

Tinsmith

Occupational Analysis Report

February 2010



Commission
de la construction
du Québec

The purpose of this report is to describe as accurately as possible the trade of tinsmith 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 vocational analysis is a first step in the definition of the skills required for practicing the trade. This report becomes one of the reference and decision-making tools used by the Commission de la construction du Québec for teaching and learning purposes.

The Commission de la construction du Québec is not responsible for the contents of this report. The latter has no legal effect and is meant as a reflection of discussions held on the date of the analysis workshop.

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The masculine gender is used generically
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APPROVAL

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INTRODUCTION

In early 2009, the CCQ's Direction de la formation professionnelle launched a large-scale operation to review the occupational analyses¹ of all construction industry trades².

The CCQ undertook this operation mainly for the following reasons:

- 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 qualifying examination question banks;
- implementation of Chapter 7 of the Agreement on Internal Trade (AIT) and of the *Québec-France* Understanding on the *Mutual Recognition of Professional Qualifications*.

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

The occupational analysis for tinsmith belongs to this context.³ Its purpose is to describe the trade as currently practiced 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 September 28 and 29, 2009.

This analysis aims to draw a portrait (tasks and operations) of the trade and its 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 workers in the tinsmith trade. A special effort was made to include all the data collected during the workshop and to ensure that the data accurately depict the realities of the trade analysed.

1. At the time of their development, in the eighties and nineties, they 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 manpower in the construction industry (Schedule A, article 11), the term “tinsmith” means:

[...] anyone who works sheet-metal of a thickness gauge 10. (Sheet-metal includes iron, copper, aluminum, stainless steel or other similar materials.) He also:

- a) traces, makes and sets all types of sheet-metal items on construction sites;
- b) erects and repairs ventilating, air conditioning and warm air heating systems, as well as all systems for exhausting such materials as shavings, fumes, smoke or dust, applies inside insulation connected with such systems and sets prefabricated apparatus;
- c) performs all other analogous work such as covering skylights, cornices, firestops and flashings with metal; installs gutters and other prefabricated metal items such as shelves, lockers, partitions, wall coverings, screens and ceilings.

Performance of the work described in the first paragraph includes trade-related handling for the purposes of immediate and permanent installation.

The tinsmiths taking part in the occupational analysis workshop consider that this definition represents quite well the practice of the trade by those working on construction sites. However, they point out that certain aspects seem to be lacking⁴. Thus, mention should be made of new materials, such as fiberglass, and it should be specified that tinsmiths can also lay slate on roofs⁵.

For several participants, this definition does not include building sheet metal parts in industrial settings. It is added that at the beginning of a career, tinsmiths are at times assigned to work in workshops.

4. Read in this regard the comment by professional subcommittee members in Annex 3.

5. The tinsmiths who participated in the workshop responded to the best of their knowledge and understanding of their trade and field of application. However, the CCQ's collective agreement application branch has issued a notice that, according to the *Regulation respecting the vocational training and qualification of manpower in the construction industry*, this activity belongs to the roofer trade.

Following discussions about this definition, the journeymen in the trade agree to describe the work done on construction sites, without excluding parts manufacturing tasks.

1.2 JOB TITLE

Although tinsmiths are also called “sheet metal workers”, the job title used for identifying the trade in this occupational analysis is “tinsmith”.

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

- “roofer”, i.e., anyone who applies and lays asphalt composition, gravel, shingles, sandstone tiles or other similar products on roofs⁶;
- “tinsmith-layout marker”, i.e., anyone who traces and builds sheet metal parts in plants.

1.3 SECTORS OF ACTIVITY

Tinsmiths are active in the four sectors of the construction industry:

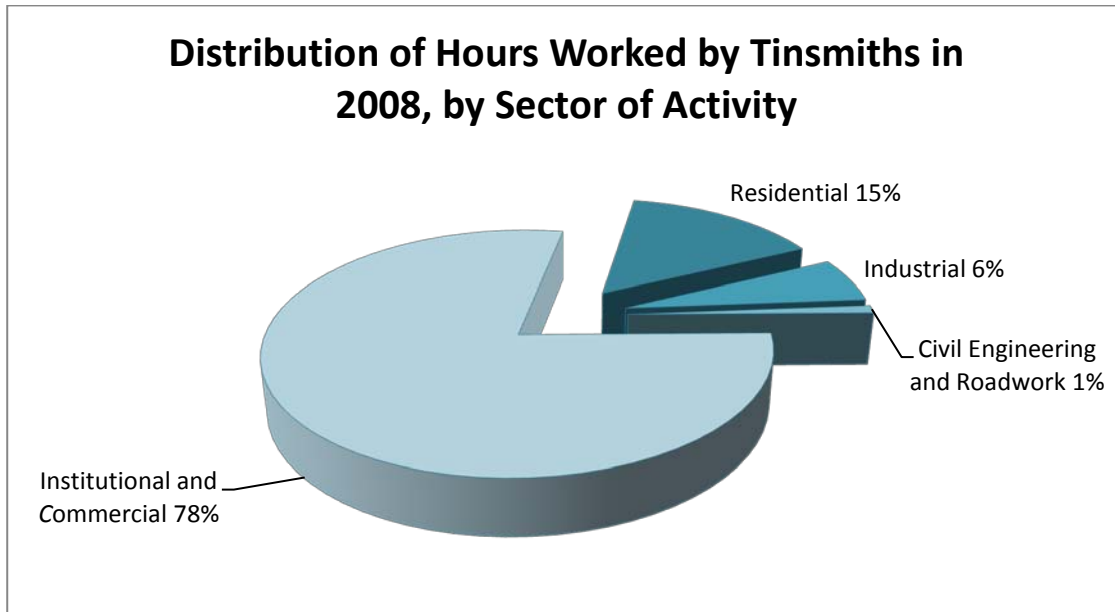
- civil engineering and roadwork;
- industrial;
- institutional and commercial;
- residential.

We note, however, that the institutional and commercial sector provides almost 80% of hours worked by tinsmiths⁷.

6. See in this regard the Regulation respecting the vocational training of workforce in the construction industry, Schedule A, section 12.

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

Table 1.1 Work Time Allocation per Sector



The tinsmiths attending the workshop consider that this table corresponds well with their perception of the settings for the practice of their trade.

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.

In the view of the tinsmiths attending the occupational analysis workshop, this definition is accurate, although it would have been preferable, on the first line of the second paragraph, to indicate demolition work again.

1.5 LEGISLATION AND REGULATIONS

Construction industry tinsmiths 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 *Act Respecting Occupational Health and Safety* (R.S.Q., c. S-2.1);
- the four sector-based collective agreements for the construction industry;
- the Québec Building Code, Chapter I – “Building”;
- the National Building Code (NBC).

1.6 WORKING CONDITIONS

The following information provides an overview of the conditions and context of the work of tinsmiths, as commented by the participants. 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

Depending on the sector of activity, a journeyman’s daytime hourly wage, in May 2009⁸, was:

- | | |
|--|---------|
| • Industrial, institutional and commercial | \$32.54 |
| • Civil engineering and roadwork | \$32.82 |
| • Light residential | \$30.13 |
| • Heavy residential | \$32.50 |

8. Salary data are taken from the following document, published by the Commission de la construction du Québec: *Carrières construction*, 2008-2009 edition, and from industry’s four collective agreements.

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.

To these vacation periods are added eight not paid 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.

Physical requirements

The tinsmith trade involves specific physical requirements. The tinsmith must:

- have good manual dexterity;
- be able to work from heights;
- have endurance and be in good physical condition.

Stress factors

The work is occasionally stressful, due to deadlines.

Work schedules

A 40-hour work week from Monday to Friday is the general in all construction industry sectors. The daily limit is 8 hours per day, except in light residential construction, where it can reach a maximum of 10 hours within a 40-hour work week.

To avoid penalizing employers and employees experiencing special constraints, the industry's four collective agreements allow many possibilities for changing the vacation periods prescribed by the general rule: compressed schedule, schedule shift, make-up time in light residential construction, etc. These special schedules confer flexibility to the work schedules in effect in the construction industry.

The work schedule of tinsmiths corresponds to that on construction sites, i.e., generally from 7 a.m. to 3 p.m., for a 40-hour work week. Outdoor work depends on weather conditions, so tinsmiths occasionally work longer to make up for lost time.

Autonomy and work organization

Tinsmiths often work within a team, under the supervision of a team leader or a foreman.

1.7 JOB MARKET ENTRY CONDITIONS⁹

To obtain the apprentice competency certificate in any construction industry trade, candidates must first:

- Supply proof that they are at least 16 years of age;
- Supply their social insurance number and their home address;
- Present their certificate for having passed the course *Santé et sécurité générale sur le chantier de construction*;
- Pay the required fees;
- Designate the union association to which they wish to belong.

9. Source: http://www.ccq.org/E_CertificatsCompetence.aspx?sc_lang=en&profil=GrandPublic.

In addition, candidates who have obtained a diploma recognized by the CCQ (DEP) in sheet metal work must:

- Present the original version of an academic transcript or apprenticeship transcript attesting that they have passed the DEP;
- Present 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 diploma¹⁰ are eligible to obtain a competency certificate-apprentice (CCA) in a trade 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 academic prerequisites;
- Present a guarantee of employment registered during a labour-pool opening by an employer registered with the Commission de la construction du Québec (CCQ), for at least 150 hours over a period of at most three consecutive months.

The apprentice tinsmith must have completed three apprenticeship periods of 2,000 hours each (6,000 hours total) in order to be eligible for the provincial qualification examination that leads to obtaining the competency certificate-journeyman for the trade. 1,800 hour credits are paid into the apprenticeship record book of an apprentice tinsmith who has obtained his DEP¹¹.

1.8 PLACE OF WOMEN IN THE TRADE

According to the CCQ¹², the proportion of women in the tinsmith trade is 0.85% (35 women out of 4,124 persons in 2008).

10. Of the 11 workshop participants, 5 began practicing the trade without training in tinsmithing.

11. Source: http://www.ccq.org/F_Formation/F03_MesuresIncitatives/F03_2_CreditsHeures.aspx?sc_lang=en&profil=Syndicales.

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

According to the tinsmiths attending the occupational analysis workshop, the low proportion of women in the trade is not explained by reasons related to physical strength, since occupational health and safety rules require anyone to request help or use hoisting equipment when the load to be raised is too heavy.

Rather, several participants think that women face prejudice from employers or their male co-workers. This situation reportedly discourages many women from having a tinsmithing career¹³.

1.9 CAREER PROSPECTS

At the beginning of his career, a tinsmith is often assigned simple tasks. His tasks will generally become more complex throughout his apprenticeship, from apprentice to journeyman.

With experience, a journeyman can become a team leader, foreman, superintendent, project manager, coordinator, draughtsman or contractor.

1.10 DEVELOPMENT OF THE TRADE

In recent years, the use of prefabricated products (wall cladding, for example) and new products (fiberglass, notably) has become commonplace. These novelties have contributed to a modification of working methods and have led tinsmiths to work more and more with ready-to-install products. Accordingly, building parts on site has become less prevalent.

Moreover, greater occupational health and safety requirements have contributed to modifying installation working methods (for example, wearing a mask is required for laying insulation), hoisting methods, handling and roofing.

13. Read in this regard the comment by members of the professional subcommittee in Annex 3.

1.11 IMPACT OF ENVIRONMENTAL STANDARDS ON THE PRACTICE OF THE TRADE

LEED (Leadership in Energy and Environmental Design) standards are being applied more and more in the industry and are affecting tinsmithing. Less use of products and materials with volatile toxic compounds, the use of vacuum cleaners to control rejects and the greater importance attached to wall and conduit sealing and insulation are among the changes observed in the work of tinsmiths.

Environmental standards also have consequences on the work. Oil leaks from hoisting equipment are no longer tolerated at all, and the presence of silica and asbestos entails severe protective measures.

2. WORK DESCRIPTION

2.1 TASKS AND OPERATIONS

List of tasks

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

- Task 1 Develop missing parts;
- Task 2 Build missing sheet metal parts or parts in similar materials;
- Task 3 Install distribution, discharge and recovery networks;
- Task 4 Cover roofs with metal or similar materials;
- Task 5 Install interior and exterior metal cladding;
- Task 6 Install prefabricated metal items;
- Task 7 Install scaffoldings and use hoisting equipment.

The following pages contain a table of tinsmiths' tasks and operations.

Table 2.1 Tasks and Operations

Tasks	Operations					
1. DEVELOP MISSING PARTS	1.1 Check the data	1.2 Draw the sketch	1.3 Determine the types of assemblies and reinforcements to be done	1.4 Determine the part's fabrication method	1.5 Determine the appropriate development method	1.6 Select layout tools and instruments
	1.7 Detect the part's specific details	1.8 Apply the appropriate development method for fabrication				
2. BUILD MISSING SHEET METAL PARTS OR PARTS IN SIMILAR MATERIALS	2.1 Determine the type of joints and rims	2.2 Trace the part's contours on the material	2.3 Cut the various elements in the sheet	2.4 Identify the part's elements	2.5 Shape the part	2.6 Secure the insulation
	2.7 Fasten the part's elements	2.8 Check the part's compliance				
3. INSTALL DISTRIBUTION, DISCHARGE AND RECOVERY NETWORKS	3.1 Secure the premises	3.2 Interpret the installation plan and the fabrication plan	3.3 Check the measurements on the plan and building	3.4 Install suspension and anchoring equipment	3.5 Do the pre-assembly	3.6 Hang and connect network conduits and cut or weld, if applicable
	3.7 Put in place devices, their soundproofing and their components	3.8 Adjust the devices	3.9 Connect the conduits to the network's various devices	3.10 Check tightness and make necessary correctives	3.11 Fasten and connect network accessories	3.12 Assist the team responsible for balancing the system and make necessary correctives

Tasks	Operations					
4. COVER ROOFS WITH METAL OR SIMILAR MATERIALS	4.1 Secure the premises	4.2 Determine the starting point	4.3 Remove existing equipment	4.4 Apply a self-adhesive membrane ¹⁴	4.5 Apply an underlay and insulation ¹⁴	4.6 Apply the first flashing
	4.7 Apply metal valleys	4.8 Apply the bases of openings	4.9 Apply cladding	4.10 Weld, staple or joint	4.11 Apply roof peak(s)	4.12 Fold down the roof peak(s), if applicable
	4.13 Cover the bases of openings	4.14 Install decorative elements	4.15 Caulk			
5. INSTALL INTERIOR AND EXTERIOR METAL CLADDING	5.1 Secure the premises	5.2 Apply the U-bar	5.3 Apply the bottom sheet, if applicable ¹⁵	5.4 Fasten supports or furrings	5.5 Apply insulation, if applicable ¹⁵	5.6 Apply base and head mouldings, and mouldings around openings
	5.7 Apply finishing sheets and cut sheets at openings	5.8 Apply remaining mouldings and the decorative elements	5.9 Caulk			
6. INSTALL PREFABRICATED METAL ITEMS	6.1 Secure the premises	6.2 Mark the location of the anchoring mechanism or the support	6.3 Install the anchoring mechanism or the support	6.4 Fasten items to the mechanism or prepare their fastening	6.5 Caulk	
7. INSTALL SCAFFOLDINGS AND USE HOISTING EQUIPMENT	7.1 Check the location	7.2 Secure the premises	7.3 Select scaffolding types	7.4 Handle scaffoldings	7.5 Check distances	7.6 Assemble sections
	7.7 Put safety devices in place	7.8 Daily inspect scaffoldings and hoisting equipment	7.9 Operate an aerial platform	7.10 Operate a lift	7.11 Operate tower scaffolding	7.12 Operate a flying scaffold

14. The CCQ's collective agreement application branch has issued a notice that, according to the *Regulation respecting the vocational training and qualification of manpower in the construction industry*, roof insulation, including the installation of vapour barriers and waterproof membranes, is the roofer's responsibility.

15. The CCQ's collective agreement application branch has issued a notice that, according to the *Regulation respecting the vocational training and qualification of manpower in the construction industry*, the tinsmith may apply interior insulation for ventilation, air conditioning and warm-air heating systems, and for any system discharging materials. In that event, the insulation is of another type, and the carpenter-joiner is responsible for the operation in the case of batt, roller or board insulation secured with nails, clips or glue. If such insulation is not secured with nails, clips or glue, the tinsmith may apply it.

2.2 OPERATIONS, SUB-OPERATIONS AND CLARIFICATIONS

In the following pages are presented sub-operations related to certain operations, as well as a few clarifications made by participants.

Table 2.2 Operations, Sub-Operations and Clarifications

TASK 1 DEVELOP MISSING PARTS		
This task is performed on the construction site or in a mobile unit when tinsmiths notice that one or more parts are missing. If several parts are missing, most tinsmiths are instructed to order their workshop fabrication.		
<i>Operations</i>	<i>Sub-Operations</i>	<i>Clarifications</i>
1.1 Check the data	1.1.1 Take measurements 1.1.2 Compare the measurements with the plan	
1.2 Draw the sketch	1.2.1 Based on the measurements, trace the drawing of the missing part 1.2.2 Quantify the required equipment 1.2.3 Add supplementary metal	
1.3 Determine the types of assemblies and reinforcements to be done		Various types of assemblies are used by tinsmiths: lap joint, welding, screwing, riveting, round pipe clip (RPC) and Pittsburgh joint (when the equipment is available), etc.
1.4 Determine the part's fabrication method		See the fabrication methods described in task 2.
1.5 Determine the appropriate development method		The development methods used by tinsmiths are: by triangulation, parallel and radial.
1.6 Select layout tools and instruments		

TASK 1 DEVELOP MISSING PARTS		
<i>Operations</i>	<i>Sub-Operations</i>	<i>Clarifications</i>
1.7 Detect the part's specific details	1.7.1 Locate details such as: <ul style="list-style-type: none"> • jointing types • quarter round • double corner joint • decorative elements • two-sided deviation or transition • etc. 	
1.8 Apply the appropriate development method for fabrication		
TASK 2 BUILD MISSING SHEET METAL PARTS OR PARTS IN SIMILAR MATERIALS		
This task is performed on the construction site or in a mobile unit when tinsmiths notice that one or more parts are missing. If several parts are missing, most tinsmiths are instructed to order their workshop fabrication.		
<i>Operations</i>	<i>Sub-Operations</i>	<i>Clarifications</i>
2.1 Determine the type of joints and rims		
2.2 Trace the part's contours on the material		
2.3 Cut the various elements in the sheet		
2.4 Identify the part's elements	2.4.1 Identify: <ul style="list-style-type: none"> • the back • the neck • the sides • etc. 	
2.5 Shape the part	2.5.1 Bend 2.5.2 Hand-beat 2.5.3 Roll 2.5.4 Use an anvil or an anvil horn 2.5.5 Use a vice 2.5.6 Use a joint former	Parts such as transitions or decorative elements are most difficult to build.

TASK 2 BUILD MISSING SHEET METAL PARTS OR PARTS IN SIMILAR MATERIALS		
Operations	Sub-Operations	Clarifications
2.6 Secure the insulation		Insulation fastened by tinsmiths must be inside parts.
2.7 Fasten the part's elements	2.7.1 Screw 2.7.2 Weld 2.7.3 Rivet 2.7.4 Use thermofusion welding	
2.8 Check the part's compliance		
TASK 3 INSTALL DISTRIBUTION, DISCHARGE AND RECOVERY NETWORKS		
Operations	Sub-Operations	Clarifications
3.1 Secure the premises	3.1.1 Coordinate with the various other trades 3.1.2 Delimit the area with cones or tape 3.1.3 Check scaffoldings and hoisting equipment	
3.2 Interpret the installation plan and the fabrication plan	3.2.1 Check whether the plan has been revised 3.2.2 Locate yourself in the building	
3.3 Check the measurements on the plan and building	3.3.1 Check conduit measurements 3.3.2 Check the ratings 3.3.3 Check the architect's elevations	
3.4 Install suspension and anchoring equipment		
3.5 Do the pre-assembly	3.5.1 Check that all parts are present 3.5.2 Assemble the parts 3.5.3 Weld, joint or use another assembly method 3.5.4 Install inlets 3.5.5 Caulk	

TASK 3 INSTALL DISTRIBUTION, DISCHARGE AND RECOVERY NETWORKS

Operations	Sub-Operations	Clarifications
3.6 Hang and connect network conduits and cut or weld, if applicable	3.6.1 Coordinate with the various other trades 3.6.2 Fasten pre-assembled parts 3.6.3 Weld, joint or use another assembly method 3.6.4 Caulk	It often happens that conduits cross piping systems, refrigeration circuits or electric wires or conduits, which complicates work.
3.7 Put in place devices, their soundproofing and their components	3.7.1 Check soundproofing 3.7.2 Put the devices in place	
3.8 Adjust the devices		
3.9 Connect the conduits to the network's various devices		
3.10 Check tightness and make necessary correctives	3.10.1 Locate the leak 3.10.2 Plug the leak	Water, smoke or noise can be used for locating a leak.
3.11 Fasten and connect network accessories		
3.12 Assist the team responsible for balancing the system and make necessary correctives	3.12.1 Drill holes in conduits 3.12.2 Assist with tests 3.12.3 Correct problems: <ul style="list-style-type: none"> • add balancing dampers • add escape keys • add lateral outlets 3.12.4 Install plugs	

TASK 4 COVER ROOFS WITH METAL OR SIMILAR MATERIALS

This task involves additional difficulties, such as unfavourable weather, working from a height, heat stress and equipment size, and when the various trades have to coordinate.

It should be noted that roofs can contain dormer windows, eaves, roof lights, vertical flashing, parapet coverings, peaks, valleys, vents, copper drains, speed bumps, C-clamps, counterflashing, flashing, etc.

Operations	Sub-Operations	Clarifications
4.1 Secure the premises		
4.2 Determine the starting point		The starting point is determined by taking into account, for example, work difficulty, coordination with other trades, and prevailing winds.
4.3 Remove existing equipment		It is not always necessary to remove the old roofing.
4.4 Apply a self-adhesive membrane ¹⁶		The membrane may be applied by roofers.
4.5 Apply an underlay and insulation ¹⁶		
4.6 Apply the first flashing		
4.7 Apply metal valleys		
4.8 Apply the bases of openings		

16. The CCQ's collective agreement application branch has issued a notice that, according to the *Regulation respecting the vocational training and qualification of manpower in the construction industry*, roof insulation, including the installation of vapour barriers and waterproof membranes, is the roofer's responsibility.

TASK 4 COVER ROOFS WITH METAL OR SIMILAR MATERIALS

Operations	Sub-Operations	Clarifications
4.9 Apply cladding ¹⁷	<p>4.9.1 For ancestral roofs, use the following roofing method:</p> <ul style="list-style-type: none"> • with beads • with pinched joints • in slate¹⁸ • in Canadian sheet metal • etc. <p>4.9.2 For roofs in the commercial, industrial and institutional sectors, use the following roofing method:</p> <ul style="list-style-type: none"> • metal building (metal structure and roofing) • sandwich (architectural metal panels with insulation inside) • reroofing (applying new sheet metal on an old roof with or without lathing) • etc. 	
4.10 Weld, staple or joint		The type of assembly is determined by the roofing method.
4.11 Apply roof peak(s)		
4.12 Fold down the roof peak(s), if applicable		
4.13 Cover the bases of openings		
4.14 Install decorative elements	<p>4.14.1 Install fascia</p> <p>4.14.2 Cut and apply soffit</p> <p>4.14.3 Fasten gutters</p>	
4.15 Caulk		

17. The participants listed in decreasing order the types of cladding most frequently installed.

18. The CCQ's collective agreement application branch has issued a notice that, according to the Regulation respecting the vocational training and qualification of manpower in the construction industry, this activity belongs to the roofer trade.

TASK 5 INSTALL INTERIOR AND EXTERIOR METAL CLADDING

This task involves additional difficulties, such as unfavourable weather, working from a height, heat stress and equipment size, and when the various trades have to coordinate.

Operations	Sub-Operations	Clarifications
5.1 Secure the premises	5.1.1 Inspect the premises 5.1.2 Locate superimposed work 5.1.3 Detect hazards of falling objects 5.1.4 Delimit a safety perimeter	
5.2 Apply the U-bar	5.2.1 Fasten sheet metal 5.2.2 Caulk 5.2.3 Install thermal cuts, if applicable	
5.3 Apply the bottom sheet, if applicable ¹⁹	5.3.1 Fasten the sheet 5.3.2 Check tightness	This may be insulating wool or a vapour barrier.
5.4 Fasten supports or furrings		
5.5 Apply insulation, if applicable ¹⁹		
5.6 Apply base and head mouldings, and mouldings around openings		
5.7 Apply finishing sheets and cut sheets at openings	5.7.1 Drill the sheets 5.7.2 Screw the sheets	
5.8 Apply remaining mouldings and the decorative elements		Mouldings may also be metal or neoprene closers.
5.9 Caulk		

19. The CCQ's collective agreement application branch has issued a notice that, according to the *Regulation respecting the vocational training and qualification of manpower in the construction industry*, the tinsmith may apply interior insulation for ventilation, air conditioning and warm-air heating systems, and for any system discharging materials. In that event, the insulation is of another type, and the carpenter-joiner is responsible for the operation in the case of batt, roller or board insulation secured with nails, clips or glue. If such insulation is not secured with nails, clips or glue, the tinsmith may apply it.

TASK 6 INSTALL PREFABRICATED METAL ITEMS

This task involves additional difficulties, such as unfavourable weather and working from a height, notably.

Operations	Sub-Operations	Clarifications
6.1 Secure the premises		
6.2 Mark the location of the anchoring mechanism or the support		
6.3 Install the anchoring mechanism or the support	6.3.1 Check the anchoring mechanism 6.3.2 Check the type of support 6.3.3 Screw 6.3.4 Staple 6.3.5 Fasten various types of nuts 6.3.6 Install threaded rods 6.3.7 etc.	
6.4 Fasten items to the mechanism or prepare their fastening		
6.5 Caulk		

TASK 7 INSTALL SCAFFOLDINGS AND USE HOISTING EQUIPMENT

In some companies, scaffolding can be assigned to subcontracted personnel. This task requires having taken training in erecting and using scaffoldings.

Operations	Sub-Operations	Clarifications
7.1 Check the location		
7.2 Secure the premises		

TASK 7 INSTALL SCAFFOLDINGS AND USE HOISTING EQUIPMENT

Operations	Sub-Operations	Clarifications
7.3 Select scaffolding types		
7.4 Handle scaffoldings		
7.5 Check distances		
7.6 Assemble sections	7.6.1 Retrofit the base 7.6.2 Assemble components 7.6.3 Install safety devices (anchors, safety arms, banana bolts, etc.)	
7.7 Put safety devices in place		
7.8 Daily inspect scaffoldings and hoisting equipment		
7.9 Operate an aerial platform	7.9.1 Circulate 7.9.2 Lift the platform 7.9.3 Remove extensions	
7.10 Operate a lift	7.10.1 Circulate 7.10.2 Raise the arm 7.10.3 Turn the arm 7.10.4 Extend the arm sections	
7.11 Operate tower scaffolding	7.11.1 Raise the scaffold 7.11.2 Lower the scaffold	
7.12 Operate a flying scaffold	7.12.1 Raise the scaffold 7.12.2 Lower the scaffold	

2.3 ACHIEVEMENT CONDITIONS AND PERFORMANCE CRITERIA

2.3.1 Achievement Conditions

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

The list of tools and equipment used for each task is presented in Annex 1.

Table 2.3 Achievement Conditions

TASK 1 DEVELOP MISSING PARTS
<p>Work areas On the construction site and in a mobile unit.</p>
<p>Levels of collaboration Alone and in a team. Under the supervision of the team leader and the foreman.</p>
<p>Instructions and references Based on plans, specifications and measurements taken on the construction site.</p>
<p>Raw materials The part may be developed on sheet metal (stainless steel, galvanized steel, aluminum, copper), plastic, fiberglass, etc.²⁰</p>
<p>Health and safety hazards In a context posing hazards:</p> <ul style="list-style-type: none"> • of noise produced by the various machines; • related to moving heavy items such as sheet metal bundles.
TASK 2 BUILD MISSING SHEET METAL PARTS OR PARTS IN SIMILAR MATERIALS
<p>Work areas On the construction site and in a mobile unit.</p>
<p>Levels of collaboration Alone. Under the supervision of the team leader or the foreman.</p>

20. Plastic and fiberglass are not exclusive to the tinsmith trade.

TASK 2 BUILD MISSING SHEET METAL PARTS OR PARTS IN SIMILAR MATERIALS

Instructions and references

Based on plans, specifications and measurements taken on the construction site.

Raw materials

The part may be developed on sheet metal (stainless steel, galvanized steel, aluminum, copper), plastic, fiberglass, etc.²¹

Health and safety hazards

In a context that poses hazards:

- of smoke and gas from welding and oxygen cutting operations;
- of noise from the various machines;
- related to moving heavy items such as sheet metal bundles;
- from cuts and burns.

TASK 3 INSTALL DISTRIBUTION, DISCHARGE AND RECOVERY NETWORKS

Work areas

On the construction site.

Levels of collaboration

In a team.

Under the supervision of the team leader or the foreman.

Instructions and references

Based on specifications, the installation plan and manufacturing sheets.

Raw materials

Using:

- hanging equipment, parts and prefabricated assemblies that will constitute the conduits;
- devices such as ventilators, roof spillways, air conditioners, etc.;
- accessories such as prefabricated bases, humidifiers or dehumidifiers, fixed louvers, motorized or gravity or tight electric shutoff or fire dampers, curved blade feed grids, door grills diffusers, flexible hoses, roof sheds, access doors, chimneys, mufflers, hoods (restaurant or laboratory), etc.

Health and safety hazards

In a context that poses hazards:

- of personal falls;
- related to weather (cold, heat, humidity);
- intense heat (working in iron and steel mills and paper mills, for example);
- related to moving heavy devices;
- related to falling items;
- related to poor lighting;
- related to working in enclosed spaces.

21. Plastic and fiberglass are not exclusive to the tinsmith trade.

TASK 4 COVER ROOFS WITH METAL OR SIMILAR MATERIALS

Work areas

On the construction site, outdoors.

Levels of collaboration

For minor repairs, the tinsmith works alone.

For new construction or more substantial renovations, the work is done by a team.

Under the supervision of the team leader or the foreman.

Instructions and references

Based on requisitions, work orders or the foreman's verbal instructions.

Raw materials

Ancestral roofs may be with beads, pinched joints, Canadian sheet metal, fish scales, copper, slate²² or zinc.

Modern roofs found in the commercial sector and the institutional and industrial sector may be made of metal structures and coverings (metal building) or architectural metal panels with insulation inside (sandwich panels), for example.

Health and safety hazards

In a context that poses hazards:

- related to weather (cold, heat humidity);
- related to the presence of live electric lines;
- related to dust;
- of falling;
- of cuts;
- metal chips in the eyes;
- back or knee injuries.

TASK 5 INSTALL INTERIOR AND EXTERIOR METAL CLADDING

Work areas

On the construction site, outdoors or indoors.

Levels of collaboration

In a team.

Under the supervision of the team leader or the foreman.

Instructions and references

Based on the client's specifications and request.

Based on the manufacturer's installation plan and installation manual.

22. The CCQ's collective agreement application branch has issued a notice that, according to the *Regulation respecting the vocational training and qualification of manpower in the construction industry*, this activity belongs to the roofer trade.

TASK 5 INSTALL INTERIOR AND EXTERIOR METAL CLADDING

Raw materials

The cladding installed may be in prepainted steel, galvanized steel, copper, zinc, fiberglass, or aluminum or vinyl siding. There may also be prefabricated walls of various types, or asbestos cement or CanExel prefinished faces²³.

Health and safety hazards

In a context that poses hazards:

- of personal falls;
- related to weather (cold, heat, humidity);
- related to the presence of live electric lines and hoisting equipment;
- related to dust;
- related to falling items;
- of cuts;
- of metal chips in the eyes;
- of back and knee injuries.

TASK 6 INSTALL PREFABRICATED METAL ITEMS

Work areas

On the construction site.

Levels of collaboration

In a team.

Under the supervision of the team leader or the foreman.

Instructions and references

Based on the client's instructions.

Based on the manufacturer's operating manuals and documentation on the installation procedure.

Raw materials

Prefabricated metal items are varied: shelves, furniture, lockers, cupboards, cold chamber or cleanroom walls, laundry chutes or garbage chutes, for example.

Health and safety hazards

In a context that poses hazards:

- of personal falls;
- related to weather (cold, heat, humidity);
- related to the presence of live electric lines and hoisting equipment;
- related to dust;
- related to falling items;
- of cuts;
- of metal chips in the eyes;
- of back and knee injuries.

23. The CCQ's collective agreement application branch has issued a notice that, according to the *Regulation respecting the vocational training and qualification of manpower in the construction industry*, vinyl clapboard and prefinished asbestos cement facings are not the tinsmith's responsibility. As for prefabricated walls of various types, it is understood that they are mainly made of sheet metal.

TASK 7 INSTALL SCAFFOLDINGS AND USE HOISTING EQUIPMENT
<p>Work areas On the construction site.</p>
<p>Levels of collaboration In a team. Under the supervision of the team leader or the foreman.</p>
<p>Instructions and references Based on the installation manual.</p>
<p>Raw materials Scaffoldings may be tubular, metal frame, tower or flying.</p>
<p>Health and safety hazards In a context that poses hazards:</p> <ul style="list-style-type: none"> • of personal falls; • related to weather (cold, heat, humidity); • related to the presence of live electric lines and hoisting equipment; • of back and knee injuries

2.3.2 PERFORMANCE CRITERIA

Performance criteria were gathered for each task. They are used for assessing whether the tasks were 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 a list of the requirements related to each task, the participants worked in teams of two or three. Their results were then collected and presented in full session.

Table 2.4 Performance Criteria

TASK 1 DEVELOP MISSING PARTS	
Performance Criteria	
Projection accuracy	Choosing the appropriate development method
Observance of dimensions	Choosing the appropriate assembly method
Sketch clarity	

TASK 2 BUILD MISSING SHEET METAL PARTS OR PARTS IN SIMILAR MATERIALS	
Performance Criteria	
Layout cleanliness and accuracy	Precise cut
Appropriate choice of material	Safe handling of materials, parts and assemblies
Parts identification according to the sketch	Following guidelines
Correct adjustment of machines	Appropriate insulation selection
Exact insulation cut	Meeting insulation fastening standards
Good choice of attachment clips	Quality of closures
Speed and accuracy in performing operations	Reducing equipment losses to a minimum
Compliant part if necessary	
TASK 3 INSTALL DISTRIBUTION, DISCHARGE AND RECOVERY NETWORKS	
Performance Criteria	
Observance of the plan's technical features	Appropriate choice of anchor bars
Strength of anchors	Joint tightness
Appropriate choice of locations and accessories	Weld quality
Appropriate use of the canvas	Network efficiency
Correctly performing pressure tests	Meeting manufacturer standards
Observing the installation sequence	Meeting earthquake-resistant standards
Observance of plans	
TASK 4 COVER ROOFS WITH METAL OR SIMILAR MATERIALS	
Performance Criteria	
Appropriate choice of a starting point	Laying the membrane adequately
Strength of valley attachments	Compliance of opening and ridge bases
Furrings applied with a square	Tightness of valley and opening bases
Laying the insulation ²⁴ and vapour barrier adequately	Correct performance of application methods
Weld quality	Quality of ridge pinching and alignment
Peak sturdiness	Cladding precision and parallelism
Roof tightness	Observance of plans and standards

24. The CCQ's collective agreement application branch has issued a notice that, according to the *Regulation respecting the vocational training and qualification of manpower in the construction industry*, applying roof insulation belongs to the roofer trade.

TASK 5 INSTALL INTERIOR AND EXTERIOR METAL CLADDING	
Performance Criteria	
Correct work planning and coordination	Precision of the bottom sheet's level
Sturdy anchoring of the bottom sheet	Support or furring anchor sturdiness
Insulation uniformity	Vapour barrier and cladding tightness
Adequate forming and sturdiness of the base flashing anchor	Flashing level precision
Adequate screwing of corners and other elements	Squared corners
Complete visual inspection	Regularity and alignment of screws
Observance of trade practices	Meeting manufacturer standards
Observance of safety rules	Observance of plans
TASK 6 INSTALL PREFABRICATED METAL ITEMS	
Performance Criteria	
Installation at the appropriate location	Sturdiness of anchors
Squared items	Suitability of devices and accessories
Safe handling	Good choice of tools
Effective use of tools	No contamination between metals (process equipment)
Quality of sanitary seals (process equipment)	Compatibility of materials used
Installation tightness	Meeting the manufacturer's installation standards
Observance of technical specifications	Meeting earthquake-resistant standards
Observance of plans	
TASK 7 INSTALL SCAFFOLDINGS AND USE HOISTING EQUIPMENT	
Performance Criteria	
Scaffolding stability	Correct scaffolding anchor
Complete and regular daily inspection	Detecting and replacing defective components
Observance of manufacturer instructions	Performing installation methods correctly
Caution when operating hoisting equipment	

2.4 FUNCTIONS

Functions correspond to a set of related tasks. This set may be defined by the work's results or by a sequence of steps.

For the tinsmith trade, the participants identified two functions. Accordingly, the work includes:

- a function of building metal-sheet parts or parts in similar materials (tasks 1 and 2);
- a function of installing metal-sheet parts or parts in similar materials (tasks 3, 4, 5, 6 and 7).

3. QUANTITATIVE DATA ON TASKS

3.1 OCCURRENCE

Occurrence data concern the percentage of tinsmiths²⁵ who perform a task in the same workplace. The data presented in the tables below are averages of the participants' results. However, they provide information on tasks performed not only by the tinsmiths attending the workshop, but also by all tinsmiths working in the companies represented.

Table 3.1 Occurrence of Tasks

Task	Occurrence
1. Develop missing parts	50,0%
2. Build missing sheet metal parts or parts in similar materials	59,7%
3. Install distribution, discharge and recovery networks	63,6%
4. Cover roofs with metal or similar materials	43,6%
5. Install interior and exterior metal cladding	47,4%
6. Install prefabricated metal items	89,1%
7. Install scaffoldings and use hoisting equipment	81,8%

3.2 WORK TIME

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

25. With the exception of apprentices.

Table 3.2 Work Time per Task

Task	Work Time
1. Develop missing parts	3.7%
2. Build missing sheet metal parts or parts in similar materials	5.9%
3. Install distribution, discharge and recovery networks	32.4%
4. Cover roofs with metal or similar materials	19.7%
5. Install interior and exterior metal cladding	13.1%
6. Install prefabricated metal items	18.9%
7. Install scaffoldings and use hoisting equipment	6.4%

The tasks related to manufacturing sheet metal products, although performed by over half of tinsmiths, represent little work time.

3.3 IMPORTANCE AND DIFFICULTY OF THE 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 tasks has no consequences on the overall quality of the product or service.
2. Not very important: Poor execution of the tasks could have minimal consequences on the overall quality of the product or service.
3. Important: Poor execution of the tasks could have serious consequences on the overall quality of the product or service.
4. Very important: Poor execution of the tasks could have very serious consequences on 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 notable physical or mental effort; performing the task is less difficult than average.
2. Easy: The task involves a few risks of error; it requires minimal physical or mental effort; it is of average difficulty.
3. Difficult: The task involves many risks of error; it requires a good physical or mental effort; performing the task is more difficult than average.
4. Very difficult: The task involves a high risk of error; it requires substantial physical or mental effort; the task is among the most difficult in the trade.

The data presented in the table below are the average results for the tinsmiths who participated in the workshop.

Table 3.3 Importance and Difficulty of the Tasks

Task	Importance	Difficulty
1. Develop missing parts	3.7	3.1
2. Build missing sheet metal parts or parts in similar materials	3.5	2.9
3. Install distribution, discharge and recovery networks	3.9	2.7
4. Cover roofs with metal or similar materials	3.8	2.5
5. Install interior and exterior metal cladding	3.8	2.8
6. Install prefabricated metal items	3.8	2.6
7. Install scaffoldings and use hoisting equipment	3.3	2.3

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 the tasks.

4.1 KNOWLEDGE

Drafting

Drafting knowledge is important in practicing the trade. Types of views and dimensions serve in the interpretation of various installation and fabrication plans that a tinsmith must consult before starting installation work.

Knowledge of drafting and how to use drafting instruments (for example, compasses, set squares and angle finders) are essential in tasks to develop and build missing parts, particularly in “draw the sketch” (operation 1.2) and “trace the part’s contours on the material” (operation 2.2) operations.

Generally, this knowledge also enables a tinsmith to imagine the plan in three dimensions and take measurements in the imperial and metric systems.

Mathematics

Angle and distance calculations are useful for each aspect of the work, particularly for tasks to develop and build missing parts, such as the “check the part’s compliance” operation (operation 2.8).

Computers

The tinsmith trade does not require particular computer skills. However, the participants mention that foremen use computers to consult plans and specifications.

Properties of materials

Knowledge of the various types of metals and alloys is necessary for the work.

Moreover, concepts regarding certain material properties are also useful. Thus, a knowledge of thermal expansion phenomena enables tinsmiths to understand what occurs following installation of various products, for example roof expansion or the behaviour of expansion joints.

Knowledge of the mutual compatibility of materials is also useful in practicing the trade. The tinsmith can thus understand the choice of materials to be used and, in some cases, decide which attachment to fasten.

Laws and regulations

Referring to the list of laws and regulations presented in Section 1.5, the tinsmiths attending the workshop specified that knowledge of certain points of those laws and regulations enables tinsmiths:

- to exercise their right to refuse work that poses occupational health and safety hazards;
- to take into account the responsibilities of various trades on construction sites.

Numerical control

Given that the work takes place on the construction site, the tinsmith trade does not require particular knowledge of how to use numerically controlled machines.

Manual machining

The tinsmith must be able to do drilling, threading and tapping work, particularly when having to suspend conduits.

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 pertain to intellectual strategies applied in working.

Problem-solving and decision-making

This skill is useful for:

- coordinating the work with that of other trades;
- adapt to weather conditions;
- settle clutter issues;
- solve occupational safety problems or exercise a right to refuse work.

Planning activities

This skill is useful for:

- estimating the time and equipment required to do a job;
- determine a task's feasibility;
- set priorities;
- install a safety perimeter.

4.2.2 Motor Skills

Motor skills involve gestures and movements. The main motor skills necessary to the trade of tinsmiths are the following:

- dexterity, for all operations involving cutting or forming;
- movement coordination, particularly for working from heights;
- physical strength, i.e., the capacity to lift, carry, push and pull loads of 5 kg to 25 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. The main perceptual skills necessary to tinsmiths are the following:

- visual acuity, to weld with precision, align surfaces, detect missing parts or deformations;
- hearing acuity, to perform handling operations safely.

4.3 ATTITUDES

Attitudes are ways of acting, reacting and relating with others or with one's environment. They involve personal skills. The main attitudes necessary to tinsmiths are the following.

Personal and interpersonal attitudes

These attitudes are manifested by patience and the ability to work within a team and under pressure.

Professional ethics

Honesty in declaring the hours worked and satisfaction in a job well done are signs of professional ethics.

Preventive attitudes and behaviours related to health and safety

These attitudes and behaviours are manifested by:

- installing equipment safely;
- wearing personal safety equipment;
- following the recommendations of health and safety committees present on the construction site;
- the ability to communicate a security lapse to a co-worker;
- observing safety perimeters;
- completely inspecting scaffoldings, hoisting equipment and tools.

5. TRAINING SUGGESTIONS

The tinsmiths present at the occupational analysis workshop made suggestions about the initial training and the training of apprentices.

Some participants consider that the conditions of admission to the initial training program should be lower than the fourth year of high school. They also think that better information at school would enable students to confirm their career choice. However, other participants estimate that the current conditions of admission should be maintained.

Some suggest that the training program focus on practical learning, particularly on learning skills specifically related to construction.

Some participants note that the trade involves three sectors: ventilation, roofing and cladding²⁶. They would find it appropriate for the training to include specializations, so that students could choose the sector in which they will work.

One person mentioned that the current DEP program emphasizes conduit installation too much and that more emphasis should be put on roofing and cladding.

Moreover, a specialist in the trade considers that the training program should include concepts on working in enclosed spaces, operating lift trucks, and occupational health and safety.

Several persons think that relations between the workplace and teaching institutions should be reinforced, notably by:

- including training stages;
- offering the program in alternating work-study periods;
- organizing tours of construction sites;
- inviting tinsmiths to give conferences in courses;
- asking employers to get more involved in the training.

26. Read in this regard the comment by members of the professional subcommittee in Annex 3.

With regard to the training of apprentices, the participants wish that the requirement to complete tinsmith-sheet metal training would be met to a greater extent by persons who obtained the apprentice competency certificate as a result of a labour shortage.

One person suggested that the provincial qualification examination take place in three stages, i.e., at the end of each apprenticeship period.

Finally, several participants think that the provincial qualification examination's question bank for tinsmiths focuses too much on conduit installation and hope that its update will cover all aspects of the trade.

ANNEXES

Annex 1
TOOLS AND EQUIPMENT

For each tinsmithing task and based on a list²⁷ submitted to them, the participants listed the tools and equipment they use: manual tools; electric, battery-powered and compressed air tools; drafting equipment, workshop tools and equipment; welding, brazing, cutting equipment; ladders, platforms, and hoisting and handling equipment; personal safety and protective equipment.

Table A.1 Tools and Equipment

TASK 1 DEVELOP MISSING PARTS

HAND TOOLS		
<i>MEASURING AND TRACING</i>		
Compass - bow - beam - segment Chalk line Square - combination - framing	Plumb bob French wire gauge Marking pen Tape measure Laser level Vernier caliper Scratch awl	Centre punch Protractor Straight edge Scriber Marking gauge
DRAFTING EQUIPMENT		
Parallel bar Compass Pencils	Set squares Drafting table Protractor	Rulers/scales - imperial & metric systems
LADDERS, PLATFORMS, AND HOISTING AND RIGGING EQUIPMENT		
Cables Fork lift	Rope Scaffolds	Ladder
PERSONAL PROTECTIVE EQUIPMENT AND SAFETY EQUIPMENT		
Safety boots Hard hat Fall arrest protection	Gloves Reflective vest Glasses	Eye protection Hearing protection

27. This list was based on the findings of the tinsmith occupational analysis performed for Red Seal: Human Resources and Skills Development Canada. *Occupational Analyses Series: Sheet Metal Worker*, Ottawa, 2006, p. 61 to 64.

TASK 2 BUILD MISSING SHEET METAL PARTS OR PARTS IN SIMILAR MATERIALS

HAND TOOLS			
<i>MEASURING AND LAYOUT</i>	<i>CUTTING AND SHEARING</i>	<i>FORMING AND ASSEMBLING</i>	<i>GENERAL</i>
Compass - bow, beam, segment Chalk line Square - combination, carpenter's French wire gauge Marking pen Tape measure Vernier calliper Scratch awl Centre punch Protractor Straight edge Scriber Marking gauge	Snips - aviation - right hand - combination Hole punch Notcher Hacksaw	Mallet Hammers - tinsmith's, à riveter Riveting gun C-clamp Crimper Hand dolly	Wire brushes Wrenches - Allen hex, combination and adjustable Soldering iron Files Level - laser and regular (bubble) Locking pliers - regular, flat, C Pliers - cutters, lineman's Caulking gun Tap and die Screwdriver
ELECTRIC/BATTERY/COMPRESSED AIR TOOLS			
Shear Impact wrench Nibbler Groove seamer	Drills Grinder Riveting gun	Saws - reciprocating - band (portable) - circular	
DRAFTING EQUIPMENT			
Parallel bar Compass Pencils	Set squares Drafting table Protractor	Rulers/scales - imperial or metric system	
SHOP TOOLS AND EQUIPMENT			
Stapler (folder) Section bender Foot shear Shear - electric, hydraulic, mechanical Dimpler Stakes - beak horn, hollow mandrel, solid mandrel, creasing, coppersmith, double seaming	Notcher Snap-lock machines Machines - burring, beading, crimping, wiring	Grinder Drill press Bending machines - apron, box (finger) Punch - bench, electric/mechanical/hydraulic Sander Chainsaw	

TASK 2 BUILD MISSING SHEET METAL PARTS OR PARTS IN SIMILAR MATERIALS

WELDING, BRAZING, SOLDERING AND CUTTING EQUIPMENT		
Tiger torch - butane - propane	Welding equipment - GMAW (MIG) - GTAW (TIG) - SMAW (rod) - Oxy-acetylene	Soldering iron Soldering furnace or pot Oxy-acetylene cutting station
PERSONAL PROTECTIVE EQUIPMENT AND SAFETY EQUIPMENT		
Safety boots Hard hat Eye wash station Welding curtain	Fire extinguisher Gloves Reflective vest Glasses Hearing protection	Respiratory protection Eye protection Leather apron Welding jacket Face shield

TASK 3 INSTALL DISTRIBUTION, DISCHARGE AND RECOVERY NETWORKS

HAND TOOLS			
<i>MEASURING AND LAYOUT</i>	<i>CUTTING AND SHEARING</i>	<i>FORMING AND ASSEMBLING</i>	<i>GENERAL</i>
Chalk line Square - combination - framing Marking pen Tape measure Protractor	Snips - aviation - Right hand - Combination Bolt cutter Hacksaw	Tinsmith's hammer Riveting gun C-clamp	Wrenches - Allen hex - combination - adjustable Files Level - laser - regular (bubble) Locking pliers - regular - flat - C Pliers - cutting - combination Caulking gun Screwdriver
ELECTRIC/BATTERY/COMPRESSED AIR TOOLS			
Shear Impact wrench Nibbler	Drills Stud gun Grinder	Saws - reciprocating - band (portable) Chainsaw	
DRAFTING EQUIPMENT			
Protractor	Rulers/scales - imperial system - metric system		
WELDING, BRAZING, SOLDERING AND CUTTING EQUIPMENT			
Welding equipment - GMAW (MIG) - GTAW (TIG) - SMAW (rod)	Cutting station - oxy-acetylene - plasma		
LADDERS, PLATFORMS, AND HOISTING AND RIGGING EQUIPMENT			
Cables Fork lift Rope Scaffolds	Ladder Slings Choker Shackle	Material lift Chain hoist Come-along	

TASK 3 INSTALL DISTRIBUTION, DISCHARGE AND RECOVERY NETWORKS

PERSONAL PROTECTIVE EQUIPMENT AND SAFETY EQUIPMENT		
Safety boots	Fire extinguisher	Respiratory protection
Hard hat	Gloves	Eye protection
Fall arrest protection	Reflective vest	Welding jacket
Retractor	Glasses	Face shield
Welding curtain	Hearing protection	

TASK 4 COVER ROOFS WITH METAL OR SIMILAR MATERIALS

HAND TOOLS			
<i>MEASURING AND LAYOUT</i>	<i>CUTTING AND SHEARING</i>	<i>FORMING AND ASSEMBLING</i>	<i>GENERAL</i>
Chalk line Square - combination - framing Marking pen Tape measure Scratch awl Centre punch Straight edge Marking gauge	Snips - aviation - right hand - combination Hole punch Hacksaw	Mallet Hammers - tinsmith's - carpenter's Riveting gun	Wire brushes Adjustable wrench Soldering iron Files Level - laser - regular (bubble) Locking pliers - regular - flat - C Caulking gun Screwdriver
ELECTRIC/BATTERY/COMPRESSED AIR TOOLS			
Shear Impact wrench Nibbler Groove seamer	Pneumatic nailer Grinder Riveting gun	Saws - reciprocating - circular Chainsaw	
WELDING, BRAZING, SOLDERING AND CUTTING EQUIPMENT			
Propane tiger torch	Soldering iron	Soldering furnace or pot	
LADDERS, PLATFORMS, AND HOISTING AND RIGGING EQUIPMENT			
Fork lift Rope Scaffolds Ladder	Slings Choker Shackle	Material lift Manlift Come-along	
PERSONAL PROTECTIVE EQUIPMENT AND SAFETY EQUIPMENT			
Safety boots Hard hat Fall arrest protection Fire extinguisher	Gloves Reflective vest Glasses Hearing protection	Respiratory protection Eye protection Face shield	

TASK 5 INSTALL INTERIOR AND EXTERIOR METAL CLADDING

HAND TOOLS			
<i>MEASURING AND LAYOUT</i>	<i>CUTTING AND SHEARING</i>	<i>FORMING AND ASSEMBLING</i>	<i>GENERAL</i>
Chalk line Square - combination - framing Plumb bob Marking pen Tape measure Scratch awl Centre punch Protractor Straight edge Scriber Marking gauge	Snips - aviation - right hand - combination Hole punch Bolt cutter Hacksaw	Rivet set Mallet Hammers - tinsmith's - body builder's - fitter's - riveting Riveting gun C-clamp Crimper	Wire brushes Wrenches - Allen hex - combination - adjustable Files Level - laser - regular (bubble) Locking pliers - regular - flat - C Pliers - cutting - combination Caulking gun Tap and die Screwdriver
ELECTRIC/BATTERY/COMPRESSED AIR TOOLS			
Shear Impact wrench Nibbler Drills	Stud gun Spray gun Grinder Riveting gun	Saws - reciprocating - circular	
DRAFTING EQUIPMENT			
Pencils Protractor	Rulers/scales - imperial system - metric system		
SHOP TOOLS AND EQUIPMENT			
Stapler (folder) Section bender Foot shear	Shear - power - mechanical	Apron bending machine	
WELDING, BRAZING, SOLDERING AND CUTTING EQUIPMENT			
Welding equipment - SMAW (rod)	Oxy-acetylene cutting station		

TASK 5 INSTALL INTERIOR AND EXTERIOR METAL CLADDING

LADDERS, PLATFORMS, AND HOISTING AND RIGGING EQUIPMENT		
Cables Fork lift Rope Scaffolds Ladder	Slings Choker Shackle Material lift Manlift	Chain fall Chain hoist Hydraulic hoist Hydraulic platform Come-along
PERSONAL PROTECTIVE EQUIPMENT AND SAFETY EQUIPMENT		
Safety boots Lifeline Hard hat Fall arrest protection Eye wash station Welding curtain Retractor	Fire extinguisher Gloves Reflective vest Safety harness Glasses Hearing protection	Respiratory protection Eye protection Welding jacket Face shield

TASK 6 INSTALL PREFABRICATED METAL ITEMS

HAND TOOLS			
<i>MEASURING AND LAYOUT</i>	<i>CUTTING AND SHEARING</i>	<i>FORMING AND ASSEMBLING</i>	<i>GENERAL</i>
Chalk line Square - combination - framing Plumb bob Marking pen Tape measure Protractor	Snips - aviation - right hand - combination Bolt cutter Hacksaw	Hammers - tinsmith's - body builder's - fitter's - riveting Riveting gun C-clamp	Wrenches - Allen hex - combination - adjustable Files Level - laser - regular (bubble) Locking pliers - regular - flat - C Combination pliers Caulking gun Screwdriver
ELECTRIC/BATTERY/COMPRESSED AIR TOOLS			
Shear Impact wrench Nibbler	Drills Stud gun Grinder	Saws - reciprocating - band (portable) Chainsaw	
DRAFTING EQUIPMENT			
Protractor	Rulers/scales - imperial system - metric system		
WELDING, BRAZING, SOLDERING AND CUTTING EQUIPMENT			
Spot welder (RSW) Tiger torch - butane - propane	Welding equipment - GMAW (MIG) - GTAW (TIG) - SMAW (rod)	Oxy-acetylene cutting station	
LADDERS, PLATFORMS, AND HOISTING AND RIGGING EQUIPMENT			
Cables Fork lift Rope Scaffolds	Ladder Slings Choker Shackle	Material lift Chain hoist Come-along	
PERSONAL PROTECTIVE EQUIPMENT AND SAFETY EQUIPMENT			
Safety boots Hard hat Fall arrest protection Retractor Welding curtain	Fire extinguisher Gloves Reflective vest Glasses Hearing protection	Respiratory protection Eye protection Welding jacket Face shield	

TASK 7 INSTALL SCAFFOLDINGS AND USE HOISTING EQUIPMENT

HAND TOOLS			
<i>MEASURING AND LAYOUT</i>	<i>FORMING AND ASSEMBLING</i>	<i>GENERAL</i>	
Tape measure Level	Fitter's hammer	Adjustable wrenches Locking pliers - regular - flat - C Combination pliers	
ELECTRIC/BATTERY/COMPRESSED AIR TOOLS			
Impact wrench			
LADDERS, PLATFORMS, AND HOISTING AND RIGGING EQUIPMENT			
Cables Rope	Choker Shackle	Electric or gasoline come-along	
PERSONAL PROTECTIVE EQUIPMENT AND SAFETY EQUIPMENT			
Safety boots Cables Hard hat Fall arrest protection Eye wash station Retractor	Welding curtain Fire extinguisher Gloves Reflective vest Safety harness Glasses	Hearing protection Respiratory protection Eye protection Leather apron Welding jacket Face shield	

GRID OF OCCUPATIONAL HEALTH AND SAFETY ELEMENTS

**Prepared by GASTON DUFOUR, inspector
Commission de la santé et de la sécurité du travail**

OCCUPATIONAL HEALTH AND SAFETY:

1. Working from heights

Using a stepladder, ladder, scaffolding, aerial platform or lift can pose fall hazards that can lead to fractures, paralysis and even death. Appropriate maintenance of equipment and a knowledge of work techniques are therefore fundamental. When work is done from a height, the installation of railings (according to article 3.8 of the Safety Code for the construction industry) must be considered as the first solution. For work done from a height of over three meters, wearing and using the safety harness is required as a means of personal protection.

2. Incorrect use of a hand tool or a portable power tool

Using equipment, instruments and tools (drills, hammers, knives, pliers) can pose hazards of injuries such as burns, bruises or cuts. Some eye injuries can be serious, and even lead to amputation. Appropriate maintenance of equipment and a knowledge of work techniques are essential. As for personal protection, wearing glasses and gloves is required.

3. Working on energized devices

Electrocutions are frequent and can cause death. Observance of CSST safety rules and a knowledge of work techniques are thus essential. For example, during work on energized devices, workers must ensure that a lockout method is applied and that all energy sources are deactivated. In addition, **regular** maintenance of equipment (instruments and tools) must be done systematically.

4. Lifting heavy items and manoeuvring large devices

Using heavy equipment (sheet metal, stepladder, ladder, roofing materials, etc.) can pose health hazards leading mainly to back injuries. To prevent this type of injury, it is recommended to use appropriate equipment, i.e., cart, dolly, etc., to know and apply working postures, and to ensure good teamwork.

5. Noise

Using equipment, instruments and tools (drill, reciprocating saw, fastener gun, riveter, nibbler) exposes the worker to high levels of noise that can alter hearing. To counter this problem, workers must use less-noisy equipment, instruments or tools to do these various types of work. Moreover, they must wear personal protective equipment, for example ear shells or plugs.

6. Hazardous environment

- ☛ Working in a plant where toxic substances, flammable products, explosives, etc. are present.

When working on a company site, workers may be exposed to various hazards depending on the workplace (chemicals, noise, gas, enclosed space). Workers must be informed of the hazards to which they are exposed. In some cases, training may prove necessary before doing the work. In addition, safety rules must be followed to the same extent as company rules.

- ☛ Presence of weld smoke

In various welding work, workers may be exposed to weld smoke or gases. As a means of prevention, the work should be done with ventilation at the source or natural, and wearing respiratory protection is required.

- ☛ Presence of materials containing asbestos

Before the start of removal, drilling or sawing work, workers must be able to identify the various materials (plaster, stucco, mechanical insulation, flocking) likely to contain asbestos, and they must inform their supervisor. This situation is all the more likely in residential, commercial or industrial buildings built before the eighties. In all cases of asbestos in materials, **article 3.23 of the Safety Code** must be applied **in its entirety**.

- ☛ Presence of materials containing silica

Removal, drilling or sawing work on materials containing silica (cement) must be done using procedures using water or ventilation at the source. Workers must know what measures to take before working and must wear necessary respiratory protective equipment.

- ☛ Working in enclosed spaces

During work in enclosed spaces, **article 3.21 of the Safety Code** must be applied **in its entirety**. The general contractor must determine the appropriate working method to ensure worker safety (industry).

Table A.2 Description of Sources of Danger

No.	Sources of Danger	Effects on Health and Safety	Means of Prevention
1	<p>Working from heights</p> <ul style="list-style-type: none"> • Stepladder • Ladder • Scaffolding • Hoisting device • Roofing 	<ul style="list-style-type: none"> • Fractures • Internal injuries • Death 	<ul style="list-style-type: none"> • Use temporary means of access safely. • Wear a safety harness with a shock absorber. • Use a railing. (See Safety Code for the construction industry, article 3.8.3). • Use a ladder for work of short duration (less than one hour) and apply article 3.5.6 of the Safety Code for the construction industry. • Use a stepladder according to standard CAN3-Z11-M81. (See Safety Code for the construction industry, article 3.5.7). • Organize the work so as to eliminate superimposed work. • Know how to use hoisting equipment.
2	<p>Incorrect use of a hand tool or a portable power tool</p>	<ul style="list-style-type: none"> • Contusions • Joint injuries • Lesions to the eyes and face • Burns • Noise 	<ul style="list-style-type: none"> • Use, maintain and repair tools according to the manufacturer's technical instructions. • Wear personal protective equipment for the eyes, limbs and ears. (See Safety Code for the construction industry, article 2.10).
3	<p>Work on energized devices</p>	<ul style="list-style-type: none"> • Electrocution, electrification • Lesions to the face and eyes • Amputation • Death 	<ul style="list-style-type: none"> • Put a lockout procedure in place. • Use an extension cord in good condition. • Use insulated tools and accessories. <p>(See Safety Code for the construction industry, article 2.11).</p> <ul style="list-style-type: none"> • Apply article 5 of the SCCI when working near an electric line.
4	<p>Lifting loads and manoeuvring large devices</p>	<ul style="list-style-type: none"> • Contusions, lesions to limbs • Backache • Sprains 	<ul style="list-style-type: none"> • Use a hoisting device. • Have taken training in the use of a safe lifting procedure.

No.	Sources of Danger	Effects on Health and Safety	Means of Prevention
5	Noise	<ul style="list-style-type: none"> • Deafness 	<ul style="list-style-type: none"> • Use less-noisy tools and equipment. • Move away from the source of noise, if possible. • Use hearing protection equipment (shells, plugs).
6	<p>Hazardous environment</p> <ul style="list-style-type: none"> • Working in a plant where toxic substances, flammable products, explosives, noise, etc. are present • Presence of materials containing asbestos • Presence of materials containing silica • Extreme temperature or humidity • Working in confined spaces 	<ul style="list-style-type: none"> • Intoxication • Burns • Deafness • Pulmonary illness • Lung cancer • Asbestosis • Mesothelioma • Pulmonary illness • Silicosis • Lung cancer • Chilblains • Heat stroke • Dehydration • Headaches • Cramps • Intoxication asphyxia 	<ul style="list-style-type: none"> • Adopt means and working methods according to the establishment's safety instructions. • Wear personal protective equipment according to the workplace and the hazard. • Have received training to identify materials likely to contain asbestos. • Ensure that materials containing asbestos are removed wherever work is to be done. Work must comply with 3.23 of the Safety Code for the construction industry. • Have received training to identify materials likely to contain silica. • Ensure that safe working methods for drilling or removing materials containing silica are put in place before working. • Wear personal protective equipment according to the risk level. Use ventilation at the source or a water process to reduce silica exposure. • Wear appropriate work clothes. • Alternate the work according to weather conditions. • Use a safe working method. (See Safety Code for the construction industry, article 3.21) • Use extraction ventilation. • Use a respirator.

Table A.3 Sources of Danger per Task and Operation

Tasks and Operations	Working from Heights	Incorrect Use of a Hand Tool or a Portable Power Tool	Working on Energized Devices	Lifting Loads or Manoeuvring Large Devices	Noise	Hazardous Environment
1. DEVELOP MISSING PARTS						
1.1 Check the data	x					x Plant
1.2 Draw the sketch						
1.3 Determine the types of assemblies and reinforcements to be done						
1.4 Determine the part's fabrication method						
1.5 Determine the appropriate development method						
1.6 Select layout tools and instruments						
1.7 Detect the part's specific details						
1.8 Apply the appropriate development method for fabrication		x	Electric tools		x	
2. BUILD MISSING SHEET METAL PARTS OR PARTS IN SIMILAR MATERIALS						
2.1 Determine the type of joints and rims						
2.2 Trace the part's contours on the material						
2.3 Cut the various elements in the sheet		x		x	x	
2.4 Identify the part's elements						
2.5 Shape the part		x		x	x	
2.6 Secure the insulation						
2.7 Fasten the part's elements		x		x	x	Welding
2.8 Check the part's compliance						

Tasks and Operations	Working from Heights	Incorrect Use of a Hand Tool or a Portable Power Tool	Working on Energized Devices	Lifting Loads or Manoeuvring Large Devices	Noise	Hazardous Environment
3. INSTALL DISTRIBUTION, DISCHARGE AND RECOVERY NETWORKS						
3.1 Secure the premises						x Plant x Cold, heat x Enclosed space
3.2 Interpret the installation plan and the fabrication plan						
3.3 Check the measurements on the plan and building	x					
3.4 Install suspension and anchoring equipment	x	x			x	x Asbestos x Silica
3.5 Do the pre-assembly	x	x			x	Weld smoke
3.6 Hang and connect network conduits and cut or weld, if applicable	x	x	x	x	x	Weld smoke
3.7 Put in place devices, their soundproofing and their components	x			x	x	
3.8 Adjust the devices	x				x	
3.9 Connect the conduits to the network's various devices	x	x			x	
3.10 Check tightness and make necessary correctives	x					
3.11 Fasten and connect network accessories	x				x	
3.12 Assist the team responsible for balancing the system and make necessary correctives						

Tasks and Operations	Working from Heights	Incorrect Use of a Hand Tool or a Portable Power Tool	Working on Energized Devices	Lifting Loads or Manoeuvring Large Devices	Noise	Hazardous Environment
4. COVER ROOFS WITH METAL OR SIMILAR MATERIALS						
4.1 Secure the premises	x		Working near an electric line			Cold, heat
4.2 Determine the starting point	x					
4.3 Remove existing equipment	x	x		x	x	
4.4 Apply a self-adhesive membrane	x			x	x	
4.5 Apply an underlay and insulation	x			x	x	
4.6 Apply the first flashing	x	x			x	
4.7 Apply metal valleys	x	x			x	
4.8 Apply the bases of openings	x	x			x	
4.9 Apply cladding	x	x		x	x	
4.10 Weld, staple or joint	x	x			x	Weld smoke
4.11 Apply roof peak(s)	x	x			x	
4.12 Fold down the roof peak(s), if applicable	x	x			x	
4.13 Cover the bases of openings	x	x			x	
4.14 Install decorative elements	x	x			x	
4.15 Caulk	x					
5. INSTALL INTERIOR AND EXTERIOR METAL CLADDING						
5.1 Secure the premises	x		Electric line			x Cold, heat
5.2 Apply the U-bar	x	x		x	x	
5.3 Apply the bottom sheet, if applicable	x	x		x	x	
5.4 Fasten supports or furrings	x	x		x	x	
5.5 Apply insulation, if applicable	x	x		x		

Tasks and Operations	Working from Heights	Incorrect Use of a Hand Tool or a Portable Power Tool	Working on Energized Devices	Lifting Loads or Manoeuvring Large Devices	Noise	Hazardous Environment
5.6 Apply base and head mouldings and mouldings around openings	x	x		x		
5.7 Apply finishing sheets and cut sheets at openings	x	x		x	x	
5.8 Apply remaining mouldings and the decorative elements	x	x		x	x	
5.9 Caulk	x					
6. INSTALL PREFABRICATED METAL ITEMS						
6.1 Secure the premises	x		Electric line			x Cold, heat
6.2 Mark the location of the anchoring mechanism or the support	x					
6.3 Install the anchoring mechanism or the support	x	x	x	x	x	x Asbestos x Silica
6.4 Fasten items to the mechanism or prepare their fastening	x	x	x	x	x	
6.5 Caulk	x					
7. INSTALL SCAFFOLDINGS AND USE HOISTING EQUIPMENT						
7.1 Check the location						x Cold, heat
7.2 Secure the premises			Electric line			
7.3 Select scaffolding types						
7.4 Handle scaffoldings				x		
7.5 Check distances						
7.6 Assemble sections	x	x		x		
7.7 Put safety devices in place	x					

Tasks and Operations	Working from Heights	Incorrect Use of a Hand Tool or a Portable Power Tool	Working on Energized Devices	Lifting Loads or Manoeuvring Large Devices	Noise	Hazardous Environment
7.8 Daily inspect scaffoldings and hoisting equipment	x		Electric line			
7.9 Operate an aerial platform	x	x				
7.10 Operate a lift	x	x				
7.11 Operate tower scaffolding	x	x				
7.12 Operate a flying scaffold	x	x				

**COMMENTS BY MEMBERS OF THE
TINSMITH PROFESSIONAL SUBCOMMITTEE**

Note 4, page 3:

The professional subcommittee members specify that installing metal furniture is also part of the tinsmith trade.

Note 13, page 10:

The professional subcommittee members think that physical strength is a factor that explains the low proportion of women in the trade. They also emphasize that, although prejudice persists, the situation has improved.

Note 26, page 41:

The professional subcommittee members specify that the trade also includes prefabricated furniture and metal items in addition to ventilation, roofing and cladding.