

Roofer Level 1

Roofer

Unit: A1 Orientation I: Structure, Scope of Roofer Trade Learning

Level: One

Duration: 7 hours

Theory: 7 hours

Practical: 0 hours

Overview:

One sign that a roofer has mastered a task or technique is to be asked to share this knowledge. Jobsite skills-exchange has long been fundamental to roofer trade-learning. Even trade veterans rely on peers to refine their knowledge and skill.

The opportunity to benefit from this process, however, is shaped by complex factors that include jobsite 'politics' and construction deadlines. As adult trade-learners, roofer apprentices at all levels of training must 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, as well as the roles and responsibilities which order jobsite work-life.

This unit profiles the trade's historical and modern significance, core tasks and skill requirements, as well as its job-ladders and long-term career options. It includes information about learning styles/strategies, stressing their application to apprenticeship and journey-level trade education. The unit also introduces the concept of skills stewardship, stressing the obligation that apprentices incur to help convey what their own journeypersons teach them to those who in turn follow them into the trade.

A sound grasp of the roles, workplace relationships, and possibilities introduced in this unit is part of 'learning to learn' in Manitoba's apprenticeship system. Senior apprentices are later offered information about learning to *teach* in this system – a central and time-honoured foundation of Roofer journeywork.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Describe structure and scope of the modern Roofer trade.	40%
a. Historical background, incl. apprentice experience	
b. Structure/scope of the trade	
• International and national characteristics	
• Characteristics and practice of the trade in Manitoba	
• Trade organizations	
c. Opportunities and career ladders	
• Generalists and specialists	
• 'lead hands and other immediate supervisors	
• Geographic mobility	
• Job hierarchies and innovations	

2. Describe the Manitoba Roofer Apprenticeship Program.

20%

- a. Concept and significance of skills stewardship
 - To the trade
 - To apprentices
 - To journeypersons
 - To employers
 - To the community
- b. Practical Training (on-the-job)
 - Roles/responsibilities of employer and journeyperson(s)
 - Roles/responsibilities of Apprenticeship Training Coordinator (ATC)
 - Roles/responsibilities of apprentice(s)
 - Role/responsibilities of instructors (including 'Related'-area faculty)
 - Role/responsibilities of apprentice(s)
- c. Technical Training (in-school)
- d. Attendance requirements
- e. Progression requirements
- f. Reporting of Grades
- g. Trade Regulation and its significance
- h. Policies (e.g. re: personal conduct, "missed" units, fees, harassment, etc.)
 - Apprenticeship Manitoba
 - Training provider(s)

3. Explain special challenges and opportunities re: apprenticeship training.

40%

- a. Adapting personal learning goals to program contexts
 - Characteristics and 'domains' (types) of adult learning
 - Description/recognition of learning and teaching styles
 - Work culture (incl. work-crew hierarchy), interpersonal skills, and trade-learning
 - Integrating Technical Training and Practical Training content
 - Possibilities and perils of peer-learning
 - Budgeting and other necessary personal arrangements
 - Handling common varieties of stress at work and in school
- b. On-the-job challenges/opportunities
 - Description/recognition of jobsite teaching styles/roles
 - Communicating with journeypersons and employers
 - Coverage/documentation of formally prescribed tasks and subtasks
 - Personal record of achievements/needs: the Trade Learning Journal option
 - Getting help and fixing mistakes
- c. In-school opportunities/challenges
 - Personal arrangements that support in-school progress
 - "Baggage handling" – self-assessing potential impacts of previous school experience on current learning (favourable/unfavourable); resources
 - Techniques for note-taking, record-keeping, and review
 - Relations with instructors (including 'Related'-area faculty)
 - College resources (library, support services, etc.)
 - 'Missed Units' – policies re: supplementals, re-tests, make-up assignments, etc.

Roofer

Unit: A2 Trade Safety Awareness (ATQ Board Standard)

Level: One

Duration: 7 hours

Theory: 7 hours

Practical: 0 hours

Overview:

Safe working procedures and conditions, injury prevention, and the preservation of health are of primary importance to industry in Canada. These responsibilities are shared and require the joint efforts of government, employers, and employees. It is imperative that all parties become aware of circumstances that may lead to injury or harm. Safe learning experiences and environments can be created by controlling the variables and behaviours that may contribute to incidents or injury.

It is generally recognized that safety-conscious attitudes and work practices contribute to a healthy, safe, and accident-free working environment.

It is imperative to apply and be familiar with the Workplace Safety and Health Act and Regulations. As well, it's essential to determine workplace hazards and take measures to protect oneself, co-workers, the public, and the environment. Safety education is an integral part of Roofer apprenticeship training both in school and on-the-job. Unit content is supplemented throughout Technical Training by trade-specific information about Roofer safety hazards and precautions presented in the appropriate contexts of discussion and study.

Note: No percentage-weightings for test purposes are prescribed for this unit's objectives. Instead, a 'Pass/Fail' grade will be recorded for the unit in its entirety.

Objectives and Content:

**Percent of
Unit Mark (%)**

1. Identify safety and health requirements.

- 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

2. Identify personal protective equipment (PPE) and procedures.

- a. Employer and employee responsibilities as related to PPE
- b. Standards: CSA, ANSI and guidelines
- c. Work protective clothing and danger if it fits poorly
- d. Importance of selecting and using appropriate gloves to suit task (e.g. re: chemicals, cold/hot items,

slivers, etc.)

- e. Standards and requirements re: selection/use of appropriate headwear
- f. Eye protection – Comparison/contrast eyeglasses, industrial safety glasses and safety goggles
- g. Foot protection - when required according to safety standards
- h. Hearing protection
 - hazards of various noise levels (hearing protection must be worn)
 - laws
 - types of hearing protection
- i. Respiratory protection – Types; selection
- j. Fall protection - Manitoba requirements Standards Guidelines
 - ANSI (U.S.A. standards), etc.
- k. Ladders and scaffolding
- l. Safety principles for working with or around industrial trucks site specific (forklifts, pallet trucks, etc.)

3. Identify electrical safety.

- a. Effects of electric current on the human body
- b. Three factors that affect the severity of an electric shock
- c. The effects of electrical arcs/blasts on the human body and on equipment
- d. Hazards/precautions re: working with energized equipment

4. Identify fire safety.

- a. Types of fires
- b. Types of fire fighting equipment
- c. Classifications of fire extinguishers (A, B and C)
- d. Location of fire extinguishers and fire exits
- e. Fire alarms and drills

5. Identify ergonomics.

- a. Definition of ergonomics and conditions that may affect the body
 - Working postures
 - Repetition
 - Force
 - Lifting
 - Special hazards and precautions re: materials handling
 - Special hazards/precautions re: lifting, carrying, and setting down a load
 - Tools
 - Identify tool and safety equipment
 - Causes of hand tool accidents
 - Equipment

6. Describe hazard recognition and control.

- a. Safe work practices
- b. Basic risk assessment
- c. Injury prevention and control measures
- d. Identification of hazards involved in pneumatic tool use and explanation of how to guard against them

7. Describe the hazards of confined-space entry.

- a. Identification of a confined space
- b. Hazards of a confined space
 - Physical
 - Biological
- c. Working in a confined space
- d. Emergency response plan
- e. Self-Contained Breathing Apparatus (SCBA)

8. Identify First Aid/CPR.

- a. Overview of First Aid Regulation
- b. Obligations of employers regarding First Aid
 - Who is certified to provide First Aid
 - What to do while waiting for help
 - Location of, and access to, First Aid kit

- c. Define First Aid, and explain First Aid requirements and techniques
 - Scope and limits of First Aid intervention
 - Specific interventions (cuts, burns, abrasions, fractures, suffocation, shock, electrical shock, etc.)
 - Interface with other services and agencies (e.g. Workers Compensation claims)
- d. Describe basic CPR requirements and techniques
 - Obtaining certification
 - Scope and limits of CPR intervention (include varieties of CPR certification)

9. Identify safety requirements as they apply to WHMIS.

- a. WHMIS as a system
- b. Provincial Regulation under the Safety and Health Act
 - Each province has a WHMIS regulation
- c. Federal Hazardous Products Act
- d. WHMIS generic training:
 - WHMIS defined and the format used to convey information about hazardous materials in the workplace
 - Information found on supplier and workplace labeling using WHMIS
 - Hazardous materials in accordance with WHMIS
 - Compliance with government safety standards and regulations
- e. Description of WHMIS (include varieties of WHMIS Certification)
 - Typology of WHMIS labels, symbols, and classifications
 - Scope and use of Materials Safety Data Sheets (MSDS)

10. Describe the identification and control of specified hazards.

- a. Basic control measures (injury prevention)
- b. Safe work procedures
- c. Explanation on the importance of industrial housekeeping
- d. Employer responsibilities
- e. How and where to store materials
- f. Safety measures related to walkways, stairs and floor openings
- g. Traffic-pathway protection of workers and persons

Roofer

Unit: B1 Trade Mathematics I (Refresher & Basic Applications)

Level: One

Duration: 21 hours

Theory: 21 hours

Practical: 0 hours

Overview:

The Roofer trade requires the ability to use mathematics and geometry with precision, resourcefulness, and confidence. Many fundamental problems in design, estimation, layout, and building involve careful work with numbers and geometric principles. Real-life trade practice involves a constant dialogue between measured or specified quantities and the performance of precision work to achieve a desired fit or tolerance among the components of a built structure.

This unit of instruction is intended to help make the world of numbers and shapes work for, rather than against, the apprentice roofer. The unit includes up-to-date information about the nature of 'math anxiety' and how it can be overcome. Unit content also includes a brief review of basic math concepts and operations, but its major focus concerns applications in actual trade practice. Apprentices will extend their trade-math skills elsewhere in Technical Training – for example, in preparing estimates and layouts for roof construction projects.

Note: Although this unit includes a review of math basics, and provides some tools for building skill and confidence in applying them, it is not a remedial math course. Unit content assumes a prior familiarity with math basics. Apprentices who might require upgrading in this area are strongly encouraged to consult with their Apprenticeship Training Coordinator (ATC) and/or their Instructor early in the program to identify suitable options and resources for math-skills upgrading where appropriate.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Describe the practical importance of math disciplines to the Roofer trade.	15%
a. Definition and scope of relevant math disciplines	
b. Detailed examples	
• Plane geometry and calculating rates of coverage by roofing materials	
• Ratio/proportion and technical drawing to scale	
• Other (specified by instructor)	
c. Time-sheets, wages, and personal budgeting	
d. Engineering of tools and equipment	
e. Manufacture and packaging of roofing materials and products	
f. Trade documents	
g. Standards, codes, tolerances, and other specifications	
h. Computer technology/applications	
i. Design/technical drawing	
j. Estimation and bidding	
k. Project planning and monitoring	
l. Roofing materials procurement, inventory, and optimization	
m. Machinery and equipment set-up	
n. Measurement and lay-out	
o. Temperatures, pressures, and other measured quantities re: properties of materials and tools	
p. Customer relations/perceptions (e.g. schedules, timetables, etc.)	

q. Business management

2. Describe “math anxiety” and its remedies.

10%

- a. Definition
- b. Recognition
- c. Options, resources, and techniques for overcoming math anxiety
- d. Other common problems
 - Importance of personal awareness of math strengths/learning needs
 - Importance of early resolution during term of apprenticeship
 - Options/resources for remedial math instruction and other assistance

3. Review general math concepts and use of electronic calculator.

25%

- a. Basic operations
 - Addition
 - Subtraction
 - Multiplication
 - Division
 - Order of operations
 - Fractions and decimals
- b. Ratio and proportion
- c. Percentage calculations
- d. Constructing/solving simple equations
- e. Trigonometry functions
- f. Units of measure
 - Imperial
 - Metric (SI)
 - Conversion factors
- g. Calculator use
 - Basic operation keys/functions
 - Percentage keys/functions
 - Trig keys/functions
 - Keys/functions re: memory and constants

4. Perform trade-related calculations as specified by instructor.

50%

- a. Linear measurement
 - Rectangular/triangular dimensions
 - Radius/diameter/circumference
- b. Area and volume
 - Squares/rectangles
 - Triangles
 - Circles/cylinders
 - Irregular shapes
- c. Ratio/proportion
 - Ratios
 - Percentages
 - Rates
 - SI/Metric Units (including conversions)

Roofer

Unit: B2 Introduction to Roof Design & Technical Drawing

Level: One

Duration: 21 hours

Theory: 7 hours

Practical: 14 hours

Overview:

Roofers require a good, practical grasp of roof-design basics, as well as the ability to use technical drawings for a variety of trade tasks. Technical drawing is medium for exploring roof structures in detail, as well as a tool for developing new ideas and solving problems. This unit of instruction is the program gateway to further learning about roof-design variations, technical drawing, and blueprint-reading skills. The unit also offers Roofer apprentices a chance to try their own hand at applying some of the techniques, procedures, and conventions used in professional drafting and design. Elsewhere in Technical Training, apprentices will refine their skills in the use of trade documents through hands-on work with a wide variety of roof-construction project blueprints.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Describe/demonstrate the major uses of technical drawing in the Roofer trade.	25%
a. Uses	
• Design and production of roofing structures/components (form/function; job details; application methods; material requirements; project planning; cost considerations, etc.)	
• Problem-solving and trouble-shooting	
• Communication among builders, drafting workers, designers, clients, architects, etc.	
• Bidding/contracting practices	
• Quality assurance – verification of compliance with/reference to specifications and standards	
• Other (specified by instructor)	
b. Types, terminology, and techniques of technical drawing	
• Freehand sketches and 'brainstorming'	
• Development of sketches/drawings from photographs	
• Pictorial drawings	
• Working drawings	
• Drawings to specification	
• Blueprints and blueprint components, including schedules	
• Layouts	
• Computer-Assisted Drawing and Design (CADD)	
2. Describe/demonstrate major varieties of roof design using technical drawings.	15%
a. Basic principles of design	
b. Roof shapes and associated terminology	
c. Comparison/contrast re: major design characteristics of common roof-types	
• Barrel	
• Flat	
• Gable	
• Gambrel	
• Intersecting	
• Dutch/Hip	

- Mansard
 - Sawtooth
 - Serpentine
 - Shed
 - Other roof shapes and structures (specified by instructor)
- d. Comparison/contrast between steep roofs and low-slope/flat roofs
- e. Comparison/contrast between residential-sector and ICI-sector roofing projects

3. Describe/demonstrate use and selection of technical-drawing equipment/materials. 10%

- a. Rules and straight edges (including T-square, parallel rule)
- b. Architect's scales (Imperial and SI)
- c. Pencils and leads (especially re: line-weight)
- d. Erasers
- e. Set squares
- f. Protractors
- g. Tools for curved work (e.g. compass; French curves)
- h. Papers (vellum, grade, 'tooth', etc.)
- i. Specialty templates (e.g. lettering guides)
- j. Other (specified by instructor)

4. Describe/demonstrate specified principles, conventions, and techniques for producing roofing sketches and technical drawings. 25%

- a. Basic orthographic projection
 - Visualization and sketching
 - Plan view
 - Elevation view
 - Side view
 - Sectional view
- b. Basic oblique projection
- c. Basic isometric projection
- d. Applied geometry
 - Constructing angles
 - Constructing circles, arcs, tangents, etc.
 - Dividing lines
 - Constructing regular polygons
- e. Line work and weight
 - Object line
 - Hidden line
 - Extension line
 - Dimension line
 - Centre line
 - Break line
 - Cutting-plane line
- f. Common architectural symbols
- g. Measurement and drawing scale (Metric; Imperial)
- h. Lettering
 - Basic knowledge of legibility and other requirements
 - Basic use of lettering templates/guides

5. Design and/or sketch a roof component per instructor specifications. 25%

- a. Interpretation of technical drawings and other materials to identify/solve a roofing problem
- b. Use of scale; accepted conventions re: line-weight, lettering, etc.
- c. Use/conversion of metric and Imperial units of measure
- d. Sequence
 - Freehand sketches (including isometric and orthographic projections)
 - Specified detail sketch
 - Finished drawing, including application of line-weights
 - Verification of sketch re: roofing component, original drawing, and/or provided specifications

Roofer

Unit: C1 Roofer Tools & Equipment: An Overview

Level: One

Duration: 21 hours

Theory: 21 hours

Practical: 0 hours

Overview:

Apprentice Roofers acquire some practical knowledge of the trade's tools and equipment long before they begin in-school Technical Training. Most have already invested money in purchasing a few basic tools of their own, and know something about how those tools can be used and misused. They will build on this knowledge long afterward, too, for tool-use is one key area of trade competence that requires special commitment to lifelong learning. The materials, technology, and practical methods involved in construction work continue to evolve. But despite ongoing change, the productivity, the quality, and the safety of trade-life continues to be influenced by developed skills in the selection, use, and maintenance of tools and equipment.

This unit introduces these skill requirements through a broad overview of the modern Roofer's tool-set, including conventional hand tools as well as portable/stationary power equipment. It explores how they are used and why. The unit also refers to the relationship between hand-tools and their motorized, air-driven, and computer-controlled counterparts. The unit even includes some practical guidance about how and when to collect the basic tools needed to practice the trade. A companion unit offers hands-on experience with basic techniques for safe use and maintenance. In addition to many items that are in general use among the building trades, however, Roofers also use an array of special devices and techniques including hot-process, propane-fuelled, motorized, and disposal equipment geared to the particular challenges of roofing work. Such specialty tool-use is introduced in the present unit as a foundation for further learning in this important content-area elsewhere in Technical Training.

Objectives and Content:

Percent of Unit Mark (%)

- | | |
|---|-------------------|
| <p>1. Describe use, selection, and maintenance of Roofer tools and equipment in general.</p> <p>a. Relevant background re: development of modern trade technology, techniques, and markets</p> <p>b. Identification/definition of major categories re: the modern trade's tool-set</p> <ul style="list-style-type: none"> • Hand tools • Portable power tools and equipment • Stationary power tools and equipment • Air-driven • Explosive-activated • Computer-assisted/controlled • Comparison/contrast between common hand-tools and their power-tool equivalents • Persisting importance of hand-tools and hand-tool skills • Tools for working with specialty materials (e.g. manual insulation carrier) <p>c. General considerations re: use of tools and equipment</p> <ul style="list-style-type: none"> • Safety precautions, including use of personal protective equipment • Manufacturer and employer requirements <p>d. General consideration re: selection of tools and equipment</p> <ul style="list-style-type: none"> • Variation in the cost, quality, and capacity of Roofer tools • Importance of matching tools/equipment to job requirements | <p>20%</p> |
|---|-------------------|

- Importance of 'knowing the limits' when selecting/setting up tools for a given job
 - Trade culture re: borrowing (and returning) tools
 - Variation in policy re: self- vs. employer-provided tools/equipment
 - Instructor's recommendations re: selecting tools/equipment for personal acquisition (budgeting; arrangements with employer, etc.)
- e. General considerations re: maintenance of tools and equipment
- Maintenance as a safety issue (e.g. arranging repair of frayed electrical cords)
 - Common sites, symptoms, and consequences of bad practice re: maintenance
 - Routine vs. scheduled maintenance requirements (e.g. manufacturer and/or employer expectation)
 - Costs/benefits of maintenance options (e.g. commercial sharpening)
 - Ways and means re: ongoing development of inspection/troubleshooting skills
- f. Special considerations re: use of on-deck roofing equipment

2. Describe personal protective equipment (PPE) and safety equipment. 20%

- a. Cuffless pants
- b. Hearing protection
- c. Eye-wash bottle
- d. Face-shield
- e. Fire extinguishers
- f. First Aid kit
- g. Gloves
- h. Guard-rails
- i. Hard-hat
- j. Heat sensors
- k. Lanyard (rope)
- l. Long sleeves
- m. Mask
- n. Respirator
- o. Safety boots
- p. Safety fence
- q. Safety glasses
- r. Safety harness
- s. Other (specified by instructor)

3. Describe hand tools and demonstrate their use, selection, and maintenance. 10%

- a. Adhesive spreader; air and material hoses; aviation snips; axe; bucket/pail; caulking gun; chalkline; chisels; drying mop;
- b. Flashlight; folding pliers; grub-hoe; hacksaw; hammer; hammer-stapler; handsaw(s); hand-spudger; hand-roller; hatchet; infrared heat gun;
- c. Manual gravel spreader; manual insulation-carrier; measuring tapes (Imperial/Metric); mechanical tape-applier; mop; pipe-wrench; plane; pop riveter; prybar;
- d. Ramrod; rake; roof-jack; roof-lifter; roofer knife; scanners; scissors; scoop-shovel; scraper; screwdrivers; seam rollers; shovels; slater punch; sliding T-bevel; staple gun; squeegee;
- e. Thermometer; tin-snips; trowel; wheelbarrow; sawhorse; water extractor; wrenches and socket sets;
- f. Other (specified by instructor)

4. Describe power tools/equipment (including pneumatic, explosive-activated, and propane-fuelled), and demonstrate their use, selection, and maintenance. 10%

- a. Air compressor; backpack blower; concrete saw; electrical cords; generator;
- b. Hammer drill; hot-air gun; hot-air welder; industrial vacuum; nibbler;
- c. Pneumatic spray gun; powder-activated tool; power mixer; power saws (chain; quick-cut; circular); power vac; pressure washer; primer machine; propane tank; pump;
- d. Roll carrier; roller; screw-gun; spray gun and nozzle; tile cutter; torch; unishear;
- f. Other (specified by instructor)

5. Describe electrical power-supply considerations. 5%

- a. Hazards and precautions re: electricity
- b. Jobsite power-supply, including generators
- c. Inspection of cords and connections
- d. Inspection of jobsite conditions (e.g. damp areas)
- e. Requirements for grounding

- f. Power ratings and their significance (e.g. 'developed power' under load)
- g. Legal and regulatory requirements
- h. Other (specified by instructor)

6. Describe hot-process and motorized roofing equipment, and demonstrate its use, selection, and maintenance. 15%

- a. Agitator kettle; asphalt spreader, automated seamer; bitumen kettle, bitumen mop, bitumen pipe/piping; bitumen tanker; chaisaw; degranulator; dipper;
- b. Felt-laying machine; forklift; hot tanker/carrier; mechanical broom; mechanical scraper; mechanical spudder; mini-mop; mop cart;
- c. Power broom; power buggy; power gravel-spreader; power insulation carrier; power scraper/spudder; power spreader; rocker; roof cutter; roof-cutting machine;
- d. Scissor lift; skid-steer loader; snowblower; tear-off machine; truck tanker; wheeled asphalt bucket;
- e. Other (specified by instructor)

7. Describe aids for roof-project rigging, lifting/hoisting, and waste disposal. 20%

- a. A-frame hoist; bottle cages; conveyors; cranes; disposal bin; disposal chute;
- b. Garbage bags; garbage chute; garbage tray; gravel-bucket; gravel-hopper; hand-hoist; hydraulic hoist;
- c. Ladder; ladder-hoist; ladder-jack; ladder-pulley; lifting fork;
- d. Mechanical hoist; monorail hoist; swing hoist; wheelbarrow;
- e. Other (specified by instructor)

Roofer

Unit: C2 Hot-Process, Propane-Fuelled, & Motorized Equipment

Level: One

Duration: 35 hours

Theory: 14 hours

Practical: 21 hours

Overview:

This unit builds on Roofer apprentices' earlier exposure to an overview of trade tools and equipment. It focuses on the theoretical and practical know-how required to use several special types of roofing equipment with safety and proficiency. Major content areas feature equipment that is powered by motors of various kinds, fuelled by propane gases and other petrochemicals such as kerosene, and includes an array of pneumatic tools such as nailers, staplers, and spray-guns that have become indispensable in modern trade practice. Particular attention is paid to hot-process equipment such as torches, kettles, and tankers, including the special hazards and precautions required of those who use it. Successful completion of the unit is essential to further learning in the Manitoba Roofer Apprenticeship program. The special equipment and techniques explored here are pursued in a variety of application contexts elsewhere in Technical Training.

Objectives and Content:

Percent of Unit Mark (%)

- | | |
|--|------------|
| 1. Describe/demonstrate the set-up, use, and maintenance of power-operated roof-top equipment. | 30% |
| a. Special hazards and precautions | |
| b. Basic components, controls, and functions | |
| c. Manufacturer specifications and requirements | |
| d. Power buggies | |
| e. Power-operated roof-sweeper | |
| f. Power-operated roof-cutter | |
| g. Power claw (power peeler) | |
| h. Combination cutter/scratcher | |
| i. Other (specified by instructor) | |
| 2. Describe/demonstrate the set-up, use, and maintenance of small, internal combustion engines. | 15% |
| a. Special hazards and precautions | |
| b. Basic types, components, controls, and functions | |
| c. Manufacturer specifications and requirements | |
| d. Pre-ignition and other inspections/checks | |
| e. Fuels and fuel mixtures | |
| f. Cleaning of foam filter | |
| g. Cleaning/replacement of spark plugs | |
| h. Cleaning of cooling system, including top fins | |
| i. Other (specified by instructor) | |

- 3. Describe/demonstrate the set-up, use, and maintenance of pneumatic tools and air compressors. 10%**
- a. Special hazards and precautions
 - Protection of eyes and skin
 - Selecting and adjusting pneumatic tools/equipment to suit job
 - Detecting wear, damage, and defects
 - b. Basic types, components, controls, and functions, including;
 - Air hoses
 - Couplings
 - Air compressors
 - Caulking guns
 - Nailers
 - c. Staplers
 - d. Sprayers, including application of primer, paints, adhesives, coatings, and bonding agents
 - e. Other (specified by instructor)
- 4. Describe/demonstrate the set-up, use, and maintenance of propane-fuelled equipment, including torches and kettles. 30%**
- a. Special hazards and precautions, including:
 - Regulatory and other requirements re: cylinder transport/handling and storage
 - Standards and procedures for connection/disconnection
 - Standards and procedures for inspection of propane lines, valves, couplers, regulators, etc.
 - Symptoms and criteria re: worn, damaged, and defective equipment
 - Personnel certification, endorsements, tickets, etc.
 - b. Basic burner types, components, controls, and functions
 - c. Manufacturer specifications and requirements
 - d. Fuels and fuel mixtures (e.g. liquid and vapour bottles)
 - e. Other (specified by instructor)
- 5. Describe/demonstrate procedure for firing, draining, and cleaning roofing kettles and tankers. 15%**
- a. General hazards and precautions, including regulations
 - b. Terminology (e.g. equiviscous temperatures [EVT]; flashpoint temperatures)
 - c. Basic types, components, controls, and functions
 - Liquid petroleum gas-fired kettle
 - Kerosene-fired kettle
 - Hot oil-bath kettle
 - Heating, application, and bitumen equipment types
 - Other (specified by instructor)
 - d. Manufacturer specifications and requirements (e.g. moisture checks)
 - e. Comparison/contrast advantages re: use of kettles vs. use of tankers
 - f. Procedures for set-up, filling, firing, and use
 - Specific hazards and precautions
 - Connection/disconnection re: hot-process equipment and fuel source
 - Connecting/disconnecting and bracing piping for asphalt
 - Automatic vs. manual firing
 - Maintaining temperature and cleanliness of bitumen
 - Shut-down procedures
 - g. Procedures for draining/disposal of hot bitumen
 - Specific hazards, precautions (including WHMIS and regulations)
 - Selection of appropriate containers
 - Techniques/standards for transfer of material from tankers/kettles
 - Storage/disposal requirements
 - h. Procedures for cleaning
 - Specific hazards, precautions (e.g. when ventilating with forced air in confined space)

Roofer

Unit: C3 Roofing Materials & Products: An Overview

Level: One

Duration: 14 hours

Theory: 14 hours

Practical: 0 hours

Overview:

This unit offers introduces apprentices to conventional as well as recently-invented roofing materials, along with the fasteners, adhesives, and special-purpose products associated with their use. Roof-covering materials range from wooden and earthenware products that have been in use for centuries to space-age membrane systems whose design and manufacture reflect state-of-the-art knowledge in the engineering and building sciences. A common thread among these materials is that they all reflect the ancient but persisting human need for ingenuity in dealing with 'fire and rain' – a purpose that is evident in early modern European regulations to ban catastrophically flammable thatch-roofs from urban buildings, and in the widespread abandonment of wooden shingles amid such innovations as the invention (1900) and patenting (1907) of asbestos-cement shingles. Trained roofers not only require a broad working knowledge of these materials, but also special understanding of how and why a given product is best suited to a particular application. The employability, productivity, and usefulness of their skills depend partly on knowing these materials of the trade. Other units provide further instruction on using and applying the particular materials introduced here. This unit will help familiarize apprentices with roofing products in general, while alerting them to new materials and practices which they might not yet have encountered in their on-the-job practical training.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Describe the variety of roofing materials.	15%
<ul style="list-style-type: none"> a. Historical change/continuity re: social, architectural, and technological factors b. Major varieties, including their physical properties and required characteristics c. Manufacturer/industry specifications, classification systems, and standards d. Recent innovations in the engineering and manufacture of roofing materials e. Other (specified by instructor) 	
2. Describe rolled roofing materials and explain their use in roofing applications.	15%
<ul style="list-style-type: none"> a. Roofing felts: <ul style="list-style-type: none"> • Asphalt-saturated • Glass • Tar • Rag b. Mineral surface c. Split sheet d. Salvage edge e. Rosin sheathing f. Determining rolled-material requirements for a specified roof area g. Other (specified by instructor) 	
3. Describe aggregates and roof coatings, and explain their preferred uses.	15%
<ul style="list-style-type: none"> a. Aggregates <ul style="list-style-type: none"> • Crushed gravel • Marble chips 	

- Pea gravel
 - Round quarried gravel
 - Slag
- b. Roof coatings
- Aluminum paint
 - Asphalt flood-coat
 - Cutback
 - Decorative
 - Emulsion
 - Fibrated/non-fibrated
 - Synthetic rubber
 - Vinyl
- c. Other (specified by instructor)

Describe/ the materials of steep-roof construction, and explain preferred uses. 10%

4. a. Shingled-roof materials, including:
- Asphalt shingles
 - Fibreglass shingles
 - Laminate shingles
 - Styrene-butadiene-styrene (SBS) shingles
 - Wood shingles/shakes
 - Underlayment (felt; ice-/water-shield; mineral-surfaced; peel-and-stick; polyethylene)
 - Mastics
 - Flashings (aluminum; copper; stainless steel)
- b. Fasteners (nails; staples)
- Tiled-roof materials, including:
- Clay tiles
 - Composite tiles
 - Concrete tiles
 - Slate tiles
 - Metal tiles
 - Underlayment (felt; ice-/water-shield; polyethylene)
 - Closure strips
 - Flashings
- c. Mortars and dyes
- Metal-roof materials
- Pre-formed metal
 - Strapping (including Z-bar, wooden, and hat channels)
 - Underlayment (felt; peel-and-stick membrane; modified bitumen, etc.)
 - Closure strips (metal; foam)
 - Flashings (including drip-edge, rake-edge, through-wall, back-pan, etc.)
 - Fasteners (clips; pop rivets; screws, including self-tapping, etc.)
 - Ridge vents(pre-formed; hood)
- d. Snow guards (metal; plastic)
- Other (specified by instructor)

Describe the materials of flat/low-slope roof construction, and explain preferred uses. 15%

- 5.. a. Built-up roofing (BUR) membrane
- b. Hot rubberized roofing
- c. Cold-process roofing
- d. Modified bituminous membrane roofing
- e. Single-ply roofing
- Polyvinyl chloride (PVC)
 - Chlorinated polyethylene (CPE)
 - Chlorosulphinated polyethylene (CSPE) ["Hypalon"]
 - Thermoplastic Olefin (TPO)
 - Ethylene Propylene Diene Monomer (EPDM)
 - Neoprene (CR)
- f. Thermoplastics
- g. Thermoset membranes
- h. Hot-process applied varieties

- Felt-paper
- Fibreglass
- Sanded modified sheets
- i. Heat-welded varieties
 - Polyvinyl chloride (PVC)
 - Thermoplastic Olefin (TPO)
 - Chlorosulphinated polyethylene (CSPE) ["Hypalon"]
- j. Metal flashings
 - Aluminum
 - Copper
 - Stainless steel
- k. Other (specified by instructor)

6. Describe roofing fasteners and adhesives, and explain preferred use(s). 15%

- a. Fasteners
 - Nails
 - Mechanical fasteners
 - Screws
 - Bolts
 - Hollow-wall
 - Clips
 - Plates
 - Bars
 - Compatibility of fasteners with various types of flashings
 - Significance of fastener standards, selection, and schedules/pattern
- b. Adhesives
 - Contact cements
 - Primer
 - Seam tape
 - Peel-and-stick
- c. Other (specified by instructor)

7. Describe/ miscellaneous roofing materials and explain their preferred uses. 15%

- a. Ballast
 - Roofing stone
 - Pavers
 - Cement-top insulation
- b. Caulking (silicone; polyurethane; latex)
- c. Insulation (rigid; foam; fiberglass; other)
- d. Gypsum board
- e. Vapour retarders
 - Polyethylene
 - Peel-and-stick
 - Torched-on (SBS)
 - Kraft laminate
 - Two-ply felt
 - Retarder adhesives
- f. Primers (solvent-based/water-based)
- g. Paints (including rust-inhibiting)
- h. Protection boards
 - Insulation; corrugated; drain-mat
 - Wood-fibre
 - Fibreglass
 - SBS boards
 - Asphalt-impregnated
- i. Surfacing products
- j. Waterproofing membranes (peel-and-stick; hot rubber compound; torch-on)

Roofer

Unit: D1 Low-Slope/Flat Roof Construction Procedures

Level: One

Duration: 42 hours

Theory: 42 hours

Practical: 0 hours

Overview:

This overview unit offers introduces apprentices to the components, key practices, and preferred applications associated with built-up roofing (BUR) and other membrane systems used in low-slope/flat roof construction. Unit content supplements other program components concerned with the materials, tools/equipment, documents, and standards of this core area of Roofer trade practice. The special emphasis here is upon how all of these aspects come together in procedures and techniques associated with flat/low-slope roof construction. The unit offers the theoretical knowledge required to grasp the range of these applications, and the know-how required to understand why they are preferred for particular projects. The unit also highlights specific techniques, and the ordering of these techniques into procedures, for each of the major varieties of low-slope/flat roof practice. Other units round out this content. They provide a closer look at the 'hands-on' requirements of performing low-slope/flat roof construction tasks, and offer apprentices the chance to refine their practical skills in actually performing these tasks with the guidance of a qualified instructor.

Objectives and Content:

Percent of Unit Mark (%)

1. **Compare/contrast major types of low-slope/flat roof systems and construction details.** 10%
 - a. BUR systems and components
 - b. Membrane systems (including Protected Membrane Roofs [PMRs]) and components
 - c. BUR system/component construction details and their significance
 - d. Loading, drainage, and substrate requirements
 - e. Types of deck, including significance of variation
 - Wood
 - Steel
 - Concrete
 - Gypsum
 - Composite (including cementitious)
 - f. Other (specified by instructor)

2. **Describe/explain installation procedures re: BUR systems.** 45%
 - a. General considerations/techniques re: phases of BUR-systems installation
 - b. Selection, fitting, securement, and sealing of gypsum board, including:
 - Loose-laid, glued-down, and mechanically fastened installation methods
 - Fastener pattern lay-outs
 - Joint sealing
 - c. Selection of primer, and options for applying primer to substrate
 - Use of rollers, applicators, and brushes
 - Impact of environmental conditions re: application
 - d. Selection, fitting, seaming/joining, and securement of vapour-retarder, including:
 - Criteria for selecting particular product (e.g. SBS vs. two-ply felt)
 - Compatibility and suitability of products re: specific job requirements

- Side-lap and end-lap allowances
 - Seams, overlaps, and sealing
 - Tie-ins/transitions with building envelope
- e. Selection, lay-out, fitting, and securement of insulation and protection board, including:
 - Patterns and placement of insulation
 - Installation precautions to maintain integrity of insulation material
 - Suitability of protection-board product re: specific job requirements (e.g. fibreglass vs. asphalt-impregnated)
 - f. Location, lay-out, installation, and protection of vents, drains, and fixtures, including:
 - Determining elevations for installation of these components
 - Locating flashings for vents and roof fixtures (B-vents; plumbing vents, etc.)
 - Sumping of drain areas
 - Reinforcement of roof details
 - Assessing/safeguarding integrity of components
 - g. Selection, fitting, and application of all materials for ballast and protective coating, including:
 - Choosing and using compatible ballast/ballast-blanket materials and protective coatings/mat and membranes (including lightweight inverted roofing systems)
 - Application techniques, including safeguards against UV damage and wind up-lift
 - Application rates and standards (e.g. evenness of application)
 - Fitting and placement of patio stones and ballast blanket
 - h. Location, lay-out, fitting, and placement of all materials for walkways
 - Methods for establishing and maintaining required elevation(s)
 - Lay-out of walkways
 - Fitting and placement of walkway materials
 - Safeguards against damage to membranes
 - i. Selection, fabrication, securement, and caulking of BUR flashings, including:
 - Techniques for cutting, finishing, and fastening metal flashings
 - Compatibility and flashings and fasteners
 - Main principles and concepts of watershed design re: flashings
 - j. Special considerations/techniques re: hot-process BUR installation
 - k. Special considerations/techniques re: cold-process BUR installation
 - l. Special considerations/techniques re: conventional BUR installation
 - m. Special considerations/techniques re: inverted roofing systems (Protected Membrane Roofs [PMRs]), including assembly details, fitting/placement of components, and inspection
 - n. Other (specified by instructor)

3. Describe/explain installation procedure re: membrane systems. 45%

- a. General considerations/techniques re: phases of membrane-/membrane-system installation
- b. Relaxing the roofing membrane
 - Assessing flexibility of material(s)
 - Significance of time, weather, and environmental factors
 - Torch-warming of membrane
 - Unrolling membrane and applying weight
- c. Lay-outs and setting of membranes
 - Variations in technique: back-rolling, dry-setting, and throwing felt
 - Establishing starting point and end-/side-lap allowances
 - Positioning membrane sheets/rolls
- d. Description/comparison of major varieties of flat-roof membrane application methods, including review of roofing membrane materials pertinent to each method (e.g. loose-laid application for EPDM; hot-air welding application for TPO and PVC)
- e. Major techniques and considerations re: hot-process application, including:
 - Asphalt types (1, 2, & 3) and temperature – measuring; monitoring
 - Asphalt spreading, including availability/selection of applicators to suit job
 - Embedding of membranes in asphalt
- f. Major techniques and considerations re: torched-on method application, including:
 - Fire-watch policies, procedures, and related requirements
 - Establishing end-/side-laps and offsets for base-/cap-sheets
 - Torch-flame/temperature adjustment for welding and granule-embedding
 - Requirements/rationale re: achieving continuity of adhesion and of bitumen bleed-out, including sponge technique to verify bonding of surfaces
- g. Major techniques and considerations re: hot-air welding application, including

- Selection, use, and adjustment of welders, seamer, roller, etc.
 - Implications of temperature/environmental factors on application and tool-use
 - Cleaning/sealing of membranes, and tests for continuity of seams
- h. Major techniques and considerations re: cold-process application, including
- Establishment of side-/end-laps
 - Cleaning and rolling back membranes
 - Using adhesives and rolling seams
 - Preparing and applying peel-and-stick membrane for cold-process application
- i. Major techniques and considerations re: mechanically-fastened applications, including:
- Standards for selection, layout, and use of mechanical fasteners
 - Variation in deck-types and location of utilities (drainage, electrical, etc.) re: job-specific requirements of mechanically-fastened membrane application
 - Determining lengths/patterns, and performing pull-out test
- j. Major techniques and considerations re: loose-laid application, including:
- Selection/compatibility of membrane-type with fasteners, ballast, pavers, primers, adhesives, sealants
 - Securing perimeter, applying protection mat, and cleaning loose-laid membrane
 - Cleaning, and rolling back membranes
 - Using adhesives and rolling seams
 - Measuring/installing ballast, on membrane and on perimeter, to suit job
- k. Major techniques and considerations re: liquid-applied application, including:
- Two-part application, and determination of membrane thickness
 - Choosing/using specialty equipment (e.g. sprayer; dispensing buggy) to suit job
- l. Major techniques re: membrane flashings – lay-out, shaping, securement, layering, back-mopping, and sealing
- m. Other (specified by instructor)

Roofer

Unit: D2 Practicum: Built-Up Roofing (BUR) Installation Techniques

Level: One

Duration: 21 hours

Theory: 0 hours

Practical: 21 hours

Overview:

This overview unit offers apprentices the opportunity to develop their knowledge and practical skills regarding specified BUR-installation techniques by means of hands-on practice under the supervision of a qualified instructor.

Objectives and Content:

**Percent of
Unit Mark (%)**

1. **Demonstrate installation techniques re: BUR-system gypsum board, primer(s), vapour-retarder, insulation, and protection board components. 50%**
 - a. Selection, fitting, securement, and sealing of gypsum board, including:
 - Loose-laid, glued-down, and mechanically fastened installation methods
 - Fastener pattern lay-outs
 - Joint sealing
 - b. Selection of primer, and options for applying primer to substrate
 - Use of rollers, applicators, and brushes
 - Impact of environmental conditions re: application
 - c. Selection, fitting, seaming/joining, and securement of vapour-retarder, including:
 - Criteria for selecting particular product (e.g. SBS vs. two-ply felt)
 - Compatibility and suitability of products re: specific job requirements
 - Side-lap and end-lap allowances
 - Seams, overlaps, and sealing
 - Tie-ins/transitions with building envelope
 - d. Selection, lay-out, fitting, and securement of insulation and protection board, including:
 - Patterns and placement of insulation
 - Installation precautions to maintain integrity of insulation material
 - Suitability of protection-board product re: specific job requirements (e.g. fibreglas vs. asphalt impregnated)
 - e. Other (specified by instructor)
2. **Demonstrate installation techniques re: BUR-system vents, drains, fixtures, and flashings. 35%**
 - a. Location, lay-out, installation, and protection, including:
 - Determining elevations for installation of these components
 - Locating flashings for vents and roof fixtures (B-vents; plumbing vents, etc.)
 - Sumping of drain areas
 - Reinforcement of roof details
 - Assessing/safeguarding integrity of components
 - b. Selection, fabrication, securement, and caulking of BUR flashings, including:
 - Techniques for cutting, finishing, and fastening metal flashings
 - Compatibility of flashings and fasteners
 - Main principles and concepts of watershed design re: flashings

- 2. Demonstrate installation techniques re: BUR-system ballast and walkway components. 15%**
- a. Selection, fitting, and application of all materials for ballast and protective coating, including:
 - Choosing and using compatible ballast/ballast-blanket materials and protective coatings/mat and membranes (including lightweight inverted roofing systems)
 - Application techniques, including safeguards against UV damage and wind up-lift
 - Application rates and standards (e.g. evenness of application)
 - Fitting and placement of patio stones and ballast blanket
 - b. Location, lay-out, fitting, and placement of all materials for walkways
 - Methods for establishing and maintaining required elevation(s)
 - Lay-out of walkways
 - Fitting and placement of walkway materials
 - Safeguards against damage to membranes
 - c. Other (specified by instructor)

Roofer

Unit: D3 Practicum: Membrane Installation Techniques

Level: One

Duration: 21 hours

Theory: 0 hours

Practical: 21 hours

Overview:

This overview unit offers apprentices the opportunity to develop their knowledge and practical skills regarding specified roofing-membrane installation techniques by means of hands-on practice under the supervision of a qualified instructor.

Objectives and Content:

Percent of Unit Mark (%)

- | | |
|---|------------|
| 1. Demonstrate basic techniques for the lay-out and setting of membranes. | 15% |
| a. Relaxing the roofing membrane | |
| • Assessing flexibility of material(s) | |
| • Adapting operation to reflect time, weather, and environmental factors | |
| • Torch-warming of membrane | |
| • Unrolling and weighting of membrane | |
| b. Lay-outs and setting of membrane | |
| • Variations in technique: back-rolling, dry-setting, and throwing felt | |
| • Establishing starting point and end-/side-lap allowances | |
| • Positioning membrane sheets/rolls | |
| c. Other (specified by instructor) | |
| | |
| 2. Demonstrate techniques re: heat-based applications of roof-membrane system components. | 25% |
| a. Hot-process membrane application techniques | |
| • Asphalt types (1, 2, & 3) and temperature – measuring; monitoring | |
| • Asphalt spreading, including selection of applicators to suit job | |
| • Embedding of membranes in asphalt | |
| • Other (specified by instructor) | |
| b. Torch-on membrane application techniques | |
| • Establishing end-/side-laps and offsets for base-/cap-sheets | |
| • Torch-flame/temperature adjustment for welding and granule-embedding | |
| • Achieving continuity of adhesion and of bitumen bleed-out, including sponge technique to verify bonding of surfaces | |
| • Other (specified by instructor) | |
| c. Hot-air welding membrane application techniques | |
| • Selection, use, and adjustment of welders, seamer, roller, etc. | |
| • Adapting operation to temperature/environmental factors | |
| • Cleaning/sealing of membranes, and tests for continuity of seams | |
| • Other (specified by employer) | |

- 3. Demonstrate techniques re: cold-process and mechanically fastened application of roof-membrane system components. 15%**
- a. Cold-process application techniques.
 - Establishment of side-/end-laps
 - Cleaning and rolling back membranes
 - Using adhesives and rolling seams
 - Preparing and applying peel-and-stick membrane for cold-process application
 - Other (specified by instructor)
 - b. Mechanically-fastened application techniques.
 - Standards for selection, layout, and use of mechanical fasteners
 - Variation in deck-types and location of utilities (drainage, electrical, etc.) re: job-specific requirements of mechanically-fastened membrane application
 - Determining lengths/patterns, and performing pull-out test
 - Other (specified by instructor)
- 4. Demonstrate techniques re: loose-laid application of roof-membrane system components. 15%**
- a. Selection/compatibility of membrane-type with fasteners, ballast, pavers, primers, adhesives, sealants
 - b. Securing perimeter, applying protection mat, and cleaning loose-laid membrane
 - c. Cleaning, and rolling back membranes
 - d. Using adhesives and rolling seams
 - e. Measuring/installing ballast, on membrane and on perimeter, to suit job
 - f. Other (specified by instructor)
- 5. Demonstrate techniques re: liquid-applied installation of roof-membrane system components. 15%**
- a. Determination of membrane thickness
 - b. Two-step procedure
 - c. Choice and use of required specialty equipment
 - d. Other (specified by instructor)
- 6. Demonstrate installation techniques re: membrane-system flashings. 15%**
- a. Lay-out
 - b. Shaping
 - c. Securement
 - d. Layering
 - e. Back-mopping
 - f. Sealing
 - g. Other (specified by instructor)
