Industrial Mechanic (Millwright)

Course Outline

2022

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Saskatchewan Apprenticeship and Trade Certification Commission

TRAINING PROFILE CHART

This Training Profile Chart represents Saskatchewan Apprenticeship and Trade Certification Commission (SATCC) technical training at the topic level.

Level One (Harmonized)	Transcript Code	Hours
Layout & Hand Cut Tools	TOOL 110 - Theory	11
	TOOL 111 - Shop	15
Drills & Abrasives	TOOL 152 - Theory	11
	TOOL 153 - Shop	15
Metallurgy	METL 102 - Theory	15
	METL 103 - Shop	11
Precision Measuring; Assembly Tools; Fasteners; Threading	MEAS 102 - Theory	22
	MEAS 103 - Shop	30
Thermal Cutting, Oxy-Fuel and Arc Welding	WLDR 104 - Theory	10
	WLDR 105 - Shop	16
Rigging, Hoisting, and Lifting	RIGG 101 - Theory	15
	RIGG 102 - Shop	11
Safety & Communication	SAFE 100 - Theory	11
	SAFE 101 - Shop	15
Technical Drawing	PRNT 102	16
Trade Mathematics	MATH 108	16
		240

Level Two (Harmonized)	Transcript Code	Hours
Shafts, Keys, Seals, Bearing and Plain Bearings	TRNM 208 - Theory	26
	TRNM 209 - Shop	26
Lubrication & Levelling	MCHN 200 - Theory	13
	MCHN 201 - Shop	13
Arc Welding	WLDR 200 - Theory	26
	WLDR 201 - Shop	26
Belts and Chains	INDM 206 - Theory	13
	INDM 207 - Shop	13
Gear Systems, Couplings, Clutches, & Brakes	BRAK 208 - Theory	13
	BRAK 209 - Shop	13
Rough Alignment and Dial Alignment	ALGN 200 - Theory	13
	ALGN 201 - Shop	13
Technical Drawing	PRNT 203	16
Trade Mathematics	MATH 201	16
		240

Level Three (Harmonized)	Transcript Code	Hours
Advanced Shaft Alignment	ALGN 300 – Theory	13
	ALGN 301 – Shop	13
Pipe Fitting, Tanks and Containers	PIPE 300 – Theory	13
	PIPE 301 – Shop	13
Pneumatics, Compressors, Vacuum Systems, Fans and Blowers	PNEU 300 – Theory	26
	PNEU 301 – Shop	26
Pumps	PUMP 300 – Theory	26
	PUMP 301 – Shop	26
Hydraulics	HYDR 302 – Theory	26
	HYDR 303 – Shop	26
Technical Drawing	PRNT 302	16
Trade Mathematics	MATH 300	16
		240

Level Four (Harmonized)	Transcript Code	Hours
Robotics and Automated	ROBT 400 – Theory	13
	ROBT 401 – Shop	13
Machine Installation	MCHN 400 – Theory	13
	MCHN 401 – Shop	13
Material Handling	MATE 400 – Theory	13
	MATE 401 – Shop	13
Mentoring Techniques, Commissioning & Decommissioning Equipment	MENT 402 – Theory	13
	MENT 403 – Shop	13
Machine Shop	MACH 400 - Theory	26
	MACH 401 – Shop	26
Steam/Prime/Preventative Maintenance	MAIN 400 – Theory	26
	MAIN 401 – Shop	26
Technical Drawing	PRNT 405	16
Trade Mathematics	MATH 400	16
		240

Exceed Topics

Throughout this guide to course content there are topics, which exceed the scope of work set out by the Industrial Mechanic (Millwright) RSOS. Industry in Saskatchewan has deemed certain topics to fall within the scope of work of the Industrial Mechanic (Millwright) trade and therefore require technical training to also cover these topics.

TECHNICAL TRAINING COURSE OUTLINE

This chart outlines the model for Saskatchewan Apprenticeship and Trade Certification Commission (SATCC) technical training sequencing.

The Red Seal Industrial Mechanic (Millwright) Curriculum Outline, which provides additional detail of the Harmonized technical training, can be found at www.red-seal.ca

Level One — 8 weeks — 240 hours

Layout & Hand Cut Tools — 26 hours

- Describe types of hand cutting tools
- Describe use of hand cutting tools
- Describe use for layout tools
- Construct projects with hand cutting tools
- Maintain hand cutting tools
- Construct projects with the use of layout tools

Drills & Abrasives — 26 hours

- Identify types of power tools
- Describe use of power tools
- Construct projects with power tools
- Maintain power tools

Metallurgy — 26 hours

- Describe metallurgy of ferrous and non-ferrous metals
- Identify steel manufacturing
- Identify soldering methods
- Identify destructive and non-destructive testing methods
- Construct tools made from steel
- Identify types of ferrous and non-ferrous metals
- Perform destructive and non-destructive testing methods
- Perform soldering methods

Precision Measuring; Assembly Tools; Fasteners; Threading — 52 Hours

- Identify precision measuring tools
- Describe uses of precision measuring tools
- Identify hand threading tools
- Describe use of hand threading tools
- Identify types of fasteners
- Identify assembly tools
- Operate precision measuring tools
- Maintain precision measuring tools
- Operate hand threading tools

Thermal Cutting, Oxy-Fuel and Arc Welding **26 hours**

- Describe the safe operation, assembly, and maintenance of OFC, OFW, PAC and TB
- Identify safe operation, assembly and maintenance of GMAW and GTAW
- Describe the safe operation of fabrication equipment
- Demonstrate the safe operation, assembly and maintenance during OFC and AC
- Demonstrate the safe operation, assembly, and maintenance while OFW
- Demonstrate the safe operation, assembly, and maintenance while TB

Rigging, Hoisting, and Lifting **26 hours**

- Identify rigging equipment
- Describe rigging techniques
- Interpret OH&S Regulations
- Apply rigging techniques
- Maintain rigging equipment
- Calculate load estimation

Safety & Communication Techniques **26 hours**

- Identify Occupation Health and Safety (OH&S) Regulations
- Interpret OH&S Regulations
- Describe WHMIS 2015 (GHS) procedures
- Describe fire safety
- Describe the importance of using effective verbal and non-verbal communication with people in the workplace
- Demonstrate knowledge of trade terminology
- Demonstrate knowledge of effective communication practices

Technical Drawing **16 hours**

- Develop working sketches
- Develop working drawings from sketches
- Construct parts and assembly from working drawings

Trade Mathematics **16 hours**

- Use basic Mathematics
- Use basic Algebra
- Perform trade calculations

Level Two — 8 weeks — 240 hours

Shafts, Keys, Seals, Bearing and Plain Bearings — 52 hours

- Seal selection and maintenance
- Shafting selection and attachments
- Anti-friction bearings selection and maintenance
- Plain bearings selection and maintenance

Lubrication and Levelling — 26 hours

- Lubricant selection and application
- Lubrication system maintenance
- Levelling method selection
- Levelling procedures

Arc Welding — 52 hours

- Safe operation, setup and maintenance of GMAW and SMAW processes
- Select the appropriate voltage and shielding gas, flow rate and type of transfer while performing GMAW
- Select the appropriate amperage and electrode while performing SMAW
- Demonstrate the appropriate techniques of GMAW and SMAW

Belts and Chains — 26 hours

- Assemble and maintain V-belt drives
- Assemble and maintain chain drives

Gear Systems, Couplings, Clutches and Brakes — 26 hours

- Describe and maintain direct drive couplings, clutches and brakes
- Describe and maintain gear drive systems

Rough Alignment and Dial Alignment — 26 hours

- Identify alignment procedures, tools and current technology
- Identify rim and face method of shaft alignment
- Demonstrate feeler gauge alignment
- Perform rim and face alignment

Trade Math — 16 hours

- Basic algebra
- Metric units
- Trade calculations

Technical Drawing — 16 Hours

- Construct machine drawings
- Interpret machine drawings
- Interpret assembly drawings

Level Three — 8 weeks — 240 hours

Advanced Shaft Alignment — **26 hours**

- Identify and apply cross dialing method
- Identify and apply laser method

Pipe Fitting, Tanks and Containers — **26 hours**

- Theory and piping systems
- System components
- Piping systems construction

Pneumatics, Compressors, Vacuum Systems, Fan and Blowers — **52 hours**

- Describe pneumatic theory
- Identify system components
- Identify schematics
- Identify pneumatics circuits
- Identify troubleshooting techniques
- Construct pneumatic circuits
- Test pneumatic circuits
- Demonstrate troubleshooting techniques
- Maintain pneumatic system components and actuators

Pumps — **52 hours**

- Pump theory and systems
- System components
- Pump types and components
- Pump and circuit testing, pump maintenance

Hydraulics — **52 hours**

- Hydraulic theory
- Hydraulic system components
- Describe fluid, conductors and fittings
- Identify schematics
- Identify hydraulic circuits
- Identify troubleshooting techniques

Technical Drawing — **16 hours**

- Construct fabrication drawings
- Interpret fabrication drawings
- Interpret piping drawings

Trade Mathematics — **16 hours**

- Basic geometry
- Trade calculations

Level Four — 8 weeks — 240 hours

Machine Installation — 26 hours

- Identify precision optical levels
- Identify types of foundations and bases
- Identify types of concrete forms and grouting
- Identify types of machine installation hardware
- Demonstrate field layout techniques

Material Handling — 26 hours

- Conveyor system identification and maintenance
- Conveyor components

Robotics and Automated Equipment — 26 hours

- Define terminology associated with robotics and automated equipment
- Describe safe work practices associated with robotics and automated equipment
- Identify tools and equipment associated with robotics and automated equipment
- Install robotics and automated equipment
- Diagnose robotics and automated equipment
- Maintain robotics and automated equipment
- Repair robotics and automated equipment

Mentoring Techniques, Commissioning & Decommissioning Equipment — 26 hours

- Identify strategies for learning skills in the workplace
- Identify strategies for mentoring in the workplace
- Define terminology associated with commissioning and decommissioning
- Demonstrate knowledge of strategies for mentoring in the workplace
- Demonstrate knowledge of the procedures used to commission systems and components
- Demonstrate knowledge of procedures used to decommission systems and components
- Demonstrate knowledge of safety practices related to commissioning and decommissioning

Steam/Prime/Preventative Maintenance — 52 hours

- Prime mover identification
- Power generation system identification
- Preventative/predictive maintenance principles and methods
- Advanced torque methods

Technical Drawing — 16 hours

- Location of part features on orthographic view drawings
- Review of engineering drawings with a variety of views
- Dimension data and tolerance information from engineering drawings
- Calculating tolerances and allowances from charts
- Interpreting mechanical drawings

Trade Mathematics — 16 hours

- Basic geometry and trigonometry
- Trade calculations

Machine Shop — 52 hours

- Describe lathe components and accessories
- Describe milling machine components and accessories
- Describe cutting tools
- Demonstrate lathe maintenance
- Perform lathe operations
- Demonstrate milling machine maintenance
- Perform milling operations

INDUSTRIAL MECHANIC (MILLWRIGHT)
TASK MATRIX CHART

This chart outlines the major work activities, tasks, and sub-tasks from the **2016 Industrial Mechanic (Millwright) Red Seal Occupational Standard**. Each sub-task details the corresponding essential skill and level of training where the content is covered. *

A – Performs common occupational skills

Task A-1 **Performs safety-related functions**	**A-1.01** **Uses personal protective equipment (PPE) and safety equipment** **1, 2, 3, 4**	**A-1.02** **Maintains safe worksite** **1, 2, 3, 4**	**A-1.03** **Protects the environment** **1, 2, 3, 4**	**A-1.04** **Performs lock-out/tag-out and zero-energy state procedures** **1, 2, 3, 4**	
Task A-2 **Uses tools and equipment**	**A-2.01 Uses hand and portable power tools** **1**	**A-2.02 Uses shop machines** **1**	**A-2.03 Uses access equipment** **1**		
Task A-3 **Performs routine trade tasks**	**A-3.01 Plans work** **1, 2, 3, 4**	**A-3.02 Fabricates work piece** **1, 2, 3, 4**	**A-3.03 Lubricates systems and components** **1, 2, 3, 4**	**A-3.04 Performs leveling of components and systems** **1, 2, 3, 4**	**A-3.05 Uses fastening and retaining devices** **1, 2, 3, 4**
	A-3.06 Performs material identification **1, 2, 3, 4**	**A-3.07 Performs heat treatment of metal** **1, 2, 3, 4**	**A-3.08 Uses mechanical drawings and schematics** **1, 2, 3, 4**		
Task A-4 **Uses communication and mentoring techniques**	**A-4.01 Uses communication techniques** **1**	**A-4.02 Uses mentoring techniques** **4**			
Task A-5 **Performs measuring and layout**	**A-5.01 Prepares work area, tools and materials** **1**	**A-5.02 Measures material and components** **1**	**A-5.03 Lays out components** **1** **(2, 3, 4 in context)**	**A-5.04 Maintains precision measuring and layout tools** **1**	

Task A-6 **Performs cutting and welding operations**	**A-6.01 Cuts material with oxy-fuel and plasma arc equipment** **1** **(2 in context)**	**A-6.02 Joins material using oxy-fuel welding equipment** **1** **(2 in context)**	**A-6.03 Welds material using shielded metal arc welding (SMAW) equipment** **1, 2**	**A-6.04 Welds material with gas metal arc welding (GMAW) equipment** **2**	**A-6.05* Welds material with gas tungsten arc welding (GTAW) equipment (NOT COMMON CORE)** **2**
	A-6.06 Maintains welding equipment **1** **(2 in context)**				

*Subtask 6.05 is not consistently performed by IMMs across Canada; therefore this content is deemed not common core and will not be assessed on the IMM certification examination.

B – Performs rigging, hoisting/lifting and moving

Task B-7 **Plans rigging, hoisting/lifting and moving**	**B-7.01 Determines load** **1, 2, 3, 4**	**B-7.02 Selects rigging equipment** **1, 2, 3, 4**	**B-7.03 Selects hoisting/lifting and moving equipment** **1, 2, 3, 4**	**B-7.04 Secures area** **1, 2, 3, 4**
Task B-8 **Rigs, hoists/lifts and moves load**	**B-8.01 Sets up rigging, hoisting/lifting and moving equipment** **1, 2, 3, 4**	**B-8.02 Performs hoist/lift and move** **1, 2, 3, 4**	**B-8.03 Maintains rigging, hoisting/lifting and moving equipment** **1, 2, 3, 4**	

C – Services mechanical power transmission components and systems

Task C-9 Services prime movers	C-9.01 Installs prime movers 4	C-9.02 Diagnoses prime movers 4	C-9.03 Maintains prime movers 4	C-9.04 Repairs prime movers 4
Task C-10 Services shafts, bearings and seals	C-10.01 Installs shafts, bearings and seals 2	C-10.02 Diagnoses shafts, bearings and seals 2	C-10.03 Maintains shafts, bearings and seals 2	C-10.04 Repairs shafts, bearings and seals 2
Task C-11 Services couplings, clutches and brakes	C-11.01 Installs couplings, clutches and brakes 2	C-11.02 Diagnoses couplings, clutches and brakes 2	C-11.03 Maintains couplings, clutches and brakes 2	C-11.04 Repairs couplings, clutches and brakes 2
Task C-12 Services chain and belt drive systems	C-12.01 Installs chain and belt drive systems 2	C-12.02 Diagnoses chain and belt drive systems 2	C-12.03 Maintains chain and belt drive systems 2	C-12.04 Repairs chain and belt drive systems 2
Task C-13 Services gear systems	C-13.01 Installs gear systems 2	C-13.02 Diagnoses gear systems 2	C-13.03 Maintains gear systems 2	C-13.04 Repairs gear systems 2
Task C-14 Performs shaft alignment procedures	C-14.01 Performs rough alignment 2	C-14.02 Performs dial alignment 2, 3	C-14.03 Performs laser alignment 3	

D – Services material handling/process systems

Task D-15 Services robotics and automated equipment	D-15.01 Installs robotics and automated equipment 4	D-15.02 Diagnoses robotics and automated equipment 4	D-15.03 Maintains robotics and automated equipment 4	D-15.04 Repairs robotics and automated equipment 4
Task D-16 Services fans and blowers	D-16.01 Installs fans and blowers 3	D-16.02 Diagnoses fans and blowers 3	D-16.03 Maintains fans and blowers 3	D-16.04 Repairs fans and blowers 3

Task D-17 **Services pumps**	**D-17.01 Installs pumps** **3**	**D-17.02 Diagnoses pumps** **3**	**D-17.03 Maintains pumps** **3**	**D-17.04 Repairs pumps** **3**	
Task D-18 **Services compressors**	**D-18.01 Installs compressors** **3**	**D-18.02 Diagnoses compressors** **3**	**D-18.03 Maintains compressors** **3**	**D-18.04 Repairs compressors** **3**	
Task D-19 **Services process piping, tanks and containers**	**D-19.01 Installs process tanks and containers** **3**	**D-19.02 Installs process piping** **3**	**D-19.03 Diagnoses process tanks and containers** **3**	**D-19.04 Diagnoses process piping** **3**	**D-19.05 Maintains process tanks and containers** **3**
	D-19.06 Maintains process piping **3**	**D-19.07 Repairs process tanks and containers** **3**	**D-19.08 Repairs process piping** **3**		
Task D-20 **Services conveying systems**	**D-20.01 Installs conveying systems** **4**	**D-20.02 Diagnoses conveying systems** **4**	**D-20.03 Maintains conveying systems** **4**	**D-20.04 Repairs conveying systems** **4**	

E – Services fluid power systems

Task E-21 **Services hydraulic systems**	**E-21.01 Installs hydraulic systems** **3**	**E-21.02 Diagnoses hydraulic systems** **3**	**E-21.03 Maintains hydraulic systems** **3**	**E-21.04 Repairs hydraulic systems** **3**
Task E-22 **Services pneumatic and vacuum systems**	**E-22.01 Installs pneumatic and vacuum systems** **3**	**E-22.02 Diagnoses pneumatic and vacuum systems** **3**	**E-22.03 Maintains pneumatic and vacuum systems** **3**	**E-22.04 Repairs pneumatic and vacuum systems** **3**

F – Performs preventative and predictive maintenance, commissioning and decommissioning

Task F-23 **Performs preventative and predictive maintenance**	**F-23.01 Performs preventative maintenance activities** **4**	**F-23.02 Performs vibration analysis procedures** **4**	**F-23.03 Performs balancing procedures** **4**	**F-23.04 Performs non-destructive testing (NDT) procedures** **4**	**F-23.05 Performs fluid analysis procedures** **4**
	F-23.06 Performs predictive maintenance activities **4**				
Task F-24 **Commissions and decommissions equipment**	**F-24.01 Commissions systems and components** **4**	**F-24.02 Decommissions systems and components** **4**			

***The Industrial Mechanic (Millwright) Red Seal Occupational Standard (RSOS), describing the "full scope" of the trade, can be found at** www.red-seal.ca

***For more detailed information on course content, please refer to the Industrial Mechanic (Millwright) Guide to Course Content at** www.saskapprenticeship.ca.