Apprenticeship Manitoba

Manitoba

Plumber
Level 3

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Apprenticeship Manitoba

Plumber

UNIT: C1 SEWERS

Subunit: C1a Storm and Combination Drainage Systems

Level: Three

Duration: 5 hours

Theory: 5 hours

Practical: 0 hours

Overview:

This unit of instruction is designed to provide the Plumber apprentice with the basic knowledge and understanding of storm and combinations drainage systems.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Define terminology associated with storm and combination drainage systems.	**7%**
2. Identify hazards and describe safe work practices pertaining to storm and combination drainage systems.	**7%**
3. Interpret codes and regulations pertaining to storm and combination drainage systems.	**7%**
4. Interpret information pertaining to storm and combination drainage systems found on drawings and specifications.	**7%**
5. Identify tools and equipment relating to storm and combination drainage systems and describe their applications and procedures for use.	**7%**
6. Identify types of storm and combination drainage systems and describe their characteristics and applications.	**7%**
7. Identify storm and combination drainage system components and describe their purpose and applications. a. Piping b. Roof drains c. Area drains d. Fire stopping e. Expansion joints	**7%**
8. Identify the factors to consider when sizing storm and combination drainage system components.	**7%**
9. Describe the procedures used to determine hydraulic load on storm and combination drainage systems.	**7%**

a. Conversion factors
b. Code requirements

10. Determine and transfer grade, percent of grade and elevation for piping in storm and combination drainage systems. **7%**

11. Describe the procedures used to grade piping for storm and combination drainage systems. **6%**

12. Describe the procedures used to install storm and combination drainage systems. **6%**

13. Describe the procedures used to protect storm and combination drainage systems. **6%**
a. Insulating
b. Supporting
c. Identification
d. Per mechanical specifications

14. Describe the procedures used to maintain and repair storm and combination drainage systems. **6%**

15. Describe the procedures used to test and troubleshoot storm and combination drainage systems. **6%**

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Plumber

Unit: C2 INTERIOR DRAINAGE, WASTE AND VENT SYSTEMS III

Subunit: C2a Commercial Drainage Waste, and Vent Systems

Level: Three

Duration: 30 hours

Theory: 18 hours

Practical: 12 hours

Overview:

This unit of instruction is designed to provide the Plumber apprentice with the basic knowledge and understanding of commercial sanitary drainage systems.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Define terminology associated with commercial sanitary drainage, waste and venting systems.	**4%**
2. Identify hazards and describe safe work practices pertaining to commercial sanitary drainage waste and venting systems.	**4%**
3. Interpret codes and regulations pertaining to commercial sanitary drainage, waste and venting systems, and health care.	**4%**
4. Interpret information pertaining to commercial sanitary drainage, waste and venting systems found on drawings and specifications.	**4%**
5. Identify tools and equipment relating to commercial sanitary drainage, waste and venting systems and describe their applications and procedures for use.	**4%**
6. Identify types of commercial sanitary drainage, waste and venting systems and describe their characteristics and applications. a. Stack vent b. Vent stack c. Individual vent d. Branch vent e. Dual vent f. Vent header g. Continuous vent h. Wet vent i. Relief vent j. Circuit vent	**4%**

k. Yoke vent
l. Offset relief vent
m. Additional circuit vent

7. Identify commercial sanitary drainage, waste and venting system components and describe their purpose and applications. 4%

a. Interceptors
b. Traps
c. Drains
d. Cleanouts/manholes
e. Primers
f. Fire stopping
g. Piping
h. Fixtures
i. Traps
j. Cleanouts
k. Joints and connections
l. Fire stopping
m. Air admittance valve

8. Identify the factors to consider when sizing commercial sanitary drainage system components. 4%

9. Describe the procedures used to size commercial sanitary drainage, waste and venting system components. 4%

10. Determine and transfer grade, percent of grade and elevation for piping in commercial sanitary drainage, waste and venting systems. 4%

11. Describe the procedures used to grade piping in commercial sanitary drainage, waste and venting systems. 4%

12. Describe the procedures used to layout and rough-in/install commercial sanitary drainage, waste and venting systems. 4%

13. Describe the procedures used to protect commercial sanitary drainage, waste and venting systems. 4%

14. Describe the procedures used to maintain and repair commercial sanitary drainage, waste and venting systems. 4%

15. Describe the procedures used to test and troubleshoot commercial sanitary drainage, waste and venting systems. 4%

16. Demonstrate the procedures used to determine and transfer grade and elevation measurements in commercial sanitary drainage, waste and venting systems. 20%

17. Demonstrate the procedures used to layout, install, maintain, test and troubleshoot commercial sanitary drainage, waste and venting systems. 20%

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Plumber

Subunit: C2b Commercial Waste Systems

Level: Three

Duration: 7 hours

Theory: 7 hours

Practical: 0 hours

Overview:

This unit of instruction is designed to provide the Plumber apprentice with the basic knowledge and understanding of Commercial Waste Systems.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Define terminology associated with commercial waste systems.	**7%**
2. Identify hazards and describe safe work practices pertaining to commercial waste systems.	**7%**
3. Interpret codes and regulations pertaining to commercial waste systems.	**7%**
4. Interpret information pertaining to commercial waste systems found on drawings and specifications.	**7%**
5. Identify tools and equipment relating to commercial waste systems and describe their applications and procedures for use.	**7%**
6. Identify types of commercial waste systems and describe their characteristics and applications. a. Municipal sewage systems b. Waste water treatment plants c. Corrosive waste systems d. Indirect waste systems	**7%**
7. Identify commercial waste system components and describe their purpose and applications. a. Sewage pumps b. Receiving tanks c. Interceptors d. Sewage sump e. Piping connections f. Drains g. Vents	**7%**

h. Piping

8. Identify factors to consider when selecting and sizing commercial waste system components. 7%

9. Describe the procedures used to size commercial waste system components. 7%

10. Describe the procedures used to layout and install commercial waste systems. 7%

11. Describe the procedures used to maintain and repair commercial waste systems. 10%

12. Describe the procedures used to test and troubleshoot commercial waste systems. 10%

13. Describe the procedures used to protect commercial waste systems from extreme conditions. 10%

a. High temperature
b. Corrosive waste
c. Bio-waste

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Plumber

Unit: C3 WATER SYSTEMS

Subunit: C3a Water Service

Level: Three

Duration: 12 hours

Theory: 10 hours

Practical: 2 hours

Overview:

This unit of instruction is designed to provide the Plumber apprentice with the basic knowledge and understanding of water service.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Define terminology associated with water service.	**4%**
2. Identify hazards and describe safe work practices pertaining to water service.	**4%**
3. Interpret codes and regulations pertaining to water service. a. Residential: single family dwelling homes, mobile homes b. Commercial/institutional	**4%**
4. Interpret information pertaining to water service found on drawings and specifications.	**4%**
5. Identify tools and equipment relating to water service systems and describe their applications and procedures for use.	**4%**
6. Identify types of water service and describe their characteristics and applications.	**4%**
7. Identify water service equipment and components and describe their purpose, operation and applications. a. Corporation main stop b. Expansion loop c. Curb stop d. Meters e. Bypass f. Strainers g. Check valves h. Backflow preventers i. Piping and fittings	**4%**

j. Main shut-off
k. Pressure reducing valve

8. Identify water service supply piping supports and restraints and describe their purpose and applications. 4%
a. Anchors
b. Rods
c. Tie rods
d. Thrust blocks
e. Mega lugs

9. Identify the factors to consider in determining elevations and grades for water service supply piping. 4%

10. Determine and transfer grade, percent of grade and elevation for piping in water service systems. 4%

11. Identify the factors to consider in sizing piping for water service. 4%
a. Number of fixture units
b. Developed length of pipe
c. Elevation
d. Available pressure

12. Calculate piping size requirements for water service. 4%

13. Describe the procedures used to layout and install water service supply piping in trenches. 4%
a. Safety consideration
b. Support
c. Protection

14. Describe the procedures used to rough-in and install water service supply piping and their associated supports and restraints. 4%

15. Describe the procedures used to protect water service supply piping. 2%
a. Recirculation pump
b. Frost box
c. Heat tracing
d. Insulation

16. Describe the procedures used to install water service components. 2%

17. Describe the procedures used to maintain and repair water service components. 5%

18. Describe the procedures used to test and troubleshoot water service components. 5%

19. Demonstrate of the procedures used to determine and transfer grade and elevation measurements for water service equipment and components. 15%

20. Demonstrate of the procedures used to install, maintain, repair, test and troubleshoot water service. 15%

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Plumber

Subunit: C3b Rural Water Supply

Level: Three

Duration: 25 hours

Theory: 20 hours

Practical: 5 hours

Overview:

This unit of instruction is designed to provide the Plumber apprentice with the basic knowledge and understanding of Rural Water Supply systems.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Define terminology associated with rural water supply.	**3%**
2. Identify hazards and describe safe work practices pertaining to rural water supply.	**3%**
3. Interpret codes and regulations pertaining to rural water supply.	**3%**
4. Interpret information pertaining to rural water supply found on drawings and specifications.	**3%**
5. Interpret well driller's information reports.	**3%**
6. Interpret information found on pump charts.	**3%**
7. Identify tools and equipment relating to rural water supply systems and describe their applications and procedures for use.	**3%**
8. Identify surface sources of water supply and describe their characteristics. a. Rivers b. Lakes c. Ponds d. Streams e. Cisterns f. Springs	**3%**
9. Identify common contamination sources of rural water supplies.	**3%**
10. Identify types of wells and describe their characteristics and applications. a. Shallow	**3%**

b. Deep
c. Dug
d. Bored
e. Driven
f. Drilled
g. Washed sand point

11. Identify considerations for determining location of wells. 3%

12. Explain forces that impact on pipe and tubing in rural water supply systems. 3%

a. Weight
b. Friction loss
c. Turbulence
d. Galvanic action

13. Identify rural water supply system components and describe their characteristics and applications. 3%

a. Foot valves
b. Piping
c. Clamps
d. Pumps and variable speed pumps
e. Pressure tanks
f. Controls
g. Shut-off valves
h. Relief valves
i. Air volume controls
j. Drain valves
k. Pitless adapter
l. Torque arrestors
m. Sand points

14. Identify types of pumps and describe their components, applications and operation. 3%

a. Positive displacement pumps
b. Variable displacement pumps

15. Identify types of pressure tanks and describe their components, applications and operation. 3%

a. Galvanized
b. Diaphragm
c. Bladder
d. Floated
e. In-line

16. Identify types of pressure tank controls and describe their components, applications and operation. 3%

17. Identify the factors to consider for sizing rural water supply system components and equipment. 3%

18. Describe the procedures used to size rural water supply system components and equipment. 3%

19. Describe the procedures used to layout and install rural water supply system piping in trenches. **3%**

a. Safety considerations
b. Supporting
c. Protection

20. Describe the procedures used to install rural water supply system components and equipment. **3%**

21. Describe the procedures used to protect rural water supply system components and equipment. **3%**

22. Describe the procedures used to maintain and repair rural water supply system components and equipment. **2%**

23. Describe the procedures used to test and troubleshoot rural water supply system components and equipment. **2%**

24. Demonstrate of the procedures used to install, maintain, repair, test and troubleshoot rural water supply. **33%**

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Plumber

Unit: C4 POTABLE WATER DISTRIBUTION

Subunit: C4a Potable Water Distribution

Level: Three
Duration: 16 hours
Theory: 16 hours
Practical: 0 hours

Overview:

This unit of instruction is designed to provide the Plumber apprentice with the basic knowledge and understanding of potable water distribution.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Define terminology associated with potable water distribution.	**5%**
2. Identify hazards and describe safe work practices pertaining to potable water distribution.	**5%**
3. Interpret codes and regulations pertaining to potable water distribution.	**5%**
4. Interpret information pertaining to potable water distribution found on drawings and specifications.	**5%**
5. Identify tools and equipment relating to potable water distribution and describe their applications and procedures for use.	**7%**
6. Explain water hammer, its causes and methods of prevention or control.	**7%**
7. Explain water flow characteristics and excess flow cavitation.	**7%**
8. Identify potable water distribution components and describe their characteristics and applications. a. Piping b. Fittings c. Valves d. Shock arrestors e. Recirculation lines and pumps f. Hose bibs g. Fire stopping	**7%**

h. Cross connection control
i. Expansion tanks
j. Pressure reducing valves

9.	**Identify the factors to consider for sizing potable water distribution system components and equipment.**	**7%**
10.	**Describe the procedures used to size potable water distribution system components and equipment.**	**7%**
11.	**Describe the procedures used to rough-in and layout potable water distribution.**	**7%**
12.	**Describe the procedures used to install potable water distribution components.**	**7%**
13.	**Describe the procedures used to protect potable water distribution components.**	**8%**
14.	**Describe the procedures used to maintain and repair potable water distribution components.**	**8%**
15.	**Describe the procedures used to test and troubleshoot potable water distribution systems.**	**8%**

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Plumber

Subunit: C4b Cross-Connection Control

Level: Three

Duration: 10 hours

Theory: 8 hours

Practical: 2 hours

Overview:

This unit of instruction is designed to provide the Plumber apprentice with the basic knowledge and understanding of cross-connection control.

Objectives and Content:		**Percent of Unit Mark (%)**
1.	**Define terminology associated with cross-connection control.**	**6%**
2.	**Identify hazards and describe safe work practices pertaining to cross-connection control.**	**6%**
3.	**Interpret codes and regulations pertaining to cross connection-control: training and certification requirements.**	**6%**
4.	**Interpret information pertaining to cross connection-control found on drawings and specifications.**	**6%**
5.	**Identify tools and equipment relating to cross-connection control and describe their applications and procedures for use.**	**6%**
6.	**Explain backflow and its causes.**	**6%**
7.	**Identify types of cross-connection control devices and describe their characteristics, operation and applications.**	**6%**
8.	**Describe the procedures used to install cross-connection control devices.**	**6%**
9.	**Describe the procedures used to maintain and repair cross-connection control devices.**	**6%**
10.	**Describe the procedures used to test and troubleshoot cross-connection control devices.**	**8%**
11.	**Demonstrate the procedures used to install, maintain, repair, test and troubleshoot cross-connection control devices.**	**38%**

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Plumber

Unit: C5 HYDRONIC SYSTEMS

Subunit: C5a Hydronic Systems including Cooling and Low Pressure Heating

Level: Three

Duration: 35 hours

Theory: 30 hours

Practical: 5 hours

Overview:

Plumbers require a good, practical grasp of hydronic systems. This unit of instruction is the program gateway to further learning about these topics.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Define terminology associated with hydronic systems.	**4%**
2. Identify hazards and describe safe work practices pertaining to hydronic systems.	**4%**
3. Interpret codes and regulations pertaining to hydronic systems.	**4%**
4. Interpret information pertaining to hydronic systems found on drawings and specifications.	**4%**
5. Identify tools and equipment relating to hydronic systems and describe their applications and procedures for use.	**4%**
6. Explain the principles of heat transfer. a. Radiation b. Conduction c. Convection	**4%**
7. Identify sources of heat used in hydronic systems. a. Oil b. Gas c. Solid fuel d. Geothermal e. Solar f. Steam	**4%**

8. Identify sources of cooling used in hydronic systems. **4%**

a. Filters
b. Softeners
c. Direct expansion

9. Identify types of hydronic systems and describe their characteristics and operation. **4%**

a. High pressure (awareness of)
b. Low pressure

10. Identify hydronic heating system components and describe their purpose and operation. **4%**

a. Piping
b. Boilers: low mass & high mass
c. Boiler trim
d. Heat pumps
e. Expansion tanks
f. Heat exchangers
g. Circulating pumps
h. Mixing components
i. Valves

11. Explain forces that impact on pipe and tubing in hydronic systems and their associated calculations. **4%**

a. Thermal expansion
b. Thermal contraction
c. Weight
d. Friction loss
e. Turbulence
f. Galvanic action

12. Identify types of heat transfer equipment and describe their characteristics and operation. **4%**

a. Radiators
b. Convectors
c. Pipe coils
d. Horizontal and vertical unit heaters
e. Radiant panels

13. Identify fluids used in hydronic systems and describe their characteristics and applications. **4%**

a. Water
b. Glycol
c. Methyl hydrate

14. Identify additives used in hydronic systems and describe their purpose and applications. **4%**

15. Identify and demonstrate piping arrangements used with hydronic heating systems and describe their characteristics and applications. **4%**

a. Reverse return
b. Direct return

c. Monoflow
d. Series loop
e. Primary/secondary

16. Identify hydronic cooling system components and describe their purpose and operation. 4%

a. Piping
b. Cooling towers
c. Expansion tanks
d. Chillers
e. Circulating pumps
f. Valves

17. Identify and demonstrate piping arrangements used with hydronic cooling systems and describe their characteristics and applications. 4%

18. Describe the procedures used to layout and install piping for hydronic systems. 4%

19. Describe the procedures used to install hydronic system components. 4%

20. Describe the procedures used to maintain and repair hydronic system components. 4%

21. Describe the procedures used to test and troubleshoot hydronic system components. 4%

22. Describe the procedures used to install heat transfer equipment. 4%

23. Describe the procedures used to protect heat transfer equipment. 4%

24. Describe the procedures used to maintain and repair heat transfer equipment. 4%

25. Describe the procedures used to test and troubleshoot heat transfer equipment. 4%

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Unit: C6 SPECIALIZED SYSTEMS I

Subunit: C6a Specialized Systems I

Level: Three
Duration: 20 hours
Theory: 15 hours
Practical: 5 hours

Overview:

This unit of instruction is designed to provide the Plumber apprentice with the knowledge and understanding of specialized systems with a focus on residential irrigation, compressed air, and green systems.

Objectives and Content:	Percent of Unit Mark (%)
1. Describe and Install piping for specialized systems I.	**25%**
2. Describe and Installs equipment and components for specialized systems I.	**25%**
3. Describe and Tests specialized systems I.	**25%**
4. Describe and Services specialized systems I.	**25%**

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Plumber

Subunit: C6b Specialty Piping Systems

Level: Three

Duration: 20 hours

Theory: 15 hours

Practical: 5 hours

Overview:

This unit of instruction is designed to provide the Plumber apprentice with the basic knowledge and understanding of specialty piping systems.

Objectives and Content:		Percent of Unit Mark (%)
1.	**Define terminology associated with specialty piping systems.**	**7%**
2.	**Identify hazards and describe safe work practices pertaining to specialty piping systems.**	**7%**
3.	**Interpret codes and regulations pertaining to specialty piping systems.**	**7%**
4.	**Interpret information pertaining to specialty piping systems found on drawings and specifications.**	**7%**
5.	**Identify tools and equipment relating to specialty piping systems and describe their applications and procedures for use.**	**7%**
6.	**Identify types of specialty piping systems and describe their characteristics and applications.**	**7%**
7.	**Identify specialty piping system components and describe their purpose and applications.**	**7%**
8.	**Identify the factors to consider when sizing specialty piping system components.**	**7%**
9.	**Describe the procedures used to size specialty piping system components.**	**7%**
10.	**Determine and transfer grade, percent of grade and elevation for piping in specialty piping systems.**	**7%**
11.	**Describe the procedures used to grade piping in specialty piping systems.**	**6%**
12.	**Describe the procedures used to layout and rough-in/install specialty piping systems.**	**6%**

13.	**Describe the procedures used to protect specialty piping systems.**	**6%**
14.	**Describe and demonstrate the procedures used to maintain and repair specialty piping systems.**	**6%**
15.	**Describe and demonstrate the procedures used to test and troubleshoot specialty piping systems.**	**6%**

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Plumber

Unit: C7: ELECTRICAL CONTROLS AND DIAGRAMS FOR PUMPS AND HYDRONICS

Subunit: C7a: Electrical Controls and Diagrams For Pumps and Hydronics

Level: Three

Duration: 40 hours

Theory: 25 hours

Practical: 15 hours

Overview:

This unit of instruction is designed to provide the Plumbing Apprentice with knowledge of electrical controls diagrams used in hydronic and pump control systems.

Objectives and Content:		**Percent of Unit Mark (%)**
1.	**Identify and describe electrical controls.**	**5%**
2.	**Identify and describe diagrams for hydronic and pump control systems.**	**5%**
3.	**Read and Interpret electrical related information on hydronic and pump control schematics.**	**10%**
4.	**Demonstrate the use of proper electrical tools and testing equipment on hydronic and pump control systems.**	**20%**
5.	**Identify electrical controls used in hydronic** and **pump systems.**	**20%**
6.	**Identify types of electrical circuits used in hydronic and pump systems.**	**10%**
7.	**Explain the operation of electrical controls in hydronic and pump systems.**	**10%**
8.	**Troubleshoot controls in hydronic and pump systems.**	**20%**

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Plumber

Unit: C8 SKETCHING/BLUEPRINT READING

Subunit: C8a Sketching/Blueprint Reading

Level: Three

Duration: 25 hours

Theory: 10 hours

Practical: 15 hours

Overview:

This unit of instruction is designed to reinforce and further enhance the techniques of sketching and drawing in the forms presented in Level 1; to reinforce the procedures of blueprint reading, relying on the principles, symbols and conventions. To reinforce the techniques of sketching and drawing in the forms presented in the Level 1 course. To give the student a technical interpretation or orthographic drawings and develop a relationship between simple object forms and a set of normal building trade drawings. To reinforce the procedures of blueprint reading relying on the principles, symbols and conventions developed in Level 1. To have the apprentice use all the techniques, principles, symbols, conventions, etc. to which s/he has been exposed and produce thereby working building drawings in her/his trade area.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Construct with the use of drafting instruments an accurate isometric or orthographic drawing of a piping system using the correct line and piping symbols.	**15%**
2. Construct using acceptable techniques an isometric or orthographic sketch of a piping system using the correct line and piping symbols. The finished sketch to be of approximately the correct shape and proportions. a. Isometric sketching and drawing b. Orthographic sketching and drawing c. Line symbols d. Piping symbols	**15%**
3. Describe how to relate a typical set(s) of building trade drawings to the orthographic drawing system and by doing so obtain required information from the various plans elevations, sections and details in the four major divisions within a set of building trade drawings (i.e. architectural, structural, mechanical and electrical).	**20%**
4. Describe how to extract correctly basic information from a typical set of specification (i.e. fixture types, hangers and supports, types of pipe and fittings for various services, etc.): Theory of sections, Development of relationship from simple orthographic drawings to build trade drawings, and Blueprint reading of suitable, available building, trade drawings and specification.	**20%**
5. Given a set of architectural drawings produce a working set of plumbing drawings as related to the mechanical section of building trade drawings: a. Interpret and extract architectural and structural information from blueprints by having	**30%**

the plumbing system conform to the conditions of the building (beams, ceiling spaces, etc.) (T),

b. Use the correct line and piping symbols for showing rain water leaders, storm sewer, sanitary sewer, vents, acid wastes, cold water, hot water and recirculated hot water lines (P),
c. Interpret site plan information by connecting building services to street mains, including the calculation of satisfactory invert elevations of storm and sanitary drains at the building line (T),
d. Indicate specification references by identifying each different plumbing fixture by a “P-number” system. (T),
e. Use her/his code tables with reference to an actual building condition in calculating storm sewer (roof area) sizes and sanitary sewer and vent (fixture unit count) sizes. (T)
f. Construct accurate isometric drawings of washroom groups from orthographic piping layouts (floor plans). (P)
g. Production of a working set of building drawings in the students’ trade area. (P)

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Plumber

Unit: **C9 MATHEMATICS AND TRADE SCIENCE III**

Subunit **C9a Mathematics III**

Level: Three

Duration: 25 hours

Theory: 25 hours

Practical: 0 hours

Overview:

This Subunit of instruction is designed to provide the Plumbing Apprentice with the knowledge of the imperial and metric systems, formulas and formula transposition, areas and volumes, elevations and grades, densities and pressures and offsets and percentages.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Identify and describe special right angle triangles. a. 45° b. 30° - 60° c. 22-1/2°	**28%**
2. Identify and describe grade. a. Simple b. Percentage c. cm/m	**26%**
3. Identify and describe density, relative density and pressure in liquids and gases (KPa). a. Percentage b. cm/m	**30%**
4. Identify and describe parallel offsets.	**8%**
5. Identify and describe simple percentage, mark-up, net profit, gross profit.	**8%**

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Plumber

Subunit **C9b Trade Science III**

Level: Three

Duration: 10 hours

Theory: 10 hours

Practical: 0 hours

Overview:

This Subunit of instruction is designed to provide the Plumbing Apprentice with knowledge and understanding of the properties of water.

Objectives and Content: **Percent of Unit Mark (%)**

1. Describe properties of water. **50%**

a. Define: Matter, States of matter, Elements, Compounds, Chemical change, Atom, Molecule, Temperature, Heat, Sensible heat, Latent heat, Specific heat, Btu, Calorie, Mixture, Suspension, Emulsion, Solution, pH, 10, Regenerating (zeolite), Hardness, Temporary, Permanent, Acid, Base
b. Molecular Structure
c. Chemical Symbols
d. Pressure & Boiling Points
e. Danger of Explosion in Hot Water Systems
f. Sensible & Latent Heat Graph
g. Temperature Conversions
h. pH: Acidity and Alkalinity, Neutralization, Dilution of, Safety
i. Hardness and Its Effects
j. Removal of Hardness
i. Hardness and Its Effects
j. Removal of Hardness
k. Measurements of Hardness
l. Regeneration of Zeolite

2. Describe simple machines. **50%**

a. Levers 1st, 2nd, 3rd Class
b. Inclined plane
c. Wheel and axle
d. Pulleys
e. Screw jack
f. Problems in solving simple machines
g. Efficiency of simple machines

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