

Roofer Level 2

Roofer

Unit: B3 Using Roof Blueprints & Other Trade Documents

Level: Two

Duration: 35 hours

Theory: 35 hours

Practical: 0 hours

Overview:

Roofers must be able to use blueprints with ease and accuracy. As introduced earlier in Technical Training, using blueprints, drawings, and other trade documents requires learning to make sense of the special symbols, codes, terminology, and rules used to convey detailed information about roof projects. This unit offers further instruction and practice to help the Roofer apprentice refine skills in interpreting blueprints and technical documents for a variety of key purposes. These include a deeper understanding of roof construction details, and of the conventions used throughout the construction industry to communicate about them both across the trades, and among other building disciplines such as architecture, engineering, estimating, and inspection. Other key purposes include the use of blueprints as a resource in organizing and coordinating work on roof-project jobsites, and preparing take-offs of required materials. Unit content touches on all of these aspects of blueprint use in the Roofer trade, and includes opportunities to practice blueprint interpretation concerning a variety of roof-detail drawings (e.g. isometric/cross-section views of parapets; expansion joints) and related documents. A companion unit makes use of blueprints in the context of preparing estimates and quantity surveys for typical roofing projects.

Objectives and Content:

Percent of Unit Mark (%)

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|--|------------|
| 1. Describe the taxonomy and variety of blueprints used in the Roofer trade. | 30% |
| a. Review principles and conventions of technical drawing as introduced in Level 1. <ul style="list-style-type: none">• Comparison/contrast re: major characteristics of common roof types and details• Projections and views• Line work/weight, lettering, and other standards• Common architectural symbols and abbreviations• Measurements, scales(s) and applied geometry• Making/verifying sketches from technical drawings, blueprints, and/or specifications• Other (specified by instructor) | |
| b. Primary categories of blueprint taxonomy and their significance <ul style="list-style-type: none">• Architectural• Structural• Mechanical• Electrical• Other (specified by instructor) | |
| c. Secondary categories of blueprint taxonomy and their significance <ul style="list-style-type: none">• Specifications• Schedules• Book (Table of Specifications)• Addenda | |
| d. Residential project blueprints vs. ICI project blueprints | |
| e. Using manuals, codes, standards, and shop drawings in conjunction with blueprints | |
| f. Other (specified by instructor) | |

- 2. Describe the preparation and use of blueprints re: Roofing projects. 20%**
- a. Detailed mapping of site and site characteristics
 - b. Visual representation of construction and/or location of a built structure
 - c. Specification of essential details and components (e.g. movement joints; roof-area dividers, etc.)
 - Shape
 - Size
 - Function
 - Materials used
 - Access
 - Construction details (including membranes, plies, joints, transitions, etc.)
 - Construction sequence and timetable
 - d. Aid in estimating and optimizing use of materials
 - e. Aid in identifying and coordinating tasks among the trades and other building disciplines
 - f. Roles/responsibilities in preparing/using blueprints
 - Client
 - Specification writer(s)
 - Designer
 - Architect
 - Mechanical engineers (electrical; HVAC, plumbing, etc.)
 - General contractor
 - Subtrades
 - g. Sequence of blueprint preparation, distribution, and use (e.g. tendering/bidding)
 - h. Interpreting blueprint codes (including hierarchy of importance)
 - i. Other (specified by instructor)

- 3. Demonstrate use of a wide variety of roof-project blueprints, including roof-detail drawings, to derive/verify information per instructor's specifications. 50%**
- a. Working with the conventions of blueprints/technical drawing
 - Accurate identification of all lines, symbols, and abbreviations
 - Interpreting information in title block to answer assigned questions
 - Using cross reference symbols and notes to extract/verify information
 - Generating new information through blueprint use/interpretation
 - Other (specified by instructor)
 - b. Navigating within/across major categories of blueprint taxonomy in relation to the roof plan
 - Interpret the architectural drawings of a complex building
 - Interpret the structural drawings of a complex building in relation to the roof plan and architectural drawings.
 - Interpret specifications, revisions, and addenda
 - Interpret the building sections of a complex building in relation to mechanical, electrical, structural, and architectural drawings.
 - c. Other (specified by instructor.)

Roofer

Unit: E1 Steep-Roof Construction Principles & Components

Level: Two

Duration: 35 hours

Theory: 35 hours

Practical: 0 hours

Overview:

This overview unit introduces the components, key practices, and preferred applications associated with shingle, tile, and pre-formed metal systems used primarily in steep-roof construction. Content supplements other units concerned with the materials, tools/equipment, documents, and standards of this core area of Roofer trade practice. Its special emphasis concerns how all these aspects come together in procedures and techniques associated with shingling, roof-tiling, and pre-formed metal roofing product installation. The unit offers the theoretical knowledge required to appreciate 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 steep-roof building practice. Other units round out this content. They provide a closer look at the 'hands-on' requirements of performing steep-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 types of steep-roof systems and their construction details. | 30% |
| Steep-roof systems and components | |
| a. | |
| • Shingled-roofs | |
| • Tiled-roof systems | |
| • Pre-formed metal roof systems | |
| b. Loading, drainage, and substrate requirements | |
| c. Other (specified by instructor) | |
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| 2. Describe/explain installation procedures re: shingled roof systems. | 40% |
| a. General considerations/techniques re: phases of shingle-roof installation | |
| b. Selection, forming/fitting, securement, and caulking of shingle-roof flashings, including: | |
| • Assessment of project requirements re: flashings | |
| • Location/selection of flashing to suit job (e.g. rake-edge vs. drip edge vs. back-pan, etc.) and specifications (e.g. plumbing vents; goose-neck exhausts, etc.) | |
| • Selection/compatibility (e.g. metallurgical) of fasteners re: flashing and substrate | |
| • Techniques for cutting, forming/jointing (e.g. mitres), and caulking of flashings | |
| c. Designing, building, and installing saddles/crickets, including | |
| • Assessing project needs for saddles/crickets | |
| • Designing, locating, and lay-out of saddles/crickets (e.g. behind chimneys and other roof-openings) | |
| • Basic techniques for fabricating saddles and crickets | |
| d. Selection, fitting, and placement of underlayment material(s), including: | |
| • Criteria for selecting particular product (e.g. mineral-surfaced vs. peel-and-stick vs. felt; | |

- compatibility with particular shingles; etc.)
- Anticipating/containing potential impacts of ice-damming, condensation, and roof-slope characteristics
- Relaxing, measuring, and cutting the underlayment (including overlap allowances)
- Special considerations re: peel-and-stick underlayment application
- e. Cutting, placement, fastening, and tabbing of shingles, including:
 - Shingling layouts, including patterns (brick; random), starter course, allowances for roof-slope/-shape characteristics, exposure/overlaps, and course-matching at dormers
 - Shingle-cutting techniques, including wood vs. asphalt; special requirements re: transitions with flashings, projections, edges, valleys, capping; ridge-caps
 - Fastening techniques, including selection of fasteners; adjustment of nailing guns; maintaining patterns/overlap allowances; special considerations re: hips and ridge-caps, etc.
 - Tabbing methods, including windproofing, applying adhesive, and caulking
- f. Location, lay-out, clearance-cutting, and installation of shingled-roof vents, including:
 - Types of vent and vent-flashings (e.g. turbine, attic, and ridge)
 - Rationale for installation of vents, including placement
 - Calculating project needs re: number and optimal location of vents required
 - Procedure and precautions re: cutting roof-decks for vent installation
 - Standards and techniques for sealing roof projections with mastics and caulking
- g. Other (specified by instructor)

3. Describe/explain installation procedures re: tiled roofing systems. 10%

- a. General considerations/techniques re: phases of tiled-roof installation (e.g. plumbing vents and gooseneck exhausts)
 - Selection/use of specialized tools/fixtures and fasteners for tiled-roof projects, including tile-cutters and diamond-bit blades, straight-line jigs/templates, etc.)
 - Lay-outs and specifications for executing patterns re: tiled-roof projects and associated materials (e.g. interlocking tiles)
- b. Selection, fitting, and placement of underlayment material(s), including:
 - Precautions against ice and water back-up
 - Choice of underlayment material (e.g. metal vs. roll roofing vs. mineral-surfaced)
 - Fitting, placement (including overlap allowances), and securement
- c. Selection, forming/fitting, securement, and caulking of tiled-roof vents, including:
 - Determining quantity and location of tiled-roof vents
 - Sealing of vents to underlayment
- d. Location, lay-out, clearance-cutting, and installation of tiled-roof flashings, including:
 - Assessment of project requirements re: flashings
 - Location/selection of flashing to suit job (e.g. rake-edge vs. drip edge vs. back-pan, etc.) and specifications
 - Selection/compatibility (e.g. metallurgical) of fasteners re: flashing and substrate
 - Techniques for cutting, forming/jointing (e.g. mitres), and caulking of flashings
- e. Selection, fitting, and placement of tiled-roof strapping, including:
 - Locating rafters and establishing nailing/fastener pattern
 - Lay-outs for tiled-roof strapping
- f. Lay-outs, location, and securement of starter strips and closure strips, including:
 - Establishing height, location, and start-line re: tiled-roof starter strips
 - Staggering of starter-strip butt joints
 - Selection of closure-strip material(s) to suit job (e.g. bird stops, screens, and foam closures)
 - Placement and securement of closure strips
- g. Fastening and cutting of roof tiles, including:
 - Special tips and techniques for cutting/fitting tiles around flashings, valleys, capping, projects, and vents
 - Establishing and maintaining pattern for tile/fastener placement
 - Fastening of ridge-/hip-caps
- i. Preparing and applying mortar to tiled-roof capping and valleys
 - Selection, mixing, and colour-matching of tiled-roof mortar
 - Considerations re: mortar placement, including environmental/atmospheric conditions
- j. Other (specified by instructor)

4. Describe/explain installation procedures re: pre-formed metal (PFM) roofing systems. 20%

- a. General considerations/techniques re: phases of PFM roof installation
- b. Basic sheet-metal work (e.g. re: cutting) and carpentry method/tools (e.g. re: strapping) for PFM work
 - Selection/use of aviation snips, tin-snips, saws, nibblers, chalkline, sliding T-bevel, squares, pop-riveters, staplers, and other wood/metal fastening tools to perform PFM-related tasks such as angle lay-outs and mitre-cuts, overlapping of corners, fabrication of crickets, etc.)
 - Review of flashing/strapping, fasteners, and other materials associated with PFM roof installation (e.g. Z-Bar, wooden and other channels, etc.)
- c. Selection, fitting, and placement of underlayment material(s), including:
 - End-/side-lap allowances
 - Adaptation of general to suit PFM underlayment material (e.g. peel-and-stick vs. mineral-surfaced)
- d. Lay-outs, location, fitting, and securement of PFM-roof starter strips and strapping including:
 - Chalk-lining of lay-out pattern for strapping
 - Compatibility/choice of wood/metal re: strapping installation
 - Fastening/anchoring of strapping
 - Cutting, placement, fastening, and caulking of foam/metal and other closure strips
- e. Lay-outs, seam-forming, and securement for the fastening of PFM roofing, including:
 - Standards (e.g. manufacturer specifications), selection, and application re: PFM fasteners and hardware (e.g. screws, washers, panels, clips); compliance with predetermined lay-outs
 - Types of PFM panels and associated seams (e.g. single-/double-standing; S-Lock, batten)
 - Selection/use of seamers (hand/power), adjustable-torque drivers, and other tools/equipment
 - Special requirements (e.g. adjustment of driver torque to protect materials; clean-up of filings, shavings, and other PMR installation-related metal debris, etc.)
- f. Location, lay-out, clearance-cutting, and installation of PFM-roof flashings, including:
 - Lay-out for flashings, crickets, saddles, etc.
 - Cutting, fitting, and mitre-jointing
 - Use of screws, rivets, and butyl tape to fasten and seal flashings
- g. Calculations, placement, and securement re: ridge-vents and snow-guards, including:
 - Assessing general requirements and precautions re: venting and snow-guard requirements
 - Considerations re: selection (e.g. hood vs. pre-formed), capacity/requirements, placement, and intended purpose of project-specific vents and snowguards
 - Techniques for applying ridge vents
 - Techniques/standards for installing snowguards (e.g. welds vs. screws vs. bolts; fastener schedules/patterns)
- h. Other (specified by instructor)

Roofer

Unit: E2 Practicum: Shingled Roofwork

Level: Two

Duration: 14 hours

Theory: 0 hours

Practical: 14 hours

Overview:

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

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Review special hazards/practical precautions associated with shingled-roofwork installation practices.	10%
2. Demonstrate installation techniques re: flashings for shingled roofwork.	15%
<ul style="list-style-type: none"> a. Assessment of project requirements re: flashings <ul style="list-style-type: none"> • Interpreting standards and job specifications/standards • Selecting flashing to suit project type and job specifications • Performing layout(s) for installation of flashings b. Forming/jointing and fitting of flashings c. Securement and caulking of flashings d. Other (specified by instructor) 	
3. Demonstrate installation techniques re: saddles/crickets for shingled roofwork.	15%
<ul style="list-style-type: none"> a. Assessing project needs for saddles/crickets b. Design, locating, and lay-out of saddles/crickets c. Fabrication of saddles/crickets d. Installation and securement e. Other (specified by instructor) 	
4. Demonstrate installation techniques re: underlayment(s) for shingled roofwork.	10%
<ul style="list-style-type: none"> a. Selection of underlayment material(s) <i>per</i> project specifications b. Relaxation of underlayment c. Special techniques re: peel-and-stick underlayment d. Other (specified by instructor) 	
5. Demonstrate techniques re: shingle layouts, fitting, and securement.	30%
<ul style="list-style-type: none"> a. Design and layout techniques <ul style="list-style-type: none"> • Practical design and layout, including patterns • Establishing special allowances for roof-slope/-shape characteristics, exposure/overlaps, and course-matching at dormers b. Cutting and fitting shingles <ul style="list-style-type: none"> • Adapting techniques to products (e.g. asphalt, wood, and other shingling products) • Fitting for transitions with ridge-caps, capping, edges, projects, and flashings, etc. 	

- Other (specified by instructor)
- c. Fastening
 - Selection/adjustment of nailing guns
 - Practical design and layout, including patterns
 - Selection of fasteners and fastener patterns to suit project materials and fastener pattern
 - Maintaining/verifying patterns and overlap allowances
 - Special considerations/fastening practices re: hips, ridge-caps, etc.
- d. Tabbing
 - Windproofing methods
 - Applying adhesive(s)
 - Caulking the work
- e. Other (specified by instructor)

6. Demonstrate installation techniques re: vents for shingled roofwork. 20%

- a. Vent lay-outs and clearances
 - Practical interpretation of specifications/standards re: required type, number, and location of vents
 - Cutting clearances for different kinds of vent, including special precautions to avoid damage to deck
 - Calculations re: vent quantity/location *per* project specifications
- b. Installation and securement of vents
 - Attic type
 - Turbine type
 - Ridge type
 - Other (specified by instructor)
- c. Sealing roof projections
 - Application of mastic
 - Caulking
 - Ridge type
- d. Other (specified by instructor)

Roofer

Unit: E3 Practicum: Tiled Roofwork

Level: Two

Duration: 7 hours

Theory: 0 hours

Practical: 7 hours

Overview:

This overview unit offers apprentices the opportunity to develop their knowledge and skills regarding tiled-roof installation techniques by means of hands-on practice under the supervision of a qualified instructor. In many important ways, the skills required to practice this particular specialty (e.g. performing layouts) overlap with those of the steep-roof sector more generally. However, the materials of tiled roofwork are quite distinct, and impose special requirements even with regard to such basic considerations as proper techniques for handling and for cutting them. Consequently, this unit of instruction also offers intermediate-level apprentices a chance to explore significant comparisons and contrasts between tiled roofwork installation and other areas of trade practice with which they might be more familiar.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Review special hazards and practical precautions associated with tiled-roofwork installation practices.	5%
2. Demonstrate general techniques re: undertaking tiled roofwork projects.	10%
a. Selection/special application of tools, equipment, and accessories for tiled roofwork. <ul style="list-style-type: none"> • Specialty cutters, blades, and bits • Jigs, fixtures and templates • Fasteners • Tips and preferred methods of work with tiled-roofwork products • Other (specified by instructor) 	
b. Interpreting tiled-roofwork project specifications <ul style="list-style-type: none"> • Patterns • Layouts 	
c. Other (specified by instructor)	
3. Demonstrate installation techniques re: underlayment(s) for tiled roofwork.	10%
a. Selection, fitting, and placement of underlayment material(s)	
b. Practical precautions against ice and water back-up	
c. Fitting and placement of underlayment materials <ul style="list-style-type: none"> • Securement • Overlap allowances 	
d. Other (specified by instructor)	
4. Demonstrate installation techniques re: vents for tiled roofwork.	15%
a. Interpreting job specifications and standards re: tiled-roofwork vent requirements <ul style="list-style-type: none"> • Determining type(s) of vent required • Determining quantity required 	

- Determining location(s) required
- b. Forming/fitting of tiled-roofwork components re: vents and exhausts
- c. Placement and securement of tiled-roof vents, exhausts, and accessories
- d. Caulking, including sealing of vents to underlayment
- e. Other (specified by instructor)

5. Demonstrate installation techniques re: flashings for tiled roofwork. 15%

- a. Selection, lay-out, and location of tiled-roof flashings
 - Assessment of project requirements re: flashings
 - Location/selection of flashing to suit job (e.g. rake-edge vs. drip edge vs. back-pan, etc.) and specifications
 - Selection/compatibility (e.g. metallurgical) of fasteners re: flashing and substrate
- b. Cutting clearances, including special precautions
- c. Installation practices
 - Techniques for cutting tiled-roof flashings
 - Fitting and jointing of tiled-roof flashings
 - Caulking tiled-roof flashings
- d. Other (specified by instructor)

6. Demonstrate installation techniques re: strapping for tiled roofwork. 10%

- a. Interpreting the project's strapping requirements
 - Interpreting specifications re: strapping material(s)
 - Locating rafters
 - Executing lay-out for tiled-roof strapping
 - Establishing nailing/fastener pattern
- b. Fitting and securement of strapping
 - Cutting strapping
 - Placing and fastening strapping
 - Lay-outs for tiled-roof strapping

7. Demonstrate installation techniques re: roof-tile cutting, placement and securement. 20%

- a. Laying out, locating, and securing starter/closure strips
 - Establishing height, location, and start-line re: tiled-roof starter strips
 - Staggering of starter-strip butt joints
 - Selection of closure-strip material(s) to suit job
 - Placement and securement of closure strips
- b. Fastening and cutting of roof tiles
 - Special tips and techniques for cutting/fitting tiles re: transitions with flashings, valleys, capping, projects, and vents
 - Establishing/maintaining pattern for tile/fastener placement
 - Fastening of ridge-/hip-caps
- c. Other (specified by instructor)

8. Demonstrate installation techniques re: applying mortar to tiled roofwork. 15%

- a. Selecting, mixing, and colour-matching mortar(s)
- b. Preferred practices re: mortar application, including adaptation(s) to anticipate environmental/atmospheric impacts
- c. Preparing and applying mortar to tiled-roof valleys and caps
- d. Other (specified by instructor)

Roofer

Unit: E4 Practicum: Preformed Metal Roofwork

Level: Two

Duration: 21 hours

Theory: 0 hours

Practical: 21 hours

Overview:

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

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Review special hazards and practical precautions associated with preformed-metal roofwork installation practices.	5%
2. Demonstrate the use of metalworking/woodworking tools and basic techniques as required to install preformed-metal roof systems/components.	5%
<ul style="list-style-type: none"> a. Woodwork tools/techniques b. Metalwork tools/techniques c. Other (specified by instructor) 	
3. Demonstrate installation techniques re: preformed-metal roofwork underlayment(s), strapping, and starter/closure strips.	25%
<ul style="list-style-type: none"> a. Installing underlayment material(s) <ul style="list-style-type: none"> • Interpreting specifications re: selection of materials and system components • Establishing allowances for side-/end-laps • Fitting and placing underlayment material(s) • Adapting technique(s) to suit underlayment (mineral-surfaced; peel-and-stick) • Other (specified by instructor) b. Installing starter/closure strips and strapping <ul style="list-style-type: none"> • Preferred practices for lay-out/location, fitting, and securement of these components • Compatibility/choice of wood/metal re: strapping installation • Fastening/anchoring of strapping • Cutting, placement, fastening, and caulking of foam/metal and other closure strips c. Other (specified by instructor) 	
4. Demonstrate installation techniques re: preformed-metal roofwork panels and related products.	25%
<ul style="list-style-type: none"> a. Identifying/selecting pre-formed metal roofwork products, accessories, etc. in general b. Interpreting and applying standards/specifications re: selection and use of specific products and associated hardware (screws, washers, panels, clips, etc.) compliance with predetermined lay-outs c. Laying-out and verifying lay-out(s) re: project specifications d. Forming seams <ul style="list-style-type: none"> • Selecting/using seamers • Using adjustable torque-drivers (including fine adjustment) 	

- Using other specialty equipment for seam-forming
- e. Fastening and securing preformed-metal roofwork products
- f. Hazards and precautions re: clean-up of metal shavings, filings, and other debris
- g. Other (specified by instructor)

5. Demonstrate installation techniques re: preformed-metal roofwork flashings. 25%

- a. Locating/laying-out the installation
 - Saddles and crickets
 - Flashings
- b. Locating/cutting clearances
- c. Cutting and fitting/jointing of flashing materials (including mitre-cuts)
- d. Application of screws, rivets, and butyl tape to secure/seal flashings
- e. Other (specified by instructor)

6. Demonstrate installation techniques re: preformed-metal roofwork vents and snow-guards. 15%

- a. Identifying/selecting vent and snow-guard products, accessories, etc. in general
- b. Practical assessment of specific project requirements and precautions re: venting and snow-guard components
 - Type
 - Layout and placement
 - Calculations
- c. Installing vents
 - Preferred practices and fastening methods
 - Selection/placement of fasteners
- d. Installing snowguards
- e. Other (specified by instructor)

Roofer

Unit: F1 Waterproofing & Maintaining Roof Structures

Level: Two

Duration: 49 hours

Theory: 25 hours

Practical: 24 hours

Overview:

This unit introduces basic concepts and practices concerned with preventing, assessing, and repairing damage to roof structures caused by water. This concern is so fundamental to Roofer trade practice that the ability to apply the special procedures and products to protect roof structures against moisture of many varieties represents a crucially important skill set in its own right. The unit's theoretical content offers apprentice Roofers an overview of this skill-set, as well as an opportunity to refine their practical familiarity with the use of water-proofing and damp-proofing products which provide a first line of defense against roof failure. Elsewhere in Technical Training, apprentices can build skills in this key area of Roofer tradework by completing units on the identification and the troubleshooting of roof failures, including practical maintenance/repair techniques.

Objectives and Content:

**Percent of
Unit Mark (%)**

- 1. Explain relationship between the structural integrity of roof-system components and the control of moisture from exterior/interior sources. 50%**
 - a. General concept of structural integrity re: roof systems/components
 - Interdependence of all building components/systems re: structural integrity
 - Technical/technological considerations re: the building sciences
 - Cost/benefit considerations, including engineering/uptake of new materials with better maintenance-cost advantages (e.g. specialized flashings to replace plastic pans and pitch pockets; membranes; coatings, etc.)
 - b. Overview of exterior/interior factors and impacts that effect the structural integrity of built structures in general, and roof structures in particular, including:
 - Quality of design, planning/coordination, and execution of construction (e.g. selection of materials, compliance with standards, etc.)
 - Gravitational force and its resolution into structural stresses
 - Loading and use requirements
 - Expansion and contraction
 - Site characteristics (climate, soils, slope, seismology, drainage, architectural environment, etc.)
 - Quality of provisions for maintenance and repair
 - Other (specified by instructor)
 - c. Variety and significance of moisture-related impacts (exterior/interior) on structural integrity of instructor-specified roof systems/components, including:
 - Physical properties of water – solid, liquid, gaseous – and significance of variation
 - Ice dams; heaving/settling of foundations and footings
 - Hydrostatic pressure
 - Propagation of moulds, rot, rust, corrosion, etc.Common sites of moisture-related damage to roof systems/components, e.g. leaks around mechanical system components (air-conditioning units, exhaust fans, etc.) and architectural

- features (doors, windows, etc.)
 - Other (specified by instructor)
- d. Overview and differentiation of key concepts/practices re: roof maintenance and repair, including:
 - Inspection
 - Prevention
 - Maintenance
 - Testing
 - Troubleshooting
 - Replacement
 - Repair
- d. Waterproofing and damp-proofing as a special category of moisture-control and preventive-maintenance practices re: structural integrity
 - To ensure the integrity of entire built structures
 - To ensure the integrity of roof systems/components in particular
- e. Other (specified by instructor)

2. Demonstrate procedure for waterproofing roof surfaces. 25%

- a. Techniques to prepare surfaces/substrates (vertical and sub-grade) for waterproofing.
 - Assessing below-grade and other hazards
 - Selecting primer(s) compatible with specific substrate (e.g. wood vs. concrete)
 - Grinding/scraping surface irregularities
 - Grouting gaps and cracks
 - Cleaning/drying substrate
 - Application of primer *per* manufacturer specifications and industry standards
 - Other (specified by instructor)
- b. Techniques to applying membranes for waterproofing.
 - Assessing below-grade and other hazards
 - Adapting methods -- heating, detailing, end-/side-lap allowances, etc. -- to suit selection of membrane (e.g. torch-on vs. hot rubber compound vs. peel-and-stick)
 - Fitting/placement of membranes
 - Where/when to apply hot rubber compound and/or reinforcing ply
 - Other (specified by instructor)
- c. Techniques to apply protection board for waterproofing.
 - Assessing below-grade and other hazards
 - Selecting protection board to suit project requirements (e.g drain-mat vs. insulation vs. corrugated products)
 - Fitting/placement and securement using insulation and/or adhesive
 - Other (specified by instructor)

3. Demonstrate procedure for damp-proofing roof surfaces. 25%

- a. Techniques to apply primer(s) for damp-proofing.
 - Selecting primer(s) compatible with specific substrate (e.g. metal vs. masonry) and environmental conditions
 - Applying primer using brush, roller, and spray-applicator
 - Other (specified by instructor)
- b. Techniques to apply coatings for damp-proofing.
 - Assessing below-grade and other hazards
 - Selecting coating (e.g. rubberized, fibrated, non-fibrated) to suit environmental conditions and other project requirements
 - Selecting/using roller, trowel, and spray-applicator *per* project requirements and choice of coating(s)
 - Other (specified by instructor)

Roofer

Unit: G1 Roofer Jobsite Preparation

Level: Two

Duration: 18 hours

Theory: 11 hours

Practical: 7 hours

Overview:

This unit offers provides important theoretical grounding required to prepare jobsites for roof installation/replacement projects of both the flat-roof and steep-roof variety. Roofer jobsite hazards and precautions are thoroughly examined in close association with the unit's technical topics and subtopics. The unit, including its safety-related themes, is complemented by related units devoted specifically to scaffolding/roof-access structures; lifting/rigging and hoisting, and jobsite coordination/maintenance.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Describe major considerations, requirements, and rationale re: organizing and preparing roof construction project jobsites in general.	45%
a. Review requirements for preparing roofing-project jobsites, including: <ul style="list-style-type: none">• Organizing work using documentations and communication• Assessing worksite conditions• Measurement/estimates re: materials, rates of application, etc.• Managing delivery, storage, and placement of tools, equipment, and materials (on ground and on roof)• Safety regulations and protocols (on ground and on roof)• Other (specified by instructor)	
b. Major criteria and rationale re: re: on-site evaluation/verification of job conditions <ul style="list-style-type: none">• Identifying, interpreting, and applying all relevant project specifications• Provision for site access/egress• Starting/finishing points• Project equipment requirements, including emission-control kettles, disposal chutes, etc.• Fall protection and access-structure requirements• Safety-related structures, including fences, public walkways, guard-rails, etc.• Interplay of project materials, materials-handling equipment, and site/project specifications• Curb/parapet heights• Type of deck• Problem areas re: safety/production considerations• Assessment of all hazards, precautions, and regulatory requirements• Standards re: secure footings for equipment, temporary access structures, etc.• Utilities (water/electrical) required• Other (specified by instructor)	
c. Procedure/criteria for ensuring jobsite access, shelter, and other facilities for personnel, including: <ul style="list-style-type: none">• Selection and use of access equipment, including scaffolding, ladders, scissor-lifts, personnel hoisting equipment, etc.•• Regulatory requirements re: operator certification (e.g. forklift), operation of access equipment,	

- fall arrest/restraint, and related concerns
- Footings and attachment to building
- d. Procedure/criteria for positioning/storage of equipment and materials on the ground
 - Planning, and communicating with jobsite personnel/others re: jobsite organization of materials, equipment, etc.
 - Regulations re: placement of kettles, propane tanks, disposal bins
 - Positioning of safety equipment including caution tape, safety fence/cones, fire extinguishers, and water hoses
- e. Procedure/criteria for positioning/storage of equipment and materials on the roof
 - Planning/sequencing the positioning of equipment and materials on roof
 - Special requirements for positioning such equipment as mini mop, roof cutter, hoist, etc.
 - Importance of recognizing hazards and taking specific precautions re: positioning of roofing materials/equipment with respect to loading, eight distribution, ease of access, securement, vent openings
 - Securement of propane tanks on roof while hoisting
 - Location of safety equipment
 - Communication of all necessary information to appropriate personnel
- f. Procedure/criteria for establishing systems for containment/disposal/salvage of project materials
 - Components of material containment/disposal systems on roofing project jobsites (e.g., bins, chutes, bags, handling equipment)
 - Regulations and standards, including re: separation of materials (metal; gravel) and other special requirements (asbestos; mould)
 - Standards and procedure for erecting/disassembling chutes and counterweights
 - Techniques for using hoist to dispose of materials
- g. Comparison/contrast jobsite [preparation requirements for flat- vs. steep-roof projects
- h. Comparison/contrast preparations for installation vs. replacement projects
- i. Regulatory requirements (e.g. municipal bylaws, provincial statutes, etc.)
- j. Other (specified by instructor)

2. Describe/demonstrate jobsite-preparation procedures specified for new-roof installation projects.

45%

- a. Substance and significance of industry standards for ensuring that all new-roof project surfaces (including substrates) are properly secured, free of defects, clean, and dry.
- b. Review comparison/contrasts re: types of deck (wood, concrete, and steel)
- c. Procedures, standards, and special precautions re: cleaning roof decks, including limiting access to cleaned deck, including:
 - Determining extent, scheduling, and intensiveness of project-specific deck-cleaning requirements
 - Techniques/precautions for removing construction debris using specified tools/equipment, including vacuums, air compressors, power brooms, etc.
 - Techniques/precautions for removing fuels, oils, and similar contaminants
 - Special hazards/precautions re: instructor-specified materials (e.g. phenolic insulation).
- d. Inspection procedures and standards to identify deck defects re: performance/failure of new roofs, including:
 - Symptoms of such defects as corrosion, height irregularities, deflection, uncured concrete, corrosion, etc.
 - Techniques for locating, assessing extent, and performing required documentation and notifications re: deck defects
 - Comparison/contrast inspection requirements as a function of deck type (wood vs. concrete vs. steel, etc.)
- e. Verification techniques and requirements re: placement of new-roof parapets and penetrations, including:
 - Components associated with roof penetrations re: flashings (chimney and other), drains, etc.
 - Standards re: location, heights, and placement/securement of nailers, reglets, cants, and blocking
 - Compatibility of materials re: parapets/penetrations
- f. Procedures and standards for drying new-roof deck, including:
 - Variation(s) in drying-characteristics/-requirements as a function of deck type and of atmospheric conditions
 - Techniques for limiting exposure of deck to moisture
 - Techniques/standards for determining area that requires drying, and when deck is dry enough for new-roof installation to proceed.

g Other (specified by instructor)

3. Describe/demonstrate jobsite-preparation procedures specified for roof-replacement projects. 35%

- a. Recognizing special hazards, precautions, and site-preparations associated with roof-replacement projects vs. new-roof construction projects
- b. Using tools, equipment, and special accessories typically required for site-preparation re: roof replacement, including:
 - Selection of all tools/equipment required to prepare specific jobsite for roof-replacement , e.g. backpack-blowers, power washers, vacuums, etc.
 - Selection/securement of tarpaulins, blankets, fabrics and other materials to shield and protect non-project components, etc.
 - Selection/application of substrate cleaners, abrasives, primers, sealants, and associated products
- c. Assessing risks/requirements re: composition of debris, materials, and building components (e.g. flashings) requiring removal, containment/disposal, salvage, and/or special precaution(s)
 - Compliance with regulations and preferred procedures re: removal of specific hazardous materials/contaminants, including animal/vegetable bio-matter, asbestos, hypodermic needles, moulds, petrochemicals, etc.
 - Collecting, containing, and managing debris
- d. Identifying and preventing damage to non-project site features, e.g. mechanical equipment, skylights, windows, vehicles, etc.
 - Recognizing areas of potential/prior damage due to fire, fume infiltration, staining, etc.
 - Installing barriers and protection materials as required
 - Other (specified by instructor)
- e. Procedures for removal, disposal, and/or salvage of roofing materials without harm to exposed surfaces or other building components
 - Damage-preventive placement of all project materials and equipment
 - Order of operations for removing roof-coverings, flashings, etc.
 - Adapting removal activity to weather impacts and other site conditions re: selection of equipment, work-scheduling, and choice of removal/disposal methods
 - Estimating the roof-surface area that can be made watertight within a specified operational time-frame
 - Damage-preventive placement of all project materials and equipment
- f. Preparation and repair of wooden, concrete, and metal substrates/substrate components
 - Procedures to ensure ensuring temporary sealing and drainage of roof
 - Techniques for assessing and remedying specific structural and/or substrate defects, including unsecured/compromised materials such as spalled concrete, rotted wood, corroded/rusted metal components, dents, voids, tears, etc.
 - Techniques for repairing/replacing damaged vapour barrier, insulation, and for securing loose components
- f. Practical calculations and procedures for modifying parapets/penetrations.
 - Analyzing requirements for adjustment, modification, extension, dismantling, and/or replacement of existing components (roof-mounted equipment) to accommodate roof-replacement project specifications
 - Calculating the required height of parapets/penetrations
 - Selecting/using compatible materials to build extensions and additions
 - Procedure and precautions for dismantling existing construction
 - Making special adjustments, including the extension of pipes, doorsills, and drains and/or adding slopes to coping
 - Other (specified by instructor)
- g. Techniques/variations re: installation of water cut-offs, temporary seals, and temporary drains.
 - Analyzing installation requirements re: the placement, time-frame, and selection of these components
 - Selecting compatible materials for cut-offs and seals (e.g. sealant, membrane, and asphalt)
 - Procedures for installation, including verification that installed components conform with all applicable standards
 - Selecting compatible materials for cut-offs and seals (e.g. sealant, membrane, and asphalt)
- a. Recognition/analysis of project's technical features, and their implication for site-preparation planning (e.g. type/phases of project, required materials and equipment, materials, construction details, industry standards, etc.)

- b. Recognition/analysis of human, environmental, and geographic factors and their significance re: site-preparation (e.g. seasonality, jobsite surroundings, etc.)
- c. Outline/justify adaptation of general site-preparation procedures to specific project requirements and constraints
- d. Other (specified by instructor)

Roofer

Unit: G2 Scaffolding & Roof-Access Structures

Level: Two

Duration: 14 hours

Theory: 7 hours

Practical: 7 hours

Overview:

The subject of scaffolding and access structures is fundamental to the safe and productive practice of the construction trades. It is closely bound up with a complex array of technological and regulatory issues, as well as with highly specific issues involving particular tasks, project characteristics, and rigorous safety precautions. The special hazards and materials of the Roofer trade make it mandatory that even entry-level apprentices achieve a sound working knowledge of scaffolding and access structures.

This unit of instruction provides an overview of essential information about access-structure equipment and practical techniques, with a special emphasis upon safety and regulatory concerns. Unit content includes important guidance about the selection of fall-protection equipment and scaffolding systems, as well as procedures for erecting, inspecting, disassembling and storing access-structure components.

Objectives and Content:

Percent of Unit Mark (%)

1. Describe scaffolding and access structures.

20%

- a. Varieties
 - Ladders
 - Ramps, runways, and stairs
 - Scaffolding and scaffold systems
 - Suspended access equipment
 - Scissor lifts
 - Bleachers and stages
- b. Applications and preferred uses re: roofing projects
- c. General safety precautions and regulatory considerations
- d. Fall-protection requirements, apparatus, and techniques
- e. Dismantling and storage
- f. Interplay with rigging/hoisting procedures and equipment
- g. Other (specified by instructor)

2. Describe/demonstrate the selection and use of fall-protection equipment.

20%

- a. Variety of fall protection
 - Arrest
 - Prevention
 - Restraint
- b. Fall-arrest equipment and techniques
 - Harnesses
 - Lanyards
 - Lifelines (horizontal/vertical)
 - Rope-grabs

- Shock absorbers
- Tie-ins/anchor points
- c. Travel-arrest equipment and accessories
 - Belly-hooks
 - Belts
 - Harnesses
 - Half-harnesses
 - Lanyards
 - Rope-grabs
 - Tie-ins
 - Anchor points
- d. Fall prevention
 - Floor-opening protection
 - Guardrail systems
 - Wall openings

3. Describe/demonstrate use of ladders, ramps/runways, and temporary stairs.

20%

- a. Ladders
 - Varieties, including fixed, job-built, manufactured
 - Base-to-height ratio; three-point contact
 - Electrical and other hazards
 - Fall protection; tie-off
 - Founding
 - Ladder cages/jacks
 - Minimum extension
 - Overlaps
 - Rest platform
 - Safety feet
 - Securement
- b. Ramps, runways, and stairs
 - Relevant regulations
 - Varieties and their rationale/use(s)
 - Guardrails and handrails
 - Slope
 - Stepping laths (cleats)
 - Tread rise/run
 - Widths
- c. Construction techniques, materials, standards, and other requirements
 - Relevant regulations
 - Bearers (transoms/ledgers)
 - Braces
 - Handrails, guardrails, and ice-boards
 - Footings
 - Loading
 - Platform material
 - Rails/rungs
 - Ribbons
 - Sills
 - Stringers
 - Treads
 - Uprights
- d. Other (Specified by instructor)

4. Describe/demonstrate the selection, use, and maintenance of scaffolding.

10%

- a. Types of scaffolding and scaffolding systems, including preferred applications
 - Birdcage
 - Bridging and cantilever scaffolds
 - Independent/dependent
 - Rolling
 - Tube and clamp
 - Frame

- Machine scaffolds (including articulated booms, mast-climbing scaffolds, scissor-lifts, and zooms)
 - Applicable regulations (including re: spans, loading, safety codes, etc.)
- b. Major components
- Baseplates
 - Bearers
 - Brackets (end/side)
 - Casters
 - Clamps
 - Connectors/couplers
 - Farm wagons
 - Frames
 - Ledgers
 - Outriggers
 - Planks (decks; grates)
 - Putlogs
 - Rails
 - Reveal; pins
 - Ribbons
 - Screw-jacks
 - Sills
 - Standards
 - Toeboards
 - Transoms
 - Trusses
 - U-heads
 - Uprights
- c. Loading and capacities
- Dead/live loads
 - Ground loads
 - Leg
 - Loads
 - Rolling loads
 - Safe workloads
 - Static loads
 - Wind loads
 - Permissible spans
- d. Erection, maintenance, and disassembly of independent scaffolding
- Access/egress
 - Base lift
 - Base-to-height ratio
 - Bracing
 - Duty ratings (light/heavy)
 - Foundations
 - Guardrails
 - Single- and double-pole
 - Tie-ins (vertical/horizontal)
 - Wood and metal
- e. Erection, maintenance, and disassembly of suspended scaffolding
- Beam clamps
 - Guardrails, toeboards, etc.
 - Hoarding
 - Moving
 - Multipoint suspension
 - Platform materials
 - Rigging
 - Trusses/beams
- f. Erection, maintenance, and disassembly of hanging scaffolding.
- Box-ties
 - Check clamps
 - Guardrails
 - Puncheons

- Rakers
- g. Erection, maintenance, and disassembly of swing-stages
 - Anchors
 - Ascenders/descenders
 - Balance-point
 - Beams/thrust-outs
 - Counterweights
 - Multipoint suspension
 - Rigging
 - Tiebacks
- h. Other (specified by instructor)

5. Describe/demonstrate inspection and hoisting procedures re: scaffolding

10%

- a. Safety considerations, including regulatory requirements and precautions
- b. Inspection procedure, including rationale, critical targets, and documentation
- c. Targets for scheduled/periodic maintenance
- d. Special considerations re: rigging/hoisting operations

Roofer

Unit: G3 Lifting, Rigging, & Hoisting on the Roofer Jobsite

Level: One

Duration: 7 hours

Theory: 7 hours

Practical: 0 hours

Overview:

The durability, usefulness, and beauty of built structures depends crucially upon the soundness of their roof components. To help accomplish this goal, roofers and other builders rely heavily upon special techniques and accessories that permit the safe movement of heavy and unwieldy materials into place along with the tools and equipment required to secure them. A repertoire of rigorously-applied jobsite techniques for lifting, rigging, and hoisting diverse equipment and materials is a vital part of the Manitoba Roofer apprentice's heritage as a trade learner.

This unit of instruction introduces the basic concepts, techniques, and jobsite aids that are involved in the handling and placement of roofing materials on the modern jobsite. Content includes important information about how gravitational and other forces act on material loads of different shapes and sizes. The unit familiarizes apprentices with the rich fund of practical know-how and technological aids – both simple and complex – that are used to stabilize and position these loads as a routine requirement of modern trade practice. The considerable hazards in handling them on the roofing jobsite are also subject to important regulations and restrictions as outlined in this unit.

Objectives and Content:	<u>Percent of Unit Mark (%)</u>
1. Describe lifting, rigging, and hoisting in the Roofer trade.	15%
a. Scope and rationale re: listing, rigging, and hoisting applications	
b. Technical terms and major concepts (e.g. gravitational centres; mechanical advantage)	
c. Calculation of loads and weights	
d. General hazards and precautions re: transportation/handling of roofing materials	
• Size of load	
• Shape/symmetry of load	
• Fragility of load	
• Rigidity/stability of load	
• Identification of balance/stabilization points	
• Identification of required clearances re: start/end points	
• Interplay with access/temporary structures (e.g. lifting while on swing-stage)	
• Regulatory considerations (e.g. tying off)	
e. Other (specified by instructor)	
2. Describe/demonstrate Roofer lifting procedure and techniques.	15%
a. General guidelines, precautions, and regulations re: trade-related lifting operations	
b. Manual lifting	
• Hazards; precautions (e.g. secure footing; bending of knees)	
• Simple aids (e.g. rope and pulley)	

- General techniques
- Special considerations re: particular roofing materials/loads
- c. Mechanically assisted lifting
 - Hand signals
 - Precautions (e.g. pinch points re: feet/hands; position of other personnel; etc.)
 - Mechanical aids (e.g. hydraulic jack)
 - General techniques
 - Special considerations re: particular roofing materials/loads
- d. Basic features and preferred uses of the forklift
 - Manitoba requirements/restrictions re: forklift operation
 - Major components
 - Preferred uses
- e. Other (specified by instructor)

3. Describe/demonstrate Roofer rigging procedure and techniques.

20%

- a. General guidelines, precautions, and regulations re: trade-related rigging operations
- b. Knots and splices
 - Bowline
 - Clove-hitch
 - Rescue knot
 - Scaffold-hitch
- c. Identification/use of specified rigging aids and equipment
 - Balance bar
 - Chain
 - Choker
 - Clip
 - Come-along
 - Deadman
 - Drum
 - Equalizer beam
 - Fid
 - Hitch
 - Hook
 - Marline spike
 - Pulley
 - Ring
 - Rope –fabric and wire
 - Shackle
 - Sheave
 - Sling
 - Socket
 - Spreader bar
 - Thimble
 - Tirfor
 - Winch
 - Other (specified by instructor)
- d. Determination of load limits
- e. Determination of placement of load
- f. Determination of Safe Working Load (SWL)
- g. Placement of chokers and taglines in general
- h. Placement/use of chokers and slings for special-requirement loads
 - Smooth, heavy loads
 - Long, flexible loads
 - Imbalanced loads
 - Heavy, fragile loads
- i. Other (specified by instructor)

4. Describe/demonstrate Roofer hoisting techniques and procedure.

20%

- a. General guidelines, precautions, and regulations re: trade-related hoisting operations
- b. Major varieties of hoisting equipment/components, including preferred use and specific hazards/precautions

- Derricks
 - Winches
 - Boom trucks (including 'zoom boom' cranes)
 - Conventional vs. hydraulic cranes
 - Tower cranes
- c. Coordination/communication with hoisting equipment operator and other site personnel
- d. Other (specified by instructor)

5. Complete the Roofer Rigging & Hoisting Project *per* instructor specifications. 30%

- a. Identify all requirements, including safety hazards/precautions re: rigging and lifting instructor-specified load(s) as a function of particular roofing materials
- b. Select and use required lifting/rigging aids re: instructor-specified load(s)
- c. Communicate/coordinate -- including by hand signals -- with other jobsite personnel re: lifting of instructor-specified load(s)
- d. Other (specified by instructor)
