

Block C: Routine Trade Activities and Electrical Concepts



Plumbing Apprenticeship Program Level 1 Series

Block C: Routine Trade Activities and Electrical Concepts

BC Plumbing Apprenticeship, Level 1

SKILLEDTRADESBC

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TRU OPEN PRESS, THOMPSON RIVERS UNIVERSITY
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Block C: Routine Trade Activities and Electrical Concepts of the Plumbing Apprenticeship Program Level 1 Series features Skilled Trades BC industry-authority content on the routine trade activities and foundational electrical concepts that support accurate, efficient, and code-compliant plumbing work. This block emphasizes the knowledge apprentices rely on to interpret information, apply standards, and make informed decisions on the job site.

In Block C, apprentices develop core skills in mathematics and science as they apply to the trades, build an understanding of basic electrical concepts and principles of electricity, and learn how to read and interpret drawings and specifications. The block also introduces codes, regulations, and standards, along with the effective use of manufacturer and supplier documentation. Together, these competencies help apprentices work safely, communicate clearly with other trades, and ensure installations meet required technical and regulatory expectations.

Plumbing Apprenticeship Program Level 1 Series

The *Plumbing Apprenticeship Program Level 1 Series* offers comprehensive training materials designed to build on foundational skills and knowledge. The series is divided into four main blocks, each focusing on critical areas of plumbing systems and installations.

Block A: Safety Related Functions

- A-1: Workplace Hazards
- A-2: WorkSafeBC Regulations
- A-3: Safe Handling of Hazardous Materials
- A-4: Personal Safety Practices
- A-5: Fire Safety

Block B: Tools and Equipment

- B-1: Use Hand Tools and Measuring Tools
- B-2: Use Portable Power Tools and Use
- B-3: Use Access Equipment
- B-4: Use Rigging, Hoisting, Lifting and Positioning Equipment, and Rigging
- B-5: Use Soldering and Brazing Equipment and Oxy-Fuel Cutting Equipment
- B-6: Use Welding Equipment

Block C: Routine Trade Activities and Electrical Concepts

- C-1: Mathematics and Science
- C-2: Electrical Concepts and Principles of Electricity
- C-3: Drawings and Specifications

C-4: Codes, Regulations and Standards

C-5: Manufacturer and Supplier Documentation

Block D: Piping and Components

D-1: Install Pipe and Tubing

D-2: Install Valves

D-3: Install Fittings

D-4: Penetrate Structures

Plumbing Apprenticeship Program Overview and Upcoming Resources

- **Plumbing Apprenticeship Program Level 1 Series** can be found in the TRU Open Press Collection.
- **Plumbing Apprenticeship Program Level 2 Series** can be found in the TRU Open Press Collection.
- **Plumbing Apprenticeship Program Level 3 Series** can be found in the BCCampus Open Collection.
- **Plumbing Apprenticeship Program Level 4 Series** can be found in the BCCampus Open Collection.
(Block F: Commission and Service will be available soon.)

Disclaimer

The materials in these Learning Guides are intended for use by students and instructional staff. They have been compiled from sources believed to be reliable and to represent the best current opinions on these subjects. These manuals are designed to serve as a starting point for good practices and may not cover all minimum legal standards. No warranty, guarantee, or representation is made by the BC Piping Trades Articulation Committee, the Skilled Trades BC authority, or the King's Printer of British Columbia regarding the accuracy or sufficiency of the information contained in these publications. These manuals aim to provide basic guidelines for piping trades practices. Therefore, do not assume that all necessary warnings and safety precautions are included, and additional measures may be required.

Safety Advisory

The current Standards and Regulation in BC can be obtained at the WorkSafeBC website: <http://www.worksafebc.com>

Please note that it is always the responsibility of any person using these materials to inform themselves about the Occupational Health and Safety Regulation pertaining to their areas of work.

[From previous 2021 book – confirm this message with Skilled Trades]

Symbol Legend



Important Information



Potentially Toxic/ Poisonous Situation



Required or Optional Resources



Potentially Flammable Situation



Complete a Self-Test



Possibly Explosive Situation



Use Protective Equipment



Potential Electric Shock

Acknowledgements

The development of the *Plumbing Apprenticeship Level 1* learning resources was a collaborative effort driven by a commitment to excellence in trades education. These resources were created to support apprentices and journeypersons in mastering the skills and knowledge essential to the piping trades. This achievement would not have been possible without the dedication and expertise of *Skilled Trades BC* and the *Piping Trades Articulation Committee*, whose contributions, leadership, and guidance have been instrumental in shaping high-quality, industry-aligned training resources. We extend our sincere gratitude for their contributions and ongoing stewardship in advancing the piping trades.

The content for *Block C: Routine Trade Activities and Electrical Concepts* is adapted from the Piping Trades Apprenticeship Program from SkilledTradesBC (2019 Harmonized) and the Trades Access Common Core (TACC) resources developed by Camosun College, created in 2015 and revised in 2019, and made available through BCcampus:

- Line D: Organizational Skills: Competency D-1: Solve Trades Mathematical Problems
- Line D: Organizational Skills: Competency D-2: Apply Science Concepts to Trades Applications
- Line D: Organizational Skills: Competency D-3: Read Drawings and Specifications
- Line D: Organizational Skills: Competency D-4: Use Codes, Regulations and Standards
- Line D: Organizational Skills: Competency D-5: Use Manufacturer and Supplier Documentation
- Line D: Organizational Skills: Competency D-6: Plan Projects

The original materials were produced in collaboration with industry partners and aligned with the Industry Training Authority (ITA)/SkilledTradesBC harmonized program outlines for Plumbing, Steamfitting/Pipefitting, and Sprinkler Fitting. These works were released under a Creative Commons Attribution 4.0 International (CC BY 4.0) licence, except where otherwise noted.

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This adapted version has been reformatted and integrated into the current Thompson Rivers University/TRU Open Press open educational resource in collaboration with the BC Piping Articulation and Curriculum Subcommittee and SkilledTradesBC, in support of open, accessible, and up-to-date apprenticeship training.



The Open Press

The Open Press combines TRU's open platforms and expertise in learning design and open resource development to support the creation and reuse of open educational resources, while encouraging open scholarship and research.

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Resources

Content adapted from:

- ©2019, Skilled Trades BC (Harmonized)
- Open School BC
- Camosun College
- Trades Training BC

For the latest BC Plumbing Trades Program Outline (2025), see the SkilledTradesBC website: www.skilledtrades.bc.ca

To order printed copies of Program Outlines or learning resources (where available) for BC Trades, contact:

Crown Publications, King's Printer

Web: www.crownpub.bc.ca

Email: crownpub@gov.bc.ca

Toll Free: 1 800 663-6105

- Piping Trades Apprenticeship Program – Perform Safety Related Functions – Level 1 Harmonized (2019) (Binder) (ISBN: 978-0-7726-7362-6; product no. 7960000260) Crown Publications Online Catalogue – Piping Trades Apprenticeship Program – Perform Safety Related Functions – Level 1 Harmonized (2019) (Binder)
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If you are using a printed copy, you can scan the QR code with your digital device to go directly to the video: Introducing SkilledTradesBC



Starting December 1, 2022, Industry Training Authority was officially renamed to SkilledTradesBC. Hear more in this video from SkilledTradesBC CEO, Shelley Gray, on what this means for the trades industry and British Columbians. Closed captioning and transcripts are available with this video, Introducing Skilled Trades BC (2022) on YouTube.



One or more interactive elements has been excluded from this version of the text. You can view them online here: <https://c-tradeactivities-electrical-bcplumbingapprl1.pressbooks.tru.ca/?p=2618>

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References

- Camosun College. (n.d.). *Line D: Organizational Skills*. BCcampus. <https://collection.bccampus.ca/textbook/qFKGAJ78/>
- SkilledTradesBC. (2025). Plumber program outline (Implementation date: August 18, 2025; Last revised: December 16, 2025) [PDF]. Province of British Columbia. <https://skilledtradesbc.ca/media/2776/download>
- SkilledTradesBC. (2022, December 1). Introducing Skilled Trades BC. YouTube. <https://www.youtube.com/watch?v=OQgwdP0rNog>

Accessibility

The web version of *Block C: Routine Trade Activities and Electrical Concepts* has been designed to meet Web Content Accessibility Guidelines 2.0, level AA. In addition, it follows all guidelines in Appendix A: Checklist for Accessibility of the Accessibility Toolkit – 2nd Edition.

Includes:

- **Easy navigation.** This resource has a linked table of contents and uses headings in each chapter to make navigation easy.
- **Accessible videos.** All videos in this resource have captions.
- **Accessible images.** All images in this resource that convey information have alternative text. Images that are decorative have empty alternative text.
- **Accessible links.** All links use descriptive link text.

Accessibility Checklist

Element	Requirements	Pass
Headings	Content is organized under headings and subheadings that are used sequentially.	
Images	Images that convey information include alternative text descriptions. These descriptions are provided in the alt text field, in the surrounding text, or linked to as a long description.	
Images	Images and text do not rely on colour to convey information.	
Images	Images that are purely decorative or are already described in the surrounding text contain empty alternative text descriptions. (Descriptive text is unnecessary if the image doesn't convey contextual content information.)	
Tables	Tables include row and/or column headers with the correct scope assigned.	
Tables	Tables include a title or caption.	
Tables	Tables do not have merged or split cells.	
Tables	Tables have adequate cell padding.	
Links	The link text describes the destination of the link.	
Links	Links do not open new windows or tabs. If they do, a textual reference is included in the link text.	
Links	Links to files include the file type in the link text.	
Video	All videos include high-quality (i.e., not machine generated) captions of all speech content and relevant non-speech content.	
Video	All videos with contextual visuals (graphs, charts, etc.) are described audibly in the video.	
H5P	All H5P activities have been tested for accessibility by the H5P team and have passed their testing.	
H5P	All H5P activities that include images, videos, and/or audio content meet the accessibility requirements for those media types.	
Font	Font size is 12 point or higher for body text.	
Font	Font size is 9 point for footnotes or endnotes.	
Font	Font size can be zoomed to 200% in the webbook or eBook formats.	

Known Accessibility Issues and Areas for Improvement

- Images in H5P self-tests lack alt text, attributions, and licenses to avoid revealing answers.
- Some tables may use merged cells, but they have been structured to work properly with screen readers and there may be long descriptions included in each section if readers prefer to see the table data in a bulleted list.
- Youtube videos do not have edited captions.

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Other Formats Available

- In addition to the web version, this book is available in a number of file formats, including PDF. The Print PDF has passed our Accessibility Check.

APPENDICES - ADDITIONAL LEARNING RESOURCES

These appendices include additional learning resources originally developed for *Line D: Organizational skills: Competency D-1: Solve trades mathematical problems* by Camosun College (2015) for the Plumbing Trades series available through BCcampus. We gratefully acknowledge the quality and care reflected in this work and felt it was important to ensure these valuable resources continue to be accessible and used. They have been included here to support student learning and provide convenient access to supplementary materials that reinforce key concepts and skills presented throughout this text.

Camosun College. (2015). *Line D: Organizational skills: Competency D-1: Solve trades mathematical problems*. BCcampus. <https://collection.bccampus.ca/textbook/qFKGAJ78/>

Appendix A: Math Web Links

Open University (OpenLearn) Resources

- **Numbers, Units and Arithmetic**
This free course reviews whole numbers, decimals, and fractions, including positive and negative values.
- **Ratio, Proportion and Percentages**
Covers key concepts related to ratios, proportions, and percentages.
- **Squares, Roots and Powers**
Reviews powers of numbers (including squares and square roots) and introduces powers of 10 and scientific notation.

Khan Academy Resources

- **Decimals**
Learn decimal concepts, operations, rounding, estimating, and conversions.
- **Fractions**
Covers fraction concepts, operations, and conversions.
- **Negative Numbers and Absolute Value**
Builds understanding of numbers below zero and absolute value.
- **Arithmetic Properties**
Explores place value, order of operations, and key arithmetic concepts.
- **Basic Geometry**
Introduces the core foundations of geometry.

Appendix B: Metric Unit Symbols and Relationships

Notes for Use

- Metric conversions are based on powers of 10 (move the decimal point).
- Always check units to confirm your answer is reasonable.
- Use this reference sheet during problem solving—memorization is not required.

Table 1: Time Conversions

Unit	Symbol	Conversion
second	s	—
minute	min	1 min = 60 s
hour	h	1 h = 60 min
day	d	1 d = 24 h
year	a	1 a = 365 d

Table 2: Length and Area Conversions

Quantity	Unit	Symbol	Conversion
Length	kilometre	km	1 km = 1000 m
	metre	m	1 m = 100 cm
	centimetre	cm	1 cm = 10 mm
	millimetre	mm	1 m = 1000 mm
Area	hectare	ha	1 ha = 10,000 m ²
	square kilometre	km ²	1 km ² = 1,000,000 m ²
	hectare	ha	1 km ² = 100 ha
	square metre	m ²	1 ha = 10,000 m ²
	square centimetre	cm ²	1 m ² = 10,000 cm ²

Table 3: Volume Conversions

Unit	Symbol	Conversion
kilolitre	kL	1 kL = 1000 L
cubic metre	m ³	1 m ³ = 1 kL
litre	L	1 L = 1000 mL
cubic centimetre	cm ³	1 L = 1000 cm ³
millilitre	mL	1 mL = 1 cm ³

Table 4: Mass Conversions

Unit	Symbol	Conversion
kilolitre	kL	1 kL = 1000 L
cubic metre	m ³	1 m ³ = 1 kL
litre	L	1 L = 1000 mL
cubic centimetre	cm ³	1 L = 1000 cm ³
millilitre	mL	1 mL = 1 cm ³

Table 5: Water Equivalencies

Quantity	Equivalent Mass
1 kL of water	1 tonne (t)
1 L of water	1 kilogram (kg)
1 mL of water	1 gram (g)

Table 6: Metric Prefixes

Prefix	Symbol	Value
mega	M	1,000,000
kilo	k	1,000
hecto	h	100
deca	da	10
deci	d	0.1
centi	c	0.01
milli	m	0.001
micro	μ	0.000001

Printable sheets:

- [Trades Math Reference SheetC_Lev1 \[docx\]](#)
- [Trades Math Reference SheetC_Lev1 \[PDF\]](#)

Appendix C: Imperial (U.S.) units

U.S. customary units differ from imperial (Canadian/UK) units, especially for liquid measure. Always confirm which system is being used.

Imperial (U.S.) Units

Table 1: Length – Imperial (U.S.) Units

Unit	Conversion
foot (ft.)	1 ft = 12 inches (in.)
yard (yd.)	1 yd = 3 ft
mile (mi.)	1 mi = 5,280 ft

Table 2: Liquid Measure

Unit	Conversion
pint (pt.)	1 pt = 2 cups
quart (qt.)	1 qt = 2 pt
gallon (gal.)	1 gal = 4 qt

Table 3: Weight

Unit	Conversion
pound (lb.)	1 lb = 16 ounces (oz.)
ton	1 ton = 2000 lb

Metric to Imperial (U.S.) Conversions

Table 4: Length

Metric Unit	Imperial Equivalent
1 cm	0.394 in.
1 m	39.4 in.
1 km	0.621 mi

Table 5: Area

Metric Unit	Imperial Equivalent
1 hectare	2.47 acres
1 km ²	0.386 sq. mi.

Table 6: Liquid Measure

Metric Unit	Imperial Equivalent
1 L	0.26 gal
1 L	4.23 cups

Table 7: Mass/Weight

Metric Unit	Imperial Equivalent
1 g	0.0353 oz
1 kg	2.20 lb

Imperial (U.S.) to Metric Conversions

Table 8: Length

Imperial Unit	Metric Equivalent
1 in.	2.54 cm
1 yd	0.914 m
1 mi	1.61 km

Table 9: Area

Imperial Unit	Metric Equivalent
1 acre	0.405 ha
1 sq. mi.	2.59 km ²

Table 10: Liquid Measure

Imperial Unit	Metric Equivalent
1 gal	3.79 L
1 cup	0.24 L

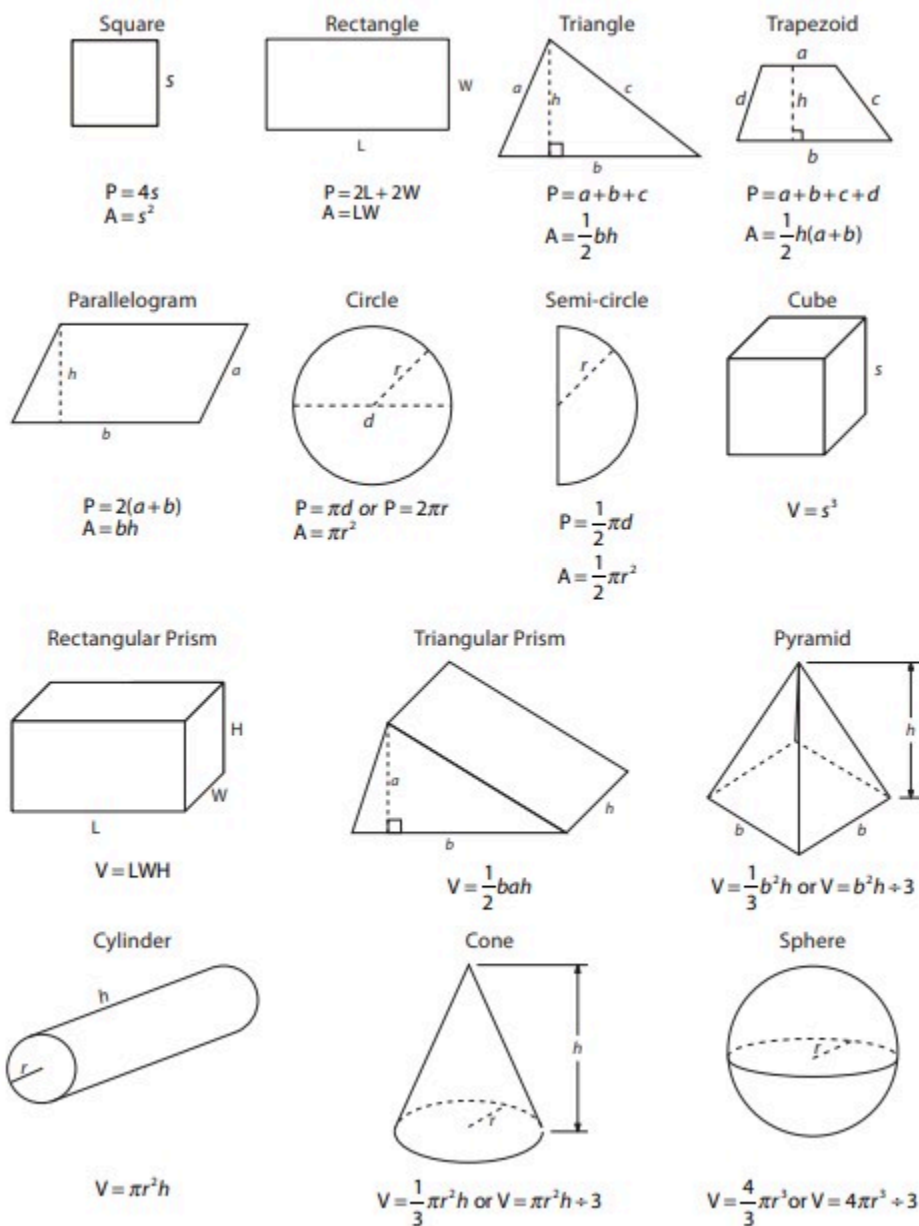
Table 11: Mass/Weight

Imperial Unit	Metric Equivalent
1 gal	3.79 L
1 cup	0.24 L

Printable sheets:

- [Trades Math Reference SheetB_Lev1 \[PDF\]](#)
- [Trades Math Reference SheetB_Lev1 \[docx\]](#)

Appendix D: Perimeter, Area, and Volume Formulas for Shapes



Printable:

- Trades Math Reference SheetD_Lev1 [docx]
- Trades Math Reference SheetD_Lev1 [PDF]

Plumbing Apprenticeship & Trade Resources in BC

A successful career in plumbing requires a strong foundation of skills, knowledge, and workplace safety awareness. Below are key resources to support plumbing apprentices in BC, including educational pathways, trade certifications, workplace safety guidelines, and mental health and wellness support.

Plumbing Apprenticeship & Certification Resources

- **SkilledTradesBC – Plumbing Apprenticeship** – Overview of plumbing training, certification requirements, and apprenticeship pathways in British Columbia.
- **Red Seal Program – Plumber** – National certification program with exam prep guides and trade mobility information.
- **BC Building Codes & Standards** – Official building and plumbing codes for British Columbia.

Workplace Safety & Regulations

- **WorkSafeBC** – Essential safety resources for plumbers, including:
 - Health & Safety – WorkSafeBC
 - Report Unsafe Working Conditions
 - Report a Workplace Injury or Disease
 - Submit a Notice of Project Form
 - Get Health and Safety Resources (Videos, Posters, Publications, and More)
 - Search the OHS Regulations (and Related Materials)
 - Conduct an Incident Investigation
- **CCOHS: OHS Answers Fact Sheets – Plumber** – Safety guidelines and best practices for plumbers in various work environments.

Financial Supports

- **Financial Support (SkilledTradesBC)** – Information about grants, tax credits, Canada apprentice loans, employment insurance, and the Indigenous Skills and Employment Training (ISET) program.
- **StudentAidBC** – Complete post-secondary education through student loans, grants, and scholarships. There is also programs that help with loan repayment.
- **WorkBC (Government of BC)** – Services for apprentices and employers.

Mental Health & Wellness Support

- **HealthLink BC – Mental Health and Substance Use** – HealthLink BC resources for mental health and wellness support.
- **Here2Talk** – Free and confidential counseling services available to all post-secondary students registered at a BC school.
- **Help Starts Here** – A database with over 2,500 listings of services related to mental health and substance use supports.
- **Hope for Wellness Helpline** – 24/7 online chat and phone line with experienced and culturally competent counselors available to all Indigenous people in Canada.
 - First Nations Health Authority Mental Health Supports Info Sheet [PDF] by First Nations health Authority – List of culturally safe services for Indigenous people.
- **HeretoHelp – BC** – Mental health resources, including videos, articles, and support services in BC.
- **BC Construction Industry Rehabilitation Plan** – Mental health and substance use services for CLRA and BCBT members and their families.
- **Virtual Mental Health Supports (Government of BC)** – Virtual services are available for British Columbians who are experiencing anxiety, depression, or other mental health challenges.

Crisis Support

- **Interior Crisis Line Network** – Call 1-888-353-2273 for 24/7 emotional support, crisis intervention, and community resource information.
- **Talk Suicide Chat Service** – An alternative if calling is difficult; available for crisis intervention.
- **310Mental Health Support** – Call 250-310-6789 for emotional support, information, and resources specific to mental health.
- **1-800-SUICIDE** – Call 1-800-784-2433 if you are experiencing feelings of distress or despair, including thoughts of suicide.
- **Opioid Treatment Access Line** – Call 1-833-804-8111 between 9 am and 4 pm to connect with a doctor, nurse, or healthcare worker who can prescribe opioid treatment medication that same day.
- **KUU-US Crisis Response Service** – Call 1-800-588-8717 for culturally-aware crisis support for Indigenous peoples in BC.
- **Alcohol and Drug Information and Referral Service** – Call 1-800-663-1441 to find resources and support.



Emergency Services – For life-threatening situations, call 911 or visit your nearest emergency department.

Version History

This page provides a record of changes made to this learning resource, Plumbing Apprenticeship Level 1, Block C. Each update increases the version number by 0.1. The most recent version is reflected in the exported files for this resource.

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