Gasfitter A
Level 3

Rev. June 2011

Apprenticeship Manitoba

Gasfitter A

Unit: C1 B Level Requirements Update

Level: Three

Duration: 35 hours

Theory: 35 hours

Practical: 0 hours

Overview:

As adult trade-learners, Gasfitter apprentices at all levels of skill-development are encouraged to use their eyes, ears, prior knowledge, and interpersonal skills to encourage journeypersons to teach as well as to supervise them. This requires understanding the trade's dynamics, including the roles and responsibilities that order jobsite activity taught to you previously. This unit content reviews the trade's skill-requirements and long-term career possibilities outlined in the previous levels. The unit's purpose is to review essential information about learning to learn as a Manitoba Gasfitter apprentice and prepare you for further learning.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Describe Gas Code.	
a. Review B licence requirements re B149.1 and B149.2 code changes and Manitoba Gas Notices	15%
b. Review gas vent sizing (residential, commercial, industrial)	17%
c. Review air supply (commercial, residential)	17%
d. Review over piping and pipe sizing	17%
e. Review fundamentals theory review	17%
f. Review final layouts	17%

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Gasfitter A

Unit: C2 Mathematics (includes gas trade formulas)

Level: Three

Duration: 30 hours

Theory: 30 hours

Practical: 0 hours

Overview:

This unit of instruction is designed to provide the Gasfitter apprentice with the knowledge of 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. Describe math fundamentals (basic mathematics). a. Identify and describe metric (s.i.) and imperial weights and measures, decimals and fractions, terms prefixes and relationships and Identify and describe formulas and formula transposition. b. Identify and describe the square root, perimeter and circumference. c. Identify and describe areas of rectangles, circles, triangles, trapezoids and surface areas. d. Identify and describe volumes of rectangular, cylindrical and irregular objects. e. Identify and describe Pythagora's theorem. f. Identify and describe special right angle triangles. g. Identify and describe grade: (simple, percentage, and cm/m). h. Identify and describe density, relative density and pressure in liquids and gases (kpa). i. Identify and describe parallel offsets. j. Identify and describe simple percentage, mark-up, net profit, gross profit.	25%
2. Describe combustion mathematics (introduction).	25%
3. Describe speed, laws and sheave sizing.	25%
4. Describe gas pressure laws, Charle's, Boyle's and Universal.	25%

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Gasfitter A

Unit: **C3 Science**

Level: Three

Duration: 30 hours

Theory:	30	hours
Practical:	0	hours

Overview:

Upon completion of this unit of instruction apprentices will be able to show understanding of stoichiometrics, hermodynamics, and fan laws, and be able to relate same to gasfitting problems.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Describe stoichiometrics e.g., combustion mixture of air and fuel.	33%
2. Describe thermodynamics.	33%
3. Describe fan laws.	34%

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Gasfitter A

Unit: C4 Electrical (Controls, Phasing, CE, Flame Safeguard Systems) Fundamentals and CE Code

Level: Three

Duration: 80 hours

Theory: 60 hours

Practical: 20 hours

Overview:

Electrical theory is presented in a manner that is relevant and useful to the Class "A" Gasfitter. The apprentice will learn about electrical safety, symbols, wiring diagrams, transformers, protective devices, malfunctions, 1 phase and 3 phase motors, VFD drives, interactions of control devices, flame detection systems, non-programmable and programmable controls, limit controls, switches, interlocks, thermocouples, RTD's, thermistors, transducers, microprocessors, relay packages. This course will give the apprentice a basic knowledge of electrical sequence of operation of Industrial Gas Burner systems.

Objectives and Content:		**Percent of Unit Mark (%)**
1.	**Describe electrical safety hazards and safe work practices.**	4%
2.	**Describe common electrical symbols.**	2%
3.	**Describe pictorial/wiring, ladder/schematic, and connection wiring diagrams.**	2%
4.	**Describe power supplies from 1 phase and 3 phase transformers, line and load reactors.**	5%
5.	**Describe protective devices – fuses, circuit breakers, and overloads.**	4%
6.	**Describe electrical malfunctions and describe troubleshooting, diagnose, and repair procedures.**	5%
7.	**Describe AC – 1 Phase review and 3 phase motors, motor controls, and starting methods.**	8%
8.	**Describe variable frequency drives and volts/hertz relationship.**	5%
9.	**Describe principles of electrical sequence of operation of Industrial Gas burner systems.**	2%
10.	**Describe the interaction of mechanical and electrical control devices.**	2%
11.	**Describe the function of flame detection systems – flame rods, photo cells, infrared, and ultraviolet.**	4%

		3%
12.	**Describe flame safeguard control systems – sequences, terminology, and types of gas pilots.**	
13.	**Describe non-programmable flame safeguard controls – specific control functions.**	5%
14.	**Describe programmable flame safeguard controls.**	4%
15.	**Describe limit controls, switches, and interlocks.**	3%
16.	**Describe thermocouples, RTD's, thermistors, and transducers.**	3%
17.	**Describe microprocessor programmers.**	5%
18.	**Describe hands on relay packages.**	4%
19.	**Describe Canadian Electrical Code requirements.**	6 %
20.	**Demonstrate programming and wiring of a variable frequency drive motor.**	6%
21.	**Demonstrate wiring and testing of a programmed programmable logics controller.**	6%
22.	**Demonstrate programming and wiring of boiler control.**	6%
23.	**Demonstrate testing methods of flame detection systems – flame rods, photo cells, infrared, and ultraviolet.**	6%

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Gasfitter A

Unit: **C5 B149.3 Gas Codes and Manitoba Gas Notices**

Level: Three

Duration: 35 hours

Theory:	35	hours
Practical:	0	hours

Overview:

Gasfitters require a good, practical grasp of B149.3 Gas Codes and Manitoba Notices.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Describe the B149.3 Field Guide and the Manitoba Gas Notices.	50%
2. Describe layouts from section 149.3.	50%

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Gasfitter A

Unit: **C6 "A" Gas Fired Equipment Layout**

Level: Three

Duration: 9 hours

Theory: 2 hours

Practical: 7 hours

Overview:

Gasfitters require a good, practical grasp of the "A" gas fired equipment layout.

Objectives and Content:

		Percent of Unit Mark (%)
1.	**Describe job layouts, permits, and equipment lists, etc.**	22%
2.	**Demonstrate how to compile job profile including layouts.**	39%
3.	**Demonstrate how to complete layouts, permits, specs, materials lists, for case study presented to student-apprentice up to pricing.**	39%

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Gasfitter A

Unit: **C7 Boilers**

Level: Three

Duration: 20 hours

Theory:	20	hours
Practical:	0	hours

Overview:

This unit of instruction is designed to provide the Gasfitter apprentice with the knowledge and understanding of boilers.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Describe Boilers:	
a. Boiler design	15%
b. Firing designs	15%
c. Recognition of above	14%
d. Burner systems as per above	14%
e. Tests as per b52	14%
f. Controls and safety	14%
g. Boilers (water level equipment)	14%

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Gasfitter A

Unit: C8 Air Make Ups

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

Overview:

Upon completion of this unit of instruction apprentices will be able to show knowledge and understanding of air make ups.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Describe air make ups. a. Basic Designs b. Sizing	25%
2. Describe use of different designs.	25%
3. Describe how to test and commission designs.	25%
4. Demonstrate how to test and commission designs	25%

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Gasfitter A

Unit: C9 Liquid Petroleum Products (LPGs) and Codes

Level: Three

Duration: 35 hours

Theory: 20 hours

Practical: 15 hours

Overview:

This unit of instruction is designed to provide the Gasfitter apprentice with the knowledge and understanding of liquid petroleum products and Codes.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Describe LPGs. a. Sizing of piping b. LP equipment required c. Best fitting practices d. Types of pumps, compressors e. Liquid meters f. Proper applications of above g. Vaporizers h. Mixers i. B149.5 gas code	57%
2. Demonstrate LPG applications as per above.	43%

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Gasfitter A

Unit: C10 Combustion Analysis

Level: Three

Duration: 24 hours

Theory: 14 hours

Practical: 10 hours

Overview:

This unit of instruction is designed to provide the Gasfitter apprentice with the detailed knowledge and understanding of combustion analysis.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Describe combustion analysis. a. Fundamentals b. Types of equipment c. Introduction to commercial and industrial realities d. Data logging systems e. Application to larger appliances	46%
2. Demonstrate how to apply fundamentals to larger appliances.	42%
3. Describe expected results from different designs.	12%

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Gasfitter A

Unit: C11 Other Gas Fired Equipment

Level: Three

Duration: 14 hours

Theory: 6 hours

Practical: 8 hours

Overview:

This unit of instruction is designed to provide the Gasfitter apprentice with the knowledge and understanding of other gas fired equipment such as mine shaft heaters and grain dryers.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Describe the operation and mechanics of other gas fired equipment. a. mine shaft heaters b. grain dryers c. Incinerators d. line burners	43%
2. Demonstrate other gas fired equipment via field trip.	57%

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Gasfitter A

Unit: C12 Troubleshooting

Level: Three

Duration: 18 hours

Theory: 11 hours

Practical: 7 hours

Overview:

This unit of instruction is designed to provide the Gasfitter apprentice with the detailed knowledge and understanding of troubleshooting techniques and strategies.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Describe troubleshooting. a. Describe analysis of systems b. Describe analysis of sequence of operation c. Interpret instrument readings	61%
2. Demonstrate troubleshooting.	39%

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