

# Elevator Mechanic

## Occupational Analysis Report

November 2009



Commission  
de la construction  
du Québec

The purpose of this report is to describe as accurately as possible the trade of elevator mechanic as currently practiced in the Quebec construction industry. The report describes the discussions held by a group of workers who met for the occasion and were referred to the Commission de la construction du Québec (CCQ) by industry partners for their expertise in the trade.

The occupational analysis is a first step in defining the qualifications required of workers in the trade. This report becomes one of the reference and decision-making tools used by the CCQ for teaching and learning purposes.

**The Commission de la construction du Québec (CCQ) is not legally responsible for this report. The latter has no legal effect and is intended solely to reflect the discussions held on the date of the analysis workshop.**

## **PRODUCTION TEAM**

The Commission de la construction du Québec wishes to thank the production team for this occupational analysis.

### **Responsibility**

*Jean Mathieu*

Section Manager

Commission de la construction du Québec

### **Coordination**

*Abraham Niziblian*

Training Advisor

Commission de la construction du Québec

*Doris Gagnon*

Training Advisor

Commission de la construction du Québec

### **Conduct of the June 13 and 14, 2009 workshop**

*Diane Barrette*

Education Consultant

Groupe Vision Compétence – Education Consulting Services

### **Note-taking and writing the report's first draft**

*Louise Blanchet*

Training Consultant

### **Validation of the occupational analysis report**

*Bernard Lamothe*

Vocational and Technical Training Consultant

ExpertISA Solutions d'apprentissage Inc.

### **Special collaboration**

*Roger Harpin*

Business Agent and Content Expert

International Union of Elevator Constructors

### **Production support**

*Michel Couillard*

Training Advisor

Commission de la construction du Québec

Editing

Féminin Pluriel

The masculine gender is used generically  
in this document to facilitate reading.



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*Allan Adams*  
Elevator Mechanic, Adjuster  
Quebec City

*Benjamin Archambault*  
Elevator Mechanic, Installations  
Laval

*Pascal Baudelet*  
Local Representative, Technical Department  
Trois-Rivières

*Christian Bourgault*  
Elevator Mechanic  
Quebec

*Mélanie Chartrand*  
Elevator Mechanic  
Brossard

*Glen Cowie*  
Elevator Mechanic, Adjuster  
Montreal

*Giovanni Di Lazzaro*  
Elevator Mechanic, Adjuster  
Montreal

*Michel Florent*  
Elevator Mechanic, Adjuster  
Longueuil

*Mario Gemme*  
Elevator Mechanic, Adjuster  
Montreal

*Brent MacMillan*  
Elevator Mechanic, Adjuster  
Delson

*Roger Messier*  
Elevator Mechanic, Adjuster  
Brossard

*Benoît Tremblay*  
Elevator Mechanic  
Sherbrooke

*Rino Viel*  
Elevator Mechanic, Adjuster  
Montreal

The following persons attended the meeting as observers:

*Michel Couillard*  
Training Advisor  
Commission de la construction du Québec

*Serge Lajoie*  
Project Manager, Sector Manager  
Ministère de l'Éducation, du Loisir et du Sport

*Roland Sayeg*  
Inspector  
Commission de la santé et de la sécurité du travail

*Thérèse Trudeau*  
Competency Evaluation Writer  
Commission de la construction du Québec

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## **APPROVAL**

This occupational analysis of the trade of Elevator Mechanic was read and approved by the following organizations and persons on the dates mentioned below.

### **Elevator Mechanic Professional Subcommittee**

January 11, 2010

*Mr. Tony Arcaro*

Association de la construction du Québec

*Mr. René Gauthier*

Association de la construction du Québec

*Mr. Francis Montmigny*

Association provinciale des constructeurs d'habitations du Québec

*Mr. Roger Harpin*

Conseil provincial du Québec des métiers de la construction - International

*Mr. Brent MacMillan*

Conseil provincial du Québec des métiers de la construction - International

*Mr. François St-Pierre*

Conseil provincial du Québec des métiers de la construction - International

*Mr. Alain Plante*

Centrale des syndicats démocratiques

### **Committee on Vocational Training in the Construction Industry**

February 18, 2010

### **Board of Directors, Commission de la construction du Québec**

March 24, 2010





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# INTRODUCTION

In early 2009, the CCQ's Direction de la formation professionnelle launched a large-scale operation to review the occupational analyses<sup>1</sup> of all construction trades.

The CCQ undertook this operation mainly for the following reasons:

- the project to reform the construction workforce apprenticeship and management system, and the eventual design of qualitative apprenticeship booklets requiring a detailed description of each trade;
- the fact that most construction occupational analyses<sup>2</sup> had been conducted between 1987 and 1991 and had not been reviewed since;
- updates to vocational qualifying examination question banks;
- implementation of Chapter 7 of the Agreement on Internal Trade (AIT) and of the Québec-France Understanding on the Mutual Recognition of Professional Qualifications.

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

The occupational analysis for elevator mechanics belongs to this context.<sup>3</sup> Its purpose is to describe the trade as currently practiced in the construction industry. The present report was written in order to collate and organize the information gathered during the occupational analysis workshop held in Laval on June 13 and 14, 2009.

This analysis aims to draw a realistic and complete portrait of the trade of a journeyman elevator mechanic. It describes the tasks, operations and conditions of the trade, as well as the behaviours required. The report of the occupational analysis workshop is an accurate reflection of the consensus reached by a group of workers in the trade. A special effort was made to include all the data collected during the workshop and to ensure that the data accurately depict the reality of the trade analysed.

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1 The terms "profession" and "trade" are used indistinctly.

2 Occupational analyses were then called "work situation analyses".

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**

“Elevator mechanic”<sup>4</sup> means anyone who installs, renews, alters, repairs, or maintains a mechanical conveying system composed of apparatus, accessories and other equipment such as elevators, hoists, escalators, flying scaffolds, ski lifts, dumbwaiters, moveable stage platforms, rolling sidewalks and other similar equipment generally used or usable for transporting persons, things or materials.

The installation of a mechanical conveying system also involves the electrical connection of apparatus and accessories from the distribution panel. The installation also includes the operation of a temporary or unfinished system, as well as the operation of a finished system when the latter is used, at the employer's request, to convoy his employees and materials.

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

## **1.2 JOB TITLES**

A person holding a Competency Certificate-Journeyman (CCJ) is called a “journeyman elevator mechanic”.

The elevator mechanics consulted added that the elevator mechanic is often called a “technician”, notably by service companies, but that the only officially recognized title is “elevator mechanic”.

## **1.3 SECTORS OF ACTIVITY**

Elevator mechanics are active in the four sectors of the construction industry: industrial, institutional and commercial, civil engineering and roadwork, and residential.

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<sup>4</sup> According to the Regulation respecting the vocational training of workforce in the construction industry, Schedule A, Group X, section 23.

The elevator mechanics who participated in the workshop are called upon to work in all these sectors. However, there is less work in the civil engineering and roadwork sector and the residential sector.

For instance, and to illustrate the diversity of workplaces, the elevator mechanics consulted mentioned that they have on occasion to work on mechanical conveying systems in plants, hospitals, retirement homes, ships, aircraft, dams, tunnels, bridges, private homes, etc.

#### **1.4 FIELD OF PRACTICE**

The trade's area 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

Elevator mechanics in the construction industry are subject to a legal framework including laws, regulations, codes and standards. Keeping apprised of these standards is mandatory. For further information on this subject, refer to the Régie du bâtiment du Québec (RBQ).

**Table 1 General Regulations**

Designation	Act, Regulation, Code, Standard, etc.	Editor
R.S.Q., c. R-20	Act respecting labour relations, vocational training and workforce management in the construction industry	
R-20, r.6.2	Regulation respecting the vocational training of workforce in the construction industry	
	The four sector-based collective agreements of the construction industry	CCQ
NBC	National Building Code	
NBC (2005)	Québec Building Code, Chapter I, "Building"	NRC-IRC
R.Q., c. S-2.1, r.6	Safety Code for the construction industry	
CAN/CSA B44-07	Building Code and Safety Code, Chapter IV, "Elevators and Other Elevating Devices"	
R.S.Q., c. S-2.1	Act respecting occupational health and safety	
S-2.1, r.19.01	Regulation respecting occupational health and safety	
CSA Z98	Standard for passenger ropeways	
	Municipal by-laws, if applicable <sup>5</sup>	

**Table 2 Reference Documents**

Safety Code for Elevators, Escalators, Dumbwaiters, Moving Walks and Freight Platform Lifts			
Article 9.1 Reference Documents			
Designation	Act, Regulation, Code, Standard, etc.	Editor	Relevance
<i>American Plywood Design Specification A3.3.1 (April 1978)</i>		APA	U.S., Canada
ANSI A14.3-1984	Safety Requirements for Fixed Ladders	ANSI	U.S., Canada
ANSI Z535.2 (latest edition)	Environment and Facility Safety Signs	ANSI	U.S., Canada

<sup>5</sup> The elevator mechanics who attended the meeting cited, as an example, the City of Montreal, which has adopted regulations for fire prevention in elevators.

<b>Safety Code for Elevators, Escalators, Dumbwaiters, Moving Walks and Freight Platform Lifts</b>			
<b>Article 9.1 Reference Documents</b>			
ANSI/AWS D1. 1 (latest edition)	Structural Welding Code - Steel	AWS	U.S., Canada
ANSI/AWS D1 .3 (latest edition)	Structural Welding Code - Sheet Steel	AWS	U.S., Canada
ANSI/UL 94 (latest edition)	Test for Flammability of Plastic Materials for Parts in Devices and Appliances	UL	U.S., Canada
ANSI/UL 723 (latest edition)	Test for Surface Burning Characteristics of Building Materials	UL	U.S., Canada
ASME B1.1 (latest edition)	Unified Inch Screw Threads	ASME	U.S., Canada
ASME B1.13M (latest edition)	Metric Screw Threads	ASME	U.S., Canada
ASME B1.20.1 (latest edition)	Pipe Threads, General Purpose (Inch)	ASME	U.S., Canada
ASME B1.20.3 (latest edition)	Dryseal Pipe Threads (Inch)	ASME	U.S., Canada
ASME B1.20.4-1976 (c1982)	Dryseal Pipe Threads (Metric Translation of B1.20.3)	ASME	U.S., Canada
ASME B29.1-1975	Precision Power Transmission Roller Chains, Attachments, and Sprockets	ASME	U.S., Canada
ASME B29.2M-1982 (c1987)	Inverted Tooth (Silent) Chains and Sprockets	ASME	U.S., Canada
ASME B29.8-2002	Leaf Chains, clevises, and sheaves	ASME	U.S., Canada
ASME B29.15-1973 (c1987)	Heavy Duty Roller Type Conveyor Chains and Sprocket Teeth	ASME	U.S., Canada
ASME B29.100-2002	Precision Power Transmission, Double-Pitch Power Transmission, and Double-Pitch Conveyor Roller Chains, Attachments, and Sprockets	ASME	U.S., Canada
ASME B31.1 (latest edition)	Power Piping	ASME	U.S., Canada
ASME (latest edition)	Boiler and Pressure Vessel Code, Section VIII	ASME	U.S., Canada
ASTM A27-84a	Specification for Mild to Medium Strength Carbon-Steel Castings for General Application	ASTM	U.S., Canada
ASTM A36-84a	Specification for Structural Steel	ASTM	U.S., Canada
ASTM A53 (latest edition)	Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless	ASTM	U.S., Canada
ASTM A106 (latest edition)	Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service, Rule 303.1a	ASTM	U.S., Canada
ASTM A283-84a	Specifications for Low and Intermediate Tensile Strength Threaded Standard Fasteners	ASTM	U.S., Canada



<b>Safety Code for Elevators, Escalators, Dumbwaiters, Moving Walks and Freight Platform Lifts</b>			
<b>Article 9.1 Reference Documents</b>			
ASTM A307-84a	Specification for Low and Intermediate Tensile Strength Carbon Steel Plates of Structural Quality	ASTM	U.S., Canada
ASTM A502-83a	Specification for Steel Structural Rivets	ASTM	U.S., Canada
ASTM A668-85	Specification for Steel Forgings, Carbon and Allow, for General Industrial Use	ASTM	U.S., Canada
ASTM D97-85	Standard Test for Pour Point of Petroleum Oils	ASTM	U.S., Canada
ASTM D 98-84	Static Tests of Timbers in Structural Sizes	ASTM	U.S., Canada
ASTM D245-81 (1986)	Establishing Structural Grades and Related Allowable Properties for Visually Graded Lumber	ASTM	U.S., Canada
ASTM D648	Standard Test Method for Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position	ASTM	U.S., Canada
ASTM D2270-79	Calculating Viscosity Index from Kinematic Viscosity	ASTM	U.S., Canada
ASTM E8 (latest edition)	Standard Test Methods for Tension Testing of Metallic Materials	ASTM	U.S., Canada
ASTM E84 (latest edition)	Standard Test Method for Surface Burning Characteristics of Building Materials	ASTM	U.S., Canada
B311-M1979	Safety Code for Manlifts	CSA	Canada
CAN3-B354.1-M82 (identical to CSA-B354)	Elevating Rolling Work Platforms	CSA	Canada
CAN4-S104-M80 (c1985)	Fire Tests of Door Assemblies	CSA	Canada
CAN/CCSB-12.1-M90 (identical to CAN2-12.1)	Tempered or Laminated Safety Glass	GCSB	Canada
CAN/CGSB-12.5-M86	Silvered Mirror Glass	GCSB	Canada
CAN/CCSB-12.11-M90 (identical to CAN2-12.11)	Wire Glass	GCSB	Canada
CAN/CGSB-12.12-M90 (identical to CAN2-12.12)	Plastic Safety Glazing	GCSB	Canada
CAN/CSA-B72-M87 (c1998) (identical to CSA-B72)	Installation Code for Lightning Protection systems	CSA	Canada
CAN/CSA C40.21-1972	Structural Steel	CSA	Canada
CAN/CSA-S16.1-94	Limit States Design of Steel Structures	CSA	Canada
CAN/CSA-T515-97 (identical to CAN3-T515-M85)	Telecommunications - Telephone Terminal Equipment - Acoustic and Magnetic Field Requirements for Handset Telephones for Use by the Hard of Hearing	CSA	Canada
CAN/CSA-Z185-M87 (c1997) (identical to CSA-Z185)	Safety Code for Personnel Hoists	CSA	Canada

<b>Safety Code for Elevators, Escalators, Dumbwaiters, Moving Walks and Freight Platform Lifts</b>			
<b>Article 9.1 Reference Documents</b>			
CAN/CSA-Z256-M87 (c1995) (identical to CSA-Z256)	Safety Code for Material Hoists	CSA	Canada
CAN/CSA-Z271-98 (identical to CSA-Z271)	Health and Safety Code for Suspended Equipment Operations	CSA	Canada
CAN/CSA-Z321-96 (identical to CSA-Z321)	Signs and Symbols for the Workplace	CSA	U.S., Canada
CAN/ULC-S102.2-M88 (identical to CAN/ULC-S102)	Method of Test for Surface Burning Characteristics of Building Materials and Assemblies	ULC	Canada
CEI 61508, part 1 to 7 (first edition - 1998)	Functional Safety of Electrical/Electronic/Programmable Electronic Safety-Related Systems	ANSI	U.S., Canada
CSA A23.3-M84 (identical to CAN3-A23.3)	Design of Concrete Structures	CSA	Canada
CSA B44.1/ASME A17.5 (latest edition)	Elevator and Escalator Electrical Equipment	ASME	U.S., Canada
CSA B167-F96	Safety Standard for Maintenance and Inspection of Overhead Cranes, Gantry Cranes, Monorails, Hoists and Trolleys	CSA	Canada
CSA B354 (latest edition)	Work Platform Standards	CSA	Canada
CSA B355-F00	Lifts for Persons with Physical Disabilities	CSA	Canada
CSA B613-F00	Private Residence Lifts for Persons With Physical Disabilities	CSA	Canada
CSA C22.1-98	Canadian electrical code, part I (18th edition), safety standard for electrical installations	CSA	Canada
CSA C22.2 No. 139-1982 (c1992)	Electrically Operated Valves	CSA	U.S., Canada
CSA C22.2 No. 141-M1985 (c1992)	Unit Equipment for Emergency Lighting	CSA	Canada
CSA 086.1-94	Limit States Design of Steel Structures	CSA	Canada
CSA OI51-M 1978 (identical to CAN/CSA-0151-FM78)	Canadian Softwood Plywood	CSA	Canada
CSA W47.1-1992 (c1998)	Certification of Companies for Fusion Welding of Steel	CSA	Canada
CSA W59-M1989	Fusion Welding of Steel (Arc Welding) (metric version)	CSA	U.S., Canada
CSA Z150-98	Safety Code on Mobile Cranes	CSA	Canada
CSA Z248-1975	Code for Tower Cranes	CSA	Canada
CNBC	National Building Code of Canada	NRC	Canada
CNPI-1995	National Fire Code	NRC	Canada

<b>Safety Code for Elevators, Escalators, Dumbwaiters, Moving Walks and Freight Platform Lifts</b>			
<b>Article 9.1 Reference Documents</b>			
EN 12016:1998	Electromagnetic Compatibility - Product Family Standard for Lifts, Escalators and Passenger Conveyors Immunity	BSI	U.S., Canada
IEEE 45 (latest edition)	Recommended Practice for Electric Installations on Shipboard	IEEE	U.S., Canada
ISO/TS 14798-2000	Risk Assessment	ANSI	U.S., Canada
Mil Spec 83420			
NFPA 80-1986	Fire Doors and Windows	NFPA	U.S., Canada
NFPA 105 (latest edition)	Recommended Practice for the Installation of Smoke-Control Door Assemblies	NFPA	U.S., Canada
NFPA 255 (latest edition)	Fire Tests for Evaluating Room Fire Growth Contribution of Textile Wall Coverings	NFPA	U.S., Canada
SAE J514-1992	Hydraulic Tube Fittings	SAE	U.S., Canada
SAE J517-1991	Hydraulic Hoses	SAE	U.S., Canada
---	Elevator Industry Field Employees' Safety Handbook	Elevator World	U.S., Canada

## 1.6 WORKING CONDITIONS<sup>6</sup>

The following data give an overview of the working conditions and context of elevator mechanics, as commented by participants in the occupational analysis workshop. Please refer to the four collective agreements of the construction industry's sectors to obtain up-to-date and complete information that has legal effect.

### Salary

According to the sectoral collective agreements of the construction industry, the hourly rate (at April 26, 2009 of a journeyman elevator mechanic is set as follows, by sector:

- *Industrial, institutional and commercial:* \$36.33
- *Civil engineering and roadwork:* \$36.01
- *Residential (light):* \$33.42
- *Residential (heavy):* \$36.00

<sup>6</sup> The data presented in this page are taken from the following document, published by the Commission de la construction du Québec: *Carrières construction*, 2008-2009 edition.

## **Vacations and time off**

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

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

## **Work schedules**

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

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

## **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 <sup>7</sup>.

## **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<sup>7</sup>.

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<sup>7</sup> Those subscribing to the Canadian plan of the International Union of Elevator Constructors receive different pension plan and fringe benefits.

## **Physical requirements**

The elevator mechanic's work requires:

- maintaining a wide variety of postures (crouching, kneeling, bowed head, etc.), in closed areas with restricted space and difficult access;
- physical strength, to move large heavy loads, in uncomfortable positions, except for maintenance tasks;
- endurance, to work in an often hostile environment (cold, heat or humidity, dust, toxic fumes, etc.);
- skill and prudence, to avoid dropping any object, which could have very serious consequences when the work is done from a height;
- good movement coordination, as well as agility and balance;
- ingenuity, to find the most efficient ways of moving components without causing damage, of moving equipment to and from narrow areas, of solidifying parts, etc.

There is a wide variety of workplaces. Elevator mechanics may work inside or outside buildings, on roofs, in an elevator mechanical room, etc. Risks of falling, uncleared roofs in winter, very narrow accesses, using metal ladders in winter, are examples of highly difficult conditions they face. Occasionally, an elevator mechanic has to work outside in the rain for entire days. Sweat and wet feet complicate work near electric currents. He must therefore use his tools correctly and adopt the appropriate way to position himself under such circumstances.

In addition to physical requirements, the workshop participants emphasized the importance of thinking about the procedure to follow, the appropriate tools to use and the safety measures to consider, before taking action. Worker and public safety is the priority; it takes precedence over the time allocated to do the work.

## **Stress factors**

The elevator mechanic is under pressure from the client and the employer. He is expected to respond quickly to service calls, at times in emergencies, often at odd hours. Getting to the incident location can be complicated in times of heavy traffic. Work deadlines are at times very tight, which adds stress, particularly for beginners in the trade.

The elevator mechanic is responsible for public safety; he must install safety barricades and ensure that people circulating nearby do not cross them. This necessary monitoring may cause distractions that could have serious consequences for the worker's safety or the quality of his work.

The participants mentioned that coordinating their work with that of other trades is also a major source of stress. Waiting for resource persons (the electrician, for example) to arrive on the scene, or for equipment to be delivered, is also stressful. A great deal of stress is added during emergencies for which firefighters are responsible, because the latter have only a basic knowledge of mechanical conveying systems. Indeed, in their haste to rescue people, firefighters can cause breakages complicating rescue manoeuvres. It is important to establish good communication rather than engage in sterile confrontations, in order to adopt an effective strategy while observing each party's field of work.

Moving and stabilizing the car, as well as evacuating captive persons, at times panicking or mobility challenged, are additional stress factors. The elevator mechanic has to make the client, maintenance person or security guard feel that he is in control of the situation. In concert with the person responsible for the company or his representative, he establishes the response procedure.

Experience helps reduce the stress. Any elevator mechanic must learn to manage it and practice self-control in all circumstances.

## **1.7 JOB MARKET ENTRY CONDITIONS**

Under the construction industry's workforce training and management system currently in effect, in order to obtain the Competency Certificate-Apprentice (CCA) in the trade, candidates must present to the CCQ a guarantee of employment of at least 150 hours from an employer registered with the CCQ, and demonstrate that they have acquired Secondary 4 academic prerequisites. As for candidates who hold a diploma in elevator mechanics, they must also present a document attesting that they have graduated with a DEP in elevator mechanics.

Then, the apprentice elevator mechanic must complete 5 apprenticeship periods of 2,000 hours each (10,000 hours total<sup>8</sup>) in order to be eligible for the provincial qualification examination that leads to obtaining the Competency Certificate-Journeyman for the trade.

Among the elevator mechanics participating in the occupational analysis workshop, two hold a DEP in elevator mechanics. All the participants have worked as apprentices with a journeyman. Some entered the trade with previously acquired training, as in engineering, aircraft maintenance, construction electricity and industrial electronics. Finally, for continuous training purposes, a few took upgrading courses in electronics and robotics.

Although the construction industry favours graduates for access to the trade<sup>9</sup>, labour shortages may at times make it necessary for the CCQ to admit candidates without a diploma. Specific conditions must then be met. There is a labour shortage when CCQ data show that less than 5% of employees holding a Competency Certificate-Apprentice or a Competency Certificate-Occupation in a trade are available in a given region.

The elevator mechanics consulted mentioned that in cases of severe shortage, employers have had to hire individuals they trained on the job. Moreover, the high salary attracts candidates. The elevator mechanics consulted expressed the hope that a follow-up be established to ensure that an apprentice benefits from continuous and complete training to make him versatile in his skills. However, they recognized from the outset that such a measure could prove difficult if not impossible to implement in specialized companies. Also to be considered is the fact that some elevator mechanics prefer to practice their trade in a specific field of activity throughout their careers.

To ensure that its workforce has a certain level of qualification, the CCQ offers training courses, which begin when the number of registrations is sufficient.

Other than training, the candidates must have the qualities that will be useful in practicing the trade; some of those qualities are particularly sought by employers. Here are the latter's main selection criteria:

- a logical mind;
- methodical work;

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<sup>8</sup> The apprenticeship period of a person who holds a vocational diploma (DEP) in elevator mechanics will be reduced by 1,800 hours, i.e., the duration of training acquired in an education institution.

<sup>9</sup> Commission de la construction du Québec ([www.ccq.org](http://www.ccq.org)).

- openness of mind (wanting to learn, in order to follow the extremely rapid technological progress);
- availability;
- a commitment to meet the trade's many requirements;
- the ability to establish interpersonal relations with the public, clients, etc.;
- versatility.

## **1.8 PLACE OF WOMEN IN THE TRADE**

Section 126.0.1 of the Act respecting labour relations, vocational training, and manpower 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<sup>10</sup>, the proportion of women active in the trade of elevator mechanic is 0.05%.

Although the trade is open to women, the participants confirm that few women practice it. However, they are welcome and respected. They stand out by their remarkable professional dedication. The physical requirements can be by-passed by appropriate work methods, as would be the case for a man with limited physical capacity. Accommodations are possible in the case of work requiring outdoor operations. The foreman is responsible for considering solutions to any difficulties. Given their low numbers, women must be prepared to work in a mainly male environment.

## **1.9 CAREER PROSPECTS**

Depending on his interests and abilities, an elevator mechanic who wants to advance in the trade and obtain related employment can consider several avenues. He can work in any of the following capacities:

- adjuster;
- foreman;

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<sup>10</sup> Commission de la construction du Québec, *Carrières construction*, Québec, 2008-2009 edition.



- supervisor (further training would be desirable);
- entrepreneur;
- inspector;
- office or outlet manager;
- local representative;
- consultant;
- etc.

The local representative's tasks are varied (mechanics, sales, office management, customer service, etc.). To fill that position, elevator mechanics are requested to hold a Competency Certificate-Journeyman (CCJ) and have a great deal of experience.

In a consulting firm, only an engineer is authorized to certify the work. In this regard, the elevator mechanic faces a choice: Either he works within a firm, or he manages it on condition of hiring an engineer.

## **1.10 DEVELOPMENT OF THE TRADE**

In the view of the workshop participants, technological progress poses the main short-term challenge.

The progress of electronics is leading to major changes:

- a diagnosis is made with computerized tools, which greatly changes the work methods;
- electronic components are miniaturized, more numerous and have an effect on repair techniques.

Elevator installations are also undergoing major changes:

- the "machine room" no longer exists in many new installations ("machine roomless" or MRL);
- the controllers and the motor are very often installed at a different location from the elevator shaft;
- the elevator shaft and car are smaller;
- access to system components is more difficult;

- the mechanics' work space is limited;
- the work is done near the public.

These factors influence the work organization of elevator mechanics, particularly in making a diagnosis without having access to the motor and controllers. "We have to work with virtual rather than visual reality." Accordingly, work that used to be carried out by a single elevator mechanic may now require a team of two. Working from a height in narrow spaces poses additional accident hazards. In some situations, the public's proximity complicates the work of elevator mechanics, who must ensure public safety (a control box installed in a public area, for example). It is also a significant distraction.

Among the new types of devices or equipment, the participants mentioned:

- dispatch consoles, which control passenger movement;
- horizontal elevators;
- voice commands;
- electronically controlled escalators and rolling sidewalks.

The arrival on the market of composite materials, kevlar belts and new car panels was also mentioned. The latter require more complex maintenance and, according to one participant, will shorten the equipment's service life. The components will then be replaced rather than repaired.

Moreover, some changes come with a set of constraints, According to the participants, the continuous training currently provided in companies is not keeping pace with technological advances. While some companies hold retraining sessions regarding new generations of devices and new procedures, others do not. In addition, equipment manufacturers develop their own technologies and want to maintain their exclusiveness (business secrets), so that companies are obliged to deal with those manufacturers for maintenance and repairs.

Finally, the technical documentation is not updated consistently, and it can be difficult to order parts or components necessary for the diagnosis or repair.

## **1.11 IMPACT OF ENVIRONMENTAL STANDARDS ON THE PRACTICE OF THE TRADE**

The elevator mechanic is required to work with chemicals, oils and materials that pose environmental hazards. He must often dispose of old mechanical components, electronic parts and waste oil, while taking care to do so correctly. The company is responsible for recovering hazardous waste, by calling upon recycling waste handlers. The elevator mechanic is responsible for disposing of them at the appropriate locations.

In the practice of this trade, the regulations of the Workplace Hazardous Materials Information System (WHMIS) apply. The products are dated (expiration dates) and accompanied by data sheets.

Preventive means to counter the environmental effects are also established with regard to equipment. As an example, the participants cited the installation of waterproof sheaths to prevent oil leaks.

It happens that the elevator mechanic has to work in special areas, such as hospitals. He is then required to wear regulation dress, wear a mask, sterilize his tools, protect his work area, etc. In a plant, he is asked to wear goggles, boots and a smock. At times, the elevator mechanic is accompanied by a security guard.



## 2. WORK DESCRIPTION

### 2.1 TASKS AND OPERATIONS

Before presenting the tasks performed by elevator mechanics, it is important to define the terms used in this part of the report.

#### Definition of terms<sup>11</sup>

- Tasks** Tasks are actions that correspond to the main activities in the exercise of the profession analyzed. A task is structured, autonomous and observable. It has a definite beginning and end. In the exercise of a profession, whether a product, service or decision is involved, the result of a task must have a specific and significant usefulness.
- Operations** Operations are actions that constitute the steps in performing a task and make it possible to determine how to attain the desired outcome. They are related to a task and are linked to one another.

#### List of tasks

A list of the elevator mechanic's tasks and operations was first submitted as a working hypothesis to participants in the occupational analysis workshop. The participants were asked to validate the document, complete it, delete erroneous parts, etc., if applicable. Changes were made to task descriptions, so as to describe the trade as practiced in 2009 – notably by adding task 9, regarding emergency responses.

It should be noted that the order in which the tasks are presented does not necessarily reflect their importance in the trade.

- Task 1 Install traction elevators and hoists
- Task 2 Install hydraulic elevators and hoists (including cable cylinders)
- Task 3 Install escalators and rolling sidewalks
- Task 4 Install other types of mechanical conveying systems
- Task 5 Maintain mechanical conveying systems, temporary or not, finished or not

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<sup>11</sup> The definitions of terms are excerpted from the *Cadre de référence et instrumentation pour l'analyse d'une profession* (glossary).  
*Op. cit.*

- Task 6      Repair mechanical conveying systems
- Task 7      Alter mechanical conveying systems
- Task 8      Make elevators operate, temporary or not, finished or not, and disassemble temporary elevators when the work is completed
- Task 9      Respond to emergencies

**Table of tasks and operations**

Other minor changes to the table of tasks and operations concern the formulation, transfer or addition of certain operations.

Table 3, presented in the following pages, describes the elevator mechanic's tasks and operations, about which the participants reached a consensus.

**Table 3 Tasks and Operations**

TASKS	OPERATIONS					
<b>TASK 1.</b>  <b>INSTALL TRACTION ELEVATORS AND HOISTS<sup>12</sup></b>	1.1 Plan the work, communicate with the site supervisor and obtain necessary authorizations	1.2 Interpret plans and diagrams	1.3 Apply individual and collective safety measures	1.4 Handle and rig equipment and materials	1.5 Temporarily erect scaffolds, false car platforms or Tyrac electric cable hoists, depending on the type of installation	1.6 Determine the shaft alignment
	1.7 Install components inside the shaft: supports, tracks, courses, shock absorbers; the winch temporarily, etc.	1.8 Install equipment (motor, control panel, etc.) in the machine room or other designated locations (if there is no machine room)	1.9 Make the motor's electrical connections	1.10 Check motor rotation	1.11 Assemble the car frames, platform and counterweight	1.12 Install suspension cables
	1.13 Install speed regulators and check their operation	1.14 Temporarily activate the platform	1.15 Install and adjust elevator door frames, locking devices and fascias	1.16 Install conduits, wires and electric and electronic accessories in the shaft and on the car frame	1.17 Clean and lubricate components in the shaft	1.18 Assemble the car on the platform and install accessories
	1.19 Install the car's electrical accessories	1.20 Complete the car's interior finishing	1.21 Make the final electrical connections	1.22 Paint components	1.23 Make final adjustments	1.24 Participate in technical tests and/or perform those required during startup, or at each addition of a landing (tower) or tower section in the case of temporary elevators

<sup>12</sup> Operations 1.5, 1.6, 1.8, 1.20, 1.21, 1.22, 1.23 and 1.25 are not taken into account in the case of temporary elevator installations.

TASKS	OPERATIONS					
	1.25 Participate in the final inspection	1.26 Clean the work area and store tools and equipment	1.27 Write installation reports, fill out sheets, update plans, etc.			
<b>TASK 2.</b>  <b>INSTALL HYDRAULIC ELEVATORS AND HOISTS (INCLUDING CABLE CYLINDERS)</b>	2.1 Plan the work, communicate with the site supervisor and obtain necessary authorizations	2.2 Interpret plans and diagrams	2.3 Apply individual and collective safety measures	2.4 Handle and rig equipment and materials	2.5 Temporarily erect scaffolds, false car platforms or Tyrac electric cable hoists, depending on the type of installation	2.6 Determine the shaft alignment
	2.7 Install components inside the shaft: supports, rails, courses, shock absorbers, etc.	2.8 Install a protective PVC sheath on the cylinder	2.9 Install the cylinder, align it and adjust the anti-sag device (valve rupture)	2.10 Install the hydraulic piston and its accessories	2.11 Install machine room equipment	2.12 Install hydraulic conduits
	2.13 Assemble and install the car frame and platform	2.14 Install suspension cables, according on the type of installation	2.15 Install speed regulators and check their operation	2.16 Check the platform's alignment on the car frame	2.17 Make the electrical connections for temporary operation	2.18 Operate the platform temporarily
	2.19 Install and adjust elevator door frames, locking devices and fascias	2.20 Install conduits, wires and electric accessories in the shaft	2.21 Clean and lubricate components in the shaft	2.22 Assemble the car on the platform and install accessories	2.23 Install the car's electric accessories	2.24 Complete the car's interior finishing
	2.25 Make the final electrical connections	2.26 Paint components	2.27 Make final adjustments	2.28 Participate in technical tests	2.29 Participate in the final inspection	2.30 Clean the work area and store tools and equipment
	2.31 Write installation reports, fill out sheets, update plans, etc.					



TASKS	OPERATIONS					
<b>TASK 3.</b> <b>INSTALL ESCALATORS AND ROLLING SIDEWALKS</b>	3.1 Plan the work, communicate with the site supervisor and obtain necessary authorizations	3.2 Interpret plans and diagrams	3.3 Apply individual and collective safety measures	3.4 Handle and rig equipment and materials	3.5 Erect scaffolds depending on the type of installation	3.6 Put the equipment in place and assemble components if applicable
	3.7 Fasten the equipment definitively	3.8 Make the electrical connections	3.9 Make adjustments	3.10 Participate in technical tests	3.11 Participate in the final inspection	3.12 Clean the work area and store tools and equipment
	3.13 Write installation reports, fill out sheets, update plans, etc.					
<b>TASK 4.</b> <b>INSTALL OTHER TYPES OF MECHANICAL CONVEYING SYSTEMS</b>  (CABLEWAYS, FLYING SCAFFOLDS, PASSENGER ROPEWAYS <sup>13</sup> , DUMBWAITERS, HOME ELEVATORS FOR DISABLED PERSONS, ELEVATORS AND HOISTS ON AN INCLINE, MOVEABLE STAGE PLATFORMS AND OTHER SIMILAR DEVICES)	4.1 Plan the work and obtain necessary authorizations	4.2 Interpret plans and diagrams	4.3 Apply individual and collective safety measures	4.4 Handle and rig equipment and materials	4.5 Erect scaffolds if applicable	4.6 Put the equipment in place and assemble components if applicable
	4.7 Fasten the equipment definitively	4.8 Make the electrical connections	4.9 Make adjustments	4.10 Participate in technical tests	4.11 Participate in the final inspection	4.12 Clean the work area and store tools and equipment
	4.13 Write installation reports, fill out sheets, update plans, etc.					

13. The elevator mechanics mentioned that to their knowledge, elevator mechanics do not install passenger ropeways, although they are qualified to do so, as provided for by the regulations in effect. In the participants' view, the installation, maintenance and repair of passenger ropeways is currently done by holders of a certificate in passenger ropeway mechanics, under the Regulation respecting the vocational training and qualification of manpower in the construction industry – a regulation that applies to the trades of electrician, pipe fitter, elevator mechanic and electric machine operator in sectors other than construction (c. F-5, r.4). For further information, see Schedule 3 on this subject.

TASKS	OPERATIONS					
<b>TASK 5.</b> <b>MAINTAIN MECHANICAL CONVEYING SYSTEMS, TEMPORARY OR NOT, FINISHED OR NOT</b>	5.1 Plan the work, communicate with the site supervisor and obtain necessary authorizations	5.2 Interpret plans and diagrams	5.3 Apply individual and collective safety measures	5.4 Check the overall operation of the equipment in place	5.5. Analyse noises and vibrations and check the wear	5.6 Diagnose operating problems if applicable
	5.7 Check protective devices	5.8 Interpret plans, sketches, maintenance schedules and maintenance sheets	5.9 Disassemble, reassemble, replace components and make adjustments	5.10 Take corrective measures	5.11 Clean and lubricate components	5.12 Perform tests and make the final inspection
	5.13 Clean the work area and store tools and equipment	5.14 Write maintenance reports, update maintenance sheets, diagrams and plans, etc.	5.15 Send relevant information to the client and inform the supervisor about work to be done if applicable			
<b>TASK 6.</b> <b>REPAIR MECHANICAL CONVEYING SYSTEMS</b> (SERVICE CALL OR PLANNED REPAIR)	6.1 Communicate with the client and obtain the necessary information	6.2 Plan the work and obtain necessary authorizations	6.3 Apply individual and collective safety measures	6.4 Interpret plans, sketches, repair reports and maintenance sheets	6.5 Diagnose operating problems	6.6 Handle and rig the equipment and materials
	6.7 Disassemble equipment	6.8 Process simple parts	6.9 Debug the system temporarily while ensuring complete safety	6.10 Replace or reinstall components	6.11 Calibrate and adjust system components	6.12 Make electrical and mechanical connections
	6.13 Lubricate components	6.14 Make adjustments	6.15 Perform tests and make the final inspection	6.16 Clean the work area and store tools and equipment	6.17 Write repair reports, record data in a logbook, update sheets, diagrams and plans, etc.	6.18 Send relevant information to the client and inform the supervisor about work to be done if applicable

TASKS	OPERATIONS					
<b>TASK 7.</b> <b>ALTER MECHANICAL CONVEYING SYSTEMS</b> (MODERNIZATION, BRINGING UP TO STANDARD, ETC.)	7.1 Communicate with the client and obtain the necessary information	7.2 Plan the work and obtain necessary authorizations	7.3 Apply individual and collective safety measures	7.4 Interpret plans, sketches and alteration reports	7.5 Evaluate the mechanical conveying system in place and determine the alteration's feasibility	7.6 Disassemble, reassemble, replace components or install new ones
	7.7 Clean and lubricate components	7.8 Adjust components	7.9 Make electrical and mechanical connections	7.10 Paint components	7.11 Make adjustments	7.12 Participate in technical tests
	7.13 Participate in the final inspection	7.14 Clean the work area and store tools and equipment	7.15 Send relevant information to the client and inform the supervisor about work to be done if applicable			
<b>TASK 8.</b> <b>MAKE ELEVATORS OPERATE, TEMPORARY OR NOT, FINISHED OR NOT, AND DISASSEMBLE TEMPORARY ELEVATORS WHEN THE WORK IS COMPLETED</b>	8.1 Check safety devices daily	8.2 Apply safety measures for users (barricades, etc.)	8.3 Estimate the weight of loads or obtain the necessary information	8.4 Arrange loads on the platform	8.5 Activate the elevator and ensure that persons or loads are moved safely to the correct location	8.6 Apply rules and procedures for disassembling temporary installations

TASKS	OPERATIONS					
<b>TASK 9.</b> <b>RESPOND TO EMERGENCIES<sup>14</sup></b>						
<b>9 a ) Elevators and cableways</b>	9.1a Communicate with the client or respondent at the scene of the incident	9.2a Assess the situation upon arrival at the scene	9.3a Communicate with the appropriate authorities	9.4a Reassure the captive persons and give them instructions	9.5a Apply safety measures	9.6a Check the condition of the elevator or cableway
	9.7a Perform manoeuvres to move the elevator car	9.8a Perform manoeuvres to move the cableway car	9.9a Evacuate the persons safely	9.10a Produce an incident report		
<b>9 b) Escalators</b>	9.1b Communicate with the client or respondent at the scene of the incident	9.2b Assess the situation upon arrival at the scene	9.3b Communicate with the appropriate authorities	9.4b Reassure the captive persons and give them instructions	9.5b Apply safety measures	9.6b Secure the premises and protect the work area
	9.7b Facilitate access to the victim for first aid measures	9.8b Disassemble components related to the situation if there are no physical injuries	9.9b Follow the authorities' instructions in the presence of an injured person	9.10b Write an incident report		

<sup>14</sup> These mechanical conveying systems are mentioned in this context because the participants consider them most representative of this type of situation. However, emergency responses are not limited to these systems, since all those listed in the Regulation may, at one time or another, require an emergency response from the elevator mechanic.

## 2.2 OPERATIONS, SUB-OPERATIONS AND CLARIFICATIONS

In the following pages are presented the sub-operations related to targeted operations formulated by the participants. Sub-operations<sup>15</sup> are actions included in operations and constitute the details of the work, such as methods and techniques. They are the steps for performing an operation and are thus the sub-steps of tasks.

Table 4 also provides the specifics expressed by participants in the workshop.

**Table 4 Operations, Sub-Operations<sup>16</sup> and Clarifications**

<b>TASK 1 INSTALL TRACTION ELEVATORS AND HOISTS</b>		
<b>Operations</b>	<b>Sub-Operations</b>	<b>Clarifications</b>
1.1 Plan the work, communicate with the site supervisor and obtain necessary authorizations		
1.2 Interpret plans and diagrams		
1.3 Apply individual and collective safety measures		
1.4 Handle and rig equipment and materials	1.4.1 Delimit a work area to unload the truck 1.4.2 Determine the location of equipment according to its order of installation and its load on the structure	These sub-operations are performed to avoid having to move the equipment again and hindering other trades on the premises.
1.5 Temporarily erect scaffolds, false car platforms or Tyrak electric cable hoists, depending on the type of installation		

<sup>15</sup> *Op. cit.*

<sup>16</sup> As mentioned in the introduction, only certain sub-operations were identified. Accordingly, numbering such as 1.4.1 and 1.4.2 only indicates that, for operation 1.4, the participants only specified those sub-operations. The latter could well be preceded, intersected or followed by other sub-operations.

**TASK 1    INSTALL TRACTION ELEVATORS AND HOISTS**

<b>Operations</b>	<b>Sub-Operations</b>	<b>Clarifications</b>
1.6 Determine the shaft alignment	1.6.1 Check required distances in the pit and upper shaft	
1.7 Install components inside the shaft: supports, tracks, courses, shock absorbers; the winch temporarily, etc.		
1.8 Install equipment (motor, control panel, etc.) in the machine room or other designated locations (if there is no machine room)		
1.9 Make the motor's electrical connections		
1.10 Check motor rotation		
1.11 Assemble the car frames, platform and counterweight	1.11.1 Ensure that the platform and counterweight are in balance	
1.12 Install suspension cables	1.12.1 Equalize the tension of cables or belts to avoid damaging them	
1.13 Install speed regulators and check their operation		
1.14 Temporarily activate the platform	1.14.1 Make required checks 1.14.2 Level the platform	
1.15 Install and adjust elevator door frames, locking devices and fascias		

**TASK 1    INSTALL TRACTION ELEVATORS AND HOISTS**

<b>Operations</b>	<b>Sub-Operations</b>	<b>Clarifications</b>
1.16 Install conduits, wires and electric and electronic accessories in the shaft and on the car frame		The installation must meet standards in effect.
1.17 Clean and lubricate components in the shaft	1.17.1 Check the operation of parachutes	
1.18 Assemble the car on the platform and install accessories	1.18.1 Ensure that the platform and counterweight are in balance	
1.19 Install the car's electrical accessories		
1.20 Complete the car's interior finishing		
1.21 Make the final electrical connections		
1.22 Paint components.		
1.23 Make final adjustments		
1.24 Participate in technical tests and/or perform those required during startup, or at each addition of a landing (tower) or tower section in the case of temporary elevators		The technical tests are performed under the supervision of the adjuster or a technician in charge.
1.25 Participate in the final inspection		The final inspection is performed under the supervision of the adjuster or a technician in charge.
1.26 Clean the work area and store tools and equipment		
1.27 Write installation reports, fill out sheets, update plans, etc.		

**TASK 2    INSTALL HYDRAULIC ELEVATORS AND HOISTS (INCLUDING CABLE CYLINDERS)**

<b>Operations</b>	<b>Sub-Operations</b>	<b>Clarifications</b>
2.1 Plan the work, communicate with the site supervisor and obtain necessary authorizations		
2.2 Interpret plans and diagrams		
2.3 Apply individual and collective safety measures		
2.4 Handle and rig equipment and materials		
2.5 Temporarily erect scaffolds, false car platforms or Tyrak electric cable hoists, depending on the type of installation		
2.6 Determine the shaft alignment	2.6.1 Ensure that the pit and course comply with the diagrams	
2.7 Install components inside the shaft: supports, rails, courses, shock absorbers, etc.		
2.8 Install a protective PVC sheath on the cylinder	2.8.1 Take necessary measures if water is present	
2.9 Install the cylinder, align it and adjust the anti-sag device (valve rupture)	2.9.1 Check that the protective sheath is waterproof	
2.10 Install the hydraulic piston and its accessories		
2.11 Install machine room equipment		This may be a pumping unit, control panel, etc.
2.12 Install hydraulic conduits		
2.13 Assemble and install the car frame and platform		



**TASK 2      INSTALL HYDRAULIC ELEVATORS AND HOISTS (INCLUDING CABLE CYLINDERS)**

<b>Operations</b>	<b>Sub-Operations</b>	<b>Clarifications</b>
2.14 Install suspension cables according to the type of installation		
2.15 Install speed regulators and check their operation		
2.16 Check the platform's alignment on the car frame		
2.17 Make the electrical connections for temporary operation		
2.18 Temporarily activate the platform	2.18.1 Make required checks 2.18.2 Proceed to levelling	
2.19 Install and adjust elevator door frames, locking devices and fascias		
2.20 Install conduits, wires and electric accessories in the shaft		
2.21 Clean and lubricate components in the shaft		
2.22 Assemble the car on the platform and install accessories		
2.23 Install the car's electrical accessories		
2.24 Complete the car's interior finishing		
2.25 Make the final electrical connections		
2.26 Paint components		
2.27 Make final adjustments		

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**TASK 2      INSTALL HYDRAULIC ELEVATORS AND HOISTS (INCLUDING CABLE CYLINDERS)**

<b>Operations</b>	<b>Sub-Operations</b>	<b>Clarifications</b>
2.28 Participate in technical tests		The technical tests are performed under the supervision of the adjuster or a technician in charge.
2.29 Participate in the final inspection		The final inspection is performed under the supervision of the adjuster or a technician in charge.
2.30 Clean the work area and store tools and equipment		
2.31 Write installation reports, fill out sheets, update plans, etc.		

**TASK 3    INSTALL ESCALATORS AND ROLLING SIDEWALKS**

<b>Operations</b>	<b>Sub-Operations</b>	<b>Clarifications</b>
3.1 Plan the work, communicate with the site supervisor and obtain necessary authorizations		Ensure the structure's load-bearing capacity.
3.2 Interpret plans and diagrams		
3.3 Apply individual and collective safety measures		
3.4 Handle and rig equipment and materials	3.4.1 Secure the work area 3.4.2 Choose transportation and hoisting equipment according to data sheets	
3.5 Erect scaffolds depending on the type of installation		
3.6 Put the equipment in place and assemble components if applicable	3.6.1 Check shaft dimensions with staircase levels 3.6.2 Check the alignment 3.6.3 Check floor levels	
3.7 Fasten the equipment definitively		
3.8 Make the electrical connections		
3.9 Make adjustments	3.9.1 Check the alignment of steps 3.9.2 Detect unusual noises	

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**TASK 3    INSTALL ESCALATORS AND ROLLING SIDEWALKS**

<b>Operations</b>	<b>Sub-Operations</b>	<b>Clarifications</b>
3.10 Participate in technical tests	3.10.1 Check that step and handrail speeds correspond 3.10.2 Check braking speed	The technical tests are performed under the supervision of the adjuster or a technician in charge.
3.11 Participate in the final inspection		The final inspection is performed under the supervision of the adjuster or a technician in charge.
3.12 Clean the work area and store tools and equipment		
3.13 Write installation reports, fill out sheets, update plans, etc.		

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**TASK 4    INSTALL OTHER TYPES OF MECHANICAL CONVEYING SYSTEMS**

(CABLEWAYS, FLYING SCAFFOLDS, PASSENGER ROPEWAYS, DUMBWAITERS, HOME ELEVATORS FOR DISABLED PERSONS, ELEVATORS AND HOISTS ON AN INCLINE, MOVEABLE STAGE PLATFORMS AND OTHER SIMILAR DEVICES)

<b>Operations</b>	<b>Sub-Operations</b>	<b>Clarifications</b>
4.1 Plan the work and obtain necessary authorizations		
4.2 Interpret plans and diagrams		
4.3 Apply individual and collective safety measures		
4.4 Handle and rig equipment and materials	4.4.1 Ensure that equipment, materials and tools comply with the data sheet	
4.5 Erect scaffolds if applicable		
4.6 Put the equipment in place and assemble components if applicable		
4.7 Fasten the equipment definitively		
4.8 Make the electrical connections		
4.9 Make adjustments	4.9.1 Follow the recommended procedure 4.9.2 Use the specific tools	
4.10 Participate in technical tests		The technical tests are performed under the supervision of the adjuster or a technician in charge.

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**TASK 4    INSTALL OTHER TYPES OF MECHANICAL CONVEYING SYSTEMS**

(CABLEWAYS, FLYING SCAFFOLDS, PASSENGER ROPEWAYS, DUMBWAITERS, HOME ELEVATORS FOR DISABLED PERSONS, ELEVATORS AND HOISTS ON AN INCLINE, MOVEABLE STAGE PLATFORMS AND OTHER SIMILAR DEVICES)

<b>Operations</b>	<b>Sub-Operations</b>	<b>Clarifications</b>
4.11 Participate in the final inspection		The final inspection is performed under the supervision of the adjuster or a technician in charge.
4.12 Clean the work area and store tools and equipment		
4.13 Write installation reports, fill out sheets, update plans, etc.		

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**TASK 5    MAINTAIN MECHANICAL CONVEYING SYSTEMS, TEMPORARY OR NOT, FINISHED OR NOT**

<b>Operations</b>	<b>Sub-Operations</b>	<b>Clarifications</b>
5.1 Communicate with the client and obtain the necessary information		In the case of a new contract, information must be obtained on the rules in effect, devices, equipment location, means of access, etc.
5.2 Plan the work and obtain necessary authorizations		
5.3 Apply individual and collective safety measures		
5.4 Check the overall operation of the equipment in place		For example, the pit-level stop, car roof, door control, door operation, indicator light, etc.
5.5. Analyse noises and vibrations and check the wear		Pay attention to door noise.
5.6 Diagnose operating problems, if applicable		
5.7 Check protective devices		For example, the speed regulator, electric interlock, cable clips, stop button, emergency exit and interlock circuit in full.
5.8 Interpret plans, sketches, maintenance schedules and maintenance sheets	5.8.1 Ensure that plans correspond to the type of equipment	This sub-operation applies in the case of a new contract.
5.9 Disassemble, reassemble, replace components and make adjustments	5.9.1 Identify the components to be disassembled 5.9.2 Follow the procedure	
5.10 Take corrective measures		

**TASK 5    MAINTAIN MECHANICAL CONVEYING SYSTEMS, TEMPORARY OR NOT, FINISHED OR NOT**

<b>Operations</b>	<b>Sub-Operations</b>	<b>Clarifications</b>
5.11 Clean and lubricate components	5.11.1 Make adjustments as needed	
5.12 Perform tests and make the final inspection		
5.13 Clean the work area and store tools and equipment		
5.14 Write maintenance reports, update maintenance sheets, diagrams and plans, etc.		
5.15 Send relevant information to the client and inform the supervisor about work to be done if applicable		



**TASK 6 REPAIR MECHANICAL CONVEYING SYSTEMS**  
(SERVICE CALL OR PLANNED REPAIR)

<b>Operations</b>	<b>Sub-Operations</b>	<b>Clarifications</b>
6.1 Communicate with the client and obtain the necessary information		
6.2 Plan the work and obtain necessary authorizations		
6.3 Apply individual and collective safety measures		
6.4 Interpret plans, sketches, repair reports and maintenance sheets		
6.5 Diagnose operating problems		
6.6 Handle and rig the equipment and materials		
6.7 Disassemble equipment		
6.8 Process simple parts	6.8.1 Check the conformity of parts with the original manufacturer	
6.9 Debug the system temporarily while ensuring complete safety	6.9.1 Repair temporarily while waiting for receipt of the unavailable part	
6.10 Replace or reinstall components	6.10.1 Ensure that the equipment is compatible	
6.11 Calibrate and adjust system components		

**TASK 6 REPAIR MECHANICAL CONVEYING SYSTEMS**  
(SERVICE CALL OR PLANNED REPAIR)

Operations	Sub-Operations	Clarifications
6.12 Make electrical and mechanical connections		
6.13 Lubricate components		
6.14 Make adjustments		
6.15 Perform tests and make the final inspection		
6.16 Clean the work area and store tools and equipment		
6.17 Write repair reports, record data in a logbook, update sheets, diagrams and plans, etc.		
6.18 Send relevant information to the client and inform the supervisor about work to be done if applicable		

**TASK 7    ALTER MECHANICAL CONVEYING SYSTEMS**  
(MODERNIZATION, BRINGING UP TO STANDARD, ETC.)

<b>Operations</b>	<b>Sub-Operations</b>	<b>Clarifications</b>
7.1 Communicate with the client and obtain the necessary information		The relevant information to be gathered concerns the location, access hours, parking, waste disposal means, etc.
7.2 Plan the work and obtain necessary authorizations		Authorizations will be given by the engineer, owner or authorized representative.
7.3 Apply individual and collective safety measures		
7.4 Interpret plans, sketches and alteration reports	7.4.1 Check the availability of tools and equipment required on the premises	
7.5 Evaluate the mechanical conveying system in place and determine the alteration's feasibility	7.5.1 Check safety conditions 7.5.2 Adopt a good working posture	
7.6 Disassemble, reassemble, replace components or install new ones		
7.7 Clean and lubricate components		
7.8 Adjust components		
7.9 Make electrical and mechanical connections		
7.10 Paint components		
7.11 Make adjustments		

**TASK 7    ALTER MECHANICAL CONVEYING SYSTEMS**  
(MODERNIZATION, BRINGING UP TO STANDARD, ETC.)

<b>Operations</b>	<b>Sub-Operations</b>	<b>Clarifications</b>
7.12 Participate in technical tests		The technical tests are performed under the supervision of the adjuster or a technician in charge.
7.13 Participate in the final inspection		The final inspection is performed under the supervision of the adjuster or a technician in charge.
7.14 Clean the work area and store tools and equipment		
7.15 Send relevant information to the client and inform the supervisor about work to be done if applicable		

**TASK 8    MAKE ELEVATORS OPERATE, TEMPORARY OR NOT, FINISHED OR NOT, AND DISASSEMBLE TEMPORARY ELEVATORS WHEN THE WORK IS COMPLETED**

<b>Operations</b>	<b>Sub-Operations</b>	<b>Clarifications</b>
8.1 Check safety devices daily	8.1.1 Perform technical tests during startup, and at each addition of a landing (tower) or tower section	Wind and chill factors should be taken into account.
8.2 Apply safety measures for users (barricades, etc.)		
8.3 Estimate the weight of loads or obtain the necessary information		Take into account the platform's load capacity.
8.4 Arrange loads on the platform		
8.5 Activate the elevator and ensure that the persons or loads are carried safely to the correct place		Open the emergency door, install temporary jumpers, etc.
8.6 Apply rules and procedures for disassembling temporary installations		

**TASK 9 RESPOND TO EMERGENCIES**

Operations	Sub-Operations	Clarifications
<p><b>9 a) Elevators and cableways</b></p> <p>9.1 a Communicate with the client or respondent at the scene of the incident</p>	<p>9.1.1 a Gather information</p> <p>9.1.2 a Inform the client of the time it will take to arrive at the scene</p> <p>9.1.3 a Give instructions</p> <p>9.1.4 a Ensure that the captive persons are reassured while waiting to be rescued</p>	
<p>9.2 a Assess the situation upon arrival at the scene</p>		<p>It is important to clearly recognize the chain of command; if the mechanic is the first responder, he takes control, otherwise he must refer to the first responder in command.</p>
<p>9.3 a Communicate with the appropriate authorities</p>		
<p>9.4 a Reassure the captive persons and give them instructions</p>		<p>The persons may be asked to sit down, to stay away from doors, not to try to exit on their own, etc.</p>
<p>9.5 a Apply safety measures</p>	<p>9.5.1 a Ensure that doors are well locked in cases of major failures</p>	<p>For example, axle, cable or hydraulic system failures are considered major failures.</p>
<p>9.6 a Check the condition of the elevator or cableway</p>	<p>9.6.1 a Free up space around the car</p>	
<p>9.7 a Perform manoeuvres to move the elevator car</p>		<p>In the event of a power outage, manoeuvres are manual.</p>
<p>9.8 a Perform manoeuvres to move the cableway car</p>		<p>In the event of a power outage, manual manoeuvres are performed and an auxiliary battery or other system is used.</p>

**TASK 9 RESPOND TO EMERGENCIES**

<b>Operations</b>	<b>Sub-Operations</b>	<b>Clarifications</b>
9.9 a Evacuate the persons safely	9.9.1 a Reduce the gap between car and landing levels 9.9.2 a Use the necessary equipment to evacuate the persons in all safety 9.9.3 a Call firefighters for emergency exit evacuations 9.9.4 a Take into account the panic level of the persons to be evacuated	
9.10 a Produce an incident report		Information to be recorded is, for example, the call time, the time of arrival at the scene, and the time when evacuation operations are completed.

**9 b) Escalators**

9.1 b Communicate with the client or respondent at the scene of the incident	9.1.1 b Gather information 9.1.2 b Inform the client of the time it will take to arrive at the scene 9.1.3 b Give instructions 9.1.4 b Ensure that the captive persons are reassured while waiting to be rescued	
9.2 b Assess the situation upon arrival at the scene		It is important to clearly recognize the chain of command; if the mechanic is the first responder, he takes control, otherwise he must refer to the first responder in command.
9.3 b Communicate with the appropriate authorities		
9.4 b Reassure the captive persons and give them instructions		

**TASK 9    RESPOND TO EMERGENCIES**

<b>Operations</b>	<b>Sub-Operations</b>	<b>Clarifications</b>
9.5 b Apply safety measures		
9.6 b Secure the premises and protect the work area		Here again, it is important to clearly recognize the chain of command; if the mechanic is the first responder, he takes control, otherwise he must refer to the first responder in command.
9.7 b Facilitate access to the victim for first aid measures		
9.8 b Disassemble components related to the situation if there are no physical injuries		
9.9 b Follow the authorities' instructions in the presence of an injured person		
9.10 b Write an incident report		Information to be reported is, for example, the call time, the time of arrival at the scene, and the time when evacuation operations are completed.

## 2.3 WORK PROCESS

The work process consists of a series of steps that are generally followed when performing most tasks of the trade. The participants agreed on the following process:

- Plan the work.
- Take individual and collective safety measures.
- Work on the mechanical conveying system.
- Perform the appropriate checks and tests to ensure the good operation of the mechanical conveying system.
- Record the required information.
- Send the required information.

## 2.4 FUNCTIONS

Work functions are task groups that have affinities. They may be defined by work results or a procedure. Although the participants did not have time to express themselves on the subject, six functions are evident in practice.

Functions	Tasks
Installation	<ul style="list-style-type: none"><li>- Install traction elevators and hoists</li><li>- Install hydraulic elevators and hoists (including cable cylinders)</li><li>- Install escalators and rolling sidewalks</li><li>- Install other types of mechanical conveying systems</li></ul>
Maintenance	<ul style="list-style-type: none"><li>- Maintain mechanical conveying systems, temporary or not, finished or not</li></ul>
Repair	<ul style="list-style-type: none"><li>- Repair mechanical conveying systems</li></ul>
Alteration	<ul style="list-style-type: none"><li>- Alter mechanical conveying systems</li></ul>
Commissioning a system	<ul style="list-style-type: none"><li>- Make elevators operate, temporary or not, finished or not, and disassemble temporary elevators when the work is completed</li></ul>
Emergency response	<ul style="list-style-type: none"><li>- Respond to emergencies</li></ul>



## 2.5 ACHIEVEMENT CONDITIONS AND PERFORMANCE CRITERIA

### 2.5.1 ACHIEVEMENT CONDITIONS

Although the participants provided data on the achievement conditions for each task of the trade, that information has been grouped in a single table for the purposes of this report. Again, achievement conditions<sup>17</sup> are conditions and circumstances that have a determining impact on the performance of a task and that take into account, notably, the work environment, occupational health and safety hazards, equipment, materials, and reference documents used in performing a task, etc.

Table 5 describes those conditions in the following pages.

**Table 5: Achievement Conditions**

ACHIEVEMENT CONDITIONS	
Workplaces per Sector <sup>18</sup>	Description <sup>19</sup>
<i>Industrial sector:</i>	As defined by law, the sector of construction of buildings, including installations and equipment physically attached or not to such buildings, reserved primarily for the carrying on of an economic activity involving the development of mineral resources, the processing of raw materials and the production of goods ( <i>art. 1w</i> ).
<i>Institutional and commercial sector:</i>	As defined by law, the sector of construction of buildings, including installations and equipment physically attached or not to such buildings, reserved primarily for institutional or commercial purposes as well as any construction that cannot be included in the residential, industrial and civil engineering and roads sectors ( <i>art. 1x</i> ).
<i>Civil engineering and roadwork sector:</i>	As defined by law, the sector of construction of public or private utility works in the general interest, including installations, equipment and buildings physically attached or not to such works, and in particular the construction of roads, waterworks, sewers, bridges, dams, power lines and gas pipelines ( <i>art. 1v</i> ).

<sup>17</sup> *Cadre de référence et instrumentation pour l'analyse d'une profession (glossary). Op. cit.*

<sup>18</sup> Not an exhaustive list.

<sup>19</sup> The descriptions of work contexts are taken from the Act respecting Labour relations, vocational training and workforce management in the construction industry (R.S.Q., c. R-20).

<b>ACHIEVEMENT CONDITIONS</b>	
<i>Residential Sector:</i>	As defined by law, the sector of construction of buildings or complexes of adjoining buildings, including installations and equipment physically attached or not to the buildings, at least 85% of the area of which, excluding parking space, is reserved for residential use, and the number of aboveground storeys of which, excluding any part of the basement and reckoned from any side of the building or complex, does not exceed six in the case of new buildings or eight in other cases ( <i>art. 1y</i> ).
<b>Note:</b> <i>The workshop participants are called upon to work in all these sectors – less frequently in the residential sector than in the civil engineering and roadwork sector.</i>	
<b>Work Organization</b>	
<p>In most cases, elevator mechanics work in a team, either with an apprentice or with another journeyman elevator mechanic. The elevator mechanic sometimes works alone when he performs maintenance tasks, answers service calls for repairs, makes a mechanical conveying system (elevator) work, or responds to emergencies.</p> <p>Normally, the work is not directly supervised. In recalls or situations involving a high risk factor, the elevator mechanic may report to a competent authority, such as a site supervisor or a manufacturer representative. During major interventions in emergencies, the elevator mechanic must defer to the authority of first responders.</p> <p>Among the other trades with which the elevator mechanic is called upon to collaborate, the participants cited construction contractors, engineers, architects, inspectors of the Régie du bâtiment du Québec, the CCQ and the Commission de la santé et de la sécurité au travail, security agents, fire safety technicians, telephony technicians, electricians, plumbers, welders, ventilation specialists, glaziers, bricklayers, tilers, plasterers, painters, etc. The task involving maintenance of mechanical conveying systems is usually performed alone, whereas the one involving their alteration may require the collaboration of electricians, plumbers and the general contractor.</p> <p>Finally, sound logic and judgement ensure an efficient work organization.</p>	
<b>Degree of Autonomy</b>	
<p>Generally, elevator mechanics enjoy a wide margin of manoeuvre in making decisions regarding tasks to be performed and safety measures to put in place. They are responsible not only for their own safety, but also that of nearby members of the public. They are required to observe the chain of command during major responses and to cooperate with other trades in action at the workplace. Finally, they must observe the laws and the many codes and regulations in effect.</p>	
<b>Instructions</b>	
<p>The work is performed according to work orders, verbal instructions, and special requests by clients or consultants. When doing maintenance work on mechanical conveying systems, the elevator mechanic should refer to the contract and the maintenance schedule.</p>	

<b>ACHIEVEMENT CONDITIONS</b>
<p><b>References Used</b></p> <p>Plans, specifications, diagrams, graphics, data sheets, manufacturer guides and technical guides are used in carrying out the elevator mechanic's tasks.</p> <p>Elevator mechanics should refer to regulations, such as laws, codes, standards, municipal by-laws, etc.</p> <p>Other documents, such as purchase orders, work permits, special emergency procedures or quality control reports, are among the references used.</p>
<p><b>Stress Factors</b></p> <p>The quality of the work to accomplish, deadlines, the consequences of decisions, the obligation to cooperate with other trades, customer service quality, a work environment that is sometimes hostile or near the public – these are widespread stress factors according to the participants. The required level of professionalism and the complexity of the tasks to be performed bring added pressure to beginners in the trade.</p>
<p><b>Environmental Attributes</b></p> <p>Elevator mechanics are often required to work outdoors, in varied and difficult weather conditions such as cold, heat, rain, snow and ice.</p> <p>Particularly in the industrial and civil engineering sectors, the trade is often practiced on construction sites, with all the hazards involved. In addition, some operations begin on the street, when the elevator mechanic unloads his truck to bring his tools to the workplace.</p> <p>The work is done from heights, in confined and narrow spaces such as shafts, or on uneven floors that sometimes have openings. Elevator mechanics must sometimes adopt uncomfortable postures (crouching, kneeling, head bowed, etc.).</p> <p>Inside, the environment may be noisy, and elevator mechanics have to deal with the presence of hazardous or toxic materials (silica, carbon, asbestos, oils, ammonia, etc.), as well as dust.</p> <p>Using handling equipment, various devices and tools involves high risk factors.</p> <p>The workplace may be difficult to access and cluttered. In addition, elevator mechanics have to work near the public at times.</p>
<p><b>Tools, Devices, Instruments, Equipment and Materials Used</b></p> <p>During the occupational analysis workshop, a basic list of the equipment, tools and instruments used by elevator mechanics was presented to the participants, who had to adapt it to each task of the trade. The resulting lists are presented in <b>Annex 1</b>.</p> <p>Moreover, under three of the four collective agreements, the journeyman elevator mechanic must provide certain tools<sup>20</sup>.</p> <p>As for materials, elevator mechanics work mainly with wood, PVC and various metals, particularly steel, stainless steel and aluminium.</p>

<sup>20</sup> Civil engineering sector: see the list in Annex N. Industrial sector: see the list in Annex E-10. Institutional and commercial sector: see the list in Annex E-10.

## 2.5.2 PERFORMANCE CRITERIA

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

Table 7 lists those criteria for each work function grouping the tasks described in Section 2.4 of the present report.

**Table 6 Performance Criteria**

<b>FUNCTION RELATED TO THE INSTALLATION OF MECHANICAL CONVEYING SYSTEMS (TASKS 1 TO 4):</b>	
<b>Performance Criteria</b>	
<p><b>For the expected outcomes</b></p> <ul style="list-style-type: none"> <li>• Sturdiness of installations</li> <li>• Safety of installations</li> <li>• Careful finishing of installations</li> <li>• Good operation of the system</li> </ul> <p><b>For the observance of standards, rules or procedures</b></p> <ul style="list-style-type: none"> <li>• Following instructions</li> <li>• Observance of regulations (laws, standards, regulations, etc.)</li> <li>• Keeping apprised of regulation changes or additions</li> <li>• Observance of health and safety rules</li> <li>• Observance of tolerance limits</li> <li>• Observance of manufacturer recommendations</li> <li>• Professional ethics</li> </ul> <p><b>For autonomy</b></p> <ul style="list-style-type: none"> <li>• Initiative and ingenuity</li> <li>• Resourcefulness</li> <li>• Problem-solving ability</li> <li>• Ability to make the right decisions in unforeseen situations</li> <li>• Stress management</li> </ul> <p><b>For communication and customer service</b></p> <ul style="list-style-type: none"> <li>• Verbal communication skills</li> <li>• Quality of written communication</li> <li>• Using the appropriate terminology</li> <li>• Ability to make information understandable</li> <li>• Ability to resolve interpersonal conflicts</li> <li>• Teamwork ability</li> </ul>	<p><b>For the work organization</b></p> <ul style="list-style-type: none"> <li>• Good planning</li> <li>• Methodical work</li> <li>• Access to everything necessary to work</li> <li>• Meeting deadlines</li> <li>• Efficient coordination between the general contractor and other tradespersons such as electricians</li> </ul> <p><b>For the use of tools, devices, equipment and materials</b></p> <ul style="list-style-type: none"> <li>• Dexterity</li> <li>• Good work techniques</li> <li>• Compliant use of devices, tools and equipment</li> </ul> <p><b>For displaying certain attitudes and behaviours</b></p> <ul style="list-style-type: none"> <li>• Sense of responsibility</li> <li>• Awareness of the impact of actions taken</li> <li>• Vigilance, attention</li> <li>• Ability to perceive dangers</li> <li>• Ability to adapt to changes</li> <li>• Discipline</li> <li>• Punctuality</li> <li>• Respect for others</li> <li>• Respect for the environment</li> <li>• Good physical condition</li> </ul>

**FUNCTION RELATED TO THE MAINTENANCE OF MECHANICAL CONVEYING SYSTEMS, TEMPORARY OR NOT, FINISHED OR NOT (TASK 5):**

**Performance Criteria**

**For the expected outcomes**

- Sturdiness of installations
- Safety of installations
- Careful finishing of installations
- Good operation of the system

**For the work organization**

- Good planning
- Methodical work
- Access to everything necessary to work
- Meeting deadlines

**For the observance of standards, rules or procedures**

- Following instructions
- Observance of regulations (laws, standards, regulations, etc.)
- Keeping apprised of regulation changes or additions
- Observance of health and safety rules
- Observance of tolerance limits
- Observance of manufacturer recommendations
- Professional ethics

**For the use of tools, devices, instruments, equipment and materials**

- Dexterity
- Good work techniques

**For displaying certain attitudes and behaviours**

- Sense of responsibility
- Awareness of the impact of actions taken
- Vigilance, attention
- Ability to perceive dangers
- Ability to adapt to changes
- Discipline
- Punctuality
- Respect for others
- Respect for the environment
- Good physical condition

**For autonomy**

- Initiative and ingenuity
- Resourcefulness
- Problem-solving ability
- Ability to make the right decisions in unforeseen situations

**For communication and customer service**

- Verbal communication skills
- Quality of written communication
- Using the appropriate terminology
- Ability to make information understandable
- Ability to resolve interpersonal conflicts
- Teamwork ability

**FUNCTION RELATED TO THE REPAIR OF MECHANICAL CONVEYING SYSTEMS (TASK 6):**

**Performance Criteria**

**For the expected outcomes**

- Sturdiness of installations
- Safety of installations
- Careful finishing of the car
- Good operation of the system

**For the work organization**

- Good planning
- Methodical work
- Access to everything necessary to work
- Meeting deadlines

**For the observance of standards, rules or procedures**

- Following instructions
- Observance of regulations (laws, standards, regulations, etc.)
- Keeping apprised of regulation changes or additions
- Observance of health and safety rules
- Observance of tolerance limits
- Observance of manufacturer recommendations
- Professional ethics

**For the use of tools, devices, equipment and materials**

- Dexterity
- Good work techniques

**For displaying certain attitudes and behaviours**

- Sense of responsibility
- Awareness of the impact of actions taken
- Vigilance, attention
- Ability to perceive dangers
- Ability to adapt to changes
- Discipline
- Punctuality
- Respect for others
- Respect for the environment
- Good physical condition

**For autonomy**

- Initiative and ingenuity
- Resourcefulness
- Problem-solving ability
- Ability to make the right decisions in unforeseen situations

**For communication and customer service**

- Verbal communication skills
- Quality of written communication
- Using the appropriate terminology
- Ability to make information understandable
- Ability to resolve interpersonal conflicts
- Teamwork ability

**FUNCTION RELATED TO THE ALTERATION OF MECHANICAL CONVEYING SYSTEMS (TASK 7):**

**Performance Criteria**

**For the expected outcomes**

- Sturdiness of installations
- Safety of installations
- Careful finishing of the car
- Good operation of the system

**For the observance of standards, rules or procedures**

- Following instructions
- Observance of regulations (laws, standards, regulations, etc.)
- Keeping apprised of regulation changes or additions
- Observance of health and safety rules
- Observance of tolerance limits
- Observance of manufacturer recommendations
- Professional ethics

**For autonomy**

- Initiative and ingenuity
- Resourcefulness
- Problem-solving ability
- Ability to make the right decisions in unforeseen situations
- Stress management

**For communication and customer service**

- Verbal communication skills
- Quality of written communication
- Using the appropriate terminology
- Ability to make information understandable
- Ability to resolve interpersonal conflicts
- Teamwork ability

**For the work organization**

- Good planning
- Methodical work
- Access to everything necessary to work
- Meeting deadlines
- Efficient coordination between the general contractor and other tradespersons such as electricians

**For the use of tools, devices, equipment and materials**

- Dexterity
- Good work techniques
- Correct use of equipment

**For displaying certain attitudes and behaviours**

- Sense of responsibility
- Awareness of the impact of actions taken
- Vigilance, attention
- Ability to perceive dangers
- Ability to adapt to changes
- Discipline
- Punctuality
- Respect for others
- Respect for the environment
- Good physical condition

**FUNCTION RELATED TO THE COMMISSIONING OF MECHANICAL CONVEYING SYSTEMS (TASK 8):**

**Performance Criteria**

**For the expected outcomes**

- Sturdiness of installations
- Safety of installations
- Good operation of the system

**For the observance of standards, rules or procedures**

- Following instructions
- Observance of regulations (laws, standards, regulations, etc.)
- Observance of health and safety rules
- Professional ethics

**For autonomy**

- Initiative and ingenuity
- Resourcefulness
- Problem-solving ability
- Ability to make the right decisions in unforeseen situations

**For communication and customer service**

- Verbal communication skills
- Ability to make information understandable
- Ability to resolve interpersonal conflicts
- Teamwork ability

**For the work organization**

- Good planning
- Methodical work
- Access to everything necessary to work
- Meeting deadlines

**For the use of tools, devices, equipment and materials**

- Good work techniques

**For displaying certain attitudes and behaviours**

- Sense of responsibility
- Awareness of the impact of actions taken
- Vigilance, attention
- Ability to perceive dangers
- Ability to adapt to changes
- Discipline
- Punctuality
- Respect for others
- Respect for the environment



**FUNCTION RELATED TO EMERGENCY RESPONSES (TASK 9):**

**Performance Criteria**

**For the expected outcomes**

- Safety of installations
- Safety of persons
- Good operation of the system

**For the work organization**

- Good planning
- Methodical work
- Access to everything necessary to work

**For the observance of standards, rules or procedures**

- Following instructions
- Cooperation with the competent authorities (first responders)
- Observance of regulations (laws, standards, regulations, etc.)
- Observance of health and safety rules
- Professional ethics

**For the use of tools, devices, equipment and materials**

- Dexterity
- Good work techniques

**For displaying certain attitudes and behaviours**

- Sense of responsibility
- Self-control
- Stress management
- Awareness of the impact of actions taken
- Vigilance, attention
- Ability to perceive dangers
- Ability to adapt to changes
- Discipline
- Punctuality
- Respect for others
- Respect for the environment
- Good physical condition

**For autonomy**

- Initiative and ingenuity
- Resourcefulness
- Problem-solving ability
- Ability to make the right decisions in unforeseen situations

**For communication and customer service**

- Verbal communication skills
- Persuasiveness
- Quality of written communication
- Using the appropriate terminology
- Ability to make information understandable
- Ability to resolve interpersonal conflicts
- Teamwork ability



### 3. QUANTITATIVE DATA ON TASKS

#### 3.1 TASK DIFFICULTY

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

<ul style="list-style-type: none"> <li>The task involves few risks of error; it requires no notable physical or mental effort. The task is less difficult than average</li> </ul>	Very easy	1
<ul style="list-style-type: none"> <li>The task involves a few risks of error; it requires minimal physical or mental effort</li> </ul>	Easy	2
<ul style="list-style-type: none"> <li>The task involves several risks of error; it requires significant physical or mental effort. The task is more difficult than average</li> </ul>	Difficult	3
<ul style="list-style-type: none"> <li>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</li> </ul>	Very difficult	4

The data presented in the table below are averages of estimates formulated by the elevator mechanics who participated in the occupational analysis workshop. The data are issued by way of indication only.

**Table 7 Task Difficulty**

Task	Average (All Sectors Taken Together)
Install traction elevators and hoists	3
Install hydraulic elevators and hoists (including cable cylinders)	2.95
Install escalators and rolling sidewalks	3.57
Install other types of mechanical conveying systems	3.18
Maintain mechanical conveying systems	2.63
Repair mechanical conveying systems	2.77
Alter mechanical conveying systems	3.17
Make elevators operate, temporary or not, finished or not, and disassemble temporary elevators when the work is completed	1.83
Respond to emergencies	3.56

**Difficulty:** The number "1" indicates the least difficult task to perform and the number "4" indicates the most difficult task to perform.

## 4. KNOWLEDGE, SKILLS AND ATTITUDES

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

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

### 4.1 KNOWLEDGE

#### *Applied mathematics*

- Knowledge of basic mathematical operations, with or without fractions
- Applying the cross product rule (rule of three)
- Calculating percentages
- Concepts of geometry regarding dimensions, areas and volumes
- Measuring and calculating angles
- Rules of algebra, Boolean algebra (operations and functions of logical variables – binary codes)
- International and imperial measuring systems

#### *Applied chemistry and physics*

- Knowledge of metals and their properties, such as steel, stainless steel, aluminium, etc.
- Knowledge of materials (PVC, wood, etc.) and their properties, notably strength
- Knowledge of products and their characteristics, such as solvents, lubricants, etc.
- Physical principles of pressure, strength, speed, flow rate, gravity, levers, friction, viscosity, magnetism; applying related calculations; Pascal's law and its applications
- Mechanical principles regarding the transmission of movement, inertia, stored energy

#### *Electricity and electronics*

- Ohm's law and its applications
- Characteristics and functions of electric and electronic components

## **Computer technology**

- Basic concepts for activating a programmable controller
- Knowledge of various languages such as C+, etc.;

*Note: Elevator mechanics are required to enter programming parameters and alter programs, as the case may be.*

- Binary code;
- Hexadecimal code.

## **Plans, diagrams and graphics**

- Plans and diagrams regarding architecture, electricity, mechanics and, occasionally, building mechanics
- Exploded views, orthogonal projections, types of lines, etc.
- Interpreting symbols, abbreviations and technical data
- Drawing dimensioned sketches and diagrams

*Note: Knowledge of technical drawing concepts is considered an asset.*

## **Occupational health and safety**

The knowledge and application of occupational health and safety rules is essential for practicing the trade. Elevator mechanics must be knowledgeable about:

- risks of accident, injury, illness or allergy
- risks of using products, and WHMIS (Workplace Hazardous Materials Information System) information
- individual and collective means of protection for countering risk factors
- ergonomic principles to be observed, notably in narrow spaces and closed areas
- work habits to adopt, ergonomic positions, etc.

*Note: All interventions on a mechanical conveying system, whether repairs, maintenance, inspections or others, require that the system be locked out, to prevent it from being turned on accidentally.*

### ***Equipment, machines, devices and instruments***

The participants completed a list of instruments widely used in performing their tasks. The list, titled List of Equipment, Tools and Instrumentation, appears in Annex 1 of the present report. In this regard, the participants mentioned:

- ways of using equipment, tools and instrumentation
- methods for maintaining equipment, tools and instrumentation
- Operating modes of motors and their components
- Ways of using materials such as pulleys, cables, etc.

### ***Work organization***

- Knowledge of the construction industry as a whole
- information about unions and collective agreements
- knowledge of the criteria for entering the labour market

### ***Work techniques***

Other than the use and maintenance of tools, the participants mentioned:

- the operating mode of hoisting, rigging and handling equipment
- Techniques of workshop work such as drilling, milling, sanding, painting, anchoring, oxygen cutting and welding<sup>21</sup> (MIG, with lead, gas, electricity, etc.)
- methods of applying glass, ceramics and other coverings
- the way of using optical fibre for transmitting commands, for communicating from one car to another, and for lighting
- basic cabinetwork techniques
- various bonding methods

## **4.2 SKILLS**

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

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<sup>21</sup> With regard to welding, the participants pointed out that the elevator mechanic is limited to basic techniques for retouching operations. More-complex welding operations are usually entrusted to professional welders, who hold a competency card to that effect.

## **Cognitive skills**

Cognitive skills pertain to intellectual strategies applied in working. Elevator mechanics must have the following main cognitive skills:

- problem-solving (finding solutions to technical problems or to constraints)
- communication skills and ability to establish harmonious and effective interpersonal relations (communicating with the client, supervisors, responders practicing other trades; giving instructions; providing understandable technical information; reassuring people who are captive in an elevator; etc.)

## **Motor skills**

Motor skills involve making gestures and moving. Elevator mechanics must have the following motor skills:

- manual dexterity
- eye and movement coordination

## **Perceptual skills**

Perceptual skills are sensory skills enabling a person to consciously perceive, with the senses, what is occurring in his environment. Elevator mechanics must have the following main perceptual skills:

- spatial perception
- sense of observation
- perception of sounds and odours
- visual acuity
- capacity to distinguish colours
- perception of hazards

### 4.3 ATTITUDES

Attitudes are a way of acting, reacting and relating with others or with one's environment. They express personal skills. The main attitudes that elevator mechanics must have are the following<sup>22</sup>:

- autonomy
- perseverance
- method and organization
- initiative and ingenuity
- sense of responsibility
- self-control (stress management)
- self-confidence
- professionalism
- precision in performing tasks
- cleanliness in carrying out and finishing the work
- observance of time constraints, standards and limits
- concern for the health and safety of oneself and others

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<sup>22</sup> The attitudes are not necessarily listed in order of importance.



## 5. TRAINING SUGGESTIONS

During the occupational analysis workshop, the workers in the trade formulated a number of suggestions about training. These are reproduced below, in no particular order.

- To be able to keep up with technological progress, training programs should be updated more frequently. The participants proposed maximum intervals of five years.
- Refresher training should be offered to elevator mechanics active in the workplace. They could thus keep apprised of new developments in the trade, and adapt their techniques and methods accordingly.
- The participants opined that the training examinations are obsolete and should be entirely reviewed to reflect the current labour market situation.
- The curriculum leading to the vocational diploma (DEP) in elevator mechanics, as currently provided by the ministère de l'Éducation, du Loisir et du Sport, largely pertains to the installation of mechanical conveying systems. The range of intervention types should be broadened to include maintenance, repairs and servicing.
- Workplace stages offer undeniable advantages. In school, students are placed in comfortable, even ideal situations. Time spent in the workplace puts the student in productive contact with reality and constitutes a great motivating factor. The participants said they recognized the difficulties this implied in the construction environment. However, in their view, the fact that only one school is mandated to offer training in the trade could facilitate eventual attempts to obtain stages, because few students would work simultaneously on construction sites. The trainees might obtain temporary cards to gain access to the workplace.



# **ANNEXES**



## **Annex 1**

### **EQUIPMENT, TOOLS AND INSTRUMENTATION**

During the occupational analysis workshop, the participants were presented with a basic list of equipment, tools and instrumentation used by elevator mechanics, and were asked to adapt the list to each task of the trade.

Accordingly, the participants added, corrected and withdrew items from the list, depending on the work to be done. The information gathered from this exercise is presented in the tables below.

Each table corresponds to the various work functions described in Section 2.4 of the present report, i.e., maintenance, repairs, alterations and commissioning of mechanical conveying systems, as well as emergency responses.

**Table A.1   Equipment, Tools and Instrumentation**

**Tools and Equipment**

- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>• Hand-operated winch, 1, 2, 3, 5 and 10 t</li> <li>• Vacuum cleaner</li> <li>• Crowbar</li> <li>• Guide blocks</li> <li>• Metal toolbox</li> <li>• Centering device</li> <li>• Pump cart (sawhorse)</li> <li>• Beam trolley</li> <li>• Cold chisel</li> <li>• Tinner's snips</li> <li>• Adjustable wrench</li> <li>• Impact wrench</li> <li>• Socket wrenches</li> <li>• Socket ratchet wrenches with less than ¾" span</li> <li>• Torque wrench</li> <li>• Alan keys</li> <li>• Combination open and box wrenches</li> <li>• Toolbox with padlock</li> <li>• Hydraulic cable cutter</li> <li>• Putty knife</li> <li>• Pocket knife</li> <li>• EPROM eraser</li> <li>• Ladder</li> <li>• Adjustable combination square, 90° - 45°, 12"</li> <li>• Square</li> <li>• Safety equipment (system locks, safety harness, lifelines, hard hat, goggles, visors, ear plugs, gloves, knee pads, boots, first aid kit)</li> <li>• Hoisting and handling equipment (hoist, slings, cable clamps, etc.)</li> <li>• Heating and cutting equipment, including oxygen cutting</li> <li>• Stepladder</li> <li>• Vice</li> <li>• Fish tape</li> <li>• Plumblines</li> <li>• Corner drill</li> <li>• ¾ drill</li> </ul> | <ul style="list-style-type: none"> <li>• Victaulic cut groover</li> <li>• Crane operator</li> <li>• Flashlight</li> <li>• Wood hammer</li> <li>• Ball-peen hammer</li> <li>• Jackhammer</li> <li>• TE52 jackhammer</li> <li>• Angle grinder</li> <li>• PeeWee grinder</li> <li>• Bench grinder</li> <li>• Level</li> <li>• Greenlee hydraulic punch</li> <li>• Cutting pliers</li> <li>• Straight pliers, insulated</li> <li>• Straight long nose pliers</li> <li>• Vise grips</li> <li>• Working platforms and trowel</li> <li>• Punch</li> <li>• Hydraulic oil pump</li> <li>• Sander</li> <li>• Cable pulley</li> <li>• Multi-ton rollers</li> <li>• Measuring tape</li> <li>• Wood handsaw</li> <li>• Adjustable hacksaw with blades</li> <li>• Circular saw</li> <li>• Reciprocating saw</li> <li>• Electric welder</li> <li>• Square-head</li> <li>• Automatic screwdriver</li> <li>• Phillips screwdriver</li> <li>• Standard hold screwdriver</li> <li>• Standard square head screwdrivers</li> <li>• Awl</li> <li>• Capstan winch</li> <li>• Trowel for heavy loads</li> <li>• Blower fan</li> <li>• Towing jack</li> <li>• Hydraulic jack</li> </ul> |
|--|--|

**FUNCTION: INSTALLING MECHANICAL CONVEYING SYSTEMS**

**Instruments**

- Dial pointers
- Ammeter
- Vibration analyzer
- Programming console
- Dynamometer
- Portable transceiver, pager, cell phone
- Motor alignment precision indicator
- Alignment gauge
- Pressure gauges
- Luxmeter
- Hydraulic oil pressure indicator
- Megohmmetre
- Digital multimeter
- Laser level
- Ohmmeter
- Laptop computer and printer
- Oscilloscope
- Multiple programmer
- Sound level meter
- Tachometer
- Thermometer
- Cable tension gauge
- Vernier
- Voltmeter

**FUNCTION: MAINTAINING MECHANICAL CONVEYING SYSTEMS**

**Tools and Equipment**

- Hand-operated winch, 1, 2, 3, 5 and 10 t
- Vacuum cleaner
- Guide blocks
- Metal toolbox
- Centering device
- Pump cart (sawhorse)
- Beam trolley
- Adjustable wrench
- Impact wrench
- Socket wrenches
- Socket ratchet wrenches with less than  $\frac{3}{4}$ " span
- Torque wrench
- Alan keys
- Combination open and box wrenches
- Toolbox with padlock
- Hydraulic cable cutter
- Pocket knife
- Handtruck
- EPROM eraser
- Ladder
- Adjustable combination square, 90° - 45°, 12"
- Safety equipment (system locks, safety harness, lifelines, hard hat, goggles, visors, ear plugs, gloves, knee pads, boots, first aid kit)
- Heating and cutting equipment, including oxygen cutting
- Stepladder
- Vice
- Fish tape
- Corner drill
- $\frac{3}{4}$  drill
- Hydraulic cut groover
- Crane operator
- Flashlight
- Limes
- Jackhammer
- TE52 jackhammer
- Angle grinder
- PeeWee grinder
- Bench grinder
- Mirror
- Hoist
- Emery paper
- Greenlee hydraulic punch
- Cutting pliers
- Straight pliers, insulated
- Long nose pliers
- Vise grips
- Brush
- Working platforms and trowel
- Hydraulic oil pump
- Sander
- Cable pulley
- Multi-ton rollers
- Measuring tape
- Circular saw
- Reciprocating saw
- Electric welder
- Square-head screwdrivers
- Automatic screwdriver
- Phillips screwdriver
- Standard hold screwdriver
- Standard square head screwdrivers
- Capstan winch
- Trowel for heavy loads
- Blower fan
- Towing jack
- Hydraulic jack



**FUNCTION: MAINTAINING MECHANICAL CONVEYING SYSTEMS**

**Instruments**

- Ammeter
- Vibration analyzer
- Programming console
- Dynamometer
- Portable transceiver, Pager, Cell phone
- Alignment gauge
- Pressure gauges
- Luxmeter
- Ultrasonic crack detector
- Hydraulic oil pressure indicator
- Megohmmetre
- Digital multimeter
- Ohmmeter
- Laptop computer and printer
- Oscilloscope
- Multiple programmer
- Sound level meter
- Tachometer
- Thermometer
- Cable tension gauge
- Vernier

**FUNCTION: REPAIRING MECHANICAL CONVEYING SYSTEMS**

**Tools and Equipment**

- Hand-operated winch, 1, 2, 3, 5 and 10 t
- Vacuum cleaner
- Crowbar
- Guide blocks
- Metal toolbox
- Centering device
- Pump cart (sawhorse)
- Beam trolley
- Cold chisel
- Tinner's snips
- Adjustable wrench
- Impact wrench
- Socket wrenches
- Socket ratchet wrenches with less than  $\frac{3}{4}$ " span
- Torque wrench
- Alan keys
- Combination open and box wrenches
- Toolbox with padlock
- Hydraulic cable cutter
- Putty knife
- Pocket knife
- EPROM eraser
- Ladder
- Adjustable combination square, 90° - 45°, 12"
- Square
- Safety equipment (system locks, safety harness, lifelines, hard hat, goggles, visors, ear plugs, gloves, knee pads, boots, first aid kit)
- Hoisting and handling equipment (hoist, slings, cable clamps)
- Heating and cutting equipment, including oxygen cutting
- Stepladder
- Vice
- Fish tape
- Plumblines
- Corner drill
- $\frac{3}{4}$  drill
- Hydraulic cut groover
- Crane operator
- Flashlight
- Wood hammer
- Ball-peen hammer
- Jackhammer
- TE52 jackhammer
- Angle grinder
- PeeWee grinder
- Bench grinder
- Level
- Greenlee hydraulic punch
- Cutting pliers
- Straight pliers, insulated
- Long nose pliers
- Vise grips
- Working platforms and trowel
- Punch
- Hydraulic oil pump
- Sander
- Cable pulley
- Multi-ton rollers
- Measuring tape
- Wood handsaw
- Adjustable hacksaw with blades
- Circular saw
- Reciprocating saw
- Electric welder
- Square-head screwdrivers
- Automatic screwdriver
- Phillips screwdriver
- Standard hold screwdriver
- Standard square head screwdrivers
- Awl
- Capstan winch
- Trowel for heavy loads
- Blower fan
- Towing jack
- Hydraulic jack

**FUNCTION: REPAIRING MECHANICAL CONVEYING SYSTEMS**

**Instruments**

- Dial pointers
- Ammeter
- Vibration analyzer
- Programming console
- Dynamometer
- Portable transceiver, Pager, Cell phone
- Motor alignment precision indicator
- Alignment gauge
- Pressure gauges
- Luxmeter
- Ultrasonic crack detector
- Hydraulic oil pressure indicator
- Megohmmetre
- Digital multimeter
- Ohmmeter
- Laptop computer and printer
- Oscilloscope
- Multiple programmer
- Sound level meter
- Tachometer
- Thermometer
- Cable tension gauge
- Vernier
- Voltmeter

**FUNCTION: ALTERING MECHANICAL CONVEYING SYSTEMS**

**Tools and Equipment**

- Hand-operated winch, 1, 2, 3, 5 and 10 t
- Vacuum cleaner
- Crowbar
- Guide blocks
- Metal toolbox
- Centering device
- Pump cart (sawhorse)
- Beam trolley
- Cold chisel
- Tinner's snips
- Adjustable wrench
- Impact wrench
- Socket wrenches
- Socket ratchet wrenches with less than  $\frac{3}{4}$ " span
- Torque wrench
- Alan keys
- Combination open and box wrenches
- Toolbox with padlock
- Hydraulic cable cutter
- Putty knife
- Pocket knife
- EPROM eraser
- Ladder
- Adjustable combination square, 90° - 45°, 12"
- Square
- Safety equipment (system padlocks, harnesses, lifelines, hard hat, goggles, visors, ear plugs, knee pads, boots, first aid kit)
- Hoisting and handling equipment (hoist, slings, cable clamps, etc.)
- Heating and cutting equipment, including oxygen cutting
- Stepladder
- Vice
- Fish tape
- Plumblines
- Corner drill
- $\frac{3}{4}$  drill
- Victaulic cut groover
- Crane operator
- Flashlight
- Wood hammer
- Ball-peen hammer
- Jackhammer
- TE52 jackhammer
- Angle grinder
- PeeWee grinder
- Bench grinder
- Level
- Greenlee hydraulic punch
- Cutting pliers
- Straight pliers, insulated
- Long nose pliers
- Vise grips
- Working platforms and trowel
- Punch
- Hydraulic oil pump
- Sander
- Cable pulley
- Multi-ton rollers
- Measuring tape
- Wood handsaw
- Adjustable hacksaw with blades
- Circular saw
- Reciprocating saw
- Electric welder
- Square-head screwdrivers
- Automatic screwdriver
- Phillips screwdriver
- Standard hold screwdriver
- Standard square head screwdrivers
- Awl
- Capstan winch
- Trowel for heavy loads
- Blower fan
- Towing jack
- Hydraulic jack

**FUNCTION: ALTERING MECHANICAL CONVEYING SYSTEMS**

**Instruments**

- Dial pointers
- Ammeter
- Vibration analyzer
- Programming console
- Dynamometer
- Portable transceiver, Pager, Cell phone
- Motor alignment precision indicator
- Alignment gauge
- Pressure gauges
- Luxmeter
- Hydraulic oil pressure indicator
- Megohmmetre
- Digital multimeter
- Ohmmeter
- Laptop computer and printer
- Oscilloscope
- Multiple programmer
- Sound level meter
- Tachometer
- Thermometer
- Vernier
- Voltmeter

**FUNCTION: COMMISSIONING MECHANICAL CONVEYING SYSTEMS**

**Equipment and Instruments**

- Safety equipment (system locks, safety harness, lifelines, hard hat, goggles, visors, ear plugs, gloves, knee pads, boots, first aid kit)
- Basic toolbox, including a multimeter
- Programming console
- Portable transceiver
- Laptop computer and printer
- Pager
- Cell phone

**FUNCTION: RESPONDING TO EMERGENCIES**

**Tools and Equipment**

- Hand-operated winch, 1, 2, 3, 5 and 10 t
- Vacuum cleaner
- Crowbar
- Guide blocks
- Metal toolbox
- Centering device
- Pump cart (sawhorse)
- Beam trolley
- Cold chisel
- Tinner's snips
- Adjustable wrench
- Impact wrench
- Socket wrenches
- Socket ratchet wrenches with less than  $\frac{3}{4}$ " span
- Torque wrench
- Alan keys
- Combination open and box wrenches
- Toolbox with padlock
- Hydraulic cable cutter
- Putty knife
- Pocket knife
- EPROM eraser
- Ladder
- Adjustable combination square, 90° - 45°, 12"
- Square
- Safety equipment (system padlocks, harnesses, lifelines, hard hat, goggles, visors, ear plugs, knee pads, boots, first aid kit)
- Hoisting and handling equipment (hoist, slings, cable clamps)
- Heating and cutting equipment, including oxygen cutting
- Stepladder
- Vice
- Fish tape
- Plumblines
- Corner drill
- $\frac{3}{4}$  drill
- Hydraulic cut groover
- Crane operator
- Flashlight
- Wood hammer
- Ball-peen hammer
- Jackhammer
- TE52 jackhammer
- Angle grinder
- PeeWee grinder
- Bench grinder
- Level
- Greenlee hydraulic punch
- Cutting pliers
- Straight pliers, insulated
- Long nose pliers
- Vise grips
- Working platforms and trowel
- Punch
- Hydraulic oil pump
- Sander
- Cable pulley
- Multi-ton rollers
- Measuring tape
- Wood handsaw
- Adjustable hacksaw with blades
- Circular saw
- Reciprocating saw
- Electric welder
- Square-head screwdrivers
- Automatic screwdriver
- Phillips screwdriver
- Standard hold screwdriver
- Standard square head screwdrivers
- Awl
- Capstan winch
- Trowel for heavy loads
- Blower fan
- Towing jack
- Hydraulic jack

**FUNCTION: RESPONDING TO EMERGENCIES**

**Instruments**

- Ammeter
- Programming console
- Dynamometer
- Portable transceiver, Pager, Cell phone
- Alignment gauge
- Pressure gauges
- Hydraulic oil pressure indicator
- Digital multimeter
- Ohmmeter
- Laptop computer and printer
- Tachometer
- Thermometer
- Vernier
- Voltmeter



## OCCUPATIONAL HEALTH AND SAFETY GRID

Produced by: **Roland Sayegh**, Inspector,  
Commission de la santé et de la sécurité du travail

Table A.2 Occupational Health and Safety Issues for Elevator Mechanics

No.	Risk Sources	Effects on Health and Safety	Means of Prevention
<b>1. FALL HAZARDS</b>			
	a) Hazard of a same-level fall (slipping, false step, etc.)	<ul style="list-style-type: none"> <li>• Collisions, contusions, fractures, bruises</li> </ul>	<ul style="list-style-type: none"> <li>• Clear the work area (pick up debris, tools, equipment).</li> <li>• Ensure that the work area is not slippery.</li> <li>• Wear safety boots with anti-slip soles.</li> <li>• Absorb oils and apply abrasives.</li> </ul>
	b) Hazard of falling from a height: <ul style="list-style-type: none"> <li>- Use of scaffolds</li> <li>- Use of ladders</li> <li>- Falling in the shaft</li> </ul>	<ul style="list-style-type: none"> <li>• Collisions, fractures, internal injuries, permanent physical and psychological after-effects, death</li> </ul>	<ul style="list-style-type: none"> <li>• Clear the work area.</li> <li>• Ensure that the work area is not slippery and is sturdy.</li> <li>• Wear a safety harness.</li> <li>• Ensure that the ladder is sturdy and stable.</li> <li>• Install balustrades.</li> <li>• Secure the work area.</li> <li>• Install and use scaffolds safely.</li> </ul>
<b>2. EQUIPMENT HAZARDS</b>			
	a) Heavy equipment to be transported and handled	<ul style="list-style-type: none"> <li>• Excessive efforts</li> <li>• Backache</li> <li>• Disk hernias</li> </ul>	<ul style="list-style-type: none"> <li>• Ensure that the hoisting equipment is adequate.</li> <li>• Request assistance from a colleague.</li> </ul>
	b) Being dragged by moving parts or transmission mechanisms	<ul style="list-style-type: none"> <li>• Jamming</li> <li>• Crushing</li> <li>• Amputation</li> <li>• Fractures</li> </ul>	<ul style="list-style-type: none"> <li>• Lock sources of electricity.</li> <li>• Wear appropriate and fitted clothing.</li> <li>• Ensure adequate lighting.</li> <li>• Maintain your distance.</li> </ul>
	c) Contact with a rotating tool	<ul style="list-style-type: none"> <li>• Contusions</li> <li>• Hand injuries</li> </ul>	<ul style="list-style-type: none"> <li>• Make sure the tool is stopped before you respond.</li> <li>• Wear safety equipment (gloves).</li> </ul>
	d) Fall of equipment	<ul style="list-style-type: none"> <li>• Crushing</li> <li>• Fractures</li> </ul>	<ul style="list-style-type: none"> <li>• Wear safety shoes.</li> <li>• Wear a hard hat.</li> </ul>
	e) Projection of various elements	<ul style="list-style-type: none"> <li>• Eye injury</li> </ul>	<ul style="list-style-type: none"> <li>• Wear safety goggles.</li> </ul>
	f) Rupture of elements or anchors	<ul style="list-style-type: none"> <li>• Fall</li> <li>• Sudden movements</li> </ul>	<ul style="list-style-type: none"> <li>• Use appropriate tools.</li> <li>• Use a safe working method.</li> </ul>
	g) Welding equipment	<ul style="list-style-type: none"> <li>• Burns</li> <li>• Electrocutation</li> </ul>	<ul style="list-style-type: none"> <li>• Ensure the equipment is in good condition.</li> <li>• Wear appropriate gloves and visors.</li> </ul>

No.	Risk Sources	Effects on Health and Safety	Means of Prevention
<b>3. CHEMICAL HAZARDS</b>			
	a) Use of hydraulic oil	<ul style="list-style-type: none"> <li>• Eye injuries</li> <li>• Dermatitis</li> </ul>	<ul style="list-style-type: none"> <li>• Consult the material safety data sheet for the product used.</li> <li>• Read container instructions on safe use of the product.</li> <li>• Wear appropriate gloves.</li> <li>• Wear a mask if the product is aerosol.</li> <li>• Wear goggles or a visor if it is recommended.</li> <li>• Wear a disposable Tyrex suit and appropriate protective equipment if asbestos is present.</li> <li>• If airborne asbestos dust is suspected, request an expert assessment before working on the premises.</li> </ul>
	b) Use of degreasers	<ul style="list-style-type: none"> <li>• Irritation of respiratory routes</li> </ul>	
	c) Use of lubricants	<ul style="list-style-type: none"> <li>• Intoxications</li> </ul>	
	d) Use of paints and solvents		
	e) Presence of asbestos in materials in place	<ul style="list-style-type: none"> <li>• Development of asbestosis and cancer (death in the long term)</li> </ul>	
<b>4. ELECTRICAL HAZARDS</b>			
	a) Electric tools b) Turned-on equipment	<ul style="list-style-type: none"> <li>• Electric shocks (discharges)</li> <li>• Electrocutation</li> <li>• Permanent physical or psychological after-effects</li> <li>• Death</li> </ul>	<ul style="list-style-type: none"> <li>• Establish a lockout policy.</li> <li>• Use appropriate voltage-insulated tools.</li> <li>• Wear insulated gloves.</li> <li>• Avoid working on live current.</li> <li>• Use double-insulated electric tools preferably.</li> <li>• Always use extension cords that are grounded, in good condition and of an appropriate size for the tool.</li> <li>• Wear fireproof clothing.</li> </ul>
<b>5. ERGONOMIC HAZARDS</b>			
	a) Posture constraints	<ul style="list-style-type: none"> <li>• Musculoskeletal lesions</li> </ul>	<ul style="list-style-type: none"> <li>• Use handling equipment.</li> </ul>
	b) Handling, lifting and moving heavy loads	<ul style="list-style-type: none"> <li>• Sprains</li> </ul>	<ul style="list-style-type: none"> <li>• Know handling techniques.</li> </ul>
	c) Difficulty of the task	<ul style="list-style-type: none"> <li>• Hernias</li> </ul>	<ul style="list-style-type: none"> <li>• Have good tools for the task to be performed.</li> </ul>
	d) Narrow areas	<ul style="list-style-type: none"> <li>• Fatigue, discomfort, pain</li> <li>• Permanent physical after-effects</li> </ul>	<ul style="list-style-type: none"> <li>• Request assistance for moving heavy loads.</li> <li>• Use the best possible working postures in narrow areas or when the task is difficult.</li> </ul>
<b>6. ENVIRONMENTAL HAZARDS</b>			
	a) Heat b) Cold c) Noise	<ul style="list-style-type: none"> <li>• Heatstroke</li> <li>• Rheumatic illnesses</li> <li>• Loss of hearing</li> <li>• Dehydration</li> <li>• Headaches</li> <li>• Chilblains</li> </ul>	<ul style="list-style-type: none"> <li>• Wear adequate clothing for the work environment.</li> <li>• Quench your thirst frequently.</li> <li>• Wear hearing protection equipment.</li> </ul>
	d) Insufficient lighting	<ul style="list-style-type: none"> <li>• Poor distinction of objects</li> </ul>	<ul style="list-style-type: none"> <li>• Ensure sufficient supplementary lighting.</li> </ul>

No.	Risk Sources	Effects on Health and Safety	Means of Prevention
<b>7. PSYCHOSOCIAL HAZARDS</b>			
	a) Stress	<ul style="list-style-type: none"> <li>• Anxiety</li> <li>• Insomnia</li> <li>• Exhaustion</li> <li>• Nervousness</li> </ul>	<ul style="list-style-type: none"> <li>• Remain calm when responding to emergencies.</li> <li>• Take the necessary time when troubleshooting.</li> <li>• Do not answer aggressive, anxious or nervous clients.</li> <li>• If necessary, entrust to another person the task of dealing with clients.</li> </ul>

**Table A.3 Sources of Risk Associated with the Tasks and Operations of the Elevator Mechanic Trade**

**Legend**

O	The risk is nil
x	The risk is low
xx	The risk is average
xxx	The risk is high

Risk levels are rated according to exposure to sources of risk, not according to the gravity of effects on personal health and safety.

**1. Install traction elevators and hoists**

No.	Tasks and Operations	Fall Hazards	Equipment Hazards	Chemical Hazards	Electrical Hazards	Ergonomic Hazards	Environmental Hazards	Psychosocial Hazards
1.1	Plan the work, communicate with the site supervisor and obtain necessary authorizations	O	O	O	O	O	O	O
1.2	Interpret plans and diagrams	O	O	O	O	O	O	O
1.3	Apply individual and collective safety measures	O	O	O	O	O	O	O
1.4	Handle and rig equipment and materials	XX	XXX	X	O	XXX	XX	O
1.4.1	Delimit a work area to unload the truck	O	O	O	O	O	X	O
1.4.2	Determine the location of equipment according to its order of installation and its load on the structure	O	O	O	O	O	X	O
1.5	Temporarily erect scaffolds, false car platforms or Tyrak electric cable hoists, depending on the type of installation	XXX	XXX	O	X	XX	XX	X
1.6	Determine the shaft alignment	XXX	X	O	O	XXX	XX	O
1.6.1	Check required distances in the pit and upper shaft	XXX	X	O	O	XX	XX	O
1.7	Install components inside the shaft: supports, tracks, courses, shock absorbers; the winch temporarily, etc.	XXX	XX	O	O	XX	XX	O
1.8	Install equipment (motor, control panel, etc.) in the machine room or other designated locations (if there is no machine room)	XXX	XX	O	X	XX	XX	O
1.9	Make the motor's electrical connections	XXX <sup>23</sup>	O	O	XX	XX	XX	X
1.10	Check motor rotation	XXX <sup>24</sup>	O	O	XX	XX	XX	X

<sup>23</sup> This rating is made necessary by the arrival of new technologies.

<sup>24</sup> *Ibid* note 1.

No.	Tasks and Operations	Fall Hazards	Equipment Hazards	Chemical Hazards	Electrical Hazards	Ergonomic Hazards	Environmental Hazards	Psychosocial Hazards
1.11	Assemble the car frames, platform and counterweight	XXX	XXX	O	X	XXX	XX	X
1.11.1	Ensure that the platform and counterweight are in balance	XXX	XXX	O	X	XXX	XX	X
1.12	Install suspension cables	XXX	XXX	O	O	XXX	XX	O
1.12.2	Equalize the tension of cables or belts to avoid damaging them	XX	XX	O	O	XX	XX	O
1.13	Install speed regulators and check their operation	X	X	O	X	XX	XX	O
1.14	Temporarily activate the platform	XX	X	O	XX	O	X	X
1.14.1	Make required checks	XX	X	O	XX	O	X	X
1.14.2	Level the platform	XX	X	O	XX	O	X	X
1.15	Install and adjust elevator door frames, locking devices and fascias	XXX	XXX	X	X	XX	XX	O
1.16	Install conduits, wires and electric and electronic accessories in the shaft and on the car frame	XXX	XX	O	XXX	XX	XX	O
1.17	Clean and lubricate components in the shaft	XXX	X	XXX	X	XX	XX	O
1.17.1	Check the operation of parachutes	X	X	X	X	XX	XX	O
1.18	Assemble the car on the platform and install accessories	XX	XX	O	XX	XX	XX	O
1.18.1	Ensure that the platform and counterweight are in balance	XX	XX	O	XX	XX	XX	O
1.19	Install the car's electrical accessories	X	X	O	XXX	X	X	O
1.20	Complete the car's interior finishing	O	X	XX	X	X	X	O
1.21	Make the final electrical connections	O	X	O	XXX	X	X	O
1.22	Paint components	XX	XX	XXX	XX	XX	X	O
1.23	Make final adjustments	X	O	O	X	X	X	X
1.24	Participate in technical tests and/or perform those required during startup, or at each addition of a landing (tower) or tower section in the case of temporary elevators	X	O	O	X	X	X	X
1.25	Participate in the final inspection	X	O	O	X	X	X	X
1.26	Clean the work area and store tools and equipment	O	X	X	X	X	X	O
1.27	Write installation reports, fill out sheets, update plans, etc.	O	O	O	O	O	O	O

## 2. Install hydraulic elevators and hoists (including cable cylinders)

No.	Tasks and Operations	Fall Hazards	Equipment Hazards	Chemical Hazards	Electrical Hazards	Ergonomic Hazards	Environmental Hazards	Psychosocial Hazards
2.1	Plan the work, communicate with the site supervisor and obtain necessary authorizations	O	O	O	O	O	O	O
2.2	Interpret plans and diagrams	O	O	O	O	O	O	O
2.3	Apply individual and collective safety measures	O	O	O	O	O	O	O
2.4	Handle and rig equipment and materials	XX	XXX	X	O	XXX	XX	O
2.5	Temporarily erect scaffolds, false car platforms or Tyrak electric cable hoists, depending on the type of installation	XXX	XXX	O	X	XX	XX	X
2.6	Determine the shaft alignment	XXX	X	O	O	XXX	XX	O
2.6.1	Ensure that the pit and course comply with the diagrams	XXX	X	O	O	XX	XX	O
2.7	Install components inside the shaft: supports, rails, courses, shock absorbers, etc.	XXX	XX	O	O	XX	XX	O
2.8	Install a protective PVC sheath on the cylinder	X	X	O	O	XX	X	O
2.8.1	Take necessary measures if water is present	O	O	O	X	X	X	O
2.9	Install the cylinder, align it and adjust the anti-sag device (valve rupture)	X	X	O	O	X	X	O
2.9.1	Check that the protective sheath is waterproof	X	X	O	O	X	X	O
2.10	Install the hydraulic piston and its accessories	X	X	O	O	X	X	O
2.11	Install machine room equipment	X	XX	O	X	X	X	O
2.12	Install hydraulic conduits	X	X	O	O	X	X	O
2.13	Assemble and install the car frame and platform	XXX	XXX	O	X	XXX	XX	X
2.14	Install suspension cables according to the type of installation	XXX	XXX	O	O	XXX	XX	O
2.15	Install speed regulators and check their operation	X	X	O	X	XX	XX	O
2.16	Check the platform's alignment on the car frame	XX	X	O	XX	O	X	X
2.17	Make the electrical connections for temporary operation	O	O	O	XXX	XX	XX	X
2.18	Temporarily activate the platform	XX	X	O	XX	O	X	X
2.18.1	Make required checks	XX	X	O	XX	O	X	X
2.18.2	Proceed to levelling	XX	X	O	XX	O	X	X
2.19	Install and adjust elevator door frames, locking devices and fascias	XXX	XXX	X	X	XX	XX	O
2.20	Install conduits, wires and electric accessories in the shaft	XXX	XXX	X	X	XX	XX	O

No.	Tasks and Operations	Fall Hazards	Equipment Hazards	Chemical Hazards	Electrical Hazards	Ergonomic Hazards	Environmental Hazards	Psychosocial Hazards
2.21	Clean and lubricate components in the shaft	XXX	XX	O	XXX	XX	XX	O
2.22	Assemble the car on the platform and install accessories	XX	XX	O	XX	XX	XX	O
2.23	Install the car's electrical accessories	X	X	X	X	XX	XX	O
2.24	Complete the car's interior finishing	O	X	XX	X	X	X	O
2.25	Make the final electrical connections	O	X	O	XXX	X	X	O
2.26	Paint components	XX	XX	XXX	XX	XX	X	O
2.27	Make final adjustments	X	O	O	X	X	X	X
2.28	Participate in technical tests	X	O	O	X	X	X	X
2.29	Participate in the final inspection	X	O	O	X	X	X	X
2.30	Clean the work area and store tools and equipment	O	X	X	X	X	X	O
2.31	Write installation reports, fill out sheets, update plans, etc.	O	O	O	O	O	O	O

### 3. Install escalators and rolling sidewalks

No.	Tasks and Operations	Fall Hazards	Equipment Hazards	Chemical Hazards	Electrical Hazards	Ergonomic Hazards	Environmental Hazards	Psychosocial Hazards
3.1	Plan the work, communicate with the site supervisor and obtain necessary authorizations	O	O	O	O	O	O	XX
3.2	Interpret plans and diagrams	O	O	O	O	O	O	O
3.3	Apply individual and collective safety measures	O	O	O	O	O	O	O
3.4	Handle and rig equipment and materials	XX	XXX	O	O	XXX	O	XXX
3.4.1	Secure the work area	O	O	O	O	O	O	O
3.4.2	Choose transportation and hoisting equipment according to data sheets	O	O	O	O	O	O	O
3.5	Erect scaffolds depending on the type of installation	XXX	XXX	O	X	XXX	O	X
3.6	Put the equipment in place and assemble components if applicable	XXX	XXX	O	X	XXX	O	XXX
3.6.1	Check shaft dimensions with staircase levels	X	X	O	O	X	O	X
3.6.2	Check the alignment	O	O	O	O	X	O	X
3.6.3	Check floor levels	O	O	O	O	X	O	X
3.7	Fasten the equipment definitively	XXX	XX	O	O	XX	O	XX
3.8	Make the electrical connections	O	O	O	XXX	X	O	X
3.9	Make adjustments	O	O	O	O	X	O	X
3.9.1	Check the alignment of steps	O	O	O	O	X	O	O
3.9.2	Detect unusual noises	O	O	O	O	O	O	O
3.10	Participate in technical tests	O	X	O	O	X	O	O
3.10.1	Check that step and handrail speeds correspond	O	O	O	O	O	O	O
3.10.2	Check braking speed	O	O	O	O	O	O	O
3.11	Participate in the final inspection	O	O	O	O	O	O	O
3.12	Clean the work area and store tools and equipment	O	X	X	X	X	X	O
3.13	Write installation reports, fill out sheets, update plans, etc.	O	O	O	O	O	O	O



**4. Install other types of mechanical conveying systems (cableways, flying scaffolds, passenger ropeways, dumbwaiters, home elevators for disabled persons, elevators and hoists on an incline, moveable stage platforms and other similar devices)**

No.	Tasks and Operations	Fall Hazards	Equipment Hazards	Chemical Hazards	Electrical Hazards	Ergonomic Hazards	Environmental Hazards	Psychosocial Hazards
4.1	Plan the work and obtain necessary authorizations	O	O	O	O	O	O	O
4.2	Interpret plans and diagrams	O	O	O	O	O	O	O
4.3	Apply individual and collective safety measures	O	O	O	O	O	O	O
4.4	Handle and rig equipment and materials	XXX	XXX	X	O	XXX	X	O
4.4.1	Ensure that equipment, materials and tools comply with the data sheet	O	O	O	O	O	O	O
4.5	Erect scaffolds if applicable	XXX	XXX	O	O	XX	X	O
4.6	Put the equipment in place and assemble components if applicable	XXX	XXX	X	X	XXX	X	O
4.7	Fasten the equipment definitively	XXX	XX	X	X	XX	X	O
4.8	Make the electrical connections	XX	X	O	XXX	X	X	O
4.9	Make adjustments	XX	XX	O	X	XX	X	O
4.9.1	Follow the recommended procedure	O	O	O	O	O	O	O
4.9.2	Use the specific tools	X	XX	O	X	X	X	O
4.10	Participate in technical tests	X	O	O	X	X	X	X
4.11	Participate in the final inspection	X	O	O	O	O	O	O
4.12	Clean the work area and store tools and equipment	O	X	X	X	X	X	O
4.13	Write installation reports, fill out sheets, update plans, etc.	O	O	O	O	O	O	O

**5. Maintain mechanical conveying systems, temporary or not, finished or not**

No.	Tasks and Operations	Fall Hazards	Equipment Hazards	Chemical Hazards	Electrical Hazards	Ergonomic Hazards	Environmental Hazards	Psychosocial Hazards
5.1	Communicate with the client and obtain the necessary information	O	O	O	O	O	O	O
5.2	Plan the work and obtain necessary authorizations	O	O	O	O	O	O	O
5.3	Apply individual and collective safety measures	O	O	O	O	O	O	O
5.4	Check the overall operation of the equipment in place	X	X	O	X	X	X	O
5.5	Analyse noises and vibrations and check the wear	X	X	O	X	X	X	O
5.6	Diagnose operating problems, if applicable	X	X	O	X	X	X	O
5.7	Check protective devices	X	X	O	X	X	O	O
5.8	Interpret plans, sketches, maintenance schedules and maintenance sheets	O	O	O	O	O	O	O
5.8.1	Ensure that plans correspond to the type of equipment	O	O	O	O	O	O	O
5.9	Disassemble, reassemble, replace components and make adjustments	XX	XX	XX	XX	XXX	XX	X
5.9.1	Identify the components to be disassembled	X	X	X	X	XX	X	O
5.9.2	Follow the procedure	O	O	O	O	O	O	O
5.10	Take corrective measures	X	X	X	X	XX	X	O
5.11	Clean and lubricate components	XX	XX	XX	XX	XX	X	O
5.11.1	Make adjustments as needed	XX	XX	X	XX	XX	X	O
5.12	Perform tests and make the final inspection	X	O	O	X	X	X	O
5.13	Clean the work area and store tools and equipment	O	X	X	X	X	X	O
5.14	Write maintenance reports, update maintenance sheets, diagrams and plans, etc.	O	O	O	O	O	O	O
5.15	Send relevant information to the client and inform the supervisor about work to be done if applicable	O	O	O	O	O	O	O

## 6. Repair mechanical conveying systems (service call or planned repair)

No.	Tasks and Operations	Fall Hazards	Equipment Hazards	Chemical Hazards	Electrical Hazards	Ergonomic Hazards	Environmental Hazards	Psychosocial Hazards
6.1	Communicate with the client and obtain the necessary information	○	○	○	○	○	○	○
6.2	Plan the work and obtain necessary authorizations	○	○	○	○	○	○	○
6.3	Apply individual and collective safety measures	○	○	○	○	○	○	○
6.4	Interpret plans, sketches, repair reports and maintenance sheets	○	○	○	○	○	○	○
6.5	Diagnose operating problems	XX	XXX	○	X	XXX	X	○
6.6	Handle and rig equipment and materials	X	XXX	X	○	XX	X	○
6.7	Disassemble equipment	X	X	X	X	XX	X	○
6.8	Process simple parts	○	X	X	○	X	○	○
6.8.1	Check the conformity of parts with the original manufacturer	○	○	○	○	○	○	○
6.9	Debug the system temporarily while ensuring complete safety	○	○	○	○	○	○	X
6.9.1	Repair temporarily while waiting for receipt of the unavailable part	○	○	○	X	○	○	X
6.10	Replace or reinstall components	X	XX	X	X	XX	X	○
6.10.1	Ensure that the equipment is compatible	○	X	X	X	X	○	○
6.11	Calibrate and adjust system components	○	○	X	X	X	X	○
6.12	Make electrical and mechanical connections	XX	XXX	XX	XXX	XX	XX	X
6.13	Lubricate components	X	X	XX	X	X	X	○
6.14	Make adjustments	X	○	○	X	X	X	○
6.15	Perform tests and make the final inspection	X	X	○	X	X	X	○
6.16	Clean the work area and store tools and equipment	○	X	X	X	X	X	○
6.17	Write repair reports, record data in a logbook, update sheets, diagrams and plans, etc.	○	○	○	○	○	○	○
6.18	Send relevant information to the client and inform the supervisor about work to be done if applicable	○	○	○	○	○	○	○

**7. Alter mechanical conveying systems (modernization, upgrading to standard, etc.)**

No.	Tasks and Operations	Fall Hazards	Equipment Hazards	Chemical Hazards	Electrical Hazards	Ergonomic Hazards	Environmental Hazards	Psychosocial Hazards
7.1	Communicate with the client and obtain the necessary information	O	O	O	O	O	O	O
7.2	Plan the work and obtain necessary authorizations	O	O	O	O	O	O	O
7.3	Apply individual and collective safety measures	O	O	O	O	O	O	O
7.4	Interpret plans, sketches and alteration reports	O	O	O	O	O	O	O
7.4.1	Check the availability of tools and equipment required on the premises	O	O	O	O	O	O	O
7.5	Evaluate the mechanical conveying system in place and determine the alteration's feasibility	X	X	O	X	X	X	O
7.5.1	Check safety conditions	X	X	O	X	X	X	O
7.5.2	Adopt a good working posture	O	O	O	O	X	O	O
7.6	Disassemble, reassemble, replace components or install new ones	XX	XX	X	XX	XX	X	O
7.7	Clean and lubricate components	XXX	X	XXX	X	XX	XX	O
7.8	Adjust components	XX	XX	X	XX	XX	X	O
7.9	Make electrical and mechanical connections	XXX	XX	O	XXX	XX	X	O
7.10	Paint components	XX	XX	XXX	XX	XX	X	O
7.11	Make adjustments	X	O	O	X	X	X	O
7.12	Participate in technical tests	X	O	O	X	X	X	O
7.13	Participate in the final inspection	X	O	O	X	X	X	X
7.14	Clean the work area and store tools and equipment	O	X	X	X	X	X	O
7.15	Send relevant information to the client and inform the supervisor about work to be done if applicable	O	O	O	O	O	O	O

**8. Make elevators operate, temporary or not, finished or not, and disassemble the temporary elevators when the work is completed**

No.	Tasks and Operations	Fall Hazards	Equipment Hazards	Chemical Hazards	Electrical Hazards	Ergonomic Hazards	Environmental Hazards	Psychosocial Hazards
8.1	Check safety devices daily	X	X	O	X	X	XX	X
8.1.1	Perform technical tests on startup and at each addition of a landing (tower) or tower section	X	X	O	X	O	XX	X
8.2	Apply safety measures for users (barricades, etc.)	O	O	O	O	O	O	XX
8.3	Estimate the weight of loads or obtain the necessary information	O	O	O	O	O	O	X
8.4	Arrange loads on the platform	O	O	O	O	XX	X	X
8.5	Activate the elevator and ensure that persons or loads are moved safely to the correct location	O	O	O	O	O	X	X
8.6	Apply rules and procedures for disassembling temporary installations	XX	X	X	X	XX	X	X

## 9. Respond to emergencies

No.	Tasks and Operations	Fall Hazards	Equipment Hazards	Chemical Hazards	Electrical Hazards	Ergonomic Hazards	Environmental Hazards	Psychosocial Hazards
<b>9 a</b>	<b><i>Elevators and Hoists</i></b>							
9.1 a	Communicate with the client or respondent at the scene of the incident	○	○	○	○	○	○	×
9.1.1 a	Gather information	○	○	○	○	○	○	×
9.1.2 a	Inform the client of the time it will take to arrive at the scene	○	○	○	○	○	○	×
9.1.3 a	Give instructions	○	○	○	○	○	○	×
9.1.4 a	Ensure that the captive persons are reassured while waiting to be rescued	○	○	○	○	○	○	×
9.2 a	Assess the situation upon arrival at the scene	○	○	○	○	○	○	XX
9.3 a	Communicate with the appropriate authorities	○	○	○	○	○	○	XX
9.4 a	Reassure the captive persons and give them instructions	○	○	○	○	○	○	XX
9.5 a	Apply safety measures	○	○	○	○	○	○	×
9.5.1 a	Ensure that doors are well locked in cases of major failures	×	×	○	×	×	×	×
9.6 a	Check the condition of the elevator or cableway	×	×	○	×	○	○	×
9.6.1 a	Free up space around the car	XX	XX	○	○	XX	XX	XX
9.7 a	Perform manoeuvres to move the elevator car	○	×	○	×	×	×	XX
9.8 a	Perform manoeuvres to move the cableway car	×	×	○	×	×	×	XX
9.9 a	Evacuate the persons safely	XXX	XX	○	○	XX	○	XXX
9.9.1 a	Reduce the gap between car and landing levels	×	×	○	○	×	○	×
9.9.2 a	Use the necessary equipment to evacuate the persons in all safety	×	×	○	○	×	○	×
9.9.3 a	Call firefighters for emergency exit evacuations	○	○	○	○	○	○	○
9.9.4 a	Take into account the panic level of the persons to be evacuated	○	○	○	○	○	○	XXX
9.10 a	Produce an incident report	○	○	○	○	○	○	○

No.	Tasks and Operations	Fall Hazards	Equipment Hazards	Chemical Hazards	Electrical Hazards	Ergonomic Hazards	Environmental Hazards	Psychosocial Hazards
<b>9 b</b>	<b>Escalators</b>							
9.1 b	Communicate with the client or respondent on the scene of the incident	○	○	○	○	○	○	X
9.1.1 b	Gather information	○	○	○	○	○	○	X
9.1.2 b	Inform the client of the time it will take to arrive at the scene	○	○	○	○	○	○	X
9.1.3 b	Give instructions	○	○	○	○	○	○	X
9.1.4 b	Ensure that the captive persons are reassured while waiting to be rescued	○	○	○	○	○	○	X
9.2 b	Assess the situation upon arrival at the scene	○	○	○	○	○	○	XX
9.3 b	Communicate with the appropriate authorities	○	○	○	○	○	○	XX
9.4 b	Reassure the captive persons and give them instructions	○	○	○	○	○	○	XX
9.5 b	Apply safety measures	○	○	○	○	○	○	X
9.6 b	Secure the premises and protect the work area	○	○	○	○	○	○	X
9.7 b	Facilitate access to the victim for first aid measures	○	○	○	○	○	○	X
9.8 b	Disassemble components related to the situation if there are no physical injuries	X	X	○	XX	XX	X	X
9.9 b	Follow the authorities' instructions in the presence of an injured person	○	○	○	○	○	○	XX
9.10 b	Write an incident report	○	○	○	○	○	○	○