Grades 9 to 12 Plumbing and Pipe Trades
Manitoba Technical Vocational Curriculum Framework of Outcomes

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Technical-Vocational Education Overview

In 2013, Manitoba Education released the document *Technical-Vocational Education Overview* (available at [www.edu.gov.mb.ca/k12/cur/teched/sy_tech_program.html](http://www.edu.gov.mb.ca/k12/cur/teched/sy_tech_program.html) to provide the philosophical and pedagogical underpinnings for curriculum development and the teaching of technical-vocational education (TVE) courses in Manitoba. This overview presents educators with the vision and goals of TVE in Manitoba.

Topics include the following:

- curriculum revitalization and renewal
- curriculum framework and implementation
- articulation of programming
- assessment and reporting
- safety
- employability/essential skills and career development
- sustainable development

TVE clusters of courses are designed to encourage students to explore career options in designated trades and trained occupations, and to address labour shortages in these areas. The TVE curriculum includes course clusters for both designated trades (those designated for apprenticeship training and certification by Apprenticeship Manitoba) and trained occupations (those not designated as trades).

The TVE curriculum is significantly different from other subject areas such as industrial arts. It has distinct qualities that, when respected, will provide students with a uniquely valuable experience that they cannot receive from any other curriculum.

TVE gives students the opportunity to learn the theoretical and practical aspects of one specific trade or trained occupation in order to facilitate their transition from school to work or to post-secondary education in that trade or trained occupation (including journeyperson status from Apprenticeship Manitoba), or into an associated trade or occupation. This transition is accomplished by having students complete an entire TVE cluster of courses, learning from industry-certified teachers with industry experience in a setting that, as much as possible, emulates an actual workplace.

The TVE curriculum includes Grades 9 to 12 courses in a variety of areas, including plumbing and pipe trades.
Plumbing and Pipe Trades Overview

Grades 9 to 12 Plumbing and Pipe Trades: Manitoba Technical- Vocational Curriculum Framework of Outcomes identifies the goals, general learning outcomes (GLOs), and specific learning outcomes (SLOs) for nine plumbing and pipe trades courses. This framework is intended for use in all Manitoba schools teaching Plumbing and Pipe Trades as part of the Senior Years Technology Education Program.

Plumbing and Pipe Trades as a TVE Cluster

Grades 9 to 12 Plumbing and Pipe Trades: Manitoba Technical- Vocational Framework of Outcomes has been developed as a technical-vocational education (TVE) cluster of courses.

The plumbing and pipe trades curriculum prepares students for careers as plumbers. Plumbing has been designated as a trade by the regulations under the Apprenticeship and Certification Act (Manitoba), and is administered by Apprenticeship Manitoba. For more information on trade programs, refer to Manitoba Trades on the Apprenticeship Manitoba website at http://www.gov.mb.ca/wd/apprenticeship/discover/mbtrades/plumber.html

Like all other TVE courses, the plumbing and pipe trades courses can be taught only as part of a complete cluster, approved by Manitoba Education and Training.

Role of Plumbers

Apprenticeship Manitoba describes the role of plumbers as follows:

“Plumbers plan, install, maintain, inspect and repair plumbing systems, fixtures, equipment and controls in residential and commercial buildings. Some plumbers install piping systems in new home construction, commercial, industrial and public buildings. Others are experts in the retrofitting, repair and maintenance of existing systems. In smaller communities, plumbers generally do a wider variety of plumbing and related tasks, including installing private sewage disposal systems and potable (drinking) water distribution systems. Plumbers must be able to read blueprints and project specifications to determine the layout for the plumbing and other materials. They may work with pipes made from iron, steel, lead, copper, plastic, glass and cement and need to know the particular characteristics of the substances being carried in the pipes.

Construction companies, heating and plumbing contractors, and maintenance departments of plants, factories, governments and schools are all major employers of plumbers.”

Career and Employment Opportunities in Plumbing and Pipe Trades

A student graduating from the Plumbing and Pipe Trades cluster may seek entry level employment as an apprentice plumber, steam fitter, sprinkler fitter, HVAC technician, gas fitter, petroleum technician, pipeline worker, building maintenance, welder, power engineer, controls technician, instrument fitter, oilfield worker, fabrication worker, rigger and a waste water technician. In order to be qualified and continue as a Plumbing and Pipe Trades worker, students must seek apprenticeship and continue post-secondary training. Plumbing and Pipe Trades graduates are typically employed by general contractors, small plumbing shops, fabrication shops, the military, school divisions, building maintenance contractors, wholesale suppliers, pipelines and plant maintenance contractors. They also have the option of self-employment after completing their apprenticeship.

The Plumbing and Pipe Trades program provides a foundation for students to go directly to work, continue into post-secondary education in Plumbing and Pipe Trades, steam fitter, sprinkler fitter, HVAC technician, gas fitter, petroleum technician, pipeline worker, building maintenance, welder, power engineer, controls technician, instrument fitter, oilfield worker, fabrication worker, rigger and a waste water technician.

Graduates of the Plumbing and Pipe Trades program will be able to demonstrate the following:

- perform basic installation of plumbing and piping systems
- complete documentation necessary to allow start-ups
- complete repairs and service to piping systems
- complete preventative maintenance procedures
- ability to understand and use modern piping techniques
- the ability to communicate and work with peers, employers, and customers
- logical thinking and decision making
- work independently or as part of a team
- demonstrate the ability for life-long learning to enhance their skills
- time management skills
- mechanical aptitude and manual dexterity
- problem-solving skills
- employability skills
Implementing the Plumbing and Pipe Trades Cluster

To receive a Senior Years Technology Education Program (SYTEP) diploma, a student must complete a minimum of eight departmentally developed courses from an approved TVE cluster, together with 17 compulsory credits and five optional credits. Students must complete the eight mandatory courses from the Grades 10 to 12 Plumbing and Pipe Trades curriculum to earn their SYTEP diploma and to meet the Level 1 apprenticeship training requirements for Plumber from Apprenticeship Manitoba. Students do not need to complete the optional Grade 9 course in order to graduate from SYTEP or to meet the Level 1 apprenticeship requirements.

Level 1 Apprenticeship for Plumber

Students completing the Plumbing and Pipe Trades cluster of courses have the opportunity to complete their Level 1 technical training for plumber, since this cluster may only be taught by a journeyperson plumber, and the curriculum includes all of the objectives from Plumber Level 1 from Apprenticeship Manitoba. This document is available on the Apprenticeship Manitoba website at http://www.gov.mb.ca/wd/apprenticeship/discover/mbtrades/plumber.html (Apprenticeship Manitoba, 2017)

Dear Editor, as of September 10, 2018, the Apprenticeship Manitoba website did not yet have the 2017 Apprenticeship Manitoba technical training documents. I assume that the Apprenticeship Manitoba staff will upload them very soon. They have emailed the 2017 files to me, so I have them in my possession, and would be delighted to share them with you.
Critical Information on SLOs from Plumber Level 1

The SLOs in this high school curriculum that correspond with the Apprenticeship Manitoba objectives from Plumber Level 1 contain an alphanumeric code at the end, which indicates the unit and objective where they originally appeared. For example, the following SLO is found under GLO 1.1 of 8876 Introduction to Plumbing and Pipe Trades 20S/20E/20M:

“Identify safety and health requirements. (A1a.1)”

The A1a.1 code indicates that the SLO is Objective 1 from Unit A1a: SAFETY RELATED FUNCTIONS, which is found on page 1 of Plumber Level 1.

To make Grades 9 to 12 Plumbing and Pipe Trades documents easier to read, the SLOs do not include all of the detailed information for each Apprenticeship Manitoba objective. For example, for objective A1a.1, Plumber Level 1 also includes the following essential details, which are not found in this Plumbing and Pipe Trades curriculum:

a. Overview of The Workplace Safety and Health Act
   - Rights and responsibilities of employees under the Act
   - Rights and responsibilities of employers under the Act
   - Rights and responsibilities of supervisors under the Act
b. Fourteen (14) regulations
c. Codes of practice
d. Guidelines
e. Right to refuse
   - Explanation of right to refuse process
   - Rights and responsibilities of employees
   - Rights and responsibilities of employers
   - Rights and responsibilities of supervisors under the Act

These details are a necessary part of this curriculum. When addressing this SLO, teachers must ensure that they are covering each point listed. Teachers need to become familiar with the Plumber Level 1 document in its entirety, as well as with the other plumber documents from Apprenticeship Manitoba. These documents provide valuable background information and are available on the Apprenticeship Manitoba website at http://www.gov.mb.ca/wd/apprenticeship/discover/mbtrades/plumber.html

Plumbing and Pipe Trades teachers should refer to the Apprenticeship Manitoba document entitled Unit to Course Comparison (UCC) Form—Plumber Level 1, available on the department website at http://www.edu.gov.mb.ca/k12/cur/teched/sytep/plumbing/index.html
This form lists under which learning outcome each apprenticeship objective is taught in this high school curriculum. Teachers might find this document helpful in applying to have their courses accredited with Apprenticeship Manitoba.

For more information on accreditation, see “Information for Instructors and Educators” on the Apprenticeship Manitoba website at

www.gov.mb.ca/wd/apprenticeship/generalinfo/instructoreducators.html

**Trade Safety Awareness Manual**

Apprenticeship Manitoba has developed a Trade Safety Awareness Unit, the purpose of which is to increase student awareness of trade safety in the workplace. All students studying a designated trade must complete this seven-hour unit.

The learning outcomes from the Trade Safety Awareness Unit are incorporated into GLO 1.2 of course 8876 Introduction to Plumbing and Pipe Trades 20S/20E/20M. The Trade Safety Awareness Unit’s alphanumeric designations are located at the end of the applicable SLOs in this framework.

For example, the following SLO is found in 8876 Introduction to Plumbing and Pipe Trades:

12D.2.7 Define workplace safety and health hazards. (TSA 7)

The TSA 7 code indicates that this SLO is taken from Apprenticeship Manitoba’s Trade Safety Awareness Unit.

For more information, and to access the Trade Safety Awareness Unit and its tests and other resources, see “Information for Instructors and Educators” on the Apprenticeship Manitoba website at

www.gov.mb.ca/wd/apprenticeship/generalinfo/instructoreducators.html
**Red Seal Resources**

Because plumber is a designated Red Seal trade across Canada, the Apprenticeship Manitoba curriculum is aligned with the Canada-wide Red Seal curriculum. High school Plumbing and Pipe Trades teachers, as well as students working towards their Level 1 apprenticeship for plumber, can find valuable resources in the *Plumber* section of the Red Seal Program website at

http://www.red-seal.ca/trades/pl.5mb.2r-eng.html

Among other resources, teachers and students can find sample examination questions used on Red Seal examinations.

**Qualifications of Plumbing and Pipe Trades Teachers**

Only vocationally certified teachers are allowed to teach TVE courses, including the ones in this plumbing and pipe trades cluster. Vocational certification includes three components:

1. **Trade Certification:** Plumbing and Pipe Trades teachers need to have personally experienced the apprenticeship and journeyperson process so that they can share it with their students.

2. **Trade Experience:** Plumbing and Pipe Trades teachers need to have been employed as plumbers for at least six years (including their four-year apprenticeship). This will enable them to share their industry experience with students, which will, in turn, prepare them for working as plumbers.

3. **Technical-Vocational Teaching Certificate:** TVE teachers should have a technical vocational teaching certificate, obtained by completing Red River College’s one-year Technical-Vocational Teacher Education Diploma program. For information about this program, see


Employing only vocationally certified teachers to teach TVE courses preserves the integrity of TVE programming by ensuring that teachers are able to share their first-hand experience working in plumbing and pipe trades, as well as their familiarity with industry certification and health and safety requirements. Students receive instruction from somebody who has been involved in that trade.

Apprenticeship Manitoba certifies TVE clusters offered in Manitoba schools only if they are taught by a vocationally certified teacher. Without a vocationally certified teacher, students’ pathways to further study and careers are limited.

School boards risk significant liability if they employ non-vocationally certified teachers to teach TVE courses. Vocational certification confirms that a teacher has the requisite skills and knowledge to teach plumbing and pipe trades safely, reducing the risk of accident and injury.

For further information, see “Professional Certification: Technical Vocational Teacher” on the Manitoba Education and Training website at

[www.edu.gov.mb.ca/k12/profcert/certificates/vocational.html](http://www.edu.gov.mb.ca/k12/profcert/certificates/vocational.html)
Plumbing and Pipe Trades Goals and General Learning Outcomes (GLOs)

The learning outcomes for each course in the plumbing and pipe trades cluster are based on the following curriculum goals and general learning outcomes (GLOs). Please note that some plumbing and pipe trades courses do not address all of these goals and GLOs.

**Goal 1:** Describe and apply health and safety practices.

  GLO 1.1: Describe and apply health and safety practices.
  GLO 1.2: Demonstrate understanding of the *Trade Safety Awareness Curriculum for Level 1 Apprentices*.

**Goal 2:** Demonstrate the use and management of equipment, tools and materials, including those used in fuel brazing and cutting.

  GLO 2.1: Demonstrate the use and management of equipment and tools
  GLO 2.2: Demonstrate the use and management of fuel brazing and cutting equipment and tools.

**Goal 3:** Demonstrate an understanding of the properties and application of various pipe and fittings.

  GLO 3.1 Demonstrate an understanding of the properties and application of plastic piping.
  GLO 3.2 Demonstrate an understanding of the properties and application of copper tube and tubing.
  GLO 3.3 Demonstrate an understanding of the properties and application of steel piping.
  GLO 3.4 Demonstrate an understanding of the properties and application of cast iron piping.
  GLO 3.5 Demonstrate an understanding of the properties and application of glass piping.
  GLO 3.6 Demonstrate an understanding of the properties and application of asbestos cement piping.

**Goal 4:** Demonstrate an understanding of the properties and application of various materials (other than pipe and tubing) used in plumbing and pipe trades.

  GLO 4.1: Demonstrate an understanding of the properties and application of various materials (other than pipe and tubing) used in plumbing and pipe trades.

**Goal 5:** Demonstrate an understanding of the design and layout of piping systems.

  GLO 5.1: Demonstrate an understanding of the design and layout of piping systems.
Goal 6: Demonstrate an understanding of the **joining, fabrication and installation** of piping systems, including **hoisting, lifting and rigging, and access equipment**.

   - **GLO 6.1**: Demonstrate an understanding of the **joining and fabrication** of piping systems.
   - **GLO 6.2**: Demonstrate an understanding of the **installation** of piping systems.
   - **GLO 6.3**: Demonstrate an understanding of **hoisting, lifting and rigging**.
   - **GLO 6.4**: Demonstrate an understanding of **access equipment**.

Goal 7: Demonstrate an understanding of the **documentation and testing** of piping systems.

   - **GLO 7.1**: Demonstrate an understanding of the **documentation and testing** of piping systems.

Goal 8: Describe and demonstrate the transferable **cross-curricular** knowledge and skills as they pertain to plumbing & pipe trades.

   - **GLO 8.1**: Read, interpret and communicate information.
   - **GLO 8.2**: Apply the knowledge and skills from **mathematics**.
   - **GLO 8.3**: Apply the knowledge and skills from the **sciences**
   - **GLO 8.4**: Apply the knowledge and skills from **Information & Communication Technology**.

Goal 9: Demonstrate understanding of the **structure and scope** of plumbing & the pipe trades.

   - **GLO 9.1**: Demonstrate understanding of the structure and scope of plumbing and pipe trades, as well as associated occupations
   - **GLO 9.2**: Describe **training and employment opportunities** in plumbing and pipe trades and associated fields.

Goal 10: Demonstrate awareness of **sustainability** as it pertains to plumbing & pipe trades.

   - **GLO 10.1**: Describe the impact of **human sustainability** on the health and well-being of plumbers, tradespersons working in the pipe trades, and those who use the systems they construct.
   - **GLO 10.2**: Describe the plumbing and pipe trade’s **sustainability practices and impact on the environment**.
   - **GLO 10.3**: Describe **sustainable business practices** within plumbing and the pipe trades.

Goal 11: Demonstrate awareness of the **ethical and legal standards, including codes**, as they pertain to plumbing & the pipe trades.

   - **GLO 11.1**: Demonstrate an understanding of **ethical and legal standards**.
   - **GLO 11.2**: Demonstrate an understanding of **gas code**.

Goal 12: Demonstrate **employability skills**.

   - **GLO 12.1**: Demonstrate fundamental **employability skills**
**GLO 12.2:** Demonstrate an understanding of the **business operations** of a plumbing and pipe trades organization.

**GLO 12.3:** Demonstrate **critical thinking** skills.

**GLO 12.4:** Demonstrate understanding of **culture,** and its influence in the workplace.

**Goal 13:** Demonstrate awareness of the **history, technological progression and emerging trends** in plumbing & pipe trades.

**GLO 13.1:** Demonstrate awareness of the **history, technological progression and emerging trends** in plumbing and pipe trades.

**Specific Learning Outcomes (SLOs)**

*Grades 9 to 12 Plumbing and Pipe Trades: Manitoba Technical-Vocational Curriculum Framework of Outcomes* identifies specific learning outcomes (SLOs) for use in all Manitoba schools teaching Grades 9 to 12 Plumbing and Pipe Trades as part of the Senior Years Technology Education Program. SLO statements define what students are expected to achieve by the end of a course.

It is essential for students to learn and to demonstrate safety practices and employability skills; therefore, some SLOs related to health and safety, as well as to employability skills, are repeated in several courses.

Please note that SLOs are not identified for the goals and GLOs that are not addressed in a given course.
Course Descriptions

8859 Exploration of Plumbing and Pipe Trades  
15S 15E 15M  
10S 10E 10M

This is an optional course intended for students wishing to sample Plumbing and Pipe Trades. The emphasis is on hands-on activities. Students are introduced to safety, tools and equipment, plumbing and piping systems and service procedures.

8876 Introduction to Plumbing and Pipe Trades  
20S 20E 20M

A student wanting to develop skills in the plumbing and pipe trades must have knowledge of the basic principles related to piping systems and service. Students learn safety, tools and equipment, piping systems and service procedures and are introduced to diagnosis strategies.

8877 Introduction to Piping Systems and Theories  
30S 30E 30M

A student wanting to develop skills in plumbing and pipe trades must have knowledge of the basic principles of layout, materials, codes and design. The student will learn the procedures to servicing, repairing and installing piping systems and their components.

8878 Installation of Plumbing and Piping Systems I  
30S 30E 30M

A student wanting to develop skills in plumbing and pipe trades must have knowledge of the basic principles of supporting and installing a piping system. The student will be able to describe, draw out and demonstrate the ability to install plumbing and piping systems. The student will develop an understanding of the principles of grade and drainage and be able to apply those principles to diagnose plumbing and piping defects.

8879 Installation of Plumbing and Piping Systems II  
30S 30E 30M

A student wanting to develop skills in plumbing and pipe trades must have knowledge of the basic principles of fixture installation and the calculations necessary to properly place and select those fixtures. The student will develop an understanding of the different methods that can be used to install systems and when to choose one over another.
8981 Sanitary Venting Systems 40S 40E 40M
A student wanting to develop skills in sanitary venting must have knowledge of the basic principles of grade, siphons and venturis. The student will understand the principles of venting, and how it relates to plumbing and piping systems. The student will be able to draw a useable blueprint to assist in the installation of a sanitary venting system. The student will be able to install support and test a sanitary venting system. The student will have a working knowledge of all codes and regulations as they apply to sanitary venting.

8982 Sanitary Drainage Systems 40S 40E 40M
A student wanting to develop skills in sanitary drainage must have knowledge of the basic principles of grade, percentages and siphonage. The student will understand the principles of drainage and how it relates to plumbing and piping systems. The student will be able to draw a useable blueprint to assist in the installation of a sanitary drainage system. The student will be able to install support and test a sanitary drainage system. The student will have a working knowledge of all codes and regulations as they apply to sanitary drainage.

8984 Installation of Plumbing and Piping Systems III 40S 40E 40M
A student wanting to develop skills in plumbing and pipe trades must have knowledge of advanced installation techniques and new green technologies. The student will understand and implement the formulas and calculations they have learned to design and layout a drain-waste-vent (DWV) system, as well as a water supply system. The student will be able to design and install a water supply system and test a system of their design.

8985 Applied Plumbing and Piping Systems 40S 40E 40M
A student wanting to extend their skills in plumbing and pipe trades must be able to demonstrate the installation and selection of the appropriate fixtures. The student will be able to diagnose and correct plumbing and piping defects. The student will be able to use the newest techniques available and implement them wherever they are practical.