimensions for mechanical components and systems. For example, an industrial mechanic may calculate the size and number of steel plates needed to support the added load capacity of two motors. A construction mechanic may calculate the specifications of a concrete platform for a two thousand pound diesel engine. A stationary equipment mechanic may calculate the height and diameter of a cylindrical storage tank with a capacity of nine hundred litres of water. (Measurement and Calculation Math), (4) • compare measurements such as width, height, temperature, pressure and rotations per minute on a variety of parts and equipment to specifications to check if they are within acceptable ranges. (Data Analysis Math), (1) , (daily) • may collect and analyse data on equipment operation such as temperature, speed and pressure to identify rates and trends. For example, they may monitor the pressures on intake and outtake pipes and liquid flow rates in relation to operating specifications to determine if there are blockages in the pipes, potential leaks in pump seals or wear on impellers. They may analyze the average pressure levels of compressors over twenty-four hours to determine whether they are operating correctly. (Data Analysis Math), (3) • estimate weights and distances. For example, they may estimate the weight of gearboxes and motors to select appropriate lifting devices and procedures to move them. (Numerical Estimation), (1) • estimate time required to complete installation and repair tasks. They consider the types of operations, the complexity of the equipment involved and past experiences with similar tasks. (Numerical Estimation), (2) , (daily)

Math Skills Summary

a. Mathematical Foundations Used

The symbol √ is explained in the Use of Symbols section.

Mathematical Foundations Used

Code	Tasks	Examples
		Number Concepts
√	Whole Numbers	Read and write, count, round off, add or subtract, multiply or divide whole numbers. For example, reading and writing part numbers, model numbers and quantities of parts; counting parts such as bearings and components such as sprockets; rounding off distances to clients' locations; adding numbers of tests conducted; multiplying numbers of parts by numbers of jobs.
√	Integers	Read and write, add or subtract, multiply or divide integers. For example, reading grades on lasers as above or below grade; calculating the slopes of ramps and conveyors.
√	Rational Numbers - Fractions	Read and write, add or subtract fractions, multiply or divide by a fraction, multiply or divide fractions. For example, reading and writing measurements of parts in fractions of an inch; subtracting tolerances from machine specifications in fractions of an inch; adding and multiplying dimensions of parts and components to fabricate in fractions of an inch.
√	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 flow rates and liquid outputs of volume capacities as decimal amounts; adding dollars and cents on expense claims.
√	Rational Numbers - Percent	Read and write percents, calculate the percent one number is of another, calculate a percent of a number. For example, reading and writing tolerances expressed as percentages; calculating the measured wear on parts as a percentage of total allowable wear.
√	Equivalent Rational Numbers	Convert between fractions and decimals or percentages. Convert between decimals and percentages. For example, converting the wear level of gas compressor veins from fractions of an inch to percentage of wear; converting decimal readings on gauges to percentages of output.
√	Other Real Numbers	Use powers and roots, scientific notation, significant digits. For example, using powers in geometric formulae; measuring dimensions to the third and fourth significant digits.

Code	Tasks	Examples
		Patterns and Relations
√	Equations and Formulae	Solve problems by constructing and solving equations with one unknown. Use formulae by inserting quantities for variables and solving. For example, solving for belt travel per minute for given rates of drive shaft rotation; using geometric formulae to calculate the dimensions of cylinders for given volumes; using equations to calculate speed and power relationships for pulleys, gears and sprockets.
√	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, using rate specifications such as pounds per square inch; using ratios to find the rate of belt travel per minute; using proportional calculations to take measurements from scale drawings. Using scale drawings.
		Shape and Spatial Sense
√	Measurement Conversions	Perform measurement conversions. For example, converting scale drawing measurements from inches and feet to millimetres, centimetres and metres; converting gallons of water into cubic feet and gallons per minute to litres per second; converting Newton metres to foot pounds of torque.
√	Areas, Perimeters, Volumes	Calculate areas. Calculate perimeters. Calculate volumes. For example, calculating areas of rectangular, circular, square and triangular fabrications; calculating perimeters to construct railings; calculating volumes of tanks.
√	Geometry	Use geometry. For example, calculating the slopes, sides and bases of triangles to fabricate ramps and supports; confirming that parts and components are square, concentric and perpendicular; analyzing shapes into constituent geometric shapes to plan fabrication steps.
√	Trigonometry	Use trigonometry. For example, using right angle trigonometry when creating bolt patterns for drilling or machine installation. Recognizing common angles. Drawing, sketching and forming common forms and figures.

Code	Tasks	Examples
Statistics and Probability		
√	Summary Calculations	Calculate averages. Calculate rates other than percentages. Calculate proportions or ratios. For example, calculating average rates of material production, average flow rates, average pressure and temperature readings; calculating rates of travel in metres per second when setting machine speed; calculating gear and pulley ratios to adjust conveyors.
√	Statistics and Probability	Use descriptive statistics (e.g. collecting, classifying, analyzing and interpreting data). Use inferential statistics (e.g. using mathematical theories of probability, making conclusions about a population or about how likely it is that some event will happen). For example, collecting and analyzing equipment readings, measurements and other data; using probability to determine the likelihood of equipment and parts failures. Using tables, schedules or other table-like text. Using graphical presentations.

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 watches, clocks and timers.
- Weight or mass. For example, using scales and weightometers.
- Distance or dimension. For example, using digital and standard tape measures, rulers, telescopic depth gauges, squares, feeler gauges, vernier callipers and micrometers.
- Liquid volume. For example, using measuring cups.
- Temperature. For example, using thermometers, temperature gauges and heat guns.
- Pressure. For example, using compression testers and pressure gauges.
- Wattage. For example, using wattmeters.
- Angles. For example, using protractors, angle finders, plumb bobs and laser levels.
- Rotations per minute. For example, using tachometers.
- Force. For example, using torque wrenches.
- Flow. For example, using flow meters.
- Use the SI (metric) measurement system.
- Using the imperial measurement system.

E. Oral Communication

Oral Communication

Tasks	**Complexity Level**	**Examples**
Typical Most Complex	1 to 2 3	Industrial Mechanics (Millwrights) • talk to suppliers and contractors about equipment specifications and access, orders, delivery and service times and price quotes. For example, a maintenance mechanic may ask an electrical contractor about the cost and time needed to disconnect and reconnect machinery. (1) • discuss work orders, equipment malfunctions and job task coordination with co-workers. For example, industrial mechanics may discuss job task coordination and shared equipment with other mechanics during repairs. Stationary equipment mechanics may question plant operators about the behaviour of equipment before and during malfunctions. Maintenance mechanics may discuss different options for mounting motors on conveyor systems. They share their expertise and creativity to identify the best methods. (2) , (daily) • inform supervisors about work progress and seek guidance and approvals from them. They discuss problems and solutions with supervisors and make recommendations. For example, industrial mechanics may recommend performing maintenance on specific machines during scheduled downtime. Maintenance mechanics may recommend improvements such as changing the maintenance schedules for ventilation systems to increase their longevity. (2) • may discuss ongoing work with clients, advise them about maintenance and propose equipment modifications. For example, a millwright repairing a printing press may suggest the redesign of a paper feeder system to the clients' plant manager. (2)

		• discuss safety, productivity, major repairs and procedural and policy changes at meetings with co-workers, supervisors, engineers and clients. For example, an industrial mechanic may participate in pre-overhaul meetings for complex repairs to hoists and conveyor systems. The mechanic may contribute suggestions such as proposing efficient lifting procedures to move very heavy machinery. A stationary equipment mechanic may meet with supervisors and engineers to discuss equipment upgrades and advise them about movement and vibration in a large conveyor system. (2) • may teach practices and procedures to co-workers, apprentices and clients. For example millwrights may teach preventive maintenance practices for newly-installed equipment to clients. Industrial mechanics may demonstrate the operation of new plasma cutting tools to co-workers and explain proper set-up procedures, safety precautions and the range of uses. (3)

Modes of Communication Used

- In person. For example, consulting plant operators for details about machinery performance.
- Using a telephone. For example, calling suppliers to discuss machine specifications.
- Using a two-way radio or other such means. For example, speaking with stationary engineers to check operating levels in large systems during emergency repair calls.
- Using specialized communications signals. For example, using standard hand and arm signals to direct crane operators delivering large machinery to work sites.

Environmental Factors Affecting Communication

Plant equipment, shop tools and large trucks at job sites create levels of noise which impede and sometimes prohibit oral communication.

Oral Communication Summary

The symbol √ is explained in the Use of Symbols section.

	Purpose for Oral Communication (Part I)					
Type	**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**
Listening (little or no interaction)						
Speaking (little or no interaction)						
Interact with co-workers			√	√	√	
Interact with those you supervise or direct			√	√	√	
Interact with supervisor/ manager			√	√		
Interact with peers and colleagues from other organization			√	√		
Interact with customers/ clients/ public			√	√		
Interact with suppliers, servicers			√	√	√	
Participate in group discussion			√	√	√	
Present information to a small group						
Present information to a large group						

The symbol √ is explained in the Use of Symbols section.

	Purpose for Oral Communication (Part II)					
Type	**To discuss (exchange information, opinions)**	**To persuade**	**To facilitate, animate**	**To instruct, instill understanding, knowledge**	**To negotiate, resolve conflict**	**To entertain**
Listening (little or no interaction)						
Speaking (little or no interaction)						
Interact with co-workers	√	√		√		
Interact with those you supervise or direct	√			√		
Interact with supervisor/ manager	√	√		√		
Interact with peers and colleagues from other organization						
Interact with customers/ clients/ public	√			√		
Interact with suppliers, servicers	√			√		
Participate in group discussion	√			√		
Present information to a small group						
Present information to a large group						

F. Thinking Skills

1. Problem Solving

Problem Solving

Tasks	Complexity Level	Examples
Typical Most Complex	2 3	Industrial Mechanics (Millwrights) • encounter supervisors and managers who reject suggestions for improvements to systems such as backup equipment. Industrial mechanics conduct research and write memos in which they discuss present deficiencies and outline the consequences of not carrying out repairs and upgrades. (2) • find that parts needed for maintenance and repairs are unavailable. They fabricate replacement parts and adapt parts from other machines. They may work with engineers, co-workers and subcontractors to fabricate replacement parts. They may need to obtain approvals from supervisors, clients and manufacturing representatives for non-standard parts. (3)

2. Decision Making

Decision Making

Tasks	Complexity Level	Examples
Typical Most Complex	2 3	Industrial Mechanics (Millwrights) • choose among refurbish, repair and replacement options for worn and defective parts such as hoses, motors, valves, belts, pins, bolts, and bushings. They take into consideration maintenance guidelines, performance and test results, age and appearance of parts, as well as availability, cost and ease of replacement. (2) , (daily) • select materials and methods to maintain, repair and improve industrial equipment and systems. When choosing repair and maintenance methods, they consider factors such as the durability, cost, ease of access, safety and efficiency. For example, a millwright decides to improve the protective housing for a moving belt after noticing gaps that may allow the belt to catch clothing. If the millwright chooses inappropriate materials and methods, other workers may be injured. (3) , (daily)

3. Critical Thinking

Critical Thinking

Tasks	**Complexity Level**	**Examples**
Typical Most Complex	2 to 3 3	Industrial Mechanics (Millwrights) • evaluate the condition of parts and equipment. They visually inspect parts for signs of wear and damage. They compare test results and measurements to specifications. They verify measurements and gauge readings for operating parameters such as motor speeds, flow rates and temperatures to ensure the equipment is operating correctly. (2) • assess feasibility of designs for small modifications to equipment and machinery, sometimes in collaboration with co-workers and supervisors. They ensure designs meet technical specifications, performance requirements and regulations. (2) • evaluate the safety of their work environments. They consider criteria such as the availability of proper equipment and tools, potential hazards and safety codes. For example, they may evaluate their personal safety before attempting to repair gas leaks in confined and unventilated spaces. (3) • may evaluate the performance of major industrial systems and plant equipment. For example, maintenance mechanics may evaluate the performance of hoists, conveyors, pumps, ventilators and hydraulic systems. They take into consideration operators' observations, system specifications and test results. They also refer to safety and environmental regulations. (3)

4. Job Task Planning and Organizing

Job Task Planning and Organizing

Complexity Level	Description
2	Own job planning and organizing • Construction millwrights and industrial mechanics receive their work assignments from their supervisors and plan their own job tasks within that framework. On longer assignments, they follow planned work schedules to coordinate their tasks with co-workers and contractors. When emergencies require them to interrupt scheduled work, they keep their supervisors informed of their progress to enable effective rescheduling. Planning and organizing for others • Construction millwrights and industrial mechanics may delegate tasks to apprentices and junior mechanics on larger repair jobs.

5. Significant Use of Memory

Examples

- remember the order and orientation of parts and components during disassembly and reassembly of machinery. They also remember steps in disassembly and assembly sequences.

6. Finding Information

Finding Information

Tasks	Complexity Level	Examples
Typical More Complex	3 to 4 4	Industrial Mechanics (Millwrights) • find technical information needed to troubleshoot faults with machinery and systems by drawing from a number of sources. They run tests and check data on checklists, forms, tables and graphs. They study diagnostic flowcharts and schematic drawings in operating and maintenance manuals. They locate procedures in service bulletins and seek advice from co-workers and suppliers. (3)

G. Working with Others

Working with Others

Complexity Level	Description
2	Construction millwrights and industrial mechanics perform many of their tasks independently. They also form teams with co-workers, clients and contractors when necessary to install and overhaul larger pieces of equipment and complete industrial systems. They may supervise and train apprentices and junior mechanics.

Participation in Supervisory or Leadership Activities

- Participate in formal discussions about work processes or product improvement.
- Have opportunities to make suggestions on improving work processes.
- Monitor the work performance of others.
- Inform other workers or demonstrate to them how tasks are performed.
- Assign routine tasks to other workers.

H. Computer Use

Computer Use

Tasks	Complexity Level	Examples
Typical	2	Industrial Mechanics (Millwrights) • may use word processing. For example, they may write, edit and format text for project proposals, incident reports and maintenance procedures using word processing programs such as Word. They may also insert tables and drawings into documents. (2) • may use databases. Industrial mechanics in larger plants and facilities may perform queries on maintenance and financial systems databases. They may also enter data from completed work orders into their organizations' databases. (2)
Most Complex	2	• may use computer-assisted design, manufacturing and machining. For example, construction millwrights may use programs such as AutoCAD to make small adjustments to scale drawings to reflect modifications to tools and equipment components. Maintenance mechanics in large facilities may use distributed control systems interfaced with programmable logic controllers to monitor operating levels such as temperatures, pressures, flow rates and volumes in machinery and systems. (2) • may use communication software. They may exchange e-mail with supervisors, clients and suppliers. They may also send and receive attachments such as machine specifications and use address books. (2) • may use hand-held devices such as vibration data collector and analyzers to report on machinery conditions such as displacement, acceleration and velocity. (2)

Computer Use Summary

- Use word processing.
- Use a database.
- Use computer-assisted design, manufacture or machining.
- Use communications software.
- Other

I. Continuous Learning

Continuous Learning

Complexity Level	Description
2	As new equipment and tools and changing regulations are a regular feature of their work environments, construction millwrights and industrial mechanics must learn continuously. They read manuals and bulletins to stay abreast of developments in their field. They also learn informally by exchanging information with co-workers and suppliers. They attend training workshops on new equipment and safety procedures as required by their employers. They may also take courses on their own initiative to learn and improve related technical skills such as welding and pump repair.

How Learning Occurs

Learning may be acquired:

- 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.
    - with costs paid by the worker.

J. Other Information

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

Physical Aspects
Construction millwrights and industrial mechanics adopt a wide range of positions at work. They sit to read work orders, memos and bulletins, use computer programs and participate in meetings. They walk around plants and installations, sometimes on rough terrain, to access equipment and machines for maintenance and repairs. They stand, bend, crouch and stretch in awkward and sometimes cramped positions to remove and install parts and undertake repairs. They stand to operate shop equipment such as drills and lathes to fabricate new structures and assemblies. Construction millwrights and industrial mechanics use upper limb coordination, hand-eye coordination and fine motor skills to take measurements, service machines, calibrate equipment and operate tools and computers. They need multiple limb coordination to remove parts, assemble machines and climb ladders. Construction millwrights and industrial mechanics frequently lift heavy parts and equipment such as gears, bearings, motors and tanks during assembly and repairs. Construction millwrights and industrial mechanics need good hearing and the ability to smell to detect important clues about machinery performance and likely sources of problems.

Attitudes
To be successful, millwrights and industrial mechanics must be mechanically inclined, methodical, patient, self-disciplined and calm under pressure.

Future Trends Affecting Essential Skills
A continuing trend toward greater use of information technology in manufacturing will place increasing demands on construction millwrights and industrial mechanics to improve their computer use skills. For example, they may need to learn to troubleshoot alarms and obtain data such as temperatures, pressures and flow rates from automated control systems. They may also need to make effective use of records management databases, communication software and the Internet.

K. Notes

This profile is based on interviews with job incumbents across Canada and validated through consultation with industry experts across the country.
For information on research, definitions, and scaling processes of Essential Skills Profiles, please consult the Readers' Guide to Essential Skills Profiles (http://www.hrsdc.gc.ca/eng/jobs/les/profiles/readersguide.shtml).