



PROGRAM OUTLINE

Roofer

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ROOFER PROGRAM OUTLINE

**APPROVED BY INDUSTRY
MAY 2022**

**BASED ON
RSOS 2020**

**Developed by
SkilledTradesBC
Province of British Columbia**

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Section 1

INTRODUCTION

Roofer

Foreword

This revised Roofer Program Outline is intended as a guide for instructors, apprentices, and employers of apprentices as well as for the use of industry organizations, regulatory bodies, and provincial and federal governments. It reflects updated standards based on the 2020 Red Seal Occupational Standard (RSOS). It was developed by British Columbia industry and instructor subject matter experts.

Practical instruction by demonstration and student participation should be integrated with classroom sessions. Safe working practices, even though not always specified in each operation or topic, are an implied part of the program and should be stressed throughout the apprenticeship.

This Program Outline includes a list of recommended reference textbooks that are available to support the learning objectives and the minimum shop requirements needed to support instruction.

Each competency is to be evaluated through the use of written examination in which the learner must achieve a minimum of 70% in order to receive a passing grade. The types of questions used on these exams must reflect the cognitive level indicated by the learning objectives and the learning tasks listed in the related competencies.

Achievement Criteria are included for those competencies that require a practical component. The intent of including Achievement Criteria in the program outline is to ensure consistency in training across the many training institutions in British Columbia. Their purpose is to reinforce the theory and to provide a mechanism for evaluation of the learner's ability to apply the theory to practice. It is important that these performances be observable and measurable and that they reflect the skills spelled out in the competency as those required of a competent journeyman. The conditions under which these performances will be observed and measured must be clear to the learner as well as the criteria by which the learner will be evaluated. The learner must also be given the level of expectation of success.

The performance spelled out in the Achievement Criteria is a suggested performance and is not meant to stifle flexibility of delivery. Training providers are welcome to substitute other practical performances that measure similar skills and attainment of the competency. Multiple performances may also be used to replace individual performances where appropriate.

SAFETY ADVISORY

Be advised that references to the WorkSafeBC safety regulations contained within these materials do not/may not reflect the most recent Occupational Health and Safety Regulation (the current Standards and Regulation in BC can be obtained on the following website: <http://www.worksafebc.com>.) Please note that it is always the responsibility of any person using these materials to inform him/herself about the Occupational Health and Safety Regulation pertaining to his/her work.

Acknowledgements

The Program Outline was prepared with the advice and direction of the following industry and instructor Subject Matter Experts:

- Geoff Henderson, Roofing Contractors Association Of British Columbia
- Steve Ryan, Nu-Tech Roofing-Waterproofing
- Adrian Tabor, Western Roofing Master Roofers Ltd.
- Ed Visscher, Roofing Contractors Association Of British Columbia
- Callum Walsh, Mack Kirk Roofing & Sheet Metal Ltd.

SkilledTradesBC would like to acknowledge the dedication and hard work of all the industry representatives appointed to identify the training requirements of the Roofer occupation.

How to Use this Document

This Program Outline has been developed for the use of individuals from several different audiences. The table below describes how each section can be used by each intended audience.

Section	Training Providers	Employers/ Sponsors	Apprentices	Challengers
Program Credentialing Model	Communicates program length and structure, and all pathways to completion	Illustrates the length and structure of the program	Illustrates the length and structure of the program, and pathway to completion	Illustrates the challenger pathway to Certificate of Qualification
OAC	Communicates the competencies that industry has defined as representing the scope of the occupation	Displays the competencies that an apprentice is expected to demonstrate in order to achieve certification	Displays the competencies apprentices will achieve as a result of program completion	Displays the competencies challengers must demonstrate in order to challenge the program
Training Topics and Suggested Time Allocation	Shows proportionate representation of general areas of competency (GACs) at each program level, the suggested proportion of time spent on each GAC, and percentage of time spent on theory versus practical application	Shows the scope of competencies covered in the technical training, the suggested proportion of time spent on each GAC, and the percentage of that time spent on theory versus practical application	Shows the scope of competencies covered in the technical training, the suggested proportion of time spent on each GAC, and the percentage of that time spent on theory versus practical application	Shows the relative weightings of various competencies of the occupation on which assessment is based
Program Content	Defines the objectives, learning tasks, high level content that must be covered for each competency, as well as defining observable, measurable achievement criteria for objectives with a practical component	Identifies detailed program content and performance expectations for competencies with a practical component; may be used as a checklist prior to signing a recommendation for certification (RFC) for an apprentice	Provides detailed information on program content and performance expectations for demonstrating competency	Allows individual to check program content areas against their own knowledge and performance expectations against their own skill levels
Assessment Guidelines	Shows the general areas of competency covered in each level of technical training, the theory and practical grading weight, and the calculation method for final percentage marks	Shows the general areas of competency covered in the technical training, the grading weight for each GAC, and the percentage of that time spent on theory versus practical application	Shows the general areas of competency covered in each level of technical training, the theory and practical grading weight, and the calculation method for final percentage marks	Shows the relative weightings of various general areas of competency within the occupation on which assessment is based

Section	Training Providers	Employers/ Sponsors	Apprentices	Challengers
Training Provider Standards	Defines the facility requirements, tools and equipment, reference materials (if any) and instructor requirements for the program	Identifies the tools and equipment an apprentice is expected to have access to; which are supplied by the training provider and which the student is expected to own	Provides information on the training facility, tools and equipment provided by the school and the student, reference materials they may be expected to acquire, and minimum qualification levels of program instructors	Identifies the tools and equipment a tradesperson is expected to be competent in using or operating; which may be used or provided in a practical assessment
Appendix – Glossary of Acronyms			Defines program specific acronyms	

Section 2

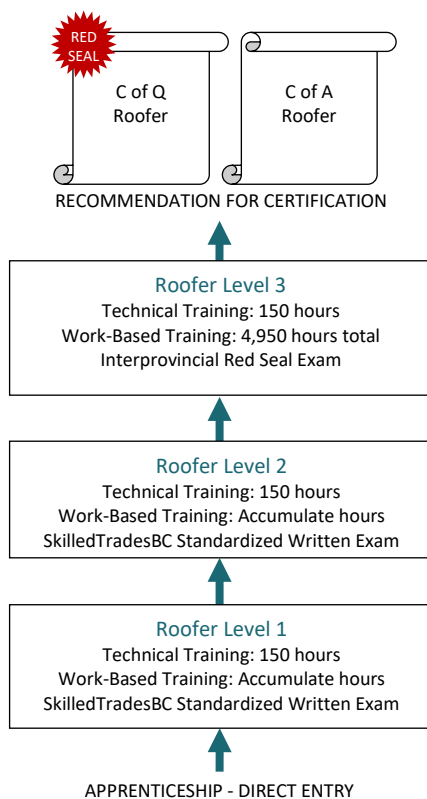
PROGRAM OVERVIEW

Roofer

Program Credentialing Model

Roofer

C of Q = Certificate of Qualification
C of A = Certificate of Apprenticeship



CROSS-PROGRAM CREDITS

Individuals who hold the credentials listed below are entitled to receive partial credit toward the completion requirements of this program

None

Occupational Analysis Chart

ROOFER

Occupation Description: Roofers install, repair, maintain and replace roofing systems. They work with membrane roofing systems that consist of a variety of materials with different application methods. They also install, replace, maintain, and repair shingles, slates, shakes, roofing tiles, sheet metal and other pre-formed sheeting on sloped roofs. They also weatherproof, waterproof and damp-proof roofing surfaces, foundation walls, floor slabs and bridge decks. The work environment is exposed and may vary from extreme cold to extreme heat.

PERFORM SAFETY-RELATED FUNCTIONS A	Maintain safe work environment A1 1	Use personal protective equipment (PPE) and safety equipment A2 1				
USE TOOLS AND EQUIPMENT B	Use hand tools B1 1 2 3	Use power tools, pneumatic tools, and hot-air welding, induction, and fuelled equipment B2 1 2 3	Use hoisting, lifting, and rigging equipment B3 1 2 3	Use access equipment B4 1 2 3	Use hot process equipment B5 1 2 3	Use motorized equipment B6 1 2 3
ORGANIZE WORK C	Use documentation and reference materials C1 1 2	Interpret blueprints and drawings C2 1 2 3	Estimate material C3 3	Assess worksite conditions C4 1 2	Position equipment and material on the ground and on the roof C5 1 2	Prepare material disposal systems C6 1 2
	Evaluate roof conditions near roof-top equipment installations C7 3	Use roofing math C8 1 2				
USE COMMUNICATION AND MENTORING TECHNIQUES D	Use communication techniques D1 1	Use communication and mentoring techniques D2 3				

Program Overview

PREPARE ROOF FOR REPLACEMENT E	Protect surrounding area E1	Remove loose debris E2	Remove roofing and flashings E3	Prepare roof substrate E4	Perform minor adjustments to penetrations, curbs, and parapets E5
	1	1	1	2	2
PREPARE DECK FOR ROOF INSTALLATION F	Inspect deck F1	Clean surface of deck F2	Verify placement of roof penetrations, curbs, and parapets F3	Dry deck F4	
	2	1	2	1	
APPLY LOW SLOPE ROOFING COMPONENTS G	Install support panels G1	Prime substrate G2	Apply vapour retarder, vapour barrier, and air barrier G3	Install insulation G4	Install cover board G5
	1	1	1	1	1
	2	2	2	2	2
	3	3	3	3	3
APPLY LOW SLOPE ROOFING MEMBRANES H	Apply ballast, walkways, and protective surfaces G7	Install metal flashings G8			
	1	1			
	2	2			
	3	3			
	Relax membranes H1	Set membranes H2	Apply membranes using hot-liquid process H3	Apply membranes using torched-on method H4	Apply membranes using hot-air welding H5
	1	1	1	2	2
	2	2	2	3	3
	3	3	3		
	Apply membranes using mechanical fasteners H7	Apply loose-laid membranes H8	Apply liquid-applied membranes H9	Install membrane flashings H10	Install temporary seals and temporary drains H11
	1			1	1
	2	3	3	2	2
	3			3	3

Program Overview

PERFORM COMMON STEEP SLOPE PRACTICES I	Install steep slope underlayment I1 1	Install steep slope venting I2 1	Install steep slope valley applications I3 1	Install steep slope saddles/crickets I4 1	Install steep slope penetration flashings I5 1	Install steep slope metal flashings and drainage I6 1
APPLY SHINGLES J	Determine type and layout of shingles J1 1 2 3	Install starter strip and starter course J2 1 2 3	Fasten shingles J3 1 2 3	Cut shingles J4 1 2 3	Tab shingles J5 1	Install metal flashings for shingled roofs J6 1 2 3
APPLY ROOF TILES K	Install battens/strapping for roof tiles K1 3	Fasten roof tiles K2 3	Cut roof tiles K3 3	Install closures for roof tiles K4 3	Install ridge and hip caps K5 3	Install metal flashings for tiled roofs K6 3
APPLY PRE-FORMED METAL ROOFING L	Install battens/strapping for pre-formed metal roofing L1 3	Cut and form sheet metal L2 3	Fasten pre-formed metal roofing L3 3	Install closure strips for pre-formed metal roofing L4 3	Install snow guards L5 3	Install metal flashings for pre-formed metal roofs L6 3
WATERPROOF SURFACES M	Prepare waterproofing substrates M1 2	Apply waterproofing membrane M2 2	Install green, sustainable, vegetative, and protected membrane components M3 3			
DAMP-PROOF SURFACES N	Apply damp-proofing materials N1 2	Apply protective layer N2 2				

Program Overview

ASSESS ROOF CONDITION O	Perform roof inspections					O1
			3			
MAINTAIN AND REPAIR LOW SLOPE ROOFING P	Perform cut test					O2
			3			
MAINTAIN AND REPAIR STEEP SLOPE ROOFING Q	Determine maintenance or repair required					O3
			3			
	Maintain low slope roofing					P1
		2	3			
	Repair low slope roofing					P2
		2	3			
	Maintain steep slope roofing					Q1
		2	3			
	Repair steep slope roofing					Q2
		2	3			

Training Topics and Suggested Time Allocation

ROOFER – LEVEL 1

			% of Time Allocated to:			
			% of Time	Theory	Practical	Total
Line A	PERFORM SAFETY-RELATED FUNCTIONS	13%	80%	20%	100%	
A1	Maintain safe work environment		✓	✓		
A2	Use personal protective equipment (PPE) and safety equipment		✓	✓		
Line B	USE TOOLS AND EQUIPMENT	10%	80%	20%	100%	
B1	Use hand tools		✓	✓		
B2	Use power tools, pneumatic tools, and hot-air welding, induction, and fuelled equipment		✓	✓		
B3	Use hoisting, lifting, and rigging equipment		✓			
B4	Use access equipment		✓	✓		
B5	Use hot process equipment		✓	✓		
B6	Use motorized equipment		✓			
Line C	ORGANIZE WORK	17%	90%	10%	100%	
C1	Use documentation and reference materials		✓			
C2	Interpret blueprints and drawings		✓	✓		
C4	Assess worksite conditions		✓			
C5	Position equipment and material on the ground and on the roof		✓			
C6	Prepare material disposal systems		✓	✓		
C8	Use roofing math		✓			
Line D	USE COMMUNICATION AND MENTORING TECHNIQUES	3%	100%	0%	100%	
D1	Use communication techniques		✓			
Line E	PREPARE ROOF FOR REPLACEMENT	5%	75%	25%	100%	
E1	Protect surrounding area		✓	✓		
E2	Remove loose debris		✓			
E3	Remove roofing and flashings		✓	✓		
Line F	PREPARE DECK FOR ROOF INSTALLATION	5%	75%	25%	100%	
F2	Clean surface of deck		✓	✓		
F4	Dry deck		✓			
Line G	APPLY LOW SLOPE ROOFING COMPONENTS	10%	50%	50%	100%	
G1	Install support panels		✓			
G2	Prime substrate		✓	✓		
G3	Apply vapour retarder, vapour barrier, and air barrier		✓	✓		
G4	Install insulation		✓	✓		
G5	Install cover board		✓	✓		
G6	Install drains, vents, curbs, and penetrations		✓	✓		
G7	Apply ballast, walkways, and protective surfaces		✓			
G8	Install metal flashings		✓			
Line H	APPLY LOW SLOPE ROOFING MEMBRANES	13%	25%	75%	100%	

		% of Time Allocated to:			
		% of Time	Theory	Practical	Total
H1	Relax membranes		✓	✓	
H2	Set membranes		✓	✓	
H3	Apply membranes using hot-liquid process		✓		
H6	Apply membranes using cold-applied methods		✓	✓	
H7	Apply membranes using mechanical fasteners		✓		
H10	Install membrane flashings		✓	✓	
H11	Install temporary seals and temporary drains		✓		
Line I	PERFORM COMMON STEEP SLOPE PRACTICES	7%	50%	50%	100%
I1	Install steep slope underlayment		✓	✓	
I2	Install steep slope venting		✓	✓	
I3	Install steep slope valley applications		✓	✓	
I4	Install steep slope saddles/crickets		✓		
I5	Install steep slope penetration flashings		✓	✓	
I6	Install steep slope metal flashings and drainage		✓	✓	
Line J	APPLY SHINGLES	17%	25%	75%	100%
J1	Determine type and layout of shingles		✓	✓	
J2	Install starter strip and starter course		✓	✓	
J3	Fasten shingles		✓	✓	
J4	Cut shingles		✓	✓	
J5	Tab shingles		✓		
J6	Install metal flashings for shingled roofs		✓	✓	
Total Percentage for Roofer Level 1		100%			

Training Topics and Suggested Time Allocation

ROOFER – LEVEL 2

		% of Time Allocated to:			
		% of Time	Theory	Practical	Total
Line B	USE TOOLS AND EQUIPMENT	13%	50%	50%	100%
B1	Use hand tools		✓	✓	
B2	Use power tools, pneumatic tools, and hot-air welding, induction, and fuelled equipment		✓	✓	
B3	Use hoisting, lifting, and rigging equipment		✓	✓	
B4	Use access equipment		✓	✓	
B5	Use hot process equipment		✓	✓	
B6	Use motorized equipment		✓		
Line C	ORGANIZE WORK	24%	70%	30%	100%
C1	Use documentation and reference materials		✓		
C2	Interpret blueprints and drawings		✓	✓	
C4	Assess worksite conditions		✓		
C5	Position equipment and material on the ground and on the roof		✓		
C6	Prepare material disposal systems		✓	✓	
C8	Use roofing math		✓		
Line E	PREPARE ROOF FOR REPLACEMENT	3%	100%	0%	100%
E4	Prepare roof substrate		✓		
E5	Perform minor adjustments to penetrations, curbs, and parapets		✓		
Line F	PREPARE DECK FOR ROOF INSTALLATION	3%	100%	0%	100%
F1	Inspect deck		✓		
F3	Verify placement of roof penetrations, curbs, and parapets		✓		
Line G	APPLY LOW SLOPE ROOFING COMPONENTS	13%	25%	75%	100%
G1	Install support panels		✓	✓	
G2	Prime substrate		✓	✓	
G3	Apply vapour retarder, vapour barrier, and air barrier		✓	✓	
G4	Install insulation		✓	✓	
G5	Install cover board		✓	✓	
G6	Install drains, vents, curbs, and penetrations		✓	✓	
G7	Apply ballast, walkways, and protective surfaces		✓		
G8	Install metal flashings		✓	✓	
Line H	APPLY LOW SLOPE ROOFING MEMBRANES	19%	25%	75%	100%
H1	Relax membranes		✓	✓	
H2	Set membranes		✓	✓	
H3	Apply membranes using hot-liquid process		✓	✓	
H4	Apply membranes using torched-on method		✓	✓	
H5	Apply membranes using hot-air welding		✓	✓	
H6	Apply membranes using cold-applied methods		✓	✓	

		% of Time Allocated to:			
		% of Time	Theory	Practical	Total
H7	Apply membranes using mechanical fasteners		✓		
H10	Install membrane flashings		✓	✓	
H11	Install temporary seals and temporary drains		✓		
Line J	APPLY SHINGLES	13%	25%	75%	100%
J1	Determine type and layout of shingles		✓	✓	
J2	Install starter strip and starter course		✓	✓	
J3	Fasten shingles		✓	✓	
J4	Cut shingles		✓	✓	
J6	Install metal flashings for shingled roofs		✓	✓	
Line M	WATERPROOF SURFACES	3%	100%	0%	100%
M1	Prepare waterproofing substrates		✓		
M2	Apply waterproofing membrane		✓		
Line N	DAMP-PROOF SURFACES	3%	100%	0%	100%
N1	Apply damp-proofing materials		✓		
N2	Apply protective layer		✓		
Line P	MAINTAIN AND REPAIR LOW SLOPE ROOFING	3%	75%	25%	100%
P1	Maintain low slope roofing		✓	✓	
P2	Repair low slope roofing		✓		
Line Q	MAINTAIN AND REPAIR STEEP SLOPE ROOFING	3%	100%	0%	100%
Q1	Maintain steep slope roofing		✓		
Q2	Repair steep slope roofing		✓		
Total Percentage for Roofer Level 2		100%			

Training Topics and Suggested Time Allocation

ROOFER – LEVEL 3

		% of Time Allocated to:			
		% of Time	Theory	Practical	Total
Line B	USE TOOLS AND EQUIPMENT	8%	90%	10%	100%
B1	Use hand tools		✓		
B2	Use power tools, pneumatic tools, and hot-air welding, induction, and fuelled equipment		✓		
B3	Use hoisting, lifting, and rigging equipment		✓		
B4	Use access equipment		✓	✓	
B5	Use hot process equipment		✓		
B6	Use motorized equipment		✓		
Line C	ORGANIZE WORK	12%	90%	10%	100%
C2	Interpret blueprints and drawings		✓	✓	
C3	Estimate material		✓		
C7	Evaluate roof conditions near roof-top equipment installations		✓		
Line D	USE COMMUNICATION AND MENTORING TECHNIQUES	2%	100%	0%	100%
D2	Use communication and mentoring techniques		✓		
Line F	PREPARE DECK FOR ROOF INSTALLATION	3%	90%	10%	100%
F1	Inspect deck		✓	✓	
F3	Verify placement of roof penetrations, curbs, and parapets		✓		
Line G	APPLY LOW SLOPE ROOFING COMPONENTS	9%	50%	50%	100%
G1	Install support panels		✓	✓	
G2	Prime substrate		✓	✓	
G3	Apply vapour retarder, vapour barrier, and air barrier		✓	✓	
G4	Install insulation		✓	✓	
G5	Install cover board		✓		
G6	Install drains, vents, curbs, and penetrations		✓	✓	
G7	Apply ballast, walkways, and protective surfaces		✓		
G8	Install metal flashings		✓	✓	
Line H	APPLY LOW SLOPE ROOFING MEMBRANES	22%	25%	75%	100%
H1	Relax membranes		✓	✓	
H2	Set membranes		✓	✓	
H3	Apply membranes using hot-liquid process		✓	✓	
H5	Apply membranes using hot-air welding		✓	✓	
H6	Apply membranes using cold-applied methods		✓	✓	
H7	Apply membranes using mechanical fasteners		✓	✓	
H8	Apply loose-laid membranes		✓	✓	
H9	Apply liquid-applied membranes		✓	✓	
H10	Install membrane flashings		✓	✓	
H11	Install temporary seals and temporary drains		✓		

		% of Time Allocated to:			
		% of Time	Theory	Practical	Total
Line J	APPLY SHINGLES	10%	25%	75%	100%
J1	Determine type and layout of shingles		✓	✓	
J2	Install starter strip and starter course		✓	✓	
J3	Fasten shingles		✓	✓	
J4	Cut shingles		✓	✓	
J6	Install metal flashings for shingled roofs		✓	✓	
Line K	APPLY ROOF TILES	5%	50%	50%	100%
K1	Install battens/strapping for roof tiles		✓	✓	
K2	Fasten roof tiles		✓	✓	
K3	Cut roof tiles		✓	✓	
K4	Install closures for roof tiles		✓	✓	
K5	Install ridge and hip caps		✓	✓	
K6	Install metal flashings for tiled roofs		✓	✓	
Line L	APPLY PRE-FORMED METAL ROOFING	10%	25%	75%	100%
L1	Install battens/strapping for pre-formed metal roofing		✓	✓	
L2	Cut and form sheet metal		✓	✓	
L3	Fasten pre-formed metal roofing		✓	✓	
L4	Install closure strips for pre-formed metal roofing		✓	✓	
L5	Install snow guards		✓		
L6	Install metal flashings for pre-formed metal roofs		✓	✓	
Line M	WATERPROOF SURFACES	6%	100%	0%	100%
M3	Install green, sustainable, vegetative, and protected membrane components		✓		
Line O	ASSESS ROOF CONDITION	7%	100%	0%	100%
O1	Perform roof inspections		✓		
O2	Perform cut test		✓		
O3	Determine maintenance or repair required		✓		
Line P	MAINTAIN AND REPAIR LOW SLOPE ROOFING	3%	100%	0%	100%
P1	Maintain low slope roofing		✓		
P2	Repair low slope roofing		✓		
Line Q	MAINTAIN AND REPAIR STEEP SLOPE ROOFING	3%	100%	0%	100%
Q1	Maintain steep slope roofing		✓		
Q2	Repair steep slope roofing		✓		
Total Percentage for Roofer Level 3		100%			

Section 3

PROGRAM CONTENT

Roofer

Level 1

Roofer

Line (GAC):	A	PERFORM SAFETY-RELATED FUNCTIONS
Competency:	A1	Maintain safe work environment

Objectives

To be competent in this area, the individual must be able to:

- Describe maintaining a safe work environment, including
 - WorkSafeBC and regulations
 - Workplace Hazardous Materials Information System (WHMIS)
 - Policies, procedures, and practices
 - Emergency equipment
 - Fire safety

LEARNING TASKS

1. Describe safety regulations

CONTENT

- Workers Compensation Act
- Occupational Health and Safety (OHS)
 - “Core requirements”
- WorkSafeBC
 - Exposure control plan
 - Investigations and reports
 - Workplace inspections
- Rights and responsibilities
 - Due diligence
 - Injury reporting
 - Right to refuse unsafe work
 - Roles
 - Employee
 - Employer
 - Supervisor
 - Prime contractor
 - WorkSafeBC
- Training and certification requirements

2. Identify hazards in the roofing industry

- Burns
 - Hot works equipment
 - Hot asphalt
 - Electrical
- Chemical, particulate, vapour, and contact exposures
 - Asbestos
 - Cyanites
 - Lead
 - Primers and adhesives
 - Silica dust

LEARNING TASKS

CONTENT

- | | |
|--|---|
| | <ul style="list-style-type: none"> • Debris <ul style="list-style-type: none"> ○ Lead ○ Asbestos • Falls • Fire • Fuels (liquid and gaseous) <ul style="list-style-type: none"> ○ Compressed gas • Electrical <ul style="list-style-type: none"> ○ Roof top wires ○ Power lines • Environmental conditions <ul style="list-style-type: none"> ○ Extreme heat/cold ○ High wind • Working below grade <ul style="list-style-type: none"> ○ Accumulation of fumes ○ Trench collapse |
| 3. Demonstrate safe work practices | <ul style="list-style-type: none"> • Awareness of surroundings • Behaviour <ul style="list-style-type: none"> ○ Drugs and alcohol ○ Horseplay ○ Respect for others • Electrical • Ergonomics <ul style="list-style-type: none"> ○ Lifting ○ Repetitive tasks • Fall protection • Housekeeping • Lockout procedures <ul style="list-style-type: none"> ○ Electrical ○ Mechanical • Personal apparel <ul style="list-style-type: none"> ○ Clothing ○ Jewellery |
| 4. Describe long-term hazards | <ul style="list-style-type: none"> • Respiratory diseases • Skin diseases • Repetitive strain injuries |
| 5. Describe safety precautions for working at height | <ul style="list-style-type: none"> • Company safety policies • Deck openings • Fall protection heirarchy |

LEARNING TASKS

CONTENT

		<ul style="list-style-type: none"> ○ Guard rails ○ Fall restraint ○ Fall arrest ○ Other work procedures
		<ul style="list-style-type: none"> • Hazard identification • Personal fall protection equipment <ul style="list-style-type: none"> ○ Harnesses ○ Ropes and rope grabs ○ Lanyards • Weather • Wind
6.	Describe emergency equipment and means of egress	<ul style="list-style-type: none"> • Emergency shutoffs • Fire control systems • Emergency exits • First aid facilities • Emergency contacts/phone numbers • Muster station
7.	Describe “General Hazard Requirements” of the Occupational Health and Safety Regulation	<ul style="list-style-type: none"> • Chemical and biological substances • Confined spaces • Cranes, hoists, and rigging • De-energization and lockout • Electrical safety Substance Specific Requirements • Fall protection • Ladders, scaffolds, and temporary work platforms • Mobile equipment • Noise, vibration, radiation, and temperature • Personal protective clothing and equipment • Protection of property and public • Tools, machinery, and equipment • Transportation of workers • Traffic control
8.	Describe WHMIS	<ul style="list-style-type: none"> • Rights and responsibilities <ul style="list-style-type: none"> ○ Workers ○ Employers ○ Suppliers ○ Regulators

LEARNING TASKS

CONTENT

- Legislation
 - Hazardous Product Act
 - Controlled Products Regulations
 - Ingredient Disclosure List
 - Hazardous Materials Information Review Act
- Key elements
 - Safety Data Sheets (SDS)
 - Labels and symbols
 - Worker education
- Storage and disposal of hazardous materials

Line (GAC):	A	PERFORM SAFETY-RELATED FUNCTIONS
Competency:	A2	Use personal protective equipment (PPE) and safety equipment

Objectives

To be competent in this area, the individual must be able to:

- Describe use of safety equipment and procedures
- Use personal protective equipment
- Apply fire prevention techniques

LEARNING TASKS

1. Describe use of safety equipment
2. Use PPE
3. Describe fall restraint and arrest systems and equipment

CONTENT

- Equipment certification
- Selection of equipment
- Operating procedures
- Safety procedures during installation and removal
- Inspection
- Maintenance
- Storage
- Selection
- Fit
- Clothing
- Eye protection
- Fall Protection
- Gloves
- Head protection
- Hearing protection
- Respiratory protection
- Safety footwear
- Personal fall protection equipment
- Installation
- Anchors
- Harnesses
- Ladder-jack
- Lifelines
- Safety nets
- Scaffolds
- Toe boards

LEARNING TASKS

4. Describe fire safety

5. Describe the use of fire extinguishers

6. Apply fire prevention techniques

CONTENT

- Fire triangle
 - Air
 - Fuel
 - Heat
- Classes of fire
 - Class A
 - Class B
 - Class C
 - Class D
- Types and classes of fire extinguisher
 - Water
 - Foam
 - CO₂
 - Dry chemical
 - Halon
- Classes A, B, C, D
- Fire department contact
 - Emergency services communication and site information
- Evacuation of others
- Fire containment
- Method of egress
- Training
- P.A.S.S. method (Pull, Aim, Squeeze, and Sweep)
 - Kettles and tankers
 - Gas and fuels
 - Solvents
- Storage and handling
- Application techniques

Achievement Criteria

Performance The learner will wear PPE as needed for each task.

Conditions The learner will be given

- Access to PPE

Criteria The learner will be evaluated on

- PPE selection
- PPE fit
- Competency of usage

Line (GAC): B USE TOOLS AND EQUIPMENT

Competency: B1 Uses hand tools

Objectives

To be competent in this area, the individual must be able to:

- Describe roofing hand tools
- Use roofing hand tools

LEARNING TASKS

1. Describe roofing hand tools

CONTENT

- Brooms
- Chalk lines
- Crescent wrenches
- Hammers
- Hatchet
- Knives
- Measuring tapes
- Mops
- Pry bars
- Saws
- Scrapers
- Screwdrivers
- Shovels
- Snips
- Spudders
- Staple hammer
- Wheelbarrow

2. Use roofing hand tools

- Safety
- Purpose/uses
- Selection
- Adjustment
- Visual inspection
- Maintenance
 - Sharpening
 - Lubrication
 - Cleaning
- Parts
- Procedures/operations
- Storage

Line (GAC):	B	USE TOOLS AND EQUIPMENT
Competency:	B2	Uses power tools, pneumatic tools, and hot-air welding, induction, and fuelled equipment

Objectives

To be competent in this area, the individual must be able to:

- Describe tools and equipment
- Select and use electrical tools, pneumatic tools, and fuelled equipment

LEARNING TASKS

1. Describe tools and equipment

CONTENT

- Electrical power tools
 - Saws
 - Drills
 - Grinders
 - Screw guns
 - Hot-air gun
- Pneumatic tools
 - Air nailers
 - Caulking guns
 - Spray guns
- Hot-air welding tools
 - Hot-air welder
 - Robotic welder
- Induction tools
 - Induction welder
- Fuelled equipment
 - Gravel spreaders
 - Power buggies
 - Roof cutter
 - Spudding machine
 - Sweepers
 - Torches
 - Kettles

2. Select and use electrical tools, pneumatic tools and fuelled equipment

- Adjustment
- Inspection
- Maintenance
 - Cleaning
 - Filter replacement
 - Lubrication
 - Sharpening
 - Tensioning
- Parts
- Procedures/operations

LEARNING TASKS

CONTENT

- Purpose/uses
- Refuelling
- Safety
- Selection
- Storage

Line (GAC):	B	USE TOOLS AND EQUIPMENT
Competency:	B3	Use hoisting, lifting, and rigging equipment

Objectives

To be competent in this area, the individual must be able to:

- Describe hoisting, lifting, and rigging equipment and its purposes
- Describe the use of hoisting, lifting, and rigging equipment
- Describe rooftop storage practices

CONTENT

LEARNING TASKS

1. Describe hoisting equipment
 - Types
 - Manual hoists
 - Hand Beam Hoist
 - Ladder wheel hoist
 - Pulley systems
 - Power hoists
 - Swing beam hoist
 - Trolley hoist
 - Ladder hoists
 - Uses
 - Limitations/ratings/specifications
 - Parts
 - Counterweights
 - Erection
 - Dismantling
 - Visual inspection
 - Maintenance
 - Storage
2. Describe rooftop delivery systems
 - Types
 - Articulating crane/knuckle boom
 - Conveyors
 - Helicopters
 - Stiff boom crane
 - Tower crane
 - Uses
 - Limitations/ratings/specifications
 - Parts
 - Visual inspection

CONTENT

LEARNING TASKS

3. Describe rigging equipment
 - Types
 - Cables
 - Chains
 - Hooks
 - Pulleys
 - Slings
 - Shackles
 - Spreader bars
 - Tag lines
 - Accessories
 - Disposal bucket/bin
 - Gravel bucket
 - Lifting forks
 - Propane cage
 - Knots, bends and hitches
 - Uses
 - Limitations/ratings/specifications
 - Load
 - Height
 - Visual inspection
 - Identify worn, damaged, and defective access equipment
 - Maintenance
 - Storage
4. Describe use of hoisting, lifting, and rigging equipment
 - Safety
 - Regulations
 - Manufacturers' specifications
 - Training and certification requirements
 - Operating procedures
 - Roof protection from equipment
 - Estimating loads and heights
 - Load distribution
 - Load limits
 - Ropes
 - Cables
 - Chains
 - Slings
 - Hooks
 - Shackles
 - Spreader bars

CONTENT

LEARNING TASKS

5. Describe rooftop storage practices

- Knots
 - Selection
 - Tying
- Hand signals
 - All stop
 - Stop
 - Lower and raise
 - Boom in and out
 - Swing boom
- Radio communications
- Precautions
 - Slings
 - Tag lines
 - Power lines
 - Knots
 - Equipment specifications
- Erection/set-up
- Dismantling
- Loading
- Unloading
- Weight distribution
- Securing loads
- Visual inspection
- Maintenance
- Storage
- Load distribution and location
- Material handling

Line (GAC): **B USE TOOLS AND EQUIPMENT**
Competency: **B4 Use access equipment**

Objectives

To be competent in this area, the individual must be able to:

- Describe ladders and elevated platforms
- Select and use ladders and elevated platforms

LEARNING TASKS

1. Describe ladders and elevated platforms

CONTENT

- Types
 - Boom lift
 - Ladders
 - Scaffolding
 - Scissor lifts
- Certification requirements
- Government regulations
- Uses
- Safety
- Hazard recognition

2. Select and use ladders and elevated platforms

- Assembly/disassembly
- Fall arrest and restraint requirements
- Levelling
- Limitations
- Maintenance
- Operating instructions
- Securing
- Selection
- Solid footing
- Storage
- Transportation
- Visual inspection

Achievement Criteria

Performance	The learner will set up, secure, and take down an extension ladder.
Conditions	<p>The learner will be given</p> <ul style="list-style-type: none"> • Extension ladder • Securement device • PPE
Criteria	<p>The learner will be evaluated on</p> <ul style="list-style-type: none"> • Equipment inspection • Procedure • Ratio • Securement • Use of PPE

Line (GAC): B USE TOOLS AND EQUIPMENT

Competency: B5 Use hot process equipment

Objectives

To be competent in this area, the individual must be able to:

- Use hot process equipment
- Use and maintain propane fuelled equipment

LEARNING TASKS

1. Describe hot process equipment

CONTENT

- Hand tools
 - Knives
 - Hot carrier
 - Felt layer
 - Mops
 - Mini-mop
 - Squeegee
 - Taping machine
 - Trowels
- Fuelled Equipment
 - Kettles
 - Melters
 - Torches
- Hot asphalt tankers
- Pumps and piping
- Types of LPG cylinders
 - Liquid
 - Vapour
- Fire extinguishers
- Safety
 - PPE
 - Flashpoint temperatures
 - Housekeeping
 - Protecting public
- Adjustment
- Certification requirements
- Handling procedures
 - Connecting and disconnecting
- Handling fuels and sources
- Hazards
 - Hot supply line (piping)
 - Keeping kettle and bitumen clean
- Moisture checks
- Maintenance

2. Use hot process equipment

LEARNING TASKS

CONTENT

- Operating procedures
- Parts
- Purpose/uses
- Storage
- Temperatures and material types
 - Asphalt types
 - Equiviscous temperature
 - High blown temperature
 - Softening point
- Transportation procedures and regulations
- Visual inspection
 - Couplers
 - Leak check solution
 - Lines
 - Regulators
 - Valves

Achievement Criteria

Performance The learner will set up a kettle.

Conditions The learner will be given

- Kettle
- Hand tools
- Fuel
- PPE
- Fire safety equipment
- Operating instructions

Criteria The learner will be evaluated on

- Safety
- Procedure
- Location
- Barricading
- Signage

Line (GAC): B USE TOOLS AND EQUIPMENT

Competency: B6 Use motorized equipment

Objectives

To be competent in this area, the individual must be able to:

- Describe motorized equipment
- Describe use of motorized equipment

LEARNING TASKS

1. Describe motorized equipment

CONTENT

- Types
 - Asphalt spreaders
 - Gravel spreaders
 - Power buggies
 - Roof cutters
 - Roof sweepers
- Manufacturers' specifications and requirements

2. Describe use of motorized equipment

- Adjustment
- Limitations
- Operating procedures
- Parts
- Purpose/uses
- Safety
- Securement
- Storage
- Types
- Visual inspection

Line (GAC):	C	ORGANIZE WORK
Competency:	C1	Use documentation and reference materials

Objectives

To be competent in this area, the individual must be able to:

- Use documentation and reference material
- Use roofing system manufacturers' application procedures

LEARNING TASKS

1. Use documentation and reference material

CONTENT

- Codes
 - National
 - Provincial
 - Municipal
 - Differences between the codes
- Reference material
 - Canadian Roofing Reference Manual
 - Roofing Contractors Association of BC (RCABC) Roofing Practices Manual
- Manufacturers' instructions
- Design authority specifications
- Canadian Standards Association (CSA)
- Underwriters Laboratories of Canada (ULC)
- Canadian Gas Association (CGA)
- National Torch Safety Program
- Employer policies and procedures

2. Use roofing system manufacturers' application procedures

- Installation
 - Overlaps
 - Minimums/maximums
- Fastening methods
- Handling
- Storage

Line (GAC):	C	ORGANIZE WORK
Competency:	C2	Interpret blueprints and drawings

Objectives

To be competent in this area, the individual must be able to:

- Describe blueprints and drawings
- Convert measurements from scale

LEARNING TASKS

1. Describe elements of blueprints
2. Describe views, lines, and symbols on blueprints and drawings
3. Locate and interpret scale and size on blueprints and drawings

CONTENT

- Architectural drawings
- Mechanical drawings
- Electrical drawings
- Structural drawings
- Site specifications
- Types of views
 - Plan views
 - Elevation drawings
 - Section drawings
 - Detail drawings
- Types of lines
 - Break Object
 - Contour
 - Dimension
 - Extension
 - Hidden
 - Section
- Types of symbols
 - Section
 - Detail
 - Mechanical
- Tools
 - Slide ruler
- Review blueprints
- Convert measurements
- Formulas
- Tools
- Drawings
- Calculator

Achievement Criteria

Performance	The learner will calculate areas and perimeters.
Conditions	<p>The learner will be given</p> <ul style="list-style-type: none"> • Calculator • Drawings • Scales
Criteria	<p>The learner will be evaluated on</p> <ul style="list-style-type: none"> • Accuracy • Procedure

Line (GAC): **C ORGANIZE WORK**
Competency: **C4 Assess worksite conditions**

Objectives

To be competent in this area, the individual must be able to:

- Describe assessment of general worksite requirements
- Describe assessment of rooftop requirements

LEARNING TASKS

1. Describe general worksite assessment prior to starting work

CONTENT

- Communication with owner, contractor, and other tradesworkers
- Document pre-existing conditions
- Onsite utilities
 - Overhead
 - Buried
 - Excavations
- Area and public protection
 - Tarps
 - Barricades
 - Signage
- Site security
- Washroom facilities
- First aid stations
- Muster area
- Access and egress
 - Ladders and scaffolding
 - Fall protection
- Equipment requirements
 - Disposal bins and chutes
 - Kettles
 - Lay-down area
 - Equipment placement
 - Propane storage and usage
 - Lifting and hoisting equipment

2. Describe general rooftop assessment prior to starting work

- Starting and finishing points
- Fall protection systems
- Gas and electrical services
- Placement of disposal chutes
- Hazards
- Storage
- Deck type and condition
- Deck sign-offs

LEARNING TASKS

CONTENT

- Pre-existing conditions
 - Inside building
 - Utilities
 - Stains and rot
 - Outside building
 - Broken windows
 - Damaged siding
- Problem and unsafe areas
 - Mechanical equipment
 - Windows
 - Skylights
- Adequate curb and parapet height

Line (GAC): C ORGANIZE WORK

Competency: C5 Position equipment and material on the ground and on the roof

Objectives

To be competent in this area, the individual must be able to:

- Describe equipment and material positioning on the ground
- Describe equipment positioning on the roof
- Describe material positioning on the roof

LEARNING TASKS

CONTENT

- | | |
|--|--|
| 1. Describe equipment and material positioning on the ground | <ul style="list-style-type: none"> • Equipment and materials <ul style="list-style-type: none"> ○ Kettles ○ Tankers ○ Melters ○ Propane tanks ○ Disposal bins ○ Material storage • Placement <ul style="list-style-type: none"> ○ Ease of access ○ Regulations • Safety equipment <ul style="list-style-type: none"> ○ Barricades ○ Caution tape ○ Hoses ○ Fire extinguishers ○ Safety cones ○ Signage |
| 2. Describe equipment positioning on the roof | <ul style="list-style-type: none"> • Loading and unloading location • Structural support and weight distribution <ul style="list-style-type: none"> ○ Equipment storage location • Equipment <ul style="list-style-type: none"> ○ Hoist ○ Lock and tool boxes ○ Mini mop ○ Propane tank ○ Roof cutter ○ Safety equipment ○ Waste disposal chutes |
| 3. Describe material positioning on the roof | <ul style="list-style-type: none"> • Loading and unloading material |

LEARNING TASKS

CONTENT

- Trucks
- Roof
- Sequence of removal and installation
- Structural support and weight distribution
- Ease of access
- Storage
 - Elevated
 - Coverings
 - Securement
 - Theft
 - Environmental protection
 - Requirements
 - Ambient temperature
 - Perimeter distance

Line (GAC):	C	ORGANIZE WORK
Competency:	C6	Prepare material disposal systems

Objectives

To be competent in this area, the individual must be able to:

- Describe assembly and disassembly of material disposal systems
- Use material disposal systems

LEARNING TASKS

1. Describe preparation of material disposal systems

CONTENT

- Components
 - Chutes
 - Counterweights
 - Disposal bins
 - Garbage bags
 - Hoarding
 - Hoists
 - Motorized power buggies
 - Wheel barrows
 - Vacuum trucks
- Separation of materials
- Regulations
- Visual inspections
- Securement
- Debris material
 - Size
 - Recycling
 - Composition
 - Hazardous material
- Fall protection
- Public and building protection
- Weight distribution
- Unguarded edge

2. Use material disposal systems

Line (GAC):	C	ORGANIZE WORK
Competency:	C8	Use roofing math

Objectives

To be competent in this area, the individual must be able to:

- Use common roofing math terminology
- Use basic roofing math
- Use basic geometry
- Calculate materials for roofing

LEARNING TASKS

1. Use common roofing math terminology

2. Use basic roofing math

3. Use basic geometry

4. Calculate materials for roofing

CONTENT

- Roofing square
- Pitch
- Slope
- Ratio
- Use fractions, decimals and ratios
- Operations
 - Fractions
 - Lowest terms
 - Decimals
 - Areas, perimeter and volume
- Decimal to fraction conversions
- Fraction to decimal conversions
- Convert measurements to ratios
- Conversions from metric to imperial
- Perimeters and areas of shapes
 - Squares
 - Rectangles
 - Triangles
 - Circles
- Volumes of shapes
 - Cubes
 - Cylinders
- Ladder ratio
- Material quantities
- Calculate shingles
- Calculate coverage rates
- Calculate volume

Line (GAC):	D	USE COMMUNICATION AND MENTORING TECHNIQUES
Competency:	D1	Use communication techniques

Objectives

To be competent in this area, the individual must be able to:

- Use communication techniques
- Use digital communication technologies and platforms

LEARNING TASKS

1. Use effective communication skills

CONTENT

- Verbal and written instructions
- Professionalism
 - Participation
 - Responsibilities
 - Respect
- Harrassment and discrimination
- Constructive feedback
- Safety and information meetings

2. Use active listening

- Attention
- Clarification
- Acknowledgement of understanding
- Eye contact
- Engagement
- Open-ended questions

3. Use digital communication technologies and platforms

- Email
- Text messages
- Social media
- Record keeping
 - Apps and platforms
 - Service/work orders
 - Inspection reports

Line (GAC):	E	PREPARE ROOF FOR REPLACEMENT
Competency:	E1	Protect surrounding area

Objectives

To be competent in this area, the individual must be able to:

- Protect area surrounding a roof replacement site from damage

LEARNING TASKS

1. Describe areas requiring protection from potential damage
2. Use protective methods and materials
3. Protect windows, walls, skylights, and mechanical equipment

CONTENT

- Skylights
- Mechanical equipment
- Walls
- Windows
- Vehicles
- Vegetation
- Methods
 - Document areas of previous damage
 - Verify utility shut down as required
 - Verify air intake mechanical equipment shut down as required
 - Placement of equipment and materials
 - Erect protection barriers
- Types of protection material
 - Dimensional lumber
 - Tarps
 - Sheeting
 - Blankets
 - Filter
- Types of damage
 - Broken glass
 - Fume infiltration
 - Staining
 - Fire
 - Water ingress
- Protection materials
 - Tarps
 - Plywood
 - Blankets
 - Fabric

LEARNING TASKS

CONTENT

- Type of damage
 - Broken glass
 - Fume infiltration
 - Staining
 - Fire
- Identification of areas of potential damage
 - Windows
 - Walls
 - Skylights
 - Mechanical equipment
 - Vehicles
- Identification of areas of previous damage
- Barrier erection
- Placement of materials

Achievement Criteria

Performance The learner will perform protective measures and select materials.

Conditions The learner will be given:

- Protection material
- Protection barrier
- Safety equipment

Criteria

- Accuracy
- Procedure
- Safety

Line (GAC): E PREPARE ROOF FOR REPLACEMENT

Competency: E2 Remove loose debris

Objectives

To be competent in this area, the individual must be able to:

- Describe removal of loose debris when replacing a roof

LEARNING TASKS

1. Describe the removal of loose debris

CONTENT

- Types of debris
 - Ballast/aggregate
 - Organic waste
 - Vegetative growth
 - Inorganic waste
 - Construction waste
 - Decommissioned equipment
 - Trash
 - Hazardous
 - Animal droppings
 - Asbestos
 - Mould
 - Used needles
- Methods
 - Safety
 - Gathering
 - Storing
 - Disposing
 - Equipment and machinery
 - Notify authority of hazardous materials

Line (GAC):	E	PREPARE ROOF FOR REPLACEMENT
Competency:	E3	Remove roofing and flashings

Objectives

To be competent in this area, the individual must be able to:

- Remove roofing and metal flashings

LEARNING TASKS

1. Remove roofing and metal flashings

CONTENT

- Use tools and equipment
 - System type
- Determine disposal systems and technique
- Hazards
 - Deteriorated deck
 - Electric wiring
 - Fasteners
 - Unforeseen conditions
 - Roof openings
 - Utility lines
- Components
 - Mechanical
 - Insulations
 - Ballasts
 - Plumbing
 - Vapour barriers
- Temporary drainage
- Temporary sealing
 - Night seal
- Effect of weather conditions
- Safety
 - Leading edge
 - PPE
- Removal sequence and procedure
 - Amount and duration of roof exposure
- Removal and disposal of materials
 - Recyclable materials
 - Regulated and hazardous materials

Achievement Criteria

Performance	The learner will remove roof materials from a mockup.
Conditions	<p>The learner will be given</p> <ul style="list-style-type: none"> • Removal instructions • Removal tools • PPE • Disposal equipment
Criteria	<ul style="list-style-type: none"> • Safety • Competency • Procedure

Line (GAC): **F PREPARE DECK FOR ROOF INSTALLATION**
Competency: **F2 Clean surface of deck**

Objectives

To be competent in this area, the individual must be able to:

- Clean the surface of the deck
- Identify safety issues when cleaning the deck

LEARNING TASKS

1. Describe and clean deck according to procedure

CONTENT

- Planning and considerations
 - Timing of cleaning
 - Size of area to be cleaned
 - Extent of cleaning required
 - Damage mitigation
- Deck types
 - Steel
 - Wood
 - Concrete
- Hazards
 - Deterioration
 - Openings
 - Penetrations and projections
 - Fasteners
- Tools
 - Hand tools
 - Mechanical equipment
- Remove materials and debris
- Contaminant removal
 - Oil
 - Fuel
 - Adhesive/residue
- Limiting access after cleaning
- Barriers

2. Identify defects when cleaning the deck

- Defects
 - Bumps and cracks
 - Corrosion
 - Deck deflection
 - Holes and voids
 - Deterioration
 - Securement and support
 - Uncured concrete
- Notification of responsible parties

Achievement Criteria

Performance	The learner will clean and prepare the deck of a mockup.
Conditions	<p>The learner will be given</p> <ul style="list-style-type: none"> • PPE • Hand tools • Instructions • Disposal equipment
Criteria	<ul style="list-style-type: none"> • Safety • Competency • Procedure

Line (GAC): F PREPARE DECK FOR ROOF INSTALLATION
Competency: F4 Dry deck

Objectives

To be competent in this area, the individual must be able to:

- Describe how to dry the deck

LEARNING TASKS

1. Describe how to dry the deck

CONTENT

- Prevention
 - Temporarily cover dried deck
 - Priming
- Considerations
 - Effect of weather conditions on drying time
 - Size of area to dry
 - Limiting deck exposure to moisture
 - Material and manufacturers' requirements
- Deck types
 - Concrete
 - Steel
 - Wood
- Techniques
 - Blowing
 - Chipping
 - Dry mopping
 - Shovelling
 - Torching
 - Vacuuming
- Tools & equipment
 - Fans
 - Heaters
 - Shovels
 - Mops
 - Snowblowers
 - Shop Vac
 - Tarps
 - Torches
- Hazards
 - Fire
 - Holes
 - Overheating
 - Ice

Line (GAC):	G	APPLY LOW SLOPE ROOFING COMPONENTS
Competency:	G1	Install support panels

Objectives

To be competent in this area, the individual must be able to:

- Describe support panel types and uses
- Describe support panel installation techniques and procedures

LEARNING TASKS

1. Describe support panels

CONTENT

- Types
 - Gypsum board
 - Wood sheathing
 - Oriented Strand Board (OSB)
 - Plywood
 - Fibreboard
 - Asphaltic core board
- Uses
 - Provide suitable substrate
 - Codes and Manufacturers' Specifications
 - Fire rating
 - Seismic considerations

2. Describe and select tools and equipment

- Safety
- Installation tools
 - Hand tools
 - Power tools

3. Describe support panel installation techniques and procedures

- Cutting, fitting and placement
- Layout
- Securement requirements
 - Adhesives
 - Asphalt
 - Low-rise foam
 - Fasteners
 - Length
 - Patterns
 - Quantity
 - Types
 - Loose-laid system
- Joint sealing

Line (GAC): **G APPLY LOW SLOPE ROOFING COMPONENTS**
Competency: **G2 Prime substrate**

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment for priming substrate
- Describe substrate and primers
- Describe substrate usability
- Apply primer

LEARNING TASKS

CONTENT

- | | |
|---|---|
| 1. Use tools and equipment for priming substrate | <ul style="list-style-type: none"> • Safety • Tools <ul style="list-style-type: none"> ○ Brush ○ Roller ○ Sprayer • Equipment |
| 2. Describe substrate and primers | <ul style="list-style-type: none"> • Types of substrate <ul style="list-style-type: none"> ○ Wood ○ Steel ○ Concrete ○ Support panels ○ Insulation • Types of primers <ul style="list-style-type: none"> ○ Solvent ○ Water-based |
| 3. Describe substrate usability | <ul style="list-style-type: none"> • Cleanliness • Moisture • Damage • Porosity |
| 4. Select primer | <ul style="list-style-type: none"> • Fire hazard considerations • Compatibility • Curing times |
| 5. Apply primer | <ul style="list-style-type: none"> • Safety signage • Application rates |

Line (GAC):	G	APPLY LOW SLOPE ROOFING COMPONENTS
Competency:	G3	Apply vapour retarder, vapour barrier, and air barrier

Objectives

To be competent in this area, the individual must be able to:

- Select tools and equipment for applying vapour retarder, vapour barrier, and air barriers
- Install vapour retarders, vapour barriers, and air barriers

LEARNING TASKS

1. Select tools and equipment for applying vapour retarder, vapour barrier, and air barriers

CONTENT

- Safety
- Hand tools
- Hot-applied equipment
- Spray equipment

2. Describe vapour retarders, vapour barriers, and air barriers

- Purpose
 - Vapour retarder
 - Moisture prevention
 - Air barrier
 - Air flow prevention
- Types
 - Modified bituminous bitumens
 - Liquid
 - Felts
 - Kraft laminate
 - Two-ply felts
 - Single-ply membranes
 - Polyethylene
- Method of application
 - Self-adhesive
 - Adhesive applied
 - Loose-laid
 - Hot asphalt applied
 - Torch applied
- Selection
 - Code requirements
 - Design requirements
 - Specifications

3. Install vapour retarders, vapour barriers, and air barriers

- Types
- Manufacturers' specifications
- Material compatibility
- Application techniques
 - Placing

LEARNING TASKS

CONTENT

- Cutting
- Fitting
- Rolling
- Seal laps, seams, and penetrations
- Continuity of vapour retarder and air barrier in building envelope

Achievement Criteria

NOTE: Include competencies G3-G6 as part of this Achievement Criteria.

Performance The learner will install and apply low slope roofing components.

Conditions The learner will be given

- Access to PPE
- Tools
- Materials
- Material specifications

Criteria The learner will be evaluated on

- Safety
- Accuracy
- Procedure
- Application

Line (GAC): **G APPLY LOW SLOPE ROOFING COMPONENTS**
Competency: **G4 Install Insulation**

Objectives

To be competent in this area, the individual must be able to:

- Describe insulation and installation securement methods and materials
- Describe storage and securement requirements of insulation
- Install insulation

LEARNING TASKS

1. Describe insulation

CONTENT

- Purpose
 - Heat transfer
 - Sound transfer
- Heat transfer terms
 - Conduction
 - Convection
 - Radiation
 - R and K factors
- Types of board insulation
 - Polystyrene
 - Expanded
 - Extruded
 - Polyisocyanurate
 - Mineral wool
 - Fibreglass
 - Phenolic
 - Perlite
 - Fibre board
 - Polyurethane
- Sloped insulation
- Heat sensitive and heat insensitive
- Mechanically attached roofing system (MARS)
- Partially adhered roofing system (PARS)
- Adhesive attached roofing system (AARS)
- Loose-laid
- Design requirements
 - CSA wind uplift requirement
- Mechanically fastened
 - Insulation plates

2. Describe insulation securement methods

3. Describe insulation securement materials

LEARNING TASKS

CONTENT

- | | |
|---|--|
| | <ul style="list-style-type: none"> ○ Fasteners ○ Patterns |
| | <ul style="list-style-type: none"> • Adhered <ul style="list-style-type: none"> ○ Asphalt <ul style="list-style-type: none"> – Application rates ○ Low-rise foam <ul style="list-style-type: none"> – Application patterns |
| | <ul style="list-style-type: none"> • Loose-laid <ul style="list-style-type: none"> ○ Ballast |
| 4. Describe insulation storage and securement | <ul style="list-style-type: none"> • Storage procedures and considerations <ul style="list-style-type: none"> ○ Bulk storage placement ○ Elevated on dunnage ○ Cutting transportation wrap ○ Tarping • Securement |
| 5. Install insulation | <ul style="list-style-type: none"> • Methods and tools • Layout • Stagger/soldier • Cut and fit • Damage prevention <ul style="list-style-type: none"> ○ Asphalt burnouts ○ Open flames ○ Installation traffic ○ Moisture |

Achievement Criteria

NOTE: Competencies G3-G6 will be assessed together in Competency G3.

Line (GAC):	G	APPLY LOW SLOPE ROOFING COMPONENTS
Competency:	G5	Install cover board

Objectives

To be competent in this area, the individual must be able to:

- Install cover board

LEARNING TASKS

1. Describe cover board

2. Install cover board

CONTENT

- Purpose and selection
- Tools and equipment
- Types
 - Wood fibre
 - Asphaltic core board
 - Gypsum
 - Composite boards
 - Wood sheathing
 - Fibreglass
- Specifications
- Layout pattern
- Cutting, fitting, and placing
- Securement methods
 - Fasteners
 - Adhesives
- Requirements
 - Joint sealing

Achievement Criteria

NOTE: Competencies G3-G6 will be assessed together in Competency G3.

Line (GAC): G APPLY LOW SLOPE ROOFING COMPONENTS

Competency: G6 Install drains, vents, curbs, and penetrations

Objectives

To be competent in this area, the individual must be able to:

- Describe an overview of installing drains, vents, curbs, and penetrations
- Install drains, vents, curbs, and penetrations on built-up roofing (BUR)

LEARNING TASKS

1. Describe drains

2. Describe curbs

CONTENT

- Primary and overflow
 - Scupper
 - Mechanical
 - Retrofit
- Components
 - Drain baskets
 - Clamping rings
 - Flange
 - Bowl
 - Connections
 - Mechanical joint coupler/MJ clamp
 - Compression seal
- Sump drain area
- Types
 - HVAC
 - Roof hatch
 - Fan curbs
 - Skylights
 - Area dividers/control joints
 - Expansion joints
 - Sleepers
- Requirements
 - Height
 - Insulation
 - Membrane installation
 - Construction
 - Wood
 - Steel
 - Concrete
 - Levelling

LEARNING TASKS

3. Describe vents and pipe penetrations

CONTENT

- Types of penetrations
 - Plumbing pipes
 - Heating intake and exhaust
 - Utility service connections
 - Ventilation
- Types of penetration flashings
 - Metal
 - Membrane
 - Penetration pocket
 - Accessories
 - Primer
 - Target patches
 - Sealants
 - Storm collars

4. Install drains, vents, curbs, and penetrations on built-up roofing (BUR)

- Read manufacturers' instructions
- Cut membranes
- Prepare flashing
 - Clean and scarify
 - Priming/mastic
- Install flashing
 - Secure flashings
 - Apply membrane
- Install accessories

Achievement Criteria

NOTE: Competencies G3-G6 will be assessed together in Competency G3.

Line (GAC): **G APPLY LOW SLOPE ROOFING COMPONENTS**
Competency: **G7 Apply ballast, walkways, and protective surfaces**

Objectives

To be competent in this area, the individual must be able to:

- Describe ballast, walkways, and protective surfaces
- Describe required tools and equipment
- Describe application of ballast, walkways, and protective surfaces

LEARNING TASKS

CONTENT

- | | |
|--|---|
| 1. Describe ballast and protective surfaces | <ul style="list-style-type: none"> • Purpose <ul style="list-style-type: none"> ○ Wind uplift ○ Cosmetic ○ Fire protection ○ Traffic protection ○ UV protection • Types <ul style="list-style-type: none"> ○ Gravel ○ Pavers and walkways ○ Protected Membrane Assemblies (PMA) ○ Smooth surface coatings ○ Granulated membranes ○ Concrete top insulation ○ Organics |
| 2. Describe tools and equipment required for application of ballast, walkways, and protective surfaces | <ul style="list-style-type: none"> • Safety • Tools <ul style="list-style-type: none"> ○ Hand tools ○ Sprayers • Equipment <ul style="list-style-type: none"> ○ Cranes ○ Hoists ○ Power buggies |
| 3. Describe application of ballast, walkways, and protective surfaces | <ul style="list-style-type: none"> • Safety • Requirements and restrictions • Distribution of ballast, aggregate, and paver material • Specifications • Acceptance of ballast and aggregate <ul style="list-style-type: none"> ○ Size |

LEARNING TASKS

CONTENT

- Cleanliness
- Cut, fit, lay out, and placement
 - Filter fabric
 - Protective material
 - Separation sheet
 - Patio stones
 - Insulation
- Apply granulated cap sheets and surface coatings
- Maintain level elevation of patio stones

Line (GAC):	G	APPLY LOW SLOPE ROOFING COMPONENTS
Competency:	G8	Install metal flashings

Objectives

To be competent in this area, the individual must be able to:

- Describe metal flashing
- Describe installation of metal flashing

LEARNING TASKS

1. Describe metal flashing

CONTENT

- Purpose
- Requirements
 - Codes
 - Manufacturers
 - Specifications
- Watershed design principles
- Selecting gauge and colour of flashing
- Location, profile, and size of flashing
- Materials
 - Aluminum
 - Copper
 - Stainless steel
 - Galvanized steel
 - Lead
 - Zinc
- Coated metals
 - Thermal Polyolefin
 - Polyvinyl Chloride
 - Pre-painted
 - Baked enamel
- Profiles and types of flashing
 - Cap
 - Wall
 - Gravel stops
 - Drip
 - Reglets
 - Valleys
- Expansion and contraction
- Safety and PPE
- Tools and equipment
- Fabrication and installation
 - Cutting
 - Finishing
 - Fastening

2. Describe installation of metal flashing

LEARNING TASKS

CONTENT

- Flashing
- Braking
- Folding
- Types of seam joints
 - S-locks
 - Standing seam
 - Lap joints
- Securement
 - Types
 - Screws
 - Nails
 - Wind cleats
 - Pins
 - Compatibility
 - Dissimilar metals
- Sealants
 - Butyl tape
 - Caulking
 - Liquid membranes
 - Mastic

Line (GAC):	H	APPLY LOW SLOPE ROOFING MEMBRANES
Competency:	H1	Relax membranes

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment for relaxing membranes
- Relax membrane
- Describe preparation of membranes

LEARNING TASKS

CONTENT

- | | |
|---|---|
| 1. Use tools and equipment for relaxing membranes | <ul style="list-style-type: none"> • Safety • Hand tools • Weights |
| 2. Prepare membranes | <ul style="list-style-type: none"> • Remove labelling and wrappers • Unroll membrane • Cut membrane roll to length |
| 3. Describe relaxing membrane process | <ul style="list-style-type: none"> • Heat membrane • Position weights • Visually inspect membrane <ul style="list-style-type: none"> ○ Damage ○ Cleanliness |

Achievement Criteria

NOTE: Competency H1, H2, H10 will be assessed together in Competency H6.

Line (GAC): H APPLY LOW SLOPE ROOFING MEMBRANES

Competency: H2 Set membranes

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment for setting membranes
- Set membrane

LEARNING TASKS

CONTENT

- | | |
|--|---|
| 1. Use tools and equipment for setting membranes | <ul style="list-style-type: none"> • Safety • Hand tools |
| 2. Set membranes | <ul style="list-style-type: none"> • Laps direction <ul style="list-style-type: none"> ○ Sheds water • Measure and cut membrane <ul style="list-style-type: none"> ○ Manufacturers' specifications • Position and overlap membrane sheets and rolls • Visually verify membrane layout and alignment |

Achievement Criteria

NOTE: Competency H1, H2, H10 will be assessed together in Competency H6.

Line (GAC):	H	APPLY LOW SLOPE ROOFING MEMBRANE
Competency:	H3	Apply membranes using hot-liquid process

Objectives

To be competent in this area, the individual must be able to:

- Describe tools and equipment for applying membranes using hot-liquid process
- Describe built-up roofing (BUR) materials
- Describe installation of BUR materials

LEARNING TASKS

1. Describe tools and equipment for applying membranes using hot-liquid process

CONTENT

- Safety
- Hand tools
- Kettles
- High boys
- Low boys
- Buckets
- Mops
- Felt layers

2. Describe built-up roofing (BUR) materials

- Roll products
 - Felts/asphalt saturated
 - Organic
 - Fibreglass
 - Polyester
 - Rolls/asphalt coated
 - Sanded
 - Mineral
 - Joint tape
- Bitumen types
 - 1, 2, 3, 4
 - Styrene Ethylene Butylene Styrene (SEBS)
 - Coal tar pitch
- Fasteners
 - Membrane
 - Insulation
- Surfacing materials
 - Smooth
 - Aggregate
 - Mineral

LEARNING TASKS

3. Describe installation of BUR materials

CONTENT

- Selection of asphalt type
- Bitumen
 - Types
 - Temperatures
 - Heating and monitoring
 - Equiviscous (EVT)
 - Full blow temperature (FBT)
 - Flash point
 - Mopping and pouring bitumen
 - Roll membrane into roofing asphalt
 - Broom membrane in place to enhance adhesion
- Rolls
 - Types of roll products
 - Bitumen application rates
 - Roll coverage rates
 - Exposure
- Surfacing
 - Types
 - Application rates
 - Bitumen
 - Gravel
 - Glaze coating
 - Flood coating
- Sealants
- Walkways

Line (GAC):	H	APPLY LOW SLOPE ROOFING MEMBRANE
Competency:	H6	Apply membranes using cold-applied methods

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment for applying membranes using cold-applied methods
- Use cold-applied BUR materials
- Install cold-process BUR materials

LEARNING TASKS

1. Use tools and equipment

CONTENT

- Safety
- Hand tools
- Notched Trowels
- Rollers
 - Weighted
 - Hand
 - Paint
- Spray equipment
- Dual cartridge applicator
- Roll products
 - Felts/asphalt saturated
 - Organic
 - Fiberglass
 - Polyester
 - Rolls/asphalt coated
 - Sanded
 - Mineral
 - Joint tape
- Attachment methods
 - Adhesives
- Surfacing materials
 - Smooth
 - Aggregate
 - Mineral
- Material preparation
 - Cleaning solvents

2. Describe cold applied BUR materials and material preparation

3. Install cold process BUR materials

- Selection of adhesive types

- Types
- Temperatures
 - Storage
 - Application
 - Curing
- Application of adhesives
 - Rolling
 - Notched trowel
 - Spray
 - Dual cartridge applicator
- Apply membrane into adhesive
 - Rolling
 - Flying in
 - Sealing seams
 - Brooming/weighted rolling
- Monitor adhesive application rates
 - Wet mil gauge
- Rolls
 - Types of roll products
 - Application rates
 - Roll coverage rates
 - Exposure
- Surfacing
 - Types
 - Application rates
 - Adhesives
 - Gravel
 - Protective coating
- Sealants
- Walkways

Achievement Criteria:

NOTE: Include competencies H1, H2, and H10 as part of this Achievement Criteria.

Performance The learner will install cold process membrane on low slope roof.

Conditions The learner will be given:

- PPE
- A low slope roof mockup
- Materials
- Tools and equipment
- Specifications

Criteria

- Safety
- Accuracy
- Procedure
- Application

Line (GAC):	H	APPLY LOW SLOPE ROOFING MEMBRANES
Competency:	H7	Apply membranes using mechanical fasteners

Objectives

To be competent in this area, the individual must be able to:

- Describe mechanical fasteners
- Describe application of mechanical fasteners

LEARNING TASKS

1. Describe mechanical fasteners

CONTENT

- Types
 - Screws
 - Plates
 - Nails
 - Bars
 - Concrete pins
 - Gauge and length
 - Tension and seating
-
- Safety
 - Selection of tools and equipment
 - Patterns and spacing
 - Fastening requirements
 - CSA wind uplift
 - Wind zones
 - Manufacturers' requirements
 - Hazards
 - Utilities on and below substrate level

2. Describe application of mechanical fasteners

Line (GAC): **H APPLY LOW SLOPE ROOFING MEMBRANES**
Competency: **H10 Install membrane flashings**

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment to install membrane flashings
- Apply BUR membrane flashing materials

LEARNING TASKS

CONTENT

- | | |
|--|---|
| 1. Use tools and equipment to install membrane flashings | <ul style="list-style-type: none"> • Safety • Tools • Equipment |
| 2. Describe BUR membrane flashing materials | <ul style="list-style-type: none"> • Rolled products <ul style="list-style-type: none"> ○ Felts (organic, glass fibre, polyester) <ul style="list-style-type: none"> – Coated rolls – Modified rolls – Reinforcement rolls • Adhesives <ul style="list-style-type: none"> ○ Primers ○ Bitumen ○ Mastics ○ Other adhesives • Mechanical fasteners <ul style="list-style-type: none"> ○ Nails ○ Screws ○ Plates ○ Bars • Protection materials • Cant strip • Location <ul style="list-style-type: none"> ○ Walls and transitions ○ Parapets ○ Drains ○ Penetrations • Selection <ul style="list-style-type: none"> ○ Accepted materials ○ Specifications ○ Coatings |
| 3. Apply BUR membrane flashing materials | <ul style="list-style-type: none"> • Membrane flashing |

LEARNING TASKS**CONTENT**

- Measure
- Cut
- Shape to form
 - Parapets
 - Penetrations
 - Roof to wall transitions
- Install materials to accept membrane flashing on substrate
- Install successive layers

Achievement Criteria

NOTE: Competency H1, H2, H10 will be assessed together in Competency H6.

Line (GAC): H APPLY LOW SLOPE ROOFING MEMBRANES

Competency: H11 Install temporary seals and temporary drains

Objectives

To be competent in this area, the individual must be able to:

- Describe purpose of water cut-offs, temporary seals, and temporary drains

LEARNING TASKS

1. Describe the purpose of installation of water cut-offs, temporary seals, and temporary drains

CONTENT

- Water cut-offs
 - Temporary
 - Permanent
- Requirements for
 - Water cut-offs
 - Temporary seals
 - Temporary drains
- Materials
 - Asphalt
 - Sealant
 - Membrane
- Material compatibility
- Determining integrity
- Removal

Line (GAC):	I	PERFORM COMMON STEEP SLOPE PRACTICES
Competency:	I1	Install steep slope underlayment

Objectives

To be competent in this area, the individual must be able to:

- Describe steep slope underlayment components and considerations
- Install eave protection and steep slope underlayments

LEARNING TASKS

1. Describe steep slope underlayment components and considerations

CONTENT

- Purpose
- Decks
 - Wood
 - Steel
 - Concrete
- Slope
 - Requirements
- Types
 - Organic felts
 - Fibreglass felts
 - Synthetics
 - Coated rolls
 - Self-adhered membranes
- Locations
 - Eave protection
 - Field underlayment
 - Valley underlayment
 - Slip sheets
 - Penetrations
- Insulation
 - Types
 - Securement
- Compatibility to roof types
- Fasteners
 - Nails
 - Adhesives
 - Requirements
 - Compatibility
- Details
- Metal flashings
- Requirements
 - Codes
 - Manufacturers' specifications
 - Design specifications

LEARNING TASKS

2. Install eave protection and steep slope underlayment

CONTENT

- Use tools and equipment
- Relax eave protection
- Apply eave protection
- Measure, cut, and fit underlayment
- Attach underlayment

Achievement Criteria

NOTE: Include all competencies in **GAC I: PERFORM COMMON STEEP SLOPE PRACTICES** as part of one Achievement Criteria.

Performance The learner will install steep slope underlayment on a mockup

Conditions The learner will be given

- PPE
- Tools
- Materials
- Specifications

Criteria

- Safety
- Accuracy
- Procedure
- Application

Line (GAC):	I	PERFORM COMMON STEEP SLOPE PRACTICES
Competency:	I2	Install steep slope venting

Objectives

To be competent in this area, the individual must be able to:

- Describe components and considerations for steep slope venting
- Install steep slope venting

LEARNING TASKS

1. Describe components and considerations for steep slope venting

CONTENT

- Purpose
- Requirements
 - Code
 - Manufacturer
 - Roof installation type
- Types and locations
 - Intake
 - Soffit
 - Baffles
 - Static
 - Air flow
 - Attic
 - Battens/counter battens
 - Geosynthetic mats
 - Exhaust
 - Mechanical
 - Ridge
 - Static
- Fasteners
- Details
 - Metal flashing

2. Install steep slope venting

- Use tools and equipment
- Venting requirements
- Fastening requirements
- Cut deck for continuous venting
- Cut deck for static air vents
- Install baffles
- Install roof vents
- Install battens and counter battens

Achievement Criteria

NOTE: Include all competencies in **GAC I: PERFORM COMMON STEEP SLOPE PRACTICES** as part of one Achievement Criteria.

Performance The learner will install steep slope venting on a mockup.

Conditions The learner will be given

- PPE
- Tools
- Materials
- Specifications

Criteria

- Safety
- Accuracy
- Procedure
- Application

Line (GAC):	I	PERFORM COMMON STEEP SLOPE PRACTICES
Competency:	I3	Install steep slope valley applications

Objectives

To be competent in this area, the individual must be able to:

- Install steep slope valley applications

LEARNING TASKS

1. Describe steep slope valley applications

CONTENT

- Purpose
 - Materials
 - Membrane
 - Metal
 - Styles
 - California
 - Closed cut
 - Open
 - Standard
 - Woven
 - Profiles of valley flashing
 - Standard
 - W valley
 - Double W valley
-
2. Install steep slope valley applications
 - Use tools and equipment
 - Determine valley type and style
 - Requirements
 - Overlaps
 - Position
 - Shingles
 - Tiles
 - Metal roofing
 - Securement
 - Fasteners
 - Clips
 - Membrane adhesion
 - Bends
 - Folds
 - Openings
 - Underlayment
 - Valley protection
 - Valley
 - Flashing

LEARNING TASKS

CONTENT

- Mitre cut and fit
 - Shingles
 - Tiles
 - Metal roofing

Achievement Criteria

NOTE: Include all competencies in **GAC I: PERFORM COMMON STEEP SLOPE PRACTICES** as part of one Achievement Criteria.

Performance The learner will install valley applications on a steep slope mockup.

Conditions The learner will be given

- PPE
- Tools
- Materials
- Specifications

Criteria

- Safety
- Accuracy
- Procedure
- Application

Line (GAC):	I	PERFORM COMMON STEEP SLOPE PRACTICES
Competency:	I4	Install steep slope saddles/crickets

Objectives

To be competent in this area, the individual must be able to:

- Install steep slope saddles and crickets

LEARNING TASKS

1. Describe steep slope saddles and crickets
2. Install steep slope saddles and crickets

CONTENT

- Purpose
- Types of crickets
 - Wood
 - Metal
- Requirements
 - Code
 - Specifications
- Location
- Use tools
- Determine materials
- Construction
 - Build saddle/cricket
- Underlying requirements
- Securement
- Metal flashings

Achievement Criteria

NOTE:	Include all competencies in GAC I: PERFORM COMMON STEEP SLOPE PRACTICES as part of one Achievement Criteria.	
Performance	The learner will install steep slope saddles/crickets on a mockup.	
Conditions	The learner will be given <ul style="list-style-type: none"> • PPE • Tools • Materials • Specifications 	
Criteria	<ul style="list-style-type: none"> • Safety • Accuracy • Procedure • Application 	

Line (GAC):	I	PERFORM COMMON STEEP SLOPE PRACTICES
Competency:	I5	Install steep slope penetration flashings

Objectives

To be competent in this area, the individual must be able to:

- Describe steep slope penetrations
- Install steep slope penetration flashings

LEARNING TASKS

1. Describe steep slope penetrations

CONTENT

- Types of pipe penetrations
 - Plumbing pipe
 - Bathroom exhaust pipe
 - Dryer exhaust pipe
 - Heating exhaust pipe
 - Ventilation
 - Hydro mast/service stacks
- Types of curbs
 - Chimney
 - Fans
 - Skylights

2. Describe steep slope penetration flashings

- Materials
 - Plastics
 - Hard
 - Flexible
 - Composite
 - Metals
 - Lead
 - Aluminum
 - Steel
 - Copper
 - Zinc
 - Membranes
 - EPDM
- Types of penetration flashings
 - Pipe stacks
 - 5-in-1
 - Lead
 - Aluminum
 - Neoprene gasketed
 - Settlement caps

- Tall cone
 - Storm collars
 - Rain caps
 - Exhaust pipes
 - Bathroom
 - Dryer
 - Heating
 - Ventilation
 - Static
 - Turbine
 - Mechanical
 - Requirements
 - Sealants
 - Manufacturer requirements
 - Design authority
 - Securement
3. Install steep slope penetration flashings
- Use tools
 - Requirements
 - Code
 - Manufacturer requirements
 - Design authority
 - Procedure
 - Cut deck for penetration flashing installation
 - Install penetration flashing
 - Secure flashing
 - Apply sealant

Achievement Criteria

NOTE:	Include all competencies in GAC I: PERFORM COMMON STEEP SLOPE PRACTICES as part of one Achievement Criteria.	
Performance	The learner will install steep slope penetration flashing on mockup.	
Conditions	The learner will be given	
	<ul style="list-style-type: none"> ● PPE ● Tools ● Materials ● Specifications 	
Criteria	<ul style="list-style-type: none"> ● Safety ● Accuracy ● Procedure ● Application 	

Line (GAC): I PERFORM COMMON STEEP SLOPE PRACTICES

Competency: I6 Install steep slope metal flashings and drainage

Objectives

To be competent in this area, the individual must be able to:

- Install steep slope metal flashing and drainage details

LEARNING TASKS

1. Describe steep slope metal flashing

CONTENT

- Purpose
- Requirements
 - Code
 - Manufacturer
 - Design authority
- Types of metal flashing
 - Drip edge
 - Rake edge
 - Step
 - Base
 - Counter
 - Through-wall
 - Back pan
 - Apron
 - Wall
 - Saddles or crickets
 - Valley
 - Reglet
 - Hip/ridge
 - Diverters
 - Clips
- Materials
 - Prepainted steel
 - Lead
 - Copper
 - Aluminum
 - Zinc
 - Fasteners
 - Sealant

2. Describe steep slope drainage

- Purpose
- Requirements
 - Code
 - Manufacturer
 - Design authority

- Types
 - Gutter
 - Built-in
 - Face mounted
 - Exterior
 - C-channels
 - Rainwater leader (RWL)
 - Snow guards
 - Materials
 - Metal
 - Prepainted steel
 - Lead
 - Copper
 - Aluminum
 - Zinc
 - Membrane
 - Modified Bituminous
 - Single plies
 - Liquid applied
- 3. Install steep slope metal flashing and drainage details
 - Selecting and using tools
 - Shop fabricating
 - Types of metal flashing
 - Drip edge
 - Rake edge
 - Step
 - Base
 - Counter
 - Through-wall
 - Back pan
 - Apron
 - Wall
 - Saddles or crickets
 - Valley
 - Reglet
 - Hip/ridge
 - Diverters
 - Clips
 - Materials
 - Prepainted steel
 - Lead
 - Copper
 - Aluminum
 - Zinc

- Fasteners
 - Types
 - Location
- Adhesives
- Application of metal flashing and drainage details
 - Requirements
 - Code
 - Manufacturer requirements
 - Design authority
 - Field forming
 - Securement
 - Sealants

Achievement Criteria

NOTE: Include all competencies in **GAC I: PERFORM COMMON STEEP SLOPE PRACTICES** as part of one Achievement Criteria.

Performance The learner will install steep slope metal flashing and drainage on mockup.

Conditions The learner will be given

- PPE
- Tools
- Materials
- Specifications

Criteria

- Safety
- Accuracy
- Procedure
- Application

Line (GAC):	J	APPLY SHINGLES
Competency:	J1	Determine type and layout of shingles

Objectives

To be competent in this area, the individual must be able to:

- Describe types of asphalt shingles
- Describe considerations and components for the layout of asphalt shingles
- Layout asphalt shingles

LEARNING TASKS

1. Describe types of asphalt shingles

CONTENT

- Composition
 - Surfacing
 - Reinforcement
 - Saturation
- Styles
 - Laminates
 - 3 tabs
 - Interlocking
 - Architectural
- Requirements
 - Codes
 - Manufacturers' specifications
 - Design authority
- Ventilation
- Slope
- Acceptable substrate
 - Wood
- Components
 - Underlayment
 - Eave protection
 - Valley
 - Field
 - Asphalt shingles
 - Starters
 - Field
 - Hip/ridge caps
 - Fasteners
 - Nails
 - Mastic
 - Metal flashings
 - Penetration flashings

2. Describe considerations and components for layout of asphalt shingles

LEARNING TASKS

3. Layout asphalt shingles

CONTENT

- Selecting tools and equipment
- Determining alignment of shingles
- Determining layout sequence
- Matching course alignment at adjacent slopes

Achievement Criteria

NOTE: Include competencies J1-J4 and J6 as part of this Achievement Criteria.

Performance The learner will install asphalt shingles on a mockup.

Conditions The learner will be given

- PPE
- Tools
- Materials
- Specifications

Criteria

- Safety
- Accuracy
- Procedure
- Application

Line (GAC):	J	APPLY SHINGLES
Competency:	J2	Install starter strip and starter course

Objectives

To be competent in this area, the individual must be able to:

- Describe components and considerations for installing starter strip for asphalt shingles
- Install starter strip for asphalt shingles

LEARNING TASKS

1. Describe starter strips for asphalt shingles

2. Describe components and considerations for installing starter strip for asphalt shingles

3. Install starter strip for asphalt shingles

CONTENT

- Purpose
- Requirements
 - Codes
 - Manufacturers' specifications
 - Design authority
- Types
 - Proprietary
 - Field cut starters
- Locations
 - Eaves
 - Rake edges
- Positioning
 - Overhang
 - Offsets
- Fastening
 - Type of fastener
 - Length
 - Number
 - Location
- Safety
- Selecting tools
- Determining offset alignment for starter strips
- Verifying overhang
- Seating the fasteners
- Fastening starter strips

Achievement Criteria

NOTE: Competency J1-J4 and J6 will be assessed together in Competency J1.

Line (GAC):	J	APPLY SHINGLES
Competency:	J3	Fasten shingles

Objectives

To be competent in this area, the individual must be able to:

- Describe components and considerations for fastening asphalt shingles
- Install asphalt shingles

LEARNING TASKS

1. Describe components and considerations for fastening asphalt shingles

CONTENT

- Requirements
 - Codes
 - Manufacturers' specifications
 - Design authority
- Slope
- Environmental conditions
- Fasteners
 - Type
 - Length
 - Number
 - Location
- Locations
 - Eaves
 - Field
 - Hips
 - Penetrations
 - Ridges
 - Rake edges
 - Valleys
- Positioning
 - Overhang
 - Offsets
- Safety
- Selecting tools
- Determining fastener location
- Selecting types and lengths of fasteners
- Maintaining shingle pattern
- Seating the fasteners
- Fastening
 - Starters
 - Fields
 - Hip and ridge caps

2. Fasten asphalt shingles

Achievement Criteria

NOTE: Competency J1-J4 and J6 will be assessed together in Competency J1.

Line (GAC): J APPLY SHINGLES

Competency: J4 Cut shingles

Objectives

To be competent in this area, the individual must be able to:

- Describe considerations for cutting asphalt shingles
- Cut asphalt shingles

LEARNING TASKS

1. Describe considerations for cutting asphalt shingles

CONTENT

- Requirements
 - Cut size allowance
 - Minimum allowable cut size
 - Water channels
- Protecting underlying materials
- Locations
 - Eaves
 - Field
 - Hips
 - Penetrations
 - Ridges
 - Rake edges
 - Valleys

2. Cut asphalt shingles

- Safety
- Selecting tools
- Cutting to fit around roof penetrations
- Cutting to facilitate offset
- Cutting to form hip and ridge caps

Achievement Criteria

NOTE: Competency J1-J4 and J6 will be assessed together in Competency J1.

Line (GAC): J APPLY SHINGLES

Competency: J5 Tab shingles

Objectives

To be competent in this area, the individual must be able to:

- Describe considerations for tabbing asphalt shingles
- Describe tabbing of asphalt shingles

LEARNING TASKS

1. Describe considerations for tabbing asphalt shingles

2. Describe tabbing of asphalt shingles

CONTENT

- Requirements
 - Codes
 - Manufacturers' specifications
 - Design authority
 - Environmental conditions
- Selecting tools
- Methods
 - Lifting shingle without damaging
 - Selecting and applying adhesive

Line (GAC):	J	APPLY SHINGLES
Competency:	J6	Install metal flashings for shingled roofs

Objectives

To be competent in this area, the individual must be able to:

- Install metal flashings for asphalt shingles

LEARNING TASKS

1. Describe metal flashings

CONTENT

- Purpose
- Materials
 - Prepainted steel
 - Lead
 - Copper
 - Aluminum
 - Zinc
 - Fasteners
- Requirements
 - Code
 - Manufacturer
 - Design authority
 - Gauge
- Select colour
- Install types of metal flashing
 - C-channels
 - Drip edge
 - Rake edge
 - Step
 - Base
 - Counter
 - Through-wall
 - Back pan
 - Apron
 - Wall
 - Saddles or crickets
 - Valley
 - Reglet
 - Hip/ridge
 - Diverters
 - Clips
- Field fabricating
- Cut and form flashing
- Fasten flashing
- Apply sealants

2. Install metal flashings for asphalt shingles

Achievement Criteria

NOTE: Competency J1-J4 and J6 will be assessed together in Competency J1.

Level 2

Roofer

Line (GAC): B USE TOOLS AND EQUIPMENT
Competency: B1 Uses hand tools

Objectives

To be competent in this area, the individual must be able to:

- Use hand tools for modified bitumen, wood, and composite shingles application

LEARNING TASKS

1. Select roofing hand tools

CONTENT

- Safety
- Tools
 - Basic hand tools
 - Round-nosed trowel
 - Seam roller
 - T-square
 - Torch cane
 - Weighted roller

2. Use roofing hand tools

- Safety
- Purpose/uses
- Selection
- Adjustment
- Visual inspection
- Maintenance
 - Sharpening
 - Lubrication
 - Cleaning
- Parts
- Procedures/operations
- Storage

Line (GAC):	B	USE TOOLS AND EQUIPMENT
Competency:	B2	Use power tools, pneumatic tools, and hot-air welding, induction, and fueled equipment

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment for modified bitumen and hot rubberized asphalt roofs

LEARNING TASKS

1. Use tools and equipment

CONTENT

- Electrical power tools
 - Adhesive applicators
 - Saws
 - Drills
 - Grinders
 - Screw guns
 - Hot-air gun
- Pneumatic tools
 - Air nailers
 - Caulking guns
 - Spray guns
- Hot-air welding tools
 - Hot-air welder
 - Robotic welder
- Fuelled equipment
 - Generators
 - Propane torches
 - Robotic torch

2. Use power tools, pneumatic tools, and fuelled equipment

- Safety
- Selection
- Adjustment
- Visual inspection
- Maintenance
 - Cleaning
 - Filter replacement
 - Lubrication
 - Disposal
 - Sharpening
 - Tensioning
- Parts
- Procedures/operations
- Purpose/uses
- Refuelling

LEARNING TASKS

CONTENT

3. Use propane fuelled equipment

- Storage
- Types of propane cylinders
 - Liquid
 - Vapour
- Certification requirements
- Handling procedures
- Transportation procedures and regulations
- Connecting and disconnecting
- Visual inspection
 - Lines
 - Valves
 - Couplers
 - Regulators
- Maintenance
- Storage

Achievement Criteria

Performance The learner will assemble torching equipment.

Conditions The learner will be given:

- Written procedures
- Torching equipment
- Safety equipment

Criteria

- Safety
- Accuracy
- Procedure

Line (GAC): B USE TOOLS AND EQUIPMENT
Competency: B3 Use hoisting, lifting, and rigging equipment

Objectives

To be competent in this area, the individual must be able to:

- Use hoisting, lifting, and rigging equipment

LEARNING TASKS

1. Use hoisting, lifting, and rigging equipment

CONTENT

- Safety
- Regulations
- Manufacturers' specifications
- Training and certification requirements
- Operating procedures
- Roof protection from equipment
- Loads and heights estimation
- Load distribution
- Load limits
 - Ropes
 - Cables
 - Chains
 - Slings
 - Hooks
 - Shackles
 - Spreader bars
- Knots
 - Selection
 - Tying
- Hand signals
 - All stop
 - Stop
 - Lower and raise
 - Boom in and out
 - Swing boom
- Radio communications
- Precautions
 - Slings
 - Tag lines
 - Power lines
 - Knots
 - Equipment specifications
- Erection/set-up
- Dismantling

LEARNING TASKS
CONTENT

- Loading
- Unloading
- Weight distribution
- Securing loads
- Visual inspection
- Storage

Achievement Criteria 1

Performance	The learner will set-up and operate a ladder wheel hoist.
Conditions	The learner will be given <ul style="list-style-type: none"> • A ladder • A ladder wheel hoist • Rope • Personal fall protection equipment • Material to be lifted • Operating instructions
Criteria	The learner will be evaluated on <ul style="list-style-type: none"> • Equipment inspection • Safety • Procedures • Assembly and disassembly • Barricading • Signage

Achievement Criteria 2

Performance	The learner will set up and operate a motorized hoist.
Conditions	The learner will be given: <ul style="list-style-type: none"> • A motorized hoist • Personal fall protection equipment • Materials to be lifted • Operation instructions
Criteria	The learner will be evaluated on <ul style="list-style-type: none"> • Equipment inspection • Safety • Procedures • Assembly and disassembly • Barricading • Signage • Tag lines

Line (GAC): B USE TOOLS AND EQUIPMENT
Competency: B4 Use access equipment

Objectives

To be competent in this area, the individual must be able to:

- Assemble scaffolding
- Disassemble scaffolding

LEARNING TASKS

1. Assemble scaffolding

CONTENT

- Safety
 - Fall arrest and restraint requirements
- Regulations
- Selection
- Securing
- Levelling
- Solid footing
- Maintenance

2. Disassemble scaffolding

- Safety
 - Fall arrest and restraint requirements
- Regulations
- Selection
- Securing
- Levelling
- Solid footing

Achievement Criteria

Performance The learner will assemble scaffolding.

Conditions The learner will be given:

- Instructions
- Scaffolding components

Criteria

- Safety
- Accuracy
- Procedure

Line (GAC): B USE TOOLS AND EQUIPMENT
Competency: B5 Use hot process equipment

Objectives

To be competent in this area, the individual must be able to:

- Use hot process equipment required for a modified bitumen and hot rubberized asphalt roof

LEARNING TASKS

1. Use hot process equipment required for a modified bitumen and hot rubberized asphalt roof

CONTENT

- Adjustment
- Certification requirements
- Handling procedures
- Connecting and disconnecting
- Handling fuels and sources
- Hazards
- Hot supply line (piping)
- Keeping kettle and bitumen clean
- Moisture checks
- Maintenance
- Operating procedures
- Parts
- Purpose/uses
- Safety
 - PPE
 - Flashpoint temperatures
 - Housekeeping
 - Protecting public
- Storage
- Temperatures and material types
 - Asphalt types
 - EVT
 - High blown temperature
 - Softening point
- Transportation procedures and regulations
- Visual inspection
 - Couplers
 - Leak check solution
 - Lines
 - Regulators
 - Valves

Achievement Criteria

Performance	The learner will set up and use a melter.
Conditions	<p>The learner will be given:</p> <ul style="list-style-type: none"> • Instructions • Safety equipment • PPE • A melter • Materials
Criteria	<ul style="list-style-type: none"> • Safety • Accuracy • Procedure

Line (GAC): **B USE TOOLS AND EQUIPMENT**

Competency: B6 Use motorized equipment

Objectives

To be competent in this area, the individual must be able to:

- Describe motorized equipment for modified bituminous membranes and hot rubber
- Describe use of motorized equipment

LEARNING TASKS

1. Describe motorized equipment for modified bituminous membranes and hot rubber

CONTENT

1. Describe motorized equipment for modified bituminous membranes and hot rubber
 - Types
 - Asphalt spreaders
 - Gravel spreaders
 - Power buggies
 - Roof cutters
 - Roof sweepers
 - Manufacturers' specifications and requirements
2. Describe use of motorized equipment
 - Safety
 - Job site assessment
 - PPE
 - Protect surrounding areas from flying debris
 - Adjustment
 - Limitations
 - Operating procedures
 - Parts
 - Purpose/uses
 - Securement
 - Storage
 - Types
 - Visual inspection

Line (GAC): **C ORGANIZE WORK**
Competency: **C1 Use documentation and reference materials**

Objectives

To be competent in this area, the individual must be able to:

- Use documentation and reference material
- Use material manufacturers' application procedures for modified bitumen, wood, and composite shingles

LEARNING TASKS

1. Use documentation and reference material

CONTENT

- Codes
 - National
 - Provincial
 - Municipal
 - Differences between the codes
- Reference material
 - Canadian Roofing Reference Manual
 - RCABC Roofing Practices Manual
 - New Roof Construction Manual
 - Cedar Shake and Shingle Bureau
- Manufacturers' instructions
- Design authority specifications
- CSA
- ULC
- CGA
- WorkSafeBC
 - Safe work procedures
 - Requirements
 - Assessments and documentation
- National Torch Safety Program
- Employer policies and procedures
 - Safety policies and procedures
 - Job site assessments
 - Documentation
 - Paperwork
 - Digital documentation and applications

2. Use material manufacturers' application procedures for modified bitumen, wood, and composite shingles

- Installation
 - Overlaps
 - Minimums/maximums

LEARNING TASKS

CONTENT

- Fastening methods
- Handling
- Storage

Line (GAC): **C ORGANIZE WORK**
Competency: **C2 Interpret blueprints and drawings**

Objectives

To be competent in this area, the individual must be able to:

- Interpret and use blueprints and drawings

LEARNING TASKS

1. Interpret and use blueprints and drawings

CONTENT

- Tools
 - Scale ruler
 - Digital ruler
 - Calculator
- Software
- Types of blueprints
 - Metric
 - Imperial
 - Components
 - Architectural drawings
 - Mechanical drawings
 - Electrical drawings
 - Structural drawings
 - Site specifications
 - Shop drawings
- Estimate work take-offs
- Cross-reference components of blueprints

Achievement Criteria

Performance The learner will estimate a work take-off from a blueprint and specifications.

Conditions The learner will be given

- Blueprint
- Specifications
- Materials

Criteria

- Accuracy
- Procedure

Line (GAC): **C ORGANIZE WORK**
Competency: **C4 Assess worksite conditions**

Objectives

To be competent in this area, the individual must be able to:

- Assess general worksite requirements
- Assess rooftop requirements

LEARNING TASKS

1. Assess general worksite prior to starting work

CONTENT

- Communication with owner, contractor, and other tradesworkers
- Document pre-existing conditions
- Onsite utilities
 - Overhead
 - Buried
 - Excavations
- Area and public protection
 - Tarps
 - Barricades
 - Signage
- Site security
- Washroom facilities
- First aid stations
- Muster area
- Access and egress
 - Ladders and scaffolding
 - Fall protection
- Equipment requirements
 - Disposal bins and chutes
 - Kettles
 - Lay-down area
 - Equipment placement
 - Propane storage and usage
- Lifting and hoisting equipment

2. Assess general rooftop requirements prior to starting work

- Start and finish points
- Fall protection systems
- Gas and electrical services
- Placement of disposal chutes
- Hazards
- General storage
- Deck type and condition

LEARNING TASKS

CONTENT

- Deck sign-offs
- Pre-existing conditions
 - Inside building
 - Utilities
 - Stains and rot
 - Outside building
 - Broken windows
 - Damaged siding
- Problem and unsafe areas
 - Mechanical equipment
 - Windows
 - Skylights
- Adequate curb and parapet height

Line (GAC): C ORGANIZE WORK

Competency: C5 Position equipment and material on the ground and on the roof

Objectives

To be competent in this area, the individual must be able to:

- Place equipment and material on the ground and on the roof

LEARNING TASKS

CONTENT

1. Place equipment and material on the ground

- Equipment and materials
 - Kettles
 - Tankers
 - Melters
 - Propane tanks
 - Disposal bins
 - Material storage
- Placement
 - Ease of access
 - Regulations
- Safety equipment
 - Barricades
 - Caution tape
 - Hoses
 - Fire extinguishers
 - Safety cones
 - Signage

2. Place equipment on the roof

- Loading and unloading location
- Structural support and weight distribution
 - Equipment storage location
- Equipment
 - Hoist
 - Lock and tool boxes
 - Mini mop
 - Propane tank
 - Roof cutter
 - Safety equipment
 - Waste disposal chutes

3. Place material on the roof

- Loading and unloading material
 - Trucks
 - Roof
- Sequence of removal and installation

LEARNING TASKS

CONTENT

- Structural support and weight distribution
- Ease of access
- Storage
 - Elevated
 - Coverings
 - Securement
 - Theft
 - Environmental protection
 - Requirements
 - Ambient temperature
 - Perimeter distance

Line (GAC): **C ORGANIZE WORK**
Competency: **C6 Prepare material disposal systems**

Objectives

To be competent in this area, the individual must be able to:

- Assemble and disassemble material disposal systems

LEARNING TASKS

1. Assemble and disassemble material disposal systems

CONTENT

- Components
 - Chutes
 - Counterweights
 - Disposal bins
 - Garbage bags
 - Crane bags
 - Hoarding
 - Hoists
 - Motorized power buggies
 - Wheel barrows
 - Vacuum trucks
- Separation of materials
- Regulations
- Visual inspections
- Securement
- Manufacturers' instructions

Achievement Criteria

Performance The learner will assemble and disassemble a disposal chute.

Conditions The learner will be given

- Instructions
- PPE
- Materials
- Equipment

Criteria

- Safety
- Proficiency
- Procedure

Line (GAC): **C ORGANIZE WORK**
Competency: **C8 Use roofing math**

Objectives

To be competent in this area, the individual must be able to:

- Use intermediate roofing math
- Use intermediate geometry
- Calculate materials for roofing

LEARNING TASKS

1. Use intermediate roofing math

2. Use intermediate geometry

3. Calculate materials for roofing

CONTENT

- Use fractions, decimals, and ratios
- Operations
 - Fractions
 - Lowest terms
 - Decimals
 - Areas, perimeter, and volume
- Decimal to fraction conversions
- Fraction to decimal conversions
- Convert measurements to ratios
- Conversions from metric to imperial
- Perimeters and areas of shapes
 - Squares
 - Rectangles
 - Triangles
 - Circles
- Volumes of shapes
 - Cubes
 - Cylinders
- Ladder ratio
- Material quantities
- Calculate materials for wood shake, wood and composite shingles, and modified bituminous membrane roofs
- Calculate coverage rates
- Calculate volume

Line (GAC): E PREPARE ROOF FOR REPLACEMENT

Competency: E4 Prepare roof substrate

Objectives

To be competent in this area, the individual must be able to:

- Describe principles of roof substrate preparation
- Describe preparation of roof substrate

LEARNING TASKS

CONTENT

- | | |
|---|---|
| 1. Identify types of substrate, structural defects, and substrate defects | <ul style="list-style-type: none"> • Types of deck substrates <ul style="list-style-type: none"> ○ Concrete ○ Steel ○ Wood • Substrate defects <ul style="list-style-type: none"> ○ Gouges ○ Wet insulation ○ Voids ○ Holes ○ Protruding fasteners ○ Dents ○ Rotten wood ○ Spalling concrete ○ Corrosion • Structural damage <ul style="list-style-type: none"> ○ Rusted metal deck ○ Rotten wood deck ○ Damaged joints or trusses |
| 2. Describe principles of roof substrate preparation | <ul style="list-style-type: none"> • Recovery vs. replacement • Existing roof substrates <ul style="list-style-type: none"> ○ Vapour barriers ○ Insulation ○ Cover boards ○ Membranes ○ Membrane flashings |
| 3. Describe preparation of roof substrate | <ul style="list-style-type: none"> • Clean • Dry • Secure loose materials • Repair damaged substrate • Securement <ul style="list-style-type: none"> ○ Loose substrate components ○ Decks ○ Metal flashings |

Line (GAC): **E PREPARE ROOF FOR REPLACEMENT**
Competency: **E5 Perform minor adjustments to penetrations, curbs, and parapets**

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment to perform minor adjustments to penetrations, curbs, and parapets
- Perform adjustments to heights of penetrations and parapets

LEARNING TASKS

CONTENT

- | | |
|--|---|
| 1. Use tools and equipment to perform minor adjustments to penetrations, curbs, and parapets | <ul style="list-style-type: none"> • Tools <ul style="list-style-type: none"> ○ Hammers ○ Saws ○ Drills • Equipment <ul style="list-style-type: none"> ○ Curb jack ○ Crane |
| 2. Perform adjustments to heights of penetrations and parapets | <ul style="list-style-type: none"> • Existing roof composition <ul style="list-style-type: none"> ○ Thickness • New roof composition <ul style="list-style-type: none"> ○ Thickness • Roof mounted equipment • Height calculations <ul style="list-style-type: none"> ○ Penetrations ○ Parapets • Adjustments <ul style="list-style-type: none"> ○ Adding slope to coping ○ Extending <ul style="list-style-type: none"> – Pipes – Drains – Curbs – Parapets – Doorsills • Building extensions • Material selection to suit new construction • Dismantle existing construction • Add material to existing construction |

Line (GAC): F PREPARE DECK FOR ROOF INSTALLATION
Competency: F1 Inspect deck

Objectives

To be competent in this area, the individual must be able to:

- Describe how to inspect a deck

LEARNING TASKS

1. Describe how to inspect a deck

CONTENT

- Deck types
 - Steel
 - Wood
 - Concrete
- Inspection requirements
- Notification of responsible parties
- Defects
 - Severity
 - Height
 - Irregularities
 - Securement
 - Support
 - Holes
 - Deck deflection
 - Uncured concrete
 - Corrosion
- Rooftop equipment openings

Line (GAC): F PREPARE DECK FOR ROOF INSTALLATION
Competency: F3 Verify placement of roof penetrations, curbs, and parapets

Objectives

To be competent in this area, the individual must be able to:

- Describe penetrations and parapets

LEARNING TASKS

1. Describe penetrations and parapets

CONTENT

- Penetration types
 - Drains
 - Scuppers/overflows
 - Gas pipes
 - Electrical pipes
 - Exhaust pipes
 - Sleepers
 - Area dividers/control joints
 - Expansion joints
 - Curbs
 - Wood
 - Steel
 - Air handling units
 - Access hatches
- Parapet composition
 - Wood
 - Concrete
 - Steel
 - Framed
- Parapet types
 - Low walls
 - High walls
 - Drip edges
 - Fire walls
- Deck types
 - Securement
 - Compatibility
 - Material
 - Wood
 - Steel
 - Concrete
- Requirements
 - Composition
 - Height

LEARNING TASKS

CONTENT

- | | |
|--|--|
| | <ul style="list-style-type: none"> – Width ○ Building code ○ Manufacturer requirements ○ Specifications |
| 2. Describe required components for penetrations | <ul style="list-style-type: none"> • Drains • Flashings <ul style="list-style-type: none"> ○ Membrane ○ Liquid membranes ○ Penetrations ○ Metal ○ Caulking • Compatibility • Securement • Sealing • Requirements <ul style="list-style-type: none"> ○ Building code ○ Manufacturer requirements ○ Specifications |
| 3. Describe required components for parapets | <ul style="list-style-type: none"> • Structural • Suitable substrates • Overlays • Slope • Nailers • Cants • Reglets • Requirements <ul style="list-style-type: none"> ○ Building code ○ Manufacturers' requirements ○ Specifications |

Line (GAC):	G	APPLY LOW SLOPE ROOFING COMPONENTS
Competency:	G1	Install support panels

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment to install support panels
- Install support panels

LEARNING TASKS

CONTENT

- | | |
|---|--|
| 1. Use tools and equipment to install support panels | <ul style="list-style-type: none"> • Safety • Tools <ul style="list-style-type: none"> ○ Installation tools <ul style="list-style-type: none"> – Hand tools – Power tools • Equipment |
| 2. Describe support panels, installation techniques, and procedures | <ul style="list-style-type: none"> • Terminology • Types <ul style="list-style-type: none"> ○ Gypsum board ○ Wood sheathing <ul style="list-style-type: none"> – OSB – Plywood ○ Fibreboard ○ Asphaltic core board • Uses <ul style="list-style-type: none"> ○ Provide suitable substrate <ul style="list-style-type: none"> – Codes and manufacturers' specifications ○ Fire rating ○ Seismic considerations |
| 3. Install support panels | <ul style="list-style-type: none"> • Cutting, fitting, and placement • Layout • Securement requirements <ul style="list-style-type: none"> ○ Building code ○ CSA wind uplift ○ Manufacturers' specifications ○ Specifications • Securement methods <ul style="list-style-type: none"> ○ AARS ○ PARS ○ MARS ○ Loose-laid system |

LEARNING TASKS

CONTENT

- Securement types
 - Adhesives
 - Asphalt
 - Low-rise foam
 - Fasteners
 - Length
 - Patterns
 - Quantity
 - Types
- Joint sealing

Achievement Criteria

NOTE: Competencies G1-G6 will be assessed together in Competency G6.

Line (GAC): **G APPLY LOW SLOPE ROOFING COMPONENTS**
Competency: **G2 Prime substrate**

Objectives

To be competent in this area, the individual must be able to:

- Describe substrate usability
- Select primer
- Apply primer

LEARNING TASKS

CONTENT

- | | |
|-----------------------------------|---|
| 1. Describe substrate and primers | <ul style="list-style-type: none"> • Types of substrate <ul style="list-style-type: none"> ○ Wood ○ Steel ○ Concrete ○ Support panels ○ Insulation • Types of primers <ul style="list-style-type: none"> ○ Solvent ○ Water-based |
| 2. Describe substrate usability | <ul style="list-style-type: none"> • Cleanliness • Moisture • Damage • Porosity |
| 3. Select primer | <ul style="list-style-type: none"> • Fire hazard considerations • Compatibility • Curing times |
| 4. Apply primer | <ul style="list-style-type: none"> • Safety signage • Application rates • Tools <ul style="list-style-type: none"> ○ Brush ○ Roller ○ Sprayer |

Achievement Criteria

NOTE: Competencies G1-G6 will be assessed together in Competency G6.

Line (GAC): **G APPLY LOW SLOPE ROOFING COMPONENTS**
Competency: **G3 Apply vapour retarder, vapour barrier, and air barrier**

Objectives

To be competent in this area, the individual must be able to:

- Select tools and equipment
- Install vapour retarders, vapour barriers, and air barriers for a modified bituminous system

LEARNING TASKS

1. Select tools and equipment

2. Use vapour retarders, vapour barriers, and air barriers

CONTENT

- Hand tools
- Hot-applied equipment
- Spray equipment

- Purpose
 - Vapour retarder/barrier
 - Moisture flow prevention
 - Air barrier
 - Air flow prevention
- Types
 - Modified bituminous
 - Liquid
 - Felts
 - Kraft laminate
 - Single-ply membranes
 - Polyethylene
- Method of application
 - Self-adhesive
 - Adhesive applied
 - Loose-laid
 - Hot asphalt applied
 - Torch applied
- Selection
 - Code requirements
 - Design requirements
 - Specifications

LEARNING TASKS

3. Install vapour retarders, vapour barriers, and air barriers

CONTENT

- Types
- Manufacturers' specifications
- Material compatibility
- Application techniques
 - Placing
 - Cutting
 - Fitting
 - Rolling
 - Location
 - Protection of substrates
 - Flame
 - Spills
- Seal laps, seams, and penetrations
- Continuity of vapour retarder and air barrier in building envelope

Achievement Criteria

NOTE: Competencies G1-G6 will be assessed together in Competency G6.

Line (GAC): **G APPLY LOW SLOPE ROOFING COMPONENTS**
Competency: **G4 Install insulation**

Objectives

To be competent in this area, the individual must be able to:

- Describe installation securement methods and materials
- Describe storage and securement requirements of insulation
- Install insulation for a modified bituminous membrane system

LEARNING TASKS

1. Describe insulation

CONTENT

- Purpose
 - Heat transfer
 - Sound transfer
- Heat transfer terms
 - Conduction
 - Convection
 - Radiation
 - R and K factors
- Types of board insulation
 - Polystyrene
 - Expanded
 - Extruded
 - Polyisocyanurate
 - Mineral wool
 - Fibreglass
 - Phenolic
 - Perlite
 - Fibre board
 - Polyurethane
- Sloped insulation
- Heat sensitive and heat insensitive

2. Describe insulation securement methods

- MARS
- PARS
- AARS
- Loose-laid
- Design requirements
 - CSA wind uplift requirement

3. Describe insulation securement materials

- Mechanically fastened
 - Insulation plates
 - Fasteners

LEARNING TASKS

CONTENT

- Patterns
 - Adhered
 - Asphalt
 - Application rates
 - Low-rise foam
 - Application patterns
 - Loose-laid conventional, EPDM
 - Ballast
 - Rocks
 - Pavers
 - Protected roof membrane assembly
 - Ballast
 - Rocks
 - Pavers
 - Concrete top insulation
 - Components
 - Filter mats
 - Batten bars
 - Metal flashings
 - Fasteners
- 4. Describe insulation storage and securement
 - Storage procedures and considerations
 - Bulk storage placement
 - Elevated on dunnage
 - Cutting transportation wrap
 - Tarping
 - Securement
- 5. Install insulation on a modified bituminous roofing system
 - Methods and tools
 - Layout
 - Stagger/soldier
 - Cut and fit
 - Damage prevention
 - Joint tape
 - Asphalt burnouts
 - Open flames
 - Installation traffic
 - Moisture

Achievement Criteria

NOTE: Competencies G1-G6 will be assessed together in Competency G6.

Line (GAC): **G APPLY LOW SLOPE ROOFING COMPONENTS**
Competency: **G5 Install cover board**

Objectives

To be competent in this area, the individual must be able to:

- Install cover board for a modified bituminous membrane system

LEARNING TASKS

1. Describe cover board

2. Install cover board

CONTENT

- Purpose and selection
- Tools and equipment
- Types
 - Wood fibre
 - Asphaltic core board
 - Gypsum
 - Composite boards
 - Wood sheathing
 - Fibreglass
- Specifications
- Layout pattern
- Cutting, fitting, and placing
- Securement methods
 - Fasteners
 - Adhesives
- Requirements
 - Joint sealing

Achievement Criteria

NOTE: Competencies G1-G6 will be assessed together in Competency G6.

Line (GAC): **G APPLY LOW SLOPE ROOFING COMPONENTS**
Competency: **G6 Install drains, vents, curbs, and penetrations**

Objectives

To be competent in this area, the individual must be able to:

- Install drains, vents, curbs, and penetrations on a modified bituminous membrane system

LEARNING TASKS

1. Describe drains

CONTENT

- Primary and overflow
 - Scupper
 - Mechanical
 - Retrofit
- Components
 - Drain baskets
 - Clamping rings
 - Flange
 - Bowl
 - Connections
 - Mechanical joint coupler (MJ clamp)
 - Compression seal
- Sump drain area

2. Describe curbs

- Types
 - HVAC
 - Roof hatch
 - Fan curbs
 - Skylights
 - Area dividers/control joints
 - Expansion joints
 - Sleepers
- Requirements
 - Height
 - Insulation
 - Membrane installation
 - Construction
 - Wood
 - Steel
 - Concrete
 - Levelling

LEARNING TASKS

3. Describe vents and pipe penetrations

CONTENT

- Types of penetrations
 - Plumbing pipes
 - Heating intake and exhaust
 - Utility service connections
 - Ventilation
- Types of penetration flashings
 - Metal
 - Membrane
 - Liquid membranes
 - Penetration pocket
- Accessories
 - Primer
 - Target patches
 - Sealants
 - Storm collars

4. Install drains, vents, curbs, and penetrations

- Requirements
 - Codes
 - Manufacturers' specifications
 - Specifications
- Cut membranes
- Prepare flashing
 - Clean and scarify
 - Priming/mastic
- Install flashing
 - Secure flashings
 - Apply membrane
- Install accessories

Achievement Criteria

NOTE: Include competencies G1-G6 as part of this Achievement Criteria.

Performance The learner will install and apply low slope roofing components.

Conditions The learner will be given

- PPE
- Tools
- Materials
- Specifications
- Mockup

Criteria

- Safety
- Accuracy
- Procedure
- Application

Line (GAC): **G APPLY LOW SLOPE ROOFING COMPONENTS**
Competency: **G7 Apply ballast, walkways, and protective surfaces**

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment required for the application of ballast, walkways, and protective surfaces
- Apply ballast, walkways, and protective surfaces for a modified bituminous membrane system

LEARNING TASKS

CONTENT

- | | |
|---|---|
| 1. Describe ballast and protective surfaces | <ul style="list-style-type: none"> • Purpose <ul style="list-style-type: none"> ○ Wind uplift ○ Cosmetic ○ Fire protection ○ Traffic protection ○ UV protection • Types <ul style="list-style-type: none"> ○ Gravel ○ Pavers and walkways ○ PMA ○ Smooth surface coatings ○ Granulated membranes ○ Concrete top insulation ○ Organics |
| 2. Use tools and equipment required for application of ballast, walkways, and protective surfaces | <ul style="list-style-type: none"> • Hand tools • Power buggies • Cranes • Hoists • Sprayers |
| 3. Apply ballast, walkways, and protective surfaces | <ul style="list-style-type: none"> • Safety • Requirements and restrictions • Distribution of ballast, aggregate, and paver material • Specifications • Acceptance of ballast and aggregate <ul style="list-style-type: none"> ○ Size ○ Cleanliness • Cut, fit, lay out, and placement <ul style="list-style-type: none"> ○ filter fabric ○ protective material |

LEARNING TASKS

CONTENT

- separation sheet
 - Patio stones
 - Insulation
- Apply granulated cap sheets and surface coatings
- Maintain level elevation of patio stones

Line (GAC): **G APPLY LOW SLOPE ROOFING COMPONENTS**
Competency: **G8 Install metal flashings**

Objectives

To be competent in this area, the individual must be able to:

- Fabricate metal flashing
- Install metal flashing

LEARNING TASKS

1. Describe metal flashings

CONTENT

- Purpose
- Requirements
 - Codes
 - Manufacturers
 - Specifications
- Watershed design principles
- Selecting gauge and colour of flashing
- Location, profile, and size of flashing
- Materials
 - Aluminum
 - Copper
 - Stainless steel
 - Galvanized steel
 - Lead
 - Zinc
- Coated metals
 - Pre-painted
 - Baked enamel
- Profiles and types of flashing
 - Cap
 - Wall
 - Gravel stops
 - Drip
 - Reglets
 - Valleys
- Expansion and contraction
- Safety
- PPE
- Tools and equipment
- Fabrication
 - Cutting
 - Finishing
 - Fastening

2. Fabricate metal flashings

LEARNING TASKS

CONTENT

3. Install metal flashings

- Flashing
- Braking
- Folding

- Safety
- PPE
- Tools and equipment
- Types of seam joints
 - S-locks
 - Standing seam
 - Lap joints
- Securement
 - Types
 - Screws
 - Nails
 - Wind cleats
 - Pins
 - Compatibility
 - Dissimilar metals
- Sealants
 - Butyl tape
 - Caulking
 - Liquid membranes
 - Mastic

Achievement Criteria

Performance The learner will install metal flashings on a low slope mockup.

Conditions The learner will be given

- PPE
- Tools
- Materials
- Specifications
- Mockup

Criteria

- Safety
- Accuracy
- Procedure
- Application

Line (GAC): **H APPLY LOW SLOPE ROOFING MEMBRANES**
Competency: **H1 Relax membranes**

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment for modified bitumunious membranes
- Prepare modified bitumunious membranes
- Relax modified bitumunious membranes

LEARNING TASKS

CONTENT

- | | |
|-------------------------------|---|
| 1. Use tools and equipment | <ul style="list-style-type: none"> • Hand tools • Weights |
| 2. Prepare membranes | <ul style="list-style-type: none"> • Remove labelling and wrappers • Unroll membrane • Cut membrane roll to length |
| 3. Relax membranes | <ul style="list-style-type: none"> • Heat membrane • Position weights • Visually inspect membrane <ul style="list-style-type: none"> ○ Damage ○ Cleanliness |

Achievement Criteria

NOTE: Competencies H1, H2, and H10 will be assessed as part of Competencies H3-H6.

Line (GAC): H APPLY LOW SLOPE ROOFING MEMBRANES
Competency: H2 Set membranes

Objectives

To be competent in this area, the individual must be able to:

- Set a modified bituminous membrane

LEARNING TASKS

1. Set a modified bituminous membrane

CONTENT

- Proper lap direction
 - Sheds water
- Measure and cut membrane
 - Manufacturers' specification
- Position and overlap membrane sheets and rolls
- Visually verify membrane layout and alignment

Achievement Criteria

NOTE: Competencies H1, H2, and H10 will be assessed as part of Competencies H3-H6.

Line (GAC): **H APPLY LOW SLOPE ROOFING MEMBRANES**
Competency: **H3 Apply membranes using hot-liquid process**

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment to apply membranes using a hot-liquid process
- Describe hot-liquid materials for modified bituminous roofing and hot rubber systems
- Install hot rubber system

LEARNING TASKS

CONTENT

- | | |
|---|--|
| 1. Use tools and equipment to apply membranes using a hot-liquid process | <ul style="list-style-type: none"> • Safety • Hand tools • Kettles • Melters • High boys • Low boys • Buckets • Mops • Squeegees • Felt layers • Gauge |
| 2. Describe hot-liquid materials for modified bituminous roofing and hot rubber systems | <ul style="list-style-type: none"> • Roll products <ul style="list-style-type: none"> ○ Felts/asphalt saturated <ul style="list-style-type: none"> – Organic – Fiberglass – Polyester ○ Rolls/asphalt-coated <ul style="list-style-type: none"> – Sanded – Mineral ○ Joint tape • Bitumen types <ul style="list-style-type: none"> ○ 1, 2, 3, 4 ○ SEBS ○ Coal tar pitch ○ Asphalt ○ Hot rubber ○ Fastening techniques • Surfacing materials |

LEARNING TASKS

CONTENT

3. Install hot rubber system

- Smooth
- Aggregate
- Mineral
- (Protected and Modified Protected Roof Systems) PMRA
 - Separation layers
 - Insulation
 - Ballast
- Rubberized asphalt
 - Types
 - Temperatures
 - Heating and monitoring
 - EVT
 - FBT
 - Flash point
 - Apply and pour hot rubber
 - Apply reinforcing materials
 - Apply field materials
 - Broom membrane in place to enhance adhesion
 - Monitor volume of rubberized asphalt with gauge
- Rolls
 - Types of roll products
 - Bitumen application rates
 - Roll coverage rates
 - Exposure
- Surfacing
 - Types
 - Application rates
- Sealants
- Walkways

Achievement Criteria

NOTE:	Include competencies H1, H2, and H10 as part of this Achievement Criteria.
Performance	The learner will apply hot-liquid (rubber) membrane on a mockup.
Conditions	The learner will be given: <ul style="list-style-type: none"> • PPE • A low slope roof mockup • Materials • Tools and equipment • Specifications
Criteria	<ul style="list-style-type: none"> • Safety • Accuracy • Procedure • Application

Line (GAC): **H APPLY LOW SLOPE ROOFING MEMBRANES**
Competency: **H4 Apply membranes using torched-on method**

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment to apply membranes using a torched-on method
- Describe torch-applied system considerations
- Install torch-applied system

LEARNING TASKS

CONTENT

- | | |
|---|--|
| 1. Use tools and equipment to apply membranes using torched-on method | <ul style="list-style-type: none"> • Safety <ul style="list-style-type: none"> ○ PPE ○ Fire extinguishers ○ Leak check solution • Tools and equipment <ul style="list-style-type: none"> ○ Hand tools <ul style="list-style-type: none"> – Round-nosed trowel – Seam roller – T-square ○ Torch cane ○ Weighted roller ○ Torch and torch accessories ○ Propane bottle |
| 2. Describe torch-applied system considerations | <ul style="list-style-type: none"> • Fire safety • Manufacturers' specifications • Regional codes |
| 3. Install torch-applied system | <ul style="list-style-type: none"> • Relax membrane • Set membrane • Prime components • Apply using torch method • Torch-weld rolls in place • Monitor propane pressure and adjust torch flame • Apply pressure to laps/seams to ensure lap/seam integrity • Maintain continuity of bitumen bleed-out as roll is torch-welded into place • Install reinforcing gussets |

LEARNING TASKS

CONTENT

- Embed granules at end laps and transitions
- Apply overlapping roll
- Install granules into areas where bitumen is exposed and granules are missing

Achievement Criteria

NOTE:	Include competencies H1, H2, and H10 as part of this Achievement Criteria.
Performance	The learner will apply a torched-applied modified bituminous membrane system on a mockup.
Conditions	The learner will be given: <ul style="list-style-type: none"> • PPE • A low slope roof mockup • Materials • Tools and equipment • Specifications
Criteria	<ul style="list-style-type: none"> • Safety • Accuracy • Procedure • Application

Line (GAC): **H APPLY LOW SLOPE ROOFING MEMBRANES**
Competency: **H5 Apply membranes using hot-air welding**

Objectives

To be competent in this area, the individual must be able to:

- Describe tools and equipment to apply membranes using hot-air welding
- Describe application of membrane using hot-air welding method
- Install membrane using hot-air welding method

LEARNING TASKS

CONTENT

- | | |
|--|--|
| 1. Describe tools and equipment to apply membranes using hot-air welding | <ul style="list-style-type: none"> • Safety <ul style="list-style-type: none"> ○ PPE ○ Fire extinguisher • Tools and equipment <ul style="list-style-type: none"> ○ Hand tools ○ Hot-air welder ○ Generator ○ Extension cord |
| 2. Describe application of membrane using hot-air welding method | <ul style="list-style-type: none"> • Manufacturers' specifications • Regional codes |
| 3. Install membranes using hot-air welding method | <ul style="list-style-type: none"> • Ensure overlapping membrane is clean and free of debris • Hot air weld side and end laps • Inspect for continuity of bleed out and repair defects |

Achievement Criteria

- NOTE:** **Include competencies H1, H2, and H10 as part of this Achievement Criteria.**
- | | |
|-------------|---|
| Performance | The learner will use hot-air welding method to install a modified bituminous membrane system on a mockup. |
| Conditions | The learner will be given: <ul style="list-style-type: none"> • PPE • A low slope roof mockup • Materials • Tools and equipment • Specifications |
| Criteria | <ul style="list-style-type: none"> • Safety • Accuracy • Procedure • Application |

Line (GAC): **H APPLY LOW SLOPE ROOFING MEMBRANES**
Competency: **H6 Apply membranes using cold-applied methods**

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment for applying membranes using cold-applied methods
- Install cold-applied modified bitumen materials

LEARNING TASKS

1. Use tools and equipment for applying membranes using cold-applied methods

CONTENT

- Safety
- Hand tools
- Notched Trowels
- Rollers
 - Weighted
 - Hand
 - Paint
- Spray equipment
- Dual cartridge applicator

2. Describe cold-applied modified bitumen materials and material preparation

- Roll products
- Adhesives
- Mastics
- Primers
- Sealants
- Material preparation
 - Cleaning solvents

3. Install cold-applied modified bitumen materials

- Selection of adhesive types
 - Types
 - Temperatures
 - Storage
 - Application
 - Curing
 - Application of adhesives
 - Rolling
 - Notched trowel
 - Spray
 - Dual cartridge applicator
 - Apply membrane into adhesive

- Rolling
 - Flying in
 - Sealing seams
 - Brooming/weighted rolling
 - Monitor adhesive application rates
 - Wet mil gauge
- Rolls
 - Types of roll products
 - Application rates
 - Roll coverage rates
 - Exposure
- Grading
 - Trowel
 - Brush
 - Winter
 - Summer
- Sealants
- Walkways

Achievement Criteria

NOTE:	Include competencies H1, H2, and H10 as part of this Achievement Criteria.
Performance	The learner will use a cold-applied method for a modified bituminous membrane system on a mockup
Conditions	The learner will be given: <ul style="list-style-type: none"> • PPE • A low slope roof mockup • Materials • Tools and equipment • Specifications
Criteria	<ul style="list-style-type: none"> • Safety • Accuracy • Procedure • Application

Line (GAC): **H APPLY LOW SLOPE ROOFING MEMBRANES**
Competency: **H7 Apply membranes using mechanical fasteners**

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment to apply membranes using mechanical fasteners
- Use mechanical fasteners for modified bituminous membranes

LEARNING TASKS

CONTENT

- | | |
|--|--|
| 1. Use tools and equipment to apply membranes using mechanical fasteners | <ul style="list-style-type: none"> • Safety • Tools • Equipment |
| 2. Select mechanical fasteners for modified bituminous membranes | <ul style="list-style-type: none"> • Types <ul style="list-style-type: none"> ○ Screws ○ Nails ○ Pins ○ Bars ○ Plates • Gauge and length |
| 3. Use mechanical fasteners for modified bituminous membranes | <ul style="list-style-type: none"> • Safety • Selection of tools and equipment • Patterns and spacing • Tension and seating • Fastening requirements <ul style="list-style-type: none"> ○ CSA wind uplift ○ Wind zones ○ Manufacturers' requirements • Hazards <ul style="list-style-type: none"> ○ Utilities on and below substrate level |

Line (GAC): **H APPLY LOW SLOPE ROOFING MEMBRANES**
Competency: **H10 Install membrane flashings**

Objectives

To be competent in this area, the individual must be able to:

- Apply modified bituminous membrane and hot rubberized membrane flashing materials

LEARNING TASKS

1. Describe modified bitumen membrane system and hot rubber system flashing materials

CONTENT

- Manufacturers' specifications
- Rolled products
 - Modified rolls
 - Reinforcement rolls
 - Expansion joints
- Adhesives
 - Primers
 - Other adhesives
 - Bitumen
 - Mastics
- Mechanical fasteners
 - Nails
 - Screws
 - Plates
 - Bars
- Protection materials
- Cant strip
- Location
 - Walls and transitions
 - Curbs
 - Parapets
 - Drains
 - Penetrations
- Selection
 - Accepted materials
 - Specifications
 - Coatings
- Tools and equipment
- Measure and cut membrane flashing
- Shape membrane flashing to form to parapets, penetrations, and roof to wall transitions
- Install materials to accept membrane flashing on substrate

2. Apply modified bituminous membrane and hot rubberized membrane flashing materials

LEARNING TASKS

CONTENT

- Install successive layers

Achievement Criteria

NOTE: Competencies H1, H2, and H10 will be assessed as part of Competencies H3-H6.

Line (GAC): H APPLY LOW SLOPE ROOFING MEMBRANES

Competency: H11 Install temporary seals and temporary drains

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment to install temporary seals and temporary drains
- Describe components and materials for temporary seals and temporary drains in a modified bituminous membrane system
- Describe installation of temporary seals and temporary drains for a modified bituminous membrane system

LEARNING TASKS

1. Use tools and equipment to install temporary seals and temporary drains

2. Describe components and materials for temporary seals and temporary drains in a modified bituminous membrane system

3. Describe installation of temporary seals and temporary drains for a modified bituminous membrane system

CONTENT

- Safety
- Tools
- Equipment

- Tie-ins and night seals
- Materials
 - Asphalt
 - Sealant
 - Membrane
 - Mastics
 - Drains

- Material compatibility
- Onsite requirements
- Prepare existing roof surfaces
- Apply temporary seal
- Install temporary roof drainage
- Verify integrity
- Removal

Line (GAC): J **APPLY SHINGLES**
Competency: J1 **Determine type and layout of shingles**

Objectives

To be competent in this area, the individual must be able to:

- Describe types of wood shake, shingle, or sidewalls
- Describe types of composite shingles
- Describe considerations and components for the layout of wood shake and wood or composite shingles
- Layout wood shake and wood or composite shingles

LEARNING TASKS

1. Describe types of wood shake, shingle, and sidewalls

CONTENT

- Shake styles
 - Tapersawn
 - Taper-split
 - Hand-split
 - Resawn
- Shingle styles
 - Perfection
 - Shingle
- Sidewalls
 - Certi-grade
 - Certi-cut
 - Certi-groove
- Grades 1-4
- Treatments
 - Fire (certi-guard)
 - Pressure-treated (certi-last)
- Ridge caps

2. Describe types of composite shingles

- Composition
 - Polymer
 - Rubber
 - Recycled
- Styles
 - Shake
 - Shingle
 - Slate
- Ridge caps

3. Describe considerations and components for

- Requirements

LEARNING TASKS

the layout of wood and composite shingles

CONTENT

- Codes
- Manufacturers' specifications
- Design authority
- Ventilation
- Slope
- Acceptable substrate
 - Wood
- Components
 - Underlayment
 - Eave protection
 - Valley
 - Field
 - Wood/composite
 - Starters
 - Field
 - Hip/ridge caps
 - Fasteners
 - Nails
 - Mastic
 - Metal flashings
 - Penetration flashings

4. Layout wood shake and composite or wood shingles

- Select tools and equipment
- Alignment
- Nailing patterns
- Layout sequence
- Offsets
- Exposures
- Spacing

Achievement Criteria

NOTE: Include competencies J1-J4 and J6 as part of this Achievement Criteria.

Performance The learner will install wood shake or shingles on a mockup.

Conditions The learner will be given

- PPE
- Tools
- Materials
- Specifications

Criteria

- Safety
- Accuracy
- Procedure
- Application

Line (GAC): J **APPLY SHINGLES**
Competency: J2 **Install starter strip and starter course**

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment to install starter strips and starter courses
- Describe components and considerations for installing starter course for wood shake or shingles
- Describe components and considerations for installing starter course for composite shingles
- Install starter course for wood shake or shingles, or composite shingles

LEARNING TASKS

CONTENT

- | | |
|--|--|
| 1. Use tools and equipment to install starter strips and starter courses | <ul style="list-style-type: none"> • Safety • Tools • Equipment |
| 2. Describe starter course for wood shake or shingles | <ul style="list-style-type: none"> • Purpose • Requirements <ul style="list-style-type: none"> ○ Codes ○ Manufacturers' specifications ○ Design authority • Types |
| 3. Describe starter course for composite shingles | <ul style="list-style-type: none"> • Purpose • Requirements <ul style="list-style-type: none"> ○ Codes ○ Manufacturers' specifications ○ Design authority • Types <ul style="list-style-type: none"> ○ Proprietary |
| 4. Describe components and considerations for installing starter course for wood shake or shingles | <ul style="list-style-type: none"> • Locations <ul style="list-style-type: none"> ○ Eaves • Positioning <ul style="list-style-type: none"> ○ Overhang ○ Offsets • Fastening <ul style="list-style-type: none"> ○ Codes and zones ○ Type of fastener ○ Length ○ Number ○ Location |

LEARNING TASKS

5. Describe components and considerations for installing starter course for composite shingles

CONTENT

- Locations
 - Eaves
 - Positioning
 - Overhang
 - Offsets
 - Fastening
 - Codes and zones
 - Type of fastener
 - Length
 - Number
 - Location
-
- Select tools
 - Offset alignment for starter course
 - Verify overhangs
 - Seat the fasteners

6. Install starter course for wood shake or shingles, or composite shingles

Achievement Criteria

NOTE: Competencies J1-J4 and J6 will be assessed together in Competency J1.

Line (GAC): J **APPLY SHINGLES**
Competency: J3 **Fasten shingles**

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment to fasten shingles
- Describe components and considerations for fastening wood shake and wood or composite shingles
- Fasten wood shake and composite or wood shingles

LEARNING TASKS

CONTENT

- | | |
|---|--|
| 1. Use tools and equipment to fasten shingles | <ul style="list-style-type: none"> • Safety • Tools • Equipment |
| 2. Describe components and considerations for fastening wood shake and wood or composite shingles | <ul style="list-style-type: none"> • Requirements <ul style="list-style-type: none"> ○ Codes ○ Manufacturers' specifications ○ Design authority • Environmental conditions • Fasteners <ul style="list-style-type: none"> ○ Type ○ Length ○ Number ○ Location • Locations <ul style="list-style-type: none"> ○ Eaves ○ Field ○ Hips ○ Penetrations ○ Ridges ○ Rake edges ○ Valleys • Positioning <ul style="list-style-type: none"> ○ Overhangs • Offsets |
| 3. Fasten wood shake and composite or wood shingles | <ul style="list-style-type: none"> • Safety • Selecting tools • Determining fastener location • Selecting types and lengths of fasteners • Patterns |

LEARNING TASKS

CONTENT

- Fastening
 - Starters
 - Fields
 - Hip and ridge caps
 - Seat the fasteners

Achievement Criteria

NOTE: Competencies J1-J4 and J6 will be assessed together in Competency J1.

Line (GAC): **J APPLY SHINGLES**
Competency: **J4 Cut shingles**

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment to cut shingles
- Describe considerations for cutting wood shake and wood or composite shingles
- Cut wood shake and wood or composite shingles

LEARNING TASKS

CONTENT

- | | |
|--|---|
| 1. Use tools and equipment to cut shingles | <ul style="list-style-type: none"> • Safety • Tools • Equipment |
| 2. Describe considerations for cutting wood shake and wood or composite shingles | <ul style="list-style-type: none"> • Requirements <ul style="list-style-type: none"> ○ Cut size ○ Water channels • Protecting underlying materials • Locations <ul style="list-style-type: none"> ○ Eaves ○ Field ○ Hips ○ Penetrations ○ Ridges ○ Rake edges ○ Valleys |
| 3. Cut wood shake and wood or composite shingles | <ul style="list-style-type: none"> • Select tools • Cut to fit |

Achievement Criteria

NOTE: Competencies J1-J4 and J6 will be assessed together in Competency J1.

Line (GAC): J **APPLY SHINGLES**
Competency: J6 **Install metal flashings for shingled roofs**

Objectives

To be competent in this area, the individual must be able to:

- Install metal flashings for wood shake and wood or composite shingles

LEARNING TASKS

1. Install metal flashings for wood shake and wood or composite shingles

CONTENT

- Requirements
 - Code
 - Manufacturer
 - Design authority
 - Gauge
- Select colour
- Select fasteners
- Installing types of metal flashing
 - C-channels
 - Drip edge
 - Rake edge
 - Step
 - Base
 - Counter
 - Through-wall
 - Back pan
 - Apron
 - Wall
 - Saddles or crickets
 - Valley
 - Reglet
 - Hip/ridge
 - Diverters
 - Clips
- Cutting and forming flashing
- Fastening flashing
- Applying sealants

Achievement Criteria

NOTE: Competencies J1-J4 and J6 will be assessed together in Competency J1.

Line (GAC): **M WATERPROOF SURFACES**
Competency: **M1 Prepare waterproofing substrates**

Objectives

To be competent in this area, the individual must be able to:

- Describe waterproofing
- Describe use of tools and equipment to prepare waterproofing substrates
- Describe preparation of waterproofing substrates
- Describe identification and repair of defects
- Describe priming the deck

LEARNING TASKS

1. Describe waterproofing

CONTENT

- Purpose
- Terminology
 - Hydrostatic pressure
 - Below grade
 - Above grade
 - Blindside waterproofing
 - Shoring
- Uses
 - Roofs and plaza decks
 - Bridge decks
 - Pools, planters, lagoons, and irrigation trenches
 - Foundations
- Materials and components
 - Primers
 - Adhesives
 - Traffic surfaces
 - Protection course

2. Describe selection and use of tools and equipment to prepare waterproofing substrates

- Safety
- Tools
- Equipment

3. Describe preparation of waterproofing substrates

- Safety
 - Confined space
 - Shoring
 - Barriers
- Deck types
- Remove materials and debris
- Cleaning and drying

LEARNING TASKS

CONTENT

- | | |
|--|--|
| | <ul style="list-style-type: none"> ○ Limiting access after cleaning |
| | <ul style="list-style-type: none"> • Contaminant removal <ul style="list-style-type: none"> ○ Oil ○ Fuel ○ Adhesive/residue ○ Dirt |
| 4. Describe identification and repair of defects | <ul style="list-style-type: none"> • Defects <ul style="list-style-type: none"> ○ Bumps and cracks ○ Corrosion ○ Deck deflection ○ Holes and voids ○ Deterioration ○ Securement and support ○ Uncured concrete • Notification of responsible parties • Repair defects <ul style="list-style-type: none"> ○ Fill cracks, voids, and holes ○ Chipping and grinding |
| 5. Describe priming the deck | <ul style="list-style-type: none"> • Select method of application • Apply primer • Allow primer to set or flash off completely |

Line (GAC):	M	WATERPROOF SURFACES
Competency:	M2	Apply waterproofing membrane

Objectives

To be competent in this area, the individual must be able to:

- Describe use of tools and equipment to apply waterproofing membrane
- Describe waterproofing materials and components
- Describe installation of waterproofing membrane and components

LEARNING TASKS

1. Describe use of tools and equipment to apply waterproofing membrane
2. Describe waterproofing materials and components
3. Describe installation of waterproofing membrane and components

CONTENT

- Safety
- Tools
- Equipment

- Materials and components
 - Primers
 - Adhesives
 - Felts
 - Reinforcing plies
 - Bitumen
 - Hot rubber
 - SBS
 - Single-ply membranes
 - Liquid membranes
 - Bentonite clay
 - Concrete additives
- Handling and storage
- Methods of application
- Details
 - Penetrations
 - Drains
 - Curbs
 - Walls
- Separation layer
 - Polyethylene
 - Mineral
- Protection course
 - Back filling

- Safety
 - Confined spaces
- Requirements
 - Code

LEARNING TASKS

CONTENT

- Manufacturers' specifications
- Specifications
- Procedure
 - Prepare substrate
 - Select membrane
 - Install waterproofing membrane
- Protection courses
- Separation layers
- Insulation
- Overburdens
- Drainage
- Details
- Environmental considerations
 - Effect of weather in installation
 - UV resistance

Line (GAC):	N	DAMP-PROOF SURFACES
Competency:	N1	Apply damp-proofing materials

Objectives

To be competent in this area, the individual must be able to:

- Describe use of tools and equipment to apply damp-proofing materials
- Describe damp proofing materials and components
- Describe installation of damp proofing materials

LEARNING TASKS

1. Describe use of tools and equipment to apply damp-proofing materials
2. Describe damp proofing materials and components
3. Describe installation of damp proofing materials

CONTENT

- Safety
- Tools
- Equipment

- Materials
 - Solvent-based
 - Emulsions
- Components
 - Protection courses
 - Drainage layers
 - Insulations
 - Securement
 - Fasteners
 - Adhesives
- Handling and storage
- Methods of application
- Separation layers
- Protection course
- Back filling

- Safety
 - Confined spaces
 - Shoring
- Requirements
 - Code
 - Manufacturer
 - Design authority
- Environmental conditions
- Procedure
 - Inspect and prepare surfaces
 - Apply damp proofing membrane
 - Apply protection layer
 - Back fill

Line (GAC): **N DAMP-PROOF SURFACES**
Competency: **N2 Apply protective layer**

Objectives

To be competent in this area, the individual must be able to:

- Use tools of and equipment to apply protective layer
- Describe protective layer
- Describe installation or application of protective layer

LEARNING TASKS

1. Use tools of and equipment

2. Describe protective layer

3. Describe installation or application of protective layer

CONTENT

- Safety
- Tools
- Equipment

- Terminology
- Types

- Select protective layer
- Cut, fit, and place protection layer
- Secure protective layer
- Back fill

Line (GAC): **P** **MAINTAIN AND REPAIR LOW SLOPE ROOFING**
Competency: **P1** **Maintain low slope roofing**

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment for general maintenance of low slope roofing
- Describe overview of maintenance for low slope roofs
- Describe maintenance of modified bituminous membrane systems

LEARNING TASKS

CONTENT

- | | |
|---|--|
| 1. Use tools and equipment for general maintenance of low slope roofing | <ul style="list-style-type: none"> • Safety • Tools • Equipment |
| 2. Describe overview of maintenance for low slope roofs | <ul style="list-style-type: none"> • Remove obstructions from drains, scuppers and gutters • Verify penetration pocket is well secured and full • Clean surface of existing sealant • Remove old caulking • Type and colour of caulking • Reapply caulking • Remove excessive snow and ice • Re-secure loose metal flashings |
| 3. Describe maintenance of modified bituminous membrane systems | <ul style="list-style-type: none"> • Clean, dry, and prime surface prior to maintenance • Reseal drains and scuppers • Apply compatible sealant • Reseal membranes • Application methods of surfacing • Disassemble and reassemble drain components • Resurface membrane with materials • Reinstall fasteners |

Line (GAC): **P** **MAINTAIN AND REPAIR LOW SLOPE ROOFING**
Competency: **P2** **Repair low slope roofing**

Objectives

To be competent in this area, the individual must be able to:

- Describe use of tools and equipment to repair low slope roofing
- Describe an overview of the repair of low slope roofs

LEARNING TASKS

1. Describe use of tools and equipment to repair low slope roofing

2. Describe an overview of the repair of low slope roofs

CONTENT

- Safety
- Tools
- Equipment

- Inspections
- Causes of failures
 - Moisture
 - Vegetation
 - Ventilation
 - Drainage
 - Metal fatigue
 - Membrane failure
 - Traffic
 - Aging
 - Wind
 - Impacts
 - Improper design
 - Improper installation
 - UV degradation
 - Solutions to failure causes
 - Animals
- Identify areas to repair
 - Metal flashings
 - Membrane flashings
 - Penetration details
 - Drainage
 - Surfacing
 - Gravel
 - Granules
 - Coating
 - Pavers
- Indications of failure

LEARNING TASKS

CONTENT

- Blisters
- Splits
- Water ingress
- Erosion
- Methods of repair
 - Proprietary
 - Temporary
 - Permanent

Line (GAC): **Q MAINTAIN AND REPAIR STEEP SLOPE ROOFING**
Competency: **Q1 Maintain steep slope roofing**

Objectives

To be competent in this area, the individual must be able to:

- Describe selection of tools and equipment for general maintenance of steep slope roofing
- Describe overview of maintenance for steep slope roofs

LEARNING TASKS

CONTENT

- | | |
|---|--|
| 1. Describe selection of tools and equipment for general maintenance of steep slope roofing | <ul style="list-style-type: none"> • Safety • Tools • Equipment |
| 2. Describe overview of maintenance for steep slope roofs | <ul style="list-style-type: none"> • Removal of organic and inorganic debris • Remove obstructions from drainage • Remove excessive snow and ice • Clean surface of existing sealant • Remove old sealants • Reapply sealants • Re-secure loose metal flashings |

Line (GAC): **Q MAINTAIN AND REPAIR STEEP SLOPE ROOFING**
Competency: **Q2 Repair steep slope roofing**

Objectives

To be competent in this area, the individual must be able to:

- Describe use of tools and equipment used in steep slope roofing repair
- Describe overview of steep slope roofing repair

LEARNING TASKS

1. Describe use of tools and equipment used in steep slope roofing repair

2. Describe overview of steep slope roofing repair

CONTENT

- Safety
- Tools
- Equipment

- Inspections
- Causes of failure
 - Moisture
 - Vegetation
 - Ventilation
 - Insects
 - Animals
 - Aging
 - Environmental conditions
 - Wind
 - UV degradation
 - Ice damming
 - Improper design
 - Improper installation
- Indicators of a required repair
 - Missing shingles
 - Water ingress
 - Erosion
 - Splits
- Identify areas to repair
 - Valleys
 - Worn
 - Buckling
 - Nails backing out
 - Broken, split, damaged shakes and shingles
 - Details and penetrations

Level 3

Roofer

Line (GAC): B USE TOOLS AND EQUIPMENT

Competency: B1 Use hand tools

Objectives

To be competent in this area, the individual must be able to:

- Describe roofing hand tools for thermoplastic (PVC, TPO) and thermoset (Ethylene Propylene Diene Monomer EPDM) membranes, liquid-applied membranes and metal shingles, and pre-formed metal tiles
- Describe use of roofing hand tools

LEARNING TASKS

1. Describe roofing hand tools for thermoplastic (PVC, TPO) and thermoset (Ethylene Propylene Diene Monomer EPDM) membranes, liquid-applied membranes, and metal shingles and pre-formed metal tiles

CONTENT

- Brooms
 - Chalk lines
 - Crescent wrenches
 - Hammers
 - Hand rollers
 - Hatchet
 - Knives
 - Measuring tapes
 - Mops
 - Pry bars
 - Saws
 - Scissors
 - Scrapers
 - Screwdrivers
 - Seam probers
 - Shovels
 - Snips
 - Spudders
 - Staple hammer
 - Wheelbarrow
-
- Safety
 - Purpose/uses
 - Selection
 - Adjustment
 - Visual inspection
 - Maintenance
 - Sharpening
 - Lubrication
 - Cleaning
 - Parts
 - Procedures/operation

LEARNING TASKS

CONTENT

- Storage

Line (GAC):	B	USE TOOLS AND EQUIPMENT
Competency:	B2	Use power tools, pneumatic tools, and hot-air welding, induction, and fuelled equipment

Objectives

To be competent in this area, the individual must be able to:

- Describe tools and equipment for thermoplastic (PVC, TPO) and thermoset (EPDM) membranes, liquid-applied membranes, metal shingles, and pre-formed metal tile roofs
- Describe use of electrical tools, pneumatic tools, and fuelled equipment for thermoplastic (PVC, TPO) and thermoset (EPDM) membranes, liquid-applied membranes, metal shingles, and pre-formed metal tile roofing

LEARNING TASKS

1. Describe tools and equipment for thermoplastic (PVC, TPO) and thermoset (EPDM) membranes, liquid-applied membranes, metal shingles, and pre-formed metal tile roofs
2. Describe use of electrical tools, pneumatic tools, and fuelled equipment for thermoplastic (PVC, TPO) and thermoset (EPDM) membranes, liquid-applied membranes, metal shingles, and pre-formed metal tile roofing

CONTENT

- Electrical power tools
 - Saws
 - Drills
 - Grinders
 - Screw guns
 - Hot-air gun
 - Metal seamer
 - Nibbler and shears
 - Panel machines
- Pneumatic tools
 - Air nailers
 - Caulking guns
 - Spray guns
- Hot-air welding tools
 - Hot-air welder
 - Robotic welder
- Induction tools
 - Induction welder
- Fuelled equipment
 - Gravel spreaders
 - Power buggies
 - Roof cutter
 - Spudding machine
 - Sweepers
- Kettles
- Safety
- Selection
- Adjustment
- Inspection
- Maintenance
 - Cleaning

LEARNING TASKS

CONTENT

- Filter replacement
- Lubrication
- Sharpening
- Tensioning
- Parts
- Procedures/operations
- Purpose/uses
- Refuelling
- Storage

Line (GAC):	B	USE TOOLS AND EQUIPMENT
Competency:	B3	Use hoisting, lifting, and rigging equipment

Objectives

To be competent in this area, the individual must be able to:

- Describe maintenance of hoisting, lifting, and rigging equipment

LEARNING TASKS

1. Describe maintenance of hoisting, lifting, and rigging equipment

CONTENT

- Safety
- Regulations
- Manufacturers' specifications
- Training and certification requirements
- Operating procedures
- Load limits
 - Ropes
 - Cables
 - Chains
 - Slings
 - Hooks
 - Shackles
 - Spreader bars
- Knots
 - Selection
 - Tying
- Radios
- Condition checks
 - Slings
 - Tag lines
 - Power lines
 - Knots
 - Equipment specifications

Line (GAC):	B	USE TOOLS AND EQUIPMENT
Competency:	B4	Use access equipment

Objectives

To be competent in this area, the individual must be able to:

- Use ladders and elevated platforms
- Use scaffolding

LEARNING TASKS

CONTENT

- | | |
|--|---|
| 1. Review ladders and elevated platforms | <ul style="list-style-type: none"> • Types <ul style="list-style-type: none"> ○ Boom lift ○ Ladders ○ Scaffolding ○ Scissor lifts • Certification requirements • Government regulations • Uses • Safety • Hazard recognition |
| 2. Use ladders and elevated platforms | <ul style="list-style-type: none"> • Assembly/disassembly • Fall arrest and restraint requirements • Levelling • Limitations • Maintenance • Operating instructions • Securing • Selection • Solid footing • Storage • Transportation • Visual inspection |
| 3. Use scaffolding | <ul style="list-style-type: none"> • Safety <ul style="list-style-type: none"> ○ Fall arrest and restraint requirements • Regulations • Selection • Securing • Levelling • Solid footing • Assemble • Disassemble • Maintenance |

Line (GAC):	B	USE TOOLS AND EQUIPMENT
Competency:	B5	Use hot process equipment

Objectives

To be competent in this area, the individual must be able to:

- Use hot process equipment for thermoplastic (PVC, TPO) and thermoset (EPDM) membranes

LEARNING TASKS

1. Describe hot process equipment for thermoplastic (PVC, TPO) and thermoset (EPDM) membranes

CONTENT

- Fire extinguishers
- Hand tools
 - Knives
 - Hot carrier
 - Felt layer
 - Mops
 - Mini-mop
 - Taping machine
 - Trowels
- Fuelled Equipment
 - Kettles
- Hot asphalt tankers
- Pumps and piping
- Types of liquid propane gas (LPG) cylinders
 - Liquid
 - Vapour

2. Use hot process equipment for thermoplastic (PVC, TPO) and thermoset (EPDM) membranes

- Transportation procedures and regulations
- Certification requirements
- Handling procedures
- Safety
 - PPE
 - Flashpoint temperatures
 - Housekeeping
 - Protecting public
- Adjustment
- Connecting and disconnecting
- Handling fuels and sources
- Hazards
- Hot supply line (piping)
- Keeping kettle clean
- Moisture checks
- Maintenance
- Operating procedures

LEARNING TASKS

CONTENT

- Parts
- Purpose/uses
- Storage
- Temperatures and material types
 - Asphalt types
 - Equiviscous temperature
 - Full blown temperature
 - Softening point
- Visual inspection
 - Couplers
 - Leak check solution
 - Lines
 - Regulators
 - Valves

Line (GAC):	B	USE TOOLS AND EQUIPMENT
Competency:	B6	Use motorized equipment

Objectives

To be competent in this area, the individual must be able to:

- Describe motorized equipment for thermoplastic (PVC, TPO) and thermoset (EPDM) membranes, liquid-applied membranes, metal shingles, and pre-formed metal tiles
- Describe use of motorized equipment thermoplastic (PVC, TPO) and thermoset (EPDM) membranes, liquid-applied membranes, metal shingles, and pre-formed metal tiles
- Describe maintenance of motorized equipment

LEARNING TASKS

CONTENT

- | | |
|--|--|
| 1. Describe motorized equipment for thermoplastic (PVC, TPO) and thermoset (EPDM) membranes, liquid-applied membranes, metal shingles, and pre-formed metal tiles | <ul style="list-style-type: none"> • Manufacturers' specifications and requirements • Types <ul style="list-style-type: none"> ○ Asphalt spreaders ○ Gravel spreaders ○ Power buggies ○ Roof cutters ○ Roof sweepers ○ Generators |
| 2. Describe use of motorized equipment thermoplastic (PVC, TPO) and thermoset (EPDM) membranes, liquid-applied membranes, metal shingles, and pre-formed metal tiles | <ul style="list-style-type: none"> • Adjustment • Limitations • Operating procedures • Parts • Purpose/uses • Safety • Securement • Storage • Types • Visual inspection |
| 3. Describe maintenance of motorized equipment | <ul style="list-style-type: none"> • Check oil • Grease zerks • Clean cooling fins • Verify thermometer function • Tag out and remove from service worn, damaged, and defective motorized equipment |

Line (GAC):	C	ORGANIZE WORK
Competency:	C2	Interpret blueprints and drawings

Objectives

To be competent in this area, the individual must be able to:

- Interpret and use blueprints and drawings
- Create a drawing for a blueprint

LEARNING TASKS

1. Interpret and use blueprints and drawings

CONTENT

- Tools
 - Scale ruler
 - Digital ruler
 - Calculator
- Software
- Types of blueprints
 - Metric
 - Imperial
 - Components
 - Architectural drawings
 - Mechanical drawings
 - Electrical drawings
 - Structural drawings
 - Site specifications
 - Shop drawings
- Identify discrepancies on blueprints
- Estimate work take-offs
- Cross-reference components of blueprints

2. Create a drawing for a blueprint

- Shop drawings
- Elevation drawings
- Site plan
- Detail drawing

Achievement Criteria

Performance	The learner will create drawings from an object.
Conditions	The learner will be given <ul style="list-style-type: none"> • Tools • Materials
Criteria	<ul style="list-style-type: none"> • Accuracy

Line (GAC): C ORGANIZE WORK

Competency: C3 Estimate material

Objectives

To be competent in this area, the individual must be able to:

- Use math to estimate new material and disposal of old roofing material
- Convert to and from metric and imperial measurements
- Use geometry for estimations

LEARNING TASKS

CONTENT

- | | |
|--|--|
| 1. Use math to estimate new materials and disposal of old roofing material | <ul style="list-style-type: none"> • Calculate volume and weight of new materials • Calculate volume and weight of old materials for disposal |
| 2. Convert to and from metric and imperial measurements | <ul style="list-style-type: none"> • Weights • Lengths • Volumes • Temperature • Areas |
| 3. Use geometry for estimations | <ul style="list-style-type: none"> • Access point measurements • Perimeters and areas of shapes <ul style="list-style-type: none"> ○ Squares ○ Rectangles ○ Triangles ○ Pentagons and higher order polygons ○ Circles • Volumes of shapes <ul style="list-style-type: none"> ○ Polyhedrons ○ Cylinders • Angles |

Line (GAC):	C	ORGANIZE WORK
Competency:	C7	Evaluate roof conditions near roof-top equipment installations

Objectives

To be competent in this area, the individual must be able to:

- Describe terminology associated with roof-top equipment installations
- Describe specialty roof-top equipment considerations
- Describe inspection of roof-top assemblies
- Describe procedure for repairs of roof-top assemblies

LEARNING TASKS

CONTENT

- | | |
|--|--|
| 1. Describe terminology associated with roof-top equipment installations | <ul style="list-style-type: none"> • Specialty rooftop equipment <ul style="list-style-type: none"> ○ Cable trays ○ Fibreoptic systems ○ Solar panels/photovoltaic (PV) • Additions to existing roofs <ul style="list-style-type: none"> ○ Tennant improvement ○ Aftermarket installation |
| 2. Describe specialty roof-top equipment considerations | <ul style="list-style-type: none"> • Design authority • National and jurisdictional requirements • Regulatory bodies • Structural requirements • Existing roof conditions |
| 3. Describe inspection of roof-top assemblies | <ul style="list-style-type: none"> • Conduct survey • Cut test or core sample • Review area around mounting components |
| 4. Describe procedure for repairs of roof-top assemblies | <ul style="list-style-type: none"> • Fill cut test and core sample voids • Seal roof projections for mounting hardware and electrical equipment • Components and membranes are intact and in place around new equipment |

Line (GAC):	D	USE COMMUNICATION AND MENTORING TECHNIQUES
Competency:	D2	Use communication and mentoring techniques

Objectives

To be competent in this area, the individual must be able to:

- Describe effective communication and mentorship skills
- Describe active listening
- Describe digital communication technologies and platforms

LEARNING TASKS

1. Describe effective communication and mentorship skills
2. Describe active listening
3. Describe digital communication technologies and platforms

CONTENT

- Safety and information meetings
- Verbal and written instructions
- Professionalism
 - Participation
 - Responsibilites
 - Respect
- Harrassment and discrimination
 - Builders Code
- Mentorship best practices
 - Patience
 - Empathy
 - Understanding
 - Giving constructive feedback
- Attention
- Clarification
- Acknowledgement of understanding
- Eye contact
- Engagement
- Open-ended questions
- Email
- Text messages
- Social media
 - Professionalism
 - Appropriate conduct
- Record keeping
 - Apps and platforms
 - Service/work orders
 - Inspection reports

Line (GAC): F PREPARE DECK FOR ROOF INSTALLATION

Competency: F1 Inspect deck

Objectives

To be competent in this area, the individual must be able to:

- Perform deck inspection

LEARNING TASKS

1. Perform deck inspection

CONTENT

- Deck types
 - Steel
 - Wood
 - Concrete
- Inspection requirements
- Notification of responsible parties
- Defects
 - Severity
 - Height
 - Irregularities
 - Securement
 - Support
 - Holes
 - Deck deflection
 - Uncured concrete
 - Corrosion
 - Rooftop equipment openings

Line (GAC):	F	PREPARE DECK FOR ROOF INSTALLATION
Competency:	F3	Verify placement of roof penetrations, curbs, and parapets

Objectives

To be competent in this area, the individual must be able to:

- Verify placement of penetrations, curbs, and parapets

LEARNING TASKS

1. Verify placement of penetrations, curbs, and parapets

CONTENT

- Review blueprints
- Measurement
 - Verify distance requirements
- Requirements
 - Composition
 - Height
 - Width
 - Building code
 - Manufacturer requirements
- Material compatibility
- Specifications

Line (GAC):	G	APPLY LOW SLOPE ROOFING COMPONENTS
Competency:	G1	Install support panels

Objectives

To be competent in this area, the individual must be able to:

- Select tools and equipment to install support panels
- Describe support panel installation techniques and procedures
- Install support panels for a single-ply system

LEARNING TASKS

1. Select tools and equipment to install support panels
2. Describe support panel installation techniques and procedures
3. Install support panels

CONTENT

- Installation tools
 - Hand tools
- Power tools
- Trade science
- Cutting, fitting, and placement
- Layout
- Securement requirements
 - Building code
 - CSA wind uplift
 - Manufacturers' specifications
 - Specifications
- Securement methods
 - AARS
 - PARS
 - MARS
 - Loose-laid system
- Securement types
 - Adhesives
 - Asphalt
 - Low-rise foam
 - Fasteners
 - Length
 - Patterns
 - Quantity
 - Types
- Joint sealing
- Terminology
- Types
 - Gypsum board
 - Wood sheathing
 - OSB
 - Plywood

LEARNING TASKS

CONTENT

- Fibreboard
- Asphaltic core board
- Uses
 - Provide suitable substrate
 - Codes and manufacturers' specifications
 - Fire rating
 - Seismic considerations

Line (GAC):	G	APPLY LOW SLOPE ROOFING COMPONENTS
Competency:	G2	Prime substrate

Objectives

To be competent in this area, the individual must be able to:

- Describe substrate and primers
- Describe substrate usability
- Apply primers for single-ply roofing system

LEARNING TASKS

1. Describe substrate and primers

2. Describe substrate usability

3. Select primer

4. Apply primer

CONTENT

- Trade science
- Types of substrate
 - Wood
 - Steel
 - Concrete
 - Support panels
 - Insulation
- Types of primers
 - Solvent
- Water-based
- Cleanliness
- Moisture
- Damage
- Porosity
- Fire hazard considerations
- Compatibility
- Curing times
- Safety signage
- Application rates
- Tools
 - Brush
 - Roller
 - Sprayer

Line (GAC): G APPLY LOW SLOPE ROOFING COMPONENTS

Competency: G3 Apply vapour retarder, vapour barrier, and air barrier

Objectives

To be competent in this area, the individual must be able to:

- Select tools and equipment for thermoplastic (PVC, TPO) and thermoset (EPDM) membranes, and liquid-applied membranes
- Install vapour retarders, vapour barriers, and air barriers for thermoplastic (PVC, TPO) and thermoset (EPDM) membranes, and liquid-applied membranes

LEARNING TASKS

1. Select tools and equipment for thermoplastic (PVC, TPO) and thermoset (EPDM) membranes, and liquid-applied membranes
2. Install vapour retarders, vapour barriers, and air barriers for thermoplastic (PVC, TPO) and thermoset (EPDM) membranes, and liquid-applied membranes

CONTENT

- Safety
- Hand tools
- Hot-applied equipment
- Spray equipment
- Trade science
 - Moisture flow
 - Heat flow
 - Air movement
- Selection
 - Code requirements
 - Design requirements
 - Specifications
- Procedures
 - Modified bituminous membrane
 - Liquid
 - Felts
 - Kraft laminate
 - Two-ply felts
 - Single-ply membranes
 - Polyethylene
- Method of application
 - Self-adhesive
 - Adhesive applied
 - Loose-laid
 - Hot asphalt applied
 - Torch applied
- Continuity 100% sealed

Achievement Criteria

NOTE: Include competencies G3-G6 competencies as part of this Achievement Criteria.

Performance The learner will install and apply low slope roofing components.

Conditions The learner will be given

- Access to PPE
- Tools
- Materials
- Material specifications

Criteria The learner will be evaluated on

- Safety
- Accuracy
- Procedure
- Application

Line (GAC):	G	APPLY LOW SLOPE ROOFING COMPONENTS
Competency:	G4	Install insulation

Objectives

To be competent in this area, the individual must be able to:

- Describe insulation
- Secure insulation
- Apply insulation securement materials
- Install insulation for a thermoplastic (PVC, TPO) membrane, thermoset (EPDM) membrane, and liquid-applied membrane

LEARNING TASKS

1. Describe insulation

CONTENT

- Trade science
 - Moisture flow
 - Heat flow
 - Air movement
- Sloped insulation
 - Purpose of sloped vs. non-sloped insulation
 - Water drainage

2. Secure insulation

- MARS
- PARS
- AARS
- Loose-laid
- Design requirements
- CSA wind uplift requirement

3. Apply insulation securement materials

- Mechanically fastened
 - Insulation plates
 - Fasteners
 - Patterns
- Adhered
 - Asphalt
 - Application rates
 - Low-rise foam
 - Application patterns
- Loose-laid
- Ballast

4. Install insulation for a thermoplastic (PVC, TPO) membrane, thermoset (EPDM) membrane, and liquid-applied membrane

- Methods and tools
- Layout
- Stagger/soldier

LEARNING TASKS

CONTENT

- Cut and fit
- Damage prevention
 - Adhesive burnouts
 - Impact damage
 - Installation traffic
 - Moisture

Achievement Criteria

NOTE: Competency G3-G6 will be assessed together in Competency G3.

Line (GAC):	G	APPLY LOW SLOPE ROOFING COMPONENTS
Competency:	G5	Install cover board

Objectives

To be competent in this area, the individual must be able to:

- Describe cover board
- Describe installation of cover board for thermoplastic (PVC, TPO) and thermoset (EPDM) membranes, and liquid-applied membranes

LEARNING TASKS

1. Describe cover board

CONTENT

- Trade science
- Purpose and selection
- Specifications
- Tools and equipment
- Types
 - Wood fibre
 - Gypsum
 - Composite boards
 - Wood sheathing
 - Fibreglass

2. Describe installation of cover board for thermoplastic (PVC, TPO) and thermoset (EPDM) membranes, and liquid-applied membranes

- Layout pattern
- Cutting, fitting, and placing
- Securement methods
 - Fasteners
 - Adhesives
- Requirements
- Joint sealing

Achievement Criteria

NOTE: Competency G3-G6 will be assessed together in Competency G3.

Line (GAC):	G	APPLY LOW SLOPE ROOFING COMPONENTS
Competency:	G6	Install drains, vents, curbs, and penetrations

Objectives

To be competent in this area, the individual must be able to:

- Install drains
- Install curbs
- Install vents and pipe penetrations
- Install drains, vents, curbs, and penetrations for thermoplastic (PVC, TPO) and thermoset (EPDM) membranes, and liquid-applied membranes

LEARNING TASKS

1. Describe drains

CONTENT

- Trade science
- Interior vs. peripheral drainage
- Primary and overflow
 - Scupper
 - Mechanical
 - Retrofit
- Components
 - Drain baskets
 - Clamping rings
 - Flange
 - Bowl
 - Connections
 - Mechanical joint coupler (MJ clamp)
 - Compression seal
- Sump drain area

2. Install curbs

- Types
 - HVAC
 - Roof hatch
 - Fan curbs
 - Skylights
 - Area dividers/control joints
 - Expansion joints
 - Sleepers
- Requirements
 - Height
 - Insulation
 - Membrane installation
 - Construction
 - Wood

LEARNING TASKS

CONTENT

- Steel
 - Concrete
- Levelling
- 3. Install vents and pipe penetrations
 - Types of penetration flashings
 - Metal
 - Membrane
 - Penetration pocket
 - Accessories
 - Primer
 - Target patches
 - Sealants
 - Storm collars
- 4. Install drains, vents, curbs, and penetrations for thermoplastic (PVC, TPO) and thermoset (EPDM) membranes, and liquid-applied membranes
 - Manufacturers' instructions
 - Cut membranes
 - Prepare flashing
 - Clean and scarify
 - Priming/mastic
 - Install flashing
 - Secure flashings
 - Apply membrane
 - Install accessories

Achievement Criteria

NOTE: Competency G3-G6 will be assessed together in Competency G3.

Line (GAC):	G	APPLY LOW SLOPE ROOFING COMPONENTS
Competency:	G7	Apply ballast, walkways, and protective surfaces

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment required for application of ballast, walkways and protective surfaces for thermoplastic (PVC, TPO) and thermoset (EPDM) membranes, and liquid-applied membranes
- Install ballast, walkways, and protective surfaces

LEARNING TASKS

1. Use tools and equipment required for application of ballast, walkways and protective surfaces for thermoplastic (PVC, TPO) and thermoset (EPDM) membranes, and liquid-applied membranes
2. Install ballast, walkways, and protective surfaces

CONTENT

- Hand tools
- Power buggies
- Cranes
- Hoists
- Sprayers
- Conveyors
- Safety
- Requirements and restrictions
- Specifications
- Trade science
- Types
 - Gravel
 - Pavers and walkways
 - Protected Membrane Assemblies (PMA)
 - Smooth surface coatings
 - Granulated membranes
 - Concrete top insulation
- Green roofing and organics
- Distribution of ballast, aggregate, and paver material
- Acceptable ballast and aggregate
 - Size
 - Cleanliness
- Cut, fit, lay out, and placement
 - filter fabric
 - protective material
 - separation sheet
 - Patio stones
 - Insulation
- Apply granulated cap sheets and surface coatings
- Maintain level elevation of patio stones

Line (GAC):	G	APPLY LOW SLOPE ROOFING COMPONENTS
Competency:	G8	Install metal flashings

Objectives

To be competent in this area, the individual must be able to:

- Install metal flashings for thermoplastic (PVC, TPO) and thermoset (EPDM) membranes, and liquid-applied membranes

LEARNING TASKS

1. Describe metal flashings for thermoplastic (PVC, TPO) and thermoset (EPDM) membranes, and liquid-applied membranes

CONTENT

- Purpose
- Requirements
 - Codes
 - Manufacturers' specifications
 - Specifications
- Watershed design principles
- Selecting gauge and colour of flashing
- Location, profile, and size of flashing
- Materials
 - Aluminum
 - Copper
 - Stainless steel
 - Galvanized steel
 - Lead
 - Zinc
- Coated metals
 - TPO
 - PVC
 - Pre-painted
 - Baked enamel
- Profiles and types of flashing
 - Cap
 - Wall
 - Gravel stops
 - Drip
 - Reglets
 - Valleys
- Expansion and contraction
- Safety and PPE
- Tools and equipment
- Fabrication and installation
 - Cutting
 - Finishing
 - Fastening

2. Install metal flashings for thermoplastic (PVC, TPO) and thermoset (EPDM) membranes, and liquid-applied membranes

LEARNING TASKS

CONTENT

- Flashing
- Braking
- Folding
- Types of seam joints
 - S-locks
 - Standing seam
 - Lap joints
- Securement
 - Types
 - Screws
 - Nails
 - Wind cleats
 - Pins
 - Compatibility
 - Dissimilar metals
- Sealants
 - Butyl tape
 - Caulking
 - Liquid membranes
- Mastic

Line (GAC): H APPLY LOW SLOPE ROOFING MEMBRANES

Competency: H1 Relax membranes

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment to relax membranes
- Prepare membranes
- Relax membrane

LEARNING TASKS

1. Use tools and equipment

2. Prepare membranes

3. Relax membrane

CONTENT

- Safety
- Hand tools
- Weights

- Remove labelling and wrappers
- Unroll membrane
- Cut membrane roll to length

- Manufacturers' recommendations for relaxment duration
- Position weights
- Visually inspect membrane
 - Damage
 - Cleanliness

Achievement Criteria

NOTE: Competencies H1-H3 and H10 will be assessed together in Competencies H5-H6.

Line (GAC): H APPLY LOW SLOPE ROOFING MEMBRANES

Competency: H2 Set membranes

Objectives

To be competent in this area, the individual must be able to:

- Set thermoplastic (PVC, TPO) and thermoset (EPDM) membranes, and liquid-applied membranes

LEARNING TASKS

1. Set thermoplastic (PVC, TPO) and thermoset (EPDM) membranes, and liquid-applied membranes

CONTENT

- Manufacturers' specifications
- Direction of laps
 - Sheds water
- Direction of rolls
- Measure and cut membrane
- Position and overlap membrane sheets and rolls
- Visually verify membrane layout and alignment

Achievement Criteria

NOTE: Competencies H1-H3 and H10 will be assessed together in Competencies H5-H6.

Line (GAC):	H	APPLY LOW SLOPE ROOFING MEMBRANES
Competency:	H3	Apply membranes using hot-liquid process

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment to apply membranes using a hot-liquid process
- Describe hot-liquid materials for thermoplastic (PVC, TPO) and thermoset (EPDM) membranes, and liquid-applied membrane roofing systems
- Describe installation of thermoplastic (PVC, TPO) and thermoset (EPDM) membranes with hot-liquid materials

LEARNING TASKS

CONTENT

- | | |
|---|---|
| 1. Use tools and equipment to apply membranes using a hot-liquid process | <ul style="list-style-type: none"> • Safety • Hand tools • Kettles • High boys • Low boys • Buckets • Mops • Squeegees • Felt layers • Gauge |
| 2. Describe hot-liquid materials for thermoplastic (PVC, TPO) and thermoset (EPDM) membranes | <ul style="list-style-type: none"> • Roll products <ul style="list-style-type: none"> ○ Fleece backed membranes ○ Joint tape • Bitumen types <ul style="list-style-type: none"> ○ 1, 2, 3, 4 ○ SEBS • Fastening techniques • Surfacing materials <ul style="list-style-type: none"> ○ PMRA ○ Overburdens |
| 3. Describe installation of thermoplastic (PVC, TPO) and thermoset (EPDM) membranes with hot-liquid materials | <ul style="list-style-type: none"> • Asphalt <ul style="list-style-type: none"> ○ Types ○ Temperatures • Heating and monitoring • EVT • FBT • Flash point |

LEARNING TASKS

CONTENT

- Apply and pour asphalt
- Apply field materials
- Broom membrane in place to enhance adhesion
- Rolls
 - Fleece back membranes
 - Bitumen application rates
- Surfacing
 - PMRA
 - Overburdens
- Sealants

Achievement Criteria

NOTE: Competencies H1-H3 and H10 will be assessed together in Competencies H5-H6.

Line (GAC): H APPLY LOW SLOPE ROOFING MEMBRANES

Competency: H5 Apply membranes using hot-air welding

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment for applying thermoplastic membranes (PVC, TPO) using hot-air welding methods
- Install membrane using hot-air welding method

LEARNING TASKS

CONTENT

- | | |
|--|--|
| 1. Use tools and equipment for applying thermoplastic membranes (PVC, TPO) using hot-air welding methods | <ul style="list-style-type: none"> • Safety <ul style="list-style-type: none"> ○ PPE ○ Fire extinguisher • Tools and equipment <ul style="list-style-type: none"> ○ Hand tools ○ Hot-air welder ○ Generator • Extension cord |
| 2. Describe application of thermoplastic membranes (PVC, TPO) using hot-air welding method | <ul style="list-style-type: none"> • Requirements <ul style="list-style-type: none"> ○ Manufacturers' ○ Design authority ○ Codes and regulations ○ Specifications |
| 3. Install membranes using hot-air welding method | <ul style="list-style-type: none"> • Ensure overlapping membrane is clean and free of debris • Perform field test with sample membrane • Perform pre-welds • Hot-air weld side and end laps • Probe seams to verify continuity • Repair defects • Apply membrane sealant to cut edges |

Achievement Criteria

NOTE: Include competencies H1-H3 and H10 as part of this Achievement Criteria.

Performance The learner will use a hot-applied method for a thermoset, thermoplastic, and liquid-applied membrane system on a mockup.

Conditions The learner will be given:

- PPE
- A low slope roof mockup
- Materials
- Tools and equipment
- Specifications

Criteria

- Safety
- Accuracy
- Procedure
- Application

Line (GAC):	H	APPLY LOW SLOPE ROOFING MEMBRANES
Competency:	H6	Apply membranes using cold-applied methods

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment to apply membranes using cold-applied methods
- Install cold-applied thermoplastics, thermosets, and liquid-applied materials

LEARNING TASKS

CONTENT

- | | |
|---|--|
| 1. Use tools and equipment to apply membranes using cold-applied methods | <ul style="list-style-type: none"> • Safety • Hand tools • Notched Trowels • Rollers <ul style="list-style-type: none"> ○ Weighted ○ Hand ○ Paint • Spray equipment • Dual cartridge applicator |
| 2. Describe cold-applied thermoplastics, thermosets, liquid-applied materials, and material preparation | <ul style="list-style-type: none"> • Roll products • Adhesives • Mastics • Material preparation <ul style="list-style-type: none"> ○ Cleaning solvents |
| 3. Install cold-applied thermoplastics, thermosets, and liquid-applied materials | <ul style="list-style-type: none"> • Selection of adhesive types <ul style="list-style-type: none"> ○ Types ○ Temperatures <ul style="list-style-type: none"> – Storage – Application – Curing ○ Application of adhesives <ul style="list-style-type: none"> – Rolling – Notched trowel – Spray – Dual cartridge applicator ○ Apply membrane into adhesive <ul style="list-style-type: none"> – Rolling – Flying in – Sealing seams |

- Brooming/weighted rolling
 - Monitor adhesive application rates
 - Wet mil gauge
 - Application rates
- Rolls
 - Types of roll products
 - Roll coverage rates
 - Exposure
- Grading
 - Trowel
 - Brush
 - Winter
 - Summer
- Sealants
- Walkways

Achievement Criteria

NOTE: Include competencies H1-H3 and H10 as part of this Achievement Criteria.

Performance The learner will use a cold-applied method for a thermoset, thermoplastic, and liquid-applied membrane system on a mockup.

Conditions The learner will be given:

- PPE
- A low slope roof mockup
- Materials
- Tools and equipment
- Specifications

Criteria

- Safety
- Accuracy
- Procedure
- Application

Line (GAC):	H	APPLY LOW SLOPE ROOFING MEMBRANES
Competency:	H7	Apply membranes using mechanical fasteners

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment for thermoplastics, thermosets, and liquid-applied membranes
- Apply mechanical fasteners for thermoplastics, thermosets, and liquid-applied membranes

LEARNING TASKS

CONTENT

- | | |
|---|---|
| 1. Use tools and equipment for thermoplastics, thermosets, and liquid-applied membranes | <ul style="list-style-type: none"> • Safety • Tools • Equipment |
| 2. Select mechanical fasteners for thermoplastics, thermosets, and liquid-applied membranes | <ul style="list-style-type: none"> • Types <ul style="list-style-type: none"> ○ Screws ○ Nails ○ Pins ○ Bars ○ Plates • Gauge and length |
| 3. Apply mechanical fasteners for thermoplastics, thermosets, and liquid-applied membranes | <ul style="list-style-type: none"> • Safety • Selection of tools and equipment • Patterns and spacing • Tension and seating • Fastening requirements <ul style="list-style-type: none"> ○ CSA wind uplift ○ Wind zones ○ Manufacturers' requirements • Hazards <ul style="list-style-type: none"> ○ Utilities on and below at substrate level Utilities on and below at substrate level |

Line (GAC): **H APPLY LOW SLOPE ROOFING MEMBRANES**
Competency: **H8 Apply loose-laid membranes**

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment to apply loose-laid membranes
- Install loose-laid membranes

LEARNING TASKS

CONTENT

- | | |
|--|--|
| 1. Use tools and equipment to apply loose-laid membranes | <ul style="list-style-type: none"> • Safety <ul style="list-style-type: none"> ○ Chemical resistant gloves ○ Safety glasses • Tools <ul style="list-style-type: none"> ○ Crayons ○ Scissors ○ Paint rollers ○ Seam rollers ○ Scrub pads ○ Caulking gun ○ Rags |
| 2. Describe application of loose-laid membranes | <ul style="list-style-type: none"> • Requirements <ul style="list-style-type: none"> ○ Code ○ Manufacturer ○ Design authority |
| 3. Install loose-laid membranes | <ul style="list-style-type: none"> • Perimeter and penetrations securement • Side and end laps <ul style="list-style-type: none"> ○ Prepare ○ Seal ○ Roll ○ Finish • Apply sealant and reinforcement membrane where required |

Line (GAC):	H	APPLY LOW SLOPE ROOFING MEMBRANES
Competency:	H9	Apply liquid-applied membranes

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment for applying liquid-applied membranes
- Install liquid-applied membranes

LEARNING TASKS

CONTENT

- | | |
|---|--|
| 1. Use tools and equipment | <ul style="list-style-type: none"> • Safety <ul style="list-style-type: none"> ○ Chemical resistant gloves ○ Safety glasses ○ Chemical resistant suits ○ Respirators • Tools <ul style="list-style-type: none"> ○ Drills ○ Mixers ○ Pails ○ Scissors ○ Rollers ○ Squeegees ○ Brushes • Equipment <ul style="list-style-type: none"> ○ Sprayers ○ Fans |
| 2. Describe application of liquid-applied membranes | <ul style="list-style-type: none"> • Requirements <ul style="list-style-type: none"> ○ Code ○ Manufacturer ○ Design authority |
| 3. Install liquid-applied membranes | <ul style="list-style-type: none"> • Preparation <ul style="list-style-type: none"> ○ Roof deck ○ Substrate deck ○ Liquid-applied membrane • Application <ul style="list-style-type: none"> ○ Liquid-applied membrane ○ Reinforcement • Confirm <ul style="list-style-type: none"> ○ Use gauge to ensure uniformity of thickness |

Line (GAC): **H APPLY LOW SLOPE ROOFING MEMBRANES**
Competency: **H10 Install membrane flashings**

Objectives

To be competent in this area, the individual must be able to:

- Describe tools and equipment to install membrane flashings
- Apply thermoplastics, thermosets, and liquid-applied membrane flashing materials to walls, curbs, drains, and service penetrations

LEARNING TASKS

1. Describe tools and equipment to install membrane flashings

2. Describe thermoplastics, thermosets, and liquid-applied system flashing materials

CONTENT

- Safety
- Tools
- Equipment

- Requirements
 - Code
 - Manufacturer
 - Design authority selection
- Membranes
- Rolled products
 - Thermosets
 - Cured
 - Reinforced
 - Non-reinforced
 - Semi-cured
 - Uncured
 - Thermoplastics
 - Reinforced
 - Non-reinforced
 - Liquid-applied
 - Reinforcing fabric
- Adhesives
 - Primers
 - Mastics
 - Bitumen
- Mechanical fasteners
 - Nails
 - Screws
 - Plates
 - Bars
- Protection materials
- Location

LEARNING TASKS

CONTENT

- | | |
|---|---|
| | <ul style="list-style-type: none"> ○ Walls and transitions ○ Parapets ○ Drains ○ Penetrations • Coatings |
| 3. Describe thermoplastics, thermosets, and liquid-applied components | <ul style="list-style-type: none"> • Walls • Curbs • Sleepers • Penetrations <ul style="list-style-type: none"> ○ Plumbing pipes ○ Ventilation pipes ○ Electrical conduits • Drains <ul style="list-style-type: none"> ○ Mechanical ○ Retrofit ○ Scuppers • Flashing details <ul style="list-style-type: none"> ○ Field fabricated ○ Factory fabricated • Penetration pocket • Measure and cut membrane flashing • Shape membrane flashing to form to parapets, penetrations, and roof to wall transitions • Install materials to accept membrane flashing on substrate • Install successive layers |
| 4. Apply thermoplastics, thermosets, and liquid-applied membrane flashing materials | |

Achievement Criteria

NOTE: Competencies H1-H3 and H10 will be assessed together in Competencies H5-H6.

Line (GAC): **H APPLY LOW SLOPE ROOFING MEMBRANES**
Competency: **H11 Install temporary seals and temporary drains**

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment to install temporary seals and temporary drains
- Install water cut-offs, temporary seals, and temporary drains in a thermoplastics, thermosets, and liquid-applied membrane system

LEARNING TASKS

CONTENT

- | | |
|--|--|
| 1. Use tools and equipment to install temporary seals and temporary drains | <ul style="list-style-type: none"> • Safety • Tools • Equipment |
| 2. Describe components and materials of temporary seals and temporary drains in a thermoplastics, thermosets, and liquid-applied membrane system | <ul style="list-style-type: none"> • Tie-ins and night seals • Materials <ul style="list-style-type: none"> ○ Asphalt ○ Sealant ○ Membrane ○ Mastics • Drains |
| 3. Describe installation of temporary seals and temporary drains for thermoplastics, thermosets, and liquid-applied membrane system | <ul style="list-style-type: none"> • Material compatibility • Onsite requirements • Prepare existing roof surfaces • Apply temporary seal • Install temporary roof drainage • Verify integrity • Removal |
| 4. Install water cut-offs, temporary seals and temporary drains | <ul style="list-style-type: none"> • Water cut-offs <ul style="list-style-type: none"> ○ Temporary ○ Permanent • Requirements for <ul style="list-style-type: none"> ○ Water cut-offs ○ Temporary seals ○ Temporary drains • Materials <ul style="list-style-type: none"> ○ Asphalt ○ Sealant ○ Membrane • Material compatibility • Determining integrity • Removal |

Line (GAC):	J	APPLY SHINGLES
Competency:	J1	Determine type and layout of shingles

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment to determine type and layout of shingles
- Describe types of metal shingles
- Describe considerations and components for the layout of metal shingles
- Layout metal shingles

LEARNING TASKS

CONTENT

- | | |
|--|---|
| 1. Use tools and equipment to determine type and layout of shingles | <ul style="list-style-type: none"> • Safety • Tools • Equipment |
| 2. Describe types of metal shingles and components | <ul style="list-style-type: none"> • Gauge • Treatments • Finishes • Composition • Styles • Components <ul style="list-style-type: none"> ○ Ridge caps ○ Flashings |
| 3. Describe considerations and components for layout of metal shingles | <ul style="list-style-type: none"> • Requirements • Ventilation • Slope • Acceptable substrate <ul style="list-style-type: none"> ○ Metal ○ Wood <ul style="list-style-type: none"> – Solid sheathing – Battens/strapping/hat tracks • Requirements <ul style="list-style-type: none"> • Code • Manufacturer • Design authority • Reference material <ul style="list-style-type: none"> ○ Canadian Roofing Reference Manual ○ RCABC Roofing Practices Manual |

LEARNING TASKS

CONTENT

4. Layout metal shingles

- Manufacturers' instructions
- Design authority specifications
- CSA
- ULC

- Alignment
- Fastening requirements
- Layout sequence
- Offsets
- Exposures
- Spacing

Achievement Criteria

NOTE: Include J1–J4 and J6 competencies as part of this Achievement Criteria.

Performance The learner will install metal shingles on a mockup.

Conditions The learner will be given

- PPE
- Tools
- Materials
- Specifications

Criteria

- Safety
- Accuracy
- Procedure
- Application

Line (GAC):	J	APPLY SHINGLES
Competency:	J2	Install starter strip and starter course

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment to install starter strip and starter course
- Describe components and considerations for installing perimeter securement for metal shingles
- Install perimeter securement for metal shingles

LEARNING TASKS

CONTENT

- | | |
|--|--|
| 1. Use tools and equipment to install starter strip and starter course | <ul style="list-style-type: none"> • Safety • Tools • Equipment |
| 2. Describe perimeter securement for metal shingles | <ul style="list-style-type: none"> • Purpose • Requirements <ul style="list-style-type: none"> ○ Codes ○ Manufacturers' specifications ○ Design authority • Types <ul style="list-style-type: none"> ○ Proprietary ○ Shop-formed ○ Field-formed • Field cut starters |
| 3. Describe components and considerations for installing perimeter securement for metal shingles | <ul style="list-style-type: none"> • Locations <ul style="list-style-type: none"> ○ Eaves ○ Rake edges • Positioning <ul style="list-style-type: none"> ○ Overhang • Fastening <ul style="list-style-type: none"> ○ Type of fastener ○ Length ○ Number • Location |
| 4. Install perimeter securement for metal shingles | <ul style="list-style-type: none"> • Determine type/profile of perimeter securement • Verify overhang • Fasten starter securement • Seat the fasteners |

Achievement Criteria

NOTE: Competency J1-J4 and J6 will be assessed together in Competency J1.

Line (GAC): J APPLY SHINGLES

Competency: J3 Fasten shingles

Objectives

To be competent in this area, the individual must be able to:

- Select tools and equipment to fasten shingles
- Describe components and considerations for fastening metal shingles
- Fasten metal shingles

LEARNING TASKS

1. Select tools and equipment to fasten shingles

2. Describe components and considerations for fastening metal shingles

3. Fasten metal shingles

CONTENT

- Safety
- Tools
- Equipment
- Requirements
 - Code
 - Manufacturer
 - Design authority
- Slope
- Environmental conditions
- Fasteners
 - Type
 - Length
 - Number
 - Location
- Locations
 - Eaves
 - Field
 - Hips
 - Penetrations
 - Ridges
 - Rake edges
 - Valleys
- Positioning
 - Overhang
- Offsets
- Safety
- Selecting tools
- Determining fastener location
- Selecting types and lengths of fasteners
- Maintaining shingle pattern

LEARNING TASKS**CONTENT**

- Seating the fasteners
- Fastening
 - First course
 - Field
- Hip and ridge caps

Achievement Criteria

NOTE: Competency J1-J4 and J6 will be assessed together in Competency J1.

Line (GAC):	J	APPLY SHINGLES
Competency:	J4	Cut shingles

Objectives

To be competent in this area, the individual must be able to:

- Select tools and equipment to cut shingles
- Describe considerations for cutting metal shingles
- Cut metal shingles

LEARNING TASKS

1. Use tools and equipment to cut shingles

CONTENT

- Safety
- Tools
 - Snips
 - Guillotine
 - Nibbler
 - Shears
- Equipment
- Requirements
 - Code
 - Manufacturer
 - Design authority
- Protecting underlying materials
- Locations
 - Eaves
 - Field
 - Hips
 - Penetrations
 - Ridges
 - Rake edges
 - Valleys
- Cut to fit
 - Roof penetrations
 - Offset facilitation
 - Hip and ridge caps
- Form hip and ridge caps

- ### 3. Cut metal shingles

Achievement Criteria

NOTE: Competency J1-J4 and J6 will be assessed together in Competency J1.

Line (GAC):	J	APPLY SHINGLES
Competency:	J6	Install metal flashings for shingled roofs

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment to install metal flashings for shingled roofs
- Install metal flashings for metal shingles

LEARNING TASKS

1. Use tools and equipment to install metal flashings for shingled roofs
2. Install metal flashings for metal shingles

CONTENT

- Safety
- Tools
- Equipment
- Requirements
 - Code
 - Manufacturer
 - Design authority
 - Gauge
- Select fasteners
- Install types of metal flashing
 - Apron
 - Back pan
 - Base
 - Clips
 - Counter
 - C-channels
 - Diverters
 - Drip edge
 - Hip/ridge
 - Rake edge
 - Reglet
 - Through-wall
 - Saddles or crickets
 - Valley
 - Wall
- Cut and form flashing
- Fasten flashing
- Apply sealants

Achievement Criteria

NOTE: Competency J1-J4 and J6 will be assessed together in Competency J1.

Line (GAC):	K	APPLY ROOF TILES
Competency:	K1	Install battens/strapping for roof tiles

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment to install battens/strapping for roof tiles
- Install underlayment for roof tiles
- Install battens/strapping for roof tiles

LEARNING TASKS

1. Use tools and equipment to install battens/strapping for roof tiles
2. Install underlayment for roof tiles
3. Install battens/strapping for roof tiles

CONTENT

- Safety
- Tools
 - Hand tools
 - Saws
 - Pneumatic
- Equipment
- Requirements
- Selection of underlayment type
- Procedure
- Requirements
 - Manufacturer
 - Structural
 - Codes and regulations
 - Specifications
- Rafter location
- Batten spacing
 - Anti-ponding device
- Cut, fit, and install battens/strapping
- Fasteners
 - Selection

Achievement Criteria

NOTE: Include all competencies in GAC K: APPLY ROOF TILES as part of one Achievement Criteria.

Performance The learner will install battens or strapping on a mockup.

Conditions The learner will be given:

- Instructions
- PPE
- Tools
- Materials

Criteria

- Safety
- Accuracy
- Procedure

Line (GAC): **K APPLY ROOF TILES**
Competency: **K2 Fasten roof tiles**

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment to fasten roof tiles
- Describe roof tiles
- Fasten roof tiles

LEARNING TASKS

1. Use tools and equipment to fasten roof tiles

2. Describe roof tiles

3. Fasten roof tiles

CONTENT

- Safety
 - Respirators
- Tools
 - Grinders
 - Tile saws
 - Concrete/mortar tools
 - Slate ripper
- Equipment
- Types
 - Concrete
 - Clay
 - Slate
 - Solar (PV)
- Terminology
 - Wind clips
 - Battens
 - Counter battens
 - Hip battens
 - Ridge battens
 - Fasteners
 - Closures
 - Adhesives
 - Mastics
 - Mortars
- Requirements
 - Codes
 - Regulations
 - Manufacturers' specifications
- Considerations
 - Tile damage prevention

LEARNING TASKS

CONTENT

- Foot traffic
- Storage
- Climate
 - Zones
- Slope
- Fasteners
 - Length
 - Type
- Layout pattern
- Fasten tiles to battens/strapping

Achievement Criteria

NOTE: Include all competencies in GAC K: APPLY ROOF TILES as part of one Achievement Criteria.

Performance The learner will fasten roof tiles on a mockup.

Conditions The learner will be given:

- Instructions
- PPE
- Tools
- Materials

Criteria

- Safety
- Accuracy
- Procedure

Line (GAC): **K APPLY ROOF TILES**
Competency: **K3 Cut roof tiles**

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment to cut roof tiles
- Cut roof tiles

LEARNING TASKS

1. Use tools and equipment to cut roof tiles

CONTENT

- Safety
 - Respirator
- Tools
 - Grinders
 - Tile saws
 - Concrete/mortar tools
- Specialty tools
 - Slate hammer
 - Slate bench/stake
 - Slate cutter
 - Slate punch
 - Slate ripper
- Equipment
- Requirements
 - Codes
 - Regulations
 - Manufacturers' specifications
- Measure and mark cuts
- Perform cuts

2. Cut roof tiles

Achievement Criteria

NOTE: **Include all competencies in GAC K: APPLY ROOF TILES as part of one Achievement Criteria.**

Performance The learner will cut roof tiles for a mockup.

Conditions The learner will be given:

- Instructions
- PPE
- Tools
- Materials

Criteria

- Safety
- Accuracy
- Procedure

Line (GAC): **K APPLY ROOF TILES**
Competency: **K4 Install closures for roof tiles**

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment to install closures for roof tiles
- Install closures for roof tiles

LEARNING TASKS

1. Use tools and equipment to install closures for roof tiles

2. Install closures for roof tiles

CONTENT

- Safety
- Tools
- Equipment

- Requirements
 - Codes
 - Regulations
 - Manufacturers' specifications
- Material types
 - Wood
 - Foam
 - Mortar/concrete
 - Mastic
 - Clay
- Considerations
 - Moisture
 - Animal incursion
 - Profile
- Location
 - Eaves
 - Rakes
 - Ridges
- Secure closure strips

Achievement Criteria

NOTE: Include all competencies in GAC K: APPLY ROOF TILES as part of one Achievement Criteria.

Performance The learner will install closures for roof tiles on a mockup.

Conditions The learner will be given:

- Instructions
- PPE
- Tools
- Materials

Criteria

- Safety
- Accuracy
- Procedure

Line (GAC): **K APPLY ROOF TILES**
Competency: **K5 Install ridge and hip caps**

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment to install ridge and hip caps
- Install ridge and hip caps

LEARNING TASKS

CONTENT

- | | |
|---|---|
| 1. Use tools and equipment to install ridge and hip caps | <ul style="list-style-type: none"> • Safety • Tools • Equipment |
| 2. Install ridge and hip caps | <ul style="list-style-type: none"> • Requirements <ul style="list-style-type: none"> ○ Codes and regulations ○ Manufacturers' specifications • Considerations <ul style="list-style-type: none"> ○ Determine exposure ○ Styles • Adhesive types <ul style="list-style-type: none"> ○ Mortars ○ Mastics • Fastener types <ul style="list-style-type: none"> ○ Screws ○ Nails ○ Specialty fasteners • Mix mortar • Apply adhesives and fasteners |

Achievement Criteria

NOTE: **Include all competencies in GAC K: APPLY ROOF TILES as part of one Achievement Criteria.**

Performance The learner will install ridge and hip caps on a mockup.

Conditions The learner will be given:

- Instructions
- PPE
- Tools
- Materials

Criteria • Safety

 • Accuracy

 • Procedure

Line (GAC):	K	APPLY ROOF TILES
Competency:	K6	Install metal flashings for tiled roofs

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment to install metal flashings for tiled roofs
- Install metal flashings for tiled roofs

LEARNING TASKS

1. Use tools and equipment to install metal flashings for tiled roofs
2. Install metal flashings for tiled roofs

CONTENT

- Safety
- Tools
- Equipment
- Requirements
 - Manufacturers' specifications
 - Codes and regulations
- Considerations
 - Metal type
 - Profiles
 - Gauge
 - Colour
- Cut and form flashing
- Install flashing
- Select and use fasteners
- Seal flashing as required

Achievement Criteria

NOTE: Include all competencies in GAC K: APPLY ROOF TILES as part of one Achievement Criteria.

Performance The learner will install metal flashings for tiled roofs on a mockup.

Conditions The learner will be given:

- Instructions
- PPE
- Tools
- Materials

Criteria

- Safety
- Accuracy
- Procedure

Line (GAC):	L	APPLY PRE-FORMED METAL ROOFING
Competency:	L1	Install battens/strapping for pre-formed metal roofing

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment to install battens/strapping for pre-formed metal roofing
- Install underlayment for pre-formed metal roofing
- Install battens/strapping for pre-formed metal roofing

LEARNING TASKS

CONTENT

- | | |
|--|--|
| 1. Use tools and equipment to install battens/strapping for pre-formed metal roofing | <ul style="list-style-type: none"> • Safety • Tools • Equipment |
| 2. Install underlayment for pre-formed metal roofing | <ul style="list-style-type: none"> • Requirements • Selection of underlayment type <ul style="list-style-type: none"> ○ Air/vapour barrier ○ Slip sheet ○ Drainage mat • Procedure |
| 3. Install battens/strapping for pre-formed metal roofing | <ul style="list-style-type: none"> • Requirements <ul style="list-style-type: none"> ○ Manufacturer ○ Structural ○ Codes and regulations ○ Specifications • Types <ul style="list-style-type: none"> ○ Dimensional lumber ○ Steel <ul style="list-style-type: none"> – Hat tracks – Z bar • Rafter location • Batten spacing • Cut, fit, and install battens/strapping • Fasteners <ul style="list-style-type: none"> ○ Selection |

Achievement Criteria

NOTE: Include competencies L1-L4 and L6 as part of the Achievement Criteria.

Performance The learner will install pre-formed metal **panels** on a mockup.

Conditions The learner will be given:

- Instructions
- PPE
- Tools
- Materials

Criteria

- Safety
- Accuracy
- Procedure

Line (GAC): **L APPLY PRE-FORMED METAL ROOFING**
Competency: **L2 Cut and form sheet metal**

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment to cut and form sheet metal
- Cut sheet metal
- Form sheet metal

LEARNING TASKS

1. Use tools and equipment to cut and form sheet metal

CONTENT

- Safety
- Tools
 - Snips
 - Shears
 - Nibblers
 - Seamers
- Equipment
 - Metal stretcher
 - Metal shrinker
 - Slitters
 - Brakes
 - Roll former
- Requirements
 - Manufacturer
 - Codes and regulations
 - Specifications
- Procedure
 - Measure
 - Determine cuts
 - Perform cuts
- Field folding
 - Bread pan
 - Upstands
 - Flat lock
- Roll forming
 - Hand tools
 - Equipment

2. Cut sheet metal

3. Form sheet metal

Achievement Criteria

NOTE: Competency L1-L4 and L6 will be assessed together in L1.

Line (GAC):	L	APPLY PRE-FORMED METAL ROOFING
Competency:	L3	Fasten pre-formed metal roofing

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment
- Install pre-formed metal roofing

LEARNING TASKS

1. Use tools and equipment
2. Install pre-formed metal roofing

CONTENT

- Safety
- Tools
- Equipment
- Requirements
 - Manufacturer
 - Structural
 - Codes and regulations
 - Specifications
- Layout pattern
- Place pre-formed metal panels
- Install pre-formed metal panels
- Fastening points
- Fastening requirements
 - Drag load fasteners
 - Exposed fastener
 - Concealed fastener
 - Concealed clip
 - Cladding screws
 - Hook strip
- Considerations
 - Loading
 - Storage
 - Securement

Achievement Criteria

NOTE: Competency L1-L4 and L6 will be assessed together in L1.

Line (GAC):	L	APPLY PRE-FORMED METAL ROOFING
Competency:	L4	Install closure strips for pre-formed metal roofing

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment to install closure strips for pre-formed metal roofing
- Install closures for pre-formed metal roofing

LEARNING TASKS

CONTENT

- | | |
|---|---|
| 1. Use tools and equipment to install closure strips for pre-formed metal roofing | <ul style="list-style-type: none"> • Safety • Tools • Equipment |
| 2. Install closures for pre-formed metal roofing | <ul style="list-style-type: none"> • Requirements <ul style="list-style-type: none"> ○ Codes ○ Regulations ○ Manufacturers' specifications • Material types <ul style="list-style-type: none"> ○ Wood ○ Foam • Considerations <ul style="list-style-type: none"> ○ Moisture ○ Animal incursion ○ Profile • Location <ul style="list-style-type: none"> ○ Eaves ○ Rakes ○ Ridges • Procedure <ul style="list-style-type: none"> ○ Set panel ○ Secure closure strips |

Achievement Criteria

NOTE: Competency L1-L4 and L6 will be assessed together in L1.

Line (GAC):	L	APPLY PRE-FORMED METAL ROOFING
Competency:	L5	Install snow guards

Objectives

To be competent in this area, the individual must be able to:

- Describe use of tools and equipment to install snow guards
- Install snow guards

LEARNING TASKS

1. Describe use of tools and equipment to install snow guards
2. Describe snow guards
3. Describe installation of snow guards

CONTENT

- Safety
- Tools
- Equipment
- Common types
 - Rails/bars
 - Clips/cleats
 - Fence
- Materials
 - Metals
 - Polymers
- Uses
 - Public safety
 - Snow retention
- Requirements
 - Manufacturers'
 - Structural
 - Codes and regulations
 - Regional
 - Specifications
- Securement
 - Fasteners
 - Adhesives
 - Clips
 - Location
- Procedure
 - Proprietary/manufacturers' specifications
 - Securement placement
 - Secure snow guard

Line (GAC):	L	APPLY PRE-FORMED METAL ROOFING
Competency:	L6	Install metal flashings for pre-formed metal roofs

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment to install metal flashings for pre-formed metal roofs
- Install metal flashings for pre-formed metal roofs

LEARNING TASKS

1. Use tools and equipment to install metal flashings for pre-formed metal roofs
2. Install metal flashings for pre-formed metal roofs

CONTENT

- Safety
- Tools
- Equipment
- Requirements
 - Manufacturers' specifications
 - Codes and regulations
- Considerations
 - Metal type
 - Profiles
 - Gauge
 - Colour
 - Compatibility
- Cut and form flashing
- Select and use fasteners
- Install flashing
- Seal flashing as required

NOTE: Competency L1-L4 and L6 will be assessed together in L1.

Line (GAC):	M	WATERPROOF SURFACES
Competency:	M3	Install green, sustainable, vegetative, and protected membrane components

Objectives

To be competent in this area, the individual must be able to:

- Describe use of tools and equipment to install green, sustainable, vegetative, and protected membrane components
- Describe green, sustainable, vegetative, and protected membrane roofs
- Describe green, sustainable, vegetative, and protected membrane components
- Describe installation of green, sustainable, vegetative, membrane, and protected membrane components

LEARNING TASKS

CONTENT

- | | |
|---|--|
| 1. Describe use of tools and equipment to install green, sustainable, vegetative, and protected membrane components | <ul style="list-style-type: none"> • Safety • Tools • Equipment |
| 2. Describe green, sustainable, vegetative, and protected membrane roofs | <ul style="list-style-type: none"> • Types of green roofing <ul style="list-style-type: none"> ○ Intensive ○ Semi-Intensive ○ Extensive • Protected roof membrane assembly |
| 3. Describe green, sustainable, vegetative, and protected membrane components | <ul style="list-style-type: none"> • Overburdens <ul style="list-style-type: none"> ○ Drainage board ○ Extruded polystyrene ○ Insulation ○ Filter fabrics ○ Ballast ○ Growing medium ○ Pavers • Drainage • Root barriers • Vegetative-free zones • Irrigation systems • Leak detection methods |
| 4. Describe installation of green, sustainable, vegetative, membrane, and protected membrane components | <ul style="list-style-type: none"> • Requirements <ul style="list-style-type: none"> ○ Manufacturers' ○ Structural ○ Codes and regulations ○ Specifications |

LEARNING TASKS

CONTENT

- Procedures
- Visually inspect protection layer for defects
- Repair protection layer and waterproof membrane
- Apply overburden components
- Apply green, sustainable, vegetative, and protected membrane components

Line (GAC):	O	ASSESS ROOF CONDITION
Competency:	O1	Perform roof inspections

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment to perform roof inspections
- Describe performing roof inspections
- Write a maintenance report

LEARNING TASKS

1. Use tools and equipment to perform roof inspections

2. Describe performing roof inspections

3. Write a maintenance report

CONTENT

- Safety
- Tools
- Equipment

- Safety
- Purpose
- Timing
 - Ideal times of year
 - Frequency
- Considerations
 - Roof types
 - Historical records
- Visual
 - Testing
 - Destructive/non-destructive
 - Thermographic imaging/infrared scanning
 - Radioisotopic detection/nuclear surveying
- Identifying defects
- Causes of defects

- Purpose
- Detailed plan
- Checklist
- Observations and recommendations

Line (GAC): O ASSESS ROOF CONDITION

Competency: O2 Perform cut test

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment to perform cut test
- Describe method cut testing

LEARNING TASKS

CONTENT

1. Use tools and equipment to perform cut test

- Safety
- Hand tools
- System specific tools
- Equipment

2. Describe method cut testing

- Prepare area
- Cut hole
- Observe and measure composition
- Record and report cut test findings
- Repair cut test area

Line (GAC):	O	ASSESS ROOF CONDITION
Competency:	O3	Determine maintenance or repair required

Objectives

To be competent in this area, the individual must be able to:

- Describe maintenance of, and repair from, roof condition assessment

LEARNING TASKS

1. Describe maintenance of, and repair from, roof condition assessment

CONTENT

- Further action
- Feasibility of maintenance or repair
- Inform client of options
 - Provide recommendations and report
- Manufacturers' specifications
- Best practices
- Identify available temporary or permanent repairs
- Timeframe required for inspections and preventative maintenance

Line (GAC):	P	MAINTAIN AND REPAIR LOW SLOPE ROOFING
Competency:	P1	Maintain low slope roofing

Objectives

To be competent in this area, the individual must be able to:

- Select tools and equipment of low slope roofing
- Describe maintenance of low slope roofs
- Describe maintenance of BUR, thermoplastic (PVC, TPO) and thermoset (EPDM) membranes, and liquid-applied membrane systems

LEARNING TASKS

CONTENT

- | | |
|--|--|
| 1. Select tools and equipment for low slope roofing | <ul style="list-style-type: none"> • Safety • Tools • Equipment |
| 2. Describe maintenance of low slope roofs | <ul style="list-style-type: none"> • Removal <ul style="list-style-type: none"> ○ Caulking ○ Excessive snow and ice ○ Obstructions • Clean surface of existing sealant • Type and colour of caulking • Reapply caulking • Re-secure loose metal flashings • Verify penetration pocket is well secured and full |
| 3. Describe maintenance of BUR, thermoplastic (PVC, TPO) and thermoset (EPDM) membranes, and liquid-applied membrane systems | <ul style="list-style-type: none"> • Clean, dry, and prime surface prior to maintenance • Reseal drains and scuppers • Apply compatible sealant • Reseal membranes • Application methods of surfacing • Disassemble and reassemble drain components • Resurface membrane with materials • Reinstall fasteners |

Line (GAC):	P	MAINTAIN AND REPAIR LOW SLOPE ROOFING
Competency:	P2	Repair low slope roofing

Objectives

To be competent in this area, the individual must be able to:

- Select tools and equipment for low slope roofing repairs
- Describe repair of BUR, thermoplastic (PVC, TPO) and thermoset (EPDM) membrane, and liquid-applied membrane systems

LEARNING TASKS

1. Select tools and equipment for low slope roofing repairs
2. Describe repair of BUR, thermoplastic (PVC, TPO) and thermoset (EPDM) membrane, and liquid-applied membrane systems

CONTENT

- Safety
- Tools
- Equipment
- Inspections
- Causes of failures
 - Moisture ingress
 - Moisture saturation
 - Vegetation
 - Ventilation
 - Drainage
 - Metal fatigue
 - Membrane failure
 - Traffic
 - Aging
 - Wind
 - Impacts
 - Improper design
 - Improper installation
 - UV degradation
 - Solutions to failure causes
 - Animals
- Identify areas to repair
 - Metal flashings
 - Membrane flashings
 - Penetration details
 - Drainage
 - Surfacing
 - Gravel
 - Granules
 - Coating
 - Pavers

LEARNING TASKS

CONTENT

- Indications of failure
 - Blisters
 - Splits
 - Water ingress
 - Erosion
- Methods of repair
 - Proprietary
 - Temporary
 - Permanent

Line (GAC): Q MAINTAIN AND REPAIR STEEP SLOPE ROOFING

Competency: Q1 Maintain steep slope roofing

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment for steep slope roofing
- Maintain steep slope roofs

LEARNING TASKS

CONTENT

- | | |
|--|--|
| 1. Use tools and equipment for steep slope roofing | <ul style="list-style-type: none"> • Safety • Tools • Equipment |
| 2. Maintain steep slope roofs | <ul style="list-style-type: none"> • Removal of organic and inorganic debris • Remove obstructions from drainage • Remove excessive snow and ice • Clean surface of existing sealant • Remove old sealants • Reapply sealants • Re-secure loose metal flashings |

Line (GAC): Q MAINTAIN AND REPAIR STEEP SLOPE ROOFING

Competency: Q2 Repair steep slope roofing

Objectives

To be competent in this area, the individual must be able to:

- Use tools and equipment required for steep slope roofing repair
- Repair steep slope roofing

LEARNING TASKS

1. Use tools and equipment required for steep slope roofing repair

2. Repair steep slope roofing

CONTENT

- Safety
- Tools
- Equipment
- Inspections
- Causes of failure
 - Moisture ingress
 - Moisture saturation
 - Vegetation
 - Ventilation
 - Insects
 - Animals
 - Aging
 - Environmental conditions
 - Wind
 - UV degradation
 - Ice damming
 - Improper design
 - Improper installation
- Indicators of a required repair
 - Missing shingles
 - Water ingress
 - Erosion
 - Splits
- Identify areas to repair
 - Valleys
 - Worn
 - Buckling
 - Nails backing out
 - Broken, split, damaged shakes and shingles
 - Details and penetrations

Section 4

ASSESSMENT GUIDELINES

Assessment Guidelines – Level 1

Level 1 Grading Sheet: Subject Competency and Weightings

PROGRAM: IN-SCHOOL TRAINING:		ROOFER LEVEL 1	
LINE	SUBJECT COMPETENCIES	THEORY WEIGHTING	PRACTICAL WEIGHTING
A	PERFORM SAFETY-RELATED FUNCTIONS	10%	10%
B	USE TOOLS AND EQUIPMENT	12%	12%
C	ORGANIZE WORK	8%	3%
D	USE COMMUNICATION AND MENTORING TECHNIQUES	2%	0%
E	PREPARE ROOF FOR REPLACEMENT	4%	4%
F	PREPARE DECK FOR ROOF INSTALLATION	4%	4%
G	APPLY LOW SLOPE ROOFING COMPONENTS	7%	7%
H	APPLY LOW SLOPE ROOFING MEMBRANES	10%	10%
I	PERFORM COMMON STEEP SLOPE PRACTICES	20%	20%
J	APPLY SHINGLES	23%	30%
	Total	100%	100%
In-school theory / practical subject competency weighting		50%	50%
Final in-school percentage score		IN-SCHOOL %	
In-school Percentage Score Combined theory and practical subject competency multiplied by		80%	
Standardized Level Exam Percentage Score The exam score is multiplied by		20%	
Final Percentage Score		FINAL%	

Assessment Guidelines – Level 2

Level 2 Grading Sheet: Subject Competency and Weightings

PROGRAM: IN-SCHOOL TRAINING:		ROOFER LEVEL 2	
LINE	SUBJECT COMPETENCIES	THEORY WEIGHTING	PRACTICAL WEIGHTING
B	USE TOOLS AND EQUIPMENT	5%	10%
C	ORGANIZE WORK	10%	10%
E	PREPARE ROOF FOR REPLACEMENT	5%	0%
F	PREPARE DECK FOR ROOF INSTALLATION	5%	0%
G	APPLY LOW SLOPE ROOFING COMPONENTS	15%	25%
H	APPLY LOW SLOPE ROOFING MEMBRANE	19%	25%
J	APPLY SHINGLES	19%	30%
M	WATERPROOF SURFACES	8%	0%
N	DAMP-PROOF SURFACES	8%	0%
P	MAINTAIN AND REPAIR LOW SLOPE ROOFING	3%	0%
Q	MAINTAIN AND REPAIR STEEP SLOPE ROOFING	3%	0%
	Total	100%	100%
In-school theory / practical subject competency weighting		50%	50%
Final in-school percentage score		IN-SCHOOL %	
In-school Percentage Score Combined theory and practical subject competency multiplied by		80%	
Standardized Level Exam Percentage Score The exam score is multiplied by		20%	
Final Percentage Score		FINAL%	

Assessment Guidelines – Level 3

Level 3 Grading Sheet: Subject Competency and Weightings

PROGRAM: IN-SCHOOL TRAINING:		ROOFER LEVEL 3	
LINE	SUBJECT COMPETENCIES	THEORY WEIGHTING	PRACTICAL WEIGHTING
B	USE TOOLS AND EQUIPMENT	3%	0%
C	ORGANIZES WORK	12%	5%
D	USE COMMUNICATION AND MENTORING TECHNIQUES	2%	0%
F	PREPARE DECK FOR ROOF INSTALLATION	3%	0%
G	APPLY LOW SLOPE ROOFING COMPONENTS	10%	25%
H	APPLY LOW SLOPE ROOFING MEMBRANES	22%	25%
J	APPLY SHINGLES	10%	15%
K	APPLY ROOF TILES	5%	15%
L	APPLY PRE-FORMED METAL ROOFING	10%	15%
M	WATERPROOF SURFACES	10%	0%
O	ASSESS ROOF CONDITION	7%	0%
P	MAINTAIN AND REPAIR LOW SLOPE ROOFING	3%	0%
Q	MAINTAIN AND REPAIR STEEP SLOPE ROOFING	3%	0%
	Total	100%	100%
In-school theory/practical subject competency weighting		50%	50%
Final in-school percentage score Apprentices must achieve a minimum 70% as the final in-school percentage score to be eligible to write the Interprovincial Red Seal exam.		IN-SCHOOL %	

All apprentices who complete Level 4 of the Carpenter program with a FINAL level mark of 70% or greater will write the Interprovincial Red Seal examination as their final assessment.

SkilledTradesBC will enter the apprentices Red Seal Interprovincial examination mark in SkilledTradesBC Portal. A minimum mark of 70% on the examination is required for a pass.

Section 5

TRAINING PROVIDER STANDARDS

Facility Requirements

Classroom Area

- Comfortable seating and tables suitable for training, teaching, lecturing
- Compliance with all local and national fire code and occupational safety requirements
- Lighting controls to allow easy visibility of projection screen allowing students to take notes
- Windows must have shades or blinds to adjust sunlight
- Heating/air conditioning for comfort all year round
- In-room temperature regulation and ventilation to ensure comfortable room temperature
- Acoustics in the room must allow the instructor to be heard
- White marking board with pens and eraser (optional: flipchart in similar size)
- Projection screen or projection area at front of classroom
- Overhead projector and/or multi-media projector

Shop Area

- Compliance with all local and national fire code and occupational safety requirements
- Ventilation and vehicle exhaust extraction as per WorkSafeBC Standards
- Compliance with Municipal and Provincial bylaws
- Ceiling shall be a minimum height of 16' or as varied by good engineering practices and code
- Appropriate lifting devices (hoists) used in industry
- Adequate hoist to student ratio
- Suitable demonstration area
- Lighting appropriate for good vision in ambient light
- Refuse and recycling bins for used shop materials
- First-aid facilities
- Computer terminals

Lab Requirements

- This section does not apply.

Student Facilities

- Adequate lunch room as per WorkSafeBC requirements
- Adequate washroom facilities as per WorkSafeBC requirements
- Personal storage lockers

Instructor's Office Space

- Desk and filing space
- Computer

Other

- WiFi

Tools and Equipment: Common to All Levels

Required Shop Equipment

- Electrical cord
- Industrial vacuum
- Pallet jack
- Power saws (circular)
- Pressure washer
- Propane tank
- Roll carrier
- Screw gun
- Strikers

Required Shop (Facility) Tools

- Adjustable spanner
- Axe
- Broom
- Bucket/pail
- Caulking gun
- Chalk line
- Chisels
- Drying mop
- Flashlight
- Hacksaw
- Hammers
- Hammer stapler
- Hand saw
- Hand spudder
- Hand roller
- Hatchet
- Hot mop
- Infrared heat gun
- Measuring tape
- Metal shear
- Pan and box brake
- Pipe wrench
- Pry bar
- Rake
- Roof jack
- Roofer knife
- Saw horse
- Scissors
- Scoop shovel
- Scraper
- Screwdriver
- Seam folder
- Seam roller
- Shovel
- Sliding T-bevel
- Squeegee
- Thermometer
- Trowel
- Wheelbarrow
- Water extractor
- T-square
- Sheet metal brakes (10ft)
- Slitter machine

Required Specialty Tools and Equipment

- Hoisting, Lifting and Rigging Equipment
 - Hydraulic Swing hoist
 - Ladders
- Motorized Equipment
 - 3/4 ton pick-up truck
 - Forklift
 - Mechanical scraper
 - Power broom
 - Roof cutter
 - Rotary spudder
 - Snow blower

- Personal Protective Equipment
 - Ear muffs
 - Eye wash bottle
 - Face shield
 - First aid kit
 - Guard rail (steep and flat roof)
 - Lanyard (rope)
 - Mask
 - Portable fire extinguisher
 - Safety glasses
 - Safety harness

Student Tools and Equipment

During attendance and completion of the technical training sessions, apprentices may be responsible for having specific equipment and tools. If equipment and tools are required, a list will be given to each apprentice at the beginning of the technical training session.

Tools and Equipment: Level One Only

Required Shop Equipment

- Adhesive spreader
- Aluminum felt broom
- Manual gravel spreader

Required Shop (Facility) Tools

- N/A

Required Specialty Tools and Equipment

- Hot process equipment
 - Bitumen kettle
 - Bitumen mop
 - Bitumen pump and piping
 - Dipper
 - Mini mop
 - Mop cart

Tools and Equipment: Level Two Only

Required Shop Equipment

- Field and detail torches

Required Shop (Facility) Tools

- N/A

Required Specialty Tools and Equipment

- Hot process equipment
 - Degranulator

Tools and Equipment: Level Three Only

Required Shop Equipment

- Thermoplast induction welder

Required Shop (Facility) Tools

- Soldering irons (propane fuelled)

Required Specialty Tools and Equipment

- N/A

Reference Materials

Recommended Reference Materials

- BC and National Building Codes
- Canadian Roofing Reference Manual (Canadian Roofing Contractors Association)
- Carlisle Specification Manual (Carlisle SynTec Systems Canada)
- Cedar Shake and Shingle Specifications Manual (Cedar Shake and Shingle Bureau)
- Decra Systems Specifications Manual (DECRA Roofing Systems)
- Firestone Specifications Manual (Firestone Building Products Canada)
- IKO Specification Manual (IKO Industries Limited)
- National Standards of Canada for Concrete Roof Tile (CSA A220 M91)
- National Torch Safety Program Booklet (Canadian Roofing Contractors Association)
- NRCA Repair Manual for Low-slope Membrane Roof Systems (National Roofing Contractors Association)
- NRCA Roofing and Waterproofing Manual (National Roofing Contractors Association)
- Occupational Health and Safety Regulation and WCB Standards
- The Roofing Practices Manual (RCABC)
- Roofer, Damp and Waterproofer manuals, Level 1-3 (RCABC)
- Residential Blueprint Reading Level 1
- Residential Blueprint Reading Level 2
- The Science and Technology of Traditional and Modern Roofing Systems (Dr. H. O. Laaly)
- Soprema Specification Manual (Soprema Inc.)
- WHMIS Publications (WorkSafeBC)

Instructor Requirements

Occupation Qualification

The instructor must possess:

- Roofer (Damp, and Waterproofing) Certificate of Qualification with an Interprovincial “Red Seal” endorsement

OR

- Roofer Certificate of Qualification with an Interprovincial “Red Seal” endorsement

Work Experience

- Must have a minimum of five years’ experience as a journeyperson
- Must have diverse industry experience covering all the competencies in this program

Instructional Experience and Education

It is preferred that the instructor also possesses one of the following:

- Instructor’s Certificate (minimum 30-hour course)
- Be registered in an Instructor’s Diploma Program, to be completed within a five-year period
- Hold a Bachelor’s or Master’s Degree in Education

Appendices

Appendix A Acronyms

APP	Atactic polypropylene
AARS	Adhesive attached roofing system
BUR	Built-up roofing
CGA	Canadian Gas Association
CSA	Canadian Standards Association
EPS	Expanded polystyrene
EPDM	Ethylene Propylene Diene Monomer
EVT	Equiviscous temperature
FBT	Full blow temperature
HVAC	Heating, ventilation, and air conditioning systems
MJ Clamp	Mechanical joint coupler
MARS	Mechanically attached roofing system
LPG	Liquid propane gas
OSB	Oriented Strand Board
OHS	Occupational Health and Safety
PARS	Partially adhered roofing system
P.A.S.S.	Pull, Aim, Squeeze, and Sweep
PMA	Protected Membrane Assemblies
PMRA	Protected and Modified Protected Roof Systems
PPE	Personal protective equipment
PU	Polyurethane
PV	Photovoltaic
PVC	Polyvinyl Chloride
RCABC	Roofing Contractors Association Of BC
RWL	Rainwater leader
SDS	Safety Data Sheets
SBS	Styrene Butadiene Styrene
SEBS	Styrene Ethylene Butylene Styrene
TPO	Thermoplastic Polyolefin Membrane
ULC	Underwriters Laboratories of Canada
UV	Ultraviolet
WHMIS	Workplace Hazardous Materials Information System

Appendix B Previous Contributors

The Program Outline was prepared with the advice and direction of a 2012 industry steering committee convened initially by the Construction Industry Training Organization (CITO Members included:

Name	Organization
• Shirley Caldwell	Construction Industry Training Organization
• Len Dewit	Construction Industry Training Organization
• Darren Light	Construction Industry Training Organization
• Howard Schlamb	Construction Industry Training Organization
• Ivan van Spronsen	Construction Industry Training Organization
• Graham Wilferd	Construction Industry Training Organization

Industry Subject Matter Experts retained to assist in the review of 2012 Program Outline content:

Name	Organization
• Simone Ballard	
• Dan Ogilvie	
• Roy Olsen	
• David Rice	
• Roger Sové	
• Callum Walsh	

Appendix C

Achievement Criteria

Achievement Criteria are included for those competencies that require a practical assessment. The intent of including Achievement Criteria in the Program Outline is to ensure consistency in training across the many training institutions in British Columbia. Their purpose is to reinforce the theory and to provide a mechanism for evaluation of the learner's ability to apply the theory to practice. It is important that these performances be observable and measurable and that they reflect the skills spelled out in the competency. The conditions under which these performances will be observed and measured must be clear to the learner as well as the criteria by which the learner will be evaluated. The learner must also be given the evaluation criteria.

The performance spelled out in the Achievement Criteria is a suggested performance and is not meant to stifle flexibility of delivery. Training providers are welcome to substitute other practical performances that measure similar skills and attainment of the competency. Multiple performances may also be used to replace individual performances where appropriate.

The following tables summarize the practical assessments for each level. **For details, please refer to the Achievement Criteria following the particular competency in the Program Content section.**

ROOFER – LEVEL 1 SUMMARY OF ACHIEVEMENT CRITERIA	
SUBJECT COMPETENCY	ACHIEVEMENT CRITERIA TASK
A2 Use personal protective equipment (PPE) and safety equipment	The learner will wear PPE as needed for each task.
B4 Use access equipment	The learner will set-up, secure, and take down an extension ladder.
B5 Use hot process equipment	The learner will set up a kettle.
C2 Interpret blueprints and drawings	The learner will calculate areas and perimeters.
E1 Protect surrounding area	The learner will perform protective measures and select materials.
E3 Remove roofing and flashings	The learner will remove roof materials from a mockup.
F2 Clean surface of deck	The learner will clean and prepare the deck of a mockup.
G3 Apply vapour retarder, vapour barrier, and air barrier	The learner will install and apply low slope roofing components. NOTE: Include competencies G3-G6 as part of this Achievement Criteria.
H6 Apply membranes using cold-applied methods	The learner will install cold process membrane on low slope roof. NOTE: Include competencies H1, H2, and H10 as part of this Achievement Criteria.
I PERFORM COMMON STEEP SLOPE PRACTICES	NOTE: Include all competencies in GAC I: PERFORM COMMON STEEP SLOPE PRACTICES as part of one Achievement Criteria.
I1 Install steep slope underlayment	The learner will install steep slope underlayment on a mockup.
I2 Install steep slope venting	The learner will install steep slope venting on a mockup.
I3 Install steep slope valley applications	The learner will install valley applications on a steep slope mockup.
I4 Install steep slope saddles/crickets	The learner will install steep slope saddles/ crickets on a mockup.
I5 Install steep slope penetration flashings	The learner will install steep slope penetration flashing on mockup.
I6 Install steep slope metal flashings and drainage	The learner will install steep slope metal flashing and drainage on mockup.
J1 Determine type and layout of shingles	The learner will install asphalt shingles on a mockup. NOTE: Include competencies J1-J4 and J6 as part of this Achievement Criteria.

ROOFER – LEVEL 2 SUMMARY OF ACHIEVEMENT CRITERIA	
SUBJECT COMPETENCY	ACHIEVEMENT CRITERIA TASK
B2 Use power tools, pneumatic tools, and hot-air welding, induction, and fueled equipment	The learner will assemble torching equipment.
B3 Use hoisting, lifting, and rigging equipment	1. The learner will set-up and operate a ladder wheel hoist.
	2. The learner will set up and operate a motorized hoist.
B4 Use access equipment	The learner will assemble scaffolding.
B5 Use hot process equipment	The learner will set up and use a melter.
C2 Interpret blueprints and drawings	The learner will estimate a work take-off from a blueprint and specifications.
C6 Prepare material disposal systems	The learner will assemble and disassemble a disposal chute.
G6 Install drains, vents, curbs, and penetrations	The learner will install and apply low slope roofing components. NOTE: Include competencies G1-G6 as part of this Achievement Criteria.
G8 Install metal flashings	The learner will install metal flashings on a low slope mockup.
H3 Apply membranes using hot-liquid process	The learner will apply hot-liquid (rubber) membrane on a mockup. NOTE: Include competencies H1, H2, and H10 as part of this Achievement Criteria.
H4 Apply membranes using torched-on method	The learner will apply a torched-applied modified bituminous membrane system on a mockup. NOTE: Include competencies H1, H2, and H10 as part of this Achievement Criteria.
H5 Apply membranes using hot-air welding	The learner will use hot-air welding method to install a modified bituminous membrane system on a mockup. NOTE: Include competencies H1, H2, and H10 as part of this Achievement Criteria.
H6 Apply membranes using cold-applied methods	The learner will use a cold-applied method for a modified bituminous membrane system on a mockup. NOTE: Include competencies H1, H2, and H10 as part of this Achievement Criteria.
J1 Determine type and layout of shingles	The learner will install wood shake or shingles on a mockup. NOTE: Include competencies J1-J4 and J6 as part of this Achievement Criteria.

ROOFER – LEVEL 3 SUMMARY OF ACHIEVEMENT CRITERIA	
SUBJECT COMPETENCY	ACHIEVEMENT CRITERIA TASK
C2 Interpret blueprints and drawings	The learner will create drawings from an object.
G3 Apply vapour retarder, vapour barrier, and air barrier	The learner will install and apply low slope roofing components. NOTE: Include competencies G3-G6 competencies as part of this Achievement Criteria.
H5 Apply membranes using hot-air welding	The learner will use a hot-applied method for a thermoset, thermoplastic, and liquid-applied membrane system on a mockup. NOTE: Include competencies H1-H3 and H10 as part of this Achievement Criteria.
H6 Apply membranes using cold-applied methods	The learner will use a cold-applied method for a thermoset, thermoplastic, and liquid-applied membrane system on a mockup. NOTE: Include competencies H1-H3 and H10 as part of this Achievement Criteria.
J1 Determine type and layout of shingles	The learner will install metal shingles on a mockup. NOTE: Include J1-J4 and J6 competencies as part of this Achievement Criteria.