Erector Mechanic (Glazier)

Occupational Analysis Report

May 2011

Commission
de la construction
du Québec

The purpose of this report is to describe as accurately as possible the erector mechanic (glazier) 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 CCQ for teaching and learning purposes.

The present report does not bind the CCQ 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

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

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TABLE OF CONTENTS

List of Tables

INTRODUCTION

In early 2009, the CCQ's Direction de la formation professionnelle 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 analysis of the erector mechanic (glazier) trade belongs to this context[3]. Its purpose is to describe the trade as currently practiced by construction industry journeymen. The present report was written in order to collate and organize the information gathered during the occupational analysis workshop held in Laval on December 11 and 12, 2010.

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 erector mechanics (glaziers). 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, sec. 24), the term “erector mechanic (glazier)” means:

> […] any person who installs and repairs work (permanent or not) related to the flat glass industry and all other similar work made of metal or substitute materials, namely: installs and repairs all types of glass and their frames, ornamental or decorative items, prefabricated sheeting, curtain walls, doors, windows, show windows and other structures made of sheet metal or trims and fastened by means of an adhesive base or otherwise, but only, in the case of works not made of glass, when such works are accessory or secondary to setting or installing flat glass, when such works are related to the doors and windows of a building, and when such works are used as a substitute for glass.
>
> Performance of the work described in the first paragraph includes trade-related handling for the purposes of immediate and permanent installation.

The workshop participants discussed the installation of garage doors by erector mechanics (glaziers), which is not specifically mentioned in the definition of the trade. It was agreed that the definition uses the term “door” in a broad sense and includes garage doors. Likewise for automatic doors.

1.2 JOB TITLES

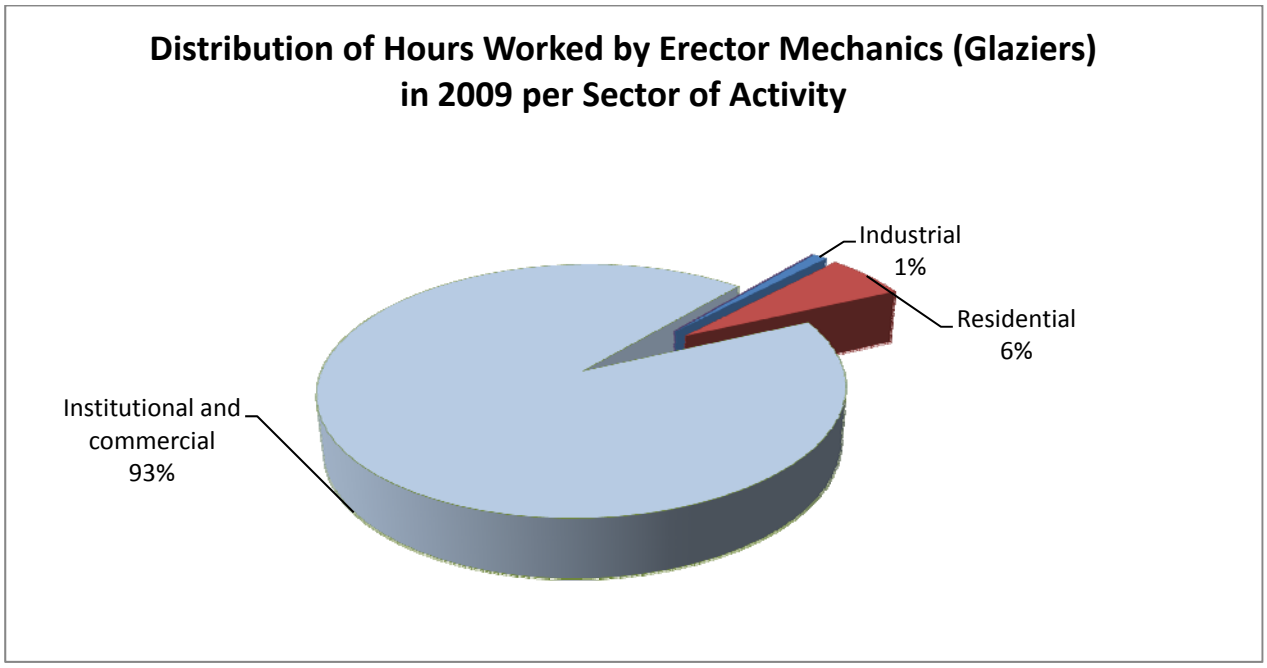
Generally, on construction sites, the title “glazier” is used. Workers who install automatic doors are often called “technicians.” However, the title “erector mechanic (glazier)” is used in the definition of the trade, so it will also be used in the present report.

1.3 SECTORS OF ACTIVITY

Erector mechanics (glaziers) are active in the construction industry's four sectors, but to varying degrees. They rarely work in the civil engineering and roads sector.

The diagram below illustrates the distribution of hours worked by all erector mechanics (glaziers) in Quebec for the year 2009 in the three most important sectors[4].

Table 1.1 Workload of Erector Mechanics (Glaziers)



We asked the participants about the sectors in which they practice their trade. According to seven participants, the above mentioned work distribution represents their reality well. However:

- According to three participants, the numbers should be: 93% for the institutional and commercial sector; 1% for the residential sector; and 6% for the industrial sector;
- According to one participant, the numbers should be: 95% for the institutional and commercial sector; 3% for the residential sector; and 2% for the industrial sector.

As we can see, the institutional and commercial sector accounts for almost all the hours worked by erector mechanics (glaziers).

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

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

The construction industry's erector mechanics (glaziers) 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 Québec 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 by-laws, if applicable.

In addition, the following standards apply, directly or indirectly, to products installed by erector mechanics (glaziers).

Table 1.2 Standards Applicable to the Trade

Directly	Indirectly
▪ ASTM F476-84 Standard Test Methods for Security of Swinging Door Assemblies ▪ CSA A-440-00 Windows ▪ CSA A-440.2-09 Fenestration Energy Performance ▪ CSA A-440.4-07 Window, Door, and Skylight Installation ▪ CAN/CGSB 12.1-M90 Tempered or Laminated Safety Glass ▪ CAN/CGSB 12.2-M91 Flat, Clear Sheet Glass ▪ CAN/CGSB 12.3-M91 Flat, Clear Float Glass ▪ CAN/CGSB 12.4-M91 Heat Absorbing Glass ▪ CAN/CGSB 12.8-97 Insulating Glass Units ▪ CAN/CGSB 12.10-M76 Glass, Light and Heat Reflecting ▪ CAN/CGSB 12.11-M90 Wired Safety Glass ▪ CAN/CGSB 12.20-M89 Structural Design of Glass for Buildings ▪ CAN/CGSB 63.14-M89 Plastic Skylights ▪ CAN/CGSB 82.1-M89 Sliding Doors ▪ CAN/CGSB 82.5-M88 Insulated Steel Doors ▪ NFPA 80 Standard for Fire Doors and Other Opening Protectives ▪ LEED standards (Leadership in Energy and Environmental Design*)* ▪ Regulation respecting energy conservation in new buildings (c. E-1.1, r. 1) ▪ AAADM (American Association of Automatic Door Manufacturers) Code	▪ ASTM E96-95 Standard Test Methods for Water Vapor Transmission of Materials ▪ CAN/CSA 0132.2 Series 90 Flush Wood Doors ▪ CAN/CSA-S157-F05/S157.1-05 Strength Design in Aluminum

1.6 WORKING CONDITIONS[5]

The following information provides an overview of the conditions and context of the work of erector mechanics (glaziers), 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 in 2009 was $52,196. The proportion of erector mechanics (glaziers) having cumulated the 500 hours was 72%.

The hourly wage of an erector mechanic (glazier) at December 11, 2010 was as follows:

- Industrial, institutional and commercial: $32.65
- Civil engineering and roads: $33.01
- Light residential: $29.19
- Heavy residential: $32.65

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 worked statutory holidays, as well as a lump sum for sick leaves not otherwise paid.

5. The general data on working conditions are taken from the 2010-2013 sector-based collective agreements of the construction industry's four sectors, and from the document *Carrières construction*, 2010-2011 edition, published by the Commission de la construction du Québec.

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 is quite demanding in terms of physical strength and endurance. Erector mechanics (glaziers) often have to lift, carry and install heavy glass (or other) products, which they must often handle with precision and without sudden moves. Those loads are often lifted and carried in teams of two, which requires good coordination with one's teammate to avoid injuries and breakages.

The capacity to work in difficult weather conditions – strong winds, rain, snow or summer heat – is necessary for erector mechanics (glaziers). Generally, the work requires a good physical condition, vigour and the capacity to provide constant effort. Finally, working from heights, which is frequent in this trade, would be difficult for erector mechanics (glaziers) subject to vertigo.

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 special schedules confer flexibility to the work schedules in effect in the construction industry.[6]

Erector mechanics (glaziers) often must work outside regular working hours, i.e., during evenings and weekends. Schedules vary according to the urgency of ongoing work and to deadlines; overtime is therefore not rare.

The majority of the participants (8 out of 11) occasionally have to work outside their residential area, and thus must be absent from their home for periods varying according to the construction sites.

It is possible for an experienced erector mechanic (glazier) to work year-long. However, many experience a work stoppage for two months annually on average. Generally, employers acquire a core of erector mechanics (glaziers) who work year-long. A number of employees gravitate around that core; they are personnel hired contractually according to demand. They are first to be laid off when the supply of work diminishes. Currently, given the high demand, most erector mechanics (glaziers) can work year-long.

1.7 JOB MARKET ENTRY CONDITIONS[7]

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 a course of study recognized by the CCQ, notably the course of study leading to a vocational studies diploma (DEP) in assembly and installation of glass products, 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.

6. Read on this subject the Professional Subcommittee's comment in Annex 3, note No. 1.
7. Other conditions than those listed above may apply, depending on the particular situation of candidates, the region, etc. 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.

Although the construction industry favours graduates for access to the trade, labour shortages may at times make it necessary for the CCQ to admit candidates without a diploma. Thus, candidates without a diploma 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 course of study leading to a DEP in the trade referred to in the application or pledge, by signing a consent letter, to take the necessary training to obtain those prerequisites;

- Present a guarantee of employment registered during a labour-pool opening by an employer registered with the CCQ, for at least 150 hours over a period of at most three consecutive months.

The erector mechanic (glazier) apprentice 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 in which leads to obtaining the Competency Certificate-Journeyman for the trade. Credits are paid into the apprenticeship record book of an erector mechanic (glazier) apprentice who has obtained his diploma.[8]

Among the erector mechanics (glaziers) attending the meeting, only one has obtained his DEP; the others began practicing the trade before the course of study existed.

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

- experience in the type of work required;
- resourcefulness;
- being conscientious;
- having team spirit;
- dexterity.

8. Read on this subject the Professional Subcommittee's comment in Annex 3, note No. 2.

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[9], the proportion of women active in the trade of erector mechanic (glazier) is 0.4% (8 women out of 1,921 erector mechanics (glaziers) in 2009).

According to the participants, the main obstacle to women's integration in the trade is the physical strength required to perform most of the tasks. Although there are standards for the maximum weight that workers may lift, it remains that in reality, erector mechanics (glaziers) do not always have hoisting equipment at hand; so they must regularly lift loads that are too heavy for most women.

However, some participants pointed out that the work is highly varied and that some sectors require less physical strength than others. Therefore, women interested in the trade could certainly find suitable work, but the participants also mentioned the persistence of prejudice about the place of women in the trade.

1.9 CAREER PROSPECTS

According to the participants, erector mechanics (glaziers) have few prospects for promotion. After a number of years of experience that varies according to function and context, erector mechanics (glaziers) may become foremen or, if office work is of interest to them, project managers.

Erector mechanics (glaziers) interested in entrepreneurship can also start their own business.

Given that erector mechanics (glaziers) of the baby-boomer generation will retire in a few years, permanent positions are expected to be available and opportunities for advancement will open up to younger erector mechanics (glaziers).

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

1.10 DEVELOPMENT OF THE TRADE

Regarding the work itself, it is observed that assembly has become less common on construction sites; more and more elements are prefabricated in plants, and thus outside construction sites. Also observed is an increased use of hoisting and handling equipment on construction sites, thus reducing accident or injury hazards for erector mechanics (glaziers). However, new products are appearing and make it possible to adapt installations to winter weather, thus shortening construction site work stoppages.

The participants also reported that deadlines are tighter and tighter, which raises the stress experienced by erector mechanics (glaziers). Indeed, they are required to work faster and faster, while maintaining the finished product's quality.

Finally, the participants mentioned a growing concern for health and safety hazards.

1.11 IMPACT OF ENVIRONMENTAL STANDARDS ON THE PRACTICE OF THE TRADE

According to the workshop participants, environmental standards do not really have much impact on the work of erector mechanics (glaziers). Only LEED[10] projects involve specific environmental requirements that have a concrete effect on the trade's tasks, but those projects, although increasing in number, are still very infrequent.

10. *Leadership in Energy and Environmental Design.*

2. WORK DESCRIPTION

2.1 TASKS AND OPERATIONS

List of tasks

The following list presents the main tasks performed by erector mechanics (glaziers). The order in which the tasks are presented does not necessarily reflect their importance in the trade.

Task 1 Install curtain walls[11]

Task 2 Install windows

Task 3 Install residential, commercial and industrial garage doors

Task 4 Install residential and commercial doors

Task 5 Install glass showers

Task 6 Install glass panels and doors

Task 7 Install mirrors

Task 8 Install glass ramps and guardrails

Task 9 Install related glass products[12]

Task 10 Repair glass products

Task 11 Install aluminum panels[13]

Table of tasks and operations

During the workshop, a table of tasks and operations performed by erector mechanics (glaziers) was proposed to the participants. After discussions, modifications were made to the table. The final version is presented in the following pages.

11. This task includes the installation of skylights, glassworks, etc.
12. Glass products such as displays, shelves, racks, divisions, smoke screens, stained-glass windows, etc.
13. Read on this subject the Professional Subcommittee's comment in Annex 3, note No. 3.

Table 2.1 Tasks and Operations

TASKS	OPERATIONS					
1. INSTALL CURTAIN WALLS[14]	1.1 Consult the plans, shop drawings and work order	1.2 Check and pick up materials, tools and equipment	1.3 Take readings and do levelling work	1.4 Prepare materials for installation	1.5 Position scaffoldings (fixed and mobile), if applicable	1.6 Secure the premises
	1.7 Prepare the opening and install anchors	1.8 Assemble and fasten the frame	1.9 Lay or apply sealants (glass) and glazing tape	1.10 Install glass and components	1.11 Ensure that the frame is sealed	1.12 Install insulating products and do the finishing around the frame
	1.13 Install pressure plates and covers	1.14 Install a fire barrier joint	1.15 Install sealants	1.16 Check the work quality	1.17 Make corrections, if applicable	1.18 Clean the premises and products
	1.19 Store the equipment and tools					
2. INSTALL WINDOWS	2.1 Consult the plans, shop drawings and work order	2.2 Check and pick up materials, tools and equipment	2.3 Prepare materials for installation	2.4 Position scaffoldings (fixed and mobile), if applicable	2.5 Secure the premises	2.6 Prepare the opening
	2.7 Fasten the frame	2.8 Apply glazing tape	2.9 Install glass and components	2.10 Install the shutter and adjust the hardware	2.11 Install insulating and sealing products	2.12 Do the finishing
	2.13 Check the work quality	2.14 Make corrections, if applicable	2.15 Clean the premises and products	2.16 Store the equipment and tools		

14. This task includes the installation of skylights, glassworks, etc.

TASKS	OPERATIONS					
3. **INSTALL RESIDENTIAL, COMMERCIAL AND INDUSTRIAL GARAGE DOORS**	3.1 Consult the plans, shop drawings and work order	3.2 Check and pick up materials, tools and equipment	3.3 Prepare materials for installation	3.4 Position scaffoldings (fixed and mobile), if applicable	3.5 Secure the premises	3.6 Prepare the opening, if applicable
	3.7 Assemble components	3.8 Install rails, panels and springs	3.9 Install door operators	3.10 Install the chain hoist or door openers	3.11 Install the security system on the door and related accessories	3.12 Adjust the door
	3.13 Install related accessories	3.14 Do the finishing	3.15 Check the work quality	3.16 Make corrections, if applicable	3.17 Clean the premises and products	3.18 Store the equipment and tools
4. **INSTALL RESIDENTIAL AND COMMERCIAL DOORS**	4.1 Consult the plans, shop drawings and work order	4.2 Check and pick up materials, tools and equipment	4.3 Prepare materials for installation	4.4 Position scaffoldings (fixed and mobile), if applicable	4.5 Secure the premises	4.6 Prepare the opening
	4.7 Install the frame	4.8 Install the door shutter(s)	4.9 Do the glazing	4.10 Install the hardware[15]	4.11 Make electrical connections, if applicable	4.12 Adjust the door, hardware and, if applicable, electrical controls
	4.13 Apply sealants and insulation and do the finishing	4.14 Check the work quality	4.15 Make corrections, if applicable	4.16 Clean the premises and products	4.17 Store the equipment and tools	

15. Hardware: motion sensors, card readers, push-buttons, door closers, panic bars, locks, etc.

TASKS	OPERATIONS					
5. **INSTALL GLASS SHOWERS**	5.1 Consult the plans, shop drawings and work order	5.2 Check and pick up materials, tools and equipment	5.3 Prepare the materials and premises for the installation	5.4 Secure the premises	5.5 Fasten trims and hardware	5.6 Install glass and components
	5.7 Lay or apply sealants	5.8 Check the work quality	5.9 Make corrections, if applicable	5.10 Clean the premises and products	5.11 Store the equipment and tools	
6. **INSTALL GLASS PANELS AND DOORS**	6.1 Consult the plans, shop drawings and work order	6.2 Check and group materials, tools and equipment	6.3 Prepare materials for installation	6.4 Take readings and do levelling work	6.5 Position scaffoldings (fixed and mobile), if applicable	6.6 Secure the premises
	6.7 Prepare the site	6.8 Fasten the bases or install the frames	6.9 Install the hardware and make electrical connections, if applicable	6.10 Apply glazing tape or mastic	6.11 Install glass and components	6.12 Lay or apply sealants
	6.13 Install the door	6.14 Adjust the hardware and electrical components	6.15 Do the finishing	6.16 Check the work quality	6.17 Make corrections, if applicable	6.18 Clean the premises and products
	6.19 Store the equipment and tools					

TASKS	OPERATIONS					
7. **INSTALL MIRRORS**	7.1 Consult the plans, shop drawings and work order	7.2 Check and group materials, tools and equipment	7.3 Prepare materials for installation	7.4 Position scaffoldings (fixed and mobile), if applicable	7.5 Secure the premises	7.6 Prepare the site
	7.7 Fasten trims	7.8 Apply adhesives	7.9 Install the mirror and components	7.10 Fasten the finish trims	7.11 Check the work quality	7.12 Make corrections, if applicable
	7.13 Clean the premises and products	7.14 Store the equipment and tools				
8. **INSTALL GLASS RAMPS AND GUARDRAILS**	8.1 Consult the plans, shop drawings and work order	8.2 Take measurements and prepare templates, if applicable	8.3 Check and pick up materials, tools and equipment	8.4 Prepare materials for installation	8.5 Position scaffoldings (fixed and mobile), if applicable	8.6 Secure the premises
	8.7 Take readings and do levelling work	8.8 Fasten the bases, if applicable	8.9 Apply adhesives or install fasteners and, if applicable, glazing tape	8.10 Install glass and components and, if applicable, sealants	8.11 Do the finishing	8.12 Check the work quality
	8.13 Make corrections, if applicable	8.14 Clean the premises and products	8.15 Store the equipment and tools			

TASKS	OPERATIONS					
9. **INSTALL RELATED GLASS PRODUCTS**	9.1 Consult the plans, shop drawings and work order	9.2 Check and pick up materials, tools and equipment	9.3 Prepare materials for installation	9.4 Take readings and do levelling work	9.5 Position scaffoldings (fixed and mobile), if applicable	9.6 Secure the premises
	9.7 Prepare the site	9.8 Put the product in place	9.9 Do the finishing	9.10 Check the work quality	9.11 Make corrections, if applicable	9.12 Clean the premises and products
	9.13 Store the equipment and tools					
10. **REPAIR GLASS PRODUCTS**	10.1 Observe the situation	10.2 Diagnose the problem	10.3 Propose a solution	10.4 Check and pick up materials, tools and equipment	10.5 Position scaffoldings (fixed and mobile), if applicable	10.6 Secure the premises
	10.7 Repair, adjust or replace a defective component	10.8 Check the work quality	10.9 Clean the premises and products	10.10 Store the equipment and tools		
11. **INSTALL ALUMINUM PANELS**[16]	11.1 Consult the plans, shop drawings and work order	11.2 Check and pick up materials, tools and equipment	11.3 Position scaffoldings (fixed and mobile), if applicable	11.4 Secure the premises	11.5 Take readings and do levelling work	11.6 Prepare the surface and install substructures and anchors
	11.7 Prepare the aluminum panels	11.8 Fasten the aluminum panels	11.9 Install finishing components	11.10 Clean the products and check the installation quality	11.11 Make corrections, if applicable	11.12 Store the equipment and tools and clean the premises

16 .Read on this subject the Professional Subcommittee's comment in Annex 3, note No. 3.

2.2 OPERATIONS, SUB-OPERATIONS AND CLARIFICATIONS

In the following pages are presented sub-operations related to most of the operations[17], as well as a few clarifications made by the participants.

Table 2.2 Sub-Operations and Operation Clarifications

TASK 1 INSTALL CURTAIN WALLS

Operations	Sub-Operations	Clarifications
1.1 Consult the plans, shop drawings and work order	1.1.1 Find out about the project 1.1.2 Check measurements in relation to centre lines 1.1.3 Check mullion numbers, anchor positions, anchor types 1.1.4 Check material, hardware and caulking product specifications	
1.2 Check and pick up materials, tools and equipment	1.2.1 Check anchors 1.2.2 Unpack and check the materials 1.2.3 Store the materials 1.2.4 Check the mullions 1.2.5 Ensure the availability of materials, tools and equipment 1.2.6 Ensure the good operation of tools 1.2.7 Check that all materials, tools and equipment are present 1.2.8 Load the truck, if applicable	
1.3 Take readings and do levelling work	1.3.1 Check survey readings and the elevation benchmark 1.3.2 Check and draw the centre lines 1.3.3 Transfer the lines to the next floors	
1.4 Prepare materials for installation	1.4.1 Unpack the materials	
1.5 Position scaffoldings (fixed and mobile), if applicable	1.5.1 Determine the type of scaffolding required: • tubular • flying • giraffe • scissor lifts • etc.	Depending on the size of necessary scaffoldings, they may be installed by subcontractors according to engineering plans. It is not always necessary to use scaffoldings. For many types of work, a stepladder may be sufficient.

17. The sequence of operations may vary according to the company's organization.

TASK 1 INSTALL CURTAIN WALLS

Operations	Sub-Operations	Clarifications
1.6 Secure the premises	1.6.1 Establish a safety perimeter (reflective cones, safety tape, trestles, etc.) 1.6.2 Check the location of electric lines 1.6.3 Locate anchors to fasten lifelines 1.6.4 Plan welding blankets for welding work	The dross and sparks produced by welding must not hinder workers on lower floors.
1.7 Prepare the opening and install anchors	1.7.1 Remove any obstacle from the opening 1.7.2 Fasten anchors 1.7.3 Clean the anchor pouch 1.7.4 Prepare the flashing	Anchors may be welded or bolted.
1.8 Assemble and fasten the frame	1.8.1 Screw window heads to mullions 1.8.2 Seal the meeting-place of components according to the air barrier line 1.8.3 Make the frame level, square and plumb, according to the leader lines 1.8.4 Fasten the frame to the anchors 1.8.5 Screw the frame to the structure (glasswork and skylight) 1.8.6 Fasten special anchors for the ASG (attached structural glazing)	The frame may be fastened by screwing or bolting. Anchors are welded.
1.9 Lay or apply sealants (glass) and glazing tape	1.9.1 Apply glazing tape 1.9.2 Install corner blocks 1.9.3 Apply sealant according to the air barrier line 1.9.4 Seal the corners 1.9.5 Seal the screws 1.9.6 Apply PVC tape on the expansion joint sleeve 1.9.7 Seal the expansion joint 1.9.8 Seal the corner blocks	
1.10 Install glass and components	1.10.1 Install setting and locating blocks 1.10.2 Install the components: • sealed units • single glazing • aluminum panels • apron panels (spandrel panels and purlins) • other glass substitutes 1.10.3 Use a temporary pressure plate to immobilize the glazing or substitutes in the frame	

TASK 1 INSTALL CURTAIN WALLS

Operations	Sub-Operations	Clarifications
1.11 Ensure that the frame is sealed	1.11.1 Lay the membrane 1.11.2 Place backup material 1.11.3 Apply sealant 1.11.4 Apply flashing 1.11.5 Seal the meeting-point of male and female mullions (prefabricated curtain wall)	
1.12 Install insulating products and do the finishing around the frame	1.12.1 Apply insulating products to the frame perimeter: • wool • urethane • extruded polystyrene 1.12.2 Apply aluminum siding: • on the parapet • on the base • on the contour	
1.13 Install pressure plates and covers	1.13.1 Install the pressure plates 1.13.2 Seal the meeting-point of pressure plates 1.13.3 Install covers 1.13.4 Apply GSG[18] and ASG[19] glazing	To install the pressure plates, stainless steel screws are used.
1.14 Install a fire barrier joint	1.14.1 Apply firestop wool with fasteners 1.14.2 Apply firestop sealant	
1.15 Apply sealants	1.15.1 Install backup material and sealant for the rain barrier line	
1.16 Check the work quality	1.16.1 Ensure the air barrier line's integrity 1.16.2 Ensure the good operation of the pressure balance chamber 1.16.3 Ensure that all corner blocks are in place 1.16.4 Ensure that all covers are clicked in place 1.16.5 Ensure that the work is aesthetic and of quality	At least two persons check the work quality. First, the erector mechanic (glazier) makes sure that his work is satisfactory. He may do so at the end of the work and throughout the installation so as to make corrections along the way. In addition, another person (client, construction superintendent, general foreman, architect, general contractor's representative, etc.) verifies the work. This verification is generally made when the work is fully completed, although it may be made each week on the largest construction sites. This person will produce a deficiency list. Erector mechanics (glaziers) will make appropriate corrections according to that list.

18. Glued structural glazing.
19. Attached structural glazing.

TASK 1 INSTALL CURTAIN WALLS

Operations	Sub-Operations	Clarifications
1.17 Make corrections, if applicable	1.17.1 Correct defects found by the erector mechanic (glazier) 1.17.2 Correct defects on the basis of the deficiency list	
1.18 Clean the premises and products	1.18.1 Pick up and dispose of rejects at the right location 1.18.2 Remove excess sealant 1.18.3 Cut the membrane exceeding the finish sheet metal	Rejects must be separated into two groups: those that must be recycled and those that must be thrown away.
1.19 Store the equipment and tools	1.19.1 Pick up and clean the tools 1.19.2 Roll up extension cords 1.19.3 Store the tools (in the truck, the trailer, etc.) 1.19.4 Recover remaining materials	

TASK 2 INSTALL WINDOWS

Operations	Sub-Operations	Clarifications
2.1 Consult the plans, shop drawings and work order	2.1.1 Check the measurements of received windows and openings 2.1.2 Check if there is a nailing base to be installed	
2.2 Check and pick up materials, tools and equipment	2.2.1 Select appropriate items for the type of installation 2.2.2 Load the truck, if applicable	
2.3 Prepare materials for installation	2.3.1 Unpack the windows 2.3.2 Check the condition of materials 2.3.3 Distribute windows at the correct locations 2.3.4 Pre-pierce windows, if applicable 2.3.5 Assemble the frames, if applicable	
2.4 Position scaffoldings (fixed and mobile), if applicable	2.4.1 Determine the scaffolding types required: • tubular • flying • giraffe • scissor lifts • etc. 2.4.2 Prepare the premises to receive scaffoldings	See operation 1.5.
2.5 Secure the premises	2.5.1 Establish a safety perimeter (reflective cones, safety tape, trestles, etc.) 2.5.2 Check the location of electric lines	

TASK 2 INSTALL WINDOWS

Operations	Sub-Operations	Clarifications
2.6 Prepare the opening	2.6.1 Remove the old window, if applicable 2.6.2 Remove any obstacle 2.6.3 Check the opening's level 2.6.4 Check or lay the waterproofing membrane 2.6.5 Prepare the flashing	
2.7 Fasten the frame	2.7.1 Make the frame level, square and plumb (wedging) 2.7.2 Position the frame according to the insulating line 2.7.3 Screw the frame to the structure (residential and commercial window)	
2.8 Apply glazing tape	2.8.1 Apply butyl tape, if applicable 2.8.2 Seal the four corners and the assembly cuts (butyl or silicone) 2.8.3 Install setting and locating blocks	
2.9 Install glass and components	2.9.1 Position the glass or substitutes: • sealed units • single glazing • aluminum panels 2.9.2 Level the glass, if applicable 2.9.3 Install glazing beads	
2.10 Install the shutter and adjust the hardware	2.10.1 Install the shutter(s) according to the window model 2.10.2 Adjust the hardware, if applicable	
2.11 Install insulating and sealing products	2.11.1 Cut the shingles 2.11.2 Install the membrane 2.11.3 To follow the air barrier line, apply backup material and sealant, waterproof adhesive tape, or any other recognized material 2.11.4 Apply insulating products on the frame perimeter: • wool • urethane	These are products such as wool, urethane, a waterproofing membrane, silicone, etc. They are installed on the window perimeter. It must be ensured that the building envelope's air barrier line is continuous. To that end, the link between the window and the adjacent wall must be ensured.

TASK 2 INSTALL WINDOWS

Operations	Sub-Operations	Clarifications
2.12 Do the finishing	2.12.1 Fold the aluminum sheets 2.12.2 Apply the siding, if applicable (drip mould, flashboard) 2.12.3 Install the window sill 2.12.4 Install backup material 2.12.5 Make the finish joint or rain joint 2.12.6 Install the window screen, if applicable	
2.13 Check the work quality	2.13.1 Make a visual check 2.13.2 Check the operation of mobile parts 2.13.3 Detect any anomaly 2.13.4 Ensure that the work is aesthetic and of quality	See operation 1.16.
2.14 Make corrections, if applicable	2.14.1 Correct errors found by the erector mechanic (glazier) 2.14.2 Correct defects according to the deficiency list	
2.15 Clean the premises and products	2.15.1 Pick up and dispose of rejects at the right location 2.15.2 Remove excess sealant 2.15.3 Cut the membrane exceeding the finish sheet metal	This operation is performed throughout the work.
2.16 Store the equipment and tools	2.16.1 Pick up and clean the tools 2.16.2 Roll up extension cords 2.16.3 Store the tools (in the truck, the trailer, etc.) 2.16.4 Recover remaining materials	

TASK 3 INSTALL RESIDENTIAL, COMMERCIAL AND INDUSTRIAL GARAGE DOORS

Operations	Sub-Operations	Clarifications
3.1 Consult the plans, shop drawings and work order	3.1.1 Check the measurements of received windows and openings 3.1.2 Check the available space for the type of door to be installed	
3.2 Check and pick up materials, tools and equipment	3.2.1 Select appropriate items for the type of installation 3.2.2 Load the truck, if applicable	
3.3 Prepare materials for installation	3.3.1 Unpack the panels and hardware 3.3.2 Check that all necessary materials are present 3.3.3 Ensure compliance with the work order	

TASK 3 INSTALL RESIDENTIAL, COMMERCIAL AND INDUSTRIAL GARAGE DOORS

Operations	Sub-Operations	Clarifications
3.4 Position scaffoldings (fixed and mobile), if applicable	3.4.1 Prepare the premises to receive scaffoldings 3.4.2 Determine the scaffolding types required: • tubular • flying • giraffe • scissor lifts • etc.	See operation 1.5.
3.5 Secure the premises	3.5.1 Establish a safety perimeter (reflective cones, safety tape, trestles, etc.)	
3.6 Prepare the opening, if applicable	3.6.1 Install fastening backup material to install door springs and operators 3.6.2 Remove the existing door, if applicable	
3.7 Assemble components	3.7.1 Assemble the rails 3.7.2 Install the hardware on panels: • hinges • latches • casters 3.7.3 Install reinforcing bars if necessary (12 feet and over)	
3.8 Install rails, panels and springs	3.8.1 Check the levels 3.8.2 Install shims 3.8.3 Install rails and check their level 3.8.4 Install panels in the rails 3.8.5 Install and level the panels while assembling them together: • rolling doors • sliding doors • fire doors 3.8.6 Install and tension the springs 3.8.7 Install the door opening system: • springs (torsion, extension) • counterweight 3.8.8 Fasten rails to the ceiling	Rails may be bolted, screwed or welded.
3.9 Install door operators	3.9.1 Bolt the door operators to fastening backup material 3.9.2 Install the chain holder	
3.10 Install the chain hoist or door openers	3.10.1 Consult the manufacturer's manual 3.10.2 Connect the door opener	

TASK 3 INSTALL RESIDENTIAL, COMMERCIAL AND INDUSTRIAL GARAGE DOORS

Operations	Sub-Operations	Clarifications
3.11 Install the security system on the door and related accessories	3.11.1 Install control buttons 3.11.2 Install safety switch cabling 3.11.3 Connect to the control panel 3.11.4 Install foam pads, bumpers, rail protectors, retaining hooks, etc.	
3.12 Adjust the door	3.12.1 Raise the door three feet so it stays in place 3.12.2 Recalibrate the spring, if applicable 3.12.3 Align the door with the rails 3.12.4 Adjust the door operator	
3.13 Install related accessories	3.13.1 Install foam pads 3.13.2 Install the loading platform (hydraulic, manual) 3.13.3 Install rubber bumpers 3.13.4 Install rail protectors 3.13.5 Program the remote controls	
3.14 Do the finishing	3.14.1 Apply weatherstripping 3.14.2 Apply sealant 3.14.3 Apply decorative trims	
3.15 Check the work quality	3.15.1 Ensure the door's good operation 3.15.2 Ensure that the work is aesthetic and of quality	See operation 1.16.
3.16 Make corrections, if applicable	3.16.1 Correct defects found by the erector mechanic (glazier) 3.16.2 Correct defects according to the deficiency list	
3.17 Clean the premises and products	3.17.1 Pick up and dispose of rejects at the right location	This operation is performed throughout the work.
3.18 Store the equipment and tools	3.18.1 Pick up and clean the tools 3.18.2 Roll up extension cords 3.18.3 Store the tools (in the truck, the trailer, etc.) 3.18.4 Recover remaining materials	

TASK 4 INSTALL RESIDENTIAL AND COMMERCIAL DOORS

Operations	Sub-Operations	Clarifications
4.1 Consult the plans, shop drawings and work order	4.1.1 Check the measurements of received windows and openings 4.1.2 Check the doors' opening direction 4.1.3 Check if there is a nailing base to be installed	
4.2 Check and pick up materials, tools and equipment	4.2.1 Select appropriate items for the type of installation 4.2.2 Load the truck, if applicable	
4.3 Prepare materials for installation	4.3.1 Prepare the door sill 4.3.2 Unpack the door 4.3.3 Remove the door shutter(s)	
4.4 Position scaffoldings (fixed and mobile), if applicable	4.4.1 Determine the scaffolding types required: • tubular • scissor lifts • etc. 4.4.2 Prepare the premises to receive scaffoldings	See operation 1.5.
4.5 Secure the premises	4.5.1 Establish a safety perimeter (reflective cones, safety tape, trestles, etc.)	
4.6 Prepare the opening	4.6.1 Make the opening, if applicable 4.6.2 Lay the membrane in the opening 4.6.3 Remove the existing door (renovation) 4.6.4 Install a nailing base, if necessary 4.6.5 Install recessed pivots (commercial door) 4.6.6 Install rails or supports (sliding door and revolving door)	
4.7 Install the frame	4.7.1 Position the frame 4.7.2 Use shims to make the frame level, square and plumb 4.7.3 Use screws to fasten the frame 4.7.4 Install anchors, if applicable 4.7.5 Inert cabling, if applicable 4.7.6 Install the sill	
4.8 Install the door shutter(s)	4.8.1 Insert the door shutter(s) in the frame according to the type of door	

TASK 4 INSTALL RESIDENTIAL AND COMMERCIAL DOORS

Operations	Sub-Operations	Clarifications
4.9 Install the glazing	4.9.1 Put setting and locating blocks at the right location 4.9.2 Apply glazing tape 4.9.3 Insert the panel in the door shutter (glass, plastic, aluminum, other) 4.9.4 Install trims (glazing bead)	
4.10 Install the hardware	4.10.1 Install door shutter hardware (latches, locks, handles, panic bars, etc.) 4.10.2 Install frame hardware (door closers, strikes, etc.)	Hardware: push buttons, card readers, magnetic locks, electric strikes, motion sensors, etc.
4.11 Make electrical connections, if applicable	4.11.1 Connect the door operators 4.11.2 Connect control equipment (push button, magnetic card, etc.) 4.11.3 Connect any other electrical equipment (magnetic lock, motion sensor, etc.)	Not all erector mechanics (glaziers) perform this operation; only some specialize in this type of work.
4.12 Adjust the door, hardware and, if applicable, electrical controls	4.12.1 Adjust door squareness 4.12.2 Adjust pivots 4.12.3 Use the levelling screw to adjust the shutter 4.12.4 Adjust hinges, strap hinges 4.12.5 Adjust the door closure 4.12.6 Make holes for latch or lock strikes 4.12.7 Adjust weatherstripping	Operation 4.12.5 will differ according to the type of door. Standard door: – adjust manual door closers. Automatic door: – adjust motion sensors; – adjust the door's opening and closing time. Sliding door: – adjust casters.
4.13 Apply sealants and insulation and do the finishing	4.13.1 Link the frame with the air barrier and vapour barrier 4.13.2 Insulate the frame (wool, urethane) 4.13.3 Apply aluminum siding, if applicable	
4.14 Check the work quality	4.14.1 Make a visual check 4.14.2 Ensure the door's good operation 4.14.3 Check the operation of mobile parts 4.14.4 Detect any anomaly 4.14.5 Ensure that the work is aesthetic and of quality	See operation 1.16.
4.15 Make corrections, if applicable	4.15.1 Correct errors found by the erector mechanic (glazier) 4.15.2 Correct defects according to the deficiency list	

TASK 4 INSTALL RESIDENTIAL AND COMMERCIAL DOORS

Operations	Sub-Operations	Clarifications
4.16 Clean the premises and products	4.16.1 Pick up and dispose of rejects at the right location 4.16.2 Remove excess sealant 4.16.3 Cut the membrane exceeding the finish sheet metal	This operation is performed throughout the work.
4.17 Store the equipment and tools	4.17.1 Pick up and clean the tools 4.17.2 Roll up extension cords 4.17.3 Store the tools (in the truck, the trailer, etc.) 4.17.4 Recover remaining materials	

TASK 5 INSTALL GLASS SHOWERS

Operations	Sub-Operations	Clarifications
5.1 Consult the plans, shop drawings and work order	5.1.1 Check measurements 5.1.2 Check the door's opening direction	
5.2 Check and pick up materials, tools and equipment	5.2.1 Make sure to have all necessary materials 5.2.2 Load the truck, if applicable	
5.3 Prepare the materials and premises for the installation	5.3.1 Unpack materials 5.3.2 Place the glass safely 5.3.3 Drill and countersink the trims 5.3.4 Assemble the trims 5.3.5 Identify the nature of the hinge or trim anchoring support 5.3.6 Check the levels and draw reference marks	
5.4 Secure the premises	5.4.1 Delimit the work area	
5.5 Fasten trims and hardware	5.5.1 Drill the wall, floor or ceiling and install anchors 5.5.2 Screw the hinges 5.5.3 Screw or glue the trims	
5.6 Install glass and components	5.6.1 Insert glass in the trims 5.6.2 Fasten the door to the hinges 5.6.3 Glue the rubber weatherstrip to the door 5.6.4 Install the handle 5.6.5 Install accessories, if applicable (soap holder, towel bar, etc.)	

TASK 5 INSTALL GLASS SHOWERS

Operations	Sub-Operations	Clarifications
5.7 Lay or apply sealants	5.7.1 Apply masking tape 5.7.2 Finish the sealing joints and form the joint 5.7.3 Remove the masking tape 5.7.4 Clean the glass	
5.8 Check the work quality	5.8.1 Ensure joint uniformity 5.8.2 Ensure that the glass has no trace of sealant 5.8.3 Ensure that the door joint is sealed	See operation 1.16.
5.9 Make corrections, if applicable	5.9.1 Correct defects found by the erector mechanic (glazier) 5.9.2 Correct defects according to the deficiency list	
5.10 Clean the premises and products	5.10.1 Pick up and dispose of rejects at the right location 5.10.2 Remove excess sealant	This operation is performed throughout the work.
5.11 Store the equipment and tools	5.11.1 Pick up and clean the tools 5.11.2 Roll up extension cords 5.11.3 Store the tools (in the truck, the trailer, etc.)	

TASK 6 INSTALL GLASS PANELS AND DOORS

Operations	Sub-Operations	Clarifications
6.1 Consult the plans, shop drawings and work order	6.1.1 Check measurements 6.1.2 Check the doors' opening direction	
6.2 Check and group materials, tools and equipment	6.2.1 Unpack materials 6.2.2 Store the glass safely	
6.3 Prepare materials for installation	6.3.1 Pre-drill the frames or bases 6.3.2 Prepare the shingles and cord	
6.4 Take readings and do levelling work	6.4.1 Determine the highest point and check the difference in level and the available height 6.4.2 Draw the centre lines 6.4.3 Determine head trim levels and plumbness	

TASK 6 INSTALL GLASS PANELS AND DOORS

Operations	Sub-Operations	Clarifications
6.5 Position scaffoldings (fixed and mobile), if applicable	6.5.1 Prepare the premises to receive scaffoldings 6.5.2 Determine the type of scaffolding required: • tubular • giraffe • scissor lift	See operation 1.5.
6.6 Secure the premises	6.6.1 Establish a safety perimeter (reflective cones, safety tape, trestles, etc.)	
6.7 Prepare the site	6.7.1 Clean the premises 6.7.2 Prepare the premises to receive panes of glass (e.g.: plan for a rubber carpet) 6.7.3 If there are floor door closers or pivots, prepare the hole to embed them	
6.8 Fasten the bases or install the frames	For windows with base and head: 6.8.1 Use shims to level the bases 6.8.2 Drill the support and screw 6.8.3 Fasten the base coverings 6.8.4 Drill the support and fasten head trims level For frames: 6.8.5 Use shims to make frames level, square and plumb 6.8.6 Screw the frames	
6.9 Install the hardware and make electrical connections, if applicable	6.9.1 Mark the location to fasten hardware 6.9.2 Drill holes for the strikes (floor or frame) 6.9.3 Install pivots, hinges or other door supports 6.9.4 Install the floor door closer, if applicable 6.9.5 Install electrical components 6.9.6 Make electrical connections	Hardware: pivots, handles, door stoppers, locks, strikes, card readers, motion sensors, magnetic locks, electrical strikes, etc.
6.10 Apply glazing tape or mastic	6.10.1 Install grooves, if applicable 6.10.2 Apply glazing tape on the frame	Glazing tape may be of different kinds: butyl tape with or without shim; tape made of neoprene, silicone, rubber, EPDM or other synthetic materials.
6.11 Install glass and components	6.11.1 Place setting blocks 6.11.2 Put the glass in place	

TASK 6 INSTALL GLASS PANELS AND DOORS

Operations	Sub-Operations	Clarifications
6.12 Lay or apply sealants	6.12.1 Install trims 6.12.2 Apply and form a joint 6.12.3 Put cement on the base, if applicable	
6.13 Install the door	6.13.1 Install pivots or hinges on the door 6.13.2 Install the door 6.13.3 Install the handle and the lock	
6.14 Adjust the hardware and electrical components	6.14.1 Adjust pivots or hinges 6.14.2 Adjust the opening and closure of the door opener 6.14.3 Adjust electrical and safety components	
6.15 Do the finishing	6.15.1 Apply decorative trims or plates 6.15.2 Finish a rain joint for the outside glass panels 6.15.3 Apply aluminum siding, if applicable	
6.16 Check the work quality	6.16.1 Ensure joint uniformity 6.16.2 Ensure that the work is aesthetic and of quality	See operation 1.16.
6.17 Make corrections, if applicable	6.17.1 Correct defects found by the erector mechanic (glazier) 6.17.2 Correct defects according to the deficiency list	
6.18 Clean the premises and products	6.18.1 Clean the panes of glass to remove any trace of sealant 6.18.2 Pick up and dispose of rejects at the right location	This operation is performed throughout the work.
6.19 Store the equipment and tools	6.19.1 Pick up and clean the tools 6.19.2 Roll up extension cords 6.19.3 Store the tools (in the truck, the trailer, etc.)	

TASK 7 INSTALL MIRRORS

Operations	Sub-Operations	Clarifications
7.1 Consult the plans, shop drawings and work order	7.1.1 Check the concordance of measurements and materials	
7.2 Check and group materials, tools and equipment	7.2.1 Choose the adhesive 7.2.2 Select appropriate items for the type of installation 7.2.3 Load the truck, if applicable	
7.3 Prepare materials for installation	7.3.1 Cut or carve the mirrors 7.3.2 Drill or notch the mirrors 7.3.3 Polish the mirror edges 7.3.4 Cut, drill and countersink the trims	
7.4 Position scaffoldings (fixed and mobile), if applicable	7.4.1 Determine the type of scaffolding required: • tubular • scissor lift	Scaffolding is used more rarely for installing mirrors. See operation 1.5.
7.5 Secure the premises	7.5.1 Establish a safety perimeter	
7.6 Prepare the site	7.6.1 Ensure surface flatness 7.6.2 Check the surface's condition 7.6.3 Make corrections as necessary 7.6.4 Clean the surface	Cement surfaces and drywalls should be covered with a primer coat.
7.7 Fasten trims	7.7.1 Place the trims level 7.7.2 Detect the screw holes 7.7.3 Screw the trims 7.7.4 Hide the screw heads	
7.8 Apply adhesives	7.8.1 Choose the adhesive 7.8.2 Apply the adhesive	Adhesive such as mirror glue, butyl tape or double-faced adhesive tape.
7.9 Install the mirror and components	7.9.1 Place the setting blocks 7.9.2 Insert the mirror and position it glued to the front of the trim 7.9.3 Adjust the mirrors' meeting joints 7.9.4 Reposition outlets and switches adequately 7.9.5 Place decorative plates for outlets and switches 7.9.6 Place decorative mirror bands, if applicable	

TASK 7 INSTALL MIRRORS

Operations	Sub-Operations	Clarifications
7.10 Fasten the finish trims	7.10.1 Take measurements 7.10.2 Cut trims 7.10.3 Apply silicone as necessary	
7.11 Check the work quality	7.11.1 Ensure that the installation is solid and flat 7.11.2 Ensure that there is no damage on the mirror 7.11.3 Remove the temporary tape after the drying period	See operation 1.16. It must be ensured that the installation does not make mirrors concave or convex, which would deform the appearance of objects reflected in them.
7.12 Make corrections, if applicable	7.12.1 Correct defects found by the erector mechanic (glazier) 7.12.2 Correct defects according to the deficiency list	
7.13 Clean the premises and products	7.13.1 Clean mirrors of any trace of sealant or glue 7.13.2 Pick up and dispose of rejects at the right location	This operation is performed throughout the work.
7.14 Store the equipment and tools	7.14.1 Pick up and clean the tools 7.14.2 Roll up extension cords 7.14.3 Store the tools (in the truck, the trailer, etc.)	

TASK 8 INSTALL GLASS RAMPS AND GUARDRAILS

Operations	Sub-Operations	Clarifications
8.1 Consult the plans, shop drawings and work order	8.1.1 Check the type of glass and attachments 8.1.2 Check the survey plan 8.1.3 Check that the glass and its dimensions are in compliance	
8.2 Take measurements and prepare templates, if applicable	8.2.1 Install the laser level 8.2.2 Use the laser level to read measurements 8.2.3 Trace the template 8.2.4 Cut the template 8.2.5 Measure stair railing angles	

TASK 8 INSTALL GLASS RAMPS AND GUARDRAILS

Operations	Sub-Operations	Clarifications
8.3 Check and pick up materials, tools and equipment	8.3.1 Plan for material, tool and equipment requirements 8.3.2 Ensure the availability of materials, tools and equipment 8.3.3 Make sure materials, tools and equipment are in good condition 8.3.4 Load everything in the truck	
8.4 Prepare materials for installation	8.4.1 Clean the glass edges 8.4.2 Clean the base to receive the glass 8.4.3 Cut and drill the bases, if applicable	The preparation varies according to the type of attachments, anchors, setting blocks, fasteners, etc.
8.5 Position scaffoldings (fixed and mobile), if applicable	8.5.1 Prepare the premises to receive scaffoldings 8.5.2 Determine the type of scaffolding required: • tubular • giraffe • scissor lift	See operation 1.5.
8.6 Secure the premises	8.6.1 Delimit the safety perimeter 8.6.2 Remove temporary guardrails 8.6.3 Coordinate the work with the other trades 8.6.4 Plan for harness fasteners	
8.7 Take readings and do levelling work	8.7.1 Install the laser level 8.7.2 Use the laser level to read measurements 8.7.3 Check and draw the centre lines	
8.8 Fasten the bases, if applicable	8.8.1 Use shims to level the bases 8.8.2 Drill the support and screw 8.8.3 Fasten the base coverings	
8.9 Apply adhesives or install fasteners and, if applicable, glazing tape		Fasteners may be glued, anchored or welded.
8.10 Install glass and components and, if applicable, sealants	8.10.1 Place glass protectors in the anchors 8.10.2 Place setting blocks in the bases	
8.11 Do the finishing	8.11.1 Install the handrail 8.11.2 Install trims or cover plates 8.11.3 Finish the joints 8.11.4 Remove the protective film 8.11.5 Clean the glass	

TASK 8 INSTALL GLASS RAMPS AND GUARDRAILS

Operations	Sub-Operations	Clarifications
8.12 Check the work quality	8.12.1 Ensure that all panes of glass are at the same height 8.12.2 Ensure, if applicable, that the joints between glass panes are uniform and do not jut out	
8.13 Make corrections, if applicable	8.13.1 Correct defects found by the erector mechanic (glazier) 8.13.2 Correct defects according to the deficiency list	See operation 1.16.
8.14 Clean the premises and products	8.14.1 Clean the glass of any trace of sealant or glue 8.14.2 Pick up and dispose of rejects at the right location	This operation is performed throughout the work.
8.15 Store the equipment and tools	8.15.1 Pick up and clean the tools 8.15.2 Roll up extension cords 8.15.3 Store the tools (truck, construction trailer, etc.)	

TASK 9 INSTALL RELATED GLASS PRODUCTS

N.B. – The letter corresponding to the glass product on which the operation is performed is in brackets.

- **A- Indoor glazing (e.g.: office divisions)**
- **B- Smoke barrier**
- **C- Glass counter**
- **D- Plastic**
- **E- Decorative glass**

Operations	Sub-Operations	Clarifications
9.1 Consult the plans, shop drawings and work order	9.1.1 Check the type of glass and attachments 9.1.2 Check the survey plan 9.1.3 Check that the glass and its dimensions are in compliance	These verifications apply to all products.
9.2 Check and pick up materials, tools and equipment	9.2.1 Plan for material, tool and equipment requirements 9.2.2 Ensure the availability of materials, tools and equipment 9.2.3 Make sure materials, tools and equipment are in good condition 9.2.4 Load everything in the truck	All these sub-operations apply to the various products.

TASK 9 INSTALL RELATED GLASS PRODUCTS

Operations	Sub-Operations	Clarifications
9.3 Prepare materials for installation	9.3.1 Unpack materials 9.3.2 Check the condition of materials 9.3.3 Clean the materials, if applicable 9.3.4 Cut components (A, B, C, D, E): • glass • aluminium • PVC 9.3.5 Cut trims, drill and countersink (A, B, C, D, E) 9.3.6 Check the inventory of required materials (A, B, C, D, E) 9.3.7 Shape or process the glass or plastic, sand, drill, notch (A, B, C, D, E)	
9.4 Take readings and do levelling work	9.4.1 Draw centre and level lines	
9.5 Position scaffoldings (fixed and mobile), if applicable	9.5.1 Prepare the premises to receive scaffoldings 9.5.2 Determine the type of scaffolding required: • tubular • giraffe • scissor lift	See operation 1.5.
9.6 Secure the premises	9.6.1 Establish a safety perimeter (reflective cones, safety tape, trestles, etc.)	
9.7 Prepare the site	9.7.1 Remove existing glass products as necessary (renovation) 9.7.2 Ensure that the location is appropriate (A, B, C, D, E) 9.7.3 Trace the location and level the opening (A, B) 9.7.4 Install trims or fasteners (A, B, E) 9.7.5 Seal the profile (C) 9.7.6 Mask the screws (trims and fasteners) 9.7.7 Apply glazing tape (A)	
9.8 Put the product in place	9.8.1 Install the product (A, B, C, D, E) 9.8.2 Assemble components (A, B, C, D, E) 9.8.3 Level and align the product (A, B, C, D, E)	

TASK 9 INSTALL RELATED GLASS PRODUCTS

Operations	Sub-Operations	Clarifications
9.9 Do the finishing		
9.10 Check the work quality	9.10.1 Clean the product or components (A, B, C, D, E) 9.10.2 Ensure that the product and installation are of quality and aesthetic (A, B, C, D, E)	See operation 1.16.
9.11 Make corrections, if applicable	9.11.1 Correct errors found by the erector mechanic (glazier) 9.11.2 Correct defects according to the deficiency list	
9.12 Clean the premises and products	9.12.1 Clean the glass of any trace of sealant or glue 9.12.2 Pick up and dispose of rejects at the right location	This operation is performed throughout the work.
9.13 Store the equipment and tools	9.13.1 Pick up and clean the tools 9.13.2 Roll up extension cords 9.13.3 Store the tools (truck, construction trailer, etc.)	

TASK 10 REPAIR GLASS PRODUCTS

Operations	Sub-Operations	Clarifications
10.1 Observe the situation	10.1.1 Check the work order or meet the client	
10.2 Diagnose the problem	10.2.1 Check the defective component(s) 10.2.2 Identify the cause of the defect: • check all components • acquire information on operating patterns	
10.3 Propose a solution	10.3.1 Write a quotation, if applicable 10.3.2 Propose a temporary solution, if applicable	When materials or components are unavailable in the short term, the erector mechanic (glazier) should propose a temporary solution, such as placing a temporary pane of glass until the sealed unit is in place.
10.4 Check and pick up materials, tools and equipment	10.4.1 Draw a list of parts or materials necessary for repairs 10.4.2 Load the truck	

TASK 10 REPAIR GLASS PRODUCTS

Operations	Sub-Operations	Clarifications
10.5 Position scaffoldings (fixed and mobile), if applicable	10.5.1 Determine the type of scaffolding required: • tubular • giraffe • scissor lift • etc.	See operation 1.5.
10.6 Secure the premises	10.6.1 Establish a safety perimeter (reflective cones, safety tape, trestles, etc.)	
10.7 Repair, adjust or replace a defective component	10.7.1 Repair a product: • curtain wall • window • door • other 10.7.2 Replace defective components: • sealed units • hardware • casters • weatherstripping • etc.	During repair or replacement work, the erector mechanic (glazier) often performs maintenance operations, such as: – lubricating components; – strengthening components; – checking the overall condition.
10.8 Check the work quality	10.8.1 Ensure that the repair is aesthetic and effective	See operation 1.16.
10.9 Clean the premises and products	10.9.1 Clean the premises and dispose of rejects so as not to inconvenience the client	This operation is performed throughout the work.
10.10 Store the equipment and tools	10.10.1 Pick up and clean the tools 10.10.2 Roll up extension cords 10.10.3 Store the tools (truck, construction trailer, etc.)	

TASK 11 INSTALL ALUMINUM PANELS[20]

Operations	Sub-Operations	Clarifications
11.1 Consult the plans, shop drawings and work order	11.1.1 Check the concordance between plan measurements and those of delivered materials	
11.2 Check and pick up materials, tools and equipment	11.2.1 Take out electric and battery-powered tools 11.2.2 Install a work table 11.2.3 Prepare necessary screws and anchors 11.2.4 Make sure that all necessary items are present and in good condition	

20. Read on this subject the Professional Subcommittee's comment in Annex 3, note No. 3.

TASK 11 INSTALL ALUMINUM PANELS

Operations	Sub-Operations	Clarifications
11.3 Position scaffoldings (fixed and mobile), if applicable	11.3.1 Get acquainted with the workplace 11.3.2 Prepare the premises for scaffoldings 11.3.3 Determine the type of scaffolding required: • tubular • giraffe • scissor lift • flying	See operation 1.5.
11.4 Secure the premises	11.4.1 Establish a safety perimeter (reflective cones, safety tape, trestles, etc.)	
11.5 Take readings and do levelling work	11.5.1 Find reference points 11.5.2 Draw lines to receive panels, according to the shop drawing	
11.6 Prepare the surface and install substructures and anchors	11.6.1 Install anchoring systems to receive panels 11.6.2 Place the starter trims	
11.7 Prepare the aluminum panels	11.7.1 Identify the various aluminum panels 11.7.2 Pre-drill and process panels to receive lighting, outlets, sprinklers, etc. 11.7.3 Assemble components received as spare parts	
11.8 Fasten the aluminum panels	11.8.1 Position the panels 11.8.2 Screw the panels 11.8.3 Check spacing, alignments, levels 11.8.4 Fasten the panels definitively	
11.9 Install finishing components	11.9.1 Install screw cover trims 11.9.2 Apply the various finish trims 11.9.3 Finish the seal joints	
11.10 Clean the products and check the installation quality	11.10.1 Clean traces of fingers, sealant, etc. 11.10.2 Remove protective films 11.10.3 Ensure that the work is aesthetic and of quality	See operation 1.16.

TASK 11 INSTALL ALUMINUM PANELS

Operations	Sub-Operations	Clarifications
11.11 Make corrections, if applicable	11.11.1 Correct defects found by the erector mechanic (glazier) 11.11.2 Correct defects according to the deficiency list	
11.12 Store the equipment and tools and clean the premises	11.12.1 Pick up all equipment and tools 11.12.2 Recycle aluminum scraps 11.12.3 Dispose of rejects	This operation is performed throughout the work.

2.3 ACHIEVEMENT CONDITIONS

Data on achievement conditions were collected for the erector mechanic (glazier) trade as a whole. The data pertain to aspects such as work areas, work instructions, health and safety hazards, reference documents consulted and material resources used.

Table 2.3 Achievement Conditions

ACHIEVEMENT CONDITIONS
Workplaces[21] Erector mechanics (glaziers) work indoors and outdoors, in any type of commercial, industrial, institutional or residential building.
Instructions Verbal instructions come mainly from the foreman or team leader; occasionally, the client may make requests to the erector mechanic (glazier). Written instructions may be given in (layout or installation) plans, shop drawings, sketches, work orders, etc.
Documentation The erector mechanic (glazier) uses few reference documents; the main ones are provided by the manufacturers of the products he installs.

21. Non-exhaustive list.

ACHIEVEMENT CONDITIONS

Raw materials, tools and equipment

Annex 1 of the present report contains a list of material resources used by erector mechanics (glaziers) in practicing their trade.

Health and safety hazards

Annex 2 of the present report contains a list of the main hazards related to the tasks and operations of the erector mechanic (glazier) trade, as well as applicable preventive measures.

Degree of autonomy

Erector mechanics (glaziers) generally work in teams of two. The teams may be larger depending on the work to be done. Erector mechanics (glaziers) work alone at times, for example when making repairs.

The erector mechanic (glazier) acts under the supervision of the team leader or the foreman. That supervision is usually indirect because the erector mechanic (glazier) works with full autonomy. The foreman periodically verifies the work done.

Stress factors

The workshop participants consider the following factors as potential sources of stress:

- the risk of error when measurements are taken;
- the risk of glass products breaking when handled;
- long delays to replace certain parts, which makes risks of breakage even more stressful;
- working in confined spaces and awkward positions;
- frequently tight deadlines;
- risks of falling when working from a height;
- long delivery times;
- difficult weather conditions.

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	**INSTALL CURTAIN WALLS**
	Performance Criteria
	– Observance of health and safety rules – Accurate reading of plans, drawings and work orders – Accurate and exact measurements – Correct determination of necessary materials and equipment – Precise levelling of components – Methodical and well-organized work – Appropriate installation of products – Correct anticipation of eventual problems – Work cleanliness – Working quickly and precisely
TASK 2	**INSTALL WINDOWS**
	Performance Criteria
	– Observance of health and safety rules – Accurate reading of plans, drawings and work orders – Accurate and exact measurements – Effective resolution of problems encountered during the installation – Using appropriate tools and equipment – Precise levelling of components – Efficient work methods – Observance of installation steps – Carefully checking the sealing – Positioning shims at the correct locations – Precise alignment of windows and components – Work cleanliness

TASK 3 **INSTALL RESIDENTIAL, COMMERCIAL AND INDUSTRIAL GARAGE DOORS**

Performance Criteria

- Observance of health and safety rules
- Accurate reading of plans, drawings and work orders
- Accurate and exact measurements
- Precise levelling of components
- Precisely centring the door in the opening
- Rails parallel to the door
- Exact calculations of the cable's length and the spring's number of turns
- Effective resolution of problems encountered
- Appropriate use of tools and equipment
- Clean and precise work

TASK 4 **INSTALL RESIDENTIAL AND COMMERCIAL DOORS**

Performance Criteria

- Observance of health and safety rules
- Accurate reading of plans, drawings and work orders
- Accurate and exact measurements
- Taking care to do good work
- Using appropriate tools and equipment
- Precise levelling of components
- Adequate connection of electric wires
- No visible wires
- Appropriate positioning of shims
- Observance of installation steps
- Observance of the AAADM code[22]

TASK 5 **INSTALL GLASS SHOWERS**

Performance Criteria

- Observance of health and safety rules
- Accurate reading of plans, drawings and work orders
- Accurate and exact measurements
- Work cleanliness
- Precise levelling of components
- Efficient work method
- No flaws or leaks
- Using appropriate anchors
- Aesthetic installation
- Checking mechanisms carefully

22. American Association of Automatic Door Manufacturers.

TASK 6 **INSTALL GLASS PANELS AND DOORS**

Performance Criteria

- Observance of health and safety rules
- Accurate reading of plans, drawings and work orders
- Accurate and exact measurements
- Work cleanliness
- Efficient work method
- Precise levelling of components
- Planning and organizing the work effectively
- Checking the quality of work carefully
- Appropriately correcting anomalies

TASK 7 **INSTALL MIRRORS**

Performance Criteria

- Observance of health and safety rules
- Accurate reading of plans, drawings and work orders
- Accurate and exact measurements
- Working cleanly and meticulously
- Precise levelling of components
- No damage to surfaces during the installation
- Solid fastening of trims to receive the mirrors
- Correctly preparing surfaces to receive the mirrors
- Appropriately adjusting the corners of finish trims

TASK 8 **INSTALL GLASS RAMPS AND GUARDRAILS**

Performance Criteria

- Observance of health and safety rules
- Accurate reading of plans, drawings and work orders
- Accurate and exact measurements
- Aesthetic assembly
- Working cleanly and meticulously
- Precise levelling of components
- Smooth and continuous application of sealants and adhesives
- Correctly determining the necessary materials and equipment
- No damage to surfaces during the installation
- Observance of patterns and symmetry
- Effective detection and correction of anomalies

TASK 9 **INSTALL RELATED GLASS PRODUCTS**

Performance Criteria

- Observance of health and safety rules
- Accurate reading of plans, drawings and work orders
- Accurate and exact measurements
- Precise levelling of components
- Efficient work method
- Working cleanly and meticulously
- No damage to surfaces during the installation

TASK 10 **REPAIR GLASS PRODUCTS**

Performance Criteria

- Observance of health and safety rules
- Accurate and exact measurements
- Correct and quick diagnosis
- Determining temporary or permanent solutions, as the case may be
- Ordering spare parts accurately and exactly
- Precise levelling of components
- Working cleanly and meticulously
- Exact invoicing
- Carefully checking the problem's resolution
- Communicating clearly and professionally with the client

TASK 11 **INSTALL ALUMINUM PANELS**

Performance Criteria

- Observance of health and safety rules
- Accurate reading of plans, drawings and work orders
- Accurate and exact measurements
- Observance of starting instructions
- Aligning and spacing panels appropriately
- Clean and precise cuts
- Appropriate use of tools and equipment
- Precise levelling of components
- Protecting surfaces before cutting and processing
- Working cleanly and meticulously

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 trade of erector mechanic (glazier), two functions appear to stand out:

- a function related to **installation** and grouping the following tasks:
  - task 1, "Install curtain walls";
  - task 2, "Install windows";
  - task 3, "Install residential, commercial and industrial garage doors";
  - task 4, "Install residential and commercial doors";
  - task 5, "Install glass showers";
  - task 6, "Install glass panels and doors";
  - task 7, "Install mirrors";
  - task 8, "Install glass ramps and guardrails";
  - task 9, "Install related glass products";
  - task 11, "Install aluminum panels";

- a function related to **repairs**, **with** the following task:
  - task 10, "Repair glass products".

3. QUANTITATIVE DATA ON TASKS

3.1 OCCURRENCE

Occurrence data concern the percentage of erector mechanics[23] (glaziers) 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 erector mechanics (glaziers) working in the companies represented.

Table 3.1 Task Occurrence

	Task	Occurrence
1	Install curtain walls	67.27%
2	Install windows	65.00%
3	Install residential, commercial and industrial garage doors	10.91%
4	Install residential and commercial doors	67.73%
5	Install glass showers	27.27%
6	Install glass panels and doors	62.73%
7	Install mirrors	57.28%
8	Install glass ramps and guardrails	67.73%
9	Install related glass products	65.00%
10	Repair glass products	51.82%
11	Install aluminum panels	63.18%

23. Including apprentices.

3.2 WORK TIME

Work time, also expressed in percentages, represents the average time allocated to each task by the consulted participants since the beginning of their careers.

Table 3.2 Work Time Allocated to Each Task

Task		Work Time
1	Install curtain walls	32.73%
2	Install windows	10.55%
3	Install residential, commercial and industrial garage doors	9.45%
4	Install residential and commercial doors	13.45%
5	Install glass showers	3.10%
6	Install glass panels and doors	6.45%
7	Install mirrors	3.36%
8	Install glass ramps and guardrails	4.73%
9	Install related glass products	2.64%
10	Repair glass products	5.45%
11	Install aluminum panels	8.09%
		100%

It should be noted that task 1, “Install curtain walls,” represents the highest percentage, i.e., around one third (32.73%) of the participants’ work time. Next are task 4, “Install residential and commercial doors,” with 13.45%, and task 2, “Install windows”, with 10.55%. Those three tasks represent, on average, over half (56.73%) of the participants’ work time. The percentages of the eight other tasks vary between 2.64% (task 9, “Install related glass products”) and 9.45% (task 3, “Install residential, commercial and industrial garage doors”).

Moreover, in examining individual results, we find that:

- one person has never performed the following tasks:
  - task 4, “Install residential and commercial doors”;
  - task 6, “Install glass panels and doors”;
  - task 9, “Install related glass products”;
  - task 10, “Repair glass products”;
- two persons have never performed the following tasks:
  - task 1, “Install curtain walls”;
  - task 2, “Install windows”;
  - task 7, “Install mirrors”;
  - task 8, “Install glass ramps and guardrails”;
  - task 11, “Install aluminum panels”;
- three persons have never performed the following task:
  - task 5, “Install glass showers”;
- nine persons have never performed the following task:
  - task 3, “Install residential, commercial and industrial garage doors.”

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	Install curtain walls	4.00	3.11
2	Install windows	3.33	2.44
3	Install residential, commercial and industrial garage doors	3.50	3.17
4	Install residential and commercial doors	3.80	3.20
5	Install glass showers	3.56	3.00
6	Install glass panels and doors	3.56	2.56
7	Install mirrors	2.67	1.89
8	Install glass ramps and guardrails	3.56	3.11
9	Install related glass products	2.90	2.33
10	Repair glass products	3.00	2.80
11	Install aluminum panels	3.33	3.11

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 erector mechanic (glazier).

4.1 KNOWLEDGE

Communication

The erector mechanic (glazier) must know the basic principles of interpersonal communication and the necessary conditions for teamwork. He must be able to establish harmonious interpersonal relations with a variety of people (client, foreman, colleagues, etc.) and work effectively within a team. The participants mentioned respect for others as essential to maintaining good relations.

Scaffoldings

The erector mechanic (glazier) must know the methods for using, checking, installing, maintaining and ensuring the safety of the scaffoldings he has to use, including more-recent equipment such as boom lifts and platforms.

Electronics and electricity

The erector mechanic (glazier) who specializes in installing automatic or garage doors must have basic knowledge of electronics and electricity, in order to make connections, install control boxes, parameterize sequences, etc.

Hoisting

The erector mechanic (glazier) must apply rigging techniques necessary to the various loads to be lifted and moved. He must choose hoisting equipment according to the load and to each device's capacity. To that end, he must be able to calculate the weight of loads. Finally, he must be able to guide the hoisting equipment operator, generally a crane operator, by using the appropriate signals.

Mathematics

In his work, the erector mechanic (glazier) must perform the four basic arithmetic operations (adding, dividing, multiplying, subtracting). Calculations are done with fractions and decimals, in imperial and metric measurement units. Conversion from one measurement system to the other is also necessary, as well as applying the rule of three.

Regarding geometry, the erector mechanic (glazier) must be able to calculate surfaces, angles, radiuses and diameters, and to apply the Pythagorean theorem. He must also know and apply trigonometry formulas related to tangents, sines and cosines.

Plans, drawings and sketches

The erector mechanic (glazier) has to read survey and architectural plans. He must also read shop drawings representing the products to be installed. So he must be able to interpret graphical conventions and scales, and to distinguish the different views (isometric, sectional, detailed, etc.) The work of the erector mechanic (glazier) also includes drawing level lines, for example to install a curtain wall. Finally, the erector mechanic (glazier) may have to produce simple freehand sketches to explain a work step to the foreman, the client or a colleague.

Occupational health and safety

Knowledge and application of occupational health and safety rules are very important. Mention is made, for example, of rules for using certain handling devices (e.g.: lift truck). The erector mechanic (glazier) must also know the Workplace Hazardous Materials Information System (WHMIS).

Welding and oxygen cutting

Although welding work is often done by subcontractors, the erector mechanic (glazier) must know and be able to apply arc welding (MIG) and oxygen cutting techniques, particularly for curtain walls.

Glass

The erector mechanic (glazier) must have a good knowledge of the various categories of glass and glass products, their characteristics (e.g.: weight, to be able to inform the crane operator well) and properties (e.g.: insulation). He must know how to handle, cut, drill, polish them, etc. He must also know the various types of sealants and their compatibility with categories of glass.[24]

The erector mechanic (glazier) must also know the characteristics of the various materials used for manufacturing doors and windows. For example, he must know their reactions to cold and heat (e.g.: expansion).

Finally, knowledge of the hardware is important. Of course, it is impossible to know all the models of all the manufacturers, but at least, the erector mechanic (glazier) must know the main types of hardware in relation to the installation of various products, for example doors, windows, etc.

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 erector mechanics (glaziers) need are the following:

- anticipating the difficulties;
- concentration;

24. Read on this subject the Professional Subcommittee's comment in Annex 3, note No. 4.

- planning the work;
- making decision;
- solving problem;
- visualizing the finished product.

Motor skills

Motor skills involve gestures and movements. The main motor skills that erector mechanics (glaziers) need are the following:

- strength, to lift and handle products;
- dexterity, to make connections in confined spaces, to work in awkward positions, etc.;
- balance, to work from heights;
- coordination, notably for welding.

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 erector mechanics (glaziers) need are the following:

- good vision, to align elements, distinguish colours, types of glass, etc.;
- good hearing, to detect sounds that suggest potential breakages, particularly when glass is being transported.

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 erector mechanics (glaziers) need are the following:

- autonomy;
- calm and discretion;
- ability to discuss (with the client, the foreman, etc.);
- courtesy and politeness;

- resourcefulness;
- interpersonal skills;
- team spirit;
- stress management;
- initiative;
- leadership;
- attention to detail;
- patience;
- versatility;
- punctuality;
- respect for others;
- rigour and taking care to do good work.

5. TRAINING SUGGESTIONS

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

- to better select candidates, in order to ensure that they have the necessary skills (e.g.: no vertigo);
- to recreate, in schools, the trade's actual conditions;
- to inform candidates on industry rules and conditions;
- to focus, during training, on the use of tools and measuring instruments, and on the properties and compatibility of materials;
- to plan contents familiarizing participants with the basic operation of automated systems;
- to advise participants from the start regarding the purchase of their toolbox.

Annexes

Annex 1
Tools and Equipment

Table A.1 List of Tools and Equipment

Grey boxes indicate **unused** items.

	Install curtain walls	Install windows	Install residential, commercial and industrial garage doors	Install residential and commercial doors	Install glass showers	Install glass panels and doors	Install mirrors	Install glass ramps and guardrails	Install related glass products	Repair glass products	Install aluminum panels
HAND TOOLS											
Glass wedge											
Pry bar											
Nail set											
Tin snips – straight, left, right											
Chisel – wood											
Chisel – cold											
Ratchet set											
Spanner or wrench – adjustable											
Allen keys (imperial and metric)											
Open end wrenches (imperial and metric)											
Construction line											
Chalk line											
Glass cutter											
Side cutter											
Sliding bevel											
Putty knife – bent, straight											
Utility knife											
Funnel											
Countersink											
24 in. Concrete and metal drill bits											
Chain link stripper											
File – bastard											

	Install curtain walls	Install windows	Install residential, commercial and industrial garage doors	Install residential and commercial doors	Install glass showers	Install glass panels and doors	Install mirrors	Install glass ramps and guardrails	Install related glass products	Repair glass products	Install aluminum panels
File – half moon											
File – round											
Mallet (rubber, plastic)											
Hammer											
Dead-Blow Hammer											
Hammer – Claw											
Drill Bit – High Speed Steel											
Weatherstrip Insertion Tool											
Rivet Tool											
Scoring Tool											
Glazing Bars											
Paint Brush											
Wire stripper											
Running glass pliers											
Long nose pliers											
Locking pliers											
Locking pliers – duck-billed											
Pliers – standard											
Caulking gun											
Scribe											
Centre punch											
Protractor											
Vinyl glazing roller											
Hacksaw											
C-clamp											
Glass clamp											
Rubber mat											
Metal spring tension rod (1/2, 5/8)											
Nut driver set (imperial and metric)											
Screwdrivers – flat											
Screwdrivers – Philips (star-headed)											
Screwdrivers – Robertson (square head)											
Standard suction cup											

	Install curtain walls	Install windows	Install residential, commercial and industrial garage doors	Install residential and commercial doors	Install glass showers	Install glass panels and doors	Install mirrors	Install glass ramps and guardrails	Install related glass products	Repair glass products	Install aluminum panels
PORTABLE POWER TOOLS											
Hot box (for sealant)											
Electric in snips											
Electric nibbler (shears)											
Hammer drill											
Cement mixer											
Grinder											
Rotary tool (Dremel)											
Concrete drill with bits											
Glass drilling machine and drill bits											
Electric drill											
Cordless drill											
Screw gun											
Heat gun											
Belt sander											
Wet sander											
Angle grinder											
Portable glass notching saw											
Chop saw											
Compound mitre saw											
Reciprocating saw											
Circular saw											
Jig saw											
Electric router											
Power suction cup											
STATIONARY POWER TOOLS[25]											
Sandblaster											
Bulk foam insulation applicator											
Bulk sealant applicator											
Table saw											
Flashing shear											

25. Before arriving at the construction site, erector mechanics (glaziers) use stationary power tools to prepare or finish materials that will be installed.

	Install curtain walls	Install windows	Install residential, commercial and industrial garage doors	Install residential and commercial doors	Install glass showers	Install glass panels and doors	Install mirrors	Install glass ramps and guardrails	Install related glass products	Repair glass products	Install aluminum panels
Milling machine (aluminium)											
Edger											
Air tools (router, drill, pop rivet gun)											
Drill press											
Bender											
Polishing machine											
Upright belt sander											
Band saw											
Radial arm saw											
Automatic cutting table											
Glass cutting table											
Air table											
Flashing brake											
Router											
Bench grinder											
LAYOUT AND MEASURING EQUIPMENT											
Calculator											
Square – combination											
Square – steel											
Sliding T bevel											
Plumb bob											
Laser distance measurer											
Multimeter											
Level											
Builder's level											
Laser level											
Ruler											
Measuring tape											
Site level											
Theodolite											
Transit level											
Meter stick											

	Install curtain walls	Install windows	Install residential, commercial and industrial garage doors	Install residential and commercial doors	Install glass showers	Install glass panels and doors	Install mirrors	Install glass ramps and guardrails	Install related glass products	Repair glass products	Install aluminum panels
SPECIALTY TOOLS											
Point driver											
Torque wrench											
Windshield knives – hot and cold											
Offset hook tool											
Self-locking rubber tool											
Rubber insert tool											
Tripod glass drill											
Offset drill											
Plate running pliers											
Glass clamp											
SCAFFOLDING AND ACCESS EQUIPMENT											
Scaffolding (baker, frame, sectional, tubular)											
Swing stage (suspended scaffolds)											
Ladders (extension and step)											
Stepladder											
Ladder jack											
Crane											
Articulated boom lift											
Platform lift											
Aerial work platform											
Hydro lift											
Lift table											
RIGGING, HOISTING AND LIFTING EQUIPMENT											
Skip (Elevator)											
Chain											
Gator Dolly											
Glass Dolly											
Fork Lift											
Ropes (Fibre And Synthetic)											
Sling											

	Install curtain walls	Install windows	Install residential, commercial and industrial garage doors	Install residential and commercial doors	Install glass showers	Install glass panels and doors	Install mirrors	Install glass ramps and guardrails	Install related glass products	Repair glass products	Install aluminum panels
Crane											
Shackle											
Chain Fall											
Hand Winch											
Chain Hoist											
Pallet Jack											
Winch											
Suction Cup											
Suction Cup – Electric											
PERSONAL PROTECTIVE EQUIPMENT											
Hard Hat											
Safety Footwear											
Asbestos blanket											
Bib											
Eye Wash Station											
Fall arrest equipment											
Welding screen											
Fire extinguisher											
Gloves											
Rubber gloves											
Welding gloves											
Knee pads											
Safety vest											
Chaps											
Safety glasses											
Respiratory mask											
Hearing protection											
Respirator											
Apron											
First aid kit											
Visor											

Annex 2

Grid of Occupational Health and Safety Elements

Produced by: **Bernard Teasdale**, Prevention Consultant
ASP Construction

Table A.2 Description of Hazards

No.	Hazards	Effects on Health and Safety	Means of Prevention
1	**Same-level fall hazards** – Slippery surfaces (rain, oil, snow, etc.)	• Collisions • Contusions • Fractures • Bruises	• Clean the work area (pick up debris). • Apply abrasives to make the surface less slippery. • Clearly delimit material storage areas.
2	**Fall-from-height hazards** a) Using a ladder b) Using a stepladder c) Using an aerial automotive work platform	• Collisions • Internal injuries • Fractures • Bruises • Death • Psychological and physical after-effects	a) • Use a class 1 ladder (rated capacity of 250 lb). • Climb up and down a ladder while: – always having three support points; – observing the angle of slope; – holding the bars, not the side rails; – remaining between the side rails; – holding nothing in the hands; – facing the ladder. b) • Use a class 1 stepladder (rated capacity of 250 lb): – open the spreader bars fully; – install on a firm level surface; – choose a model according to the required height. c) • Took the training required by safety standards. • Wear a shock-absorbing safety harness for the jib boom platform, and a harness that includes a tensioner and a shock absorber for the scissor lift. • Delimit the work area on the ground to avoid the risk of collision. • Keep the feet on the platform floor at all times. • Climb up and down facing the equipment.

No.	Hazards	Effects on Health and Safety	Means of Prevention
			• Always have three support points. • Keep the platform's access points and floor clean. • Never modify this type of equipment without the manufacturer's authorization of an engineer's documentation.
	d) Using a small mobile scaffold (Baker)		d) • Always use the wheel locking mechanism. • Climb down a mobile scaffold to move it. • Starting with the third scaffold section, use stabilizers.
	e) Using a metal frame scaffold		e) • When there is a risk of falling more than 3 m: – install a guardrail or wear a shock-absorbing harness, with an anchor that has a breaking strength of 18 kN (4046 lb/F) or a vertical lifeline complying with the specifications in the Safety Code for the construction industry; – check the bearing capacity of the ground; – install beds and jack screws if the ground is sloped; – for each scaffolding section, install vertical locks; – use safe means of access; – install anchors to the structure at intervals not exceeding 3 times the minimum scaffolding width; – ensure that the planks comply with the NLGA standard, that the floor is wide enough (min. 470 mm) and that the distance between the structure and the floor is less than 350 mm.
	f) Using a flying scaffold[26]		f) • Wear a safety harness with a rope grab on a vertical lifeline for each worker, and with an anchor point that has a capacity of 18 kN (4046 lb/F). • Use a winch equipped with two independent braking mechanisms, including an automatic brake. • Install the equipment according to an engineering plan or the manufacturer's instructions.

26. Prohibited for those less than 18 years of age.

No.	Hazards	Effects on Health and Safety	Means of Prevention
3	**Falling object hazards**	• Collisions • Internal injuries • Fractures • Bruises • Death • Psychological and physical after-effects	• Never do superimposed jobs. • Wear a hard hat at all times. • Delimit the work area on the ground. • Raise and lower tools and light equipment with a rope in platforms and scaffolds.
4	**Chemical hazards** – Silica dust (sandblasting, cement, etc.) – Insulating foam (urethane) – Welding fumes	• Respiratory illnesses • Cancer • Silicosis • Pneumoconiosis • Occupational asthma	• Took WHMIS training. • Wear respiratory protection: – an air line hood for sandblasting (CS, sec. 3.20); – a full face air line mask for applying urethane foam insulation (isocyanates). • Ensure appropriate mechanical ventilation for the risk level. • Wear appropriate personal protective equipment (gloves, coveralls, safety glasses, visor, welding helmet, etc.). • Use a vacuum cleaner equipped with a highly effective filter or knock the dust down with a damp process.
5	**Ergonomic hazards** – Postural constraints, statis – Repeated movements – Handling – Task difficulty – Excessive efforts	• Musculoskeletal injuries • Sprains • Tendinitis • Bursitis • Hernias • Fatigue • Discomfort • Pain	• Rotate tasks if possible. • Favour the purchase of tools limiting vibrations to a minimum. • Use handling equipment (cart, etc.). • Use handling techniques.
6	**Electrical hazards** – Contact with overhead electric lines – Electric tools, welding	• Burns • Electric shocks • Electrocution	• Maintain the minimum distances of approach prescribed for electric lines by the Safety Code. • Establish a working agreement with the operating company and the CSST. • Use tools with double insulation. • Use extension cords that are appropriate and in good condition.
7	**Noise hazards**	• Hearing loss • Occupational deafness	• Wear hearing protection. • Choose the least noisy equipment possible.

No.	Hazards	Effects on Health and Safety	Means of Prevention
8	**Other hazards**	• Cuts • Lacerations • Scratches • Projection of objects in the eyes • Cold, heat, etc.	• Wear appropriate personal protective equipment (gloves, glasses, visor, disposable coveralls, knee pads, etc.). • Use the appropriate work method. • Choose appropriate ergonomic tools. • Drink 250 ml of water every 20 minutes during a heat wave.

Annex 3

Comments from the Erector Mechanic (Glazier) Professional Subcommittee

At the meeting of the Erector Mechanic (Glazier) Professional Subcommittee, held in Montreal on March 27, 2012, the subcommittee members made the following clarifications or comments:

1. Point 1.6, Working Conditions, on work schedules, p.9

   The 2010-2013 collective agreement of the institutional and commercial sector provides a specific rule for erector mechanics (glaziers) to the effect that the regular work week is 40 hours from Monday to Friday, with a daily limit of 10 hours a day.

2. Point 1.7, Job Market Entry Conditions, p. 10

   A credit of 1,350 hours, equivalent to the duration of his study program *Installation et fabrication de produits verriers,* will be paid into the erector mechanic (glazier) apprentice's record book.

3. List of Tasks and Operations p. 13, 18, 39 and at all other mentions of task 11:

   Task 11 should read as follows:
   "Install panels made of metal or substitute materials."

4. Point 4.1, Knowledge, "Glass" subsection, p. 57

   The erector mechanic (glazier) must know not only how different types of sealant react with glass, but also how they react with different installation materials and depending on weather conditions.