Tile Setter

Occupational Analysis Report

November 2011

Commission
de la construction
du Québec

The purpose of this report is to describe as accurately as possible the tile setter 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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The masculine gender is used generically
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APPROVAL

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INTRODUCTION

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

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[2] 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 Understanding 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 of the tile setter trade belongs to this context[3]. Its purpose is to describe this 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 April 11 and 12, 2011.

This analysis aims to draw a portrait of the trade (tasks and operations) 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 workers in the tile setter trade. 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. The terms “profession” and “trade” are considered synonymous.
2. Called “work situation analyses” at the time.
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, section 6), the term “tile setter” means:

> […] anyone who:
>
> a) cuts and sets marble, granite, prefabricated terrazzo, slate, glazed or enameled ceramic tiles and all other similar or substitute materials;
>
> b) installs strips, laths and metal anchoring devices and applies various granitic mixtures;
>
> c) sets the base for the above operations;
>
> d) polishes by hand or machine and by means of dry or wet processes, all surfaces made of granite, marble or any other similar material and cements or fills in cracks or gaps.

The participants agree with the definition. However, they point out that preparing the work site should also be mentioned as part of the work.

1.2 JOB TITLES

On construction sites, the job titles “ceramic tile setter” or “tile setter” are most often used for designating tile setters. The job title “tile setter”, used in the Regulation respecting the vocational training of workforce in the construction industry, will be used in the present report.

Tile setters are occasionally confused with resilient flooring layers or with bricklayers, because those two trades sometimes involve similar tasks to those of tile setters.

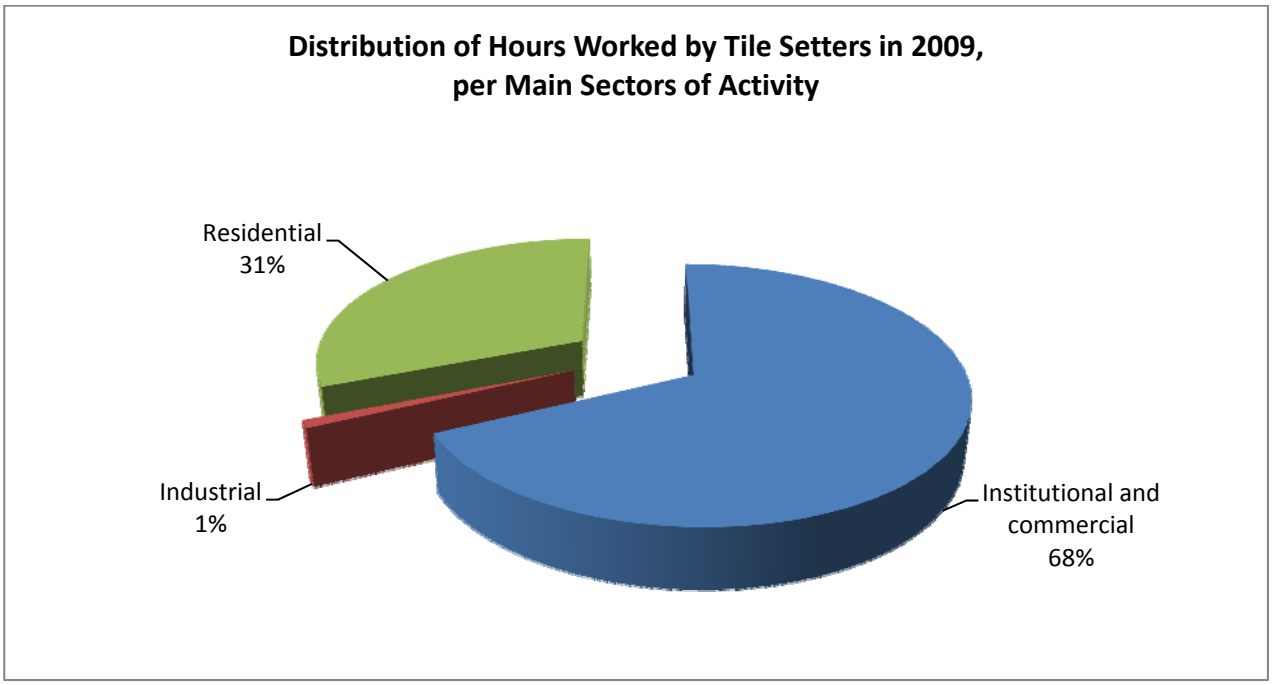
1.3 SECTORS OF ACTIVITY

Tile setters are active, to different degrees, mainly in three construction industry sectors:

- residential;
- industrial;
- institutional and commercial.

The diagram below illustrates the allocation of all tile setters' work time in Quebec 2009[4].

Table 1.1 Tile Setters' Workload



Following the presentation of the above diagram, we asked the participants about the sectors in which they practice their trade. The table on the following page presents the situation described by the tile setters attending the workshop, as well as the situation for all workers in the trade.

4. Commission de la construction du Québec, *Carrières construction*, 2010-2011 edition.

Table 1.2 Work Time Allocated to Each Sector

Sector	Percentage of work time allocated to each sector	
	All Tile Setters in Quebec	Tile Setters attending the meeting
Residential	31%	28%
Institutional and commercial	68%	71.3%
Civil engineering and roads	–	–
Industrial	1%	0.7%

1.4 FIELD OF PRACTICE

The trade's field of practice is the construction industry. The Act respecting labour relations, vocational training, and workforce 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

Tile setters 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 four sector-based collective agreements of the construction industry;

- the National Building Code – Canada (NBC);
- the Quebec Building Code, Chapter I, “Building”;
- the Act Respecting Occupational Health and Safety (R.S.Q., c. S-2.1);
- the Safety Code for the construction industry (R.Q. c. S-2.1, r.6);
- municipal bylaws, if applicable.

The participants mentioned that they must also know the standards of the Terrazzo, Tile and Marble Association of Canada (TTMAC).

1.6 WORKING CONDITIONS[5]

The following information provides an overview of the conditions and context of the work of tile setters, 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 of the construction industry sectors.

Salary

The average annual salary of a journeyman having worked at least 500 hours was $43,882 in 2009. The proportion of journeymen who had cumulated the 500 hours was 61%.

In April 2010, the hourly wage of a journeyman tile setter was as follows:

- Industrial, institutional and commercial: $33.66
- Civil engineering and roads: $33.76
- Light residential: $30.51
- Heavy residential: $33.63

5. The general data on working conditions are taken from the collective agreements of the four construction industry sectors, and from the following document, published by the Commission de la construction du Québec: *Carrières construction*, 2010-2011 edition.

Vacations and time off

Mandatory annual holidays of four weeks – two weeks in summer and two in winter at fixed periods determined 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 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.

Physical requirements

The work requires a good physical condition and a certain physical strength. Tile setters often have to lift and move substantial loads, from fifty to a hundred pounds (e.g. marble slabs). The back, legs and knees work particularly hard.

Work schedules

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

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

In the residential sector, tile setters generally work during week days and in the daytime. In the institutional and commercial sector, they often work in the evening or weekend, to avoid hindering the activities of stores where the work is done.

Given that tile setters are often the last to work on a construction site, they have to deal with delays accumulated before their arrival. This can affect the schedules of tile setters, who are then asked to work more in order to make up for the delays.

Tile setters work mainly in their area of residence. However, depending on the employer they work for, they may be called to travel somewhat, and this particularly at the beginning of their career. But this is not a general rule – many tile setters have never worked outside their area of residence.

1.7 JOB MARKET ENTRY CONDITIONS[6]

To obtain the competency certificate-apprentice in the trade, 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 tile setting – recognized by the CCQ and giving access to the industry, 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 to admit tile setters without a diploma.

6. For a complete list of conditions for entering the trade, see the Act respecting labour relations, vocational training and workforce management in the construction industry (R.S.Q., c. R-20). You can also consult the CCQ's website: http://www.ccq.org/E_CertificatsCompetence.aspx?sc_lang=en&profil=DevenirTravailleur.

Thus, candidates without a diploma 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 academic prerequisites;

- present a guarantee of employment produced 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.

An apprentice tile setter must have completed three apprenticeship periods of 2,000 hours each (for a total of 6,000 hours) in his trade in order to be eligible for the provincial qualification examination, success of which leads to obtaining the competency certificate-journeyman for the trade. Credits are paid into the apprenticeship record book of an apprentice tile setter who has obtained his diploma.

Three of the ten tile setters attending the meeting have obtained their DEP in tile setting.

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

- versatility;
- resourcefulness;
- punctuality;
- reliability;
- productivity;
- sense of responsibility;
- conscientiousness.

The criteria for selecting tile setters may vary somewhat from one employer to another, but mainly depend on the type of work to be done. The participants mentioned that two tile setter profiles are found: one more focused on production and the other more on the final result.

1.8 PLACE OF WOMEN IN THE TRADE

Section 126.0.1 of the Act respecting labour relations, vocational training and workforce management in the construction industry pertains to women's access to the construction industry: "The Commission, after consultation with the Commission des droits de la personne et des droits de la jeunesse, shall develop measures to favour the access of women to and their maintenance and greater representation on the labour market in the construction industry."

According to the CCQ[7], in 2009, 51 women (out of 1,940 tile setters in total) were practising the trade, i.e., 2.63%.

According to the participants, no factor related to the trade's requirements prevents women from doing the work. However, the participants mention that prejudice and the attitude of some co-workers may contribute to discouraging women from choosing this field.

1.9 CAREER PROSPECTS

With experience, tile setters who want to can become foremen and eventually superintendents. They can also become contractors by starting up their own tile setting company. Finally, some may choose to become trade-related company representatives or vocational teachers.

1.10 DEVELOPMENT OF THE TRADE

Among changes that have occurred in recent years, we mainly observe the following:

- New products and materials have appeared:
    - they are used more and more frequently (e.g. porcelain tiles, mosaics, new adhesives, etc.);
    - they require new work techniques;
    - originating from Asia, products are often of lesser quality, thus making it more difficult to lay tiles. Access to adequate information on their harmful effects is also often deficient.

7. Commission de la construction du Québec, *Carrières construction*, 2010-2011 edition.

- The technique of setting tiles on a fresh mortar bed is used less often than previously due to the cost of materials, so tile setters must level floors more and more often.

- Some products are more corrosive (e.g.: epoxy) than traditional products (cement, sand, etc.), which increases the risks for tile setters.

- New tile setting techniques are appearing, such as the metal support fastening system for outdoors, which the participants call “ventilated tiling.”

Among changes likely to spread, the participants mentioned mortar-free tile setting and, for large surfaces, using a machine to apply grout.

1.11 IMPACT OF ENVIRONMENTAL STANDARDS ON THE PRACTICE OF THE TRADE

The application of environmental standards is not yet affecting tile setters notably. The participants mentioned that on some construction sites, specific containers exist for recyclable products and others for hazardous products, but these are exceptions. Most of the time, the responsibility falls on the tile setter, who finds himself with hazardous product residues he must dispose of without having access to appropriate means to do so. Hazardous products thus end up with other waste products; little monitoring is done in this regard.

2. WORK DESCRIPTION

2.1 TASKS AND OPERATIONS

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

Task 1	Prepare the work to be done
Task 2	Prepare surfaces
Task 3	Lay tiles according to the thinset process
Task 4	Lay tiles on a mortar bed according to the thickbed process
Task 5	Apply Portland cement-based terrazzo
Task 6	Apply epoxy-based terrazzo
Task 7	Lay slabs one by one on floors according to the thickbed process
Task 8	Lay slabs on floors according to the thinset process
Task 9	Lay slabs on walls
Task 10	Polish a surface
Task 11	Do repair work

The participants pointed out that what distinguishes tiles and slabs is the material's thickness; slabs are over ⅝ inch thick and tiles less than ⅝ inch thick.

During the workshop, a table of tasks and operations performed by tile setters was submitted to the participants. After discussion, modifications were made to the table. The final version is presented in the following pages.

Table 2.1 Tasks and Operations

TASKS	OPERATIONS					
1. **PREPARE THE WORK TO BE DONE**	1.1 Find out about the work to be done	1.2 Clean the work area	1.3 Check the condition of surfaces to be covered	1.4 Organize the work area	1.5 Erect scaffolds, if applicable	1.6 Locate or determine the position of joints (expansion, control, contraction, mechanical)
2. **PREPARE SURFACES**	2.1 Install cement and engineering panels, if applicable	2.2 Establish the levels and plumb of reference points	2.3 Determine and make necessary corrections	2.4 If applicable, install a vapour barrier, a waterproof membrane or a cleavage sublayer	2.5 Fasten lattice sheets or wire mesh, if applicable	2.6 Prepare mortar mixes
	2.7 Shape reference points or guides	2.8 Apply a scratch coat of mortar, if applicable	2.9 Spread a bond coat, if applicable	2.10 Apply the straightening coat or the mortar, if applicable	2.11 Compact with a trowel, if applicable	2.12 Level and finish with a trowel, if applicable
	2.13 Lay a membrane (waterproof, anti-fissure or uncoupling), if applicable					
3. **LAY TILES ACCORDING TO THE THINSET PROCESS**	3.1 Establish the leader lines	3.2 Trim and cut the tiles, if necessary	3.3 Back butter the underside of tiles with mortar, if applicable	3.4 Apply the bond coat on the surface	3.5 Put the tiles in place and tamp them	3.6 Check the finished surface's flatness
	3.7 Remove excess adhesive on and between tiles	3.8 Do the grouting (after setting)	3.9 Ensure the quality of the work	3.10 Clean the work area		

TASKS	OPERATIONS					
4. **LAY TILES ON A MORTAR BED ACCORDING TO THE THICKBED PROCESS**	4.1 Establish the leader lines	4.2 Trim and cut the tiles, if necessary	4.3 Spread the bond coat on the fresh mortar bed	4.4 Put the tiles in place and tamp them	4.5 Do the grouting	4.6 Ensure the quality of the work
	4.7 Clean the work area					
5. **APPLY PORTLAND CEMENT-BASED TERRAZZO**	5.1 Establish the leader lines	5.2 Install division blades (on fresh or hardened mortar)	5.3 Wet the hardened base	5.4 Spread the bond coat	5.5 Mix the terrazzo components	5.6 Spread the mix
	5.7 Level the mix	5.8 Spread dry aggregates	5.9 Compact with a trowel	5.10 Compact with a roller	5.11 Remove excess cement	5.12 Ensure the quality of the work
	5.13 Clean the work area	5.14 Control the moisture				
6. **APPLY EPOXY-BASED TERRAZZO**	6.1 Establish the leader lines	6.2 Install division blades, if applicable	6.3 Spread a bond coat	6.4 Mix the terrazzo components	6.5 Spread the mix	6.6 Spread dry aggregates, if applicable
	6.7 Finish with a trowel	6.8 Ensure the quality of the work	6.9 Clean the work area	6.10 Control the moisture		

TASKS	OPERATIONS					
7. **LAY SLABS ONE BY ONE ON FLOORS ACCORDING TO THE THICKBED PROCESS**	7.1 Establish the leader lines	7.2 Make the mortar mix	7.3 Cut the slabs, if applicable	7.4 Clean and prepare the underside of slabs	7.5 Spread a bond coat on the floor (slab area)	7.6 Spread the base layer of mortar on the bond coat
	7.7 Lay the slab on the mortar bed	7.8 Adjust the mortar to the desired level	7.9 Raise the slab	7.10 Spread a bond coat on the underside of the slab	7.11 Put the slab back and compact it	7.12 Check the final level
	7.13 Do the grouting	7.14 Ensure the quality of the work	7.15 Protect the surface	7.16 Clean the work area		
8. **LAY SLABS ON FLOORS ACCORDING TO THE THINSET PROCESS**	8.1 Establish the leader lines	8.2 Cut the slabs, if applicable	8.3 Clean the underside of slabs	8.4 Mix the thinset mortar	8.5 Spread the thinset mortar on the floor	8.6 Back butter the thinset mortar on the underside of the slabs
	8.7 Place the slabs on the floor	8.8 Tamp the slabs to adjust their level	8.9 Do the grouting	8.10 Ensure the quality of the work	8.11 Clean the work area	
9. **LAY SLABS ON WALLS**	9.1 Establish the leader lines	9.2 Cut the slabs, if applicable	9.3 Polish the ridges	9.4 Clean and prepare the underside of slabs	9.5 Prepare the underside of slabs to lay them outdoors	9.6 Prepare the slabs to receive anchors
	9.7 Drill or prepare the wall to receive anchors	9.8 Install anchors on the wall or slabs	9.9 Plumb and align the slabs	9.10 Place spacers	9.11 Put the slabs in place	9.12 Secure the anchors
	9.13 Place adhesive spots if applicable	9.14 Do the grouting or caulking	9.15 Ensure the quality of the work	9.16 Clean the work area		

TASKS	OPERATIONS					
10. **POLISH A SURFACE**	10.1 Ensure that the material has hardened sufficiently	10.2 Do the first grinding	10.3 Clean the surface thoroughly	10.4 Correct imperfections	10.5 Do the finish grinding	10.6 Clean the surface
	10.7 Ensure the quality of the work	10.8 Clean the work area	10.9 Apply sealant, if applicable			
11. **DO REPAIR WORK**	11.1 Locate areas to be repaired	11.2 Remove damaged surfaces	11.3 Remove the bond coat and the mortar bed, if applicable	11.4 Prepare the surface to cover	11.5 Put the new finish materials in place	11.6 Do the grouting
	11.7 Ensure the quality of the work	11.8 Clean the work area				

2.2 OPERATIONS, SUB-OPERATIONS AND CLARIFICATIONS

In the following pages are presented the sub-operations related to most of the operations[8], as well as a few clarifications made by the participants.

Table 2.2 Sub-Operations and Operation Clarifications

TASK 1 PREPARE THE WORK TO BE DONE

During each step for preparing the work to be done, the tile setter must ensure that the work he is asked to do is feasible given the conditions in which he is to do it. Thus, he must pay special attention to the assessment of certain constraints that could hinder the work's feasibility. Those constraints include:

- the time allotted;
- access to the work area;
- the quality and compliance of materials;
- the extent of corrections that must be made before the start of work;
- safety problems.

OPERATIONS	Sub-Operations	Clarifications
1.1 Find out about the work to be done	1.1.1 Consult the plans and specifications 1.1.2 Receive instructions (verbal or sketches) from the foreman	The way to find out about the work to be done varies according to the companies. In many cases, tile setters will consult the plans and specifications, which will be available to them throughout the project. The foremen will also always give a few verbal clarifications and will sometimes product a freehand sketch to explain the work to be done. Of the 10 persons consulted, 9 have access to plans and specifications.
1.2 Clean the work area		Given that several trades have done work on the construction site before the tile setters arrive, it is rare that the work area is free of debris, empty boxes, materials, etc. So tile setters have to clean thoroughly before being able to do their work. It is often necessary to scrape joint compound residues on the floors and remove all traces of dirt.
1.3 Check the condition of surfaces to be covered	1.3.1 Check the following aspects: – plumb – reference points – level – finish – presence of problems (mould, differences in level, lack of stability, etc.)	

8. The sequence of operations may vary according to the products and materials used.

TASK 1 PREPARE THE WORK TO BE DONE

Operations	Sub-Operations	Clarifications
1.4 Organize the work area	1.4.1 Receive materials and check their compliance with plans and specifications 1.4.2 Lay out materials and equipment in the work area 1.4.3 Delimit the safety perimeter 1.4.4 Protect adjacent surfaces 1.4.5 Ensure necessary conditions (water, electricity, ventilation, lighting, temperature, etc.)	To check the compliance of received materials with plans and specifications, a tile setter must open boxes and examine materials. He must also check batch numbers, tile sizes and delivered quantities. The safety perimeter may be delimited with cordons, barriers, cones, etc. Materials and equipment must be laid out in the work area so as to reduce movements. A tile setter must therefore determine a starting point and organize everything accordingly. Adjacent surfaces are generally protected with polyethylene.
1.5 Erect scaffolds, if applicable		Given the type of work, scaffolds are little used in the residential sector.
1.6 Locate or determine the position of joints (contraction, expansion, control, mechanical)	1.6.1 Mark the location of joints 1.6.2 Adjust joint sizes	

TASK 2 PREPARE SURFACES

Operations	Sub-Operations	Clarifications
2.1 Install cement and engineering panels, if applicable	2.1.1 Ensure a sufficient quantity of screws 2.1.2 Trim and install 2.1.3 Check the installation's solidity 2.1.4 Joint the panels with cement and fibreglass tape	In some cases, this step has already been taken by carpenter-joiners before tile setters arrive. In such cases, tile setters must then ensure that the installation meets their standards of quality, because they are responsible for the finished product.
2.2 Establish the levels and plumb of reference points	2.2.1 Check the starting points 2.2.2 Check the squareness 2.2.3 Determine the highest and lowest points 2.2.4 Establish the levels 2.2.5 Install the reference points	
2.3 Determine and make necessary corrections		The most frequent correction is surface levelling. The choice of materials is particularly important.

TASK 2 PREPARE SURFACES

Operations	Sub-Operations	Clarifications
2.4 If applicable, install a vapour barrier, a waterproof membrane or a cleavage sublayer	2.4.1 Evaluate the necessary quantity for the surface to be covered 2.4.2 Choose the type of membrane or sublayer to be installed according to the desired result	The vapour barrier may be made of polyethylene or black paper. The waterproof membrane, as its name indicates, is used for waterproofing. The cleavage sublayer may be made of polystyrene foam, sand, etc.
2.5 Fasten lattice sheets or wire mesh, if applicable		Wire mesh may be anchored to the surface or left floating. It is important to check overlapping between lattice sheets, to ensure that the entire surface is covered.
2.6 Prepare mortar mixes		The tile setter must check manufacturer specifications for mortar slake time and its general preparation. It is important to follow the recipe. Mortar consistency must be adjusted according to the surface on which the mortar will be applied (wall or floor).
2.7 Shape reference points or guides	2.7.1 Determine the width of filling areas 2.7.2 Allocate reference points according to the length of rulers	
2.8 Apply a scratch coat of mortar, if applicable		The scratch coat serves to facilitate the adhesion of the next coat of mortar.
2.9 Spread a bond coat, if applicable		The choice of bond coat has a major effect on the result.
2.10 Apply the straightening coat or the mortar, if applicable	2.10.1 Apply a coarse layer 2.10.2 Rectify with a ruler	This coat serves to level the surface.
2.11 Compact with a trowel, if applicable		Compacting is done only on floors.
2.12 Level and finish with a trowel, if applicable		Levelling is done with a ruler.
2.13 Lay a membrane (waterproof, anti-fissure or uncoupling), if applicable	2.13.1 Refer to specifications or manufacturer standards for the waiting period 2.13.2 Choose the membrane, if applicable	The necessary type of membrane may be prescribed in the specifications, or the tile setter may have to choose it. The uncoupling membrane is fastened to the surface.

TASK 3 LAY TILES ACCORDING TO THE THINSET PROCESS

Operations	Sub-Operations	Clarifications
3.1 Establish the leader lines	3.1.1 Determine the starting points 3.1.2 Trace the reference lines	Tracing is generally done with a chalk line.
3.2 Trim and cut the tiles, if necessary	3.2.1 Choose the cutting tool (tile cutter or wet saw) according to the format and composition of materials 3.2.2 Take measurements 3.2.3 Trace on the tiles, as necessary 3.2.4 Trim or cut	The expression “cut the tiles” refers to a straight cut of tiles, whereas the verb “trim” refers to cutting tiles in various shapes.
3.3 Back butter the underside of tiles with thinset, if applicable	3.3.1 Prepare the thinset mortar 3.3.2 Apply the thinset mortar with the appropriate type of trowel	It is appropriate to coat the underside of tiles when they are made of porcelain or marble, or if they are large.
3.4 Apply the bond coat on the surface	3.4.1 Choose a notched trowel 3.4.2 Spread the bond coat between tracer lines	The choice of trowel depends on the surface’s condition and on the size of tiles.
3.5 Put the tiles in place and tamp them	3.5.1 Orient the direction of tiles 3.5.2 Set tiles firmly in place	Tiles must be oriented in the desired direction (patterns, grain, etc.).
3.6 Check the finished surface’s flatness	3.6.1 Ensure tile height and alignment uniformity	
3.7 Remove excess adhesive on and between tiles	3.7.1 Pass a margin trowel tip between tiles 3.7.2 Pass a wet sponge on the tiles	
3.8 Do the grouting (after setting)	3.8.1 Prepare the grout 3.8.2 Prepare two pails containing clean water 3.8.3 Spread the grout with a rubber float or squeegee 3.8.4 Do a first cleaning with a wet sponge 3.8.5 Rinse the residues	
3.9 Ensure the quality of the work	3.9.1 Check the alignment 3.9.2 Check the entire work 3.9.3 Make corrections, if applicable	
3.10 Clean the work area	3.10.1 Pick up the scrap 3.10.2 Put the scrap in containers 3.10.3 Clean and store materials and equipment 3.10.4 Wash soiled surfaces	

TASK 4 LAY TILES ON A MORTAR BED ACCORDING TO THE THICKBED PROCESS

This task corresponds to the traditional method for setting ceramic tiles; it is not suitable for setting porcelain tiles.

Operations	Sub-Operations	Clarifications
4.1 Establish the leader lines	4.1.1 Establish the starting point 4.1.2 Establish the levels of the surface to be covered	
4.2 Trim and cut the tiles, if necessary	4.2.1 Take measurements 4.2.2 Soak the tiles in water, if applicable 4.2.3 Trace on the tiles, if applicable 4.2.4 Trim or cut the tiles	
4.3 Spread the bond coat on the fresh mortar bed	4.3.1 Calculate the quantity of bond coat necessary for covering the mortar bed 4.3.2 Prepare and spread the bond coat	
4.4 Put the tiles in place and tamp them	4.4.1 Place the support boards 4.4.2 Prepare the tiles, if applicable 4.4.3 Place the tiles 4.4.4 Tamp the tiles	
4.5 Do the grouting	4.5.1 Prepare the grout 4.5.2 Spread the grout 4.5.3 Sprinkle with dry grout 4.5.4 Sweep the excess grout 4.5.5 Wash the work while scrubbing the joints	
4.6 Ensure the quality of the work	4.6.1 Check the work's flatness 4.6.2 Ensure that the joints are well filled	
4.7 Clean the work area	4.7.1 Pick up the scrap 4.7.2 Put the scrap in containers 4.7.3 Clean and store materials and equipment	

TASK 5 APPLY PORTLAND CEMENT-BASED TERRAZZO

Operations	Sub-Operations	Clarifications
5.1 Establish the leader lines	5.1.1 Trace the grid 5.1.2 Establish the design, if applicable 5.1.3 Establish the coating's height	The size of each square in the grid is generally 3 ft. × 3 ft.
5.2 Install division blades (on fresh or hardened mortar)	Fresh mortar 5.2.1 Make ridges in the fresh mortar 5.2.2 Position the blades 5.2.3 Press on the blades until they are well dug in (depth stoppers) Hardened mortar 5.2.4 Position the blades 5.2.5 Nail or glue the blades	
5.3 Wet the hardened base	5.3.1 Saturate the surface with water	
5.4 Spread the bond coat		
5.5 Mix the terrazzo components	5.5.1 Choose the aggregates (dosage, colour, gauge) 5.5.2 Add cement to the aggregates 5.5.3 Dry mix 5.5.4 Add water and, if applicable, additives and colouring 5.5.5 Mix everything	
5.6 Spread the mix	5.6.1 Spread the mix in a U-shaped pattern between division blades 5.6.2 Spread the mix on the central part	
5.7 Level the mix		Levelling is generally done with a trowel.
5.8 Spread dry aggregates		This operation serves to make the distribution of aggregates, colours, etc. uniform.
5.9 Compact with a trowel		This is a preliminary compaction to incorporate dry aggregates.

TASK 5 APPLY PORTLAND CEMENT-BASED TERRAZZO

Operations	Sub-Operations	Clarifications
5.10 Compact with a roller	5.10.1 Wait for the mix to be hardened, but malleable 5.10.2 Roll while crisscrossing 5.10.3 Push the terrazzo toward the edges	
5.11 Remove excess cement		
5.12 Ensure the quality of the work		This checking is done throughout the process. In addition, a final check of the work is done once the surface is polished (task 10).
5.13 Clean the work area		
5.14 Control the moisture		

TASK 6 APPLY EPOXY-BASED TERRAZZO

Operations	Sub-Operations	Clarifications
6.1 Establish the leader lines	6.1.1 Trace the grid 6.1.2 Establish the design, if applicable 6.1.3 Establish the coating's height	
6.2 Install division blades, if applicable		
6.3 Spread a bond coat		
6.4 Mix the terrazzo components	6.4.1 Choose the aggregates (dosage, colour, gauge) 6.4.2 Dry mix the aggregates 6.4.3 Mix the liquid ingredients 6.4.4 Add the aggregates to the liquid mix	
6.5 Spread the mix	6.5.1 Spread the mix in a U-shaped pattern between division blades 6.5.2 Spread the mix in the central part	The mix is spread with a trowel.

TASK 6 APPLY EPOXY-BASED TERRAZZO

Operations	Sub-Operations	Clarifications
6.6 Spread dry aggregates, if applicable		
6.7 Finish with a trowel		
6.8 Ensure the quality of the work		
6.9 Clean the work area		Equipment and tools must be cleaned with special products, for example acetone.
6.10 Control the moisture		

TASK 7 LAY SLABS ONE BY ONE ON FLOORS ACCORDING TO THE THICKBED PROCESS

Operations	Sub-Operations	Clarifications
7.1 Establish the leader lines	7.1.1 Find the highest point 7.1.2 Trace the starting lines	
7.2 Make the mortar mix	7.2.1 Mix the sand, cement and water	
7.3 Cut the slabs, if applicable		The cuts may have been made at the shop.
7.4 Clean and prepare the underside of slabs		This operation may consist, for example, in removing the fibreglass mesh, scarifying the underside of slabs, removing cut residues, etc.
7.5 Spread a bond coat on the floor (slab area)		
7.6 Spread the base layer of mortar on the bond coat		
7.7 Lay the slab on the mortar bed		
7.8 Adjust the mortar to the desired level		

TASK 7 LAY SLABS ONE BY ONE ON FLOORS ACCORDING TO THE THICKBED PROCESS

Operations	Sub-Operations	Clarifications
7.9 Raise the slab		
7.10 Spread a bond coat on the underside of the slab		
7.11 Put the slab back and compact it		
7.12 Check the final level		
7.13 Do the grouting		
7.14 Ensure the quality of the work		
7.15 Protect the surface		
7.16 Clean the work area		

TASK 8 LAY SLABS ON FLOORS ACCORDING TO THE THINSET PROCESS

Operations	Sub-Operations	Clarifications
8.1 Establish the leader lines	8.1.1 Check the room's squareness 8.1.2 Determine the starting point (according to slab sizes) 8.1.3 Trace the setting lines	
8.2 Cut the slabs, if applicable	8.2.1 Take measurements 8.2.2 Trace on the slabs, if applicable 8.2.3 Cut the slabs	The slabs may be cut in advance depending on the work to be done.
8.3 Clean the underside of slabs	8.3.1 Remove dirt, dust, etc.	
8.4 Mix the thinset mortar	8.4.1 Choose the thinset mortar, if applicable	The choice of thinset mortar depends on the type of material.
8.5 Spread the thinset mortar on the floor	8.5.1 Choose the appropriate trowel 8.5.2 Apply a notched layer of thinset mortar on the floor	

TASK 8 LAY SLABS ON FLOORS ACCORDING TO THE THINSET PROCESS

Operations	Sub-Operations	Clarifications
8.6 Back butter the thinset mortar on the underside of the slabs	8.6.1 Apply a flat coat on the slab	
8.7 Place the slabs on the floor		
8.8 Tamp the slabs to adjust their level	8.8.1 Tamp the slab to transfer mortar (adhesion) 8.8.2 Check the slab's level	
8.9 Do the grouting	8.9.1 Clean the completed floor, as necessary 8.9.2 Protect the surface, if applicable 8.9.3 Spread grout 8.9.4 Allow to dry for a short period 8.9.5 Clean the joints	
8.10 Ensure the quality of the work	8.10.1 Check the following elements: – slab alignment – the floor's flatness – the filling of joints	
8.11 Clean the work area	8.11.1 Pick up the scrap 8.11.2 Put the scrap in containers 8.11.3 Clean and store materials and equipment 8.11.4 Secure the premises during the drying	

TASK 9 LAY SLABS ON WALLS

Operations	Sub-Operations	Clarifications
9.1 Establish the leader lines		
9.2 Cut the slabs, if applicable	9.2.1 Take measurements 9.2.2 Mark the slabs 9.2.3 Cut with a wet saw or a grinder	
9.3 Polish the ridges		This means polishing exposed edges with abrasive paper, soft stone, etc.
9.4 Clean and prepare the underside of slabs	9.4.1 Wash with a sponge and dry 9.4.2 Scarify the underside of slabs	

TASK 9 LAY SLABS ON WALLS

Operations	Sub-Operations	Clarifications
9.5 Prepare the underside of slabs to lay them outdoors	9.5.1 Place a membrane on the underside of slabs 9.5.2 Keep slabs at the temperature of the surface to be covered	
9.6 Prepare the slabs to receive anchors	9.6.1 Determine the necessary type of anchors 9.6.2 Drill the slabs 9.6.3 Groove the slabs	
9.7 Drill or prepare the wall to receive anchors		
9.8 Install anchors on the wall or slabs		Anchors may be mechanical or glued.
9.9 Plumb and align the slabs		
9.10 Place spacers		
9.11 Put the slabs in place	9.11.1 Position the slabs 9.11.2 Check their plumb and level	In some cases, operations 9.10 and 9.11 may be inverted.
9.12 Secure the anchors		
9.13 Place adhesive spots, if applicable		
9.14 Do the grouting or caulking		Some types of slabs require grouting.
9.15 Ensure the quality of the work		
9.16 Clean the work area		

TASK 10 POLISH A SURFACE

Operations	Sub-Operations	Clarifications
10.1 Ensure that the material has sufficiently hardened	10.1.1 Test surface hardness manually	
10.2 Do the first grinding	10.2.1 Determine the grit of the polishing stone 10.2.2 Choose the appropriate grinding accessory 10.2.3 Install the accessory on the grinder 10.2.4 Grind	
10.3 Clean the surface thoroughly	10.3.1 Remove residues with a squeegee 10.3.2 Clean the surface with a wet mop	
10.4 Correct imperfections	10.4.1 Prepare a grout 10.4.2 Spread the grout on the entire surface	
10.5 Do the finish grinding		
10.6 Clean the surface		
10.7 Ensure the quality of the work		
10.8 Clean the work area		
10.9 Apply sealant, if applicable		

TASK 11 DO REPAIR WORK

The repairs concerned here have been noted on the defects list at the end of the work.

Operations	Sub-Operations	Clarifications
11.1 Locate areas to be repaired		
11.2 Remove damaged surfaces	11.2.1 Empty the joints 11.2.2 Remove the surface	
11.3 Remove the bond coat and the mortar bed, if applicable	11.3.1 Remove damaged elements 11.3.2 Clean the surface	
11.4 Prepare the surface to cover	11.4.1 Choose the type of mortar (quickset or cement/sand, etc.) 11.4.2 Spread the mortar	
11.5 Put the new finish materials in place	11.5.1 Make a thickness jig, if applicable 11.5.2 Install finish material	
11.6 Do the grouting	11.6.1 Choose grout whose colour corresponds to the existing grout 11.6.2 Spread the grout 11.6.3 Wash the work	This step is not necessary if a terrazzo surface is being repaired.
11.7 Ensure the quality of the work	11.7.1 Check the work's flatness 11.7.2 Ensure that the joints are well filled, if applicable 11.7.3 Ensure that aggregates and colours are uniform, if applicable 11.7.4 Ensure the work's cleanliness	
11.8 Clean the work area	11.8.1 Pick up the scrap 11.8.2 Put the scrap in containers 11.8.3 Clean and store materials and equipment 11.8.4 Secure the premises during the drying	

2.3 ACHIEVEMENT CONDITIONS

Data on achievement conditions were collected for the tile setter trade as a whole. The data pertains to aspects such as work areas, work instructions, health and safety hazards, reference documents consulted, material resources used, etc.

Table 2.3 Achievement Conditions

ACHIEVEMENT CONDITIONS
Work areas[9] Tile setters work on construction sites, in various types of buildings, and on different jobs – in residences, hotels, restaurants, shopping centres, etc. Their work applies particularly to bathrooms, kitchens, floors generally, pools, balconies, solariums, etc. Tile setters usually work indoors. The participants estimate they spend around 5% of their time working outdoors.
Collaboration and supervision In the residential sector, tile setters must demonstrate a lot of autonomy. Most of the time, the foreman gives them guidelines at the start of work and verifies the result at the end, but the rest of the time, tile setters work autonomously. In the institutional and commercial sector, supervision is a little more important; for example, tile setters must often attend follow-up meetings. Teamwork is quite frequent. The size of teams varies according to the type of work to be done.
Instructions Tile setters receive verbal instructions from their foreman or, occasionally, directly from the client (particularly in the residential sector). The foreman may also produce freehand sketches.

9. Non-exhaustive list.

ACHIEVEMENT CONDITIONS
Stress factors The main stress factors that tile setters have to deal with are the following: ▪ production deadlines are tighter and tighter, particularly in the residential sector; ▪ the availability of materials; ▪ the risk of error, particularly during work with costly materials; ▪ work requiring a great deal of concentration, such as complex patterns; ▪ the lack of job security in the construction field.
References The main references used by tile setters are the plans and specifications. On request, tile setters may also obtain data sheets for the various products and materials.
Tools and equipment In Annex 1 of the present report is a list of material resources used by tile setters in the practice of their trade.
Health and safety hazards According to the participants, the main health and safety hazards to which tile setters are exposed are the following: ▪ backache (weight of materials to be transported); ▪ various injuries (falling, slipping, using power tools, etc.); ▪ crushed fingers (handling tiles and slabs); ▪ cuts and eye injuries (handling laths, contact with splinters when tiles or slabs are being cut or ground); ▪ electrocution (using a wet saw); ▪ injuries due to repetitive movements; ▪ intoxication (fumes from epoxy-based products); ▪ respiratory disorders from inhaling dust. In addition, in Annex 2 of the present report is a more detailed list of the main hazards related to the tasks and operations of the tile setter trade, as well as applicable preventive measures.

2.4 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 the list of criteria for each task, the participants worked in teams of two or three. Their results were then collected and presented in full session. Thus, certain criteria may at times be as relevant to other tasks as to those for which they have been retained.

Table 2.4 Performance Criteria

TASK 1	**PREPARE THE WORK TO BE DONE**
	Performance Criteria
	– Observance of health and safety rules – Correct interpretation of plans, specifications and sketches – Efficient planning of the work – Efficient grouping of materials and equipment – Cleanliness of the work area – Adequate protection of adjacent surfaces – Using appropriate products – No wasted materials – Effectively communicating with co-workers (tile setters, foreman, superintendent, etc.) – Appropriate work allocation among tile setters – Precise determination of everything that should be considered as an extra – Taking all criteria into account when checking surfaces – Scaffolds that meet standards and are appropriate for the work to be done – Carefully checking delivered materials – Appropriate delimitation of the safety perimeter

TASK 2 PREPARE SURFACES

Performance Criteria

- Observance of health and safety rules
- Correct flatness, squareness and level of surfaces
- Carefully checking the solidity of surfaces and the presence of cracks
- Choosing appropriate products
- No wasted materials
- Observance of the characteristics of chosen products
- Meticulous application of products
- Correct installation of membranes, lattices, meshes, etc.
- Observance of work techniques
- Appropriate use of tools and equipment

TASK 3 LAY TILES ACCORDING TO THE THINSET PROCESS

Performance Criteria

- Observance of health and safety rules
- Appropriate choice of tools
- Carefully checking materials
- Meticulously detecting any tile imperfection or breakage
- Exact measurements
- Precision and observance of leader lines
- Observance of measurements
- Precise cuts
- No wasted materials
- Tile cleanliness (before setting)
- Flatness of the work
- Appropriate use of tools and equipment
- Observance of setting heights
- Homogeneous grout
- Observance of data sheets (preparing materials, spreading and cleaning the grout, etc.)
- Joint uniformity
- Cleanliness of the work area after the work is completed
- Effectively collaborating with workers in other trades
- Demonstrating meticulousness and concentration
- Securing the setting area during the curing period

TASK 4	LAY TILES ON A MORTAR BED ACCORDING TO THE THICKBED PROCESS

Performance Criteria

- Observance of health and safety rules
- Choosing the starting point well
- Exact measurements
- Observance of measurements
- Precision and observance of leader lines
- Precise cuts
- Observance of the moisture level for the bond coat
- Flatness of the work (rectitude)
- Appropriate use of tools and equipment
- No wasted materials
- Uniformity and appropriate filling of joints
- Correctly assessing the work done
- Cleanliness of the tools and work area after the work is completed
- Disposing of scrap in appropriate containers
- Securing the setting area during the curing period

TASK 5	APPLY PORTLAND CEMENT-BASED TERRAZZO

Performance Criteria

- Observance of health and safety rules
- Solidity of division blades
- Precision and observance of leader lines
- Consistent thickness of the bond coat
- Following the recipe
- Homogeneous mix
- Observance of application techniques
- No wasted materials
- Regular spreading
- Appropriate use of tools and equipment
- Smooth surface without defects
- Appropriate moisture control
- Securing the setting area during the curing period

TASK 6 APPLY EPOXY-BASED TERRAZZO

Performance Criteria

- Observance of health and safety rules
- Appropriate moisture control
- Precise measurements
- Precision and observance of leader lines
- Solidity of division blades
- Consistent thickness of the bond coat
- Following the recipe
- Homogeneous mix
- No wasted materials
- Observance of open-time for applying material
- Smooth surface without defects
- Observance of application techniques
- Regular spreading
- Appropriate use of tools and equipment
- Using appropriate products for cleaning tools and equipment
- Cleanliness of the tools and work area after the work is completed
- Disposing of scrap in appropriate containers
- Securing the setting area during the curing period

TASK 7 LAY SLABS ONE BY ONE ON FLOORS ACCORDING TO THE THICKBED PROCESS

Performance Criteria

- Observance of health and safety rules
- Precision and observance of leader lines
- Adequate quantity of mortar for the surface to be covered
- Using appropriate blades for the material to be cut
- Observance of the slab grain direction
- Clean slabs
- Consistent thickness of the bond coat
- Observance of application techniques
- No wasted materials
- Appropriate use of tools and equipment
- Observance of techniques
- Taking the material's characteristics into account when tamping
- Flatness of the work
- Cleanliness of the tools and work area after the work is completed
- Disposing of scrap in appropriate containers
- Securing the setting area during the curing period

TASK 8 LAY SLABS ON FLOORS ACCORDING TO THE THINSET PROCESS

Performance Criteria

- Observance of health and safety rules
- Precision and observance of leader lines
- Correct slab alignment
- Precise cuts
- Mixing and spreading thinset mortar uniformly
- Flatness of the work
- Uniformity and appropriate filling of joints
- No wasted materials
- Appropriate use of tools and equipment
- Cleanliness of the tools and work area after the work is completed
- Disposing of scrap in appropriate containers
- Securing the setting area during the curing period

TASK 9 LAY SLABS ON WALLS

Performance Criteria

- Observance of health and safety rules
- Precision and observance of leader lines
- Correct slab alignment
- Precise cuts
- No wasted materials
- Meticulously polishing the ridges
- Clean slabs (before setting them)
- Installing membranes correctly
- Drilling slabs and walls precisely
- Appropriate drilling size
- Secure anchors
- Flatness of the work
- Appropriate use of tools and equipment
- Tightening bolts securely
- Appropriate adhesive consistency
- Smooth and uniform caulking
- Uniformity and appropriate filling of joints
- Cleanliness of the tools and work area after the work is completed
- Disposing of scrap in appropriate containers

TASK 10 POLISH A SURFACE

Performance Criteria

- Observance of health and safety rules
- Observance of data sheets
- Sound and appropriate use of tools and equipment
- Grinding surfaces carefully
- Cleaning surfaces meticulously
- Smooth surfaces without defects
- Cleanliness of the tools and work area after the work is completed
- Disposing of scrap in appropriate containers

TASK 11 DO REPAIR WORK

Performance Criteria

- Observance of health and safety rules
- Correctly locating areas to be repaired
- Precise determination of corrections to be made
- No damage to adjacent surfaces
- Sound choice of products
- Correct surface preparation
- Observance of work techniques
- Appropriate use of tools and equipment
- Uniformity and appropriate filling of joints
- Aesthetic work
- Cleanliness of the tools and work area after the work is completed
- Disposing of scrap in appropriate containers

2.5 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 tile setter trade, three functions appear to stand out:

- a function related to **preparation**, and grouping the following tasks:
  - prepare the work to be done;
  - prepare surfaces;
- a function related to **setting and finishing**, and grouping the following tasks:
  - lay tiles according to the thinset process;
  - lay tiles on a mortar bed according to the thickbed process;
  - apply portland cement-based terrazzo;
  - apply epoxy-based terrazzo;
  - lay slabs one by one on floors according to the thickbed process;
  - lay slabs on floors according to the thinset process;
  - lay slabs on walls;
  - polish a surface;
- a function related to **repairs**, with the following task:
  - do repair work.

3. QUANTITATIVE DATA ON TASKS

3.1 OCCURRENCE

Occurrence data concern the percentage of tile setters[10] who perform a task in the same work environment. The data presented in the tables below are the average results of the workshop participants. However, they account for the use of time not only of the workshop participants, but also of all tile setters working in the companies represented.

Table 3.1 Task Occurrence

	TASK	Occurrence
1	Prepare the work to be done	76.6%
2	Prepare surfaces	77.1%
3	Lay tiles according to the thinset process	94%
4	Lay tiles on a mortar bed according to the thickbed process	53%
5	Apply Portland cement-based terrazzo	16%
6	Apply epoxy-based terrazzo	17%
7	Lay slabs one by one on floors according to the thickbed process	54%
8	Lay slabs on floors according to the thinset process	67.3%
9	Lay slabs on walls	46.3%
10	Polish a surface	33.8%
11	Do repair work	85.3%

10. Including apprentices.

3.2 WORK TIME

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

Table 3.2 Work Time Allocated to Each Task

TASK		Work Time
1	Prepare the work to be done	13.6%
2	Prepare surfaces	17.5%
3	Lay tiles according to the thinset process	43%
4	Lay tiles on a mortar bed according to the thickbed process	3.9%
5	Apply Portland cement-based terrazzo	3%
6	Apply epoxy-based terrazzo	–
7	Lay slabs one by one on floors according to the thickbed process	2.9%
8	Lay slabs on floors according to the thinset process	2.7%
9	Lay slabs on walls	4.9%
10	Polish a surface	1.9%
11	Do repair work	6.6%
		100%

Upon examination of the work time allocation, it was noticed that task 3, “Lay tiles according to the thinset process,” takes up the most of tile setters’ work time (43%), followed by task 2, “Prepare surfaces” (17.5%) and task 1, “Prepare the work to be done” (13.6%). The other tasks each take up between 6.6% (task 11, “Do repair work”) and 1.9% (task 10, “Polish a surface”) of tile setters’ work time. It should be noted that task 6, “Apply epoxy-based terrazzo”, is performed by none of the participants[11].

11. A few participants had performed this task before, but not recently.

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 on the quality of the result, the costs, health and safety, etc.

2. Not very important: Poor execution of the task could lead to minimal costs, a result of lesser quality, minor injury or accident hazards, etc.

3. Important: Poor execution of the task could lead to an unsatisfactory result, substantial additional costs, injuries, accidents, etc.

4. Very important: Poor execution of the task could lead to an unacceptable result and have very substantial consequences in terms of costs, safety, etc.

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.

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 workshop participants.

Table 3.3 Importance and Difficulty of Tasks

	TASK	Importance	Difficulty
1	Prepare the work to be done	3.7	1.9
2	Prepare surfaces	3.8	2.5
3	Lay tiles according to the thinset process	3.3	2.1
4	Lay tiles on a mortar bed according to the thickbed process	3.4	2.6
5	Apply Portland cement-based terrazzo	3.7	3.0
6	Apply epoxy-based terrazzo	3.8	3.4
7	Lay slabs one by one on floors according to the thickbed process	3.5	2.9
8	Lay slabs on floors according to the thinset process	3.5	2.6
9	Lay slabs on walls	3.8	3.2
10	Polish a surface	3.7	2.7
11	Do repair work	3.3	2.2

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 participants, are considered essential for performing the tasks of the tile setter trade.

4.1 KNOWLEDGE

Communication

In their work, tile setters have to communicate with various people, for example other tile setter journeymen and apprentices, as well as foremen, superintendents, workers in other trades, clients (mainly in the residential sector), etc. In all cases, they must be able to maintain good relations, work effectively in teams, and demonstrate respect for others.

Moreover, the tile setting field has a specific terminology to describe equipment, tools, materials, etc.; the tile setter must know that terminology in order to communicate clearly with those around him.

Occasionally, data the tile setter needs to do his work are available only in English (data sheets, packaging of certain products, etc.). Basic knowledge of English terms related to the trade is thus an asset, although not a requirement for practicing the trade.

Materials

The tile setter has to know the basic characteristics of the various materials he uses (ceramic, porcelain, mortar, natural stones, glues, etc.). He must know the incompatibilities between them, the techniques and precautions to use for working on them (cutting, grinding, drilling, polishing, etc.), and must also be able to predict the different reactions of materials, for example to temperature changes. Finally, he must know the Workplace Hazardous Materials Information System (WHMIS) and be able to interpret its material safety data sheets (MSDSs).

Mathematics

Tile setters have to apply basic mathematical knowledge, for example to calculate material quantities. They also apply basic geometry to determine areas (e.g.: Pythagorean Theorem), angles, radiuses, etc. All those calculations use fractions and decimals, since the metric and imperial systems are used. The rule of three is also useful, particularly for converting from one system to the other or for adapting mortar recipes.

Plans and specifications

Given that the tile setter has to interpret plans (and, occasionally, some freehand sketches), he must know the various symbols, scales, abbreviations, etc. He must be able to clearly and precisely interpret the information in the specifications.

Techniques

Tile setters must have a good knowledge of the various techniques for setting tiles, slabs and terrazzo. To do so, knowledge of certain basic principles of physics, in particular the law of gravity, is useful to them. That knowledge is also useful for handling very heavy slabs with lifting appliances.

In addition, the participants emphasized the importance of knowing and mastering grouting techniques, which can have a crucial impact on the final quality of the work. Indeed, a perfect installation can be ruined by poorly executed grouting.

4.2 SKILLS

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

Cognitive skills

Cognitive skills pertain to intellectual strategies applied in working. The main cognitive skills that tile setters need are the following:

- logic;

- decision-making (e.g.: to assess the feasibility of certain tasks);
- problem-solving (e.g.: to adapt work procedures, face contingencies, etc.).

Motor skills

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

- dexterity;
- coordination.

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 that tile setters need are the following:

- distinguishing colours, shades and nuances, to ensure coherent surfaces and finishes;
- tactile perception, to evaluate the flatness of surfaces and ensure the absence of defects;
- sense of observation, to detect defects, fitting problems during repairs, etc.

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 tile setters need are the following:

- autonomy;
- ability to adapt to different situations and contingencies;
- ability to concentrate;
- confidentiality of client information;
- sociability, to interact with co-workers, the foreman, clients, workers in other trades, etc.;
- team spirit;
- aesthetic sense;
- conscientiousness.

5. TRAINING SUGGESTIONS

Initial training

The participants made suggestions about various aspects of initial training. They suggest:

- a mentoring system whereby contractors would be subsidized to hire and train new apprentices, thus enabling contractors to spend more time supervising the new workforce;
- choosing apprentices among workers who already have experience in the field, for example as labourers, rather than by opening up candidate pools;
- training apprentices well in using common tools like grinders;
- encouraging apprentices to work in the commercial sector, which offers a more complete apprenticeship of the trade than the residential sector;
- insisting on the actual working conditions on construction sites during the selection of students in training centres;
- increasing the duration of the occupational training program, which the participants find too short, and introducing students to construction sites.

Continuous training and professional development

For professional development, the participants suggest activities regarding:

- the application of terrazzo (Portland cement and epoxy);
- sanding techniques;
- methods for improving mortar bed quality;
- practical measurement and calculation methods. The participants pointed out that the current course in these subjects is too theoretical and lacks concrete applications in the trade.

Annexes

Annex 1
Tools and Equipment

During the workshop, the participants were shown lists of tools and equipment from the national occupational analysis of the tile setter trade (Red Seal). In the following pages is the list, for each task, of tools and equipment that was validated by the participants.

Table A.1 Tools and Equipment

Shaded boxes indicate **unused** items.

	Prepare the work to be done	Prepare surfaces	Lay tiles according to the thinset process	Lay tiles on a mortar bed according to the thickbed process	Apply Portland cement-based terrazzo	Apply epoxy-based terrazzo	Lay slabs one by one on floors according to the thickbed process	Lay slabs on floors according to the thinset process	Lay slabs on walls	Polish a surface	Do repair work
STANDARD TOOLKIT											
lights											
broom											
surge protector											
mitre box											
mortar holder											
hand brush											
wheelbarrow											
tin snips											
chisels											
chalk line											
tile cutters											
putty knife											
utility knife											
sponges											
plastic sheets											
floor scraper											

	Prepare the work to be done	Prepare surfaces	Lay tiles according to the thinset process	Lay tiles on a mortar bed according to the thickbed process	Apply Portland cement-based terrazzo	Apply epoxy-based terrazzo	Lay slabs one by one on floors according to the thickbed process	Lay slabs on floors according to the thinset process	Lay slabs on walls	Polish a surface	Do repair work
marking instruments										■	
mallet	■	■			■	■				■	
claw hammer							■	■	■	■	■
shovel			■					■	■		
clawbar			■	■	■	■				■	
stone polisher	■	■							■		■
vise grips	■	■		■	■	■	■	■	■	■	■
pliers	■	■			■		■	■	■	■	■
tile nippers	■	■			■	■	■		■	■	
caulking gun	■	■					■				
mortar board	■	■				■	■	■	■	■	■
squeegee	■	■				■	■		■		
extension cords											
straight edge										■	
gummed tape	■	■			■		■				
hacksaw	■	■					■	■	■	■	
pail											
grout float	■	■			■				■		
wood float	■		■				■	■	■	■	
rags	■	■									
screwdrivers	■	■			■	■	■	■			
joint trowel	■	■			■		■				
cove base trowel	■	■	■				■	■	■	■	■
compaction trowel	■	■	■					■	■	■	
finishing trowel	■		■					■	■		
notched trowel	■				■				■	■	
magnesium float	■		■		■		■	■	■	■	

	Prepare the work to be done	Prepare surfaces	Lay tiles according to the thinset process	Lay tiles on a mortar bed according to the thickbed process	Apply Portland cement-based terrazzo	Apply epoxy-based terrazzo	Lay slabs one by one on floors according to the thickbed process	Lay slabs on floors according to the thinset process	Lay slabs on walls	Polish a surface	Do repair work
margin trowels	■	■					■				
mop											
suction cups	■	■		■	■	■			■	■	
MEASURING AND LAYOUT EQUIPMENT											
storey pole	■	■			■					■	
calculator											
squares	■	■								■	
plumb line	■	■				■	■	■		■	
water level	■	■								■	■
laser leveller (horizontal, line and rotating)										■	
builder's level			■	■			■	■	■	■	■
straight edges							■			■	
tape measure										■	
theodolite (levelling)	■	■	■	■	■		■	■		■	■
PERSONAL PROTECTIVE EQUIPMENT AND SAFETY EQUIPMENT											
full body harness					■	■	■	■		■	■
hard hat											
safety footwear											
air circulator		■					■		■		■
coveralls (fire retardant)	■	■	■	■	■	■	■	■			■
lifeline					■		■	■		■	■
rope grabs	■	■	■		■		■	■		■	■
ground-fault circuit interrupter	■	■	■						■		
eye wash facilities		■									
air exchanger	■	■	■	■		■	■		■		
face shields	■	■	■	■	■	■	■				
fire extinguishers	■	■	■	■	■	■					■
rubber gloves											
leather gloves		■	■	■	■			■			

	Prepare the work to be done	Prepare surfaces	Lay tiles according to the thinset process	Lay tiles on a mortar bed according to the thickbed process	Apply Portland cement-based terrazzo	Apply epoxy-based terrazzo	Lay slabs one by one on floors according to the thickbed process	Lay slabs on floors according to the thinset process	Lay slabs on walls	Polish a surface	Do repair work
knee pads											
safety vest											
portable lighting											
particle masks											
vapour masks											
warning signs											
saw guards											
ear plugs and muffs											
respirators											
caution tape											
signage											
first aid kit/equipment											
exhaust fan											
SCAFFOLDING AND ACCESS EQUIPMENT											
sawhorses											
scaffolds (mechanical, stationary, rolling)											
ladders											
telescopic ladders											
boom lifts											
scissor-lift											
aluminium planks											
ramps											
pallet truck											
PORTABLE POWER TOOLS AND ACCESSORIES											
industrial wet and dry vacuum cleaner											
power chisel											
power grout washing machine											
floor scrubber											
power grouting machine											

	Prepare the work to be done	Prepare surfaces	Lay tiles according to the thinset process	Lay tiles on a mortar bed according to the thickbed process	Apply Portland cement-based terrazzo	Apply epoxy-based terrazzo	Lay slabs one by one on floors according to the thickbed process	Lay slabs on floors according to the thinset process	Lay slabs on walls	Polish a surface	Do repair work
jack hammer		■	■		■		■		■	■	
drum cement mixer	■	■	■				■	■	■		■
floor grinding machine		■					■		■		■
base grinding machine	■	■	■				■	■	■		■
angle grinders	■		■				■	■			
impact drill	■		■			■	■			■	
power drill	■	■	■		■	■	■			■	
mixing drill	■										
hot glue gun	■	■			■	■	■		■	■	■
buffer	■		■								■
floor polisher	■		■					■	■		■
angle grinder	■										
power scarifier				■	■	■	■		■	■	■
wet saw	■	■			■	■				■	
circular saw	■	■	■	■	■	■	■	■		■	
chipping hammer					■		■	■	■	■	
SPECIALTY TOOLS AND EQUIPMENT											
heaters											
communication devices			■		■		■				■
sealer applicator	■		■								
tile cutting jigs	■	■			■	■		■	■	■	
generator			■		■	■	■				■
cement mixer	■		■		■				■	■	
stone grinder	■	■	■				■		■		
stone polisher	■	■	■								
terrazzo roller	■	■	■			■	■	■	■		

Annex 2

Grid of Occupational Health and Safety Elements

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Commission de la santé et de la sécurité du travail

Table A.2 Description of Hazards in the Tile Setter Trade

No.	Hazards	Effects on Health and Safety	Means of Prevention
1	**Using machines and tools** Trimming and cutting tiles (tile cutter or wet saw)	• Hearing disorders (hearing loss up to deafness) provoked by regular exposure to loud noise	• If possible, reduce noise at the source. • Make hearing protectors (earmuffs, plugs, etc.) available to workers. • Limit the time spent using noisy machines and tools.
		• Respiratory disorders due to dust inhalation	• Use respiratory protective equipment (dust masks).
		• Eye and face injuries (tile or slab splinters when they are cut or polished)	• Wear goggles.
		• Electrifications, electrical discharges, electrocution (with the wet saw)	• Before each use of the wet saw, check the condition of power cords and electrical connections. • Use a power outlet well protected against electrical overloads caused by moisture. • Use a ground-fault interrupter.
	Using sharp and pointy tools (chisels, tin snips, utility knife, putty knife, etc.)	• Cuts • Hand injuries	• Use suitable tools. • Plan for protection on tools' sharp areas (case, storage) as soon as tools are no longer in use.
		• Musculoskeletal disorders (tendinitis, epicondylitis, carpal tunnel syndrome, etc.)	• Limit the duration of tasks requiring movements exercising finger pressure or flexing and twisting wrists or forearms.

No.	Hazards	Effects on Health and Safety	Means of Prevention
1	Using portable power tools (jack hammer, power or impact drill, circular saw, polisher, etc.)	• Hand-arm vibration syndrome: vascular (white fingers), neurological (numbness and neurosensory disorders) and musculoskeletal (pain, stiffness, loss of dexterity, etc.) disorders	• Maintain tools in good condition through regular maintenance. • Use a tool suitable for the task to be performed. • Check the good condition of each tool before use. • Follow manufacturer instructions. • Choose and use appropriate protective equipment.
	Using scaffolds and access equipment: scaffolds (stationary, mechanical, rolling), telescopic ladders, scissor lift, etc.	• Falls that may lead to death, head trauma, fractures, contusions, wounds and crushing	• Use work platforms equipped with guardrails, toeboards and handrails. • Use ladders that meet standards, rest on stable supports and are kept in place by an anti-slip device. • Use personal protection equipment against falls (harness with shock absorber, fixed-point ties, etc.).
2	**Using products and materials** Applying epoxy-based terrazzo	• Skin lesions (eczema) on fingers, wrists, forearms and face, notably on eyelids	• Eliminate or reduce skin contact possibilities. • Use appropriate gloves (those specially made for using epoxy). • Inform users about epoxy hazards.
	Preparing mortar mixes and applying Portland cement-based terrazzo	• Skin irritations and allergies • Eye disorders (eyelid irritations, conjunctivitis)	• Limit contact with cement. • Wear adequate personal protective equipment (gloves, protective clothing, dust masks if necessary, etc.). • Maintain rigorous hygiene (washing hands with soap, protective and regenerative creams).

No.	Hazards	Effects on Health and Safety	Means of Prevention
3	**Air quality** Presence and inhalation of silica dust during cutting, sanding, etc. operations	• Bronchopulmonary cancer • Pneumoconiosis, scleroderma	• Detect materials likely to contain silica. • Ensure that safe methods are put in place for removing materials containing silica. • Wear personal protective equipment.
	Presence and inhalation of asbestos dust during repair work	• Bronchopulmonary cancer • Pleural thickening, pleural plaques • Asbestosis • Mesothelioma	• Detect materials likely to contain asbestos. • Ensure that safe methods are put in place for removing materials containing asbestos. • Wear personal protective equipment.
4	**Awkward postures** Awkward postures during the execution of certain tasks (crouching, kneeling, bending over, etc.)	• Lesions of the knee (affecting the menisci) or of the Achilles tendon • Knee hygroma (or bursitis) • Neck lesions	• Organize the work so as to eliminate or reduce awkward postures. • Use a knee roller for kneeling postures (small cushion or knee pad).
5	**Handling loads manually** Lifting and moving heavy loads, from fifty to a hundred pounds (e.g. marble slabs)	• Lumbar spine injuries (sciatica, herniated disk, etc.) • Back-injury accidents: sprains, strains and tears	• Ensure that loads do not weigh more than certain recognized limits (25 kg for the NIOSH[12] or 25 kg for the ISO 11 228-1 standard, for example) and that the pace of work is suitable. • Make handling tools available to workers. • Store materials as close as possible from their place of use, to minimize handling. • Ensure that the workers have been trained in safe handling techniques (placing oneself as close as possible to the load, keeping the back straight, bending the legs, etc.).
		• Limb contusions	• Wear personal protective equipment: handling gloves, safety shoes, etc. • Use grasping accessories such as jacks, rams, hooks, to ensure that the load is safely grasped.

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No.	Hazards	Effects on Health and Safety	Means of Prevention
6	**Work environment** Cleaning the work area (scraping joint compound residues on floors and removing all traces of dirt)	• Intoxications by inhalation or absorption, and skin or eye burns from strong chemicals • Being cut or pricked by certain scrap	• Choose the cleaning products. • Wear personal protective equipment.
	Moving frequently on uneven, cluttered, poorly lit or slippery ground (construction site work)	• Wounds, fractures and sprains from same-level falls	• Maintain order in and around the work space. • Remove any obstacle from paths. • Make it mandatory to wear safety shoes, particularly anti-slip ones.
7	**Variable weather conditions** Working outdoors in cold or hot weather	• Frostbite • Heatstroke • Dehydration • Headache • Cramps	• Adopt work-rest cycles that allow adequate recovery. • Drink water more often (working in hot weather) or drink a hot beverage (working in cold weather). • Wear appropriate work clothing.
8	**Working in indoor spaces** Working inside buildings (bathrooms, kitchens, solariums, etc.) with exposure to fumes from chemicals used	• Irritation (skin, eyes, respiratory tracts) • Headache, fainting • Organ lesions (liver, kidneys, nervous system)	• Ventilate the area (fume hood). • Replace a dangerous product with a less dangerous one. • Wear personal protective equipment.
9	**Work organization and duration** Frequently working in the evening or weekend (institutional and commercial sector), or working more hours to make up for construction site delays	• Sleep and attention disorders • Digestive disorders • Nervous disorders • Irritability • Cardiovascular disease • Wearing out prematurely	• Organize breaks during the night. • Avoid worker isolation. • Ensure optimized lighting.

No.	Hazards	Effects on Health and Safety	Means of Prevention
10	**Stress** Main stress factors to which tile setters are exposed: - tighter and tighter deadlines - availability of materials - risks of errors during work with costly materials - worrying about job security	• Musculoskeletal disorders (joint and muscular pain) • Gastrointestinal disorders (stomach ache, pain and ulcers) • Heart attacks and strokes (high blood pressure, heart palpitations, coronary heart disease, etc.) • Headaches, migraines	• Adopt an approach for analysing symptoms to determine their causes. • Eliminate or reduce recognized causes. • Offer support to workers exposed to stress. • Train workers exposed to stress (time management, workload management, etc.).