Roofer
Level 2

Rev. May 2015

Apprenticeship Manitoba

Roofer

Unit: B3 Roof Blueprints and Trade Documents

Level: Two

Duration: 35 hours

Theory: 28 hours

Practical: 7 hours

Overview:

Level One, Unit B2 "Roof Design and Technical Drawing" introduced the use of technical drawing in the roofing trades. This unit further examines the types, preparation and use of blueprints in the Roofer Trade and other areas (e.g., architecture, engineering, estimating and inspection). Roofers use roof blueprints and trade documents when coordinating roofing projects and preparing take-offs of materials.

Apprentices will practice identifying information from roof project blueprints and roof detail drawings (e.g., isometric/cross section views of parapets; expansion joints).

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

1. Describe types of blueprints used in the Roofer trade. **30%**

a. Review technical drawing (Level 1, Unit B2)
- Compare/contrast the 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
- Architectural
- Structural
- Mechanical
- Electrical
- Other (specified by Instructor)

c. Secondary categories of blueprint taxonomy and significance
- Specifications
- Schedules
- Book (Table of Specifications)
- Addenda

d. Residential project blueprints compared with Industrial, Commercial Institutional (ICI) project blueprints

e. Using manuals, codes, standards and shop drawings in conjunction with blueprints

f. Other (specified by Instructor)

2. Describe preparation and use of blueprints in 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 various 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
   - Interpret information in title block to answer assigned questions
   - Use cross reference symbols and notes to extract/verify information
   - Generate new information through blueprint use/interpretation
   - Other (specified by Instructor)
b. Navigate 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.)

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Apprenticeship Manitoba

Roofer

Unit: C3 Hot Process, Propane and Motorized Equipment

Level: Two

Duration: 21 hours

Theory: 7 hours

Practical: 14 hours

Overview:

Level One, Unit C1 "Roofing Tools and Equipment" introduced the trade tools and equipment used in the roofing trade. This unit provides further instruction and practical experience on the use of specialized power-operated rooftop equipment, maintenance and safety precautions.

This unit has a focus on hot-process equipment (e.g., torches, kettles, and tankers), hazards, procedures and precautions. Tools include power motors (e.g., propane gas, kerosene) and pneumatic tools (e.g., nailers, staples, spray guns).

This unit must be successfully completed to continue in the Roofer Apprenticeship Program.

Objectives and Content:	**Percent of Unit Mark (%)**
1. Describe/demonstrate set-up, use and maintenance of power-operated rooftop equipment. 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)	**30%**
2. Describe preparation and use of blueprints re: Roofing projects. 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. Clean foam filter g. Clean/replace spark plugs h. Clean of cooling system, including top fins i. Other (specified by Instructor)	**15%**

3. Describe/demonstrate set-up, use and maintenance of pneumatic tools and air compressors. **10%**

a. Special hazards and precautions
   - Protection of eyes and skin
   - Select and adjust 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 (inc. application of primer, paints, adhesives, coatings, and bonding agents)

e. Other (specified by Instructor)

4. Describe/demonstrate 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 procedures 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. Compare/contrast advantages re: use of kettles and tankers

f. Procedures for set-up, filling, firing and use
   - Specific hazards and precautions
   - Connect/disconnect re: hot-process equipment and fuel source
   - Connect/disconnect and brace piping for asphalt
   - Automatic versus manual firing
   - Maintain temperature and cleanliness of bitumen
   - Shut-down procedures

g. Procedures for draining/disposal of hot bitumen
   - Specific hazards, precautions (inc. WHMIS and regulations)
   - Select appropriate containers
   - Techniques/standards for transfer of material from tankers/kettles

- Storage/disposal requirements

h. Procedures for cleaning
   - Specific hazards, precautions (e.g., ventilating with forced air in confined space

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Apprenticeship Manitoba

Roofer

Unit: D1 Low Slope and Flat Roof Construction

Level: Two

Duration: 42 hours

Theory: 35 hours

Practical: 7 hours

Overview:

This unit reviews the major types of roof systems and construction (i.e., low slope, flat roof), and the procedures to install built-up roofing (BUR) and membrane systems.

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 installation procedures re: BUR systems — **45%**

a. General considerations/techniques re: phases of BUR-systems installation
b. Select, fit, secure and seal gypsum board, including:
   - Loose-laid, glued-down, and mechanically fastened installation methods
   - Fastener pattern lay-outs
   - Joint sealing
c. Select primer and options for applying primer to substrate
   - Use of rollers, applicators, and brushes
   - Impact of environmental conditions re: application
d. Select fit, seaming/joining, and secure 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. Select, lay-out, fit and secure 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 versus 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. Select, fit, 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)

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. Select, fabricate, secure and caulk 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: BUR installation
   - Hot-process
   - Cold-process
   - Conventional process

k. Special considerations/techniques re: inverted roofing systems (Protected Membrane Roofs [PMRs]), including assembly details, fitting/placement of components, and inspection

l. Other (specified by Instructor)

3. Describe 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 (inc. lay-out, shaping, securement, layering, back-mopping, and sealing)

m Other (specified by Instructor)

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Apprenticeship Manitoba

Roofer

Unit: D2 Practicum: Built-Up Roofing Installation

Level: Two

Duration: 21 hours

Theory: 0 hours

Practical: 21 hours

Overview:

This unit provides practical experience in Built-Up Roofing (BUR) installation procedures under the supervision of a qualified Instructor. Installation techniques include: gypsum board, primer(s), vapour-retarder, insulation, and protection board components; vents, drains, fixtures, and flashings; ballast and walkway components.

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., fiberglass 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.)
- Sump 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

3. 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)

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)

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Apprenticeship Manitoba

Roofer

Unit: D3 Practicum: Membrane Installation

Level: Two

Duration: 21 hours

Theory: 0 hours

Practical: 21 hours

Overview:

This unit provides practical experience in membrane installation techniques under the supervision of a qualified Instructor. Installation of roof membrane components include: lay-out and setting of membranes; heat-based application, cold-process and mechanically fastened; loose-laid and liquid-applied. Techniques to install membrane-system flashing will be reviewed.

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
- Assess flexibility of material(s)
- Adapt operation to reflect time, weather and environmental factors
- Torch-warming of membrane
- Unroll and weight membrane

b. Lay-outs and setting of membrane
- Variations in technique (e.g., back-rolling, dry-setting, and throwing felt)
- Establish starting point and end-/side-lap allowances
- Position 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 (inc. selection of applicators to suit job)
- Embed membranes in asphalt
- Other (specified by Instructor)

b. Torch-on membrane application techniques
- Establish end-/side-laps and offsets for base-/cap-sheets
- Torch-flame/temperature adjustment for welding and granule-embedding
- Achieve continuity of adhesion and of bitumen bleed-out (inc. include sponge technique to verify bonding of surfaces)
- Other (specified by Instructor)

c. Hot-air welding membrane application techniques
- Select, use and adjust welders, seamer, roller, etc.

- Adapt operation to temperature/environmental factors
- Clean/seal 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
   - Establish side-/end-laps
   - Clean and roll back membranes
   - Use adhesives and rolling seams
   - Prepare and apply 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
   - Determine lengths/patterns and perform pull-out test
   - Other (specified by Instructor)

4. Demonstrate techniques re: loose-laid application of roof-membrane system components **15%**

a. Select/compatibility of membrane-type with fasteners, ballast, pavers, primers, adhesives, sealants
b. Secure perimeter, apply protection mat, and cleaning loose-laid membrane
c. Clean and roll back membranes
d. Use adhesives and rolling seams
e. Measure/install 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. Determine 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)

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Apprenticeship Manitoba

Roofer

Unit: F1 Maintain and Waterproof Roof Structures

Level: Two
Duration: 35 hours
Theory: 21 hours
Practical: 14 hours

Overview:

This unit introduces the basic concepts and practices to prevent, assess and repair damage to roof structures caused by water. Topics include: roof systems and moisture control, procedures to waterproof roof surfaces, and procedures to damp-proof roof surfaces.

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

1. Explain relationship between structural integrity of roof system components and 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)
- 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 (i.e., 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, and architectural features such as doors, windows)

d. Overview of key concepts/practices re: roof maintenance and repair, including
   - Inspection
   - Prevention
   - Maintenance
   - Testing
   - Troubleshooting
   - Replacement
   - Repair

e. Waterproofing and damp-proofing as a special category of moisture control and preventive maintenance practices for structural integrity of:
   - Entire built structures
   - Roof systems/components in particular

f. Other (specified by Instructor)

2. Demonstrate procedure for waterproofing roof surfaces. 25%

a. Techniques to prepare surfaces/substrates (vertical and sub-grade) for waterproofing.
   - Assess below-grade and other hazards
   - Select primer(s) compatible with specific substrate (e.g., wood vs. concrete)
   - Grind/scrape surface irregularities
   - Grout gaps and cracks
   - Clean/dry substrate
   - Apply primer *per* manufacturer specifications and industry standards
   - Other (specified by Instructor)

b. Techniques to apply membranes for waterproofing.
   - Assess below-grade and other hazards
   - Adapt methods (e.g., heating, detailing, end-/side-lap allowances) to suit selection of membrane (e.g., torch-on, hot rubber compound, peel-and-stick)
   - Fit/place membranes
   - Where/when to apply hot rubber compound and/or reinforcing ply
   - Other (specified by Instructor)

c. Techniques to apply protection board for waterproofing.
   - Assess below-grade and other hazards
   - Select protection board to suit project requirements (e.g., drain mat, insulation, corrugated products)
   - Fit, place and secure 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.
   - Select primer(s) compatible with specific substrate (e.g., metal vs. masonry) and environmental conditions
   - Apply primer using brush, roller and spray applicator
   - Other (specified by Instructor)

b. Techniques to apply coatings for damp-proofing.
   - Assess below-grade and other hazards
   - Select coating (e.g., rubberized, fibrated, non-fibrated) to suit environmental conditions and other project requirements
   - Select/use roller, trowel, and spray-applicator per project requirements and choice of coating(s)
   - Other (specified by Instructor)

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Apprenticeship Manitoba

Roofer

Unit: G2 Roofer Lifting, Rigging and Hoisting

Level: Two

Duration: 14 hours

Theory: 7 hours

Practical: 7 hours

Overview:

Roofer Level One, Unit G1 "Fall Protection, Scaffolding and Roof Access Structures" introduced equipment use and procedures with an emphasis on workplace health and safety.

This unit identifies the procedures for safe lifting, rigging and hoisting to move roofing materials, tools and equipment. There is an emphasis on equipment selection, inspection and maintenance, as well as the basic guidelines (e.g., regulations, restrictions)

Apprentices will have the opportunity to practice basic procedures and techniques to stabilize loads of various sizes and shapes.

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

1. Describe lifting, rigging and hoisting in the roofing trades. **15%**

a. Scope and rationale for lifting, rigging and hoisting applications
b. Technical terms and major concepts (e.g., gravitational centres, mechanical advantage)
c. Calculate 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
   - Identify balance/stabilization points
   - Identify required clearances re: start/end points
   - Interplay with access/temporary structures (e.g., lifting while on swing stage)
   - Regulatory considerations (e.g., fall protection, tying off)
e. Other (specified by Instructor)

2. Describe/demonstrate roofer lifting procedures 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. Mechanical assisted lifting
   - Hand signals
   - Precautions (e.g., pinch points re: feet/hands, position of other personnel)
   - Mechanical aids (e.g., hydraulic jack)
   - General techniques
   - Special considerations re: particular roofing materials, loads

d. Basic features and preferred uses of forklifts
   - Manitoba requirements and restrictions re: forklift operation
   - Major components
   - Preferred uses

e. Other (specified by Instructor)

3. Describe/demonstrate roofer rigging procedures 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. Identify and 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. Determine load limits

e. Determine placement of load

f. Determine Safe Working Load (SWL)

g. Placement of chokers and taglines

h. Placement and use of chokers/slings for special requirement loads
   - Smooth, heavy loads
   - Long, flexible loads
   - Unbalanced, uneven and excess**ive** loads

- Heavy, fragile loads

i. Other (specified by Instructor)

4. Describe guidelines for hoisting procedures and techniques. 20%

a. General guidelines, precautions and regulations re: trade related hoisting operations
b. Major types of hoisting equipment and components (inc. preferred use, specific hazards, precautions)
   - Winches (roof hoist, ladder hoist)
   - Boom trucks (including 'zoom boom' cranes)
   - Conventional and hydraulic cranes (e.g., hydraulic roof hoist)
   - Tower cranes
c. Coordinate/communicate with hoisting equipment operator (e.g., crane signals)
d. Other (specified by Instructor)

5. Describe/demonstrate roofer hoisting procedures and techniques. 30%

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

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Apprenticeship Manitoba

Roofer

Unit: G3 Roofer Jobsite Preparation and Inspection

Level: Two

Duration: 21 hours

Theory: 14 hours

Practical: 7 hours

Overview:

This unit provides the basic concepts, requirements and practices for Roofers to prepare and inspect the jobsite. Roofer projects can include installation, repair or replacement of flat, low and steep roofs.

Topics include: prepare and inspect roof construction jobsite, prepare for new roof installation, and prepare for roof replacement.

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

1. **Review rationale, requirements and major considerations to prepare and inspect roof construction jobsites.** **30%**
   a. Selection/special application of tools, equipment, and accessories for tiled roofwork.
      - Organize work using documentation and communication
      - Assess worksite conditions
      - Measure/estimate re: materials, rates of application, etc.
      - Manage 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: onsite evaluation/verification of job conditions
      - Identify, interpret and apply all relevant project specifications
      - Provide site access/egress
      - Starting/finishing points
      - Project equipment requirements (inc. emission-control kettles, disposal chutes, etc.)
      - Fall protection and access-structure requirements
      - Safety-related structures (inc. fences, public walkways, guardrails, etc.)
      - Interplay of project materials, materials-handling equipment and site/project specifications
      - Curb/parapet heights
      - Type of deck
      - Problem areas re: safety/production considerations
      - Assess 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 to ensure jobsite access, shelter, and other facilities for personnel, including:
   - Select and use of access equipment (incl. 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
   - Plan and communicate with jobsite personnel/others re: jobsite organization of materials, equipment, etc.
   - Regulations re: placement of kettles, propane tanks, disposal bins
   - Position safety equipment (inc. caution tape, safety fence/cones, fire extinguishers, and water hoses)

e. Procedure/criteria to position/store equipment and materials on the roof
   - Plan/sequence 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
   - Secure propane tanks on roof while hoisting
   - Location of safety equipment
   - Communicate necessary information to appropriate personnel

f. Procedure/criteria to establish 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 to erect/disassemble chutes and counterweights
   - Techniques to use hoist to dispose of materials

g. Compare jobsite preparation requirements for flat and steep roof projects

h. Compare preparation for installation and 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. **35%**

a. Substance and significance of industry standards to ensure all new roof project surfaces (inc. substrates) are properly secured, free of defects, clean, and dry.

b. Compare types of deck (wood, concrete, and steel)

c. Procedures, standards and special precautions re: cleaning roof decks/limiting access to cleaned deck, including:
   - Determine extent, scheduling and intensiveness of project specific deck cleaning
   - Techniques/precautions to remove construction debris using specified tools/equipment (inc. vacuums, air compressors, power brooms, etc.)
   - Techniques/precautions to remove 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 defects (e.g., corrosion, height irregularities, deflection, uncured concrete, corrosion)
   - Techniques to locate, assess extent and perform 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 to dry 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 to determine 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. **35%**

a. Recognize special hazards, precautions and site preparations for roof replacement projects and new roof construction projects

b. Use tools, equipment and special accessories typically required for site preparation re: roof replacement, including:
   - Select all tools/equipment required to prepare specific jobsite for roof replacement (e.g. backpack-blowers, power washers, vacuums, etc.)
   - Select/secure tarpaulins, blankets, fabrics and other materials to shield and protect non-project components, etc.
   - Select apply substrate cleaners, abrasives, primers, sealants and associated products

c. Assess risks/requirements re: composition of debris, materials and building components (e.g., flashings) that require removal, containment/disposal, salvage, and/or special precaution(s)
   - Compliance with regulations and preferred procedures re: removal of specific hazardous materials/contaminants (inc. animal/vegetable bio-matter, asbestos, hypodermic needles, moulds, petrochemicals, etc.)
   - Collecting, containing, and managing debris

d. Identify and prevent damage to non-project site features, e.g., mechanical equipment, skylights, windows, vehicles, etc.
   - Recognize areas of potential/prior damage due to fire, fume infiltration, staining, etc.
   - Install barriers and protection materials as required
   - Other (specified by Instructor)

e. Procedures to remove, dispose and/or salvage 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
   - Estimate roof surface area that can be made watertight within a specified operational timeframe

f. Prepare and repair of wooden, concrete and metal substrates/substrate components
   - Procedures to ensure temporary sealing and drainage of roof
   - Techniques to assess and remedy specific structural and/or substrate defects (inc. unsecured/compromised materials such as spalled concrete, rotted wood, corroded/rusted metal components, dents, voids, tears, etc.)
   - Techniques to repair/replace damaged vapour barrier, insulation and to secure loose components

g. Practical calculations and procedures to modify parapets/penetrations.
   - Analyze requirements to adjust, modify, extend, dismantle and/or replace existing components (roof mounted equipment) to accommodate roof replacement project

specifications
- Calculate required height of parapets/penetrations
- Select/use compatible materials to build extensions and additions
- Procedure and precautions to dismantle existing construction
- Make special adjustments (inc. extension of pipes, doorsills, and drains and/or adding slopes to coping)
- Other (specified by Instructor)

h. Techniques/variations re: installation of water cut-offs, temporary seals and temporary drains.
- Analyze installation requirements re: the placement, timeframe, and selection of these components
- Select compatible materials for cut-offs and seals (e.g., sealant, membrane, and asphalt)
- Procedures for installation (inc. verification that installed components conform with all applicable standards)
- Select compatible materials for cut-offs and seals (e.g., sealant, membrane, and asphalt)

i. Recognition/analysis of project technical features and their implication for site preparation planning (e.g., type/phases of project, required materials and equipment, materials, construction details, industry standards)

j. Recognition/analysis of human, environmental and geographic factors and their significance re: site-preparation (e.g., seasonality, jobsite surroundings)

k. Outline/justify adaptation of general site preparation procedures to specific project
. requirements and constraints

l. Other (specified by Instructor)

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