

# Atlantic Workforce Partnership

Curriculum Standard

## Industrial Mechanic (Millwright)

Version: 2019

Revised: N/A

Atlantic Apprenticeship



# Atlantic Apprenticeship Curriculum Standard

## Industrial Mechanic (Millwright)

## Preface

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This Atlantic Apprenticeship Curriculum Standard is intended to assist instructional staff in the design and delivery of technical, in-class training in support of the Industrial Mechanic (Millwright) program.

This document contains all the technical training elements required to complete the Industrial Mechanic (Millwright) apprenticeship program and has been developed based on the 2017 Red Seal Occupational Standard (RSOS). The RSOS can be found on the Red Seal website ([www.red-seal.ca](http://www.red-seal.ca)).

Implementation of this Atlantic Apprenticeship Curriculum and Standard (AACS) for Apprenticeship training is outlined in the following table.

Level	Implementation Effective
Level 1	2019/2020
Level 2	2020/2021
Level 3	2021/2022
Level 4	2022/2023

*\*\* The above implementation schedule identifies the training season where implementation is required to be complete in all Atlantic jurisdictions. Please **confirm** with Apprenticeship Staff in your jurisdiction for more specific implementation dates for your jurisdiction prior to commencing training.*

Granting of credit or permission to challenge level examinations for pre-employment or pre-apprenticeship training for the Industrial Mechanic (Millwright) trade will be based on the content outlined in this standard. Training providers must contact their provincial apprenticeship authority for more information on the process and requirements for determining eligibility for credit towards an apprenticeship program. Programs which have been deemed acceptable by the jurisdictional apprenticeship authority will be identified in transfer credit matrix developed through the Atlantic Apprenticeship Harmonization Project.

## Acknowledgements

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The development of the Atlantic Apprenticeship Curriculum Standard (AACS) is an initiative of the Atlantic Apprenticeship Council's Atlantic Apprenticeship Harmonization Project (AAHP) through the Atlantic Workforce Partnership and Employment and Social Development Canada.

The Atlantic Apprenticeship Council wishes to acknowledge the contributions of the following industry and instructional representatives on the Atlantic Trade Advisory Committee (ATAC) who participated in the development of this document in April, 2018.

Frank Denine	New Brunswick
Shannon Savoy	New Brunswick
David Steeve	New Brunswick
Gavin Brake	Newfoundland and Labrador
Ben Strickland	Newfoundland and Labrador
Frank Emilio	Nova Scotia
Jeff Richardson	Nova Scotia
Terry Dobbin	Nova Scotia

*\* Prince Edward Island recused from the committee due to low volume trade uptake in their jurisdiction.*

Advisory committees, industry representatives, instructors and apprenticeship staff provided valuable input to the development of this document. Without their dedication to quality apprenticeship training, this document could not have been produced.

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## User Guide

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Atlantic Apprenticeship Curriculum Standards (AACS) are developed based on Red Seal Occupational Standards (RSOS), National Occupational Analyses (NOA), Interprovincial Program Guides (IPG) (if available) and extensive industry consultation. This document represents the minimum content to be delivered as part of the harmonized Atlantic program for the Industrial Mechanic (Millwright) trade.

The AACS's are deliberately constructed for ease of use and flexibility of structure in order to adapt to all delivery requirements. They detail units of training, unit outcomes and objectives. They do not impose a delivery model or teaching format.

Jurisdictions and/or training providers will select and develop delivery materials and techniques that accommodate a variety of learning styles and delivery patterns. The AACS does not dictate study materials, textbooks or learning activities to be used in delivery.

The document includes a Level Structure to facilitate mobility for apprentices moving from one jurisdiction to another.

### *Structure*

The content of the AACS is divided into units. Unit codes are used as a means of identification and are not intended to convey the order of delivery. It is at the discretion of the training provider to deliver the content in the required logical sequence of delivery within the level. Jurisdictions are free to deliver units one at a time or concurrently within a level, provided all outcomes are met.

The Learning Outcomes describe what the apprentice should know or be able to do at the end of training. Wording of the Learning Outcomes, "Demonstrate knowledge of..." acknowledges the broad spectrum of ways in which knowledge can be assessed (i.e. practical projects, multiple choice testing, presentations, etc.) by instructional staff within the training.

Summative evaluation will be through a multiple-choice Level Examination administered through the jurisdictional Apprenticeship Authority.

## **User Guide** *(continued)*

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The 2017 Red Seal Occupational Standard References (RSOS) to AACS Comparison chart outlines the relation between each RSOS sub-task and the AACS units. RSOS References have also been detailed in each unit to highlight the direct link between the unit and relevant sub-tasks in the RSOS.

In the Level Structure section, the document identifies suggested hours in order to provide an indication of the time it should take to cover the material in the unit and is intended as a guide only. Adjustments to the suggested hours for each unit may be required to account for rate of apprentice learning, statutory holidays, storm days, registration and examinations. These suggested hours detailed for each unit will represent both theory and practical training (if relevant) and for consistency will be based on a standard of 30 hours per week of training. The actual length of time required to deliver an outcome successfully will depend upon the learning activities and teaching methods used.

There are two types of objectives found in the AACS document: theoretical and practical.

The theoretical objectives represent the material that is to be covered during the technical training in order to convey the required knowledge to the apprentice.

The practical objectives represent the tasks or skills that have been deemed by the Atlantic Trade Advisory Committee as critical for the apprentices to receive exposure to while attending technical training. For example, exposure could be done through instructor demonstration or individual or group performance of the skill or task. Training providers are encouraged to use practical demonstration and opportunities for hands-on learning whenever possible. Practical objectives are not intended to replace the on-the-job training component of the apprentice's program or to mirror or replace the logbook skills that are to be taught and evaluated in the workplace.

Detailed content for each objective has not been developed. Where detail is required for clarity, content has been provided.

## **Glossary of Terms**

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These definitions are intended as a guide to how language is used in the document.

<b>ADJUST</b>	To put in good working order; regulate; bring to a proper state or position.
<b>APPLICATION</b>	The use to which something is put and/or the circumstance in which an individual would use it.
<b>CHARACTERISTIC</b>	A feature that helps to identify, tell apart or describe recognizably; a distinguishing mark or trait.
<b>COMPONENT</b>	A part that can be separated from or attached to a system; a segment or unit.
<b>DEFINE</b>	To state the meaning of (a word, phrase, etc.).
<b>DESCRIBE</b>	To give a verbal account of; tell about in detail.
<b>EXPLAIN</b>	To make plain or clear; illustrate; rationalize.
<b>IDENTIFY</b>	To point out or name objectives or types.
<b>INTERPRET</b>	To translate information from observation, charts, tables, graphs and written material.
<b>MAINTAIN</b>	To keep in a condition of good repair or efficiency.
<b>METHOD</b>	A means or manner of doing something that has procedures attached to it.
<b>OPERATE</b>	How an object works; to control or direct the functioning of.
<b>PROCEDURE</b>	A prescribed series of steps taken to accomplish an end.
<b>PURPOSE</b>	The reason for which something exists or is done, made or used.

## Glossary of Terms *(continued)*

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<b>SERVICE</b>	<p>Routine inspection and replacement of worn or deteriorating parts.</p> <p>An act or business function provided to a customer in the course of an individual's profession (e.g., haircut).</p>
<b>TECHNIQUE</b>	<p>Within a procedure, the manner in which technical skills are applied.</p>
<b>TEST</b>	<p>v. To subject to a procedure that ascertains effectiveness, value, proper function or other quality.</p> <p>n. A way of examining something to determine its characteristics or properties, or to determine whether or not it is working correctly.</p>

## Essential Skills Profiles

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Through extensive research, the Government of Canada and other national and international agencies have identified and validated key essential skills for the workplace. These skills are used in nearly every job and at different levels of complexity. They provide the foundation for learning all other skills and enable people to evolve with their jobs and adapt to workplace change.

Essential Skills Profiles describe how workers in various occupations use each of the key essential skills. They include:

- a brief description of the occupation;
- examples of tasks that illustrate how each essential skill is applied; and,
- complexity ratings that indicate the level of difficulty of the example tasks.

Essential Skills profiles can be found on the Employment and Social Development Canada (ESDC) website at [www.esdc.gc.ca/eng/jobs/les/profiles/index.shtml](http://www.esdc.gc.ca/eng/jobs/les/profiles/index.shtml)

The development and improvement of these Essential Skills is inherent throughout the apprenticeship training program as apprentices work towards achieving journey person status.

## Profile Chart

<b>PERFORMS COMMON OCCUPATIONAL SKILLS</b>			
IMM-105 Safety	IMM-110 Hand and Portable Power Tools	IMM-115 Stationary Tools and Equipment	IMM-120 Access and Fall Protection Awareness
IMM-125 Lubricants	IMM-130 Measuring and Layout	IMM-135 Metallurgy & Metals	IMM-140 Oxy-Fuel Cutting and Welding
IMM-145 Plasma Arc Cutting	IMM-155 Communication and Trade Documentation	IMM-160 Work Planning	IMM-165 Fasteners and Retainers
IMM-170 Mechanical Drawings	IMM-200 Shafts, Bearings and Seals	IMM-225 Shielded Metal Arc Welding (SMAW)	IMM-230 Gas Metal Arc Welding (GMAW)
IMM-235 Gas Tungsten Arc Welding (GTAW)	MENT-700 Mentoring I		
<b>PERFORMS RIGGING, HOISTING/LIFTING AND MOVING</b>			
IMM-150 Rigging, Hoisting, Lifting and Moving			
<b>SERVICES MECHANICAL POWER TRANSMISSION COMPONENTS AND SYSTEMS</b>			
IMM-200 Shafts, Bearings and Seals	IMM-205 Couplings, Clutches and Brakes	IMM-210 Chain and Belt Drive Systems	IMM-215 Gear Systems
IMM-220 Shaft Alignment I	IMM-300 Shaft Alignment II	IMM-400 Prime Movers	
<b>SERVICES MATERIAL HANDLING/PROCESS SYSTEMS</b>			
IMM-305 Fans and Blowers	IMM-310 Pumps	IMM-315 Compressors	IMM-320 Process Piping
IMM-325 Process Tanks and Containers	IMM-405 Conveying Systems	IMM-440 Robotics and Automated Equipment	
<b>SERVICES FLUID POWER SYSTEMS</b>			
IMM-330 Hydraulic Systems	IMM-335 Pneumatic and Vacuum Systems		

## Profile Chart *(continued)*

PERFORMS PREVENTATIVE AND PREDICTIVE MAINTENANCE, COMMISSIONING AND DECOMMISSIONING			
IMM-410 Preventative and Predictive Maintenance	IMM-415 Vibration Analysis	IMM-420 Balancing	IMM-425 Non-Destructive Testing (NDT)
IMM-430 Fluid Analysis	IMM-435 Commissioning and Decommissioning		

## Recommended Atlantic Level Structure

### Level 1 - 8 Weeks

Unit Code	Unit Title	Sugg Hrs*	Pg #	Practical Objectives*
MENT-700	Mentoring I	6	18	N/A
IMM-105	Safety	15	20	<ol style="list-style-type: none"> <li>1. Perform lock-out and tag-out procedures.</li> <li>2. Demonstrate hazard identification.</li> </ol>
IMM-110	Hand and Portable Power Tools	18	23	Inspect, use and maintain hand and portable power tools.
IMM-115	Stationary Tools and Equipment	30	25	Use stationary tools and equipment (calculate speeds and feeds; adjust clearances; face, turn & mill work piece to specific tolerance; layout, drill & tap holes).
IMM-120	Access and Fall Protection Awareness	12	27	N/A
IMM-125	Lubricants	12	29	N/A
IMM-130	Measuring and Layout	30	31	<ol style="list-style-type: none"> <li>1. Select and use measuring tools and equipment.</li> <li>2. Read and interpret measurements.</li> <li>3. Transfer measurements to components, work area and material.</li> <li>4. Take inside and outside measurements.</li> </ol>
IMM-135	Metallurgy and Metals	18	34	Fabricate and heat treat a test piece.
IMM-140	Oxy-Fuel Cutting and Welding	12	36	Demonstrate safe use of oxy-fuel equipment.
IMM-145	Plasma Arc Cutting	6	38	Demonstrate safe use of plasma arc equipment.
IMM-150	Rigging, Hoisting, Lifting and Moving	24	40	<ol style="list-style-type: none"> <li>1. Tie basic knots.</li> <li>2. Rig and lift a load.</li> </ol>
IMM-155	Communication & Trade Documentation	3	43	N/A
IMM-160	Work Planning	6	45	N/A
IMM-165	Fasteners and Retainers	18	47	Drill, tap and torque exercise.
IMM-170	Mechanical Drawings	30	49	<ol style="list-style-type: none"> <li>1. Create sketch using a blueprint/drawing as a starting point.</li> <li>2. Interpret and extract information from drawings.</li> </ol>

### Level 2 - 7 Weeks

Unit Code	Unit Title	Sugg Hrs*	Pg #	Practical Objectives*
IMM-200	Shafts, Bearings and Seals	30	54	Heat, install and remove a bearing.
IMM-205	Couplings, Clutches and Brakes	30	56	N/A
IMM-210	Chain and Belt Drive Systems	30	59	<ol style="list-style-type: none"> <li>1. Align sheaves and sprockets.</li> <li>2. Break and install drive chain.</li> </ol>

Unit Code	Unit Title	Sugg Hrs*	Pg #	Practical Objectives*
IMM-215	Gear Systems	30	62	N/A
IMM-220	Shaft Alignment I	30	65	1. Perform rough alignment. 2. Perform rim and face dial alignment.
IMM-225	Shielded Metal Arc Welding (SMAW)	20	67	Set up and perform a weld using SMAW equipment.
IMM-230	Gas Metal Arc Welding (GMAW)	20	69	Set up and perform a weld using GMAW equipment.
IMM-235	Gas Tungsten Arc Welding (GTAW)	20	71	Set up and perform a weld using GTAW equipment.

### Level 3 - 7 Weeks

Unit Code	Unit Title	Sugg Hrs*	Pg #	Practical Objectives*
IMM-300	Shaft Alignment II	24	74	1. Perform a reverse dial alignment. 2. Perform a laser alignment.
IMM-305	Fans and Blowers	24	76	N/A
IMM-310	Pumps	24	78	1. Disassemble a pump. 2. Install seals and packing. 3. Set clearances.
IMM-315	Compressors	24	81	N/A
IMM-320	Process Piping	30	83	1. Thread pipe using handheld die and threading machine. 2. Fabricate and assemble piping system.
IMM-325	Process Tanks and Containers	12	86	N/A
IMM-330	Hydraulic Systems	54	89	Assemble, operate and troubleshoot a hydraulic circuit.
IMM-335	Pneumatic and Vacuum Systems	18	92	Assemble, operate and troubleshoot a pneumatic or vacuum system.

### Level 4 - 6 Weeks

Unit Code	Unit Title	Sugg Hrs*	Pg #	Practical Objectives*
IMM-400	Prime Movers	30	98	N/A
IMM-405	Conveying Systems	30	100	
IMM-410	Preventative and Predictive Maintenance	18	103	N/A
IMM-415	Vibration Analysis	15	106	Read and interpret vibration data.
IMM-420	Balancing	15	108	N/A
IMM-425	Non-Destructive Testing	12	110	Perform a dye penetrant test.
IMM-430	Fluid Analysis	12	112	Perform a visual inspection of oil sample.
IMM-435	Commissioning and Decommissioning	6	114	N/A
IMM-440	Robotics and Automated Equipment	6	116	N/A
MENT-701	Mentoring II	6	118	N/A
IMM-450	Program Review	30	120	N/A

\***Suggested Hours:** The time it should take to cover the unit (a guide only).

\***Practical Objectives:** The tasks/skills apprentices must be exposed to during technical training. An individual or group performance of the task/skill is recommended; if not possible, an instructor demonstration is acceptable. Training Providers should use practical, hands-on learning whenever possible, whether identified in the curriculum as a practical objective or not.

## 2017 RSOS Sub-task to AACS Unit Comparison

RSOS Sub-task		AACS Unit	
<b>Task A-1 - Performs safety-related functions</b>			
1.01	Uses personal protective equipment (PPE) and safety equipment.	IMM-105	Safety
1.02	Maintains safe worksite.	IMM-105	Safety
1.02	Protects the environment.	IMM-105	Safety
1.04	Performs lock-out/tag-out and zero energy procedures.	IMM-105	Safety
<b>Task A-2 - Uses tools and equipment</b>			
2.01	Uses hand and portable power tools.	IMM-110	Hand and Portable Power Tools
2.02	Uses shop machines.	IMM-115	Stationary Tools and Equipment
2.03	Uses access equipment.	IMM-120	Access and Fall Protection Awareness
<b>Task A-3 - Performs routine trade tasks</b>			
3.01	Plans work.	IMM-160	Work Planning
3.02	Fabricates workpiece.	IMM-115	Stationary Tools and Equipment
		IMM-135	Metallurgy and Metals
3.03	Lubricates systems and components.	IMM-200	Shafts, Bearings and Seals
3.04	Performs leveling of components and systems.	IMM-130	Measuring and Layout
3.05	Uses fastening and retaining devices.	IMM-165	Fasteners and Retainers
3.06	Performs material identification.	IMM-135	Metallurgy and Metals
3.07	Performs heat treatment of metal.	IMM-135	Metallurgy and Metals
3.08	Uses mechanical drawings and schematics.	IMM-170	Mechanical Drawings
<b>Task A-4 - Uses communication and mentoring techniques</b>			
4.01	Uses communication techniques.	IMM-155	Communication and Trade Documentation
4.02	Uses mentoring techniques.	MENT-700	Mentoring I
<b>Task A-5 - Performs measuring and layout</b>			
5.01	Prepares work area, tools and materials.	IMM-130	Measuring and Layout
		IMM-135	Metallurgy and Metals
5.02	Measures material and components.	IMM-130	Measuring and Layout
5.03	Lays out components.	IMM-130	Measuring and Layout
5.04	Maintains precision measuring and layout tools.	IMM-130	Measuring and Layout
<b>Task A-6 - Performs cutting and welding operations</b>			
6.01	Cuts material with gas and plasma arc cutting equipment.	IMM-140	Oxy-Fuel Cutting and Welding

RSOS Sub-task		AACCS Unit	
		IMM-145	Plasma Arc Cutting
6.02	Joins material using oxy-fuel welding equipment.	IMM-140	Oxy-Fuel Cutting and Welding
6.03	Welds material using arc welding equipment (SMAW).	IMM-225	Shielded Metal Arc Welding (SMAW)
6.04	Welds material with gas metal arc welding (GMAW) equipment.	IMM-230	Gas Metal Arc Welding (GMAW)
6.05	Welds material with gas tungsten arc welding (GTAW) equipment.	IMM-235	Gas Tungsten Arc Welding (GTAW)
6.06	Maintains welding equipment.	IMM-140	Oxy-Fuel Cutting and Welding
<b>Task B-7 - Plans rigging, hoisting/lifting and moving</b>			
7.01	Determines load.	IMM-150	Rigging, Hoisting, Lifting & Moving
7.02	Selects rigging equipment.	IMM-150	Rigging, Hoisting, Lifting & Moving
7.03	Selects hoisting/lifting and moving equipment.	IMM-150	Rigging, Hoisting, Lifting & Moving
7.04	Secures area.	IMM-150	Rigging, Hoisting, Lifting & Moving
<b>Task B-8 - Rigs, hoists/lifts and moves load</b>			
8.01	Sets up rigging, hoisting/lifting and moving equipment.	IMM-150	Rigging, Hoisting, Lifting & Moving
8.02	Performs hoist/lift and move.	IMM-150	Rigging, Hoisting, Lifting & Moving
8.03	Maintains rigging, hoisting/lifting and moving equipment.	IMM-150	Rigging, Hoisting, Lifting & Moving
<b>Task C-9 - Services prime movers</b>			
9.01	Installs prime movers.	IMM-400	Prime Movers
9.02	Diagnoses prime movers.	IMM-400	Prime Movers
9.03	Maintains prime movers.	IMM-400	Prime Movers
9.04	Repairs prime movers.	IMM-400	Prime Movers
<b>Task C-10 - Services shafts, bearings and seals</b>			
10.01	Installs shafts, bearings and seals.	IMM-200	Shafts, Bearings and Seals
10.02	Diagnoses shafts, bearings and seals.	IMM-200	Shafts, Bearings and Seals
10.03	Maintains shafts, bearings and seals.	IMM-200	Shafts, Bearings and Seals
10.04	Repairs shafts, bearings and seals.	IMM-200	Shafts, Bearings and Seals
<b>Task C-11 - Services couplings, clutches and brakes</b>			
11.01	Installs couplings, clutches and brakes.	IMM-205	Couplings, Clutches and Brakes
11.02	Diagnoses couplings, clutches and brakes.	IMM-205	Couplings, Clutches and Brakes
11.03	Maintains couplings, clutches & brakes.	IMM-205	Couplings, Clutches and Brakes
11.04	Repairs couplings, clutches and brakes.	IMM-205	Couplings, Clutches and Brakes

RSOS Sub-task		AACCS Unit	
<b>Task C-12 - Services chains and belt drive systems</b>			
12.01	Installs chain and belt drive systems.	IMM-210	Chain and Belt Drive Systems
12.02	Diagnoses chain and belt drive systems.	IMM-210	Chain and Belt Drive Systems
12.03	Maintains chains and belt drive systems.	IMM-210	Chain and Belt Drive Systems
12.04	Repairs chains and belt drive systems.	IMM-210	Chain and Belt Drive Systems
<b>Task C-13 - Services gear systems</b>			
13.01	Installs gear systems.	IMM-215	Gear Systems
13.02	Diagnoses gear systems.	IMM-215	Gear Systems
13.02	Maintains gear systems.	IMM-215	Gear Systems
13.04	Repairs gear systems.	IMM-215	Gear Systems
<b>Task C-14 - Performs shaft alignment procedures</b>			
14.01	Performs rough alignment.	IMM-220	Shaft Alignment I
14.02	Performs dial alignment.	IMM-220	Shaft Alignment I
		IMM-300	Shaft Alignment II
14.03	Performs laser and optical alignment.	IMM-300	Shaft Alignment II
<b>Task D-15 - Services robotics and automated equipment</b>			
15.01	Installs robotics and automated equipment.	IMM-440	Robotics and Automated Equipment
15.02	Diagnoses robotics & automated equipment.	IMM-440	Robotics and Automated Equipment
15.03	Maintains robotics & automated equipment.	IMM-440	Robotics and Automated Equipment
15.04	Repairs robotics and automated equipment.	IMM-440	Robotics and Automated Equipment
<b>Task D-16 - Services fans and blowers</b>			
16.01	Installs fans and blowers.	IMM-305	Fans and Blowers
16.02	Diagnoses fans and blowers.	IMM-305	Fans and Blowers
16.03	Maintains fans and blowers.	IMM-305	Fans and Blowers
16.04	Repairs fans and blowers.	IMM-305	Fans and Blowers
<b>Task D-17 - Services pumps</b>			
17.01	Installs pumps.	IMM-310	Pumps
17.02	Diagnoses pumps.	IMM-310	Pumps
17.03	Maintains pumps.	IMM-310	Pumps
17.04	Repairs pumps.	IMM-310	Pumps
<b>Task D-18 - Services compressors</b>			
18.01	Installs compressors.	IMM-315	Compressors
18.02	Diagnoses compressors.	IMM-315	Compressors
18.03	Maintains compressors.	IMM-315	Compressors
18.04	Repairs compressors.	IMM-315	Compressors
<b>Task D-19 - Services process piping, tanks and containers</b>			

RSOS Sub-task		AACCS Unit	
19.01	Installs process tanks and containers.	IMM-325	Process Tanks and Containers
19.02	Installs process piping.	IMM-320	Process Piping
19.03	Diagnoses process tanks and containers.	IMM-325	Process Tanks and Containers
19.04	Diagnoses process piping.	IMM-320	Process Piping
19.05	Maintains process tanks and containers.	IMM-325	Process Tanks and Containers
19.06	Maintains process piping.	IMM-320	Process Piping
19.07	Repairs process tanks and containers.	IMM-325	Process Tanks and Containers
19.08	Repairs process piping.	IMM-320	Process Piping
<b>Task D-20 - Services conveying systems</b>			
20.01	Installs conveying systems.	IMM-405	Conveying Systems
20.02	Diagnoses conveying systems.	IMM-405	Conveying Systems
20.03	Maintains conveying systems.	IMM-405	Conveying Systems
20.04	Repairs conveying systems.	IMM-405	Conveying Systems
<b>Task E-21 - Services hydraulic systems</b>			
21.01	Installs hydraulic systems.	IMM-330	Hydraulic Systems
21.02	Diagnoses hydraulic systems.	IMM-330	Hydraulic Systems
21.03	Maintains hydraulic systems.	IMM-330	Hydraulic Systems
21.04	Repairs hydraulic systems.	IMM-330	Hydraulic Systems
<b>Task E-22 - Services pneumatic and vacuum systems</b>			
22.01	Installs pneumatic and vacuum systems.	IMM-335	Pneumatic and Vacuum Systems
22.02	Diagnoses pneumatic & vacuum systems.	IMM-335	Pneumatic and Vacuum Systems
22.03	Maintains pneumatic & vacuum systems.	IMM-335	Pneumatic and Vacuum Systems
22.04	Repairs pneumatic & vacuum systems.	IMM-335	Pneumatic and Vacuum Systems
<b>Task F-23 - Performs preventative and predictive maintenance</b>			
23.01	Performs preventative maintenance activities.	IMM-410	Preventative and Predictive Maintenance
23.02	Performs vibration analysis procedures.	IMM-415	Vibration Analysis
23.03	Performs balancing procedures.	IMM-420	Balancing
23.04	Performs non-destructive evaluation procedures.	IMM-425	Non-Destructive Testing
23.05	Performs fluid analysis procedures.	IMM-430	Fluid Analysis
23.06	Performs predictive maintenance activities.	IMM-410	Preventative & Predictive Maintenance
<b>Task F-24 - Commissions and decommissions equipment</b>			
24.01	Commissions systems and components.	IMM-435	Commissioning & Decommissioning
24.02	Decommissions systems & components.	IMM-435	Commissioning & Decommissioning

# LEVEL 1

Unit Code	Title	Hours	Page
MENT-700	Mentoring I	6	18
IMM-105	Safety	15	20
IMM-110	Hand and Portable Power Tools	18	23
IMM-115	Stationary Tools and Equipment	30	25
IMM-120	Access and Fall Protection Awareness	12	27
IMM-125	Lubricants	12	29
IMM-130	Measuring and Layout	30	31
IMM-135	Metallurgy and Metals	18	34
IMM-140	Oxy-Fuel Cutting and Welding	12	36
IMM-145	Plasma Arc Cutting	6	38
IMM-150	Rigging, Hoisting, Lifting and Moving	24	40
IMM-155	Communication and Trade Documentation	3	43
IMM-160	Work Planning	6	45
IMM-165	Fasteners and Retainers	18	47
IMM-170	Mechanical Drawings	30	49

## **MENT-700      Mentoring I**

### **Learning Outcomes:**

- Demonstrate knowledge of effective communication practices as a learner.
- Demonstrate knowledge of strategies for learning skills in the workplace.

### **Red Seal Occupational Standard Reference:**

4.01 Uses communication techniques

4.02 Uses mentoring techniques

### **Suggested Hours:**

6 hours

### **Theoretical Objectives:**

1. Describe the importance of one's own individual experiences.
2. Identify behaviours that demonstrate positive learning experiences.
3. Identify the benefits of workplace mentoring for the apprentice, mentor, and employer.
4. Identify the partners involved in apprenticeship training.
5. Describe the shared responsibilities for workplace learning in apprenticeship.
6. Identify different learning needs and strategies to address challenges or barriers in the workplace.
  - i) learning disabilities
  - ii) language
  - iii) underrepresentation
7. Identify the components that create a positive and inclusive workplace culture.
  - i) workplace characteristics

- ii) individual behaviours
- 8. Identify various learning styles and determine one's own learning preferences.
- 9. Explain how learning preferences impact learning new skills.
- 10. Identify different learning strategies to meet individual learning needs.
- 11. Describe the importance of adapting to a variety of teaching and learning methods in the workplace.
- 12. Identify techniques for effective communication as a learner.
  - i) verbal and non-verbal
  - ii) active listening
- 13. Identify and describe personal responsibilities and attitudes that contribute to on-the-job success.
  - i) self advocating
  - ii) asking questions
  - iii) accepting constructive feedback
  - iv) working safely
  - v) employing time management techniques and being punctual

**Practical Objectives:**

N/A

## **IMM-105            Safety**

### **Learning Outcomes:**

- Demonstrate knowledge of personal protective equipment (PPE) and safety equipment, their applications, maintenance and procedures for use.
- Demonstrate knowledge of safe work practices.
- Demonstrate knowledge of regulatory requirements pertaining to environmental safety and protection.
- Demonstrate knowledge of the procedures and potential hazards associated with lock-out/tag-out and zero energy state procedures.

### **2017 Red Seal Occupational Standard Reference:**

- 1.01 Uses personal protective equipment (PPE) and safety equipment.
- 1.02 Maintains safe work environment.
- 1.03 Protects the environment.
- 1.04 Performs lock-out/tag-out and zero energy procedures.

### **Suggested Hours:**

15 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with safety in the worksite.
2. Identify hazards and describe safe work practices.
  - i) job hazard assessment
  - ii) procedures to maintain a safe worksite
  - iii) rigging, hoisting, lifting and moving
  - iv) inert gases, oxy-fuel cutting, heating, welding, brazing and soldering
  - v) working in confined spaces
  - vi) working at heights
  - vii) working around energized equipment
  - viii) personal ergonomics
3. Interpret jurisdictional regulations.

- i) workplace health and safety
  - ii) rigging, hoisting/lifting and moving
  - iii) inert gases, oxy-fuel cutting, heating, welding, brazing and soldering
  - iv) working in confined spaces
  - v) working at heights
  - vi) working around energized equipment
  - vii) mobile equipment
4. Identify types of PPE and clothing, and describe their characteristics, applications and procedures.
- i) safety glasses (face shield)
  - ii) respirators
  - iii) hardhats
  - iv) footwear
  - v) gloves
  - vi) coveralls
  - vii) acid suits
  - viii) personal monitors
  - ix) fall protection
  - x) hearing protection
  - xi) high-visibility clothing
5. Identify types of safety equipment, and describe their characteristics, applications and procedures for use.
- i) lockout devices
  - ii) fire extinguishers
  - iii) gas detectors
  - iv) fall protection equipment and devices
6. Describe the procedures used to care for, inspect, maintain and store safety equipment and PPE.
7. Identify environmental hazards, assess risks and describe the procedures used to protect the environment.
8. Identify how to access current information on site specifications and jurisdictional regulations.
9. Identify reporting requirements and procedures.

10. Identify energy potential in machines, process systems and components and methods to verify zero energy state.
11. Describe the procedures used to lock-out and tag-out equipment and to return to zero energy state.
12. Identify and describe situations where zero energy state cannot be achieved.
13. Identify and describe potential outcomes of not following procedures used to lock-out and tag-out equipment and to return to zero energy state.

Practical Objectives

1. Demonstrate ability to perform lock-out and tag-out procedures.
2. Demonstrate hazard identification.

## **IMM-110            Hand and Portable Power Tools**

### **Learning Outcomes:**

- Demonstrate knowledge of hand tools, their applications and procedures for use.
- Demonstrate knowledge of the procedures used to maintain and store hand tools.
- Demonstrate knowledge of portable power tools, their applications and procedures for use.
- Demonstrate knowledge of the procedures used to maintain and store portable power tools.
- Demonstrate knowledge of safety practices related to hand and portable power tools.

### **2017 Red Seal Occupational Standard Reference:**

2.01    Uses hand and portable power tools.

### **Suggested Hours:**

18 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1.     Define terminology associated with hand tools and portable power tools.
2.     Identify hazards and describe safe work practices pertaining to the use of hand and portable power tools.
3.     Interpret jurisdictional regulations, and manufacturers' specifications pertaining to hand tools and portable power tools.
  - i)     federal
  - ii)    provincial/territorial
  - iii)   municipal
  - iv)    site specific
  - v)     International Organization for Standards (ISO) procedures
  - vi)    Canadian Nuclear Safety Commission (CNSC)

4. Identify types of hand tools, and describe their applications and procedures for use.
  - i) wrenches
  - ii) screwdrivers
  - iii) measuring tools
  - iv) hammers
  - v) pry bars
  - vi) hand saws
  
5. Identify types of portable power tools, and describe their applications and procedures for use.
  - i) grinders
  - ii) power metal saws
  - iii) drilling machines
  - iv) wrenches
    - hydraulic
    - impact
  - v) portable hydraulic unit
  - vi) pneumatic tools
  - vii) explosive actuated tools
  - viii) portable milling machine
  
6. Describe the procedures used to clean and inspect hand tools.
  
7. Describe the procedures used to maintain and store hand tools.
  
8. Describe the procedures used to clean, inspect, maintain and store portable power tools.

Practical Objectives

1. Inspect, use and maintain hand and portable power tools.

## **IMM-115                      Stationary Tools and Equipment**

### **Learning Outcomes:**

- Demonstrate knowledge of shop machines, their applications and procedures for use, safety practices, associated calculations, cleaning, inspection, maintenance and storage.

### **2017 Red Seal Occupational Standard Reference:**

- 2.02 Uses shop machines.
- 3.02 Fabricates workpiece.

### **Suggested Hours:**

30 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Identify hazards and describe safe work practices pertaining to shop machines.
2. Identify types of shop machines and their components.
  - i) drill presses
  - ii) pedestal grinders
  - iii) surface and cylindrical grinders
  - iv) abrasive and cold cutoff saws
  - v) band saws
  - vi) lathes
  - vii) milling machines
  - viii) ironworker
  - ix) slip-roll and brakes
  - x) sandblasters
  - xi) shears
  - xii) hydraulic press
  - xiii) arbour press
3. Describe the procedures used to perform grinding operations.

- i) select grinding wheels
  - ii) change, ring test, mount and dress grinding wheels
4. Describe the procedures used to perform cutting operations using power metal saws.
- i) select cutting fluids and coolants
  - ii) select saw blades
  - iii) change saw blades and tension
  - iv) select saw feed and speed
5. Describe the procedures used to perform drilling operations.
- i) select cutting fluids and coolants
  - ii) calculate speeds and feeds for drilling operations
6. Describe the procedures used to perform basic lathe operations.
- i) set up and align work pieces
  - ii) prevent and correct problems during lathe operations
  - iii) select tool holding and work holding devices,
  - iv) select lathe tools
  - v) sharpen lathe cutting tools
  - vi) calculate and determine speeds, feeds and depth of cut
  - vii) select cutting fluids and coolants
7. Describe the procedures used to perform milling operations.
- i) select cutting fluids and coolants
  - ii) select tool holding and work holding devices
  - iii) select cutting tools
  - iv) calculate and determine speeds, feeds and depth of cut

Practical Objectives

1. Use stationary tools and equipment.
- i) calculate speeds and feeds
  - ii) face, turn and mill work piece to specific tolerance
  - iii) layout, drill and tap holes

## **IMM-120            Access and Fall Protection Awareness**

### **Learning Outcomes:**

- Demonstrate knowledge of access equipment and fall protection equipment, their applications, procedures and limitations.

### **2017 Red Seal Occupational Standard Reference:**

2.03    Uses access equipment.

### **Suggested Hours:**

12 Hours

### **Objectives and Content:**

#### *Theoretical Objectives*

1. Define terminology associated with access equipment and fall protection equipment.
2. Identify hazards and describe safe work practices pertaining to access equipment and fall protection equipment.
3. Interpret jurisdictional regulations pertaining to access equipment and fall protection equipment.
  - i) federal
  - ii) provincial/territorial
  - iii) municipal
  - iv) site specific
  - v) International Organization for Standards (ISO) procedures
  - vi) Canadian Nuclear Safety Commission (CNSC)
4. Identify types of access equipment, and describe their characteristics and applications.
  - i) powered mobile equipment (PME)
  - ii) ladders
  - iii) scaffolds

5. Identify types of fall protection equipment, and describe their applications and procedures for use.
6. Describe the procedures used to erect and dismantle ladders and scaffolding.
7. Describe the procedures used to inspect and maintain access equipment and fall protection equipment.

Practical Objectives

None

## **IMM-125            Lubricants**

### **Learning Outcomes:**

- Demonstrate knowledge of lubricants, lubrication systems and their components, applications and procedures for use.
- Demonstrate knowledge of the procedures used to handle, store, recycle and dispose of lubricants.
- Demonstrate knowledge of safety practices related to lubricants and lubricant systems.

### **2017 Red Seal Occupational Standard Reference:**

3.03 Lubricates systems and components.

### **Suggested Hours:**

12 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with lubricants and lubrication systems.
2. Identify hazards and describe safe work practices pertaining to lubricants and lubrication systems.
  - i) environmental
  - ii) personal health
  - iii) fire
  - iv) contamination
  - v) housekeeping issues
  - vi) using personal protective equipment (PPE)
  - vii) disposing according to jurisdictional requirements
  - viii) spill response procedures and reporting
  - ix) storing materials.
3. Interpret jurisdictional regulations and specifications pertaining to lubricants and lubrication systems.

- i) storage
  - ii) recycling
  - iii) disposal
4. Identify types of lubricants and lubrication systems, and describe their characteristics and applications.
- i) oil
  - ii) grease
  - iii) dry solid
  - iv) water
  - v) once through
  - vi) oil bath
  - vii) oil mist
  - viii) manual
  - ix) enclosed circulating
  - x) pressurized
  - xi) automated
5. Identify maintenance and troubleshooting procedures for lubrication systems.
6. Identify tools and equipment used with lubricants and lubrication systems, and describe their applications and procedures.
7. Explain the principles and types of friction, and their effects on surfaces in contact.
8. Identify the properties and characteristics of lubricants.
9. Identify the factors to consider when selecting lubricants.
10. Explain the effects of using incorrect lubricant.
11. Identify sources of information relating to system lubricant and lubrication requirements.
12. Describe the effect of lubricant levels on machine operation.

Practical Objectives

None

## IMM-130            Measuring and Layout

### Learning Outcomes:

- Demonstrate knowledge of the procedures used to level and align equipment.
- Demonstrate knowledge of the procedures used to maintain, calibrate and store precision measuring and layout tools.
- Demonstrate knowledge of measuring and layout and their applications.
- Demonstrate knowledge of the procedures used to perform layout operations.
- Demonstrate knowledge of precision measuring and layout tools, their applications and procedures.

### 2017 Red Seal Occupational Standard Reference:

- 3.04 Performs leveling of components and systems.
- 5.01 Prepares work area, tools and materials.
- 5.02 Measures material and components.
- 5.03 Lays out components.
- 5.04 Maintains precision measuring and layout tools.

### Suggested Hours:

30 Hours

### Objectives and Content:

#### Theoretical Objectives

1. Define terminology associated with equipment leveling and alignment, measuring and layout.
2. Identify hazards and describe safe work practices pertaining to leveling, alignment, measuring and layout procedures, and their use.
3. Identify measuring and layout tools and equipment and describe their application and procedures.
  - i) equipment leveling and alignment
    - theodolites
    - levels (optical, laser, spirit)

- piano wire
- plumb bob
- ii) precision measuring tools
  - micrometers
  - calipers
  - dial indicators
  - protractors
  - vernier height gauges
  - feeler gauges
  - plug, ring and snap gauges
  - gauge blocks
  - theodolites
  - transits
  - total station
- iii) layout tools
  - straightedges
  - squares
  - combination sets
  - surface plates
  - scribes
  - hermaphrodite calipers
  - dividers
  - trammels
  - prick and centre punches
  - angle plates
  - parallels
  - v-blocks
  - surface gauges
  - layout dye

4. Identify types of bases used and describe their applications.

- i) base plate
- ii) sole plate
- iii) fabricated
- iv) skid mounted

5. Describe the procedures used to level and align equipment.

6. Describe the procedures to inspect, maintain, calibrate and store precision measuring and layout tools.

7. Describe the procedures used to lay out equipment and components.
8. Describe the procedures used to transfer and document measurements.
9. Interpret information from precision measuring tools.

Practical Objectives

1. Select and use measuring tools and equipment.
2. Read and interpret measurements.
3. Transfer measurements to components, work area and material.
4. Take inside and outside measurements.

## IMM-135 Metallurgy & Metals

### Learning Outcomes:

- Demonstrate knowledge of metals and their characteristics.
- Demonstrate knowledge of metallurgic principles.
- Demonstrate knowledge of structural shapes and their applications.
- Demonstrate knowledge of processes used in the heat treatment of metals.
- Demonstrate knowledge of safety practices related to heat treatment of metal.

### 2017 Red Seal Occupational Standard Reference:

- 3.02 Fabricates workpiece.
- 3.06 Performs material identification.
- 3.07 Performs heat treatment of metal.

### Suggested Hours:

18 Hours

### Objectives and Content:

#### Theoretical Objectives

1. Define terminology associated with metallurgy and non-metallic materials.
2. Define terminology associated with heat treatment of metal.
3. Interpret jurisdictional regulations pertaining to heat treatment of metal.
4. Describe the properties of metals.
  - i) hardness
  - ii) colour
  - iii) malleability
  - iv) embeddability
  - v) ductility
  - vi) conductivity
5. Describe the identification systems for metals.

6. Identify the methods and processes used in the manufacture of steel and alloys.
7. Describe the problems that can occur when working metals.
  - i) stress
  - ii) contraction
  - iii) expansion
  - iv) distortion
  - v) work hardening
  - vi) galvanic action
8. Describe the procedures used to prevent and correct problems that occur when working metals.
9. Identify structural shapes, and describe their characteristics and applications.
10. Identify types of heat treating equipment and accessories, and describe their applications.
11. Describe the procedures used in the heating of metal.
  - i) stress relieving
  - ii) hardening
  - iii) annealing
  - iv) tempering
  - v) normalizing
  - vi) quenching
12. Identify hazards and describe safe work practices pertaining to heat treatment of metal.
  - i) personal
  - ii) shop/facility
  - iii) equipment
  - iv) ventilation
  - v) storage

### Practical Objectives

1. Fabricate and heat treat a test piece.

## IMM-140            Oxy-Fuel Cutting and Welding

### Learning Outcomes:

- Demonstrate knowledge of oxy-fuel equipment and accessories.
- Demonstrate knowledge of the procedures used to cut with oxy-fuel.
- Demonstrate knowledge of safety practices related to oxy-fuel cutting, heating, welding, brazing, soldering.
- Demonstrate knowledge of the procedures used to heat, weld, solder and braze with oxy-fuel equipment.

### 2017 Red Seal Occupational Standard Reference:

- 6.01 Cuts material with gas and plasma arc cutting equipment.
- 6.02 Joins material using oxy-fuel welding equipment.
- 6.06 Maintains welding equipment.

### Suggested Hours:

12 Hours

### Objectives and Content:

#### Theoretical Objectives

1. Define terminology associated with oxy-fuel cutting, heating and welding.
2. Identify hazards and describe safe work practices pertaining to oxy-fuel cutting, oxy-fuel heating, welding, brazing and soldering.
  - i) personal
  - ii) shop/facility
  - iii) equipment
  - iv) ventilation
  - v) storage, handling and transportation
  - vi) pressures and tank safety
3. Interpret jurisdictional and site regulations pertaining to oxy-fuel cutting, heating, welding, brazing and soldering.

4. Identify types of oxy-fuel cutting, heating, welding, brazing and soldering equipment and accessories, and describe their applications.
5. Describe the procedures used to set up, adjust and shut down oxy-fuel equipment.
  - i) adjusting flame characteristics (carburizing, neutral and oxidizing)
  - ii) assembling equipment
  - iii) adjusting pressures
6. Describe the procedures used to inspect and maintain and repair oxy-fuel equipment.
7. Describe the procedures used to cut, heat, weld, braze and solder materials using oxy-fuel equipment.
8. Describe the procedures used to prepare materials using oxy-fuel equipment.

Practical Objectives

1. Demonstrate safe use of oxy-fuel equipment.

## **IMM-145            Plasma Arc Cutting**

### **Learning Outcomes:**

- Demonstrate knowledge of plasma arc equipment and accessories.
- Demonstrate knowledge of the procedures used to cut with plasma arc equipment.
- Demonstrate knowledge of safety practices related to plasma arc cutting.

### **2017 Red Seal Occupational Standard Reference:**

6.01 Cuts material with gas and plasma arc cutting equipment.

### **Suggested Hours:**

6 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with plasma arc cutting.
2. Identify hazards and describe safe work practices pertaining to plasma arc cutting.
3. Interpret jurisdictional regulations pertaining to plasma arc cutting.
4. Interpret information pertaining to plasma arc cutting found on drawings and specifications.
5. Describe the plasma arc cutting process and its applications.
6. Describe the procedures used to prepare materials when plasma arc cutting.
7. Identify plasma arc equipment and accessories, and describe their application.
8. Describe the procedures used to set up, adjust and shut down plasma arc equipment.

9. Describe the procedures used to inspect and maintain plasma arc equipment.

Practical Objectives

1. Demonstrate safe use of plasma arc equipment.

## IMM-150

## Rigging, Hoisting, Lifting and Moving

### Learning Outcomes:

- Demonstrate knowledge of rigging, hoisting, lifting and moving equipment, their applications, limitations and procedures for use.
- Demonstrate knowledge of calculations required when performing hoisting, lifting and moving operations.
- Demonstrate knowledge of safety practices related to rigging, hoisting/lifting and moving equipment.
- Demonstrate knowledge of the procedures used to perform rigging, hoisting/lifting and moving operations.
- Demonstrate knowledge of the use of standard hand signals.
- Demonstrate knowledge of the procedures used to maintain rigging, hoisting, lifting and moving equipment.

### 2017 Red Seal Occupational Standard Reference:

- 7.01 Determines load.
- 7.02 Selects rigging equipment.
- 7.03 Selects hoisting, lifting and moving equipment.
- 7.04 Secures area.
- 8.01 Sets up rigging, hoisting, lifting and moving equipment.
- 8.02 Performs hoist, lift and move.
- 8.03 Maintains rigging, hoisting, lifting and moving equipment.

### Suggested Hours:

24 Hours

### Objectives and Content:

#### Theoretical Objectives

1. Define terminology associated with rigging, hoisting, lifting and moving equipment and procedures.
2. Identify hazards and describe safe work practices.
  - i) company policies

- ii) site procedures
  - iii) jurisdictional regulations
  - iv) manufacturers' recommendations
  - v) hazard identification
    - suspended loads
    - blocking
3. Interpret jurisdictional regulations pertaining to rigging, hoisting, lifting and moving equipment and procedures.
4. Identify types of equipment and accessories, and describe their applications, limitations and procedures for use.
- i) rigging
  - ii) hoisting
  - iii) lifting
  - iv) moving
  - v) cribbing
5. Identify the factors to consider when selecting rigging, hoisting, lifting and moving equipment.
- i) weight (dry or wet)
  - ii) material, dimensions
  - iii) sling angles
  - iv) centre of gravity
  - v) environmental conditions
  - vi) working load limit
6. Describe the procedures used to determine the weight and weight distribution of loads.
- i) reference load charts
  - ii) determine types of loads
  - iii) engineered drawings
  - iv) nameplates
  - v) calculations
  - vi) scales
7. Describe the procedures used to rig material or equipment for hoisting, lifting and moving.
8. Describe the procedures used to ensure the work area is safe for lifting.

- i) barriers installed and tagged
  - ii) assessment of ground conditions
  - iii) non-congestion of the work area
  - iv) approach limits
  - v) obtain required permits
9. Identify types of knots, hitches and bends, and describe their applications.
10. Explain sling angle when preparing for rigging, hoisting, lifting and moving operations.
11. Describe the procedures used to perform a lift.
- i) planning
  - ii) environment analysis
  - iii) load determination
  - iv) communication methods
  - v) pre-lift checks
  - vi) placement of load
  - vii) post-lift inspection
  - viii) supervision of lift
  - ix) securing work area
12. Describe procedures used to communicate during hoisting, lifting and moving operations.
- i) hand signals
  - ii) radios
13. Describe the procedures used to inspect, maintain and store rigging, hoisting, lifting and moving equipment.

Practical Objectives

1. Tie basic knots.
2. Rig and lift a load.

**Learning Outcomes:**

- Demonstrate knowledge of effective communication practices.
- Demonstrate knowledge of trade related documentation and its use.

**2017 Red Seal Occupational Standard Reference:**

4.01 Uses communication techniques.

**Suggested Hours:**

3 Hours

**Objectives and Content:***Theoretical Objectives*

1. Identify various types of communication practices.
  - i) verbal
  - ii) hand signal
  - iii) written
  - iv) electronic
  
2. Identify types of trade related documentation, and describe their applications and procedures for use.
  - i) manufacturers' specifications
  - ii) safety/hazard assessment forms
  - iii) mill certificates
  - iv) heat numbers
  - v) customer specifications
  - vi) codes and standards
  - vii) manuals/catalogues
  - viii) work orders
  - ix) requisitions/purchase orders
  - x) permits
  - xi) procedure sheets

Practical Objectives

None

## **IMM-160            Work Planning**

### **Learning Outcomes:**

- Demonstrate knowledge of job planning.
- Demonstrate knowledge of the procedures used to plan and organize jobs.

### **2017 Red Seal Occupational Standard Reference:**

3.01 Plans work.

### **Suggested Hours:**

6 Hours

### **Objectives and Content:**

#### *Theoretical Objectives*

1. Define terminology associated with job planning.
2. Identify sources of information relevant to job planning.
  - i) procedures
  - ii) documentation
    - machine history
    - manufacturer documentation
  - iii) drawings
  - iv) related professionals
  - v) clients
  - vi) feedback
3. Identify the factors to consider for determining job requirements.
  - i) personnel
  - ii) tools and equipment
  - iii) materials
  - iv) permits
  - v) environmental
  - vi) time
  - vii) safety

- viii) priorities
- 4. Explain job sequencing, its application, and purpose in the job planning process.
- 5. Describe the procedures used to plan job tasks.
  - i) scheduling
  - ii) estimating
- 6. Describe the procedures used to organize and store tools, equipment and materials on-site.

Practical Objectives

None

## **IMM-165            Fasteners and Retainers**

### **Learning Outcomes:**

- Demonstrate knowledge of fastening and retaining devices, and their applications.
- Demonstrate knowledge of the procedures used to install and remove fastening and retaining devices.
- Demonstrate knowledge of safety practices related to fastening and retaining devices.

### **2017 Red Seal Occupational Standard Reference:**

3.05 Plans work.

### **Suggested Hours:**

18 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with fastening and retaining devices.
2. Identify hazards and describe safe work practices pertaining to the use of fastening and retaining devices.
3. Identify tools and equipment pertaining to the use of fastening and retaining devices, and describe their applications and procedures.
  - i) torque wrenches
  - ii) impact wrenches
  - iii) hydraulic tensioning devices
  - iv) hand tools (snap ring pliers, riveting tools)
4. Identify types of fastening devices and materials, and describe their characteristics and applications.
  - i) mechanical
  - ii) chemical

5. Identify strength of fasteners by grade and applications.
6. Identify types of retaining devices, and describe their characteristics and applications.
  - i) snap-rings
  - ii) pins
  - iii) keys
  - iv) set screws
  - v) locking tabs
  - vi) anchors
7. Identify thread types and classifications, and describe the procedures used for thread identification.
8. Explain the purpose of torquing and tensioning fastening devices, and describe associated procedures.
9. Describe the procedures used to install, remove and repair fastening devices.
10. Describe the procedures used to install and remove retaining devices.
11. Describe the procedures used to make internal and external threads to specifications.
  - i) external threading (dies)
  - ii) internal threading (taps)
  - iii) threading machines

Practical Objectives

1. Drill, tap and torque exercise.

## IMM-170            Mechanical Drawings

### Learning Outcomes:

- Demonstrate knowledge of drawings, their use and interpretation.
- Demonstrate knowledge of calculations relevant to drawings.
- Demonstrate knowledge of basic sketching techniques.

### 2017 Red Seal Occupational Standard Reference:

3.08 Plans work.

### Suggested Hours:

30 Hours

### Objectives and Content:

#### Theoretical Objectives

1. Define terminology associated with drawings.
  - i) civil/site
  - ii) engineered
  - iii) architectural
  - iv) mechanical
  - v) structural
  - vi) electrical
  - vii) shop drawings
  - viii) field drawings
  - ix) sketches
  - x) as-builts
  - xi) working
  - xii) piping and instrumentation diagram (P&ID)
  - xiii) installation
  - xiv) inspection and test plan (ITP)
  - xv) drawing assembly
  
2. Identify the views found on drawings, and describe their characteristics.
  - i) elevation

- ii) plan
  - iii) section
  - iv) detail
3. Interpret drawings and instructions on drawings.
  4. Interpret material specifications found on drawings.
  5. Identify the purposes for drawings
    - i) determine location of components
    - ii) determine the positioning of components
    - iii) determine elevation of components
  6. Describe the procedures used to perform calculations relevant to drawings.
  7. Identify the metric and imperial systems of measurement, and describe the procedures used to perform conversions between the systems.
  8. Identify drawing projections and describe their applications.
    - i) orthographic
    - ii) oblique
    - iii) isometric
    - iv) section
    - v) auxiliary
  9. Interpret and extract information from drawings.
    - i) dimensions
    - ii) lines
    - iii) legend
    - iv) symbols and abbreviations
    - v) title block
    - vi) notes and specifications
    - vii) tolerances/allowances
    - viii) bill of materials
  10. Explain the use of scales.
  11. Identify the styles of dimensioning on drawings, and describe their applications.
  12. Demonstrate basic sketching techniques.

13. Demonstrate awareness of computer aided drawing (CAD) systems.

Practical Objectives

1. Create sketch using a blueprint and/or drawing as a starting point.
2. Interpret and extract information from drawings.



# LEVEL 2

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## IMM-200            Shafts, Bearings and Seals

### Learning Outcomes:

- Demonstrate knowledge of shafts, bearings and seals, their components and operation.
- Demonstrate knowledge of safety practices related to shafts, bearings and seals.
- Demonstrate knowledge of the procedures used to install shafts, bearings and seals.
- Demonstrate knowledge of the procedures used to diagnose, maintain and repair shafts, bearings and seals.

### 2017 Red Seal Occupational Standard Reference:

- 3.03 Lubricates systems and components.
- 10.01 Installs shafts, bearings and seals.
- 10.02 Diagnoses shafts, bearings and seals.
- 10.03 Maintains shafts, bearings and seals.
- 10.04 Repairs shafts, bearings and seals.

### Suggested Hours:

30 Hours

### Objectives and Content:

#### Theoretical Objectives

1. Define terminology associated with shafts, bearings and seals.
2. Identify hazards and describe safe work practices associated with shafts, bearings and seals.
  - i) company policies
  - ii) site procedures
  - iii) jurisdictional regulations
  - iv) manufacturers' recommendations

3. Identify types of shafts, bearings and seals and their components and accessories, and describe their purpose, applications and operation.
  - i) shafts
    - drive
    - counter
    - jack
  - ii) bearings
    - plain (friction)
    - rolling element (anti-friction)
    - type of load
    - fixed/floating
  - iii) seals
    - static (gaskets)
    - dynamic
    - mechanical
    - non-contacting (labyrinth/annulus)
4. Identify tools and equipment used with shafts, bearings and seals and describe their applications and procedures.
5. Describe the procedures used to install shafts, bearings and seals and their components.
6. Describe the procedures used to inspect, diagnose, maintain and repair shafts, bearings and seals and their components.

Practical Objectives

1. Heat, install and remove a bearing.

## IMM-205

## Couplings, Clutches and Brakes

### Learning Outcomes:

- Demonstrate knowledge of couplings, clutches and brakes, their components and operation.
- Demonstrate knowledge of safety practices related to couplings, clutches and brakes.
- Demonstrate knowledge of the procedures used to install couplings, clutches and brakes.
- Demonstrate knowledge of the procedures used to diagnose, maintain and repair couplings, clutches and brakes.

### 2017 Red Seal Occupational Standard Reference:

- 11.01 Installs couplings, clutches and brakes.
- 11.02 Diagnoses couplings, clutches and brakes.
- 11.03 Maintains couplings, clutches and brakes.
- 11.04 Repairs couplings, clutches and brakes.

### Suggested Hours:

30 Hours

### Objectives and Content:

#### Theoretical Objectives

1. Define terminology associated with couplings, clutches and brakes.
2. Identify hazards and describe safe work practices associated with couplings, clutches and brakes.
  - i) company policies
  - ii) site procedures
  - iii) jurisdictional regulations
  - iv) manufacturers' recommendations
3. Interpret jurisdictional regulations and manufacturers' specifications pertaining to the use of couplings, clutches and brakes.

4. Identify types of couplings, clutches and brakes, their components and accessories, and describe their purpose, applications and operation.
  - i) couplings
    - rigid
    - elastomeric
    - grid
    - mechanical
    - fluid
  - ii) clutches
    - overrunning
    - friction
    - positive contact
    - fluid
    - electromagnetic
  - iii) brakes
    - friction
    - fluid/wet disc
    - electromagnetic
  
5. Identify tools and equipment used to install, diagnose, repair and maintain couplings, clutches and brakes, and describe their applications and procedures.
  - i) torque wrenches
  - ii) feeler gauges
  - iii) straight edges
  - iv) micrometers
  - v) calipers
  - vi) presses
  - vii) pullers
  - viii) laser alignment equipment
  - ix) hand tools
  - x) dial indicators
  
6. Describe the procedures used to remove and install couplings, clutches and brakes and their components.
  
7. Describe the procedures used to inspect, maintain and repair couplings, clutches and brakes and their components.

Practical Objectives

None

## **IMM-210            Chain and Belt Drive Systems**

### **Learning Outcomes:**

- Demonstrate knowledge of chain and belt drive systems, their components and operation.
- Demonstrate knowledge of safety practices related to chain and belt drive systems.
- Demonstrate knowledge of the procedures used to install chain and belt drive systems.
- Demonstrate knowledge of the procedures used to align, diagnose, repair and maintain chain and belt drive systems.
- Demonstrate knowledge of formulae and calculations pertaining to chain and belt drive systems.

### **2017 Red Seal Occupational Standard Reference:**

- 12.01 Installs chain and belt drive systems.
- 12.02 Diagnoses chain and belt drive systems.
- 12.03 Maintains chains and belt drive systems.
- 12.04 Repairs chains and belt drive systems.

### **Suggested Hours:**

30 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with chain and belt drive systems.
2. Identify hazards and describe safe work practices associated with chain and belt drive systems.
  - i) company policies
  - ii) site procedures
  - iii) jurisdictional regulations
  - iv) manufacturers' recommendations

3. Interpret jurisdictional regulations and manufacturers' specifications pertaining to the use of chain and belt drive systems.
4. Identify types of chain and belt drive systems and their components and accessories, and describe their purpose, applications and operation.
  - i) chain drive
    - roller
    - silent
    - composite
    - lube free
  - ii) belt drive
    - v-belt
    - cog belt
    - timing
    - flat belt
  - iii) components
    - sprockets and sheaves
    - taper bushing
    - link (half link, off-set)
5. Identify tools and equipment used to install, align, diagnose, repair, and maintain chain and belt drive systems, and describe their applications and procedures.
  - i) presses
  - ii) tensioners
  - iii) chain breakers
  - iv) ropes/pullers
  - v) torque wrenches
  - vi) straight edges
  - vii) parallel shaft alignment tools
  - viii) hand tools
  - ix) belt tensioning tools
6. Describe the procedures used to install chain and belt drive systems and their components.
7. Describe the procedures used to inspect, diagnose, repair, and maintain chain and belt drive systems and their components.

8. Identify the factors to consider and required calculations to determine chain and belt drive systems requirements.
9. Identify formulae and perform calculations.
  - i) belt/chain lengths
  - ii) speed and torque ratios
  - iii) belt tension

Practical Objectives

1. Align sheaves and sprockets.
2. Break and install drive chain.

## **IMM-215            Gear Systems**

### **Learning Outcomes:**

- Demonstrate knowledge of gears and gear drives, their components and operation.
- Demonstrate knowledge of safety practices related to gears and gear drives.
- Demonstrate knowledge of the procedures used to install and align gears and gear drives.
- Demonstrate knowledge of the procedures used to diagnose, maintain and repair gears and gear drives.
- Demonstrate knowledge of gear engagement procedures.
- Demonstrate knowledge of formulae and calculations pertaining to gears and gear drives.

### **2017 Red Seal Occupational Standard Reference:**

- 13.01 Installs gear systems.
- 13.02 Diagnoses gear systems.
- 13.03 Maintains gear systems.
- 13.04 Repairs gear systems.

### **Suggested Hours:**

30 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with gears and gear drives.
2. Identify hazards and describe safe work practices associated with gears and gear drives.
  - i) company policies
  - ii) site procedures
  - iii) jurisdictional regulations
  - iv) manufacturers' recommendations

3. Interpret jurisdictional regulations and manufacturers' specifications pertaining to the use of gears and gear drives.
4. Identify tools and equipment used to install, diagnose, maintain and repair gears and gear drives, and describe their applications and procedures.
  - i) presses
  - ii) hydraulic jacks
  - iii) torque wrenches
  - iv) jacks
  - v) alignment tools
  - vi) mechanics' blue
  - vii) plasti-gauges
  - viii) dial indicators
  - ix) calipers
  - x) micrometers
  - xi) hand tools
  - xii) strobe lights
5. Identify tools and equipment used to set backlash and tooth contact.
6. Identify types of gears and gear drives and their components and accessories, and describe their purpose, applications and operation.
  - i) gears
    - spur
    - bevel
    - spiral
    - herringbone
    - helical
    - worm
  - ii) gear drives
    - planetary
    - worm
    - parallel shaft
    - crown and pinion
    - rack and pinion
7. Identify the factors to consider and required calculations to determine gears and gear drives requirements.
  - i) worn bearings
  - ii) gear pass frequency

- iii) tribology
- 8. Describe the procedures used to install and align gears and gear drives and their components.
- 9. Describe the procedures used to inspect, maintain, and repair gears and gear drives and their components.
- 10. Describe the procedures used to set backlash and tooth contact.
- 11. Describe the procedures used to perform gear calculations.
  - i) diametrical pitch
  - ii) pitch diameter
  - iii) gear ratios

Practical Objectives

None

## IMM-220            Shaft Alignment I

### Learning Outcomes:

- Demonstrate knowledge of shaft alignment.
- Demonstrate knowledge of the procedures used to align shafts.
- Demonstrate knowledge of safety practices related to shaft alignment.

### 2017 Red Seal Occupational Standard Reference:

14.01 Performs rough alignment.

14.02 Performs dial alignment.

### Suggested Hours:

30 Hours

### Objectives and Content:

#### Theoretical Objectives

1. Define terminology associated with shaft alignment methods.
2. Identify hazards and describe safe work practices pertaining to shaft alignment.
3. Identify tools and equipment used for shaft and dial alignment methods, and describe their applications and procedures.
  - i) mag bases
  - ii) dial indicators
  - iii) contact points
  - iv) feeler gauges
  - v) straightedges
  - vi) tape measure
  - vii) calipers
4. Describe the procedures used to determine shaft misalignment.
5. Identify rough and dial alignment methods, and describe their applications and limitations.

- i) rim and face
- 6. Describe the procedures used to calculate shims for hot or cold alignment.
- 7. Describe the procedures used to align shafts using the straight edge and feeler gauge, and dial alignment methods.
  - i) pre-alignment checks
  - ii) selecting tools and equipment
  - iii) performing calculations
  - iv) making adjustments

Practical Objectives

- 1. Perform rough alignment.
- 2. Perform rim and face dial alignment.

## **IMM-225            Shielded Metal Arc Welding (SMAW)**

### **Learning Outcomes:**

- Demonstrate knowledge of shielded metal arc welding (SMAW) equipment and accessories.
- Demonstrate knowledge of procedures used to weld using shielded metal arc welding (SMAW) equipment.
- Demonstrate knowledge of safety practices related to shielded metal arc welding (SMAW).

### **2017 Red Seal Occupational Standard Reference:**

6.03    Welds material using arc welding equipment (SMAW).

### **Suggested Hours:**

20 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1.     Define terminology associated with shielded metal arc welding (SMAW).
2.     Interpret jurisdictional regulations pertaining to SMAW.
3.     Identify hazards and describe safe work practices pertaining to SMAW.
  - i)     personal
  - ii)    shop/facility
  - iii)    equipment
  - iv)    ventilation sparks
  - v)     radiation
  - vi)    ultraviolet light
  - vii)   storage
4.     Interpret information pertaining to SMAW found on drawings and specifications.

5. Identify SMAW equipment, consumables and accessories, and describe their applications.
6. Describe the SMAW process and its applications.
7. Describe the procedures used to set up and adjust SMAW equipment.
8. Identify the types of welds performed using SMAW equipment.
9. Identify welding positions and describe their applications.
10. Describe the procedures used to weld using SMAW equipment.
11. Describe weld defects, their causes and prevention.

*Practical Objectives*

1. Set up and perform a weld using SMAW equipment.

## **IMM-230            Gas Metal Arc Welding (GMAW)**

### **Learning Outcomes:**

- Demonstrate knowledge of gas metal arc welding (GMAW) equipment and accessories.
- Demonstrate knowledge of procedures used to weld using gas metal arc welding (GMAW) equipment.
- Demonstrate knowledge of safety practices related to gas metal arc welding (GMAW).

### **2017 Red Seal Occupational Standard Reference:**

6.04    Welds material with gas metal arc welding (GMAW) equipment.

### **Suggested Hours:**

20 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1.     Define terminology associated with gas metal arc welding (GMAW).
2.     Interpret jurisdictional regulations pertaining to GMAW.
3.     Identify hazards and describe safe work practices pertaining to GMAW.
  - i)     personal
  - ii)    shop/facility
  - iii)    equipment
  - iv)    ventilation sparks
4.     Interpret information pertaining to GMAW found on drawings and specifications.
5.     Identify GMAW equipment, consumables and accessories, and describe their applications.

6. Describe the GMAW process and its applications.
7. Describe the procedures used to set up, adjust and shut down GMAW equipment.
8. Identify the types of welds performed using GMAW equipment.
9. Identify welding positions and describe their applications.
10. Describe the procedures used to weld using GMAW equipment.
11. Describe weld defects, their causes and prevention.

Practical Objectives

1. Set up and perform a weld using GMAW equipment.

## **IMM-235            Gas Tungsten Arc Welding (GTAW)**

### **Learning Outcomes:**

- Demonstrate knowledge of gas tungsten arc welding (GTAW) equipment and accessories.
- Demonstrate knowledge of procedures used to weld using gas tungsten arc welding (GTAW) equipment.
- Demonstrate knowledge of safety practices related to gas tungsten arc welding (GTAW).

### **2017 Red Seal Occupational Standard Reference:**

6.05    Welds material with gas tungsten arc welding (GTAW) equipment.

### **Suggested Hours:**

20 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1.     Define terminology associated with gas tungsten arc welding (GTAW).
2.     Interpret jurisdictional regulations pertaining to GTAW.
3.     Identify hazards and describe safe work practices pertaining to GTAW.
  - i)     personal
  - ii)    shop/facility
  - iii)    equipment
  - iv)    ventilation sparks
  - v)     radiation
  - vi)    ultraviolet light
  - vii)   storage
4.     Interpret information pertaining to GTAW found on drawings and specifications.

5. Identify GTAW equipment, consumables and accessories, and describe their applications.
6. Describe the GTAW process and its applications.
7. Describe the procedures used to set up, adjust and shut down GTAW equipment.
8. Identify the types of welds performed using GTAW equipment.
9. Identify welding positions and describe their applications.
10. Describe the procedures used to weld using GTAW equipment.
11. Describe weld defects, their causes and prevention.

*Practical Objectives*

1. Set up and perform a weld using GTAW equipment.

# LEVEL 3

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## IMM-300          Shaft Alignment II

### Learning Outcomes:

- Demonstrate knowledge of shaft alignment.
- Demonstrate knowledge of the procedures used to align shafts.
- Demonstrate knowledge of safety practices related to shaft alignment.

### 2017 Red Seal Occupational Standard Reference:

14.02 Performs dial alignment.

14.03 Performs laser and optical alignment.

### Suggested Hours:

24 Hours

### Objectives and Content:

#### Theoretical Objectives

1. Define terminology associated with shaft and level alignment methods.
2. Identify hazards and describe safe work practices pertaining to shaft and level alignment.
3. Identify tools and equipment used for shaft and dial alignment methods, and describe their applications and procedures.
  - i) mag bases
  - ii) dial indicators
  - iii) contact points
  - iv) feeler gauges
  - v) straightedges
  - vi) tape measure
  - vii) laser
  - viii) optical levelling equipment
  - ix) benchmark
4. Describe the procedures used to determine shaft and level misalignment.

5. Identify reverse dial and laser alignment methods, and describe their applications and limitations.
6. Describe the procedures to shim for hot or cold alignment.
  - i) performing pre-alignment checks
  - ii) selecting tools and equipment
  - iii) performing calculations
  - iv) making adjustments
7. Describe the procedures used to align shafts using the dial and laser alignment methods.
  - i) rear?? alignment
  - ii) rim and face
  - iii) reverse??
  - iv) cross dial
  - v) cool??

Practical Objectives

1. Perform a reverse dial alignment.
2. Perform a laser alignment.

## **IMM-305            Fans and Blowers**

### **Learning Outcomes:**

- Demonstrate knowledge of fans and blowers, their components and operation.
- Demonstrate knowledge of safe work practices related to fans and blowers.
- Demonstrate knowledge of the procedures used to remove and install fans and blowers.
- Demonstrate knowledge of the procedures used to diagnose, maintain, and repair fans and blowers.

### **2017 Red Seal Occupational Standard Reference:**

- 16.01 Installs fans and blowers.
- 16.02 Diagnoses fans and blowers.
- 16.03 Maintains fans and blowers.
- 16.04 Repairs fans and blowers.

### **Suggested Hours:**

24 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with fans and blowers.
2. Interpret jurisdictional regulations and manufacturers' specifications pertaining to fans and blowers.
3. Identify hazards and describe safe work practices pertaining to fans and blowers.
  - i) company policies
  - ii) site procedure
  - iii) jurisdictional regulations
  - iv) manufacturers' recommendations
4. Identify types of fans and blower systems, and describe their components and operation.

5. Identify tools and equipment used to remove and install, diagnose, maintain and repair fans and blowers, and describe their applications and procedures.
  - i) hand tools
  - ii) dial indicators
  - iii) precision levels
  - iv) optical or laser alignment equipment
  - v) hydraulic rams
  - vi) rigging/lifting equipment
  - vii) tachometers
  - viii) thermal imaging equipment
  - ix) strobe light
6. Identify types of fan blades, and describe their applications.
7. Describe the procedures used to remove and install fans and blowers.
8. Describe the procedures used to diagnose, inspect, maintain, and repair fans and blowers.
9. Describe the procedures used to regulate output for fans and blowers.
10. Describe the procedures used to balance fans and blowers.

Practical Objectives

None

## **IMM-310            Pumps**

### **Learning Outcomes:**

- Demonstrate knowledge of pumps, their components and operation.
- Demonstrate knowledge of safety practices related to pumps.
- Demonstrate knowledge of the procedures used to remove and install pumps.
- Demonstrate knowledge of the procedures used to diagnose, maintain, and repair pumps.

### **2017 Red Seal Occupational Standard Reference:**

- 17.01 Installs pumps.
- 17.02 Diagnoses pumps.
- 17.03 Maintains pumps.
- 17.04 Repairs pumps.

### **Suggested Hours:**

24 Hours

### **Objectives and Content:**

#### *Theoretical Objectives*

1. Define terminology associated with pumps.
2. Identify hazards and describe safe work practices associated with pumps and their components and accessories.
  - i) company policies
  - ii) site procedures
  - iii) jurisdictional regulations
  - iv) manufacturers' recommendations
3. Interpret jurisdictional regulations, site and manufacturers' specifications pertaining to the use of pumps.
4. Identify types of pumps and their components and accessories, and describe their purpose, applications and operation.

- i) pumps
    - non-positive (centrifugal)
    - positive displacement (reciprocating)
    - American Petroleum Institute (API) pumps
  - ii) components
    - filters
    - gaskets
    - wear sleeves
    - seals
    - impeller
    - shafts
    - wear rings
    - stuffing box assembly
    - rotating assembly
    - bearings
  - iii) relevant science
    - Pascal's Law
    - Bernoulli's Principle
    - Atmospheric Pressure
5. Identify the types of seals and gaskets and describe their applications.
- i) packings
  - ii) o-rings
  - iii) mechanical seal
  - iv) v-rings
  - v) labyrinth
6. Explain the method used to interpret pump curves.
7. Identify tools and equipment used to remove and install, diagnose, maintain, and repair pumps, and describe their applications and procedures.
- i) hand tools
  - ii) levelling and alignment tools
  - iii) measuring tools
  - iv) monitoring equipment
  - v) rigging and hoisting equipment
  - vi) manual for troubleshooting
8. Describe the procedures used to remove and install, inspect, diagnose, maintain, and repair pumps and their components and accessories.

Practical Objectives

1. Disassemble pump.
2. Install seals and packing.
3. Set clearances.

## **IMM-315            Compressors**

### **Learning Outcomes:**

- Demonstrate knowledge of compressors, their components and operation.
- Demonstrate knowledge of safety practices related to compressors.
- Demonstrate knowledge of the procedures used to remove, install and align compressors.
- Demonstrate knowledge of the procedures used to diagnose, maintain, and repair compressors.

### **2017 Red Seal Occupational Standard Reference:**

- 18.01 Installs compressors.
- 18.02 Diagnoses compressors.
- 18.03 Maintains compressors.
- 18.04 Repairs compressors.

### **Suggested Hours:**

24 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with compressors.
2. Identify hazards and describe safe work practices associated with compressors and their components.
  - i) company policies
  - ii) site procedures
  - iii) jurisdictional regulations
  - iv) manufacturers' recommendations
3. Interpret jurisdictional regulations and manufacturers' specifications pertaining to the use of compressors.

4. Identify classifications and types of compressors and components, and describe their purpose and operation.
  - i) compressors
    - dynamic/centrifugal
    - positive displacement (reciprocating, radial, screw, vane)
  - ii) components
    - filters
    - pressure relief valves
    - temperature controllers
    - regulators
    - unloading valve
    - dryers
  - iii) relevant science
    - Charles' law
    - Boyle's law
    - Atmospheric Pressure
  
5. Identify tools and equipment used to install, diagnose, maintain, and repair compressors, and describe their applications and procedures.
  - i) straight edge
  - ii) hand tools
  - iii) impact wrenches
  - iv) dial indicators
  - v) precision levels
  - vi) optical or laser alignment equipment
  - vii) rigging/lifting equipment
  
6. Describe the procedures used to remove, install and align compressors and their components.
  
7. Describe the procedures used to inspect, diagnose, maintain, and repair compressors and their components.
  - i) condition-based monitoring reports (worn bearings, oil analysis, vibration analysis, temperature analysis),
  - ii) reliability centered maintenance (RCM)

Practical Objectives

None

## IMM-320          Process Piping

### Learning Outcomes:

- Demonstrate knowledge of process piping, components and application.
- Demonstrate knowledge of safety practices related to process piping.
- Demonstrate knowledge of the procedures used to remove and install process piping.
- Demonstrate knowledge of the procedures used to diagnose, maintain, and repair process piping.
- Demonstrate knowledge of the procedures used to test and inspect process piping and their components.

### 2017 Red Seal Occupational Standard Reference:

- 19.02 Installs process piping.
- 19.04 Diagnoses process piping.
- 19.06 Maintains process piping.
- 19.08 Repairs process piping.

### Suggested Hours:

30 Hours

### Objectives and Content:

#### Theoretical Objectives

1. Define terminology associated with process piping.
2. Interpret jurisdictional regulations and manufacturers' specifications pertaining to the use of process piping and their components.
3. Identify hazards and describe safe work practices associated with process piping.
  - i) residual materials
  - ii) pressure
  - iii) heat
  - iv) weight
  - v) acidic (caustic/corrosive) level of product (ph)

- vi) alkaline
  - vii) poisonous substances
4. Identify tools and equipment used to install, diagnose, maintain, and repair process piping and their components, and describe their applications and procedures.
  5. Identify types of process piping and their components, accessories and supports and describe their purpose, applications and operation.
    - i) piping
      - acrylonitrile butadiene styrene (ABS)
      - high-density polyethylene (HDPE)
      - polyvinyl chloride (PVC)
      - stainless
      - composite
      - carbon steel
      - tubing
      - copper
    - ii) hose
    - iii) components
      - fittings
      - valves
      - strainers
      - gaskets
      - connectors
    - iv) supports
      - stands
      - hangers
      - brackets
  6. Describe the procedures used to remove and install process piping and its components.
  7. Describe the procedures used to test, inspect, diagnose, maintain, and repair process piping and its components.
  8. Identify the factors to consider when determining if process piping needs to be repaired or replaced.
    - i) vibration
    - ii) expansion/contraction

iii) pipe strain

Practical Objectives

1. Thread pipe using handheld die and threading machine.
2. Fabricate and assemble piping system.

## **IMM-325            Process Tanks and Containers**

### **Learning Outcomes:**

- Demonstrate knowledge of process tanks and containers, components and application.
- Demonstrate knowledge of safety practices related to process tanks and containers.
- Demonstrate knowledge of the procedures used to remove and install process tanks and containers.
- Demonstrate knowledge of the procedures used to diagnose, maintain, and repair process tanks and containers.
- Demonstrate knowledge of the procedures used to test and inspect process tanks and containers and their components.

### **2017 Red Seal Occupational Standard Reference:**

- 19.01 Installs process tanks and containers.
- 19.03 Diagnoses process tanks and containers.
- 19.05 Maintains process tanks and containers.
- 19.07 Repairs process tanks and containers.

### **Suggested Hours:**

12 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with process tanks and containers.
2. Interpret jurisdictional regulations and manufacturers' specifications pertaining to the use of process tanks and containers and their components.
3. Identify hazards and describe safe work practices associated with process tanks and containers.
  - i) residual materials
  - ii) pressure

- iii) heat
  - iv) weight
  - v) acidic (caustic/corrosive) level of product (ph)
  - vi) alkaline
  - vii) poisonous substances
4. Identify tools and equipment used to install, diagnose, maintain, and repair process tanks, containers and their components, and describe their applications and procedures.
- i) layout
  - ii) levelling tools
  - iii) rigging and hoisting equipment
5. Identify types of process tanks, containers and their components and accessories, and describe their purpose, applications and operation.
- i) process tanks and containers
    - bins
    - hoppers
    - receivers
    - reservoirs
    - storage tanks
    - pressure vessel
  - ii) components
    - agitators
    - impellers
    - scrapers
    - mixers
    - level indicators
    - skimmers
    - valves
6. Describe the procedures used to remove and install process tanks and containers and their components.
7. Describe the procedures used to test, inspect, diagnose, maintain, and repair process tanks, containers and their components.

Practical Objectives

None

## IMM-330            Hydraulic Systems

### Learning Outcomes:

- Demonstrate knowledge of safety practices related to hydraulic systems.
- Demonstrate knowledge of the principles and applications of hydraulics.
- Demonstrate knowledge of hydraulic system related calculations.
- Demonstrate knowledge of schematics, their use and interpretation.
- Demonstrate knowledge of hydraulic systems, their components and operation.
- Demonstrate knowledge of the procedures used to install hydraulic systems and components.
- Demonstrate knowledge of the procedures used to diagnose, maintain, and repair hydraulic systems and components.

### 2017 Red Seal Occupational Standard Reference:

- 21.01 Installs hydraulic systems.
- 21.02 Diagnoses hydraulic systems.
- 21.03 Maintains hydraulic systems.
- 21.04 Repairs hydraulic systems.

### Suggested Hours:

54 Hours

### Objectives and Content:

#### Theoretical Objectives

1. Define terminology associated with the installation of hydraulic systems and their components.
2. Identify hazards and describe safe work practices pertaining to hydraulic and piping systems and their components.
  - i) company policies
  - ii) site procedures
  - iii) jurisdictional regulations
  - iv) manufacturers' recommendations

3. Interpret jurisdictional regulations and manufacturers' specifications pertaining to hydraulic and piping systems and their components.
4. Identify tools and equipment used to install, diagnose, maintain, and repair hydraulic systems and their components, and describe their applications and procedures.
5. Explain the principles and theories of hydraulics.
  - i) Pascal's law
  - ii) Bernoulli's principle
6. Describe units of measure as they relate to hydraulic systems.
7. Identify formulae related to hydraulic systems, and describe their applications.
8. Describe and perform the calculations used to select, install and diagnose hydraulic systems and components.
9. Identify symbols and abbreviations related to hydraulic systems found on schematics.
10. Describe and interpret hydraulic systems schematics and their applications.
11. Identify types of hydraulic systems and their components, and describe their purpose, applications and operation.
  - i) pumps
  - ii) valves
  - iii) actuators
  - iv) reservoirs
  - v) hoses
  - vi) seals
  - vii) fittings
  - viii) strainers
  - ix) filters
  - x) accumulators
  - xi) motors
12. Describe the procedures used to install hydraulic systems.

13. Describe the procedures used to inspect, diagnose, maintain, and repair hydraulic systems.
  - i) check hoses, piping and tubing
  - ii) check fluids (condition and level)
  - iii) check/change filters
  - iv) determine operating parameters
  - v) adjust system pressure
  - vi) temperature and flow
  - vii) replacing hoses, piping and tubing, fluids
  - viii) check/change filters
  - ix) adjust system pressure
  - x) temperature and flow
  - xi) condition-based monitoring
  - xii) sensory inspection

Practical Objectives

1. Assemble, operate and troubleshoot a hydraulic circuit.

## **IMM-335            Pneumatic and Vacuum Systems**

### **Learning Outcomes:**

- Demonstrate knowledge of the principles and applications of pneumatic and vacuum systems.
- Demonstrate knowledge of pneumatic and vacuum systems related calculations.
- Demonstrate knowledge of schematics, their use and interpretation.
- Demonstrate knowledge of safety practices related to pneumatic and vacuum systems.
- Demonstrate knowledge of pneumatic and vacuum systems, their components and operation.
- Demonstrate knowledge of the procedures used to install pneumatic and vacuum systems and components.
- Demonstrate knowledge of the procedures used to diagnose, maintain, and repair pneumatic and vacuum systems and components.

### **2017 Red Seal Occupational Standard Reference:**

- 22.01 Installs pneumatic and vacuum systems.
- 22.02 Diagnoses pneumatic and vacuum systems.
- 22.03 Maintains pneumatic and vacuum systems.
- 22.04 Repairs pneumatic and vacuum systems.

### **Suggested Hours:**

18 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with pneumatic, vacuum and piping systems and their components.
2. Interpret jurisdictional regulations and manufacturers' specifications pertaining to installation of pneumatic, vacuum and piping systems and their components.

3. Identify hazards and describe safe work practices pertaining to pneumatic, vacuum and piping systems and their components.
  - i) company policies
  - ii) site procedures
  - iii) jurisdictional regulations
  - iv) manufacturers' recommendations
4. Identify tools and equipment used to install, diagnose, maintain and repair pneumatic and vacuum systems, and their components, and describe their applications and procedures.
5. Explain the principles and theories of pneumatic and vacuum systems.
  - i) Pascal's law
  - ii) Boyle's law
  - iii) Charles' law
  - iv) Gay-Lussac's law
  - v) Bernoulli's principle
6. Describe units of measure as they relate to pneumatic and vacuum systems.
7. Identify formulae related to pneumatic and vacuum systems, and describe their applications.
8. Describe and perform the calculations used to select, install, diagnose, maintain and repair pneumatic and vacuum systems and their components.
9. Identify symbols and abbreviations related to pneumatic and vacuum systems found on schematics.
10. Describe and interpret schematics to determine the assembly and operation of pneumatic, and vacuum systems and their applications.
11. Identify types of pneumatic and vacuum systems and their components and describe their applications and operation.
  - i) hoses
  - ii) seals
  - iii) fittings
  - iv) strainers
  - v) filter regulator lubricator (FRL)
  - vi) piping

- vii) receivers
  - viii) blowers
  - ix) pumps
  - x) motors
  - xi) actuators
  - xii) valves
12. Describe the methods of air treatment in pneumatic and vacuum systems.
- i) dryers
  - ii) inter/after-coolers
  - iii) de-icers
  - iv) filters
13. Describe the procedures used to install pneumatic, vacuum, piping, tubing and hose systems and their components.
14. Describe the procedures used to diagnose, inspect, maintain and repair pneumatic, vacuum, piping, tubing and hose systems and components.
- i) check hoses, piping and tubing
  - ii) check lubricating fluids (condition and level)
  - iii) check/change filters
  - iv) determine operating parameters
  - v) adjust system pressure
  - vi) temperature and flow
  - vii) replacing hoses, piping and tubing, fluids
  - viii) check/change filters
  - ix) adjust system pressure, temperature and flow
  - x) condensate drains
15. Identify types of piping systems, and describe their applications.
16. Identify types of piping, tubing, and hoses, and describe their compatibility, characteristics and applications.
17. Identify types of fittings and valves used in piping systems, and describe their characteristics and applications.
18. Identify piping system accessories, and describe their characteristics and applications.

Practical Objectives

1. Assemble, operate and troubleshoot a pneumatic or vacuum system.



# Level 4

<b>Unit Code</b>	<b>Unit Title</b>	<b>Suggested Hours</b>	<b>Page Number</b>
IMM-400	Prime Movers	30	98
IMM-405	Conveying Systems	30	100
IMM-410	Preventative and Predictive Maintenance	18	103
IMM-415	Vibration Analysis	15	106
IMM-420	Balancing	15	108
IMM-425	Non-Destructive Testing	12	110
IMM-430	Fluid Analysis	12	112
IMM-435	Commissioning and Decommissioning	6	114
IMM-440	Robotics and Automated Equipment	6	116
MENT-701	Mentoring II	6	118
IMM-450	Program Review	30	120

## **IMM-400            Prime Movers**

### **Learning Outcomes:**

- Demonstrate knowledge of prime movers, their components and operation.
- Demonstrate knowledge of safety practices related to prime movers.
- Demonstrate knowledge of the procedures used to install prime movers.
- Demonstrate knowledge of the procedures used to diagnose, maintain and repair prime movers.

### **2017 Red Seal Occupational Standard Reference:**

- 9.01 Installs prime movers.
- 9.02 Diagnoses prime movers.
- 9.03 Maintains prime movers.
- 9.04 Repairs prime movers.

### **Suggested Hours:**

30 Hours

### **Objectives and Content:**

#### *Theoretical Objectives*

1. Define terminology associated with prime movers.
2. Interpret jurisdictional regulations and manufacturers' specifications pertaining to the use of prime movers.
3. Identify hazards and describe safe work practices associated with prime movers.
  - i) company policies
  - ii) site procedures
  - iii) jurisdictional regulations
  - iv) manufacturers' recommendations
4. Identify tools and equipment used to install, inspect, diagnose, maintain and repair prime movers, and describe their applications and procedures.
  - i) torque wrenches

- ii) dial indicators
  - iii) precision levels
  - iv) optical or laser alignment equipment
  - v) hand tools
  - vi) hoisting and rigging equipment
5. Identify types of prime movers and their components and accessories, and describe their purpose, applications and operation.
- i) prime movers
    - electric/hydraulic/pneumatic motors
    - turbines (wind, water, gas or steam)
    - internal combustion engines
  - ii) components
    - gear boxes
    - drive shafts
  - iii) auxiliary systems
    - fuel
    - intake and exhaust
    - cooling
    - controls
    - lubrication
    - filtration
6. Describe the procedures used to install prime movers and their components.
7. Describe the procedures used inspect, diagnose, maintain and repair prime movers and their components.

Practical Objectives

None

## IMM-405            Conveying Systems

### Learning Outcomes:

- Demonstrate knowledge of conveying systems, their components and operation.
- Demonstrate knowledge of safety practices related to conveying systems.
- Demonstrate knowledge of the procedures used to install conveying systems.
- Demonstrate knowledge of the procedures used to diagnose, maintain and repair conveying systems.

### 2017 Red Seal Occupational Standard Reference:

- 20.01 Installs conveying systems.
- 20.02 Diagnoses conveying systems.
- 20.03 Maintains conveying systems.
- 20.04 Repairs conveying systems.

### Suggested Hours:

30 Hours

### Objectives and Content:

#### Theoretical Objectives

1. Define terminology associated with conveying systems.
2. Interpret jurisdictional regulations and manufacturers' specifications pertaining to the use of conveying systems.
3. Identify hazards and describe safe work practices associated with conveying systems.
  - i) company policies
  - ii) site procedures
  - iii) jurisdictional regulations
  - iv) manufacturers' recommendations
4. Identify tools and equipment used to install, inspect, diagnose, maintain and repair conveying systems, and describe their applications and procedures.

- i) hand tools
  - ii) gauges
  - iii) levelling and alignment equipment
  - iv) hoisting and rigging equipment
5. Identify types of conveying systems and their components and accessories, and describe their purpose, applications and operation.
- i) conveying systems
    - pneumatic
    - belt
    - rollers
    - chain
    - screw
    - bucket
    - flume/water
  - ii) components
    - bearings
    - pulleys
    - rollers
    - gear reduction units
    - take-ups
    - scrapers
    - brushes
    - skirting
    - guarding
6. Describe the procedures used to install conveying systems and their components.
7. Describe the procedures used to inspect, diagnose, maintain and repair conveying systems and their components.
8. Describe the procedures used to cut and splice a conveyor belt.
9. Describe the procedures used to track a conveyor.
10. Identify the factors to consider and required calculations to determine conveying system requirements.

Practical Objectives

None

## **IMM-410            Preventative and Predictive Maintenance**

### **Learning Outcomes:**

- Demonstrate knowledge of preventative and predictive maintenance.
- Demonstrate knowledge of safety practices related to preventative and predictive maintenance procedures.
- Demonstrate knowledge of the procedures used to perform preventative and predictive maintenance.

### **2017 Red Seal Occupational Standard Reference:**

23.01 Performs preventative maintenance activities.

23.06 Performs predictive maintenance activities.

### **Suggested Hours:**

18 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with preventative and predictive maintenance.
2. Interpret jurisdictional regulations, site and manufacturers' specifications pertaining to preventative and predictive maintenance procedures.
3. Identify hazards and describe safe work practices pertaining to preventative and predictive maintenance procedures.
  - i) company policies
  - ii) site procedures
  - iii) jurisdictional regulations
  - iv) manufacturers' recommendations
4. Identify tools and equipment used for preventative and predictive maintenance, and describe their applications and procedures.
  - i) hand tools
  - ii) strobe lights

- iii) dye penetrant tool kit
  - iv) ultrasonic thickness tester
  - v) thermographic camera
  - vi) pressure gauges
  - vii) vibration analysis tools
  - viii) balancing tools
5. Identify types of maintenance, and describe their purpose and applications.
- i) breakdown (run to failure)
  - ii) preventative
  - iii) predictive
  - iv) proactive
  - v) corrective
  - vi) reliability centered maintenance (RCM)
6. Identify sources of information used to develop maintenance history.
- i) reports
    - lab
    - inspection
  - ii) checklists
  - iii) manufacturers' specifications
  - iv) root cause analysis
  - v) spectrums
  - vi) graphs
  - vii) logbooks
  - viii) images
  - ix) work order history
7. Identify preventative and predictive maintenance practices, and describe their applications.
- i) non-destructive testing
  - ii) fluid analysis
  - iii) balancing
  - iv) thermography
  - v) motor current analysis
  - vi) ultrasonic
  - vii) reactive
  - viii) scheduled overhauls
  - ix) scheduled replacement
  - x) running preventative maintenance

- xi) data analysis
8. Describe the procedures used to schedule, perform and record preventative and predictive maintenance activities.

Practical Objectives

None

## **IMM-415            Vibration Analysis**

### **Learning Outcomes:**

- Demonstrate knowledge of safety practices related to vibration analysis.
- Demonstrate knowledge of the procedures used to perform vibration analysis.

### **2017 Red Seal Occupational Standard Reference:**

23.02 Performs vibration analysis procedures.

### **Suggested Hours:**

15 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with vibration analysis.
2. Identify hazards and describe safe work practices pertaining to vibration analysis.
  - i) company policies
  - ii) site procedure
  - iii) jurisdictional regulations
  - iv) manufacturers' recommendations
3. Identify tools and equipment used for vibration analysis, and describe their applications and procedures.
  - i) data collector
  - ii) probes
  - iii) vibration pen
  - iv) strobe
  - v) online monitor
  - vi) transducers
4. Identify and interpret sources of information pertaining to vibration analysis.
  - i) manufacturers' specifications

- ii) vibration standards and charts
  - iii) Canadian Machinery Vibration Association (CMVA) interpretations and guidelines
  - iv) equipment history
5. Identify causes of vibration.
- i) eccentricity
  - ii) misalignment
  - iii) shaft faults
  - iv) mechanical looseness
  - v) mechanical frequencies
  - vi) natural frequencies
  - vii) imbalance
6. Identify vibration analysis methods, and describe their applications.
7. Describe the procedures used to perform vibration analysis.
8. Describe the procedures used to record and interpret data collected using vibration analysis equipment.

Practical Objectives

1. Read and interpret vibration data

## IMM-420            Balancing

### Learning Outcomes:

- Demonstrate knowledge of safety practices related to balancing procedures.
- Demonstrate knowledge of balancing procedures.

### 2017 Red Seal Occupational Standard Reference:

23.03 Performs balancing procedures.

### Suggested Hours:

15 Hours

### Objectives and Content:

#### Theoretical Objectives

1. Define terminology associated with balancing.
2. Identify hazards and describe safe work practices pertaining to balancing procedures.
  - i) company policies
  - ii) site procedure
  - iii) jurisdictional regulations
  - iv) manufacturers' recommendations
3. Identify tools and equipment used for balancing, and describe their applications and procedures.
  - i) hand tools
  - ii) weights
  - iii) polar graphing charts
  - iv) protractor
  - v) balancing equipment
4. Identify and interpret sources of information pertaining to balancing.
  - i) manufacturers' specifications.
  - ii) vibration standards and charts

- iii) Canadian Machinery Vibration Association (CMVA) interpretations and guidelines
  - iv) equipment history
5. Identify the conditions of imbalance, and describe their characteristics.
- i) static
  - ii) couple
  - iii) quasi-static
  - iv) dynamic
6. Identify and describe balancing methods, their applications and procedures.
- i) single-plane
  - ii) multi-plane
7. Identify the calculations required for balancing.

Practical Objectives

None

## IMM-425          Non-Destructive Testing

### Learning Outcomes:

- Demonstrate knowledge of safety practices related to non-destructive testing.
- Demonstrate knowledge of the procedures used to perform non-destructive testing.

### 2017 Red Seal Occupational Standard Reference:

23.04 Performs non-destructive testing (NDT) procedures.

### Suggested Hours:

12 Hours

### Objectives and Content:

#### Theoretical Objectives

1. Define terminology associated with non-destructive testing (NDT).
2. Demonstrate an awareness of jurisdictional regulations pertaining to NDT methods.
3. Identify hazards and describe safe work practices pertaining to vibration analysis.
  - i) company policies
  - ii) site procedure
  - iii) jurisdictional regulations
  - iv) manufacturers' recommendations
4. Identify tools and equipment used for NDT, and describe their applications and procedures.
  - i) hand tools
  - ii) dye penetrant tool kit
  - iii) ultrasonic thickness tester
  - iv) thermographic camera
  - v) pressure gauges

5. Identify types of NDT methods, and describe their applications.
  - i) dye penetrant
  - ii) magnetic particle
  - iii) radiography
  - iv) ultrasonic
  - v) visual
  - vi) thermography
  - vii) air or water pressure testing
  - viii) eddy current analysis
6. Describe the procedures used to perform NDT methods.
7. Describe the procedures used to record and interpret data collected using NDT methods.

Practical Objectives

1. Perform a dye penetrant test.

## **IMM-430            Fluid Analysis**

### **Learning Outcomes:**

- Demonstrate knowledge of safety practices related to fluid sampling.
- Demonstrate knowledge of fluid analysis.
- Demonstrate knowledge of the procedures used to collect and test fluid samples.

### **2017 Red Seal Occupational Standard Reference:**

23.05 Performs fluid analysis procedures.

### **Suggested Hours:**

12 Hours

### **Objectives and Content:**

#### Theoretical Objectives

1. Define terminology associated with fluid analysis.
2. Identify hazards and describe safe work practices pertaining to fluid analysis.
  - i) company policies
  - ii) site procedure
  - iii) jurisdictional regulations
  - iv) manufacturers' recommendations
3. Identify tools and equipment used for fluid analysis, and describe their applications and procedures.
  - i) hot plate
  - ii) viscometer (viscosimeter)
  - iii) litmus paper
  - iv) infrared
  - v) sample bottles
  - vi) hand tools
4. Identify fluid contaminants, and describe their causes and remedies.

5. Describe the procedures used to collect and test fluid samples from systems.
6. Interpret fluid sampling results according to jurisdictional regulations.
7. Describe the procedures used to record and interpret data collected from fluid analysis.

Practical Objectives

1. Perform a visual inspection of an oil sample.

## IMM-435

## Commissioning and Decommissioning

### Learning Outcomes:

- Demonstrate knowledge of safety practices related to commissioning and decommissioning.
- Demonstrate knowledge of commissioning and its purpose.
- Demonstrate knowledge of decommissioning and its purpose.
- Demonstrate knowledge of the procedures used to commission systems and components.
- Demonstrate knowledge of the procedures used to decommission systems and components.

### 2017 Red Seal Occupational Standard Reference:

24.01 Commissions systems and components.

24.02 Decommissions systems and components.

### Suggested Hours:

6 Hours

### Objectives and Content:

#### Theoretical Objectives

1. Define terminology associated with commissioning and decommissioning.
2. Identify hazards and describe safe work practices pertaining to commissioning and decommissioning.
  - i) mechanical
  - ii) fluid power systems
3. Explain the purpose of commissioning and decommissioning and identify the types of mechanical and fluid power systems and components involved.
4. Interpret information sources and documentation pertaining to commissioning and decommissioning of systems, components and parts.
  - i) manufacturers' specifications

- ii) operating parameters
  - iii) jurisdictional codes and regulations
  - iv) Workplace Hazardous Material Information System (WHMIS)/Globally Harmonized System (GHS)
  - v) environmental assessment
5. Describe the procedures used to commission mechanical and fluid power systems and components.
  6. Describe the procedures used to decommission mechanical and fluid power systems and components.
  7. Identify the potential environmental impact of commissioning and decommissioning.

Practical Objectives

None

## IMM-440            Robotics and Automated Equipment

### Learning Outcomes:

- Demonstrate knowledge of safety practices related to robotics and automated equipment.
- Demonstrate knowledge of robotics and automated equipment, their components and operation.
- Demonstrate knowledge of the procedures used to install robotics and automated equipment.
- Demonstrate knowledge of the procedures used to diagnose, maintain and repair robotics and automated equipment.

### 2017 Red Seal Occupational Standard Reference:

- 15.01 Installs robotics and automated equipment.
- 15.02 Diagnoses robotics and automated equipment.
- 15.03 Maintains robotics and automated equipment.
- 15.04 Repairs robotics and automated equipment.

### Suggested Hours:

6 Hours

### Objectives and Content:

#### Theoretical Objectives

1. Define terminology associated with robotics and automated equipment.
  - i) three-axis
  - ii) six-axis
  - iii) seven-axis
  - iv) end of arm tooling (EOAT)
  - v) grippers and effectors
  - vi) Selective Compliance Assembly Robot Arm (SCARA)
  
2. Identify hazards and describe safe work practices associated with robotics and automated equipment.
  - i) company policies

- ii) site procedures
  - iii) jurisdictional regulations
  - iv) manufacturers' recommendations
3. Interpret jurisdictional regulations and manufacturers' specifications pertaining to the use of robotics and automated equipment.
  4. Identify tools and equipment used to install, diagnose, maintain and repair robotics and automated equipment and describe their applications and procedures.
    - i) hoisting and rigging equipment
    - ii) hand tools
    - iii) alignment tools
  5. Identify classifications for robotics and automated equipment and their components, and describe their purpose, applications and operation.
    - i) type of movement (degrees of freedom after application)
    - ii) application (manufacturing process)
    - iii) architecture (serial or parallel)
  6. Identify classifications of auxiliary equipment, and describe their purpose, applications and operation.
    - i) wire feeders
    - ii) articulating fingers
    - iii) filtering systems
    - iv) tip cleaners
    - v) tip changers
  7. Describe the procedures used to install robotics and automated equipment and their components.
  8. Describe the procedures used to inspect, diagnose, maintain and repair robotics and automated equipment and their components.

Practical Objectives

None

## **MENT-701      Mentoring II**

### **Learning Outcomes:**

- Demonstrate knowledge of effective communication practices as a mentor.
- Demonstrate knowledge of strategies for teaching workplace skills.

### **Red Seal Occupational Standard Reference:**

4.01 Uses communication techniques

4.02 Uses mentoring techniques

### **Suggested Hours:**

6 hours

### **Theoretical Objectives:**

1. Identify the different roles played by a workplace mentor.
2. Identify strategies to create a supportive learning environment.
3. Identify techniques for effective communication as a mentor.
  - i) constructive feedback
  - ii) active listening
  - iii) leading meetings and one-on-one sessions
4. Describe the steps in teaching a skill.
  - i) identifying the point of lesson
  - ii) linking the lesson
  - iii) demonstrating the skill
  - iv) providing practice
  - v) giving feedback
  - vi) assessing skill and progress

5. Identify strategies to assist in teaching a skill while meeting individual learning needs.
  - i) principles of instruction
  - ii) coaching skills
6. Explain how to adjust a lesson for various situations.

## IMM-450            Program Review

### Learning Outcomes:

- Demonstrate knowledge of the Red Seal Occupational Standard (RSOS) and its relationship to the Interprovincial Examination.
- Demonstrate knowledge of overall comprehension of the trade in preparation for the Interprovincial Examination.

### Entire Red Seal Occupational Standard (RSOS)

### Suggested Hours:

30 Hours

### Objectives and Content:

#### Theoretical Objectives

1. Define terminology associated with a Red Seal Occupational Standard (RSOS).
  - i) levels
  - ii) tasks
  - iii) sub-tasks
  
2. Explain how an RSOS is developed and the link it has with the Interprovincial Red Seal Examination.
  - i) development
  - ii) validation
  - iii) level and task weighting
  - iv) examination breakdown (pie-chart)
  
3. Identify Red Seal products and describe their use when preparing for the Interprovincial Red Seal Examination.
  - i) Red Seal website
  - ii) examination preparation guide
  - iii) sample questions
  - iv) examination counselling sheets

4. Explain the relationship between the RSOS and the Atlantic Apprenticeship Curriculum and Standards (AACCS).
5. Review common occupational skills for the Industrial Mechanic (Millwright) trade as identified in the RSOS.
  - i) safety-related functions
  - ii) tools and equipment
  - iii) routine trade tasks
  - iv) communication and mentoring
  - v) measuring and layout
  - vi) cutting and welding techniques
6. Review process to perform rigging, hoisting lifting and moving for the Industrial Mechanic (Millwright) trade as identified in the RSOS.
7. Review process to service mechanical power transmission components and systems for the Industrial Mechanic (Millwright) trade as identified in the RSOS.
  - i) prime movers
  - ii) shafts, bearings and seals
  - iii) couplings, clutches and brakes
  - iv) chains and belt drive systems
  - v) gear systems
  - vi) shaft alignment procedures
8. Review process to service material handling and process systems for the Industrial Mechanic (Millwright) trade as identified in the RSOS.
  - i) robotics and automated equipment
  - ii) fans and blowers
  - iii) pumps
  - iv) compressors
  - v) process piping, tanks and containers
  - vi) conveying systems
9. Review process to service fluid power systems for the Industrial Mechanic (Millwright) trade as identified in the RSOS.
  - i) hydraulic systems
  - ii) pneumatic and vacuum systems

10. Review process to perform preventative and predictive maintenance, commissioning and decommissioning for the Industrial Mechanic (Millwright) trade as identified in the RSOS.

Practical Objectives

N/A

## Feedback and Revisions

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This AACCS will be amended periodically; comments or suggestions for improvements should be directed to:

**New Brunswick:**

Apprenticeship and Occupational  
Certification  
Post-Secondary Education, Training and  
Labour  
470 York St., Rm. 110, PO Box 6000  
Fredericton, NB E3B 5H1  
Tel: 506-453-2260  
Toll Free in NB: 1-855-453-2260  
[www.gnb.ca](http://www.gnb.ca)

**Prince Edward Island:**

Apprenticeship, Training and  
Certification  
Atlantic Technology Centre  
212-176 Great George St.,  
PO Box 2000  
Charlottetown, PE C1A 7N8  
Tel: 902-368-4460  
[www.apprenticeship.pe.ca](http://www.apprenticeship.pe.ca)

**Newfoundland and Labrador:**

Apprenticeship and Trades Certification  
Immigration, Population Growth & Skills  
Confederation Bldg., West Block  
Prince Philip Dr., PO Box 8700  
St. John's, NL A1B 4J6  
Toll Free: 877-771-3737  
[www.gov.nl.ca/atcd](http://www.gov.nl.ca/atcd)

**Nova Scotia:**

Nova Scotia Apprenticeship Agency  
1256 Barrington St., PO Box 578  
Halifax, NS B3J 2S9  
Tel: 902-424-5651  
Toll Free in NS: 1-800-494-5651  
[www.nsapprenticeship.ca](http://www.nsapprenticeship.ca)

Any comments or suggestions received will be reviewed and considered to determine the course of action required. If the changes are deemed to be minor, they will be held for implementation during the next review cycle. If immediate change is deemed appropriate and approved by the Atlantic Trade Advisory Committee, it will result in a revision to this version of the AACCS and will be detailed in the following section.

### Version Changes

Revision Date	Affected Section	Description of Change
May 2024	Levels 1 and 4	Integration of MENT-700 Mentoring I and MENT-701 Mentoring II

