Apprenticeship Manitoba

Manitoba

Gasfitter B
Level 2

Rev. February 2011

Apprenticeship Manitoba

Gasfitter B

Unit: B1 Gas/Safety Control Requirements

Level: Two

Duration: 35 hours

Theory: 28 hours

Practical: 7 hours

Overview:

This unit of instruction is designed to provide the Gasfitter apprentice with the knowledge and understanding of gas/safety control requirements. There is a trend towards increased conversion to natural gas. The scope of Class B license-ticket training is limited to maximum 400,000 BTUH per single appliance with maximum 1/2 psig manifold pressure.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Describe gas control requirements (includes principles of gas).	**40%**
2. Describe safety control requirements (includes combustion safety controls).	**40%**
3. Demonstrate gas and safety control requirements.	**20%**

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Gasfitter B

Unit: B2 Supply Air/Venting Permit Requirements

Level: Two

Duration: 34 hours

Theory: 28 hours

Practical: 6 hours

Overview:

This unit of instruction is designed to provide the Gasfitter apprentice with the knowledge and understanding of supply air/venting permit requirements. There is a trend towards increased conversion to natural gas. The scope of Class B license-ticket training is limited to maximum 400,000 BTUH per single appliance with maximum 1/2 psig manifold pressure.

Objectives and Content:		**Percent of Unit Mark (%)**
1.	Describe supply air and venting requirements (venting principles and operations, B-149 Canadian Gas Codes, other appropriate codes and by-laws, determining input totals for gas burning equipment, interpreting sizing charts for supply air and venting).	**80%**
2.	Demonstrate how to supply air and venting requirements (venting principles and operations, B-149 Canadian Gas Codes, other appropriate codes and by-laws, determining input totals for gas burning equipment, interpreting sizing charts for supply air and venting).	**20%**

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Gasfitter B

Unit: B3 Gas Burning Equipment/Materials Determination and Burner Orifice Sizing/Conversion Work

Level: Two

Duration: 38 hours

Theory: 20 hours

Practical: 18 hours

Overview:

This unit of instruction is designed to provide the Gasfitter apprentice with the knowledge and understanding of gas burning equipment and determination of materials, and of burner orifice sizing and conversion work. There is a trend towards increased conversion to natural gas. There is a trend towards increased conversion to natural gas. The scope of Class B license-ticket training is limited to maximum 400,000 BTUH per single appliance with maximum 1/2 psig manifold pressure.

Objectives and Content:		**Percent of Unit Mark (%)**
1.	**Describe natural and LPG system components and operating characteristics.**	**8%**
2.	**Describe B-149 Canadian Gas Codes.**	**12%**
3.	**Describe flues, vents and chimney types and applications**.	**8%**
4.	**Describe natural and LPG gas system installation principles and methods.**	**12%**
5.	**Describe shop drawings and project specifications.**	**8%**
6.	**Describe natural and LPG system material requirements.**	**8%**
7.	**Describe burner orifice sizing procedures.**	**8%**
8.	**Describe conversion methods.**	**16%**
9.	**Demonstrate how to perform gas burning equipment/materials determination and burner orifice sizing/conversion work.**	**40%**
10	**Describe commercial kitchen equipment.**	**7%**

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Gasfitter B

Unit: B4 Longest Run/Gas Burning Equipment, BTUH Input Demand, Systems/Pipe Size Determination/Pressure and Measurement Requirements

Level: Two

Duration: 42 hours

Theory: 28 hours

Practical: 14 hours

Overview:

This unit of instruction is designed to provide the Gasfitter apprentice with the knowledge and understanding of determining longest run, and BTUH output of gas burning equipment requirements systems, determination of pipe size, and regulator requirements, and of pressure requirements and measurement. There is a trend towards increased conversion to natural gas. The scope of Class B license-ticket training is limited to maximum 400,000 BTUH per single appliance with maximum 1/2 psig manifold pressure.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Describe longest run determination requirements (gas history and transportation, B-149 Canadian Gas Codes [as amended by local gas notices] and terminology, mechanical plans and specifications, reading and interpreting piping drawings).	**25%**
2. Describe demand requirements regarding BTUH output of gas burning equipment (B-149 Canadian Gas Codes, natural and LPG system principles and operating requirements, physical and chemical properties of natural and propane gas, determining input capacity of gas burning equipment).	**15%**
3. Describe pressure requirements and measurement (B-149 Canadian Gas Codes, general gas laws such as Charles and Boyles, natural and LPG system principles and operating requirements, determine manifold pressure and appliance input, read and interpret gas burning equipment shop drawings and job specifications).	**5%**
4. Describe types of systems such as warm air heating, hot water and steam boilers.	**5%**
5. Describe pipe size determination (gas pipe types, sizes and applications, B-149 Gas Codes and pipe and tubing size charts, purging gas lines).	**10%**
6. Describe regulator requirements (principles, concepts and terms, regulator types and applications, various internal pressure controls and attachments, total gas demands for gas burning equipment determination, regulating valve specifications and shop drawings, selecting size gas PRVs and adjusting discharge pressure, meter clocking, regulator vents, sizing regulator vents).	**10%**
7. Demonstrate longest run/gas burning equipment, btuh input demand, systems/pipe size determination/pressure and measurement requirements.	**30%**

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Gasfitter B

Unit: B5 Tests/Inspects Piping and Gas Appliance Efficiency

Level: Two

Duration: 33 hours

Theory: 16 hours

Practical: 17 hours

Overview:

This unit of instruction is designed to provide the Gasfitter apprentice with the knowledge and understanding of testing and Inspecting piping and gas appliance efficiency. There is a trend towards increased conversion to natural gas. The scope of Class B license-ticket training is limited to maximum 400,000 BTUH per single appliance with maximum 1/2 psig manifold pressure.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Describe tests and inspections for piping (includes trenching, meter dial test procedure for leak detection.)	**20%**
2. Describe tests and measurements for gas appliance efficiency (includes combustion efficiency testing and methods for measuring stack temperature and carbon dioxide).	**30%**
3. Demonstrate how to test/inspect piping and gas appliance efficiency.	**50%**

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Gasfitter B

Unit: B6 Electrical Requirements

Level: Two

Duration: 105 hours

Theory: 70 hours

Practical: 35 hours

Overview:

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

Objectives and Content:		**Percent of Unit Mark (%)**
1.	**Describe all level 1 related electrical material as part of a review.**	**10%**
2.	**Describe licenses and permits for "E" endorsement related electrical for the Manitoba Gas Fitter.**	**.5%**
3.	**Describe wire and breaker sizing for equipment.**	**2%**
4.	**Describe solenoids, relays, contactors, switches, thermostats, time delays, motor starters, overloads, fuses.**	**5%**
5.	**Describe motor start/stop stations 2-wire and 3-wire controls, motor control circuits.**	**1%**
6.	**Describe motors – shaded pole, split phase, CSIR, PSC, CSCR, 3 phase run and start capacitors, potential and current relays, power rating, duty cycle, service factors, efficiency, enclosures, voltage, FLA, LRA, Hz frequency, HP, Torque (starting, full load, breakdown, pull-up), RPM, multi-speed, thermal protection, frame and shaft sizes, mountings, maintenance procedures, lubrication, motor problems..**	**6%**
7.	**Describe transformers – single phase and 3 phase, Delta, Wye, polarity, labels, wire connections, turns ratio, VA ratings, calculate loading.**	**5%**
8.	**Describe ladder/schematic diagrams – reading, interpreting, drawing, circuit symbols.**	**4%**
9.	**Describe pictorial/wiring diagrams –reading, interpreting, drawing, circuit symbols.**	**4%**
10.	**Describe standing pilot, intermittent pilot, direct spark ignition, hot surface ignition, glow coil pilot systems theory.**	**6%**

11.	**Describe troubleshooting procedures and flow charts.**	**2%**
12.	**Describe series, parallel, series-parallel combination circuits, advanced theory calculations.**	**6%**
13.	**Describe electrical code as pertains to the gas fitter trade with "E" endorsement.**	**8%**
14.	**Describe flame rectification, controls, testing.**	**2%**
15.	**Describe troubleshooting and testing from scenarios applied to equipment ladder/schematic and pictorial/wiring diagrams.**	**5%**
16.	**Demonstrate flame rectification, controls, testing.**	**1.5%**
17.	**Demonstrate practical system setup and testing for each ignition system.**	**6%**
18.	**Demonstrate wiring and testing of practical projects for different circuits**	**4%**
19.	**Demonstrate thermocouples, thermopiles, diaphragm gas valves wiring, testing, flash test, open circuit test, closed circuit – full load, closed circuit – partial load, pilot drop out test, minimum pilot turn down test.**	**4%**
20.	**Demonstrate practical wiring ladder/schematic and pictorial/wiring diagrams and practical projects for variety of gas appliances including hot water boiler, steam boiler, standing pilot millivolt and 24 volt, intermittent pilot, direct spark ignition, hot surface ignition, glow coil pilot.**	**15%**
21.	**Demonstrate troubleshooting and testing from scenarios applied to equipment.**	**3%**

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Gasfitter B

Unit: B7 Mentoring/Coaching

Level: Two
Duration: 14 hours
Theory: 14 hours
Practical: 0 hours

Overview:

Gasfitter Technical Training offers an entry-level orientation to the challenges of apprenticeship learning. The present unit introduces senior apprentices to the responsibilities of workplace *teaching* that they will assume as supervising journeypersons. Tradeworkers have a particularly rich tradition of refreshing and sharing their skills from one generation of practitioners to the next. This unit orients senior apprentices to some of the practical and conceptual tools that can enable them to contribute to this trade heritage when they themselves become certified journeypersons. The journeyperson's obligation to assist trade learners to develop skills and knowledge is complex and challenging. It involves safety considerations, employer expectations, provincial regulations, as well as the tradition of skills stewardship that links modern practice with the long history of workplace teaching and learning that defines the apprenticeable trades. The ability to offer timely, appropriate support to apprentices is itself an important area of trade learning. This unit presents material intended to help refine this ability through reflection and discussion by senior apprentices, and dialogue with their instructor. The detailed descriptors under each unit-objective reflect Manitoba and Canadian standards prescribed for journey-level supervisory capabilities, as well as key topics in current research on the importance of workplace teaching and learning in trades-apprenticeship systems. Thus, descriptors represent suggested focal points or guidelines for potentially-worthwhile exploration. Delivery of this content will vary with the discretion of individual instructors, and with the experiences senior apprentices bring forward for group/individual reflection on the skills-stewardship dimension of their own future practice as journeypersons.

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

1. Describe the scope, substance, and significance of journey-level status. **15%**

a. Historical background, including trainee experiences
- Origin, definition, and examples of journey-level status
- Obligations to employers, trade clients, and apprentices
- Concept of skills stewardship, and its rationale
- Customary responsibilities of journeyperson as workplace trainer/supervisor
- Overview development of formal systems for regulating/recognizing journey-level competence in designated apprenticeable trades
- Contributions of 'unticketed journeymen' and other informally-qualified Gasfitters to workplace trade-learning
- Achievements/limitations of informal systems for workplace training
- Trends (e.g., succession planning in the trades; recognition of credentials and prior learning; defined standards for on-the-job trades education and training)

b. Regulatory/legal dimensions of journey-level status in designated trades

- Rights and obligations re: Canada's Interprovincial 'Red Seal' program (Red Seal rationale, scope, and products, including the National Occupational Analysis [NOA], and Interprovincial examinations
- Manitoba provincial requirements [e.g., *Apprenticeship and Certifications Act; General Regulation*; the *Trade Regulation*; relevant policies of the Apprenticeship and Certifications Board]
- Trade-specific requirements re: Practical Training supervision and documentation; importance of quality assurance and broad-scope coverage of prescribed task-content; ratios, etc.

c. Other (as may be specified by instructor)

2. Compare/contrast role-options and responsibilities of the supervising journeyperson. **30%**

a. Recognizing the variability of supervision assignments, situations, and roles
b. Source and specification of the supervision assignment
c. Formal vs. informal roles (e.g., mandated by an employer's succession plan)
d. Implicit vs. explicit standards and content: training goals are/are not codified; assessment measures are/are not used,
e. Accountability for results: subject/not subject to third-party notification; completion of supervision assignment itself is/is not assessed by third party; journeyperson is/is not required to prepare performance evaluation that could affect apprentice's employability or wage-rate, etc.
f. General vs. task- or job-specific supervision assignments: e.g., scope of expectations re: content of supervisory task(s)
g. Long-term vs. short-run supervision assignments – e.g., considerable latitude/little latitude for apprentice to learn from mistakes
h. Formally vs. informally structured – e.g., supervision assignment is part of a prescribed cycle of assignments involving coordination among multiple journeypersons; apprentice is trained according to an individual Training Plan negotiated with employer
i. Typology of common supervisory role-options and what is implied by each:
   - Coach role: is often initiated by someone other than apprentice, and limited to a particular skill set, task, or production requirement
   - Mentor role : often initiated by apprentice, and relatively open-ended regarding content, duration, etc.
   - Peer role: typically involves individual upgrading or cross-training of one journeyperson by another; can include senior apprentice assisting less-experienced trade learner
   - Managerial role(s): can shade over into hire/fire issues as lead-hand or site-boss
   - Coordinator role: often a senior-level journeyperson appointed by an organization to assume responsibilities for monitoring progression of groups of apprentices
   - Other roles: may be improvised by journeyperson
j. Possibilities, perils, and likelihood of role-overlap in 'real-life' trade practice
k. Importance of clarifying all roles, expectations, and implications involved in accepting a supervision assignment
l. Role of Apprenticeship Training Coordinator (ATC), Apprenticeship Manitoba
m Resources for developing skills and knowledge re: providing journey-level supervision
   - Books and journals (not always trade-specific)
   - Websites
   - Conversation with trade instructors, journeypersons, and peers
   - Workshops
n. Other (as may be specified by instructor

3. Describe/demonstrate common requirements re: providing journey-level supervision. **30%**

a. Review content re: challenges/opportunities opportunities of Apprenticeship learning adapted to journey-level supervision assignments and a journey-level standpoint

- Application of adult education concepts to trades teaching/learning (e.g., responsibilities and expectations of adult learners)
- Practical significance of 'styles' of adult learning and teaching
- Helping apprentices to integrate Technical Training (in school) and Practical Training (on-the-job) learning experiences
- Providing help and guidance re: new tasks and skills
- Providing help and guidance re: fixing mistakes
- Learning/teaching "the ropes" – socialization of learner within a community of trade practice (e.g., how to borrow a tool, interrupt a journeyperson, 'recruit' an advisor)
- Coverage/documentation of prescribed tasks and subtasks (Gasfitter POA), including responsibility re: logbook sign-off (where applicable)
- Consultation with Apprenticeship Training Coordinator (ATC), Apprenticeship Manitoba
- Communicating with apprentices and employers about supervision assignments and assignment specifications, including the limits of the trainers' own responsibilities and competence (e.g., substance-abuse intervention)
- Benefits of maintaining a personal record of achievements, ideas, and needs as a workplace trainer

b. Individual reflection and guided group discussion re: personal experiences of workplace learning as an apprentice
   - Identification of best and worst practices of supervising journeypersons
   - Assessment of personal experiences (if any) to date in supervising, coaching, or guiding other people to learn or improve their skills (e.g., entry-level apprentices, members of athletic team, younger family members, etc.), and how this might compare/contrast with the journey-level support of apprenticeship learning
   - Identification of workplace and other factors that can contribute to good and bad trades teaching/learning experiences
   - Development of personal standards re: responsibility to share one's knowledge and skill with others in the workplace (e.g., use/misuse of humour, rigour, discretion, craft-pride, etc.)

c. Comparison/contrast of discussion results with current knowledge/resources re: workplace skills coaching methods as applicable to journey-level supervision assignments
   - Qualities of a good workplace coach
   - Components of workplace skills coaching
   - Processes and recommended practices re: workplace coaching
   - Troubleshooting problems re: supervision assignments

d. Other (as may be specified by instructor)

4. Complete Modules 1 to 3, *Workplace Coaching Skills* (Burnaby, BC: 1995), ISBN 1-55139-030-2. (or equivalent). 10%

a. Identifying purpose of the lesson
   - explaining the point of the lesson
   - role of the coach in specific coaching situation
   - Other (specified by instructor)

b. Linking the lesson
   - Learner needs
   - Lesson sequence
   - Focus on learner
   - Selection/timing of coaching opportunities

c. Demonstration of skill/task to be learned
   - Starting the coaching session
   - Demonstration
   - Hands-on trial
   - Recap for learner

5. Complete Modules 4 to 6, *Workplace Coaching Skills* (or equivalent). 15%

a. Practice of skill/task to be learned
- Nature and importance of practice
- Setting up for learner practice
- Types of practice
- Recycling and reinforcing skill/task learning

a. Providing feedback to the learner
- Value of feedback
- Kinds of feedback
- Guidelines and tips

c. Assessment
- Value of assessing learner progress
- Assessing level of skill
- Planning further steps toward skill/task mastery

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Apprenticeship Manitoba

Gasfitter B

Unit: B8 Applied Trade Projects

Level: Five

Duration: 35 hours

Theory: 0 hours

Practical: 35 hours

Overview:

Upon completion of this unit of instruction apprentices will be able to demonstrate the practical application of the knowledge acquired in Levels 1 and 2 gasfitter units. Trade projects to be assigned by instructor.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Demonstrate gasfitter skills through a variety of trade projects from complete wiring to pre-start, startup, testing and operation of controls, combustion analyzing, purging, and meter clocking as per complete field- start up.	**60%**
2. Demonstrate how to detect faulty equipment by using specific types of tools and instruments (e.g., faulty controls, and cracked heat exchangers).	**40%**

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Apprenticeship Manitoba

Gasfitter B

Unit: B9 Alternate Fuel Systems

Level: Two

Duration: 14 hours

Theory:	14	hours
Practical:	0	hours

Overview:

Upon completion of this unit of instruction apprentices will be able to demonstrate application of the basic concepts of alternate fuel systems, and be able to relate same to gasfitting problems.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Describe principles of product handling.	**25%**
2. Describe how to install and maintain Liquid Petroleum (LP) storage and handling facilities. a. Describe Liquid Petroleum (LP) liquid installation b. Describe LP pump, compressors and vaporizers c. Describe LP storage facilities d. Describe utility systems, pipeline and supply storage e. Describe natural gas utility systems f. Describe high and low pressure natural gas and LP gas supply systems g. Describe how to install and maintain LP, handling equipment, pumps, compressors, vaporizers, meters h. Describe how to install, service and maintain high and low pressure natural gas and LP gas supply systems	**75%**

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