

# Grades 9 to 12 Plumbing and Pipe Trades

Manitoba Technical-Vocational  
Curriculum Framework  
of Outcomes





GRADES 9 TO 12 PLUMBING  
AND PIPE TRADES

Manitoba Technical-Vocational Curriculum  
Framework of Outcomes

Manitoba Education Cataloguing in Publication Data

Grades 9 to 12 plumbing and pipe trades :

Manitoba technical-vocational curriculum framework  
of outcomes

Includes bibliographical references.

ISBN: 978-0-7711-6317-3 (pdf)

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Manitoba Education  
Winnipeg, Manitoba, Canada

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[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).

Available in alternate formats upon request

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## ACKNOWLEDGEMENTS

Manitoba Education gratefully acknowledges the contributions of the following individuals in the development of *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 courses in the Senior Years Technology Education Program. This overview presents educators with the vision and goals of technical-vocational education (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 journeyman 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 the 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 the 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 Curriculum 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 [www.gov.mb.ca/wd/apprenticeship/discover/mbtrades/plumber.html](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 that are 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. (Apprenticeship Manitoba, 2019b)

## 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 wastewater technician. In order to be qualified and to 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 or continue into post-secondary education in plumbing and the 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 wastewater technician.

Graduates from plumbing and pipe trades will be able to

- 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
- understand and use modern piping techniques
- communicate and work with peers, employers, and customers
- demonstrate logical thinking and decision making
- work independently or as part of a team
- pursue lifelong learning to enhance their skills
- use time management skills effectively
- demonstrate mechanical aptitude and manual dexterity
- demonstrate problem-solving skills
- demonstrate employability skills

## Implementation of Plumbing and Pipe Trades Courses

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.

## The Multi-Course and Individual-Course Formats

This curriculum has been developed in two different formats. The **multi-course format** (found in this document) is comprised of either five columns (one course each in Grades 9 and 10, and three in Grade 11) or four columns (the four Grade 12 courses). It is found in this document, starting on page 15.

The **individual-course files** are made up of one course per file. Those nine files are found at [www.edu.gov.mb.ca/k12/cur/teched/sytep/plumbing/index.html](http://www.edu.gov.mb.ca/k12/cur/teched/sytep/plumbing/index.html).

The multi-course and individual-course formats have been developed for different reasons and serve different purposes. The most important difference is that the multi-course files (containing four or five columns) **do not contain all of the content**. Specifically, while they contain all of the specific learning outcomes (SLOs), they **do not contain all of the detailed content** associated with each SLO. That detailed content is found only in the individual-course files. Therefore, **teachers need to use the individual-course files**.

The multi-course format does not contain all of the content simply because there is not enough room for it. If it were to contain all of the content, some individual SLOs and

their content would fill a narrow column for several pages, making them impossible to read.

However, teachers find the multi-course format very useful, because it allows them to compare the four or five courses listed there, and to see how students progress from one course to the next within each goal and general learning outcome.

The SLOs in this curriculum that correspond with the Apprenticeship Manitoba objectives from *Plumber Level 1* have an alpha-numeric code at the end, which indicates the unit and objective from which they were taken.

Here is an example of an SLO and its content taken from *Plumber Level 1*. 8876 Introduction to Plumbing and Pipe Trades includes the following SLO 10.1.1.1:

10.1.1.1 "Identify safety and health requirements. (A1a.1)"

A1a.1 indicates that the SLO is Objective 1 from Unit A1a Trade Safety Awareness, from page 1 of *Plumber Level 1*: [www.gov.mb.ca/wd/apprenticeship/pdfpubs/pubs/discover/mb\\_trades/plumber/plumber\\_lev1.pdf](http://www.gov.mb.ca/wd/apprenticeship/pdfpubs/pubs/discover/mb_trades/plumber/plumber_lev1.pdf). The Level 1 document also includes the following essential content:

- 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. So, when teaching this SLO, teachers must ensure that they are covering each point listed. Teachers also need to become familiar with the Plumber documents from Apprenticeship Manitoba. These documents provide invaluable background to this curriculum, and are found at [www.gov.mb.ca/wd/apprenticeship/discover/mbtrades/plumber.html](http://www.gov.mb.ca/wd/apprenticeship/discover/mbtrades/plumber.html).

## Unit to Course Comparison (UCC) Form

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 [www.edu.gov.mb.ca/k12/cur/teched/sytep/plumbing/index.html](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 when 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](http://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, including those in high school, studying a designated trade must complete this seven-hour unit.

## 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 [www.red-seal.ca/trades/pl.5mb.2r-eng.html](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 be journeyperson plumbers. They need to have personally experienced the apprenticeship and journeyman 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, such as the one offered through Red River College's one-year Technical-Vocational Teacher Education Diploma program. For information about this program, see <http://me.rrc.mb.ca/Catalogue/ProgramInfo.aspx?RegionCode=WPG&ProgCode=TECVF-DP>.

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 of 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 uncertified 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 the department's website at [www.edu.gov.mb.ca/k12/cur/teched/docs/teacher-cert.pdf](http://www.edu.gov.mb.ca/k12/cur/teched/docs/teacher-cert.pdf).

## 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:**

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

**GLO 1.1:** Describe and apply **health and safety** practices.

**GLO 1.2:** Demonstrate an understanding of the **Trade Safety Awareness Curriculum for Level 1 Apprentices**.

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**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**.

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**Goal 3:** Demonstrate an understanding of the **properties and applications of various pipes and fittings**.

**GLO 3.1:** Demonstrate an understanding of the properties and applications of piping and tubing.

**GLO 3.2:** Demonstrate an understanding of the properties and applications of **plastic** piping.

**GLO 3.3:** Demonstrate an understanding of the properties and applications of **copper** tubes and tubing.

**GLO 3.4:** Demonstrate an understanding of the properties and applications of **steel piping**.

**GLO 3.5:** Demonstrate an understanding of the properties and applications of **cast iron piping**.

**GLO 3.6:** Demonstrate an understanding of the properties and applications of **glass piping**.

**GLO 3.7:** Demonstrate an understanding of the properties and applications of **asbestos-cement piping**.

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

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

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**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.

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**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**.

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**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.

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

**GLO 8.1:** **Read, interpret, and communicate** information.

**GLO 8.2:** Apply knowledge and skills from **mathematics**.

**GLO 8.3:** Apply knowledge and skills from the **sciences**.

**GLO 8.4:** Apply knowledge and skills from **information and communication technology**.

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

**GLO 9.1:** Demonstrate an understanding of the **structure and scope** of plumbing and the pipe trades, as well as associated occupations.

**GLO 9.2:** Demonstrate an understanding of **training and employment opportunities** in plumbing and the pipe trades, as well as in associated occupations.

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**Goal 10:** Demonstrate an awareness of **sustainability** as it pertains to plumbing and the 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 plumbing and the pipe trades' **sustainability practices and impact on the environment.**

**GLO 10.3:** Describe **sustainable business practices** within plumbing and the pipe trades.

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

**GLO 11.1:** Demonstrate an understanding of **ethical and legal standards.**

**GLO 11.2:** Demonstrate an understanding of **gas codes.**

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**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 an understanding of **culture** and its influence in the workplace.

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

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

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## 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 courses as part of the Senior Years Technology Education Program. Specific learning outcome statements define what students are expected to achieve by the end of the course.

It is essential that students learn safety practices and employability skills; therefore, with a few exceptions, all SLOs related to safety and employability skills are repeated from course to course.



## Course Descriptions

Course titles, descriptions, and codes for the motion picture arts courses follow. For an explanation of the codes, refer to the *Subject Table Handbook: Technology Education* (Manitoba Education), available at [www.edu.gov.mb.ca/k12/docs/policy/sthte/index.html](http://www.edu.gov.mb.ca/k12/docs/policy/sthte/index.html).

### 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 the 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 plumbing and the pipe trades must have knowledge of the basic principles related to piping systems and service. Students learn about safety, tools and equipment, piping systems, and service procedures, and they are introduced to diagnosis strategies.

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

A student wanting to develop skills in plumbing and the pipe trades must have knowledge of the basic principles of layout, materials, codes, and design. The student will learn the procedures for 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 the 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 the 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 venting relates to plumbing and piping systems. The student will be able to draw a usable 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 those principles relate to plumbing and piping systems. The student will be able to draw a usable 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.

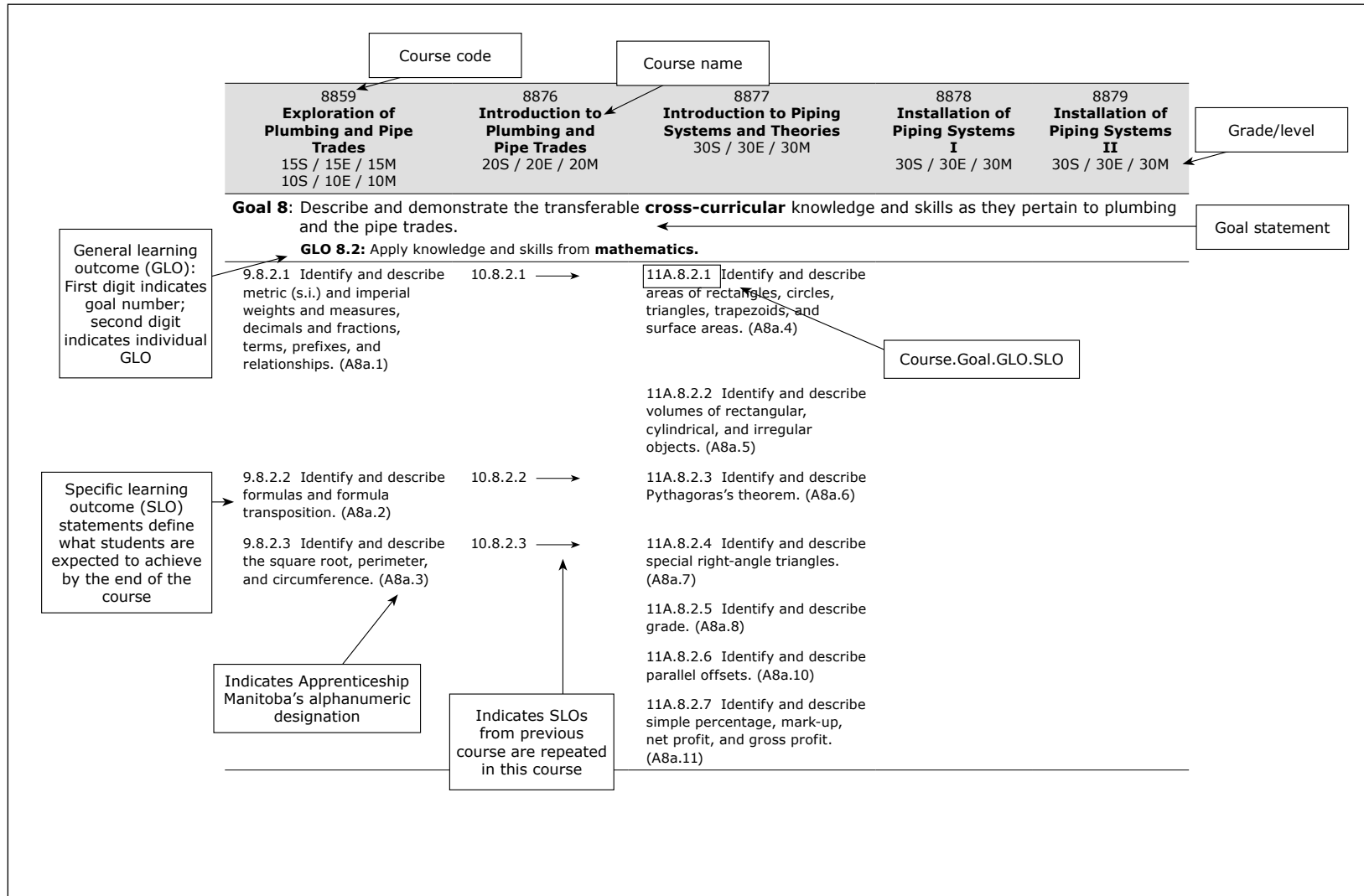
**8984 Installation of Plumbing and Piping Systems III  
40S/40E/40M**

A student wanting to develop skills in plumbing and the pipe trades must have knowledge of advanced installation techniques and new green technologies. The student will understand and implement the formulas and calculations he or she has learned to design and lay out 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 her or his design.

**8985 Applied Plumbing and Piping Systems  
40S/40E/40M**

A student wanting to extend skills in plumbing and the 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.

# Guide to Reading the Plumbing and Pipe Trades Goals and Learning Outcomes







GRADES 9 TO 11  
PLUMBING AND PIPE  
TRADES

General and Specific Learning  
Outcomes by Goal



# GRADES 9 TO 11 PLUMBING AND PIPE TRADES

## GENERAL AND SPECIFIC LEARNING OUTCOMES BY GOAL

8859 <b>Exploration of Plumbing and Pipe Trades</b> 15S / 15E / 15M 10S / 10E / 10M	8876 <b>Introduction to Plumbing and Pipe Trades</b> 20S / 20E / 20M	8877 <b>Introduction to Piping Systems and Theories</b> 30S / 30E / 30M	8878 <b>Installation of Piping Systems I</b> 30S / 30E / 30M	8879 <b>Installation of Piping Systems II</b> 30S / 30E / 30M
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**Goal 1:** Describe and apply **health and safety** practices.

**GLO 1.1:** Describe and apply health and safety practices.

	<p>10.1.1.1 Identify safety and health requirements. (A1a.1)</p> <p>10.1.1.2 Identify personal protective equipment (PPE) and procedures. (A1a.2)</p> <p>10.1.1.3 Identify workplace regulations. (A1a.3)</p> <p>10.1.1.4 Identify ergonomics. (A1a.4)</p> <p>10.1.1.5 Demonstrate an understanding of the principles of hazard recognition and control. (A1a.5)</p>	<p>11A.1.1.1 Demonstrate an understanding of, and adherence to, health and safety practices.</p>	<p>11B.1.1.1 →</p>	<p>11C.1.1.1 →</p>
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**Goal 1:** Describe and apply **health and safety** practices. *(continued)*

**GLO 1.1:** Describe and apply health and safety practices. *(continued)*

10.1.1.6 Demonstrate an understanding of the hazards of confined space entry. (A1a.6)

10.1.1.7 Identify first aid/CPR. (A1a.7)

10.1.1.8 Identify safety requirements as they apply to WHMIS, with emphasis on the topics found in *Apprenticeship Level 1 Technical Training*. (A1a.8)

10.1.1.9 Demonstrate the ability to identify and control hazards. (A1a.9)

10.1.1.10 Describe and discuss the safe storage of stock equipment in service vehicles and the transportation of dangerous goods. (A1a.10)



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**Goal 1:** Describe and apply **health and safety** practices. *(continued)*

**GLO 1.1:** Describe and apply health and safety practices. *(continued)*

10.1.1.11 Describe asbestos safety and health requirements. (A1a.11)

10.1.1.12 Review the amendments to *The Workplace Safety and Health Regulation* to meet harmonization recommendations of the Occupational Safety and Health of the Canadian Association of Administrators of Labour Legislation, a cross-jurisdictional advisory and consultative body respecting shared issues relating to occupational safety and health. (A1a.12)

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**Goal 1:** Describe and apply **health and safety** practices. *(continued)*

**GLO 1.2:** Demonstrate an understanding of the **Trade Safety Awareness Curriculum for Level 1 Apprentices.**

10.1.2.1 Explain the importance of trade safety and health in reducing injuries and fatalities to young employees in Manitoba. (TSA 1)

10.1.2.2 Describe the rights and responsibilities of employees, employers, and supervisors under the *Workplace Safety and Health Act*. (TSA 2)

10.1.2.3 Describe the steps to use in the Right to Refuse process. (TSA 3)

10.1.2.4 Explain how and where to find information on workplace safety and health. (TSA 4)

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**Goal 1:** Describe and apply **health and safety** practices. *(continued)*

**GLO 1.2:** Demonstrate an understanding of the *Trade Safety Awareness Curriculum for Level 1 Apprentices.*  
*(continued)*

10.1.2.5 Demonstrate how to handle a potentially dangerous work situation. (TSA 5)

10.1.2.6 Explain the S.A.F.E. acronym. (TSA 6)

10.1.2.7 Define workplace safety and health hazards. (TSA 7)

10.1.2.8 Give examples of trade-specific workplace safety and health hazards. (TSA 8)

10.1.2.9 Give examples of five types of safety and health hazards. (TSA 9)

10.1.2.10 Define workplace safety and health risk. (TSA 10)

10.1.2.11 Give examples of trade-specific workplace safety and health risks. (TSA 11)

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**Goal 1:** Describe and apply **health and safety** practices. *(continued)*

**GLO 1.2:** Demonstrate an understanding of the **Trade Safety Awareness Curriculum for Level 1 Apprentices.**  
*(continued)*

10.1.2.12 Explain the principles of hazard recognition and control as they apply to the specific trade. (TSA 12)

10.1.2.13 Explain the Workplace Hazardous Material Information System (WHMIS). (TSA 13)

10.1.2.14 Match the WHMIS symbols and their meanings. (TSA 14)

10.1.2.15 Describe the importance of the Material Safety Data Sheets (MSDS). (TSA 15)

10.1.2.16 Describe the importance of using PPE. (TSA 16)

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**Goal 1:** Describe and apply **health and safety** practices. *(continued)*

**GLO 1.2:** Demonstrate an understanding of the *Trade Safety Awareness Curriculum for Level 1 Apprentices.*  
*(continued)*

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10.1.2.17 Demonstrate proper selection and use of a variety of PPE and fall protection systems. (TSA 17)

10.1.2.18 Outline the safety principles for working on and around electrical equipment. (TSA 18)

10.1.2.19 Outline workplace fire safety principles. (TSA 19)

10.1.2.20 Identify the hazards in confined spaces and the preparation needed to work in a confined space. (TSA 20)

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**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**.

10.2.1.1 Describe the use, selection, and maintenance of safety gear and PPE by plumbers. (A2a.1)

10.2.1.2 Demonstrate basic techniques for the use, selection, and maintenance of safety gear and PPE by plumbers. (A2a.2)

10.2.1.3 Describe the use, selection, and maintenance of hand tools by plumbers. (A2a.3)

10.2.1.4 Demonstrate basic techniques for hand-tool selection, use, and maintenance. (A2a.4)

11A.2.1.1 Describe the selection, use, and maintenance of technical instruments, testers, and other tools and equipment, as specified by the instructor. (A2a.7)

11A.2.1.2 Demonstrate basic techniques for the selection, use, and maintenance of technical instruments, testers, and other tools and equipment, as specified by the instructor. (A2a.8)

11B.2.1.1 Describe the selection, use, and maintenance of steel welding tools and equipment. (A2a.11)

11B.2.1.2 Demonstrate basic techniques for the selection, use, and maintenance of steel welding tools and equipment. (A2a.12)

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

GLO 2.1: Demonstrate the use and management of equipment and tools. *(continued)*

10.2.1.5 Describe the selection, use, and maintenance of power tools and equipment. (A2a.5)

10.2.1.6 Demonstrate basic techniques for the selection, use, and maintenance of power tools and equipment. (A2a.6)

10.2.1.7 Describe the selection, use, and maintenance of soldering tools and equipment. (A2a.9)

10.2.1.8 Demonstrate basic techniques for the selection, use, and maintenance of soldering tools and equipment. (A2a.10)

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

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

11B.2.2.1 Define terminology associated with fuel brazing and cutting. (A2d.1)

11B.2.2.2 Identify hazards and describe safe work practices pertaining to fuel brazing and cutting. (A2d.2)

11B.2.2.3 Interpret codes and regulations pertaining to fuel brazing and cutting. (A2d.3)

11B.2.2.4 Identify types of fuel brazing and cutting equipment, and describe their components and applications. (A2d.4)

11B.2.2.5 Identify fuel brazing and cutting equipment accessories, and describe their applications and procedures for use. (A2d.5)



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

GLO 2.2: Demonstrate the use and management of **fuel brazing and cutting equipment and tools**. *(continued)*

11B.2.2.6 Describe the procedures used to set up, adjust, and shut down fuel cutting and brazing equipment. (A2d.6)

11B.2.2.7 Describe the procedures used to cut materials using fuel cutting equipment. (A2d.7)

11B.2.2.8 Identify cutting faults and describe the procedures to prevent and correct them. (A2d.8)

11B.2.2.9 Describe the procedures used to braze materials using fuel brazing equipment. (A2d.9)

11B.2.2.10 Describe the procedures used to inspect and maintain fuel cutting and brazing equipment. (A2d.10)

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

GLO 2.2: Demonstrate the use and management of **fuel brazing and cutting equipment and tools.** *(continued)*

11B.2.2.11 Describe the procedures used to transport and store fuel cutting and brazing equipment. (A2d.11)

11B.2.2.12 Demonstrate the procedures used to cut and braze materials using fuel brazing and cutting equipment. (A2d.12)

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**Goal 3:** Demonstrate an understanding of the **properties and applications** of various types of **piping and tubing**.

**GLO 3.1:** Demonstrate an understanding of the **properties and applications** of **piping and tubing**.

11A.3.1.1 Define terminology associated with pipe, tube, and tubing. (A5aPipe.1)

11B.3.1.1 Demonstrate pipe, tube, and tubing applications. (Fundamentals Practical A6a.1)

11A.3.1.2 Identify types of pipe, tube, and tubing systems. (A5aPipe.2)

11A.3.1.3 Identify types of pipe, tube, and tubing, and describe their applications. (A5aPipe.3)

11A.3.1.4 Explain forces that have an impact on pipe, tube, and tubing systems, and perform associated calculations. (A5aPipe.4)

11A.3.1.5 Perform calculations to determine pipe, tube, and tubing measurements. (A5aPipe.5)

11A.3.1.6 Demonstrate pipe, tube, and tubing applications. (A5aPipe.6)

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**Goal 3:** Demonstrate an understanding of the **properties and applications** of various types of **pipng and tubing**.  
(continued)

**GLO 3.2:** Demonstrate an understanding of the **properties and applications** of **plastic piping**.

10.3.2.1 Define terminology associated with plastic piping. (A5aPlastic.1)

10.3.2.2 Identify hazards and describe safe work practices pertaining to plastic piping. (A5aPlastic.2)

10.3.2.3 Interpret codes and regulations pertaining to plastic piping. (A5aPlastic.3)

10.3.2.4 Interpret information pertaining to plastic piping found on drawings and specifications. (A5aPlastic.4)

11A.3.2.1 Identify the methods used to join plastic piping and describe their associated procedures. (A5aPlastic.16)

11A.3.2.2 Describe the procedures used to install fittings and accessories for plastic piping. (A5aPlastic.17)

11A.3.2.3 Demonstrate the procedures used to measure, cut, and join plastic piping. (A5aPlastic.18)

11B.3.2.1 Demonstrate the procedures used to measure, cut, and join plastic piping. (Plastic Practical A6a.1)

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**Goal 3:** Demonstrate an understanding of the **properties and applications** of various types of **piping and tubing**. *(continued)*

**GLO 3.2:** Demonstrate an understanding of the **properties and applications** of **plastic piping**. *(continued)*

10.3.2.5 Describe the identification systems and methods for plastic piping. (A5aPlastic.5)

10.3.2.6 Identify tools and equipment related to plastic piping and describe their applications and procedures for use. (A5aPlastic.6)

10.3.2.7 Identify plastic piping systems and describe their characteristics and applications. (A5aPlastic.7)

10.3.2.8 Identify types of plastic piping and describe their properties and characteristics. (A5aPlastic.8)

10.3.2.9 Identify fittings used with plastic piping and describe their purpose and applications. (A5aPlastic.9)

10.3.2.10 Identify plastic piping accessories and describe their purpose and applications. (A5aPlastic.10)

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**Goal 3:** Demonstrate an understanding of the **properties and applications** of various types of **pipng and tubing**.  
(continued)

**GLO 3.2:** Demonstrate an understanding of the **properties and applications** of **plastic piping**. (continued)

10.3.2.11 Explain the systems of measurement for plastic piping. (A5aPlastic.11)

10.3.2.12 Describe the procedures used to measure plastic piping. (A5aPlastic.12)

10.3.2.13 Perform calculations to determine plastic piping measurements. (A5aPlastic.13)

10.3.2.14 Describe the procedures used to inspect plastic piping. (A5aPlastic.14)

10.3.2.15 Identify the methods used to cut plastic piping and describe their associated procedures. (A5aPlastic.15)

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**Goal 3:** Demonstrate an understanding of the **properties and applications** of various types of **piping and tubing.**  
(continued)

**GLO 3.3:** Demonstrate an understanding of the **properties and applications** of **copper tubes and tubing.**

10.3.3.1 Define terminology associated with copper tubes and tubing. (Installation.1)

10.3.3.2 Identify hazards and describe safe work practices pertaining to copper tubes and tubing. (A5aCopper.2)

10.3.3.3 Demonstrate ability to interpret codes and regulations pertaining to copper tubes and tubing. (A5aCopper.3)

10.3.3.4 Interpret information pertaining to copper tubes and tubing found on drawings and specifications. (A5aCopper.4)

11A.3.3.1 Identify the methods used to join copper tubes and tubing, and describe their associated procedures. (A5aCopper.17)

11A.3.3.2 Describe the procedures used to install fittings and accessories for copper tubes and tubing. (A5aCopper.18)

11A.3.3.3 Demonstrate the procedures used to measure, cut, and join copper tubes and tubing. (A5aCopper.19)

11B.3.3.1 Demonstrate the procedures used to measure, cut, and join copper tubes and tubing. (Copper Practical A6a.1)

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**Goal 3:** Demonstrate an understanding of the **properties and applications** of various types of **pipng and tubing**. *(continued)*

**GLO 3.3:** Demonstrate an understanding of the **properties and applications** of **copper tubes and tubing**. *(continued)*

10.3.3.5 Describe the identification systems and methods for copper tubes and tubing. (A5aCopper.5)

10.3.3.6 Identify tools and equipment related to copper tubes and tubing, and describe their applications and procedures for use. (A5aCopper.6)

10.3.3.7 Identify copper tubes and tubing systems, and describe their characteristics and applications. (A5aCopper.7)

10.3.3.8 Identify types of copper tubes and tubing, and describe their properties and characteristics. (A5aCopper.8)

10.3.3.9 Identify fittings used with copper tubes and tubing, and describe their purpose and applications. (A5aCopper.9)



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**Goal 3:** Demonstrate an understanding of the **properties and applications** of various types of **pipng and tubing**.  
(continued)

**GLO 3.3:** Demonstrate an understanding of the **properties and applications** of **copper tubes and tubing**. (continued)

10.3.3.10 Identify copper tubes and tubing accessories, and describe their purpose and applications. (A5aCopper.10)

10.3.3.11 Explain the systems of measurement for copper tubes and tubing. (A5aCopper.11)

10.3.3.12 Describe the procedures used to measure copper tubes and tubing. (A5aCopper.12)

10.3.3.13 Perform calculations to determine copper tubes and tubing measurements. (A5aCopper.13)

10.3.3.14 Describe the procedures used to inspect copper tubes and tubing. (A5aCopper.14)

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**Goal 3:** Demonstrate an understanding of the **properties and applications** of various types of **piping and tubing.** *(continued)*

**GLO 3.3:** Demonstrate an understanding of the **properties and applications** of **copper tubes and tubing.** *(continued)*

10.3.3.15 Identify the methods used to cut copper tubes and tubing, and describe their associated procedures. (A5aCopper.15)

10.3.3.16 Describe the procedures used to bend copper tubes and tubing. (A5aCopper.16)

**GLO 3.4:** Demonstrate an understanding of the **properties and applications** of **steel piping.**

10.3.4.1 Define terminology associated with steel piping. (A5aSteel.1)

10.3.4.2 Identify hazards and describe safe work practices pertaining to steel piping. (A5aSteel.2)

11A.3.4.1 Identify the methods used to join steel piping and describe their associated procedures. (A5aSteel.16)

11A.3.4.2 Describe the procedures used to install fittings and accessories for steel piping. (A5aSteel.17)

11B.3.4.1 Demonstrate the procedures used to measure, cut, and join steel piping. (Steel Practical A6a.1)

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**Goal 3:** Demonstrate an understanding of the **properties and applications** of various types of **piping and tubing.** *(continued)*

**GLO 3.4:** Demonstrate an understanding of the **properties and applications** of **steel piping.** *(continued)*

10.3.4.3 Interpret codes and regulations pertaining to steel piping. (A5aSteel.3)

11A.3.4.3 Demonstrate the procedures used to measure, cut, and join steel piping. (A5aSteel.18)

10.3.4.4 Interpret information pertaining to steel piping found on drawings and specifications. (A5aSteel.4)

10.3.4.5 Describe the identification systems and methods for steel piping. (A5aSteel.5)

10.3.4.6 Identify tools and equipment related to steel piping, and describe their applications and procedures for use. (A5aSteel.6)

10.3.4.7 Identify steel piping systems and describe their characteristics and applications. (A5aSteel.7)

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**Goal 3:** Demonstrate an understanding of the **properties and applications** of various types of **pipng and tubing**.  
(*continued*)

**GLO 3.4:** Demonstrate an understanding of the **properties and applications** of **steel piping**. (*continued*)

10.3.4.8 Identify types of steel piping and describe their properties and characteristics. (A5aSteel.8)

10.3.4.9 Identify fittings used with steel piping and describe their purpose and applications. (A5aSteel.9)

10.3.4.10 Identify steel piping accessories and describe their purpose and applications. (A5aSteel.10)

10.3.4.11 Explain the systems of measurement for steel piping. (A5aSteel.11)

10.3.4.12 Describe the procedures used to measure steel piping. (A5aSteel.12)

10.3.4.13 Perform calculations to determine steel piping measurements. (A5aSteel.13)

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**Goal 3:** Demonstrate an understanding of the **properties and applications** of various types of **piping and tubing.**  
(continued)

**GLO 3.4:** Demonstrate an understanding of the **properties and applications** of **steel piping.** (continued)

10.3.4.14 Describe the procedures used to inspect steel piping. (A5aSteel.14)

10.3.4.15 Identify the methods used to cut steel piping and describe their associated procedures. (A5aSteel.15)

**GLO 3.5:** Demonstrate an understanding of the **properties and applications** of **cast iron piping.**

10.3.5.1 Define terminology associated with cast iron. (A5aCast.1)

10.3.5.2 Identify hazards and describe safe work practices pertaining to cast iron. (A5aCast.2)

11A.3.5.1 Identify the methods used to join cast iron and describe their associated procedures. (A5aCast.16)

11A.3.5.2 Describe the procedures used to install fittings and accessories for cast iron. (A5aCast.17)

11B.3.5.1 Demonstrate the procedures used to measure, cut, and join cast iron. (Cast Practical A6a.1)

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**Goal 3:** Demonstrate an understanding of the **properties and applications** of various types of **pipng and tubing**.  
(*continued*)

**GLO 3.5:** Demonstrate an understanding of the **properties and applications** of **cast iron piping**. (*continued*)

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| <p>10.3.5.3 Interpret codes and regulations pertaining to cast iron. (A5aCast.3)</p> <p>10.3.5.4 Interpret information pertaining to cast iron found on drawings and specifications. (A5aCast.4)</p> <p>10.3.5.5 Describe the identification systems and methods for cast iron. (A5aCast.5)</p> <p>10.3.5.6 Identify tools and equipment related to cast iron, and describe their applications and procedures for use. (A5aCast.6)</p> | <p>11A.3.5.3 Demonstrate the procedures used to measure, cut, and join cast iron. (A5aCast.18)</p> |
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**Goal 3:** Demonstrate an understanding of the **properties and applications** of various types of **piping and tubing.** *(continued)*

**GLO 3.5:** Demonstrate an understanding of the **properties and applications** of **cast iron piping.** *(continued)*

10.3.5.7 Identify cast iron systems and describe their characteristics and applications. (A5aCast.7)

10.3.5.8 Identify types of cast iron and describe their properties and characteristics. (A5aCast.8)

10.3.5.9 Identify fittings used with cast iron and describe their purpose and applications. (A5aCast.9)

10.3.5.10 Identify cast iron accessories and describe their purpose and applications. (A5aCast.10)

10.3.5.11 Explain the systems of measurement for cast iron. (A5aCast.11)

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**Goal 3:** Demonstrate an understanding of the **properties and applications** of various types of **pipng and tubing**.  
(*continued*)

**GLO 3.5:** Demonstrate an understanding of the **properties and applications** of **cast iron piping**. (*continued*)

10.3.5.12 Describe the procedures used to measure cast iron.  
(A5aCast.12)

10.3.5.13 Perform calculations to determine cast iron measurements.  
(A5aCast.13)

10.3.5.14 Describe the procedures used to inspect cast iron. (A5aCast.14)

10.3.5.15 Identify the methods used to cut cast iron and describe their associated procedures.  
(A5aCast.15)



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**Goal 3:** Demonstrate an understanding of the **properties and applications** of various types of **piping and tubing**.  
(continued)

**GLO 3.6:** Demonstrate an understanding of the **properties and applications** of **glass piping**.

- 11C.3.6.1 Define terminology associated with glass piping. (A5aGlass.1)
- 11C.3.6.2 Identify hazards and describe safe work practices pertaining to glass piping. (A5aGlass.2)
- 11C.3.6.3 Interpret codes and regulations pertaining to glass piping. (A5aGlass.3)
- 11C.3.6.4 Interpret information pertaining to glass piping found on drawings and specifications. (A5aGlass.4)
- 11C.3.6.5 Describe the identification systems and methods for glass piping. (A5aGlass.5)

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**Goal 3:** Demonstrate an understanding of the **properties and applications** of various types of **piping and tubing**.  
(continued)

**GLO 3.6:** Demonstrate an understanding of the **properties and applications** of **glass piping**. (continued)

11C.3.6.6 Identify tools and equipment related to glass piping, and describe their applications and procedures for use. (A5aGlass.6)

11C.3.6.7 Identify glass piping systems and describe their characteristics and applications. (A5aGlass.7)

11C.3.6.8 Identify types of glass piping and describe their properties and characteristics. (A5aGlass.8)

11C.3.6.9 Identify fittings used with glass piping and describe their purpose and applications. (A5aGlass.9)

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**Goal 3:** Demonstrate an understanding of the **properties and applications** of various types of **piping and tubing.** *(continued)*

**GLO 3.6:** Demonstrate an understanding of the **properties and applications** of **glass piping.** *(continued)*

11C.3.6.10 Identify glass piping accessories and describe their purpose and applications. (A5aGlass.10)

11C.3.6.11 Explain the systems of measurement for glass piping. (A5aGlass.11)

11C.3.6.12 Describe the procedures used to measure glass piping. (A5aGlass.12)

11C.3.6.13 Perform calculations to determine glass piping measurements. (A5aGlass.13)

11C.3.6.14 Describe the procedures used to inspect glass piping. (A5aGlass.14)

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**Goal 3:** Demonstrate an understanding of the **properties and applications** of various types of **piping and tubing**.  
(continued)

**GLO 3.6:** Demonstrate an understanding of the **properties and applications** of **glass piping**. (continued)

11C.3.6.15 Identify the methods used to cut glass piping and describe their associated procedures. (A5aGlass.15)

11C.3.6.16 Identify the methods used to join glass piping and describe their associated procedures. (A5aGlass.16)

11C.3.6.17 Describe the procedures used to install fittings and accessories for glass piping. (A5aGlass.17)

11C.3.6.18 The apprentice-learner will perform procedures used to install fittings and accessories for glass piping on the job. (Glass Practical A6a.1)

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**Goal 3:** Demonstrate an understanding of the **properties and applications** of various types of **piping and tubing.**  
(continued)

**GLO 3.7:** Demonstrate an understanding of the **properties and applications** of **asbestos-cement piping.**

11B.3.7.1 Define terminology associated with asbestos-cement. (A5aAsbestos.1)

11B.3.7.2 Identify hazards and describe safe work practices pertaining to asbestos-cement piping. (A5aAsbestos.2)

11B.3.7.3 Interpret codes and regulations pertaining to asbestos-cement piping. (A5aAsbestos.3)

11B.3.7.4 Interpret information pertaining to asbestos-cement piping found on drawings and specifications. (A5aAsbestos.4)

11B.3.7.5 Describe the identification systems and methods for asbestos-cement piping. (A5aAsbestos.5)

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**Goal 3:** Demonstrate an understanding of the **properties and applications** of various types of **pipng and tubing**.  
(continued)

**GLO 3.7:** Demonstrate an understanding of the **properties and applications** of **asbestos-cement piping**. (continued)

11B.3.7.6 Identify tools and equipment related to asbestos-cement piping, and describe their applications and procedures for use.  
(A5aAsbestos.6)

11B.3.7.7 Identify asbestos-cement piping systems and describe their characteristics and applications.  
(A5aAsbestos.7)

11B.3.7.8 Identify types of asbestos-cement piping and describe their properties and characteristics.  
(A5aAsbestos.8)

11B.3.7.9 Identify fittings used with asbestos-cement piping and describe their purpose and applications.  
(A5aAsbestos.9)

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**Goal 3:** Demonstrate an understanding of the **properties and applications** of various types of **piping and tubing.** *(continued)*

**GLO 3.7:** Demonstrate an understanding of the **properties and applications** of **asbestos-cement piping.** *(continued)*

11B.3.7.10 Identify asbestos-cement piping accessories and describe their purpose and applications. (A5aAsbestos.10)

11B.3.7.11 Explain the systems of measurement for asbestos-cement piping. (A5aAsbestos.11)

11B.3.7.12 Describe the procedures used to measure asbestos-cement piping. (A5aAsbestos.12)

11B.3.7.13 Perform calculations to determine asbestos-cement piping measurements. (A5aAsbestos.13)

11B.3.7.14 Describe the procedures used to inspect asbestos-cement piping. (A5aAsbestos.14)

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**Goal 3:** Demonstrate an understanding of the **properties and applications** of various types of **pipng and tubing**. *(continued)*

**GLO 3.7:** Demonstrate an understanding of the **properties and applications** of **asbestos-cement piping**. *(continued)*

11B.3.7.15 Identify the methods used to cut asbestos-cement piping and describe their associated procedures. (A5aAsbestos.15)

11B.3.7.16 Identify the methods used to join asbestos-cement piping and describe their associated procedures. (A5aAsbestos.16)

11B.3.7.17 Describe the procedures used to install fittings and accessories for asbestos-cement piping. (A5aAsbestos.17)

11B.3.7.18 Describe the procedures used to measure asbestos-cement piping. (A5aAsbestos.18)



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**Goal 3:** Demonstrate an understanding of the **properties and applications** of various types of **piping and tubing**.  
(continued)

**GLO 3.7:** Demonstrate an understanding of the **properties and applications** of **asbestos-cement piping**. (continued)

11B.3.7.19 Describe the procedures used to cut asbestos-cement piping.  
(A5aAsbestos.19)

11B.3.7.20 Describe the procedures used to join asbestos-cement piping.  
(A5aAsbestos.20)

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

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

11A.4.1.1 Demonstrate an understanding of oils and lubricants used in plumbing and the pipe trades.

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**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.**

	11A.5.1.1 Define terminology associated with drawings and sketches. (A3c.1)	11B.5.1.1 Identify types of symbols and describe their characteristics and applications. (A3c.4)	11C.5.1.1 Demonstrate basic plumber and gas layout drawings. (A3c.13)
	11A.5.1.2 Describe metric and imperial systems of measurement and the procedures used to perform conversions. (A3c.2)	11B.5.1.2 Identify construction/project related documents and describe their applications. (A3c.5)	
	11A.5.1.3 Identify the types of drawings and describe their applications. (A3c.3)	11B.5.1.3 Identify drawing projections and views, and describe their applications. (A3c.6)	
	11A.5.1.4 Demonstrate basic sketching techniques. (A3c.12)	11B.5.1.4 Describe the use of scales. (A3c.7)	

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

**GLO 5.1:** Demonstrate an understanding of the **design and layout of piping systems.** *(continued)*

11B.5.1.5 Describe the procedures used for the care, handling, and storage of drawings. (A3c.8)

11B.5.1.6 Describe plumber and gas layout drawings. (A3c.9)

11B.5.1.7 Interpret information on drawings. (A3c.10)

11B.5.1.8 Demonstrate the procedures used for the care, handling, and storage of drawings. (A3c.11)

**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.

No applicable SLOs.

**GLO 6.2:** Demonstrate an understanding of the **installation** of piping systems.

No applicable SLOs.

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

**GLO 6.3:** Demonstrate an understanding of **hoisting, lifting, and rigging.**

11B.6.3.1 Define terminology associated with hoisting, lifting, and rigging. (A2b.1)

11B.6.3.2 Identify hazards and describe safe work practices pertaining to hoisting, lifting, and rigging. (A2b.2)

11B.6.3.3 Identify codes and regulations pertaining to hoisting, lifting, and rigging. (A2b.3)

11B.6.3.4 Identify types of rigging equipment and accessories, and describe their limitations, applications, and procedures for use. (A2b.4)

11B.6.3.5 Identify types of hoisting and lifting equipment and accessories, and describe their applications and procedures for use. (A2b.5)

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**Goal 6:** Demonstrate an understanding of the **joining, fabrication, and installation** of piping systems, including **hoisting, lifting, and rigging, and access equipment.** *(continued)*

**GLO 6.3:** Demonstrate an understanding of **hoisting, lifting, and rigging.** *(continued)*

11B.6.3.6 Describe the procedures used to inspect, maintain, and store hoisting, lifting, and rigging equipment. (A2b.6)

11B.6.3.7 Identify types of knots, hitches, and bends, and describe their applications and the procedures used to tie them. (A2b.7)

11B.6.3.8 Describe the procedures used to rig material/equipment for lifting. (A2b.8)

11B.6.3.9 Describe the procedures used to ensure the work area is safe for lifting. (A2b.9)

11B.6.3.10 Identify and describe procedures used to communicate during hoisting, lifting, and rigging operations. (A2b.10)

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**Goal 6:** Demonstrate an understanding of the **joining, fabrication, and installation** of piping systems, including **hoisting, lifting, and rigging, and access equipment.** *(continued)*

**GLO 6.3:** Demonstrate an understanding of **hoisting, lifting, and rigging.** *(continued)*

11B.6.3.11 Explain sling angle when preparing for hoisting and lifting operations. (A2b.11)

11B.6.3.12 Identify the factors to consider when selecting rigging equipment. (A2b.12)

11B.6.3.13 Describe the procedures used for attaching rigging equipment to the load. (A2b.13)

11B.6.3.14 Describe the procedures used to perform a lift. (A2b.14)

11B.6.3.15 Demonstrate the procedures used to perform hoisting and lifting operations. (A2b.15)

11B.6.3.16 Demonstrate calculations required when performing hoisting and lifting operations. (A2b.16)

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**Goal 6:** Demonstrate an understanding of the **joining, fabrication, and installation** of piping systems, including **hoisting, lifting, and rigging, and access equipment.** *(continued)*

**GLO 6.4:** Demonstrate an understanding of **access equipment.**

11B.6.4.1 Define terminology associated with ladders, scaffolding, and hydraulic lifts. (A2c.1)

11B.6.4.2 Identify hazards and describe safe work practices pertaining to ladders, scaffolding, and hydraulic lifts. (A2c.2)

11B.6.4.3 Identify codes and regulations pertaining to ladders, scaffolding, and hydraulic lifts. (A2c.3)

11B.6.4.4 Identify types of ladders, scaffolding, and hydraulic lifts, and describe their characteristics and applications. (A2c.4)

11B.6.4.5 Describe the procedures used to erect and dismantle ladders and scaffolding. (A2c.5)

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**Goal 6:** Demonstrate an understanding of the **joining, fabrication, and installation** of piping systems, including **hoisting, lifting, and rigging, and access equipment.** *(continued)*

**GLO 6.4:** Demonstrate an understanding of **access equipment.** *(continued)*

11B.6.4.6 Describe the procedures used to inspect, maintain, and store ladders, scaffolding, and hydraulic lifts. (A2c.6)

11B.6.4.7 Demonstrate procedures on the use of ladders, scaffolding, and hydraulic lifts, their applications, and their limitations. (A2c.7)

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

No applicable SLOs.

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

**GLO 8.1:** **Read, interpret, and communicate** information.

No applicable SLOs.



8859 <b>Exploration of Plumbing and Pipe Trades</b> 15S / 15E / 15M 10S / 10E / 10M	8876 <b>Introduction to Plumbing and Pipe Trades</b> 20S / 20E / 20M	8877 <b>Introduction to Piping Systems and Theories</b> 30S / 30E / 30M	8878 <b>Installation of Piping Systems I</b> 30S / 30E / 30M	8879 <b>Installation of Piping Systems II</b> 30S / 30E / 30M
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**Goal 8:** Describe and demonstrate the transferable **cross-curricular** knowledge and skills as they pertain to plumbing and the pipe trades.

**GLO 8.2:** Apply knowledge and skills from **mathematics**.

9.8.2.1 Identify and describe metric (s.i.) and imperial weights and measures, decimals and fractions, terms, prefixes, and relationships. (A8a.1)	10.8.2.1 →	11A.8.2.1 Identify and describe areas of rectangles, circles, triangles, trapezoids, and surface areas. (A8a.4)
9.8.2.2 Identify and describe formulas and formula transposition. (A8a.2)	10.8.2.2 →	11A.8.2.2 Identify and describe volumes of rectangular, cylindrical, and irregular objects. (A8a.5)
9.8.2.3 Identify and describe the square root, perimeter, and circumference. (A8a.3)	10.8.2.3 →	11A.8.2.3 Identify and describe Pythagoras’s theorem. (A8a.6)  11A.8.2.4 Identify and describe special right-angle triangles. (A8a.7)  11A.8.2.5 Identify and describe grade. (A8a.8)  11A.8.2.6 Identify and describe parallel offsets. (A8a.10)  11A.8.2.7 Identify and describe simple percentage, mark-up, net profit, and gross profit. (A8a.11)

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

**GLO 8.3:** Apply knowledge and skills from the **sciences**.

11A.8.3.1 Identify and describe density, relative density, and pressure in liquids and gases (kpa), as well as Charles' and Boyle's gas laws. (A8a.9)

11A.8.3.2 Describe metals and alloys with respect to science. (A8a.12)

**GLO 8.4:** Apply knowledge and skills from **information and communication technology**.

11A.8.4.1 Explain requirements for loading software and for file management. (A4a.1)

11A.8.4.2 Explain Internet-access software. (A4a.2)

11A.8.4.3 Load software and use proper file management techniques. (A4a.3)

11A.8.4.4 Use Internet-access software. (A4a.4)

8859 <b>Exploration of Plumbing and Pipe Trades</b> 15S / 15E / 15M 10S / 10E / 10M	8876 <b>Introduction to Plumbing and Pipe Trades</b> 20S / 20E / 20M	8877 <b>Introduction to Piping Systems and Theories</b> 30S / 30E / 30M	8878 <b>Installation of Piping Systems I</b> 30S / 30E / 30M	8879 <b>Installation of Piping Systems II</b> 30S / 30E / 30M
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**Goal 9:** Demonstrate an understanding of the **structure and scope** of plumbing and the pipe trades. *(continued)*

**GLO 9.1:** Demonstrate an understanding of the structure and scope of plumbing and the pipe trades, as well as associated occupations.

10.9.1.1 Describe the structure and scope of the plumbing trade. (A3b.1)

**GLO 9.2:** Demonstrate an understanding of **training and employment opportunities** in plumbing and the pipe trades, as well as in associated occupations.

9.9.2.1 Demonstrate an awareness of apprenticeship and the reason why trades use this system.

10.9.2.1 →

11A.9.2.1 Demonstrate an awareness of training opportunities available to tradespeople.

11B.9.2.1 →

11C.9.2.1 →

10.9.2.2 Demonstrate an awareness of the benefits of Red Seal certification, including the opportunities to work in other provinces.

10.9.2.3 Demonstrate an awareness of the regulating bodies that oversee plumbing and pipefitting.

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**Goal 10:** Demonstrate an awareness of **sustainability** as it pertains to plumbing and the 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.

9.10.1.1 Demonstrate an awareness of sustainability as it relates to human health and well-being.	10.10.1.1 →	11A.10.1.1 Demonstrate an awareness of the sustainable factors that influence human health and well-being for plumbers and pipe trade workers.	11B.10.1.1 →	11C.10.1.1 →
	10.10.1.2 Demonstrate an awareness of the long-term health concerns related to the different materials used in plumbing and the pipe trades.	11A.10.1.2 Demonstrate an awareness of the long-term health concerns related to plumbing and the pipe trades.	11B.10.1.2 →	11C.10.1.2 →
	10.10.1.3 Demonstrate an awareness of the necessity of plumbing in a modern society.	11A.10.1.3 Demonstrate an awareness of the sustainability of plumbers' working conditions; explain working hours, out-of-town travel, and shift work.	11B.10.1.3 →	11C.10.1.3 →

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**Goal 10:** Demonstrate an awareness of **sustainability** as it pertains to plumbing and the 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. (*continued*)

	11A.10.1.4 Demonstrate an awareness of the long-term health concerns related to the different materials used in plumbing and the pipe trades.	11B.10.1.4 Demonstrate an awareness of the sustainability of plumbers' working conditions; explain working hours, out-of-town travel, and shift work.	11C.10.1.4 →
	11A.10.1.5 Demonstrate an awareness of the sustainability of plumbers' working conditions; explain working hours, out-of-town travel, and shift work.		

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**Goal 10:** Demonstrate an awareness of **sustainability** as it pertains to plumbing and the pipe trades. *(continued)*

**GLO 10.2:** Describe plumbing and the pipe trades' **sustainability practices** and **impact on the environment**.

10.10.2.1 Demonstrate an awareness of environmental sustainability as it pertains to plumbing and the pipe trades.	11A.10.2.1 Demonstrate an awareness of environmentally appropriate methods of disposing of plumbing and pipe materials.	11B.10.2.1 Demonstrate an awareness of the importance of designing piping systems in order to minimize the amount of material used.	11C.10.2.1 Demonstrate an awareness of the benefits of environmentally appropriate fixtures, such as low-flush toilets.
10.10.2.2 Demonstrate an awareness of the environmental benefits of modern plumbing and sewage disposal systems.	11A.10.2.2 Demonstrate an awareness of how plumbing and the pipe trades can adapt to a changing economy.		

**GLO 10.3:** Describe **sustainable business practices** within plumbing and the pipe trades.

10.10.3.1 Demonstrate an awareness of business practices and the difference between those that are sustainable and those that are not.	11A.10.3.1 Demonstrate an awareness of how plumbing and the pipe trades can adapt to a changing economy.	11B.10.3.1 Demonstrate an awareness of the types of employers who hire plumbers and pipe trade workers.	11C.10.3.1 Demonstrate an awareness of the relationship between working conditions and employee retention.
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8859 <b>Exploration of Plumbing and Pipe Trades</b> 15S / 15E / 15M 10S / 10E / 10M	8876 <b>Introduction to Plumbing and Pipe Trades</b> 20S / 20E / 20M	8877 <b>Introduction to Piping Systems and Theories</b> 30S / 30E / 30M	8878 <b>Installation of Piping Systems I</b> 30S / 30E / 30M	8879 <b>Installation of Piping Systems II</b> 30S / 30E / 30M
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**Goal 11:** Demonstrate an awareness of the **ethical and legal standards, including codes**, as they pertain to plumbing and the pipe trades.

**GLO 11.1:** Demonstrate an understanding of **ethical and legal standards**.

10.11.1.1 Exhibit positive ethics by demonstrating quality workmanship.	11A.11.1.1 →	11B.11.1.1 →	11C.11.1.1 →
10.11.1.2 Demonstrate an awareness of ethical and legal standards.	11A.11.1.2 Demonstrate an awareness of the ethical and legal expectations of plumbers and pipe trade workers.	11B.11.1.2 Demonstrate an awareness of ethical concerns as they relate to job-site safety.	11C.11.1.2 Demonstrate an awareness of hydrostatic and pneumatic testing and inspections.
10.11.1.3 Demonstrate an awareness of building codes and their purpose.	11A.11.1.3 Demonstrate an awareness of the legal requirements related to specialized procedures and testing.	11B.11.1.3 Demonstrate an understanding of all applicable codes and regulations.	

8859 <b>Exploration of Plumbing and Pipe Trades</b> 15S / 15E / 15M 10S / 10E / 10M	8876 <b>Introduction to Plumbing and Pipe Trades</b> 20S / 20E / 20M	8877 <b>Introduction to Piping Systems and Theories</b> 30S / 30E / 30M	8878 <b>Installation of Piping Systems I</b> 30S / 30E / 30M	8879 <b>Installation of Piping Systems II</b> 30S / 30E / 30M
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**Goal 12:** Demonstrate **employability skills.**

**GLO 12.1:** Demonstrate fundamental **employability skills.**

9.12.1.1 Demonstrate regular and punctual attendance.	10.12.1.1 →	11A.12.1.1 →	11B.12.1.1 →	11C.12.1.1 →
9.12.1.2 Communicate respectfully and effectively with teachers, supervisors, co-workers, and students.	10.12.1.2 →	11A.12.1.2 →	11B.12.1.2 →	11C.12.1.2 →
	10.12.1.3 Demonstrate problem-solving skills.	11A.12.1.3 →	11B.12.1.3 →	11C.12.1.3 →
	10.12.1.4 Demonstrate critical-thinking skills.	11A.12.1.4 →	11B.12.1.4 →	11C.12.1.4 →
	10.12.1.5 Demonstrate the ability to accept and follow direction and feedback.	11A.12.1.5 →	11B.12.1.5 →	11C.12.1.5 →
	10.12.1.6 Demonstrate teamwork skills.	11A.12.1.6 →	11B.12.1.6 →	11C.12.1.6 →



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**Goal 12:** Demonstrate **employability skills**. *(continued)*

**GLO 12.2:** Demonstrate an understanding of the **business operations** of a plumbing and pipe trades organization.

	10.12.2.1 Demonstrate an awareness of some of the factors that are required for the effective business operation of a plumbing and pipe trades facility.	11A.12.2.1 Demonstrate an awareness of how each tradesperson's work affects the work of others, including those working in other trades.	11B.12.2.1 Demonstrate an awareness of the effects of inefficient work habits.	11C.12.2.1 Demonstrate an awareness of the effect of wasting materials on the business operation of a plumbing and pipe trades facility.
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**Goal 13:** Demonstrate an awareness of the **history, technological progression, and emerging trends** in plumbing and the pipe trades.

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

	11A.13.1.1 Demonstrate an awareness of the history, technological progression, and emerging trends in piping systems.	11B.13.1.1 Demonstrate an awareness of the history, technological progression, and emerging trends in plumbing and piping systems and their installation.	11C.13.1.1 Demonstrate an awareness of the history, technological progression, and emerging trends in plumbing fixtures.
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# GRADE 12 PLUMBING AND PIPE TRADES

General and Specific Learning  
Outcomes by Goal



# GRADE 12 PLUMBING AND PIPE TRADES

## GENERAL AND SPECIFIC LEARNING OUTCOMES BY GOAL

<b>8981</b> <b>Sanitary Venting Systems (12A)</b> 40S / 40E / 40M	<b>8982</b> <b>Sanitary Drainage Systems (12B)</b> 40S / 40E / 40M	<b>8984</b> <b>Installation of Plumbing and Piping Systems III (12C)</b> 40S / 40E / 40M	<b>8985</b> <b>Applied Plumbing and Piping Systems (12D)</b> 40S / 40E / 40M
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**Goal 1:** Describe and apply **health and safety** practices.

**GLO 1.1:** Describe and apply health and safety practices.

12A.1.1.1 Demonstrate an understanding of, and adherence to, health and safety practices.	12B.1.1.1 →	12C.1.1.1 →	12D.1.1.1 →  12D.1.1.2 Discuss implications of asbestos cement pipe and fittings. (A1a.11)
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**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, tools, and materials**.

12A.2.1.1 Apply knowledge and skills related to the safe and appropriate cleaning, maintenance, and management of plumbing tools and equipment.	12B.2.1.1 →	12C.2.1.1 →	12D.2.1.1 →
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8981  
**Sanitary  
Venting Systems  
(12A)**  
40S / 40E / 40M

8982  
**Sanitary  
Drainage Systems  
(12B)**  
40S / 40E / 40M

8984  
**Installation of Plumbing  
and Piping  
Systems III  
(12C)**  
40S / 40E / 40M

8985  
**Applied Plumbing  
and Piping Systems  
(12D)**  
40S / 40E / 40M

**Goal 3:** Demonstrate an understanding of the **properties and applications of various pipes and fittings.**

No applicable SLOs.

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

No applicable SLOs.

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8981  
**Sanitary  
Venting Systems  
(12A)**  
40S / 40E / 40M

8982  
**Sanitary  
Drainage Systems  
(12B)**  
40S / 40E / 40M

8984  
**Installation of Plumbing  
and Piping  
Systems III  
(12C)**  
40S / 40E / 40M

8985  
**Applied Plumbing  
and Piping Systems  
(12D)**  
40S / 40E / 40M

**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.

12A.5.1.1 Perform piping system layout. (A3a.1)

12B.5.1.1 Define terminology associated with residential sanitary drainage. (A7a.1)

12D.5.1.1 Demonstrate the knowledge, skills, and attitudes required to lay out piping systems.

12B.5.1.2 Identify hazards and describe safe work practices pertaining to residential sanitary drainage systems. (A7a.2)

12B.5.1.3 Interpret codes and regulations pertaining to residential sanitary drainage systems. (A7a.3)

12B.5.1.4 Interpret information pertaining to residential sanitary drainage systems found on drawings and specifications. (A7a.4)

12B.5.1.5 Identify tools and equipment related to residential sanitary drainage systems, and describe their applications and procedures for use. (A7a.5)

8981 <b>Sanitary Venting Systems (12A)</b> 40S / 40E / 40M	8982 <b>Sanitary Drainage Systems (12B)</b> 40S / 40E / 40M	8984 <b>Installation of Plumbing and Piping Systems III (12C)</b> 40S / 40E / 40M	8985 <b>Applied Plumbing and Piping Systems (12D)</b> 40S / 40E / 40M
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**Goal 5:** Demonstrate an understanding of the **design and layout** of piping systems. *(continued)*

**GLO 5.1:** Demonstrate an understanding of the **design and layout** of piping systems. *(continued)*

12B.5.1.6 Identify the methods of back flow protection used in residential sanitary drainage systems. (A7a.6)

12B.5.1.7 Identify types of residential sanitary drainage systems, and describe their properties and characteristics. (A7a.7)

12B.5.1.8 Identify residential sanitary drainage system components, and describe their purpose and applications. (A7a.8)

12B.5.1.9 Identify the factors to consider when sizing residential sanitary drainage system components. (A7a.9)

12B.5.1.10 Demonstrate residential, sanitary, drainage, and venting systems. (A7a.10)



8981 <b>Sanitary Venting Systems (12A)</b> 40S / 40E / 40M	8982 <b>Sanitary Drainage Systems (12B)</b> 40S / 40E / 40M	8984 <b>Installation of Plumbing and Piping Systems III (12C)</b> 40S / 40E / 40M	8985 <b>Applied Plumbing and Piping Systems (12D)</b> 40S / 40E / 40M
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**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.

12D.6.1.1 Demonstrate the knowledge, skills, and attitudes to fabricate piping systems.

**GLO 6.2:** Demonstrate an understanding of the **installation** of piping systems.

12A.6.2.1 Install piping supports. (A3a.4)

12A.6.2.2 Coordinate excavation and backfilling of trenches. (A3a.5)

**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.

12C.7.1.1 Demonstrate the ability to test a water supply system and document the test procedure.

12D.7.1.1 Document and test piping systems.

8981 <b>Sanitary Venting Systems (12A)</b> 40S / 40E / 40M	8982 <b>Sanitary Drainage Systems (12B)</b> 40S / 40E / 40M	8984 <b>Installation of Plumbing and Piping Systems III (12C)</b> 40S / 40E / 40M	8985 <b>Applied Plumbing and Piping Systems (12D)</b> 40S / 40E / 40M
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**Goal 8:** Describe and demonstrate the transferable **cross-curricular** knowledge and skills as they pertain to plumbing and the pipe trades.

**GLO 8.1: Read, interpret, and communicate** information.

12C.8.1.1 Demonstrate the knowledge, skills, and attitudes to read, interpret, and communicate information used in plumbing and the pipe trades (i.e., technical information, technical manuals, permits, codes and regulations, bills of lading, invoices, manufacturers' directions, and specifications).

12D.8.1.1 →

**GLO 8.2: Apply** knowledge and skills from **mathematics**.

12A.8.2.1 Calculate pipe lengths. (A3a.2)

12D.8.1.1 Demonstrate the ability to apply knowledge and skills from mathematics in the layout, joining, and fabrication of plumbing systems.

12A.8.2.2 Calculate piping offsets. (A3a.3)

8981 <b>Sanitary Venting Systems (12A)</b> 40S / 40E / 40M	8982 <b>Sanitary Drainage Systems (12B)</b> 40S / 40E / 40M	8984 <b>Installation of Plumbing and Piping Systems III (12C)</b> 40S / 40E / 40M	8985 <b>Applied Plumbing and Piping Systems (12D)</b> 40S / 40E / 40M
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**Goal 8:** Describe and demonstrate the transferable **cross-curricular** knowledge and skills as they pertain to plumbing and the pipe trades. *(continued)*

**GLO 8.3:** Apply knowledge and skills from the **sciences**.

- 12D.8.3.1 Demonstrate the ability to apply knowledge and skills required in the layout, joining, and fabrication of piping systems.
- 12D.8.3.2 Define terminology associated with electricity as related to the trade. (A9a.1)
- 12D.8.3.3 Identify hazards and describe safe work practices pertaining to electricity. (A9a.2)
- 12D.8.3.4 Interpret electrical-related information found on drawings and specifications. (A9a.3)
- 12D.8.3.5 Identify tools and equipment used to test electrical circuits, and describe their applications and procedures for use. (A9a.4)
- 12D.8.3.6 Explain Ohm’s law and describe its applications and associated calculations. (A9a.5)

8981 <b>Sanitary Venting Systems (12A)</b> 40S / 40E / 40M	8982 <b>Sanitary Drainage Systems (12B)</b> 40S / 40E / 40M	8984 <b>Installation of Plumbing and Piping Systems III (12C)</b> 40S / 40E / 40M	8985 <b>Applied Plumbing and Piping Systems (12D)</b> 40S / 40E / 40M
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**Goal 8:** Describe and demonstrate the transferable **cross-curricular** knowledge and skills as they pertain to plumbing and the pipe trades. *(continued)*

**GLO 8.3:** Apply knowledge and skills from the **sciences**. *(continued)*

12D.8.3.7 Identify types of current, and describe their characteristics and applications. (A9a.6)

12D.8.3.8 Identify types of electrical circuits, and describe their characteristics, operation, and applications. (A9a.7)

12D.8.3.9 Identify and demonstrate types of electrical equipment and components, and describe their characteristics, operation, and applications. (A9a.8)

8981 <b>Sanitary Venting Systems (12A)</b> 40S / 40E / 40M	8982 <b>Sanitary Drainage Systems (12B)</b> 40S / 40E / 40M	8984 <b>Installation of Plumbing and Piping Systems III (12C)</b> 40S / 40E / 40M	8985 <b>Applied Plumbing and Piping Systems (12D)</b> 40S / 40E / 40M
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**Goal 9:** Demonstrate an understanding of the **structure and scope** of plumbing and the pipe trades.

**GLO 9.1:** Demonstrate an understanding of the **structure and scope** of plumbing and the pipe trades, as well as associated occupations.

	12B.9.1.1 Demonstrate an understanding of the trades related to plumbing (e.g., steamfitter, etc.).	12D.9.1.1 Demonstrate an understanding of the regulating bodies that oversee plumbing and the pipe trades.  12D.9.1.2 Describe two levels of workplace competency. (A3b.2)  12D.9.1.3 Describe accommodation for apprentices with disabilities. (A3b.3)
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**GLO 9.2:** Demonstrate an understanding of **training and employment opportunities** in plumbing and the pipe trades, as well as in associated occupations.

12A.9.2.1 Demonstrate an understanding of training and its relationship to opportunities in various careers.	12B.9.2.1 →	12C.9.2.1 →	12D.9.2.1 Demonstrate an understanding of some of the various training certifications that can increase a plumber’s employability (i.e., confined space, first aid, etc.).  12D.9.2.2 Demonstrate an understanding of the training programs that are available in plumbing and the pipe trades.  12D.9.2.3 Demonstrate the knowledge, skills, and attitudes to participate in a job interview.
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8981 <b>Sanitary Venting Systems (12A)</b> 40S / 40E / 40M	8982 <b>Sanitary Drainage Systems (12B)</b> 40S / 40E / 40M	8984 <b>Installation of Plumbing and Piping Systems III (12C)</b> 40S / 40E / 40M	8985 <b>Applied Plumbing and Piping Systems (12D)</b> 40S / 40E / 40M
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**Goal 9:** Demonstrate an understanding of the **structure and scope** of plumbing and the pipe trades. *(continued)*

**GLO 9.2:** Demonstrate an understanding of **training and employment opportunities** in plumbing and the pipe trades, as well as in associated occupations. *(continued)*

12D.9.2.4 Demonstrate the knowledge, skills, and attitudes to create a resumé and portfolio to be used in finding a position in plumbing and the pipe trades, or a related occupation.

**Goal 10:** Demonstrate an awareness of **sustainability** as it pertains to plumbing and the 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.

12A.10.1.1 Demonstrate an understanding of the sustainable factors that influence human health and well-being for plumbers and pipe trade workers.

12B.10.1.1 Demonstrate an understanding of long-term health concerns related to plumbing and the pipe trades.

12C.10.1.1 Demonstrate an understanding of the long-term health concerns related to the different materials used in plumbing and the pipe trades.

12D.10.1.1 Demonstrate an understanding of the impact of human sustainability on the health and well-being of plumbers, tradespersons working in the pipe trades, and those who use their systems.

12A.10.1.2 Demonstrate an understanding of sustainability as it relates to human health and well-being.

12C.10.1.2 Demonstrate an understanding of the sustainability of plumbers' working conditions, including working hours, travel, and shift work.

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

**GLO 10.2:** Describe the plumbing and pipe trades' **sustainability practices** and **impact on the environment**.

<p>12A.10.2.1 Demonstrate an understanding of sustainability practices and of the environmental impact of sanitary drainage systems with regard to their design, fabrication, and use.</p> <p>12A.10.2.2 Demonstrate an understanding of where sanitary venting systems are required.</p>	<p>12B.10.2.1 Demonstrate an understanding of sustainability practices and of the environmental impact of sanitary drainage systems with regard to their design, fabrication, and use.</p> <p>12B.10.2.2 Demonstrate an understanding of where sanitary drainage systems are required.</p> <p>12B.10.2.3 Demonstrate an understanding of the appropriate reuse of materials in the plumbing and piping industry.</p>	<p>12C.10.2.1 Demonstrate an understanding of sustainability practices and of the environmental impact of water supply systems with regard to their design, fabrication, and use.</p> <p>12C.10.2.2 Demonstrate an understanding of the importance of using recycled materials.</p>	<p>12D.10.2.1 Demonstrate an understanding of the sustainability practices and of the environmental impact of plumbing and the pipe trades.</p> <p>12D.10.2.2 Demonstrate an awareness of piping systems that incorporate green technology.</p>
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**GLO 10.3:** Describe **sustainable business practices** within plumbing and the pipe trades.

<p>12A.10.3.1 Demonstrate an awareness of the influence of plumbing and the pipe trades on local economies.</p>	<p>12B.10.3.1 Demonstrate an awareness of the relationship between quality of work and the long-term sustainability of a business.</p>	<p>12C.10.3.1 Demonstrate an awareness of the relationship between positive customer relations and the long-term sustainability of a business.</p>	<p>12D.10.3.1 Describe sustainable business practices within plumbing and the pipe trades.</p>
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**Goal 11:** Demonstrate an awareness of **ethical and legal standards including costs**, as they pertain to plumbing and the pipe trades. (*continued*)

**GLO 11.1:** Demonstrate an understanding of **ethical and legal standards**.

12A.11.1.1 Demonstrate ethics by practising quality workmanship.	12B.11.1.1 →	12C.11.1.1 →	12D.11.1.1 Demonstrate an understanding of codes and regulations related to plumbing and the pipe trades.
12A.11.1.2 Demonstrate ethics by creating and maintaining safe working conditions for all concerned.	12B.11.1.2 →	12C.11.1.2 →	12D.11.1.2 Demonstrate an awareness of the legal requirements related to specialized procedures and testing.
12A.11.1.3 Discuss the relationship between ethics and employability skills, such as creating a respectful workplace.	12B.11.1.3 Demonstrate an understanding of codes and regulations related to sanitary drainage systems.	12C.11.1.3 Demonstrate an understanding of codes and regulations related to water supply systems.	
12A.11.1.4 Demonstrate an understanding of codes and regulations related to sanitary venting systems.	12B.11.1.4 →	12C.11.1.4 Demonstrate an awareness of the legal requirements related to specialized procedures and testing of water supply systems	



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**Goal 11:** Demonstrate an awareness of **ethical and legal standards including costs**, as they pertain to plumbing and the pipe trades. *(continued)*

**GLO 11.1:** Demonstrate an understanding of **ethical and legal standards**. *(continued)*

12A.11.1.5 Perform hydrostatic and pneumatic testing and inspections.

12B.11.1.5 Demonstrate an awareness of the legal requirements related to specialized procedures and testing of sanitary drainage systems.

12A.11.1.6 Demonstrate an awareness of the legal requirements related to specialized procedures and testing of sanitary venting systems.

**GLO 11.2:** Demonstrate an understanding of **gas codes**.

12D.11.2.1 Define terminology associated with gas code. (A10a.1)

12D.11.2.2 Identify hazards and describe safe work practices pertaining to gas code. (A10a.2)

12D.11.2.3 Interpret codes and regulations pertaining to gas. (A10a.3)

12D.11.2.4 Interpret information pertaining to gas found on drawings and specifications. (A10a.4)

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**Goal 11:** Demonstrate an awareness of **ethical and legal standards including costs**, as they pertain to plumbing and the pipe trades. *(continued)*

**GLO 11.2:** Demonstrate an understanding of **gas codes**. *(continued)*

12D.11.2.5 Describe the identification systems and methods for gas. (A10a.5)

12D.11.2.6 Identify tools and equipment related to gas, and describe their applications and procedures for use. (A10a.6)

12D.11.2.7 Identify gas systems, and describe their characteristics and applications. (A10a.7)

12D.11.2.8 Identify types of gas, and describe their properties and characteristics. (A10a.8)

12D.11.2.9 Explain the systems of measurement for gas. (A10a.9)

12D.11.2.10 Describe the procedures used to install fittings and accessories for steel piping. (A10a.10)

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**Goal 12:** Demonstrate **employability skills.**

**GLO 12.1:** Demonstrate fundamental **employability skills.**

12A.12.1.1 Demonstrate regular and punctual attendance.	12B.12.1.1 →	12C.12.1.1 →	12D.12.1.1 →
12A.12.1.2 Demonstrate critical-thinking and problem-solving skills.	12B.12.1.2 →	12C.12.1.2 →	12D.12.1.2 →
12A.12.1.3 Demonstrate accountability by taking responsibility for their actions.	12B.12.1.3 →	12C.12.1.3 →	12D.12.1.3 →
12A.12.1.4 Demonstrate adaptability, initiative, and effort.	12B.12.1.4 →	12C.12.1.4 →	12D.12.1.4 →
12A.12.1.5 Demonstrate the ability to accept and follow direction and feedback.	12B.12.1.5 →	12C.12.1.5 →	12D.12.1.5 →
12A.12.1.6 Demonstrate teamwork skills.	12B.12.1.6 →	12C.12.1.6 →	12D.12.1.6 →
12A.12.1.7 Demonstrate the ability to stay on task and use time effectively.	12B.12.1.7 →	12C.12.1.7 →	12D.12.1.7 →
12A.12.1.8 Demonstrate the ability to communicate respectfully and effectively with teachers, supervisors, coworkers, and students.	12B.12.1.8 →	12C.12.1.8 →	12D.12.1.8 →

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**Goal 12:** Demonstrate **employability skills.** *(continued)*

**GLO 12.2:** Demonstrate an understanding of the **business operations** of a plumbing and pipe trades organization.

12A.12.2.1 Identify business activities that affect profit and loss.	12C.12.2.1 Read and interpret a material take-off sheet as part of an estimate.	12D.12.2.1 Prepare a material take-off sheet as part of an estimate.
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**GLO 12.3:** Demonstrate **critical thinking** skills.

12A.12.3.1 Demonstrate an awareness of critical thinking.	12C.12.3.1 Demonstrate problem-solving skills.	12D.12.3.1 Demonstrate the ability to solve complex, multi-stage problems related to the design, construction, and/or renovation of structures.
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**GLO 12.4:** Demonstrate an understanding of **culture** and its influence in the workplace.

12A.12.4.1 Demonstrate an awareness of culture.	12B.12.4.1 Demonstrate an awareness of cultural differences in the workplace.	12C.12.4.1 Demonstrate an awareness of how people's culture affects their values and behaviour.	12D.12.4.1 Demonstrate respectful interactions with individuals of different cultures.
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**Goal 13:** Demonstrate an awareness of the **history, technological progression, and emerging trends** in plumbing and the pipe trades.

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

12A.13.1.1 Demonstrate an awareness of the history of sanitary venting.	12B.13.1.1 Demonstrate an awareness of the history of sanitary drainage.	12C.13.1.1 Demonstrate an awareness of the potential of renewable energy sources, such as solar energy, in plumbing and the pipe trades.	12D.13.1.1 Demonstrate an awareness of the history, technological progression, and emerging trends in plumbing and the pipe trades.
12A.13.1.2 Demonstrate an awareness of the increasing use of geothermal in new construction.	12B.13.1.2 Demonstrate an awareness of green technologies in plumbing and the pipe trades.	12C.13.1.2 Demonstrate an awareness of the use of GPS in the trades for locating and levelling systems.	





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Printed in Canada  
Imprimé au Canada