

Machinist/Tool and Die Maker Common Core - Level 1

Machinist/Tool and Die Maker

Unit: A1 Trade Safety Awareness

Level: One

Duration: 7 hours

Theory: 7 hours

Practical: 0 hours

Overview:

Safe working conditions, injury prevention, and the preservation of health are of primary importance to industry in Canada. These responsibilities are shared and require the joint efforts of government, employers, supervisors, and workers. It is imperative to be familiar and apply the Manitoba Workplace Safety and Health Act and Regulations. Safety education is an integral part of apprenticeship training both in school and on-the-job. This unit is an overview of occupational safety and health best practices in Manitoba and covers Personal Protective Equipment, the Workplace Hazardous Materials Information System, and Safe Work Procedures. The unit also describes injury prevention and response. Finally, the unit reinforces these best practices by navigating the SAFE Work Manitoba website through each objective to apply Manitoba's most current safety and health standards. Additional trade safety awareness related resources are located on the Apprenticeship Manitoba website link below. Trade specific hazards and safe work practices are supplemented and delivered in-context within technical training units.

- **SAFE Work Manitoba website:** <https://www.safemanitoba.com/>
- **Safety resources:** <https://www.gov.mb.ca/aesi/apprenticeship/generalinfo/instructoreducators.html>

Note: No percentage-weightings for test purposes are prescribed for this unit's objectives. Instead, a "Pass/Fail" grade will be recorded for the unit in its entirety.

Objectives and Content:

**Percent of
Unit Mark (%)**

1. **Define and describe Manitoba safety and health requirements.**
 - a. Overview of the *Workplace Safety and Health Act and Regulations*
 - Rights and responsibilities of workers under the *Act*
 - Rights and responsibilities of supervisors under the *Act*
 - Rights and responsibilities of employers under the *Act*
 - b. Public agencies
 - Workplace Safety and Health (Enforcement)
 - SAFE Work Manitoba (Prevention)
 - Other
 - c. Codes of practice, guidelines, policies and standards (differences)
 - d. Worker rights
 - Right to know, participate and refuse
 - Protection from reprisal
 - e. Workplace safety and health program (worker's involvement)
 - Workplace safety and health committee
 - Participation in investigation and inspection process

n/a

- 2. Identify and describe personal protective equipment (PPE) requirements and standards in the workplace.** n/a
- a. Employer, supervisor and worker responsibilities
 - b. Hierarchy of control measures
 - c. Personal protective equipment (PPE)
 - Eye and face protection
 - Hearing protection
 - Foot, head, hand and skin protection
 - Respiratory protection
 - Protective clothing (including Hi-Visibility/Hi-Vis)
 - Fall protection (trade specific)
- 3. Identify and describe the Workplace Hazardous Material Information System (WHMIS) and procedures.** n/a
- a. Hazard identification
 - b. Product labels, symbols and classification
 - Supplier
 - Workplace
 - c. Safety Data Sheets (SDS)
 - d. Chemical and biological hazards
 - Emergency washing
 - Transportation of dangerous goods
 - Storage and handling
- 4. Identify and describe Safe Work Procedures (SWP).** n/a
- a. Hazard identification
 - b. Uncontrolled risk
 - c. SWP development
- 5. Identify and describe injury prevention.**
- a. Hazard recognition, evaluation, and control (SAFE acronym)
 - b. Occupational disease and illness
 - c. Musculoskeletal
 - Ergonomics
 - d. Psychological health and safety
 - Harassment and violence
 - Working alone
 - e. Young workers
 - f. Physical hazards
 - g. Chemical and biological hazards and exposures
 - Dust and fibres
 - Fumes, aerosols, gases and vapours
 - h. Confined space entry
 - i. Electrical safety
 - Lockout/tagout procedures
 - j. Fire types, fire extinguisher classifications and applications
- 6. Identify and describe injury response.** n/a
- a. Control the scene
 - b. Incident investigation
 - Near miss
 - Incident
 - Serious incident
 - c. Corrective actions

- d. Follow-up
- e. Reporting an injury (Workers Compensation Board of Manitoba (WCB))

7. Demonstrate navigation and retrieval of key content areas from SAFE Work Manitoba's website and apply resources directly to unit objectives.

n/a

- a. Legislation
- b. Bulletins
- c. Templates
- d. Shop talk
- e. Other resources

Machinist/Tool and Die Maker

Unit: A2 Safety

Level: One

Duration: 7 hours

Theory: 7 hours

Practical: 0 hours

Overview:

This unit of instruction is designed to introduce knowledge of safety equipment, their applications, maintenance and procedures for use. It is also designed to introduce knowledge of safe work practices, and knowledge of regulatory requirements pertaining to safety. Percentage of unit mark for each section is at the discretion of the instructor.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Identify types of personal protective equipment (PPE) and describe their applications.	%
2. Describe the procedures used to care for and maintain PPE.	%
3. Identify types of fire extinguishing equipment and describe their applications and procedures for use.	%
4. Identify workplace hazards and describe safe work practices and equipment.	%
a. Personal	
b. Shop/facility	
• Energy state awareness (electrical and mechanical)	
• Lockout/tag out	
• Ventilation/fumes	
• Fire	
c. Environment	
• Discharge/spills	
• Material waste	
	%
5. Identify and interpret workplace safety and health regulations.	
a. Federal	
• Material Safety Data Sheets (MSDS)	
• Workplace Hazardous Material Information System (WHIMIS)	
b. Provincial/territorial	
• Occupational Health and Safety (OHS)	

Machinist/Tool and Die Maker

Unit: A3 Learning About Work

Level: One

Duration: 7 hours

Theory: 7 hours

Practical: 0 hours

Overview:

One sign that an apprentice has become competent in a task or technique is to be asked to share this knowledge. Jobsite skills-exchange has long been fundamental to trade-learning. Even trade veterans rely on peers to refine their knowledge and skill.

The opportunity to benefit from this process, however, is shaped by complex factors that include jobsite 'politics' and industrial/construction deadlines. As adult trade-learners, apprentices at all levels of training must use their observational, listening and interpersonal skills to benefit from the journey person's knowledge and experience. This requires understanding the trade's dynamics, as well as the roles and responsibilities which order workplace/jobsite work-life.

This unit profiles the trade's structure and scope as determined by the Apprenticeship and Certification Act, regulations, Provincial Advisory Committees and the Red Seal Occupational Standard (RSOS) from which the training standards are derived (core tasks and skill requirements), as well as its job-ladders and long-term career options and social competencies. This includes information about major areas of working knowledge, activities and interactions at work, and expansive and restrictive workplaces, stressing their application to apprenticeship on-the-job training.

A sound grasp of the roles, workplace relationships, and possibilities introduced in this unit are part of 'learning to learn' in Manitoba's apprenticeship system. Senior apprentices are later offered information about learning to *teach* in this system – a central and time-honored foundation of Trades journeywork.

Objectives and Content:

**Percent of
Unit Mark (%)**

1. Describe structure and scope of the Machinist trade.

60%

- a. The Apprenticeship and Certification Act
 - Apprenticeship and Certification Board and Provincial Advisory Committees
 - General and specific trade regulation
 - Policies regarding attendance, evaluation procedures, conduct and progression requirements (Apprenticeship Manitoba, Training provider)
- b. Uses of the Red Seal Occupational Standard (RSOS)
 - Technical training in-school curriculum
 - On-the-job record book of hours (Manitoba blue book)
 - Examinations (level placement tests, final certification examinations)
- c. Opportunities and future career options.
 - Generalists and specialists. The move toward specialization is well known to modern tradespeople. Some prefer to specialize and others want to do it all. Supervisory positions require a broad scope.

- Lead hands and other immediate supervisors. Apprentices need to know how to become a lead-hand as much as they need to know the benefits and pit-falls of leadership between management and shop floor workers.
- Geographic mobility. What does it mean to a construction/industrial worker to have to travel to find work? Are there more opportunities if they do? What are they? What are the draw-backs to being away from home for several weeks at a time?
- Job hierarchies and innovations. What trade specific special training opportunities are available in your trade? Is there travel involved? Is there an opportunity to move up the ladder on a work crew as opposed to staying in the shop?

2. Describe two levels of workplace competency. 30%

- a. Job competencies related to workplace culture
 - Knowledge of workplace equipment and materials
 - Skills and techniques
- b. Social competencies related to workplace culture
 - Frame of reference for evaluation workplace events
 - Language of work
 - Workplace belief systems
 - Rules and meanings
 - Multiculturalism and equity in the workplace

3. Describe accommodation for apprentices with disabilities. 10%

- a. Technical training
 - Requirements
 - Roles and responsibilities
 - Services and information required by persons with disabilities
- b. On-the-job
 - Requirements
 - Roles and responsibilities
 - Services and information required by persons with disabilities

Machinist/Tool and Die Maker

Unit: A4 Hand Threading

Level: One

Duration: 10 hours

Theory: 6 hours

Practical: 4 hours

Overview:

This unit of instruction is designed to introduce knowledge of basic threads, and fits, and their applications. It is also designed to introduce knowledge of the procedures used to measure and gauge threads.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with threads.	5%
2. Identify hazards and describe safe work practices pertaining to threading.	5%
3. Identify types of threads and describe their purpose and applications.	30%
4. Explain thread fit, classifications and series.	5%
5. Identify types of thread inserts and describe their applications and installation procedures.	5%
6. Describe the importance of thread fit and the use of thread gauges.	10%
7. Identify types of thread failures and describe their causes and remedies.	5%
8. Calculate and select tap drill sizes in metric and imperial.	10%
9. Identify methods used to measure and gauge threads and describe their associated procedures.	5%
10. Describe the procedures used to produce threads using taps and dies.	5%
11. Perform procedures used to cut or tap a thread.	15%

Machinist/Tool and Die Maker

Unit: A5 Hoisting, Lifting and Rigging

Level: One

Duration: 7 hours

Theory: 3 hours

Practical: 4 hours

Overview:

This unit of instruction is designed to introduce knowledge of hoisting, lifting and rigging equipment, their applications, limitations and procedures for use. It is also designed to introduce knowledge of basic hoisting, lifting and rigging techniques.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with hoisting, lifting and rigging.	10%
2. Identify hazards and describe safe work practices pertaining to hoisting, lifting and rigging.	30%
3. Identify codes and regulations pertaining to rigging, hoisting and lifting.	5%
a. Training and certification requirements	
4. Identify types of rigging equipment and accessories and describe their applications, limitations and procedures for use:	5%
a. Ropes	
b. Slings	
c. Chains	
d. Hooks	
e. Spreader bar	
f. Shackles	
5. Identify and interpret hand signals used for hoisting and lifting.	5%
6. Identify types of hoisting and lifting equipment and accessories and describe their applications, limitations and procedures for use.	10%
7. Describe the considerations when rigging material/equipment for lifting.	5%
a. Load characteristics	
b. Equipment and accessories	
c. Environmental factors	
d. Anchor points	
e. Sling angles	

- 8. Describe the procedures used to inspect, maintain and store hoisting, lifting and rigging equipment. 10%**
- 9. Perform procedures used to inspect, maintain and store hoisting, lifting and rigging equipment. 20%**

Machinist/Tool and Die Maker

Unit: A6 Basic Drawings

Level: One

Duration: 28 hours

Theory: 28 hours

Practical: 0 hours

Overview:

This unit of instruction is designed to introduce knowledge of basic drawings and their applications. It is also designed to introduce knowledge of interpreting and extracting information from drawings.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with drawings.	20%
a. Nominal size	
b. Limits	
c. Tolerance	
d. Allowance	
e. Scale	
f. Symmetry	
2. Identify types of basic drawings and sketches and describe their purpose.	10%
3. Interpret and extract information from drawings.	50%
a. Lines	
b. Projections	
c. Dimensions	
d. Notes	
e. Lay/surface finish symbols	
f. Welding symbols	
4. Explain the principles of orthographic projection.	10%
5. Describe basic sketching techniques.	10%

Machinist/Tool and Die Maker

Unit: A7 Fluids and Coolants

Level: One

Duration: 7 hours

Theory: 5 hours

Practical: 2 hours

Overview:

This unit of instruction is designed to introduce knowledge of cutting fluids, their applications, and procedures for use. It is also designed to introduce knowledge of coolants, their applications and procedures for use. In addition, it will introduce knowledge of lubricants, their applications and procedures for use. Finally, It will introduce knowledge of solvents, their applications and procedures for use.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with fluids and coolants.	10%
2. Identify hazards and describe safe work practices pertaining to fluids and coolants.	15%
a. Personal	
b. Shop/facility	
c. Environmental	
3. Interpret regulations pertaining to the use of fluids and coolants.	5%
4. Identify types of fluids and coolants and describe their purpose, characteristics and applications.	10%
a. Cutting fluids	
b. Coolants	
c. Lubricants	
d. Solvents	
5. Describe the procedures used to apply and maintain lubricants.	5%
6. Perform procedures used for mixing, maintaining and adjusting coolants.	20%
7. Describe the procedures used to apply cutting fluids and coolants.	5%
8. Describe the procedures used to handle, store and dispose of fluids and coolants.	10%
a. Cutting fluids	
b. Coolants	
c. Lubricants	
9. Perform procedures used to handle, store and dispose of fluids and coolants.	20%

Machinist/Tool and Die Maker

Unit: A8 Hand and Power Tools

Level: One

Duration: 21 hours

Theory: 7 hours

Practical: 14 hours

Overview:

This unit of instruction is designed to introduce knowledge of hand tools, their applications, maintenance and procedures for use. It is also designed to introduce knowledge of power tools, their applications, maintenance and procedures for use.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Identify hazards and describe safe work practices pertaining to hand and power tools.	10%
2. Identify types of hand tools and describe their applications and procedures for use.	10%
a. Vices	
b. Hammers	
c. Screw drivers	
d. Wrenches	
e. Pliers	
f. Punches	
g. Stamps	
h. Hacksaws	
i. File	
j. Scrapers	
k. Deburring tools	
l. Chisels	
m. Taps	
n. Dies	
o. Arbor press	
p. Extractors	
3. Describe the procedures used to inspect, maintain and store hand tools.	10%
4. Perform the procedures used to inspect, maintain and store hand tools.	25%
5. Identify types of power tools and equipment and describe their applications and procedures for use.	10%
a. Electrical	

- b. Cordless
- c. Hydraulic
- d. Pneumatic

6. Describe the procedures used to inspect, maintain and store power tools and equipment. 10%

7. Perform procedures used to inspect, maintain and store power tools and equipment. 25%

Machinist/Tool and Die Maker

Unit: A9 Drills and Drill Presses

Level: One

Duration: 15 hours

Theory: 7 hours

Practical: 8 hours

Overview:

This unit of instruction is designed to introduce knowledge of drills and drill presses, their applications, maintenance and procedures for use.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with drills and drill presses.	5%
2. Identify hazards and describe their safe work practices pertaining to drills and drill presses.	10%
3. Identify types of drills and describe their applications.	5%
4. Identify types of drill presses and describe their components and application.	5%
5. Identify drill press accessories and describe their applications and procedures for use.	5%
a. Jigs and fixtures	
b. Work holding devices	
c. Tool holding devices	
6. Describe the procedures used to set up and perform drill press operations.	10%
a. Drilling	
b. Counterboring	
c. Countersinking	
d. Tapping	
e. Reaming	
7. Describe the procedures used to inspect, maintain and store drilling equipment and accessories.	10%
8. Perform procedures used to sharpen drill bits.	10%
9. Describe the considerations to determine speed, feed and depth of cut for drill press operations.	10%

10. Perform set up and drill press operations.

30%

- a. Drilling
- b. Counterboring
- c. Countersinking
- d. Tapping

Machinist/Tool and Die Maker

Unit: A10 Precision Measurement I

Level: One

Duration: 15 hours

Theory: 10 hours

Practical: 5 hours

Overview:

This unit of instruction is designed to introduce knowledge of basic precision measurement and its use. It is also designed to introduce knowledge of basic precision measuring instruments, their applications and procedures for use.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with basic precision measurement.	10%
2. Describe the imperial and metric measuring systems and the procedures used to perform conversions for machining operations.	10%
3. Describe the procedures used to read basic precision measuring instrument scales.	10%
4. Identify types of precision measuring instruments and describe their applications and procedures for use. a. Micrometers b. Vernier calipers c. Dial indicators d. Gauges	10%
5. Describe the procedures used to perform basic calibration of measuring instruments.	10%
6. Describe the procedures used to inspect, maintain and store basic precision measuring instruments.	10%
7. Demonstrate applications and procedures when inspecting, maintaining and storing precision measuring instruments.	40%

Machinist/Tool and Die Maker

Unit: A11 Basic Layout

Level: One

Duration: 14 hours

Theory: 8 hours

Practical: 6 hours

Overview:

This unit of instruction is designed to introduce knowledge of basic layout and its use. It is also designed to introduce knowledge of basic layout tools and equipment, their applications, maintenance and procedures for use. In addition, it will introduce the procedures used to perform a basic layout.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with basic layout.	5%
2. Identify types of basic layout tools, equipment and accessories and describe their applications and procedures for use.	10%
a. Surface tables	
b. Angle planes	
c. Scribes	
d. Dividers and trammels	
e. Hermaphrodite calipers	
f. Squares	
g. Gauges	
h. Rulers	
3. Identify types of layout media/solutions and describe their applications.	5%
4. Calculate layout dimensions and reference points.	20%
5. Describe the procedures used to read and transfer sizes from a drawing.	5%
6. Describe the procedures used to perform basic layout.	5%
7. Identify methods used to mark workpieces for identification and describe their associated procedures.	5%
8. Describe the procedures used to inspect, maintain and store layout tools and equipment.	5%
9. Perform basic layout.	40%

Machinist/Tool and Die Maker

Unit: A12 Introduction to Conventional Lathes

Level: One

Duration: 21 hours

Theory: 21 hours

Practical: 0 hours

Overview:

This unit of instruction is designed to introduce knowledge of lathes, their accessories, attachments and applications. It is also designed to introduce knowledge of lathe tools and their applications

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with conventional lathes.	10%
2. Identify types of conventional lathes and describe their operating principles and applications.	5%
3. Identify the components and controls of conventional lathes and describe their purpose and operation.	10%
4. Identify conventional lathe accessories and attachments and describe their applications.	10%
5. Identify types of tool holding devices and describe their applications.	5%
6. Identify types of work holding devices and describe their applications.	10%
a. Four jaw chuck	
b. Three jaw chuck	
c. Face plate	
d. Between centres	
7. Identify types of conventional lathe tools and describe their characteristics and applications.	30%
a. Turning	
b. Boring	
c. Threading	
d. Grooving	
e. Facing	
f. Knurling	
g. Parting off	
h. Reaming	

- i. Tool post grinding
- j. Drilling

- 8. Describe the procedures used to sharpen conventional lathe cutting tools. 10%
- 9. Describe the procedures used to grind cutting tool angles. 10%

Machinist/Tool and Die Maker

Unit: A13 Basic Conventional Lathe Operation

Level: One

Duration: 105 hours

Theory: 21 hours

Practical: 84 hours

Overview:

This unit of instruction is designed to introduce knowledge of conventional lathes, their maintenance and procedures for use.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Identify hazards and describe safe work practices pertaining to conventional lathe.	5%
2. Describe the considerations to determine speed, feed and depth of cut for conventional lathe operations.	5%
3. Calculate speed, feed and depth of cut.	5%
4. Identify potential set up problems and describe their causes and remedies.	5%
5. Describe the procedures used to set up lathes.	5%
6. Describe the procedures used to mount and adjust rests.	5%
7. Identify cutting fluids and coolants used during lathe operations.	2%
8. Identify the considerations and requirements for selecting tools and accessories for specific operations.	8%
9. Describe the procedures used to adjust and maintain conventional lathes.	2%
10. Describe the procedures used to align lathe centres.	5%
11. Describe the procedures used to perform basic conventional lathe operations.	10%
a. Turning	
b. Boring	
c. Threading	
d. Grooving	

- e. Facing
- f. Knurling
- g. Parting off
- h. Reaming
- i. Drilling
- j. Set up lathe
- k. Mount and adjust rests

- | | |
|---|------------|
| 12. Describe the procedures used to set up eccentrics on conventional lathes. | 3% |
| 13. Identify techniques used to troubleshoot conventional lathe operations and describe their associated procedures. | 2% |
| 14. Describe the procedures used to inspect and maintain conventional lathes. | 3% |
| 15. Perform basic lathe operations. | 35% |

Machinist/Tool and Die Maker

Unit: A14 Advanced Lathe Drilling, Boring, Reaming, Tapping and Die Threading

Level: One

Duration: 24 hours

Theory: 14 hours

Practical: 10 hours

Overview:

This unit of instruction is designed to introduce knowledge of conventional lathe drilling, boring, reaming, tapping, and die threading operations.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Describe the procedures used for spotting and drilling work on a conventional lathe.	5%
2. Identify types of boring tools and describe their applications and procedures for use.	5%
3. Describe the procedures used for boring work on a conventional lathe.	5%
4. Identify types of machine reamers and describe their applications and procedures for use.	10%
5. Describe the procedures used for reaming work on a conventional lathe.	10%
6. Identify types of machine taps and dies and describe their applications and procedures for use.	10%
7. Describe the procedures used for tapping on a conventional lathe.	10%
8. Describe the procedures used for die threading on a conventional lathe.	10%
9. Describe the procedures used for counterboring and countersinking work on a conventional lathe.	10%
10. Describe speed, feed and depth of cut for conventional lathe operations.	10%
a. Reaming	
b. Drilling	
c. Tapping	
d. Die threading	
e. Counterboring	
f. Countersinking	

11. Perform processes for speed, feed and depth of cut for conventional lathe operations.

15%

Machinist/Tool and Die Maker

Unit: A15 Introduction to Milling Machines

Level: One

Duration: 27 hours

Theory: 27 hours

Practical: 0 hours

Overview:

This unit of instruction is designed to introduce knowledge of milling machines, their accessories, attachments and applications. In addition, it will introduce knowledge of milling cutting tools and their applications.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Define terminology associated with milling machines.	10%
2. Identify hazards and describe safe work practices pertaining to conventional milling machines.	10%
3. Identify types of milling machines and describe their applications.	10%
a. Vertical	
b. Horizontal/universal	
c. Ram and turret	
d. Horizontal boring mill	
e. Vertical boring mill	
4. Identify the components and controls of milling machines and describe their purpose and operation.	10%
5. Identify types of milling machine accessories and attachments and describe their applications and maintenance.	10%
6. Identify types of tool holding devices and describe their applications.	10%
7. Identify types of work holding devices and describe their applications and maintenance.	10%
8. Identify types of materials used in milling cutter construction and describe their characteristics.	10%
9. Identify types of cutting tools and describe their applications.	10%
10. Knowledge of reciprocating machines, slotters, shapers, broaching and keyseating machines.	10%
a. Terminology associated with reciprocating machines	

- b. Hazards and safe work practices pertaining to reciprocating machines
- c. Types of slotters and their components and applications
- d. Markings and documentation relating to material selection
- e. Procedures used to set up and operate slotters
- f. Procedures used to set up and operate shapers
- g. Operating principles of machine broaching and keyseating
- h. Types of broaching and keyseating machines and their applications
- i. Types of tooling for broaching and keyseating machines and their applications
- j. Procedures used to set up and operate broaching and keyseating machines
