Roofer

Occupational Analysis Report

April 2010

Commission
de la construction
du Québec

The purpose of this report is to describe as accurately as possible the roofing trade as currently practiced in Québec's construction industry. It is a record of discussions held by a group of workers who met for the occasion after industry partners recommended them to the Commission de la construction du Québec for their expertise in the trade.

The occupational analysis is a first step in the definition of the competencies required for practicing the trade. This report becomes one of the reference and decision-making tools used by the Commission for teaching and learning purposes.

The present report does not bind the Commission in any way. It has no legal effect and is meant as a reflection of discussions held on the date of the analysis workshop.

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APPROVAL

This occupational analysis was read and approved by Commission de la construction du Québec decision-makers and the following persons on the dates mentioned below.

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INTRODUCTION

In early 2009, the Commission de la construction du Québec's (CCQ) Direction de la formation professionnelle launched a large-scale operation to review the occupational analyses[1] of all construction industry trades[2].

The CCQ undertook this operation for many reasons, particularly the following:

- the project to reform the construction workforce apprenticeship and management system, and the eventual design of qualitative apprenticeship booklets requiring a detailed description of each trade;
- the fact that most construction occupational analyses had been conducted between 1987 and 1991 and had not been reviewed since;
- updates to vocational qualification examination question banks;
- implementation of Chapter 7 of the Agreement on Internal Trade (AIT) and of the Québec-France Agreement on the Mutual Recognition of Professional Qualifications.

These factors demonstrate the necessity of updating the occupational analyses in order to obtain a current and complete profile of the various trades in Quebec.

The occupational analysis for roofers belongs to this context[3]. Its purpose is to describe the trade as currently practiced by journeymen in the construction industry. The present report was written in order to collate and organize the information gathered during the occupational analysis workshop held in Laval on January 21 and 22, 2010.

This analysis aims to draw a portrait (tasks and operations) of the trade and its working conditions, and to identify the skills and behaviours required. The report of the occupational analysis workshop is an accurate reflection of the consensus reached by a group of experienced roofers. A special effort was made to include in this report all the data collected during the workshop and to ensure that the data accurately depict the realities of the trade analysed.

1. When they were developed, during the 1980s and 1990s, the analyses were called "work situation analyses".
2. The terms "profession" and "trade" are considered synonymous.
3. This occupational analysis was conducted according to the *Cadre de référence et instrumentation pour l'analyse d'une profession* produced in 2007 by the ministère de l'Éducation, du Loisir et du Sport (Direction générale de la formation professionnelle et technique) and the Commission des partenaires du marché du travail, ministère de l'Emploi et de la Solidarité sociale.

1. GENERAL CHARACTERISTICS OF THE TRADE

1.1 DEFINITION OF THE TRADE

According to the Regulation respecting the vocational training of workforce in the construction industry (Schedule A, article 12) the term “roofer” means:

> […] anyone who applies and lays asphalt composition, gravel, shingles, sandstone tiles or other similar products on roofs. Work also includes the repair and insulation of such roofs, including vapour barriers, build-up roofing membranes and waterproofing barriers, as well as laying unwelded and unhooked sheet metal.
>
> Performance of the work described in the first paragraph includes trade-related handling for the purposes of immediate and permanent installation.

The roofers attending the occupational analysis workshop estimate that this definition represents well the practice of the trade for persons working on construction sites. However, they emphasize that the list of materials should not be read by order of importance; and they specify that the list is incomplete because it does not refer to certain products such as elastomeric membranes or ethylene-propylene-diene monomer (EPDM) membranes.

1.2 JOB TITLES

The job title used for describing the practice of the trade in this occupational analysis is “roofer”.

Job titles not to be confused with the roofer trade are:

- carpenter, because those persons can also install shingle roofs;
- tinsmith, because those persons cover roofs with metal or similar materials;
- cement finisher, because those persons lay membranes on foundation walls.

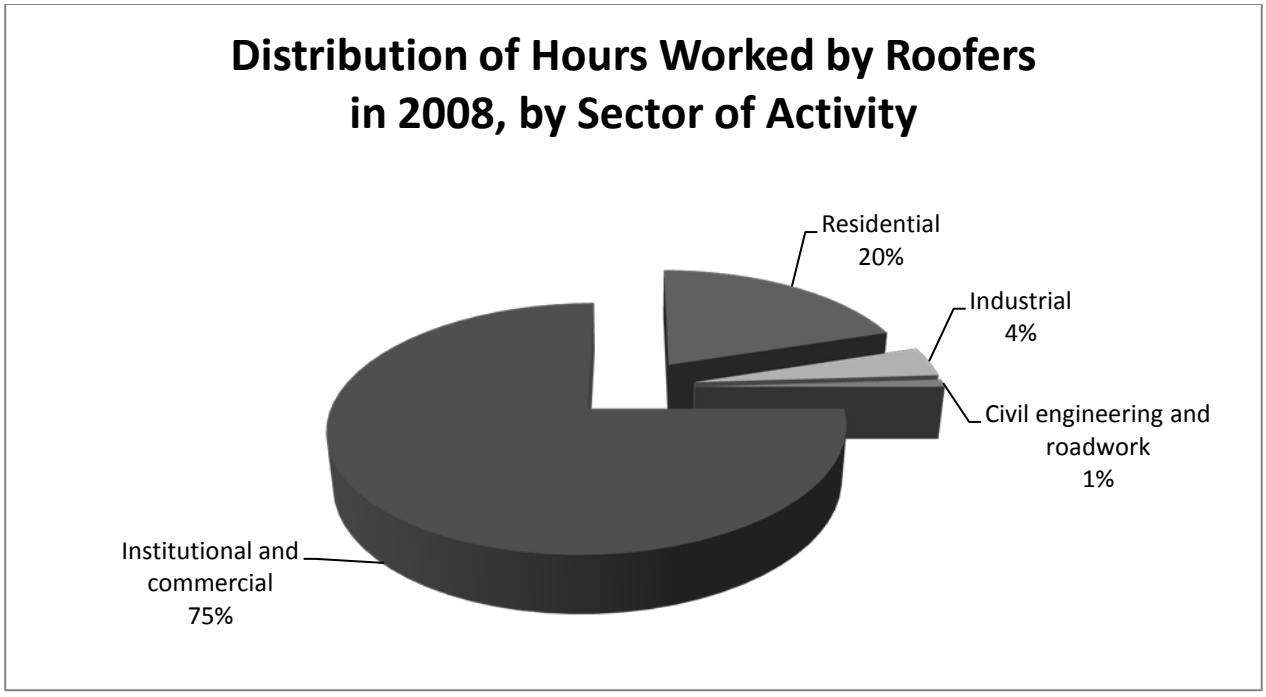
1.3 SECTORS OF ACTIVITY

Roofers are active in all four sectors of the construction industry:

- civil engineering and roadwork;
- industrial;
- institutional and commercial;
- residential.

However, the institutional and commercial sector accounts for almost 75% of all hours worked by roofers[4].

Table 1.1 Workload



The experts consider that this table corresponds well to their perception of the places where their trade is practiced.

4. Commission de la construction du Québec, *Carrières construction*, 2009-2010 edition.

Asked about the sector of activity where they practice their trade, ten roofers attending the analysis workshop stated that they work mainly in the institutional and commercial sector, while one mentioned that he works mainly in the residential sector.

All the roofers attending the workshop practice their activities in at least one other sector. Thus, for nine of the roofers, the industrial sector constitutes the second sector of activity, while for two of the others, the residential sector and the institutional and commercial sector do.

1.4 FIELD OF PRACTICE

The trade's field of practice is the construction industry. The Act respecting labour relations, vocational training, and manpower management in the construction industry (R.S.Q., c. R-20) defines construction as follows:

> […] the foundation, erection, maintenance, renewal, repair, alteration and demolition work on buildings and civil engineering works carried out on the job site itself and vicinity including the previous preparatory work on the ground;
>
> In addition, the word "construction" includes the installation, repair and maintenance of machinery and equipment, work carried out in part on the job site itself and in part in the shop, moving of buildings, transportation of employees, dredging, turfing, cutting and pruning of trees and shrubs and laying out of golf courses, but solely in the cases determined by regulation.

1.5 LEGISLATION AND REGULATIONS

Roofers working in the construction industry are subject to:

- the Act respecting Labour relations, vocational training and workforce management in the construction industry (R.S.Q., c. R-20);
- the Regulation respecting the vocational training of workforce in the construction industry (R-20, r.6.2*)*;
- the Safety Code for the construction industry (R.Q. c. S-2.1, r.6);
- the four sector-based collective agreements for the construction industry;

- the Quebec Building Code, Chapter I – “Building”;
- the National Building Code.

Those attending the workshop think that to the above list should be added the Act Respecting Occupational Health and Safety and its regulations, as well as dangerous goods transportation regulations.

1.6 WORKING CONDITIONS [5]

The following information provides an overview of the conditions and context of the work of roofers, as commented by the participants in the occupational analysis workshop. To obtain up-to-date and complete information that has legal effect, it is necessary to refer to the four collective agreements for the construction industry sectors.

Salary

Under the 2007-2010 collective agreements for the four construction sectors, in May 2009 a journeyman’s daytime hourly wage was as follows:

Industrial, institutional and commercial	$32.54
Civil engineering and roads	$32.82
Residential (light)	$30.13
Residential (heavy)	$32.50

Vacations and time off

Mandatory annual holidays of four weeks – two weeks in summer and two in winter at periods predetermined in collective agreements – are the general rule in the construction industry. To avoid penalizing employers and employees experiencing special constraints, the industry’s four collective agreements allow certain possibilities for changing the vacation periods prescribed by the general rule.

5. General working conditions data are taken from the four 2007-2010 collective agreements of the construction industry and the following CCQ publication: *Carrières construction*, 2009-2010 ed.

To these vacation periods are added eight not worked statutory holidays, as well as a lump sum for sick leaves not otherwise paid.

Pension plan

Construction industry workers participate in a pension plan. They retain their eligibility for this pension plan throughout their career in construction, even if they change employer, trade or sector.

Insurance

The group insurance plan (medications, illness, disability, death) is fully paid by employers. Workers (and their families, as the case may be) are eligible for it so long as they remain active in the construction industry and work the required number of hours, whether or not they change employer.

The roofers attending the analysis workshop specified that many companies subscribe to mutual insurance coverage.

Physical requirements

The roofing trade has specific physical requirements. The person must:

- not have vertigo;
- be meticulous;
- be capable of teamwork;
- be in good physical condition and be able to adapt to extreme changes in temperature.

Stress factors

The work involves many stress factors, particularly occupational health and safety hazards. Major stress factors include the presence of rotten materials and of electric cables, such as those held by tripods on flat roofs, and working from heights.

Weather hazards and delivery periods can also be stressful to roofers.

Work schedules

While a 40-hour work week is the general rule in all construction industry sectors, a roofer's work week is set by collective agreements at 50 hours from Monday to Friday for the institutional and commercial, civil engineering and roads, and industrial sectors (except for heavy industry), for a daily limit of 10 hours a day. For the residential sector, the regular work week is 40 hours from Monday to Friday, for a maximum of 8 hours a day for heavy residential construction and for a maximum of 10 hours a day for light construction.

The roofers attending the workshop also specified that some construction sites present specific conditions that modify the working hours. For example, it often happens that bitumen on a school's roof has to be repaired in the students' absence.

Weather conditions may lengthen or shorten working days. Bad weather conditions can force roofers to stop working and do temporary waterproofing work to preserve a building.

Autonomy and work organization

Roofers usually work in a team, under the supervision of a team leader, foreman or project manager.

Occasionally, roofing inspectors working for engineering and architectural associations, manufacturers or inspection organizations, for example, are present on construction sites to ensure work quality. Given that those inspectors monitor roofing work, they comment on the quality of the work. The foreman is then responsible for deciding what measures should be taken.

Clients may also comment on work quality.

1.7 JOB MARKET ENTRY CONDITIONS [6]

To obtain the competency certificate-apprentice in the trade (CCA), candidates must present to the CCQ the original version of an academic transcript or apprenticeship transcript attesting that they have passed the course of study for the DEP in roofing, as well as a guarantee of employment from an employer registered with the CCQ for at least 150 hours within a period of not more than three consecutive months.

Although the construction industry favours graduates for access to the trade, labour shortages may at times make it necessary for the CCQ to admit candidates without a diploma. Thus, candidates without a diploma[7] are eligible to obtain a competency certificate-apprentice only during a labour shortage and must:

- Supply proof that they have the academic prerequisites for the program leading to a vocational studies diploma (DEP) in the trade referred to in the application or pledge, by signing a consent letter, to take the necessary training to obtain those prerequisites;
- Present a guarantee of employment registered during a labour-pool opening by an employer registered with the CCQ, for at least 150 hours over a period of at most three consecutive months.

The apprentice roofer must have completed an apprenticeship period of 2,000 hours in order to be eligible for the provincial qualification examination that leads to obtaining the competency certificate-journeyman for the trade. Credits are paid into the apprenticeship record book of an apprentice roofer who has obtained his diploma.

Moreover, certain qualities are sought by employers hiring new roofers. The following list presents the main qualities, in the order they were mentioned and not in order of importance:

- Physical strength
- Punctuality and diligence

6. For detailed information on access to the industry, the following may be consulted: http://www.ccq.org/E_CertificatsCompetence.aspx?sc_lang=en&profil=GrandPublic
7. Of the 11 workshop participants, 9 entered the trade without roofing training.

- Resourcefulness
- Teamwork ability

1.8 PLACE OF WOMEN IN THE TRADE

According to the CCQ[8], the proportion of women active in the roofing trade is 0.36% (19 women were practicing the trade out of a total number of 5,284 roofers in 2008).

According to the roofers attending the occupational analysis workshop, the low proportion of women in the trade may be related to physical strength requirements, because the loads to be lifted are often very heavy.

1.9 CAREER PROSPECTS

With experience, a roofer can become a team leader, and then a foreman. Over the years and depending on their fields of interest, roofers can practice other functions or professions, such as project manager, estimator, roofing inspector and trainer.

1.10 DEVELOPMENT OF THE TRADE

In recent years, many new roofing products have appeared, particularly with regard to membranes.

In addition, the high human and financial costs of occupational accidents have helped raise health and safety requirements. Accordingly, the establishment of new safety measures and mechanisms, closer monitoring, the modification of certain work methods and application techniques have helped improve construction site safety and working conditions.

8. Commission de la construction du Québec, *Carrières construction*, 2009-2010 ed.

1.11 IMPACT OF ENVIRONMENTAL STANDARDS ON THE PRACTICE OF THE TRADE

The arrival of green roofs and more-ecological and recyclable roofing products are examples of changes observed at work.

In addition, recycling old materials is spreading on construction sites, and certain sorting operations now take place during removal of existing covering.

2. WORK DESCRIPTION

2.1 TASKS AND OPERATIONS

List of tasks

The following list presents the main tasks performed by roofers. The order in which the tasks are presented does not necessarily reflect their importance in the trade.

Task 1	Install single-ply membrane roofing
Task 2	Install two-ply membrane roofing
Task 3	Install multi-ply membrane roofing
Task 4	Install shingle or tile roofing
Task 5	Install unwelded and unhooked sheet metal roofing
Task 6	Repair roofing

Section 2.3 presents the table of tasks and operations for roofers.

It should be noted that the operation “Do temporary waterproofing, if applicable” may apply to all tasks and may be performed at any time after existing covering is removed. The roofers attending the workshop agreed that this operation could therefore not be placed at any particular location in the sequence of task operations.

Table 2.1 Tasks and Operations

Tasks	Operations					
1. INSTALL SINGLE-PLY MEMBRANE ROOFING	1.1 Find out what work needs to be done	1.2 Prepare the equipment	1.3 Load the truck and go to the construction site	1.4 Examine the site and choose the location of the waste disposal container	1.5 Secure the working area	1.6 Organize the access of workers and materials to the roof
	1.7 Plan the work	1.8 Raise tools and equipment on the roof	1.9 Remove existing roof covering, if applicable	1.10 Check the decking and have it repaired, if applicable	1.11 Clean the decking	1.12 Install a support board, if applicable
	1.13 Install and glue the vapour barrier	1.14 Apply insulation	1.15 Install the support board, if applicable	1.16 Apply protection paper, if applicable	1.17 Apply the membrane	1.18 Glue or weld the joints
	1.19 Install drains and vents	1.20 Seal the projections	1.21 Check and seal the finish joints	1.22 Install ballast, if applicable	1.23 Apply and seal metal flashing (if unwelded and unhooked)	1.24 Check the work done
	1.25 Pick up tools and equipment	1.26 Clean the working area				
2. INSTALL TWO-PLY MEMBRANE ROOFING	2.1 Find out what work needs to be done	2.2 Prepare the equipment	2.3 Load the truck and go to the construction site	2.4 Examine the site and choose the location of the waste disposal container	2.5 Secure the working area	2.6 Organize the access of workers and materials to the roof
	2.7 Plan the work	2.8 Raise tools and equipment on the roof	2.9 Remove existing roof covering, if applicable	2.10 Check the decking and have it repaired, if applicable	2.11 Apply a primer	2.12 Install a support board, if applicable
	2.13 Apply the vapour barrier	2.14 Apply insulation	2.15 Install support boards, if applicable	2.16 Apply the base sheet	2.17 Install control joints	2.18 Seal the control and expansion joints

Tasks	Operations					
2. INSTALL TWO-PLY MEMBRANE ROOFING (Cont'd)	2.19 Install fasteners, if applicable	2.20 Install and seal drains and vents	2.21 Apply the base flashing on projections	2.22 Apply and seal drip edges made of unwelded and unhooked sheet metal	2.23 Apply the finish membrane on the current surface	2.24 Apply the finish membrane on projections
	2.25 Check the work done	2.26 Pick up tools and equipment	2.27 Clean the working area			
3. INSTALL MULTI-PLY MEMBRANE ROOFING	3.1 Find out what work needs to be done	3.2 Prepare the equipment	3.3 Load the truck and go to the construction site	3.4 Examine the site and choose the location of the waste disposal container	3.5 Secure the working area	3.6 Organize the access of workers and materials to the roof
	3.7 Plan the work	3.8 Raise tools and equipment on the roof	3.9 Remove existing roof covering, if applicable	3.10 Check the decking and have it repaired, if applicable	3.11 Clean the decking	3.12 Apply the primer
	3.13 Install a support board, if applicable	3.14 Install a vapour barrier	3.15 Install control joints	3.16 Seal the control and expansion joints	3.17 Apply insulation	3.18 Install a support board
	3.19 Install chamfers	3.20 Lay bitumen and place the paper, starting with the lowest point	3.21 Install and seal drains and vents	3.22 Apply membrane flashing	3.23 Seal the control and expansion joints	3.24 Seal projections
	3.25 Apply and seal drip edges made of unwelded and unhooked sheet metal	3.26 Lay bitumen and spread gravel	3.27 Check the work done	3.28 Pick up tools and equipment	3.29 Clean the working area	

Tasks	Operations					
4. INSTALL A SHINGLE OR TILE ROOFING	4.1 Find out what work needs to be done	4.2 Prepare the equipment	4.3 Load the truck and go to the construction site	4.4 Examine the site and choose the location of the waste disposal container	4.5 Secure the working area	4.6 Organize the access of workers and materials to the roof
	4.7 Plan the work	4.8 Raise tools and equipment on the roof	4.9 Remove existing roof covering, if applicable	4.10 Check the decking and, if applicable, have it repaired or make minor repairs	4.11 Apply the appropriate paper	4.12 Install vents and seal projections
	4.13 Apply metal flashing made of unwelded and unhooked sheet metal	4.14 Trace the hypotenuse	4.15 Lay shingles or tiles as well as roofing brackets	4.16 Lay the ridge tile	4.17 Check the work done	4.18 Pick up tools and equipment
	4.19 Clean the working area					
5. INSTALL UNWELDED AND UNHOOKED SHEET METAL ROOFING	5.1 Find out what work needs to be done	5.2 Prepare the equipment	5.3 Load the truck and go to the construction site	5.4 Examine the site and choose the location of the waste disposal container	5.5 Secure the working area	5.6 Organize the access of workers and materials to the roof
	5.7 Plan the work	5.8 Raise tools and equipment on the roof	5.9 Remove existing roof covering, if applicable	5.10 Check the decking and have it repaired, if applicable	5.11 Clean the decking	5.12 Apply the appropriate paper
	5.13 Apply metal flashing made of unwelded and unhooked sheet metal, if applicable	5.14 Trace the hypotenuse	5.15 Install metal sheets while taking roofing projections into account	5.16 Install vents and seal projections	5.17 Caulk the joints, if applicable	5.18 Lay the ridge tile
	5.19 Check the work done	5.20 Pick up tools and equipment	5.21 Clean the working area			

Tasks	Operations					
6 REPAIR ROOFING	6.1 Find out what work needs to be done	6.2 Prepare necessary equipment	6.3 Load the truck and go to the construction site	6.4 Locate the water infiltration source from the inside, if possible	6.5 Secure the working area	6.6 Organize the access of workers and materials to the roof
	6.7 Plan the work	6.8 Raise tools and equipment on the roof	6.9 Prepare the surfaces	6.10 Dry if applicable	6.11 Install the waste chute, if applicable	6.12 Remove damaged or damp materials
	6.13 Make water cutoffs according to the roofing type	6.14 Replace the covering with appropriate materials	6.15 Make the connection	6.16 Use water to check tightness	6.17 Pick up tools and equipment	6.18 Clean the working area

2.2 TYPES OF ROOFING, ROOFS AND COVERINGS

The types of coverings used depend on the type of roofing. The following correspondences can be established.

Table 2.2 Types of Roofing, Roofs and Coverings

SINGLE-PLY MEMBRANE ROOFING
➢ Types of roofs: flat, low slope, sandwich[9], inverted and ventilated. ➢ Types of coverings: EPDM, TPO, PVC, rubber, elastomeric membrane for UNILAY systems.
TWO-PLY MEMBRANE ROOFING
➢ Types of roofs: flat, low slope, pitched, sandwich, inverted and ventilated. ➢ Types of coverings: elastomeric membrane, modified elastomeric bitumen.
MULTI-PLY MEMBRANE ROOFING
➢ Types of roofs: flat, low slope, sandwich, inverted and ventilated. ➢ Types of coverings: bitumen and gravel, bitumen.
SHINGLE OR TILE ROOFING
➢ Types of roofs: pitched, sandwich and ventilated. ➢ Types of coverings: asphalt shingles, fiberglass shingles, shingles made of recycled materials, cedar shingles, slate tiles[10], sandstone tiles.
SHEET METAL ROOFING (IF UNWELDED AND UNHOOKED)
➢ Types of roofs: pitched, sandwich and ventilated. ➢ Types of coverings: corrugated and box profile steel sheets.

9. Or insulated roof.
10. On this subject, read the professional subcommittee's comment in Annex 3, note 1.

2.3 OPERATIONS, SUB-OPERATIONS AND CLARIFICATIONS

In the following pages are presented the sub-operations related some of the operations, as well as some of the participants' clarifications.

Table 2.3 Sub-Operations and Operation Clarifications

TASK 1 INSTALL SINGLE-PLY MEMBRANE ROOFING

This task is performed on the following types of roofs: flat, low slope, sandwich, inverted and ventilated. The operations presented here are required for a sandwich (or insulated) roof.

Operations		Sub-Operations		Clarifications
1.1	Find out what work needs to be done			
1.2	Prepare the equipment			
1.3	Load the truck and go to the construction site			
1.4	Examine the site and choose the location of the waste disposal container	1.4.1	Check the proximity of electric cables	
1.5	Secure the working area	1.5.1	Make sure to have protection equipment available	
		1.5.2	Establish a safety perimeter on the ground	
		1.5.3	Secure the ladder	
		1.5.4	Use fall arrest	
		1.5.5	Establish a safety perimeter at the top	
		1.5.6	Install guardrails	
1.6	Organize the access of workers and materials to the roof			
1.7	Plan the work			The work is planned according to the surface, the allotted time and the weather.

TASK 1 INSTALL SINGLE-PLY MEMBRANE ROOFING

Operations		Sub-Operations	Clarifications
1.8	Raise tools and equipment on the roof		This operation should be performed twice, if the covering has to be removed.
1.9	Remove existing roof covering, if applicable		
1.10	Check the decking and have it repaired, if applicable		
1.11	Clean the decking		
1.12	Install a support board, if applicable		
1.13	Install and glue the vapour barrier	1.13.1 Glue the vapour barrier to the junctions	
1.14	Apply insulation	1.14.1 Glue the insulation 1.14.2 Screw the insulation 1.14.3 Apply loose-laid insulation	
1.15	Install the support board, if applicable	1.15.1 Fasten the support board mechanically 1.15.2 Glue the support board 1.15.3 Install a loose-laid support board	
1.16	Apply protection paper, if applicable		This operation applies to a case of a single-ply elastomeric membrane.
1.17	Apply the membrane	1.17.1 For ethylene-propylene-diene monomer (EPDM) roofing: • Fasten mechanically • Glue (for full adhesion) 1.17.2 For polyisobutytene (PIB) roofing:[11] • Fasten mechanically • Ballast the loose-laid membrane • Glue or bitumen (for full adhesion)	Application methods vary according to product characteristics, manufacturer standards, insurance company standards, architectural specifications, and building type.

11. On this subject, read the professional subcommittee's comment in Annex 3, note 2.

TASK 1 INSTALL SINGLE-PLY MEMBRANE ROOFING

Operations	Sub-Operations	Clarifications
1.18 Glue or weld the joints		
1.19 Install drains and vents		
1.20 Seal the projections		
1.21 Check and seal the finish joints		
1.22 Install ballast, if applicable		This operation aims to ballast the membrane.
1.23 Apply and seal metal flashing (if unwelded and unhooked)		If metal flashing has to be welded or hooked, this operation is performed by tinsmiths.
1.24 Check the work done		
1.25 Pick up tools and equipment		
1.26 Clean the working area		

TASK 2 INSTALL TWO-PLY MEMBRANE ROOFING

This task is performed on the following types of roofs: flat, low slope, pitched, sandwich (or insulated), inverted and ventilated.
The operations presented here are required for a sandwich roof.

Operations		Sub-Operations		Clarifications
2.1	Find out what work needs to be done			
2.2	Prepare the equipment	2.2.1	Prepare the kettle[12]	
		2.2.2	Prepare the propane gas tank	
		2.2.3	Pick up the tools	
		2.2.4	Pick up disposal equipment	
2.3	Load the truck and go to the construction site			It is important to ensure that all the equipment is loaded, to avoid coming and going, back and forth.
2.4	Examine the site and choose the location of the waste disposal container			
2.5	Secure the working area	2.5.1	Make sure to have protection equipment available	
		2.5.2	Establish a safety perimeter on the ground	
		2.5.3	Secure the ladder	
		2.5.4	Use fall arrest	
		2.5.5	Establish a safety perimeter at the top	
		2.5.6	Install guardrails	
2.6	Organize the access of workers and materials to the roof			
2.7	Plan the work			It is important to plan for the installation of temporary seals[12].
2.8	Raise tools and equipment on the roof			This operation should be performed twice if the existing covering has to be removed[12].

12. On this subject, read the professional subcommittee's comment in Annex 3, note 3.

TASK 2 INSTALL TWO-PLY MEMBRANE ROOFING

Operations	Sub-Operations	Clarifications
2.9 Remove existing roof covering, if applicable		It is important to ensure the safety of people below.
2.10 Check the decking and have it repaired, if applicable		
2.11 Apply a primer	2.11.1 Apply an adhesive on wood and steel decking 2.11.2 Apply a primer on porous concrete decking[13]	
2.12 Install a support board, if applicable		
2.13 Apply the vapour barrier		
2.14 Apply insulation	2.14.1 Put the insulation in place 2.14.2 Build a slope with the insulation 2.14.3 Glue the insulation 2.14.4 Screw the insulation 2.14.5 Bitumen the insulation	
2.15 Install support boards, if applicable	2.15.1 Glue the support boards 2.15.2 Screw the support boards 2.15.3 Cover the support boards with bitumen	
2.16 Apply the base sheet	2.16.1 Glue the base sheet 2.16.2 Screw the base sheet 2.16.3 Nail the base sheet 2.16.4 Cover the base sheet with bitumen	The base sheet may be nailed when it is covered with bitumen.
2.17 Install control joints		
2.18 Seal the control and expansion joints		

13. On this subject, read the professional subcommittee's comment in Annex 3, note 3 d.

TASK 2 INSTALL TWO-PLY MEMBRANE ROOFING

Operations	Sub-Operations	Clarifications
2.19 Install fasteners, if applicable		This sub-operation is performed while the base sheet is glued[14].
2.20 Install and seal drains and vents		
2.21 Apply the base flashing on projections	2.21.1 Apply the self-adhesive membrane 2.21.2 Weld the base flashing	In some cases, the self-adhered membrane may be nailed from a certain height, according to manufacturer standards.
2.22 Apply and seal drip edges made of unwelded and unhooked sheet metal		
2.23 Apply the finish membrane on the current surface	2.23.1 Glue the membrane 2.23.2 Weld the membrane 2.23.3 Cover the membrane with bitumen 2.23.4 Apply the self-adhesive membrane	
2.24 Apply the finish membrane on projections	2.24.1 Glue the membrane 2.24.2 Weld the membrane 2.24.3 Cover the membrane with bitumen 2.24.4 Apply the self-adhesive membrane	
2.25 Check the work done		
2.26 Pick up tools and equipment		
2.27 Clean the working area		

14. On this subject, read the professional subcommittee's comment in Annex 3, note 3 e.

TASK 3 INSTALL MULTI-PLY MEMBRANE ROOFING

This task is performed on the following types of roofs: flat, low slope, sandwich, inverted and ventilated. The operations presented here are required for a sandwich (or insulated) roof.

Operations	Sub-Operations	Clarifications
3.1 Find out what work needs to be done		
3.2 Prepare the equipment	3.2.1 Prepare the kettle 3.2.2 Prepare the propane gas tank 3.2.3 Pick up the tools 3.2.4 Pick up disposal equipment	
3.3 Load the truck and go to the construction site		It is important to made sure that all the equipment is loaded, to avoid coming and going, back and forth.
3.4 Examine the site and choose the location of the waste disposal container		
3.5 Secure the working area	3.5.1 Make sure to have protection equipment available 3.5.2 Establish a safety perimeter on the ground 3.5.3 Secure the ladder 3.5.4 Use fall arrest 3.5.5 Establish a safety perimeter at the top 3.5.6 Install guardrails	
3.6 Organize the access of workers and materials to the roof		
3.7 Plan the work		
3.8 Raise tools and equipment on the roof		This operation should be performed twice, if the existing roof covering has to be removed[15].

15. On this subject, read the professional subcommittee's comment in Annex 3, note 3 c.

TASK 3 INSTALL MULTI-PLY MEMBRANE ROOFING

Operations	Sub-Operations	Clarifications
3.9 Remove existing roof covering, if applicable		It is important to ensure the safety of people below.
3.10 Check the decking and have it repaired, if applicable		
3.11 Clean the decking		
3.12 Apply the primer	3.12.1 Apply an adhesive on wood and steel decking 3.12.2 Apply a primer on concrete decking	
3.13 Install a support board, if applicable		
3.14 Install a vapour barrier		
3.15 Install control joints		
3.16 Seal the control and expansion joints		
3.17 Apply insulation	3.17.1 Apply the insulation 3.17.2 Build a slope with the insulation 3.17.3 Glue the insulation 3.17.4 Screw the insulation 3.17.5 Cover the insutation with bitumen	For this type of roof, most of the materials are applied with bitumen.
3.18 Install a support board		
3.19 Install chamfers		
3.20 Lay bitumen and place the paper, starting with the lowest point		Openings must have been sealed to prevent bitumen infiltration.

TASK 3 INSTALL MULTI-PLY MEMBRANE ROOFING

Operations	Sub-Operations	Clarifications
3.21 Install and seal drains and vents		In comparison with the task "Install two-ply membrane roofing", it should be noted that the sequence of operations for installing multi-ply membrane roofing is different starting with the operation of installing projections.
3.22 Apply membrane flashing		
3.23 Seal the control and expansion joints		
3.24 Seal projections		
3.25 Apply and seal drip edges made of unwelded and unhooked sheet metal		
3.26 Lay bitumen and spread gravel		
3.27 Check the work done		
3.28 Pick up tools and equipment		
3.29 Clean the working area		

TASK 4 INSTALL SHINGLE OR TILE ROOFING

This task is performed on the following types of roofs: pitched, sandwich (or insulated) and ventilated. The operations presented here are required for installing asphalt shingle roofing.

Operations	Sub-Operations	Clarifications
4.1 Find out what work needs to be done		
4.2 Prepare the equipment		
4.3 Load the truck and go to the construction site		
4.4 Examine the site and choose the location of the waste disposal container		
4.5 Secure the working area	4.5.1 Make sure to have protection equipment available 4.5.2 Establish a safety perimeter on the ground 4.5.3 Secure the ladder[16] 4.5.4 Use fall arrest 4.5.5 Establish a safety perimeter at the top 4.5.6 Install guardrails on perimeter	It is sometimes necessary to install tarps to protect landscaping.
4.6 Organize the access of workers and materials to the roof	4.6.1 Make sure to have: • roofing brackets (new roofs) • planks and guardrails • scaffolds • a lift	
4.7 Plan the work		
4.8 Raise tools and equipment on the roof		This operation should be performed twice, if the existing covering has to be removed[17].
4.9 Remove existing roof covering, if applicable		

16. On this subject, read the professional subcommittee's comment in Annex 3, note n° 4.
17. On this subject, read the professional subcommittee's comment in Annex 3, note n° 3 c.

TASK 4 INSTALL SHINGLE OR TILE ROOFING

Operations	Sub-Operations	Clarifications
4.10 Check the decking and, if applicable, have it repaired or make minor repairs		
4.11 Apply the appropriate paper	4.11.1 Apply a self-adhesive membrane or 4.11.2 Apply felt paper	
4.12 Install vents and seal projections		
4.13 Apply metal flashing made of unwelded and unhooked sheet metal	4.13.1 Apply: • Drip edges • valleys	
4.14 Trace the hypotenuse		This operation ensures that asphalt shingles will be applied perpendicularly to drip edges.
4.15 Lay shingles or tiles as well as roofing brackets	4.15.1 Nail the shingles or tiles 4.15.2 Cut the shingles or tiles at the ends	
4.16 Lay the ridge tile		
4.17 Check the work done		
4.18 Pick up tools and equipment		
4.19 Clean the working area		

TASK 5 INSTALL UNWELDED AND UNHOOKED SHEET METAL ROOFING

This task is performed on the following types of roofs: pitched, sandwich and ventilated.

Operations		Sub-Operations	Clarifications
5.1	Find out what work needs to be done		
5.2	Prepare the equipment		
5.3	Load the truck and go to the construction site		
5.4	Examine the site and choose the location of the waste disposal container		
5.5	Secure the working area	5.5.1 Make sure to have protection equipment available 5.5.2 Establish a safety perimeter on the ground 5.5.3 Secure the ladder 5.5.4 Use fall arrest 5.5.5 Establish a safety perimeter at the top 5.5.6 Install guardrails	
5.6	Organize the access of workers and materials to the roof	5.6.1 Make sure to have: • roofing brackets (new roofs) • planks and guardrails • scaffolds • a lift	
5.7	Plan the work		
5.8	Raise tools and equipment on the roof		This operation should be performed twice, if the existing covering has to be removed[18].
5.9	Remove existing roof covering, if applicable		
5.10	Check the decking and have it repaired, if applicable		

18. On this subject, read the professional subcommittee's comment in Annex 3, note n° 3 c.

TASK 5 INSTALL UNWELDED AND UNHOOKED SHEET METAL ROOFING

Operations	Sub-Operations	Clarifications
5.11 Clean the decking		
5.12 Apply the appropriate paper	5.12.1 Apply a self-adhesive membrane or 5.12.2 Apply felt paper	
5.13 Apply metal flashing made of unwelded and unhooked sheet metal, if applicable		
5.14 Trace the hypotenuse		This operation ensures that the sheet metal will be applied perpendicularly to drip edges.
5.15 Lay metal sheets while taking roofing projections into account		
5.16 Install vents and seal projections		
5.17 Caulk the joints, if applicable		
5.18 Lay the ridge flashing		
5.19 Check the work done		
5.20 Pick up tools and equipment		
5.21 Clean the working area		

TASK 6 REPAIR ROOFING

This task is performed on all types of roofs.

Operations	Sub-Operations	Clarifications
6.1 Find out what work needs to be done		
6.2 Prepare the necessary equipment		
6.3 Load the truck and go to the construction site		
6.4 Locate the water infiltration source from the inside, if possible		
6.5 Secure the working area	6.5.1 Make sure to have protection equipment available 6.5.2 Establish a safety perimeter on the ground 6.5.3 Secure the ladder 6.5.4 Use fall arrest 6.5.5 Establish a safety perimeter at the top 6.5.6 Install guardrails	
6.6 Organize the access of workers and materials to the roof		
6.7 Plan the work		
6.8 Raise tools and equipment on the roof		This operation should be performed twice, if the existing covering has to be removed[19].
6.9 Prepare the surfaces		

19. On this subject, read the professional subcommittee's comment in Annex 3, note n° 3 c.

TASK 6 REPAIR ROOFING

Operations	Sub-Operations	Clarifications
6.10 Dry if applicable	6.10.1 Allow to dry 6.10.2 Ventilate with hot air 6.10.3 Use a burner 6.10.4 Place sawdust 6.10.5 Pump the water 6.10.6 Soak up	
6.11 Install the waste disposal chute, if applicable		
6.12 Remove damaged or damp materials		
6.13 Make water cutoffs according to the roofing type		
6.14 Replace the covering with appropriate materials	6.14.1 Apply the appropriate construction method for the type of roofing	
6.15 Make the connection		
6.16 Use water to check tightness		
6.17 Pick up tools and equipment		
6.18 Clean the working area		

2.4 ACHIEVEMENT CONDITIONS AND PERFORMANCE CRITERIA

2.4.1 Achievement Conditions

Data on achievement conditions were collected for the roofing trade as a whole. The data pertain to aspects such as work areas, level of collaboration, work instructions, reference documents consulted, material resources used, and health and safety hazards.

Annex 1 presents a list of tools and equipment used for each task.

Table 2.4 Achievement Conditions

TASK 1 INSTALL SINGLE-PLY MEMBRANE ROOFING
Work areas On the construction site, outdoors, and sometimes in the workshop to prepare projections.
Level of collaboration In a team of two or more. Under the supervision of the team leader, the foreman or the project manager.
Instructions and references Based on manufacturer standards and contractor instructions.
Raw materials EPDM membrane, TPO membrane, PVC membrane, rubber membrane, elastomeric membrane for UNILAY systems, primer, sealants and caulking compounds, mechanical fasteners, glue, vapour barrier, insulation, support boards, protection paper or board (if bitumen was laid previously), propane gas, gravel, terrace slabs, earth (green roof), wood terrace elements, drains, vents, corner pieces, filter cloth, adhesive tape and metal flashing.
Health and safety hazards In a context that presents hazards of: • personal falls; • falling objects; • intoxication; • deafness; • cuts; • burns; • electrocution; • chilblains; • heat stroke.

TASK 2 INSTALL TWO-PLY MEMBRANE ROOFING

Work areas

On the construction site, outdoors and indoors (parking lot, pool or basin, for example).

Level of collaboration

In a team.

Under the supervision of the team leader, the foreman or the project manager.

Instructions and references

Based on manufacturer standards and on instructions from the contractor, architect or client.

Raw materials

Bitumen, nails, vapour barrier, insulation, finish membrane, base sheet (membrane), propane gas, primer, support boards, metal flashing, drips, drains, vents, sealants, mechanical fasteners and drop cloth.

Health and safety hazards

In a context that poses hazards of:

- personal falls;
- falling objects;
- explosions;
- intoxication;
- burns;
- bodily injuries;
- thermal stress.

TASK 3 INSTALL MULTI-PLY MEMBRANE ROOFING

Work areas

On the construction site, outdoors.

Level of collaboration

In a team.

Under the supervision of the team leader, the foreman or the project manager.

Instructions and references

Based on manufacturer standards and on instructions from the contractor, architect or client.

Raw materials

Adhesive, primer, bitumen, wood, butyl, asphalt mastic, nails, vapour barrier, drain, vent (rubber or metal), organic and inorganic felt, propane gas, gravel, insulation (various types), support boards, mechanical fasteners, saturated cotton, 15-lb paper, metal flashing, solvents and sheet metal.

TASK 3 INSTALL MULTI-PLY MEMBRANE ROOFING

Health and safety hazards

In a context that poses hazards of:

- personal falls;
- falling objects;
- explosions;
- intoxication;
- burns;
- bodily injuries;
- thermal stress.

TASK 4 INSTALL SHINGLE OR TILE ROOFING

Work areas

On the construction site, outdoors.

Level of collaboration

In a team.

Under the supervision of the team leader, the foreman or the project manager.

Instructions and references

Based on manufacturer standards and contractor instructions.

Raw materials

Asphalt shingles, fiberglass shingles, shingles made of recycled materials, cedar shingles, slate tiles, sandstone tiles, self-adhesive membrane, asphalt mastic, nails, vent, starting felt, sheet metal gussets, starting moulding, 45-lb paper, chimney flashing, membrane flashing and solvents.

Health and safety hazards

In a context that poses hazards of:

- personal falls;
- falling objects;
- cuts;
- eye injuries;
- sunburns and heat strokes;
- chilblains.

TASK 5 INSTALL UNWELDED AND UNHOOKED SHEET METAL ROOFING

Work areas

On the construction site, outdoors.

Level of collaboration

In a team.

Under the supervision of the team leader, the foreman or the project manager.

Instructions and references

Based on manufacturer standards and contractor instructions.

Raw materials

Sheet metal, sheet metal edge, asphalt mastic, sheet metal valleys, self-adherant membrane, 45-lb paper, paint (for touch ups), vent, caulking compound and sheet metal screws or nails, etc.

Health and safety hazards

In a context that poses hazards of:

- personal falls;
- falling objects;
- cuts;
- eye injuries;
- chilblains.

TASK 6 REPAIR ROOFING

Work areas

On the construction site, outdoors or indoors.

Level of collaboration

In a team of two or more.
Under the supervision of the team leader, the foreman or the project manager.

Instructions and references

Based on manufacturer standards and contractor instructions.

Raw materials

According to the type of covering. See the corresponding task.

Health and safety hazards

In a context that poses hazards of:

- personal falls;
- falling objects;
- intoxication;
- deafness;
- cuts;
- burns;
- electrocution;
- chilblains;
- heat stroke.

2.4.2 Performance Criteria

Performance criteria were collected for each task. They are used for assessing whether the tasks are performed satisfactorily. The criteria pertain to aspects such as the quantity and quality of work done, the observance of a work procedure, the attitudes adopted, etc.

To draw the list of criteria for each task, the participants worked in teams of three. Their results were then collected and presented in full session.

Table 2.5 Performance Criteria

TASK 1 INSTALL SINGLE-PLY MEMBRANE ROOFING	
Performance Criteria	
Planning the work according to the surface and time	Water tightness of the roofing
Resourcefulness	No broken materials
Precision of membrane alignment	Neatness of the roof and working area
Spreading gravel uniformly	Meeting manufacturer standards
Correct welding or gluing	Observance of trade practices
Rapid execution	Observance of occupational health and safety rules
Checking work quality appropriately	
TASK 2 INSTALL TWO-PLY MEMBRANE ROOFING	
Performance Criteria	
Planning the work according to the surface and time	Water tightness of the roofing
Sense of responsibility	No broken materials
Teamwork ability	Neatness of the roof and working area
Precision of membrane alignment	Meeting manufacturer standards
Rapid execution	Observance of trade practices
Caution (overheating)	Observance of occupational health and safety rules

TASK 3 INSTALL MULTI-PLY MEMBRANE ROOFING	
Performance Criteria	
Planning the work according to the surface and time	Water tightness of the roofing
Sense of responsibility	Rapid execution
Teamwork ability	Neatness of the roof and working area
Precision of membrane alignment	Meeting manufacturer standards
Precision of paper alignment	Observance of trade practices
Precision of workmanship	Observance of occupational health and safety rules

TASK 4 INSTALL SHINGLE OR TILE ROOFING	
Performance Criteria	
Planning the work according to the surface and time	Aesthetic appearance of the work
Resourcefulness	No broken tiles
Ability to do repetitive work	Water tightness of the roofing
Placing the roofing brackets correctly	Neatness of the roof and working area
Precision of measurements	Meeting manufacturer standards
Precision of course alignment	Observance of trade practices
Tracing the hypotenuse correctly	Observance of occupational health and safety rules

TASK 5 INSTALL UNWELDED AND UNHOOKED SHEET METAL ROOFING	
Performance Criteria	
Planning the work according to the surface and time	No broken sheet metal
Precision of measurements	Water tightness of the roofing
Precision of sheet metal alignment	Neatness of the roof and working area
Attention to detail	Meeting manufacturer standards
Tracing the hypotenuse correctly	Observance of trade practices
Aesthetic appearance of the work	Observance of occupational health and safety rules

TASK 6 REPAIR ROOFING	
Performance Criteria	
Planning the work according to the surface and time	Rapid execution according to the scope and urgency of the work
Autonomy	Correct application of roofing methods
Resourcefulness	Water tightness of the roofing
Sense of observation	Neatness of the roof and working area
Decisiveness	Meeting manufacturer standards
Precision of locating the infiltration	Observance of trade practices
	Observance of occupational health and safety rules

2.5 FUNCTIONS

A function:

- is a set of interrelated tasks;
- may be defined by work results or a procedure;
- is a natural and concrete set of tasks.

After examining their tasks according to the definition of “function”, the participants consider that the tasks are different for the roofing profession and cannot be grouped by affinity.

3. QUANTITATIVE DATA ON TASKS

3.1 OCCURRENCE

Occurrence data concern the percentage of roofers[20] who perform a task in the same workplace. The data presented in the following tables are the participants' average results. However, they give an accounting of tasks performed not only by the workshop participants, but also by all roofers working in the companies represented.

Table 3.1 Occurrence of Tasks

	Task	Occurrence
1	Install single-ply membrane roofing	61.6%
2	Install two-ply membrane roofing	83.3%
3	Install multi-ply membrane roofing	60.3%
4	Install shingle or tile roofing	38.9%
5	Install unwelded and unhooked sheet metal roofing	13.3%
6	Repair roofing	36.9%

3.2 WORK TIME

Work time, also expressed in percentages, represents the time allocated by each roofer to each task, on an annual basis.

20. These data exclude apprentices.

Table 3.2 Work Time Allocated to Tasks

	Task	Work Time
1	Install single-ply membrane roofing	20.0%
2	Install two-ply membrane roofing	44.3%
3	Install multi-ply membrane roofing	20.9%
4	Install shingle or tile roofing	2.4%
5	Install unwelded and unhooked sheet metal roofing	0.7%
6	Repair roofing	11.7%

3.3 IMPORTANCE AND DIFFICULTY OF TASKS

The importance of a task is estimated according to the more or less harmful consequences of performing a task poorly or not at all. The importance is assessed according to the following scale:

1. Not important at all: Poor execution of the task has no consequences for the overall quality of the product or service.

2. Not very important: Poor execution of the task could have minimal consequences for the overall quality of the product or service.

3. Important: Poor execution of the task could have substantial consequences for the overall quality of the product or service.

4. Very important: Poor execution of the task has very substantial consequences for the overall quality of the product or service.

A task's difficulty is assessed according to the following scale:

1. Very easy: The task involves little risk of error;
   it requires no particular mental or physical effort;
   it is less difficult than average, etc.

2. Easy: The task involves a few risks of error;
   it requires minimal mental or physical effort;
   it is of average difficulty, etc.

3. Difficult: The task involves many risks of error;
   it requires substantial mental or physical effort;
   it is more difficult than average, etc.

4. Very difficult: The task involves a very high risk of error;
   it requires a very substantial mental or physical effort;
   it is one of the most difficult in the profession, etc.

The data presented in the following table are the average results for the roofers who attended the workshop.

Table 3.3 Importance and Difficulty of Tasks

	Task	Importance	Difficulty
1	Install single-ply membrane roofing	4.00	3.1
2	Install two-ply membrane roofing	4.00	3.4
3	Install multi-ply membrane roofing	3.5	3.0
4	Install shingle or tile roofing	3.5	3.1
5	Install unwelded and unhooked sheet metal roofing	4.00	3.6
6	Repair roofing	3.9	3.5

4. KNOWLEDGE, SKILLS AND ATTITUDES

The occupational analysis enabled us to specify some of the knowledge, skills and attitudes necessary for performing the tasks. Those qualities are transferable, i.e., applicable to a variety of tasks and situations.

The following pages present the knowledge, skills and attitudes that, according to the workshop participants, are considered essential for performing roofing tasks.

4.1 KNOWLEDGE

Mathematics

The profession requires being able to perform the four basic operations, notably to calculate areas, quantities, fractions (units of measurement) and to convert measurements.

Geometric concepts are also necessary. The roofer must be able to calculate hypotenuses, angles and slopes.

Mathematical knowledge is useful for:

- preparing the equipment;
- tracing the hypotenuse (operations 4.14 and 5.14).

Material properties

Knowledge of material properties is useful for understanding the work to be done. Thus, concepts regarding the insulation factor, the compatibility of materials and the characteristics of products to be used make it possible to:

- find out what work needs to be done (operations 1.1, 2.1, 3.1, 4.1, 5.1 and 6.1);
- know the fire resistance of materials;
- understand phenomena such as material expansion and the behaviour of control and expansion joints (operations 1.18, 1.21, 2.17, 2.18, 3.15, 3.16 and 3.23);

- Repair roofing (task 6), since materials to be installed must be compatible with existing ones.

Ventilation

A basic knowledge of ventilation enables the roofer to understand the consequences of poor ventilation and to detect roofing problems.

Fighting an outbreak of fire

Roofers must be able to prevent and fight an outbreak of fire. The ability to use firefighting equipment such as class A, B and C fire extinguishers, first-response nozzles and heat detectors is particularly important for installing single-ply (task 1), two-ply (task 2) and multi-ply (task 3) roofing and for making repairs (task 6).

Laws and regulations

Referring to the list of laws and regulations in Section 1.5, the roofers attending the workshop specified that this knowledge is required for all tasks, particularly those intended to prevent occupational health and safety hazards.

4.2 SKILLS

Skills are types of know-how. They are divided into three categories: cognitive, motor and perceptual.

4.2.1 Cognitive Skills

Cognitive skills involve intellectual strategies applied in working. The main cognitive skills necessary to roofers are the following:

Problem-resolution

This skill is useful for:

- adapting to installation contingencies;

- accommodating to bad weather situations;
- adjusting the work when decking is defective.

Planning activities

This skill is useful for operations performed at the beginning of a task and for coordinating the work with other roofers.

4.2.2 Motor Skills

Motor skills involve gestures and movements. The main motor skills that roofers need are the following:

- dexterity, to cut materials while drains and vents are being installed;
- movement coordination, to lay membranes and work on pitched roofs;
- physical strength, i.e., the ability of one person to lift, carry, push and pull loads of 25 kg to 50 kg, or the ability of two persons doing so with loads of more than 50 kg.

4.2.3 Perceptual Skills

Perceptual skills are sensory skills enabling a person to perceive by his senses what is happening in his environment.

Roofers need good visual acuity to perceive details, prevent accidents at work and locate infiltrations.

The sense of smell is particularly useful for detecting overheating equipment, propane leaks and outbreaks of fire.

4.3 ATTITUDES

Attitudes are ways of acting, reacting and relating with others or with one’s environment. They involve personal skills.

Personal and interpersonal attitudes

Teamwork ability, perseverance in executing finish details, and patience in searching for infiltrations are important attitudes for roofers to adopt.

Professional ethics

Professional ethics is manifested by the care with which work is done and by the logical and essential outcome of such care: the absence of infiltration.

It is also manifested by respect for others and the use of appropriate language, since roofers often work near the public.

Preventive attitudes and behaviours regarding health and safety

Roofers manifest those attitudes and behaviours by:

- securing the working area;
- wearing personal protective equipment;
- working in twos;
- using the correct tools;
- preventing fires;
- preventing heat stroke;
- anticipating.

5. TRAINING SUGGESTIONS

The roofers attending the occupational analysis workshop made suggestions about the initial training and the training of apprentices.

With regard to the initial training, the participants made the following suggestions:

- At the start of training, students should visit construction sites to understand the requirements of practicing the roofing trade.
- A stage should be included in the roofing program, or the training should alternate between work and study.
- It would be desirable to ensure that schools have more materials and surfaces to cover so that students could install larger roofs.
- Bitumen and gravel materials are reportedly too prevalent in the current program; their importance compared to other types of roofing should be reviewed.
- Certain requirements should be tightened regarding student attendance at the courses, because reportedly some students are repeatedly absent.
- The roofing study program should be lengthened.

As for the training of apprentices, several participants consider that the current apprenticeship program is too short. In their view, this situation has resulted in the profession being used as an opportunity for some roofers with competency certificates to have access to other construction trades.

For a good number of those attending the occupational analysis, a longer apprenticeship period would resolve this situation while retaining the labour force.

Those persons also expressed hope for better supervision of apprentices and an expansion of upgrading courses, particularly in metal flashing.

ANNEXES

Annex 1

TOOLS AND EQUIPMENT

For each roofing task and based on a list that had been submitted to them[21], the participants identified the tools and equipment they use: hand tools; power tools, pneumatic tools, powder actuated tools, electric tools and propane-fuelled equipment; rigging, hoisting and lifting equipment; hot process equipment; motorized equipment; personal protective equipment and safety equipment; disposal equipment.

Table A.1 Tools and Equipment

TASK 1 INSTALL SINGLE-PLY MEMBRANE ROOFING

Hand Tools	
Broom	Drill
Pry bar	Grub hoe
Spade	Pneumatic caulking gun
Aviation snips (left and right handed)	Heat detector gun
Tin snips	Squeegee
Trimmers	Rake
Wrench	Seam roller
Pipe wrench	Hand roller
Chalk line	Membrane roller
Roofer knife	Measuring tape
Hook blade knife	Bucket/pail
Adhesive spreader	Screwdriver
Manual gravel spreader	Manual insulation carrier
Scraper/spudder	Trowel
Axe	Mop
Hammer	Drying mop
Shovels	

Power Tools, Pneumatic Tools, Electric Tools, Powder Actuated Tools and Propane-Fuelled Equipment	
Propane cylinder	Roll carrier
Elastomeric torch	Concrete saw
Bitumen kettle torch	Power saws (chain, quick-cut, hand circular)
Air compressor	Hot air welder
Primer machine	
Hot air gun	

21. This list was based on the Red Seal occupational analysis of the roofing trade: Human Resources and Skills Development Canada, *Occupational Analyses Series: Roofer*, Ottawa, 2006, p. 71 to 73.

TASK 1 INSTALL SINGLE-PLY MEMBRANE ROOFING

Rigging, Hoisting and Lifting Equipment	
A-frame hoist	Monorail hoist («track fall»)
Ladder	Hoists
Lifting fork	Cylinder cart
Crane	Gravel bucket

Hot Process Equipment	
Mop cart	Mini mop
Bitumen kettle	Bitumen bucket on wheels
Dipper	Bitumen mop

Motorized Equipment	
Tear-off machine	Power scraper or mechanical spudder
Deckhorse/prowler	Scissor lift
Roofing cutting machine (“roof cutter”)	Gas blower
Spreader (mechanical or powered)	

Protective Equipment and Safety Equipment	
Respirator	Gloves
Safety boots	Guardrails
Ear protector	Safety harness
Hard hat	Leggings
Safety fence	Safety glasses
Lanyard (rope)	Long sleeves
Heat sensor	Mask
Face shield	Eye wash bottle
Portable fire extinguisher	First aid kit

Disposal Equipment	
Disposal bin	Waste disposal container
Waste disposal chute	Garbage bags

TASK 2 INSTALL TWO-PLY MEMBRANE ROOFING

Hand Tools	
Mechanical tape applicator	Shovels
Broom	Drill
Pry bar	Grub hoe
Spade	Pneumatic caulking gun
Wheelbarrow	Heat detector gun
Heating belt	Rake
Aviation snips (left and right handed)	Seam roller
Wrench	Hand roller
Pipe wrench	Measuring tape
Chalk line	Screwdriver
Roofer knife	Manual insulation carrier
Hook blade knife	Trowel
Adhesive spreader	Air and material hoses
Scraper/spudder	Water hoses
Axe	Mop
Hammer	

Power Tools, Pneumatic Tools, Electric Tools, Powder Actuated Tools and Propane-Fuelled Equipment	
Propane cylinder	Roll carrier
Elastomeric torch	Pneumatic spray gun
Bitumen kettle torch	Concrete saw
Air compressor	Power saws (chain, quick-cut, hand circular)
Primer machine	Hot air welder
Hot air gun	

Rigging, Hoisting and lifting Equipment	
A-frame hoist	Crane
Ladder	Hoists
Lifting fork	

Hot Process Equipment	
Mop cart	Bitumen kettle
Wheeled bitumen bucket	Bitumen mop
Bitumen spreader	

TASK 2 INSTALL TWO-PLY MEMBRANE ROOFING

Motorized Equipment	
Tear-off machine	Power scraper or mechanical spudder
Carts	Chain-saw
Roofing cutting machine (“roof cutter”)	Gas blower

Personal Protective Equipment and Safety Equipment	
Respirator	Gloves
Safety boots	Guardrail
Ear protector	Safety harness
Hard hat	Leggings
Safety fence	Safety glasses
Lanyard (rope)	Long sleeves
Heat sensor	Mask
Patch	Eye wash bottle
Face shield	First aid kit
Portable fire extinguisher	

Disposal Equipment	
Disposal bin	Waste disposal container
Waste disposal chute	Garbage bags

TASK 3 INSTALL MULTI-PLY MEMBRANE ROOFING

Hand Tools	
Mechanical tape applicator	Hammer
Broom	Shovels
Pry bar	Drill
Spade	Grub hoe
Wheelbarrow	Pneumatic caulking gun
Aviation snips (left and right handed)	Heat detector gun
Wrench	Scraper
Pipe wrench	Rake
Chalk line	Measuring tape
Roofer knife	Bucket/pail
Hook blade knife	Screwdriver
Adhesive spreader	Manual insulation carrier
Manual gravel spreader	Trowel
Spud	Air and material hoses
Axe	Mop

TASK 3 INSTALL MULTI-PLY MEMBRANE ROOFING

Power Tools, Pneumatic Tools, Electric Tools, Powder Actuated Tools and Propane-Fuelled Equipment	
Propane cylinder	Pneumatic spray gun
Bitumen kettle torch	Concrete saw
Air compressor	Power saws (chain, quick-cut, hand circular)
Primer machine	

Rigging, Hoisting and lifting Equipment	
A-frame hoist	Crane
Ladder	Hoists
Lifting fork	Gravel bucket

Hot Process Equipment	
Bitumen power buggy	Bitumen kettle
Wheeled bitumen bucket	Dipper
Degranulator	Felt laying machine
Bitumen spreader	Bitumen mop

Motorized Equipment	
Tear-off machine	Spreaders
Carts	Power scraper or mechanical spudder
Roofing cutting machine (“roof cutter”)	Chain-saw
Rocker	Gas blower

Protective Equipment and Safety Equipment	
Respirator	Gloves
Safety boots	Guardrail
Ear protector	Safety harness
Hard hat	Leggings
Safety fence	Safety glasses
Lanyard (rope)	Long sleeves
Heat sensor	Mask
Patch	Eye wash bottle
Face shield	First aid kit
Portable fire extinguisher	

Disposal Equipment	
Disposal bin	Waste disposal container
Waste disposal chute	Garbage bags

TASK 4 INSTALL SHINGLE OR TILE ROOFING

Hand Tools	
Broom	Hammer
Pry bar	Hammer stapler
Spade	Drill
Wheelbarrow	Caulking gun
Aviation snips (left and right handed)	Slater punch
Wrench	Rake
Chalk line	Measuring tape
Roofer knife	Roof jack
Hook blade knife	Screwdriver
Sliding T-bevel	

Power Tools, Pneumatic Tools, Electric Tools, Powder Actuated Tools and Propane-Fuelled Equipment	
Air nailer	Tile cutter
Air compressor	

Rigging, Hoisting and lifting Equipment	
Ladder	Lifts
Crane	Ladder hoist

Personal Protective Equipment and Safety Equipment	
Respirator	Gloves
Safety boots	Guardrail
Ear protector	Safety harness
Hard hat	Leggings
Safety fence	Safety glasses
Lanyard (rope)	Long sleeves
Heat sensor	Mask
Patch	Eye wash bottle
Face shield	First aid kit
Portable fire extinguisher	

Disposal Equipment	
Disposal bin	Waste disposal container
Waste disposal chute	Garbage bags

TASK 5 INSTALL UNWELDED AND UNHOOKED SHEET METAL ROOFING

Hand Tools	
Broom	Sliding T-bevel
Pry bar	Hammer
Spade	Drill
Wheelbarrow	Tinsmith pliers
Aviation snips (left and right handed)	Pneumatic caulking gun
Tin snips	Measuring tape
Chalk line	Hacksaw
Hook blade knife	

Power Tools, Pneumatic Tools, Powder Actuated Tools, Propane-Fuelled and Electric Equipment	
Unishear	Nibbler

Rigging, Hoisting and lifting Equipment	
Ladder	Lifts
Crane	Ladder hoist

Personal Protective Equipment and Safety Equipment	
Respirator	Gloves
Safety boots	Guardrail
Ear protector	Safety harness
Hard hat	Leggings
Safety fence	Safety glasses
Lanyard (rope)	Long sleeves
Heat sensor	Mask
Patch	Eye wash bottle
Face shield	First aid kit
Portable fire extinguisher	

Disposal Equipment	
Disposal bin	Waste disposal container
Waste disposal chute	Garbage bags

TASK 6 REPAIR ROOFING

Hand Tools	
Roofer nail puller	Drill
Broom	Grub hoe
Pry bar	Caulking gun
Spade	Heat detector gun
Wheelbarrow	Folding pliers
Aviation snips (left and right handed)	Slater punch
Tin snips	Pump
Scissors	Rake
Wrench	Seam roller
Pipe wrench	Hand roller
Chalk line	Measuring tape
Roofer knife	Saws
Hook blade knife	Bucket/pail
Sliding T-bevel	Roof jack
Scraper/spudder	Screwdriver
Axe	Trowel
Flashlight	Water hose
Hammer	Mop
Shovel	

Power Tools, Pneumatic Tools, Powder Actuated Tools, Propane-Fuelled and Electric Equipment	
Vacuum	Hot air gun
Propane cylinder	Pump
Elastomeric torch	Roll carrier
Bitumen kettle torch	Marouflage roller
Unishear	Concrete saw
Air compressor Tile cuter	Power saws (chain, quick-cut, hand circular)
	Hot air welder

Rigging, Hoisting and lifting Equipment	
Crane	Ladder hoist
Hoists	Ladder pulley

Hot Process Equipment
See the corresponding task.

Motorized Equipment	
Chain-saw	Gas blower

TASK 6 REPAIR ROOFING

Personal Protective Equipment and Safety Equipment	
Respirator	Gloves
Safety boots	Guardrail
Ear protector	Safety harness
Hard hat	Leggings
Safety fence	Safety glasses
Lanyard (rope)	Long sleeves
Heat sensor	Mask
Patch	Eye wash bottle
Face shield	First aid kit
Portable fire extinguisher	

Disposal Equipment	
Disposal bin	Waste disposal container
Waste disposal chute	Garbage bags

Annex 2

GRID OF OCCUPATIONAL HEALTH AND SAFETY ELEMENTS

Produced by: **Marc Dupont,** Inspector
Commission de la santé et de la sécurité du travail

Table A.2 Occupational Health and Safety Issues Involving the Roofing Trade

No.	Hazards	Effects on Health and Safety	Means of Prevention and Protection
1	Contact with tools (electric, pneumatic or manual)	• Body injuries, particularly to fingers, hands and eyes	• Follow the manufacturer's usage instructions. • Wear appropriate personal protective equipment at all times (glasses, hard hat, boots, gloves). • Never work under the influence of alcohol, drugs or excessive fatigue. • Maintain tools adequately.
2	Handling	• Back injuries	• Handle all heavy loads in a team or with the help of an adequate lifting appliance. • Avoid bending the back, preferably use the legs to keep the back straight.
3	Moving parts and sharp edges	• Hand and finger injuries	• Protect all access to straps, gears and re-entrant corners with adequate safety guards. • Wear working gloves for sharp edges and dangerous chemicals.
4	Torn sling	• Crushing • Collisions • Death	• Inspect slings and hoisting cables daily. • Replace in case of damage or excessive wear.
5	Poorly attached load	• Crushing • Collisions • Death	• Attach any load with an adequate rigging method. • Delimit and monitor the load-lifting area.

No.	Hazards	Effects on Health and Safety	Means of Prevention and Protection
6	Compressed gas cylinders	• Serious burns • Death	• Use and handle any compressed gas cylinder according to manufacturer recommendations and the requirements of the Safety Code for the construction industry.
7	Handling controlled products	• Blindness • Skin or lung irritations • Intoxication • Chemical burns	• Apply and meet the requirements of labels and material safety data sheets for the products concerned.
8	Working from heights	• Fractures • Permanent impairments • Death	• Eliminate the danger at the source by performing tasks on the ground whenever possible. • When it is impossible to perform tasks on the ground: – install guardrails/fall arrest around the work area as a collective safeguard; or – wear a safety harness with a lanyard equipped with a shock absorber. • Protect all floor openings with guardrails or a sufficiently strong board.
9	Debris and rejects	• Fractures • Tetanus • Cuts, scratches • Debris in the eyes, dust particles	• Keep the construction site clean and free of obstacles. • De-ice in winter.
10	Carbon monoxide, bitumen, solvent and glue, tar	• Intoxication • Asphyxia • Burns • Death	• Ensure sufficient natural or artificial ventilation to maintain air exchange according to regulations in effect.
11	Overhead electric lines, electric tools and extension cords	• Burns • Electrification • Electrocution	• Locate all overhead electric lines near the building before starting to work, and choose the appropriate method of prevention (power shutoff, sheathing, etc.) with the electric company. • Immediately replace any damaged electric tool or extension cord.

No.	Hazards	Effects on Health and Safety	Means of Prevention and Protection
12	Sunlight, temperature	• Heat stroke • Sunburns • Hypothermia	• Drink a lot of water and take regular breaks in very hot summer weather. • Apply sun cream with the appropriate protection factor. • In cold weather, wear warm clothing and take regular breaks in a heated area.
13	Machinery, environment	Occupational deafness	• Block noise at the source, with a screen or other method if the situation allows, or wear ear protection (ear protector).

Table A.3 Hazards by Task and Operation

Legend

0	The risk is nil.
+	The risk is low.
++	The risk is average.
+++	The risk is high.

Risk levels are noted according to exposure to hazards, not according to the gravity of effects on personal health and safety.

No.	Tasks and Operations	Contact with Tools (Electric, Pneumatic or Manual)	Handling	Moving Parts and Sharp Edges	Torn Sling	Poorly Attached Load	Compressed Gas Cylinders	Handling Controlled Products	Working from Heights	Debris and Rejects	Carbon Monoxide, Bitumen, Solvent and Glue, Tar	Overhead Electric Lines, Electric Tools and Extension Cords	Sunlight, Temperature	Machinery, Environment
TASK 1	**Install single-ply membrane roofing**													
1.1	**Find out what work needs to be done**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
1.2	**Prepare the equipment**	**+**	**++**	**+**	**0**	**+**	**+**	**+**	**0**	**+**	**0**	**0**	**0**	**+**
1.3	**Load the truck and go to the construction site**	**+**	**+++**	**++**	**++**	**++**	**+++**	**+**	**0**	**++**	**+**	**0**	**0**	**+**
1.4	**Examine the site and choose the location of the waste disposal container**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**+**	**0**	**0**	**0**	**+**
1.4.1	Check the proximity of electric cables	0	0	0	0	0	0	0	0	0	0	+++	0	0

No.	Tasks and Operations	Contact with Tools (Electric, Pneumatic or Manual)	Handling	Moving Parts and Sharp Edges	Torn Sling	Poorly Attached Load	Compressed Gas Cylinders	Handling Controlled Products	Working from Heights	Debris and Rejects	Carbon Monoxide, Bitumen, Solvent and Glue, Tar	Overhead Electric Lines, Electric Tools and Extension Cords	Sunlight, Temperature	Machinery, Environment
1.5	**Secure the working area**	**+**	**+**	**+**	**+**	**+**	**0**	**0**	**++**	**+**	**0**	**+**	**+**	**+**
1.5.1	Make sure to have protection equipment available	0	0	0	0	0	0	0	0	0	0	0	0	0
1.5.2	Establish a safety perimeter on the ground	++	++	++	+	+	++	++	+++	++	++	+++	++	++
1.5.3	Secure the ladder	++	++	+	++	++	++	++	+++	++	++	+++	++	++
1.5.4	Use fall arrest	0	+	0	0	0	0	0	+++	+	0	+	+	+
1.5.5	Establish a safety perimeter at the top	++	++	+	++	+	+	+	+++	++	+	+++	++	+
1.5.6	Install guardrails	+	++	++	0	0	0	0	+++	+	0	++	+	+
1.6	**Organize the access of workers and materials to the roof**	**+**	**++**	**+**	**0**	**+**	**0**	**0**	**+++**	**+**	**0**	**++**	**++**	**+**
1.7	**Plan the work**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**+**	**0**	**0**	**0**	**+**
1.8	**Raise tools and equipment on the roof**	**+**	**++**	**+**	**+++**	**+++**	**0**	**+**	**++**	**++**	**+**	**+++**	**++**	**++**
1.9	**Remove existing roof covering, if applicable**	**++**	**+++**	**++**	**0**	**+**	**0**	**0**	**++**	**+++**	**++**	**+**	**+++**	**++**
1.10	**Check the decking and have it repaired, if applicable**	**+**	**++**	**+**	**0**	**0**	**0**	**0**	**++**	**++**	**0**	**+**	**++**	**++**
1.11	**Clean the decking**	**+**	**++**	**+**	**0**	**0**	**0**	**++**	**++**	**+**	**+**	**+**	**+++**	**++**
1.12	**Install a support board, if applicable**	**+**	**++**	**+**	**0**	**0**	**0**	**0**	**++**	**+**	**+**	**+**	**+++**	**+**
1.13	**Install and glue the vapour barrier**	**+**	**++**	**+**	**0**	**0**	**0**	**+**	**++**	**+**	**+**	**+**	**+++**	**+**
1.13.1	Glue the vapour barrier at junctions	+	++	+	0	0	0	++	++	+	+	+	+++	+
1.14	**Apply insulation**	**+**	**++**	**+**	**0**	**0**	**0**	**+**	**++**	**++**	**++**	**+**	**+++**	**++**
1.14.1	Glue the insulation	+	++	+	0	0	0	++	++	++	+	+	+++	++

No.	Tasks and Operations	Contact with Tools (Electric, Pneumatic or Manual)	Handling	Moving Parts and Sharp Edges	Torn Sling	Poorly Attached Load	Compressed Gas Cylinders	Handling Controlled Products	Working from Heights	Debris and Rejects	Carbon Monoxide, Bitumen, Solvent and Glue, Tar	Overhead Electric Lines, Electric Tools and Extension Cords	Sunlight, Temperature	Machinery, Environment
1.14.2	Screw the insulation	+	++	++	0	0	0	0	++	++	+	+	+++	++
1.14.3	Apply loose-laid insulation	+	++	+	0	0	0	0	++	++	++	+	+++	++
1.15	**Install the support board, if applicable**	**+**	**++**	**+**	**0**	**0**	**0**	**0**	**++**	**+**	**+**	**+**	**+++**	**++**
1.15.1	Fasten the support board mechanically	+	++	++	0	0	0	0	++	+	+	+	+++	++
1.15.2	Glue the support board	+	++	+	0	0	0	++	++	+	+	+	+++	+
1.15.3	Install a loose-laid support board	+	++	+	0	0	0	0	++	+	+	+	+++	++
1.16	**Apply protection paper, if applicable**	**+**	**++**	**+**	**0**	**0**	**0**	**0**	**++**	**+**	**0**	**+**	**+++**	**++**
1.17	**Apply the membrane**	**+**	**++**	**+**	**0**	**0**	**0**	**++**	**++**	**++**	**++**	**+**	**+++**	**++**
1.17.1	For ethylene-propylene-diene monomer (EPDM) roofing:													
	– Fasten mechanically	+	++	++	0	0	0	+	++	+	+	+	++	+
	– Glue (for full adhesion)	+	++	+	0	0	0	++	++	+	++	+	+++	+
1.17.2	For polyisobutytene (PIB) roofing:													
	– Fasten mechanically													
	– Ballast the loose-laid membrane	+	++	++	0	0	0	+	++	+	+	+	++	+
	– Glue or bitumen (for full adhesion)	+	++	+	0	0	0	+	++	+	+	+	+	+
		+	++	+	0	0	0	++	++	+	++	+	+++	+
1.18	**Glue or weld the joints**	**++**	**+**	**+**	**0**	**0**	**0**	**++**	**++**	**++**	**++**	**+**	**+++**	**++**
1.19	**Install drains and vents**	**++**	**++**	**+**	**+**	**+**	**+++**	**+**	**++**	**++**	**+**	**+**	**+++**	**++**
1.20	**Seal the projections**	**+**	**++**	**+**	**0**	**0**	**0**	**++**	**++**	**++**	**+**	**+**	**+++**	**++**
1.21	**Check and seal the finish joints**	**+**	**+**	**+**	**0**	**0**	**0**	**+**	**++**	**++**	**+**	**+**	**++**	**+**
1.22	**Install ballast, if applicable**	**+**	**++**	**+**	**0**	**0**	**0**	**0**	**++**	**++**	**+**	**+**	**0**	**+**

No.	Tasks and Operations	Contact with Tools (Electric, Pneumatic or Manual)	Handling	Moving Parts and Sharp Edges	Torn Sling	Poorly Attached Load	Compressed Gas Cylinders	Handling Controlled Products	Working from Heights	Debris and Rejects	Carbon Monoxide, Bitumen, Solvent and Glue, Tar	Overhead Electric Lines, Electric Tools and Extension Cords	Sunlight, Temperature	Machinery, Environment
1.23	**Apply and seal metal flashing (if unwelded and unhooked)**	**+**	**++**	**++**	**0**	**0**	**0**	**+**	**++**	**++**	**+**	**+**	**+++**	**++**
1.24	**Check the work done**	**+**	**+**	**0**	**0**	**0**	**0**	**+**	**++**	**+**	**0**	**+**	**++**	**+**
1.25	**Pick up tools and equipment**	**++**	**++**	**++**	**++**	**+++**	**0**	**+**	**++**	**+++**	**0**	**++**	**+++**	**+**
1.26	**Clean the working area**	**+**	**++**	**+**	**0**	**0**	**0**	**0**	**++**	**++**	**++**	**++**	**++**	**+**
TASK 2	**Install two-ply membrane roofing**													
2.1	**Find out what work needs to be done**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
2.2	**Prepare the equipment**	**+**	**++**	**+**	**0**	**+**	**+**	**+**	**0**	**+**	**0**	**0**	**0**	**+**
2.2.1	Prepare the kettle	+	+	+	0	+	+	+	0	+	0	+	0	+
2.2.2	Prepare the propane gas tank	+	++	0	0	0	++	++	0	+	+	0	0	+
2.2.3	Pick up the tools	+	+	+	0	0	0	0	0	0	0	0	0	+
2.2.4	Pick up disposal equipment	+	+	+	0	0	0	0	0	0	0	+	0	+
2.3	**Load the truck and go to the construction site**	**+**	**+++**	**++**	**++**	**++**	**+++**	**+**	**0**	**++**	**+**	**0**	**0**	**+**
2.4	**Examine the site and choose the location of the waste disposal container**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**+**	**0**	**0**	**0**	**+**
2.5	**Secure the working area**	**+**	**+**	**+**	**+**	**+**	**0**	**0**	**++**	**+**	**0**	**+**	**+**	**+**
2.5.1	Make sure to have protection equipment available	++	++	++	++	++	+++	++	+	++	++	+	++	++
2.5.2	Establish a safety perimeter on the ground	+	++	++	+	+	+	++	0	+	++	+	++	++
2.5.3	Secure the ladder	+	++	++	++	++	++	++	+++	++	++	+++	++	++

No.	Tasks and Operations	Contact with Tools (Electric, Pneumatic or Manual)	Handling	Moving Parts and Sharp Edges	Torn Sling	Poorly Attached Load	Compressed Gas Cylinders	Handling Controlled Products	Working from Heights	Debris and Rejects	Carbon Monoxide, Bitumen, Solvent and Glue, Tar	Overhead Electric Lines, Electric Tools and Extension Cords	Sunlight, Temperature	Machinery, Environment
2.5.4	Use fall arrest	++	++	+	+	+	++	++	+++	++	++	++	+++	++
2.5.5	Establish a safety perimeter at the top	+	+++	+	++	++	++	+	+++	+++	++	+++	+++	+
2.5.6	Install guardrails	++	+++	+	++	++	++	+	+++	+++	+	+++	+++	+++
2.6	**Organize the access of workers and materials to the roof**	**+**	**++**	**+**	**0**	**+**	**0**	**0**	**+++**	**+**	**0**	**++**	**++**	**+**
2.7	**Plan the work**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**+**	**0**	**0**	**0**	**+**
2.8	**Raise tools and equipment on the roof**	**+**	**++**	**+**	**+++**	**+++**	**++**	**+**	**++**	**++**	**+**	**+++**	**++**	**++**
2.9	**Remove existing roof covering, if applicable**	**++**	**+++**	**++**	**0**	**+**	**0**	**0**	**++**	**+++**	**++**	**+**	**+++**	**++**
2.10	**Check the decking and have it repaired, if applicable**	**+**	**++**	**+**	**0**	**0**	**0**	**0**	**++**	**++**	**0**	**+**	**++**	**++**
2.11	**Apply a primer**	**+**	**++**	**0**	**0**	**0**	**0**	**+++**	**++**	**+**	**++**	**+**	**+++**	**++**
2.11.1	Apply an adhesive on wood and steel decking	+	++	0	0	0	0	+++	++	+	++	+	+++	++
2.11.2	Apply a primer on porous concrete decking	+	++	0	0	0	0	+++	++	+	++	+	+++	++
2.12	**Install a support board, if applicable**	**++**	**++**	**+**	**0**	**0**	**0**	**0**	**++**	**++**	**+**	**+**	**+++**	**++**
2.13	**Apply the vapour barrier**	**+**	**++**	**+**	**0**	**0**	**0**	**+**	**++**	**++**	**+**	**+**	**+++**	**++**
2.14	**Apply insulation**	**++**	**++**	**++**	**+**	**+**	**+**	**++**	**++**	**++**	**+**	**+**	**+++**	**++**
2.14.1	Put the insulation in place	++	++	++	+	+	+	++	++	++	+	+	+++	++
2.14.2	Build a slope with the insulation	++	++	+	0	0	0	0	++	++	+	+	+++	++
2.14.3	Glue the insulation	++	++	+	0	0	0	+++	++	++	++	+	+++	++
2.14.4	Screw the insulation	++	++	++	0	0	0	0	++	++	+	++	+++	++
2.14.5	Cover the insulation with bitumen	++	++	+	0	0	0	+++	++	++	++	+	+++	++

No.	Tasks and Operations	Contact with Tools (Electric, Pneumatic or Manual)	Handling	Moving Parts and Sharp Edges	Torn Sling	Poorly Attached Load	Compressed Gas Cylinders	Handling Controlled Products	Working from Heights	Debris and Rejects	Carbon Monoxide, Bitumen, Solvent and Glue, Tar	Overhead Electric Lines, Electric Tools and Extension Cords	Sunlight, Temperature	Machinery, Environment
2.15	**Install support boards, if applicable**	**++**	**++**	**+**	**0**	**0**	**0**	**++**	**++**	**++**	**++**	**+**	**+++**	**++**
2.15.1	Glue the support boards	++	++	+	0	0	0	++	++	++	++	++	+++	+
2.15.2	Screw the support boards	++	++	++	0	0	0	+++	++	++	+	+	+++	+
2.15.3	Cover the support boards with bitumen	++	++	+	0	0	0	+++	++	++	++	+	+++	++
2.16	**Apply the base sheet**	**++**	**+++**	**+**	**0**	**0**	**+++**	**+++**	**++**	**++**	**+**	**+**	**+++**	**++**
2.16.1	Glue the base sheet	++	+++	+	0	0	+++	+++	++	++	++	+	+++	++
2.16.2	Screw the base sheet	++	+++	+	0	0	+++	0	++	++	0	++	+++	++
2.16.3	Nail the base sheet	++	+++	+	0	0	+++	0	++	++	0	++	+++	++
2.16.4	Cover the base sheet with bitumen	+	+++	0	0	0	+++	+++	++	++	++	+	+++	++
2.17	**Install control joints**	**++**	**++**	**+**	**0**	**0**	**0**	**0**	**++**	**++**	**+**	**+**	**+++**	**++**
2.18	**Seal the control and expansion joints**	**+**	**+**	**+**	**0**	**0**	**0**	**0**	**++**	**++**	**+**	**+**	**+++**	**++**
2.19	**Install fasteners, if applicable**	**++**	**++**	**++**	**0**	**0**	**0**	**0**	**++**	**++**	**0**	**+**	**+++**	**++**
2.20	**Install and seal drains and vents**	**++**	**++**	**+**	**0**	**0**	**+++**	**+**	**++**	**++**	**+**	**+**	**+++**	**++**
2.21	**Apply the base flashing on projections**	**+**	**++**	**+**	**+**	**+**	**+**	**+++**	**++**	**++**	**+**	**+**	**+++**	**++**
2.21.1	Apply the self-adhesive membrane	++	+++	+	0	0	+++	++	++	+	+++	+	+++	++
2.21.2	Weld the base flashing	++	++	0	+	+	++	+++	++	++	+++	++	+++	++
2.22	**Apply and seal drip edges made of unwelded and unhooked sheet metal**	**++**	**+**	**+++**	**0**	**0**	**+++**	**+**	**++**	**+**	**+++**	**+**	**+++**	**++**
2.23	**Apply the finish membrane on the current surface**	**++**	**+++**	**+**	**0**	**0**	**+++**	**++**	**++**	**++**	**+++**	**+**	**+++**	**++**
2.23.1	Glue the membrane	++	+++	0	0	0	0	+++	++	++	++	+	+++	++
2.23.2	Weld the membrane	++	++	0	+	+	++	+++	++	++	+++	++	+++	++

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2.23.3	Cover the membrane with bitumen	+	+	0	+	+	+	+++	++	++	+	+	+++	++
2.23.4	Apply the self-adhesive membrane	++	++	+	+	+	+	+++	+++	++	+	+	+++	++
2.24	**Apply the finish membrane on projections**	**++**	**++**	**+**	**0**	**0**	**+++**	**++**	**++**	**++**	**++**	**+**	**+++**	**++**
2.24.1	Glue the membrane	++	++	0	0	0	0	+++	++	++	+	+	+++	++
2.24.2	Weld the membrane	++	+++	+	0	0	+++	++	++	++	+++	++	+++	++
2.24.3	Cover the membrane with bitumen	+	+	0	+	+	+	+++	++	++	+	+	+++	++
2.24.4	Apply the self-adhesive membrane	+	+	+	+	+	+	+++	+++	++	+	++	+++	++
2.25	**Check the work done**	**+**	**+**	**0**	**0**	**0**	**0**	**+**	**++**	**+**	**0**	**+**	**++**	**+**
2.26	**Pick up tools and equipment**	**++**	**++**	**++**	**++**	**+++**	**++**	**+**	**+++**	**+++**	**0**	**++**	**+++**	**+**
2.27	**Clean the working area**	**+**	**++**	**+**	**0**	**0**	**0**	**0**	**++**	**++**	**++**	**++**	**++**	**+**
TASK 3	**Install multi-ply membrane roofing**													
3.1	**Find out what work needs to be done**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
3.2	**Prepare the equipment**	**+**	**++**	**+**	**0**	**+**	**+**	**+**	**0**	**+**	**0**	**0**	**0**	**+**
3.2.1	Prepare the kettle	+	+	+	0	+	+	+	0	+	0	+	0	+
3.2.2	Prepare the propane gas tank	+	++	0	0	0	++	++	0	+	+	0	0	+
3.2.3	Pick up the tools	+	+	+	0	0	0	0	0	0	0	0	0	+
3.2.4	Pick up disposal equipment	+	+	+	0	0	0	0	0	0	0	+	0	+
3.3	**Load the truck and go to the construction site**	**+**	**+++**	**++**	**++**	**++**	**+++**	**+**	**0**	**++**	**+**	**0**	**0**	**+**
3.4	**Examine the site and choose the location of the waste disposal container**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**+**	**0**	**0**	**0**	**+**

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3.5	**Secure the working area**	**+**	**+**	**+**	**+**	**+**	**0**	**0**	**++**	**+**	**0**	**+**	**+**	**+**
3.5.1	Make sure to have protection equipment available	0	0	0	0	0	0	0	0	0	0	0	0	0
3.5.2	Establish a safety perimeter on the ground	+	++	+	+	+	++	+	0	+	+	+	+++	++
3.5.3	Secure the ladder	+	+++	+	+	+	+	+	+++	++	+	+	+++	++
3.5.4	Use fall arrest	0	+	0	0	0	0	0	+++	+	0	+	+	+
3.5.5	Establish a safety perimeter at the top	+	++	+	+	+	+	++	+++	++	+	+++	+++	++
3.5.6	Install guardrails	+	++	++	0	0	0	0	+++	+	0	+++	+++	++
3.6	**Organize the access of workers and materials to the roof**	**+**	**++**	**+**	**0**	**+**	**0**	**0**	**+++**	**+**	**0**	**++**	**++**	**+**
3.7	**Plan the work**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**+**	**0**	**0**	**0**	**+**
3.8	**Raise tools and equipment on the roof**	**+**	**++**	**+**	**+++**	**+++**	**++**	**+**	**++**	**++**	**+**	**+++**	**++**	**++**
3.9	**Remove existing roof covering, if applicable**	**++**	**+++**	**++**	**0**	**+**	**0**	**0**	**++**	**+++**	**++**	**+**	**+++**	**++**
3.10	**Check the decking and have it repaired, if applicable**	**+**	**++**	**+**	**0**	**0**	**0**	**0**	**++**	**++**	**0**	**+**	**++**	**++**
3.11	**Clean the decking**	**+**	**++**	**+**	**0**	**0**	**0**	**++**	**++**	**+**	**+**	**+**	**+++**	**++**
3.12	**Apply the primer**	**+**	**++**	**0**	**0**	**0**	**0**	**+++**	**++**	**+**	**++**	**+**	**+++**	**++**
3.12.1	Apply an adhesive on wood and steel decking	+	++	0	0	0	0	+++	++	+	++	+	+++	++
3.12.2	Apply a primer on concrete decking	+	++	0	0	0	0	+++	++	+	++	+	+++	++
3.13	**Install a support board, if applicable**	**++**	**++**	**+**	**0**	**0**	**0**	**0**	**++**	**++**	**+**	**+**	**+++**	**++**
3.14	**Apply a vapour barrier**	**+**	**++**	**+**	**0**	**0**	**0**	**+**	**++**	**++**	**+**	**+**	**+++**	**++**

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3.15	**Install control joints**	**++**	**++**	**+**	**0**	**0**	**0**	**0**	**++**	**++**	**+**	**+**	**+++**	**++**
3.16	**Seal the control and expansion joints**	**+**	**+**	**+**	**0**	**0**	**0**	**0**	**++**	**++**	**+**	**+**	**+++**	**++**
3.17	**Apply insulation**	**++**	**++**	**++**	**+**	**+**	**+**	**++**	**++**	**++**	**+**	**+**	**+++**	**++**
3.17.1	Apply the insulation	++	++	++	+	+	+	++	++	++	+	+	+++	++
3.17.2	Build a slope with the insulation	++	++	+	0	0	0	0	++	++	+	+	+++	++
3.17.3	Glue the insulation	++	++	+	0	0	0	+++	++	++	++	+	+++	++
3.17.4	Screw the insulation	++	++	++	0	0	0	0	++	++	+	++	+++	++
3.17.5	Cover the insulation with bitumen	++	++	+	0	0	0	+++	++	++	++	+	+++	++
3.18	**Install a support board**	**++**	**++**	**++**	**0**	**0**	**0**	**++**	**++**	**++**	**+++**	**+**	**+++**	**++**
3.19	**Install chamfers**	**++**	**+**	**+**	**0**	**0**	**0**	**++**	**++**	**++**	**+++**	**+**	**+++**	**++**
3.20	**Lay bitumen and place the paper, starting with the lowest point**	**++**	**++**	**++**	**0**	**0**	**0**	**+**	**++**	**++**	**+++**	**+**	**+++**	**++**
3.21	**Install drains and vents**	**++**	**++**	**+**	**0**	**0**	**+++**	**+**	**++**	**++**	**+**	**+**	**+++**	**++**
3.22	**Apply membrane flashing**	**++**	**++**	**+**	**0**	**0**	**++**	**++**	**++**	**++**	**+++**	**+**	**+++**	**++**
3.23	**Seal the control and expansion joints**	**+**	**++**	**+**	**+**	**+**	**+**	**++**	**++**	**++**	**+**	**+**	**++**	**++**
3.24	**Seal projections**	**++**	**++**	**+**	**0**	**0**	**0**	**+**	**++**	**++**	**+**	**+**	**++**	**++**
3.25	**Apply and seal drip edges made of unwelded and unhooked sheet metal**	**++**	**++**	**+++**	**0**	**0**	**0**	**+**	**++**	**++**	**++**	**+**	**+++**	**++**
3.26	**Lay bitumen and spread gravel**	**++**	**+++**	**++**	**0**	**0**	**0**	**++**	**++**	**++**	**++**	**+**	**+++**	**++**
3.27	**Check the work done**	**+**	**+**	**0**	**0**	**0**	**0**	**+**	**++**	**+**	**0**	**+**	**++**	**+**
3.28	**Pick up tools and equipment**	**++**	**++**	**++**	**++**	**+++**	**++**	**+**	**+++**	**+++**	**0**	**++**	**+++**	**+**
3.29	**Clean the working area**	**+**	**++**	**+**	**0**	**0**	**0**	**0**	**++**	**++**	**++**	**++**	**++**	**+**

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TASK 4	**Install shingle or tile roofing**													
4.1	**Find out what work needs to be done**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
4.2	**Prepare the equipment**	**+**	**++**	**+**	**0**	**+**	**+**	**+**	**0**	**+**	**0**	**0**	**0**	**+**
4.3	**Load the truck and go to the construction site**	**+**	**+++**	**++**	**++**	**++**	**+++**	**+**	**0**	**++**	**+**	**0**	**0**	**+**
4.4	**Examine the site and choose the location of the waste disposal container**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**+**	**0**	**0**	**0**	**+**
4.5	**Secure the working area**	**+**	**+**	**+**	**+**	**+**	**0**	**0**	**++**	**+**	**0**	**+**	**+**	**+**
4.5.1	Make sure to have protection equipment available	0	0	0	0	0	0	0	0	0	0	0	0	0
4.5.2	Establish a safety perimeter on the ground	++	++	+	+	+	++	++	0	++	+	+	+++	++
4.5.3	Secure the ladder	+	++	+	+	+	+	+	+++	++	+	+++	+++	++
4.5.4	Use fall arrest	0	+	0	0	0	0	0	+++	+	0	+	+	+
4.5.5	Establish a safety perimeter at the top	+	+	+	++	++	+	+	+++	++	+	+	+++	++
4.5.6	Install guardrails	+	++	++	0	0	0	0	+++	+	0	+++	+++	+
4.6	**Organize the access of workers and materials to the roof**	**+**	**++**	**+**	**0**	**+**	**0**	**0**	**+++**	**+**	**0**	**++**	**++**	**+**
4.6.1	Make sure to have: – roofing brackets (new roofs) – planks and guardrails – scaffolds – a lift	+	++	+	0	+	0	0	+++	+	0	++	++	+
4.7	**Plan the work**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**+**	**+**

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4.8	**Raise tools and equipment on the roof**	**+**	**++**	**+**	**+++**	**+++**	**++**	**+**	**++**	**++**	**+**	**+++**	**++**	**++**
4.9	**Remove existing roof covering, if applicable**	**++**	**+++**	**++**	**0**	**+**	**0**	**0**	**++**	**+++**	**++**	**+**	**+++**	**++**
4.10	**Check decking and, if applicable, have it repaired or make minor repairs**	**+**	**++**	**+**	**0**	**0**	**0**	**0**	**++**	**++**	**0**	**+**	**++**	**++**
4.11	**Apply the appropriate paper**	**++**	**++**	**++**	**0**	**0**	**0**	**+**	**+++**	**++**	**+**	**++**	**+++**	**+++**
4.11.1 4.11.2	Apply a self-adhesive membrane or Apply felt paper	++	++	++	0	0	0	+	+++	++	+	++	+++	+++
4.12	**Install vents and seal projections**	**++**	**++**	**++**	**+**	**+**	**+**	**++**	**++**	**++**	**+**	**++**	**+++**	**+++**
4.13	**Apply metal flashing made of unwelded and unhooked sheet metal**	**++**	**++**	**++**	**0**	**0**	**0**	**++**	**+++**	**++**	**+**	**++**	**+++**	**+++**
4.13.1	Apply: – Drips edges – valleys	++	++	++	0	0	0	++	+++	++	+	++	+++	+++
4.14	**Trace the hypotenuse**	**+**	**+**	**+**	**0**	**0**	**0**	**0**	**+++**	**+**	**+**	**++**	**+++**	**+++**
4.15	**Lay shingles or tiles as well as roofing brackets**	**+++**	**++**	**+++**	**0**	**0**	**0**	**+**	**+++**	**++**	**+**	**++**	**+++**	**+++**
4.15.1	Nail the shingles or tiles	+++	++	+++	0	0	0	+	+++	++	+	++	+++	+++
4.15.2	Cut the shingles or tiles at the ends	+++	++	+++	0	0	0	+	+++	++	+	++	+++	+++
4.16	**Lay the ridge tile**	**+++**	**++**	**++**	**0**	**0**	**0**	**+**	**+++**	**++**	**+**	**++**	**+++**	**+++**

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4.17	**Check the work done**	**+**	**+**	**0**	**0**	**0**	**0**	**+**	**++**	**+**	**0**	**+**	**++**	**+**
4.18	**Pick up tools and equipment**	**++**	**++**	**++**	**++**	**+++**	**++**	**+**	**+++**	**+++**	**0**	**++**	**+++**	**+**
4.19	**Clean the working area**	**+**	**++**	**+**	**0**	**0**	**0**	**0**	**++**	**++**	**++**	**++**	**++**	**+**
TASK 5	**Install unwelded and unhooked sheet metal roofing**													
5.1	**Find out what work needs to be done**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
5.2	**Prepare the equipment**	**+**	**++**	**+**	**0**	**+**	**+**	**+**	**0**	**+**	**0**	**0**	**0**	**+**
5.3	**Load the truck and go to the construction site**	**+**	**+++**	**++**	**++**	**++**	**+++**	**+**	**0**	**++**	**+**	**0**	**0**	**+**
5.4	**Examine the site and choose the location of the waste disposal container**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**+**	**0**	**0**	**0**	**+**
5.5	**Secure the working area**	**+**	**+**	**+**	**+**	**+**	**0**	**0**	**++**	**+**	**0**	**+**	**+**	**+**
5.5.1	Make sure to have protection equipment available	0	0	0	0	0	0	0	0	0	0	0	0	0
5.5.2	Establish a safety perimeter on the ground	+	++	+	+	+	+	++	0	++	+	+	++	++
5.5.3	Secure the ladder	+	+++	+	++	++	+	+	+++	++	+	+++	++	++
5.5.4	Use fall arrest	0	+	0	0	0	0	0	+++	++	0	+	+	+
5.5.5	Establish a safety perimeter at the top	+	++	++	+	+	+	++	+++	++	+	++	++	++
5.5.6	Install guardrails	+	++	++	0	0	0	0	+++	++	0	++	++	+

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5.6	**Organize the access of workers and materials to the roof**	**+**	**++**	**+**	**0**	**+**	**0**	**0**	**+++**	**+**	**0**	**++**	**++**	**+**
5.6.1	Make sure to have: – roofing brackets (new roofs) – planks and guardrails – scaffolds – a lift	+	++	+	0	+	0	0	+++	+	0	++	++	+
5.7	**Plan the work**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**+**	**0**	**0**	**0**	**+**
5.8	**Raise tools and equipment on the roof**	**+**	**++**	**+**	**+++**	**+++**	**++**	**+**	**++**	**++**	**+**	**+++**	**++**	**++**
5.9	**Remove existing roof covering, if applicable**	**++**	**+++**	**++**	**0**	**+**	**0**	**0**	**++**	**+++**	**++**	**+**	**+++**	**++**
5.10	**Check the decking and have it repaired, if applicable**	**+**	**++**	**+**	**0**	**0**	**0**	**0**	**++**	**++**	**0**	**+**	**++**	**++**
5.11	**Clean the decking**	**+**	**++**	**+**	**0**	**0**	**0**	**++**	**++**	**+**	**+**	**+**	**+++**	**++**
5.12	**Apply the appropriate paper**	**++**	**++**	**++**	**0**	**0**	**0**	**+**	**+++**	**++**	**+**	**++**	**+++**	**+++**
5.12.1 5.12.2	Apply a self-adhesive membrane <u>or</u> Apply felt paper	++	++	++	0	0	0	+	+++	++	+	++	+++	+++
5.13	**Apply nailed metal flashing made of unwelded and unhooked sheet metal, if applicable**	**++**	**++**	**++**	**0**	**0**	**0**	**++**	**+++**	**++**	**+**	**++**	**+++**	**+++**
5.14	**Trace the hypotenuse**	**+**	**+**	**+**	**0**	**0**	**0**	**0**	**+++**	**+**	**+**	**++**	**+++**	**+++**
5.15	**Lay metal sheets while taking roofing projections into account**	**++**	**+++**	**+++**	**0**	**0**	**0**	**+**	**++**	**++**	**+**	**++**	**+++**	**+++**
5.16	**Install vents and seal projections**	**++**	**++**	**+**	**0**	**0**	**+++**	**+**	**++**	**++**	**+**	**+**	**+++**	**++**

No.	Tasks and Operations	Contact with Tools (Electric, Pneumatic or Manual)	Handling	Moving Parts and Sharp Edges	Torn Sling	Poorly Attached Load	Compressed Gas Cylinders	Handling Controlled Products	Working from Heights	Debris and Rejects	Carbon Monoxide, Bitumen, Solvent and Glue, Tar	Overhead Electric Lines, Electric Tools and Extension Cords	Sunlight, Temperature	Machinery, Environment
5.17	**Caulk the joints, if applicable**	**+**	**+**	**++**	**0**	**0**	**0**	**++**	**+++**	**+**	**++**	**++**	**+++**	**+++**
5.18	**Lay the ridge flashing**	**+++**	**++**	**++**	**0**	**0**	**0**	**+**	**+++**	**++**	**+**	**++**	**+++**	**+++**
5.19	**Check the work done**	**+**	**+**	**0**	**0**	**0**	**0**	**+**	**++**	**+**	**0**	**+**	**++**	**+**
5.20	**Pick up tools and equipment**	**++**	**++**	**++**	**++**	**+++**	**++**	**+**	**+++**	**+++**	**0**	**++**	**+++**	**+**
5.21	**Clean the working area**	**+**	**++**	**+**	**0**	**0**	**0**	**0**	**++**	**++**	**++**	**++**	**++**	**+**
TASK 6	**Repair roofing**													
6.1	**Find out what work needs to be done**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
6.2	**Prepare the necessary equipment**	**+**	**++**	**+**	**0**	**+**	**+**	**+**	**0**	**+**	**0**	**0**	**0**	**+**
6.3	**Load the truck and go to the construction site**	**+**	**+++**	**++**	**++**	**++**	**+++**	**+**	**0**	**++**	**+**	**0**	**0**	**+**
6.4	**Locate the water infiltration source from the inside, if possible**	**+**	**+**	**+**	**0**	**0**	**0**	**0**	**+++**	**++**	**+**	**+++**	**++**	**+**
6.5	**Secure the working area**	**+**	**+**	**+**	**+**	**+**	**0**	**0**	**++**	**+**	**0**	**+**	**+**	**+**
6.5.1	Make sure to have protection equipment available	0	0	0	0	0	0	0	0	0	0	0	0	0
6.5.2	Establish a safety perimeter on the ground	+	++	+	+	+	+	++	0	++	+	+	+++	++
6.5.3	Secure the ladder	+	++	+	+	+	+	0	+++	++	+	+++	++	++
6.5.4	Use fall arrest	0	+	0	0	0	0	0	+++	+	0	+	+	+
6.5.5	Establish a safety perimeter at the top	+	++	++	+	+	+	++	+++	++	+	++	++	+
6.5.6	Install guardrails	+	++	++	0	0	0	0	+++	++	0	++	+	+
6.6	**Organize the access of workers and materials to the roof**	**+**	**++**	**+**	**0**	**+**	**0**	**0**	**+++**	**+**	**0**	**++**	**++**	**+**
6.7	**Plan the work**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**+**	**0**	**0**	**0**	**+**

No.	Tasks and Operations	Contact with Tools (Electric, Pneumatic or Manual)	Handling	Moving Parts and Sharp Edges	Torn Sling	Poorly Attached Load	Compressed Gas Cylinders	Handling Controlled Products	Working from Heights	Debris and Rejects	Carbon Monoxide, Bitumen, Solvent and Glue, Tar	Overhead Electric Lines, Electric Tools and Extension Cords	Sunlight, Temperature	Machinery, Environment
6.8	**Raise tools and equipment on the roof**	**+**	**++**	**+**	**+++**	**+++**	**++**	**+**	**++**	**++**	**+**	**+++**	**++**	**++**
6.9	**Prepare the surfaces**	**+**	**++**	**+**	**0**	**0**	**0**	**+++**	**++**	**++**	**++**	**++**	**+++**	**++**
6.10	**Dry if applicable**	**+**	**++**	**+**	**0**	**0**	**0**	**0**	**++**	**+**	**++**	**++**	**+++**	**++**
6.10.1	Allow to dry	+	+	+	0	0	0	0	++	+	++	+	+++	++
6.10.2	Ventilate with hot air	++	+	+	0	0	0	0	++	+	++	++	+++	++
6.10.3	Use a burner	+	++	+	0	0	+++	+++	++	+	++	++	+++	++
6.10.4	Place sawdust	+	++	+	0	0	0	0	++	++	++	++	+++	++
6.10.5	Pump the water	++	++	+	0	0	0	0	++	++	++	++	+++	++
6.10.6	Soak up	+	++	+	0	0	0	+++	++	++	++	++	+++	++
6.11	**Install the waste chute, if applicable**	**++**	**++**	**+**	**+**	**+**	**0**	**0**	**++**	**++**	**0**	**0**	**+++**	**++**
6.12	**Remove damaged or damp materials**	**++**	**++**	**+**	**0**	**0**	**0**	**+**	**++**	**++**	**+**	**++**	**+++**	**++**
6.13	**Make water cutoffs according to the roofing type**	**++**	**++**	**+**	**0**	**0**	**+**	**+**	**++**	**++**	**+**	**++**	**+++**	**++**
6.14	**Replace the covering with appropriate materials**	**+++**	**++**	**++**	**0**	**0**	**+**	**+++**	**++**	**++**	**+++**	**++**	**+++**	**++**
6.14.1	Apply the appropriate construction method for the type of roofing	+++	++	++	0	0	+	+++	++	++	+++	++	+++	++
6.15	**Make the connection**	**++**	**++**	**++**	**0**	**0**	**+**	**++**	**++**	**++**	**++**	**++**	**+++**	**++**
6.16	**Use water to check tightness**	**+**	**+**	**0**	**0**	**0**	**0**	**+**	**++**	**+**	**0**	**+**	**++**	**+**
6.17	**Pick up tools and equipment**	**++**	**++**	**++**	**++**	**+++**	**++**	**+**	**+++**	**+++**	**0**	**++**	**+++**	**+**
6.18	**Clean the working area**	**+**	**++**	**+**	**0**	**0**	**0**	**0**	**++**	**++**	**++**	**++**	**++**	**+**

Annex 3

COMMENTS BY THE ROOFER PROFESSIONAL SUBCOMMITTEE

At the February 2, 2011 meeting held in Longueuil, the members of the roofer professional subcommittee made the following comments.

1. Table 2.2, p. 18 Shingle or Tile Roofing
   Add to the list of coverings: *"synthetic tiles".*

2. Task 1, Sub-operation 1.17.2, p. 20
   "For polyvinyl chloride roofing (PVC)" should replace "For polyisobutytene (PIB) roofing".

3. Task 2, p. 22 to 24
   a) Sub-operation 2.2.1 should read *"Prepare the kettle, if applicable"*;

   b) The clarification of operation 2.7 should read *"It is important to plan for temporary seals"*;

   c) The clarification of operation 2.8 should read *"This operation should be performed once, if the covering has to be removed".* The same applies to operations 3.8, 4.8, 5.8 and 6.8;

   d) Sub-operations 2.11.1 and 2.11.2 are not always performed; *"if applicable"* should be added at the end of each one;

   e) The clarification of operation 2.19 should read *"This operation is performed when the base sheet is glued to the asphalt".*

4. Task 4, Operation 4.5, p. 28
   A sub-operation *"Install anchors"* should be added between 4.5.3 and 4.5.4.