



Industrial Mechanic/Millwright

10/20/30

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Introduction

This curriculum was developed in response to a community need identified by the Churchbridge Public School-Community Council. The group believed that an Industrial Arts program geared towards the industrial trades would benefit students and employers.

This program could provide the students with the essential work experience, life skills and academic development in full and part-time trades which promote life-long learning opportunities which respond to the needs of the adult population, communities, organizations and employers in the ever changing environment of our region. The Saskatchewan Youth Apprenticeship program would be implemented and would ready students for the Apprenticeship programs offered at Parkland College in Esterhazy and the SIAST Industrial Mechanic Apprenticeship Program in Saskatoon where this would count towards hours logged in the apprenticeship program and bring the students closer to receiving their Journeyman status.

Major stakeholders in the program would be the Ministry of Education, GSSD, SIAST, Saskatchewan Apprenticeship and Trade Certification Commission, local employers such as: Mosaic Potash, Potash Corp of Saskatchewan, Louis Dreyfus, EMW Industrial, plus many local mechanical contractors.

The Industrial Mechanic/ Millwright 10 curriculum is designed with modules to complete one, 100 hour pure course. It is our intent to further develop 20 and 30 level courses.

Industrial Mechanic / Millwright

Industrial Mechanics/Millwrights install, repair and maintain machinery that is used in factories, mines and production facilities.

What do Industrial Mechanics (Millwrights) do?

- Read blueprints, diagrams and schematic drawings to determine work procedures.
- Install, align, dismantle and move stationary industrial machinery and mechanical equipment according to layout plans using hand and power tools.
- Operate hoisting and lifting devices during installation, set-up and repair of machinery.
- Adjust machinery and repair or replace defective parts.

Essential skills for success as an Industrial Mechanic/Millwright

Reading

- Read notes from co-workers, such as descriptions of work completed.
- Read directions on product labels for safe handling, usage and first aid procedures.
- Read memos and notices from supervisors, co-workers and suppliers, such as notices about scheduled power shutdowns.
- Read bulletins from regulatory organizations about changes to standards, regulations and code requirements.
- Read manuals for operating, troubleshooting and repairing tools and equipment

Document Use

- Look for caution and warning signs to identify hazards in work areas.
- Scan labels for information, such as part, model and serial numbers.
- Locate data in lists, tables and schedules, such as to find out what tools and parts are needed to assemble machinery.
- Fill in forms, such as purchase orders.
- Interpret schematic drawings.
- Retrieve data from scale drawings, such as to identify the locations of machinery to be installed and serviced.

Numeracy

- Measure using rulers, tapes, thermometers and scales.
- Compare measurements such as width, height, temperature, pressure and rotations per minute on a variety of parts and specifications to make sure they are within an acceptable range.
- Estimate time required to complete installation and repair tasks.
- Adjust and align machinery and equipment according to specifications.
- Use specialized measuring tools such as vernier callipers, micrometers, angle finders, feeler gauges and dial indicators.
- Calculate loads, capacities and dimensions for mechanical components and systems.

Writing

- Write brief text entries in forms and logbooks, such as observations of equipment performance.
- Write incident reports in forms that describe malfunctions, breakdowns and accidents that identify potential causes and effects.
- Write maintenance and repair procedures.

Oral communication

- Talk to suppliers and contractors about equipment specifications, deliveries, service times and price quotes.
- Discuss work orders, equipment malfunctions and job task coordination with co-workers.
- Communicate with supervisors about work progress and seek their guidance and approvals.
- Discuss issues such as safety, productivity, major repairs and policy changes at meetings with co-workers, supervisors, engineers and clients.
- Teach practices and procedures to co-workers, apprentices and clients.

Working with others

- Work independently.
- Form teams with co-workers, clients and contractors when installing and overhauling large pieces of equipment or completing industrial systems.
- Participate in discussions about work processes or product improvement.
- Demonstrate how to perform tasks to other workers.
- Orient or train new employees.
- Monitor the work performance of others.

Thinking

- Determine whether to refurbish, repair or replace worn and defective parts.
- Assess whether designs meet technical specifications, performance requirements and regulations.
- Plan job tasks based on work assignments and follow planned work schedules to coordinate work with co-workers and contractors.
- Take necessary steps when parts needed for maintenance and repairs are unavailable, such as fabricating replacement parts or obtaining approvals to use non-standard parts.
- Select materials and methods to maintain, repair and improve industrial equipment and systems.
- Evaluate the safety of work environments.
- Use a number of sources to find technical information needed to troubleshoot faults with machinery and systems

Computer use

- Use databases, such as maintenance and financial systems databases.
- Use computer-assisted design, manufacturing and machining programs.
- Use email to communicate with supervisors, clients and suppliers.
- Use handheld devices such as vibration data collectors and analyzers

Continuous learning

- Read manuals and bulletins to stay aware of new developments in the industry.
- Learn informally by exchanging information with co-workers and suppliers.
- Attend training workshops on new equipment and safety procedures.
- Take courses to learn and improve technical skills.

References:

Human Resources and Skills Development Canada/Essential skills

Saskatchewan Apprenticeship and Trade Certification Commission

Purpose and Areas of Focus Level 10

Modules	Name	Suggested hours	Shop hours	Page
Module 001A	Safety 10	5		4
Module 002A	Electrical 10	2-3		5
Module 003A	Measurement & Layout 10	5	5	6
Module 004A	Hand & Power tools 10	10	5	7
Module 005A	Rigging 10	5-10	5	8
Module 006A	Fasteners 10	5	5	9
Module 007A	Metallurgy 10	5	5	10
Module 008A	Bearings & Seals 10	5	5	11
Module 010A	Oxy-Acetylene welding 10	10	10	12
Module 015A	Trade Math 10	5-10		13
Module 017A	Blueprint Reading 10	5-10		14
Module 018	Saskatchewan Youth Apprenticeship	Student's time		15
	Total hours	62-78	40	
		Min 100 theory and shop time		

Purpose and Areas of Focus Level 20

Modules	Name	Suggested hours	Shop hours	Page
Module 001B	Safety 20	5		16
Module 002B	Electrical 20	2-3		17
Module 003B	Measurement & Layout 20	5	5	18
Module 004B	Abrasives & Grinders 20	5	5	19
Module 005B	Rigging 20	5-10	5	20
Module 007B	Metallurgy 20	5	5	21
Module 008B	Bearings & Seals 20	5	5	22
Module 009B	Belt & Chain Drive 20	5	5	23
Module 010B	Electric arc welding 20	10	10	24
Module 012B	Metal Lathe	5	5	25
Module 015B	Trade Math 20	5-10		26
Module 016B	Workplace Communication 20	5-10		27
Module 017B	Blueprint Reading 20	5-10		28
Module 018	Saskatchewan Youth Apprenticeship	Student's time		29
	Total hours	67-88	45	
		Min 100 theory and shop time		

Purpose and Areas of Focus Level 30

Modules	Name	Suggested hours	Shop hours	Page
Module 001C	Safety 30	15		30
Module 002C	Electrical 30	2-5		31
Module 003C	Measurement & Layout 30	5	5	32
Module 004C	Drills & Drilling 30	5	5	33
Module 005C	Rigging 30	5-10	5	34
Module 008C	Bearings, Seals & Lubrication 30	5	5	35
Module 009C	Gear Drives & Couplings 30	5-10	5	36
Module 013C	Milling Machine	5-10	5	37
Module 014C	Machinery Installation 30	5	5	38
Module 015C	Trade Math 30	5-10		39
Module 017C	Blueprint Reading 30	5-10		40
Module 018	Saskatchewan Youth Apprenticeship	Student's time		41
	Total hours	62-90	35	
		Min 100 theory and shop time		

Outcomes:	Indicators:	Prerequisite:
<p>Apply principles and techniques for unintentional injury prevention to ensure safe work performance in all work areas.</p> <p>Work safely with properly maintained safety equipment in an organized environment.</p>	<p>a. Identify the purpose and demonstrate the proper use and fit of personal protective equipment (PPE) including eye protection (lens shades), clothing, hearing protection, and footwear while identifying the hazards from which they protect individuals.</p> <p>b. Analyze potential risk situations and solutions that apply specifically to slips, trips and falls, as well as lifting heavy material, and identify safe solutions. Proper housekeeping and correct lifting procedures.</p> <p>c. Recognize hazards associated with the Industrial Mechanic trade (hand tools, power tools, equipment and electricity) and take the necessary measures to avoid unintentional injuries.</p> <p>d. Demonstrate the proper procedures to follow when reporting an unintentional injury.</p> <p>a. Express knowledge of safe handling of materials according to WHMIS, using materials safety data sheets (MSDS).</p> <p>b. Research and discuss Occupational Health and Safety regulations which apply to the Industrial Mechanical trade.</p> <p>c. Recognize and apply safe and fair work practices including freedom from violence and harassment.</p> <p>d. Complete an assessment of all tools and welding equipment.</p>	<p>None</p>

Module: 002 A

Electricity

Suggested time: 2-3

Level: 10

Outcomes:	Indicators:	Prerequisite:
Provide the Industrial Mechanic with enough electrical knowledge so that safe decisions may be made when working on or around electrical equipment.	a. Describe the basic principles of electricity b. Identify potential electrical equipment hazards c. Identify safety problems and discuss with Instructor, Teacher ways of correcting safety hazards.	None

Outcomes:	Indicators:	Prerequisite:
Describe the use of measuring tools for the millwright trade	a. Identify basic measuring tools used in the millwright trade b. Describe metric and imperial comparison and conversion measurements.	None
Describe & demonstrate layout procedures, understand the purpose and safe handling of each layout tool.	a. Identify the tools used for layout procedures. b. Explain layout purpose and procedures. c. Demonstrate uses of layout tools in shop projects. d. Prepare metal for layout with layout dye. d. The student will be able to accurately layout and safely handle layout tools.	
Describe & demonstrate uses of non-cutting hand tools.	a. Identify & name common tools used for performing non-cutting bench-work procedures. b. Describe & demonstrate methods used in the workshop for cleaning Handtools. (non-cutting).	
Describe & demonstrate the correct use and maintenance of cutting type hand tools.	a. Describe the use and maintenance of common hand-held cutting tools used in bench work, hacksaws, cold chisels. b. Describe the care and use of taps and dies	

Outcomes:	Indicators:	Prerequisite:
Develop safety practices in the use and care of hand tools.	a. Describe and identify non-cutting hand tools b. Describe and identify cutting hand tools c. Explain two uses of arbour presses. d. The student will be able to demonstrate the proper selection and safe use of types of hand tools	None
Develop safe practices in the use and care of pneumatic and electric portable power tools.	a. Describe proper tool selection based on job requirements b. Describe safe procedures used to operate portable power tools. Use of proper PPE. c. Describe & demonstrate correct procedures used to inspect and maintain portable pneumatic & electric power tools.	
Describe the procedures used to inspect and maintain portable power tools.	a. The student will be able to describe operating principles of various electrical and pneumatic tools b. Describe & demonstrate the procedures used to cut metal with a band saw. Feed & speed and lubrication if required. c. Describe the procedures used to select the proper band saw blade for a specific task. d. Describe & demonstrate precautions & procedures used to cut metal with an abrasive wheel cut off saw, wheel selection and safety hazards. Use checklist to record student's attendance for teacher demonstration before student does demonstration for teacher to ensure student has the required knowledge to safely use tools on his own.	

Outcomes:	Indicators:	Prerequisite:
<p>Safely erect ladders and use safety harnesses.</p> <p>Safely select different rigging apparatus to lift and move equipment and machinery.</p>	<p>a. Describe & demonstrate proper method of erecting and installing ladders</p> <p>b. Describe & demonstrate proper use of safety harnesses and lanyards</p> <p>c. Identify 100% tie off</p> <p>a. Identify and describe the types, construction and use of fibre & wire rope</p> <p>b. Identify safety factors pertaining to rigging equipment.</p> <p>c. Identify & be able to tie various types of knots used in rigging equipment for lifting or moving</p>	<p>None</p>

Module: 006A

Fasteners

Suggested time: 5

Level: 10

Outcomes:	Indicators:	Prerequisite:
The student will be able to select and install fastening devices	a. Describe the types, sizes, classification and uses of threaded and non-threaded fastening devices. b. Demonstrate the procedures used to select the proper fastening device for use in metal, wood and concrete. c. Describe & demonstrate the procedures used to identify the grade of cap screws and nuts. d. Describe & demonstrate the procedure to torque fastening devices to specifications	None
The student will be able to install fasteners remove broken fasteners.	a. Describe & demonstrate methods of removing broken fasteners, thread reconditioning and (helicoils).	

Module: 007A

Metallurgy

Suggested time: 5

Level: 10

Outcomes:	Indicators:	Prerequisite:
The student will be able to select the correct type of metal for an application	a. Explain the physical properties of metals, ferrous and non-ferrous. b. Describe metal manufacturing processes and type of furnace used in each process. c. Describe types and classifications of metals. d. Explain & demonstrate the heat treatment of metals, normalizing, quenching, annealing, tempering etc. e. Explain tensile and hardness testing of metals. d. Identify different metals and carbon content.	None

Outcomes:	Indicators:	Prerequisite:
The student will be able to identify and classify Anti-Friction Bearings	a. Identify the type, parts and functions of common anti-friction ball bearing b. Describe the type, size and features of anti-friction bearings from the bearing code. c. Demonstrate how to properly pack and lubricate a ball bearing.	None
Describe the principles of operation and classification of static and dynamic seals.	a. Identify, select and maintain gaskets, seals and packing b. Practise using bearing & seal manuals to select proper bearing & seals for different applications c. Identify the purpose of different types of gaskets, seals and packing and identify their proper use. d. Practise making gaskets and o-rings.	

Outcomes:	Indicators:	Prerequisite:
The student will be able to operate oxy-fuel equipment to cut and execute basic welding procedures of metals.	a. Describe the purpose of various safety devices and the precautions to follow when using oxy-fuel equipment. b. Describe & demonstrate the proper procedures to set up & shutdown oxy-fuel equipment. c. Describe the procedures used to select the proper tips from a chart for various cutting and welding jobs on different metals. d. Describe & demonstrate brazing techniques along with the safety hazards associated with different gases produced when welding different metals. e. Describe proper soldering techniques. f. Demonstrate proper soldering techniques.	None

Outcomes:	Indicators:	Prerequisite:
The student will be able to perform mathematical operations with real numbers.	<ul style="list-style-type: none"> a. Perform addition and subtractions with real numbers. b. Perform multiplication and divisions with real numbers 	None
The student will be able to solve problems involving fractions.	<ul style="list-style-type: none"> a. Read and write decimal fractions and decimal numbers. b. Convert decimal inches to decimal numbers. c. Convert decimal numbers to common fractions with practical denominators. d. Convert decimal feet to feet and inches and convert inches to feet. 	
The student will be able to solve problems involving measurement and conversion using geometric formulas.	<ul style="list-style-type: none"> a. Identify key terms and concepts used in working with formulas. b. Define perimeter and identify common formulas to calculate perimeter in Imperial and Metric (SI) systems. c. Define area and identify common formulas to calculate area in Imperial and Metric (SI) systems. d. Define volume and identify common formulas to calculate volume in Imperial and metric (SI) systems. e. Define the parts of a circle and identify common formulas to calculate those parts of a circle in Imperial and Metric (SI) systems. 	

Outcomes:	Indicators:	Prerequisite:
The student will be able to identify and sketch components.	a. Identify the six planes of an orthographic projection and the key view. b. Identify first and third angle projection and recognize the ISO symbol for each projection. c. Describe the types of lines used on prints and their application. d. Sketch and dimension simple objects in orthographic projection.	None
The student will be able to interpret and sketch machine shop drawings containing advanced terminology.	a. Calculate the limits and fits for the mating parts on working drawings. b. Interpret prints including all information generally provided on prints, shop drawings and sketches.	

Module: 018A

Saskatchewan Youth Apprenticeship

Suggested time: Student's time

Level: 10

Outcomes:	Indicators:	Prerequisite:
Student is accepted in the Saskatchewan Youth Apprenticeship Program.	Contract is signed by both student and school.	None

Module: 001 B

Safety

Suggested time: 5

Level: 20

Prerequisite:

Outcome:	Indicators	
<p>Due to the nature of the work of the Millwright trade it is imperative that safety, WHMIS and environmental concerns be taught on a continuous basis throughout the entirety of this course.</p>	<p>a. Review module 001A</p>	<p>Module 001A</p>
<p>Identify and describe fire classes, extinguishers, prevention, detection, cleanup and restoration.</p>	<p>a. Recognize the classes of fires and the appropriate fire extinguishers suitable to fight each of these fires. b. Describe procedures and equipment related to preventing, detecting and warning of fires.</p>	
<p>Identify and describe types and applications of ladders and scaffolding.</p>	<p>a. Demonstrate the use of various types and applications of ladders and scaffolding.</p>	

Module: 002B

Electricity

Suggested time: 2-3

Level: 20

Prerequisite:

Outcome:

Provide the Industrial Mechanic with enough electrical knowledge so that safe decisions may be made when working on or around electrical equipment.

Indicators

- a. Able to explain the principles of magnetism and electromagnetism.
- b. Identify the mathematical relationship between amps, volts, ohms and watts.

Module 005 A

Outcome:	Indicators	
Describe the use of precision measuring tools.	a. Describe vernier instruments and their uses b. Describe the types of micrometers and their uses. c. Describe principle of the imperial and metric micrometer d. Identify parts of the micrometers	Module 006A
Describe & demonstrate the procedures used to properly store and maintain measuring and layout tools.	a. Demonstrate the calibration of precision measuring tools b. Demonstrate sharpening of layout tools	
Perform & demonstrate several measuring tasks using precision tools.	a. Define limits, tolerances, allowances and fits.	

Module: 004B

Abrasives & Grinders

Suggested time: 5

Level: 20

Prerequisite:

Outcome:

Ability to operate & maintain pedestal & bench grinders in a safe, efficient and responsible manner.

Indicators:

- a. Describe the procedures used to select the proper type of wheel to grind a specific metal.
- b. Describe the procedures used to change, mount and dress wheels on a pedestal grinder.
- c. The student will be able to identify & explain the code systems found on grinding wheels
- d. Describe the techniques used to sharpen different tools.

Module 004A

Module: 005B

Rigging

Suggested time: 5-10

Level: 20

Prerequisite:

<p>Outcome:</p> <p>Identify procedures used to select the appropriate sling to perform a given task.</p>	<p>Indicators:</p> <ul style="list-style-type: none">a. Describe various types of slings & demonstrate uses of different hitches.b. Describe safety considerations & demonstrate, hand signals when lifting, moving and securing equipment.	<p>Module 005A</p>
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Module: 007B

Metallurgy

Suggested time: 5

Level: 20

Prerequisite:

Outcome:

The student will have an understanding of basic metallurgy principles.

Indicators:

- a. Identify the classification of steel and describe the numbering system for steel.
- b. Define heat treatment terms
- c. Describe the properties and uses of various non-ferrous metals.
- d. Identify structural steel shapes and how they are sized.
- e. Define terms and describe methods and procedures used in hardness testing

Module 007A

Module: 008B

Bearings & Seals

Suggested time: 5

Level: 20

Prerequisite:

<p>Outcome: Describe the application, installation and remanufacture of plain bearings.</p> <p>Bearing Maintenance Reducing the frequency of bearing failures</p>	<p>Indicators:</p> <ul style="list-style-type: none">a. Describe the construction, function and application of plain bearings.b. Describe the characteristics of the common plain bearing materials. a. Identify the causes of bearing failure.b. Describe the symptoms of bearing failure.c. Describe bearing lubrication methods.	<p>Module 008A</p>
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Outcome:	Indicators:	
<p>The student will have an understanding of the operation of belt drive systems.</p>	<p>a. Describe the principles of operation of belt drive systems. b. Identify belt drive components. c. Describe the various classifications of belts and chains, sizes and codes. d. Describe variable speed drive systems. e. Perform calculations required for the installation and maintenance of belt drive systems.</p>	None
<p>The student will have an understanding of the operation of chain drive systems.</p>	<p>a. Identify chain drive components. b. Identify chain drive components and chain code numbers. c. Perform calculations required for the installation and maintenance of chain drive systems.</p>	

Outcome: The student will be able to set up arc welding equipment and describe the different types of electrodes and their purpose.	Indicators: a. Describe & demonstrate how to set up and operate arc welding equipment b. Describe the numbering system for electrodes, tensile strength, position and penetration. c. Demonstrate a working knowledge of the different types of joints encountered in welding.	Module 010A
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<p>Outcome:</p> <p>Describe the sizing, parts, accessories and attachments of lathe types.</p>	<p>Indicators:</p> <ul style="list-style-type: none">a. Describe lathe safety.b. Describe the construction of lathes.c. Identify parts and accessories and their function.d. Identify work holding devices.e. Describe the procedures used to calculate correct speeds and feeds.	<p>None</p>
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<p>Outcome:</p> <p>The student will be able to solve problems involving measurement and conversion using geometric formulas.</p> <p>The student will be able to solve problems involving percentage and ratios.</p>	<p>Indicators:</p> <p>a. Define mass and identify common formulas to calculate mass in Imperial and Metric (SI) systems.</p> <p>b. Define capacity and identify common formulas to calculate capacity in Imperial and Metric (SI) systems.</p> <p>a. Calculate ratio problems: express two quantities in the form of a ratio.</p> <p>b. Calculate ratio problems: express two ratios in the form of a proportion.</p> <p>c. Convert between fractions and percents.</p> <p>d. Convert between decimals and percents.</p>	<p>Module 015A</p>
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<p>Outcome:</p> <p>The student will be able to recognize the principles of effective communication including letters, memos, resumes, short report writing, oral presentations and interpersonal communications.</p> <p>Interpersonal Communications</p>	<p>Indicators:</p> <p>a. Apply rules and principles for writing clear, concise, complete sentences which adhere to the conventions of grammar, punctuation, and mechanics.</p> <p>b. Describe the value of well-developed writing skills to career success.</p> <p>c. Define and describe the major characteristics of an effective resume.</p> <p>d. Review the importance of revising and proofreading.</p> <p>a. Examine and apply listening techniques</p> <p>b. Discuss the importance of body language</p>	<p>None</p>
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Outcome:

The student will be able to recognize and name technical elements of break lines and sectional representation.

Indicators:

- a. Define the terms cutting plane lines, break lines, symmetry and describe their application.
- b. Describe the use of sectional views and name the types of components that are not sectioned on a drawing.

Module 017A

Module: 018B

Saskatchewan Youth Apprenticeship

Suggested time: Student's time

Level: 20

Prerequisite:

Outcomes: Student is accepted in the Saskatchewan Youth Apprenticeship Program.	Indicators: Contract is signed by both student and school.	None
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<p>Outcome:</p> <p>Complete online WHMIS</p> <p>Complete online SCOT</p> <p>Complete online Rights & Responsibilities</p> <p>Complete ST. John Ambulance standard first aid</p>	<p>Indicators:</p> <p>a. Obtain WHMIS certificate</p> <p>a. Obtain SCOT certificate</p> <p>a. Obtain Rights & Responsibilities certificate</p> <p>a. Recognize situations requiring emergency action and to make appropriate decisions concerning first aid</p>	<p>Module 001A, 001B</p>
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Module: 002C

Electricity

Suggested time: 2-5

Level: 30

Prerequisite:

Outcome:

To provide the Industrial Mechanic with enough electrical knowledge so that safe decisions may be made when working on or around electrical equipment.

Indicators:

- a. Identify & describe the types of electric current, phases and cycles.
- b. Examine the mathematical relationship between amps, volts, and watts and solve trade-related problems involving current, electromotive force and resistance using Ohm's law and Kirchhoff's law.

Module 002A, 002B

Module: 003C

Measurement & Layout

Suggested time: 5

Level: 30

Prerequisite:

Outcome:

Review of modules 003A and 003B showing an understanding of the proper use and safe handling of tools used in the millwright trade.

Indicators:

a. Demonstrate knowledge learned in modules 003A & 003B.

Module 003A, 003B

<p>Outcome:</p> <p>The student will be able to operate, maintain drilling machines and reamers in a safe and efficient manner</p> <p>Determine proper speed and feed while using drilling machines and reamers.</p>	<p>Indicators:</p> <p>a. Describe the different types of drilling machines and their uses.</p> <p>a. Identify accepted safety practices when operating drilling machines.</p> <p>b. Describe the procedures used to calculate speeds and feeds for efficient drilling of different metals.</p> <p>c. Describe the procedures used to select the proper cutting fluids used for machining various metals.</p> <p>d. Describe the different parts of a twist drill and their purpose</p> <p>e. Describe the procedures used to calculate the tap drill size using the formula.</p> <p>f. Describe the different taps in a set and the purpose of each.</p> <p>g. Describe procedures to sharpen a twist drill for various materials</p> <p>h. Describe the different types of threading dies.</p> <p>i. Describe different types of drill bits and their purpose.</p>	<p>Module 004A, 004B</p>
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<p>Outcome:</p> <p>The student will be able to distinguish procedures used to select and use various chain blocks and come-alongs.</p> <p>Describe the different types of lifting accessories, mobile cranes, overhead travelling cranes and their uses.</p>	<p>Indicators:</p> <p>a. Describe mechanical advantage b. Identify deficiencies when performing safety inspections of rigging equipment.</p> <p>a. Identify various types of hoisting equipment. b. Describe the types of mobile cranes. c. Describe the electric overhead traveling cranes. d. Describe electric overhead traveling crane inspection procedures. e. Review standard hand signals used for rigging and hoisting operations</p>	<p>Module 005A, 005B</p>
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Outcome:	Indicators:	Prerequisite:
<p>Describe the characteristics and applications of bearing seals and pillow blocks.</p> <p>Describe the installation and maintenance of gaskets used in industrial machinery.</p> <p>Explain the uses of lubricants in industry.</p>	<p>a. Describe the various types and applications of bearing seals b. Describe the various types and uses of pillow blocks.</p> <p>a. Describe the types of gasket joints common in industry. b. Able to list the types and applications of various kinds of gasket material.</p> <p>a. Explain the characteristics of friction. b. Describe the general characteristics of oil. c. Explain lubrication theory. d. Describe the types of oil and application of each type. e. Describe the properties and applications of the various types of greases.</p>	<p>Module 008A, 008B</p>

Outcome:	Indicators:	
Describe principle of operation of gear drive units	a. Identify gear terminology, gear types and shaft arrangement. b. Describe the procedures and formulas used to perform gear calculations	None
Describe the purpose of different types of couplings and clutches and identify their proper use.	a. Identify the various types of couplings and explain their application. b. Identify the different types of keys and keyways and their purpose c. Describe the procedures used to select the proper lubrication for the various clutches and couplings.	

Module: 013C

Milling Machine

Suggested time: 5-10

Level: 30

Prerequisite:

Outcome:

Perform set up and safely execute basic milling operations.

Indicators:

- a. Identify safety hazards involved in operating a milling machine.
- b. Describe the principles of operation of milling machines
- c. Describe the procedures used to perform calculations involved in using a milling machine.

None

<p>Outcome:</p> <p>Describe procedures to properly place and level a piece of equipment on its base or foundation at the correct location and elevation.</p>	<p>Indicators:</p> <ul style="list-style-type: none">a. Describe procedures to construct foundations for equipment using concrete terms, anchor bolt types, mechanical expansion anchors and chemical adhesive anchors.b. Describe base plate and sole plate purpose and installation procedurec. Describe procedures to locate and lay out a form from a blueprint including the reference lines, centerlines, benchmarks, elevations and datum lines.d. Identify the differences between cement and concrete including concepts such as aggregates and additives.	<p>None</p>
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Outcome:	Indicators:		
Solve problems involving special triangles and elementary trigonometry.	a. Identify key terms and concepts used in working with triangles and trigonometry. b. Identify Pythagorean theory and use it to solve problems.	Module 015A, 015B	
Recognize math symbols used in millwright trade calculations.	a. Locate math formulas to apply to specific trade calculations in the four periods of millwright training.		
Solve problems involving measurement and conversion using geometric formulas.	a. Identify common formulas and solve problems for perimeter. b. Identify common formulas and solve problems for area. c. Identify common formulas and solve problems for volume d. Calculate the weight of a solid. e. Calculate the capacity of a container in gallons. f. Identify common formulas to calculate belt length, gear ratio, chain lengths.		

<p>Outcome:</p> <p>Sketch isometric pictorial drawings.</p> <p>Identify basic joints and welds.</p>	<p>Indicators:</p> <p>a. Describe three types of picture views. b. Sketch isometric drawings on isometric lined paper.</p> <p>a. Identify the five basic joints. b. Describe the types of welds and their acceptable dimensions. c. Explain the purpose of welding symbols. d. Draw and interpret basic weld symbols. e. Identify the dimensioning of weld symbols.</p>	<p>Module 017A, 017B</p>
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Module: 018A

Saskatchewan Youth Apprenticeship

Suggested time: Student's time

Level: 30

Prerequisite:

<p>Outcomes:</p> <p>Student is accepted in the Saskatchewan Youth Apprenticeship Program.</p>	<p>Indicators:</p> <p>Contract is signed by both student and school to be completed no later than completion of level 30</p>	<p>None</p>
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Assessment and Evaluation of Student Learning

Assessment and evaluation require thoughtful planning and implementation to support the learning process and to inform teaching. All assessment and evaluation of student achievement must be based on the outcomes in the provincial curriculum.

Assessment involves the systematic collection of information about student learning with respect to:

- Achievement of curriculum outcomes
- Effectiveness of teaching strategies employed
- Student self-reflection on learning.

Evaluation compares assessment information against criteria based on curriculum outcomes for the purpose of communicating to students, teachers, parents/caregivers, and others about student progress and to make informed decisions about the teaching and learning process.

Reporting of student achievement must be in relation to curriculum outcomes. Assessment information which is not related to outcomes can be gathered and reported (e.g., attendance, behaviour, general attitude, completion of homework, effort) to complement the reported achievement related to the outcomes of Industrial Mechanic/Millwright. There are three interrelated purposes of assessment. Each type of assessment, systematically implemented, contributes to an overall picture of an individual student's achievement.

Assessment for learning involves the use of information about student progress to support and improve student learning and inform instructional practices, and:

- is teacher-driven for student, teacher, and parent use
- occurs throughout the teaching and learning process, using a variety of tools
- engages teachers in providing differentiated instruction, feedback to students to enhance their learning, and information to parents in support of learning.

Assessment as learning involves student reflection on and monitoring of her/his own progress related to curricular outcomes and:

- is student-driven with teacher guidance for personal use
- occurs throughout the learning process
- engages students in reflecting on learning, future learning, and thought processes (metacognition).

Assessment of learning involves teachers' use of evidence of student learning to make judgements about student achievement and:

- provides opportunity to report evidence of achievement related to curricular outcomes
- occurs at the end of a learning cycle, using a variety of tools
- provides the foundation for discussion on placement or promotion.

In Industrial Mechanic/Millwright, students need to be regularly engaged in assessment as learning. The various types of assessments should flow from the learning tasks and provide direct feedback to the students regarding their progress in attaining the desired learnings as well as opportunities for the students to set and assess personal learning goals related to the content of Industrial Mechanic/Millwright.

REFERENCES

Online references obtained from:

Saskatchewan Ministry of Education Curricula: Survey Modules and Pure Courses

Human Resources and Skills Development Canada/Essential skills

Saskatchewan Apprenticeship and Trade Certification Commission

SIAST Industrial Mechanic/Millwright Apprenticeship Program

Government of Alberta Apprenticeship and Industry Training

Government of Newfoundland and Labrador Dept. Of Education, Institutional and Industrial Education Division

List of Resource Materials

A list of reference textbooks is provided below. It is not necessary to use these specific textbooks, as you may find others which will be equally beneficial. You are encouraged to seek additional reference materials in all test areas.

Manual of Instruction for the Millwright Trade

Millwright Manual Study Guide

Metalwork: Technology and Practice by V. Repp, pub. McGraw-Hill. ISBN 978-0-02-676484-1.

Study Guide for Metalwork: Technology & Practice, pub. McGraw-Hill. ISBN 978-0-02-67486-5.

Interpreting Engineering Drawing by Jenson, pub. Nelson Canada. ISBN 978-0-17-650-199-0.

Handbook for Riggers by Newberry. ISBN 978-0-9690154-1-3.

The Occupational Health and Safety Act, 1993 and The Occupational Health and Safety Regulations, 1996 Saskatchewan Labour Occupational Health and Safety

Welding Service Program - Oxyacetylene

Math Manual – 136 –Level 1

<http://trades.exambank.com>

Individual Learning Modules (ILM's) for the Industrial Mechanic (Millwright) trade may be ordered through

www.tradesecrets.org/ under Millwright.

*Unless otherwise noted, books listed here are available through the SIAST Bookstore Call Centre:1-866-569-8398.
NOTE: Textbooks **are not** usually available from libraries. When purchasing texts, allow several weeks for delivery and several weeks for studying.

PAA Online Resources

<http://rover.edonline.sk.ca/index.htm>

<http://ecast.edonline.sk.ca/classprolearn20112012/classprolearn20112012.asp>

<http://www.education.gov.sk.ca/>

<http://www.education.gov.sk.ca/Curriculum>

<http://www.education.gov.sk.ca/paa-trades>

<http://iss.rbe.sk.ca/paa>

<http://www.saskapprenticeship.ca/>

<http://www.scsaonline.ca/>

WorkSafe Saskatchewan - Online Courses

The **Saskatchewan Construction Safety Association (SCSA)** has launched their new online **Safety Construction Orientation Training (SCOT)** program on November 16th. This quality online web based program is **available to all high school students** in the province **free** and is aligned with Saskatchewan OH&S legislation. Follow this link <http://scsaonline.ca> to find out more about **SCOT**. To access this training for your students please contact Thomas Archer or Sharon Lockhart at the SCSA.

Thomas Archer thomasa@scsaonline.ca Phone 525-0175 ext. 222

Sharon Lockhart sharonl@scsaonline.ca Phone 525-0175 ext. 240