

Pipe Fitter

Occupational Analysis Report

May 2012



Commission
de la construction
du Québec

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

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

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

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The masculine gender is used generically
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APPROVAL

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INTRODUCTION

In early 2009, the Direction de la formation professionnelle of the Commission de la construction du Québec (CCQ) launched a large-scale operation to review the occupational analyses¹ of all construction industry trades.

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

- the project to reform the construction workforce apprenticeship and management system, and the eventual design of qualitative apprenticeship booklets requiring a detailed description of each trade;
- the fact that most construction occupational analyses² had been conducted between 1987 and 1991 and had not been reviewed since;
- updates to vocational qualification examination question banks;
- implementation of Chapter 7 of the Agreement on Internal Trade (AIT) and of the Quebec-France Understanding on the Mutual Recognition of Professional Qualifications.

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

The occupational analysis of the pipe fitter trade belongs to this context³. Its purpose is to describe this trade as currently practiced by journeymen in the construction industry. The present report was written in order to collate and organize the information gathered during the occupational analysis workshop held in Laval on December 5 and 6, 2011.

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

1. The terms “profession” and “trade” are considered synonymous.

2. Called “work situation analyses” at the time.

3. This occupational analysis was conducted according to the *Cadre de référence et instrumentation pour l'analyse d'une profession*, produced in 2007 by the ministère de l'Éducation, du Loisir et du Sport (Direction générale de la formation professionnelle et technique) and the Commission des partenaires du marché du travail, ministère de l'Emploi et de la Solidarité sociale.

1. GENERAL CHARACTERISTICS OF THE TRADE

1.1 DEFINITION OF THE TRADE

According to the *Regulation respecting the vocational training of workforce in the construction industry* (Schedule A, section 22):

“Pipe fitter” means any person who performs, in any building or construction, the work of installing, renewing, altering, repairing or maintaining the systems included in the following specialties, except the piping of sewers and water mains and the connection thereof:

1. Specialty of plumber:

The plumber is responsible for:

a) plumbing systems, including:

- i. piping, devices, accessories and other apparatus necessary for the flow of fluids in the said system;
- ii. piping, devices, accessories and other apparatus used for the draining and the back air ventilation of the said system;

b) the piping, the devices and accessories used in installations such as refineries, gasoline pumps, air vents, pipe-lines and sprinkling systems.

2. Specialty of the heating systems installer:

The heating systems installer is responsible for:

a) heating and combustion systems including their piping, devices, accessories and/or other apparatus necessary for the distribution of fluids or the production of motive power or heat by the said system;

b) piping, devices and accessories utilized in installations such as oil refineries, gasoline pumps, air vents, pipe-lines and sprinklers.

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

According to the participants, this definition of the trade is accurate, but incomplete. References should be added on piping in the various industrial processes and in specialized fields such as medical gases.

In addition, the participants said that work on piping devices and accessories that use propane and natural gas are also absent from the definition, and that pipe fitters must hold many certifications in that field, such as the various certificates in gas appliance techniques (TAG) or the certificate in gas piping installation (ITG).

Moreover, the definition should indicate that the ability to use shielded metal arc welding (SMAW) and gas metal arc welding (GMAW) processes is an asset for practicing the trade.

1.2 JOB TITLES

The job title used for describing the trade in the present occupational analysis is “pipe fitter.”

The trade is at times designated by the term “pipe fitter” in French as well. The terms “plumber” and “specialized plumber” are also used occasionally. However, according to the participants, using the term “pipe fitter” leads to an erroneous perception that the work is related solely to pipe installation. The participants also find the term “plumber” restrictive; indeed, according to some people, “plumber” includes all piping work, including the installation of heating systems.

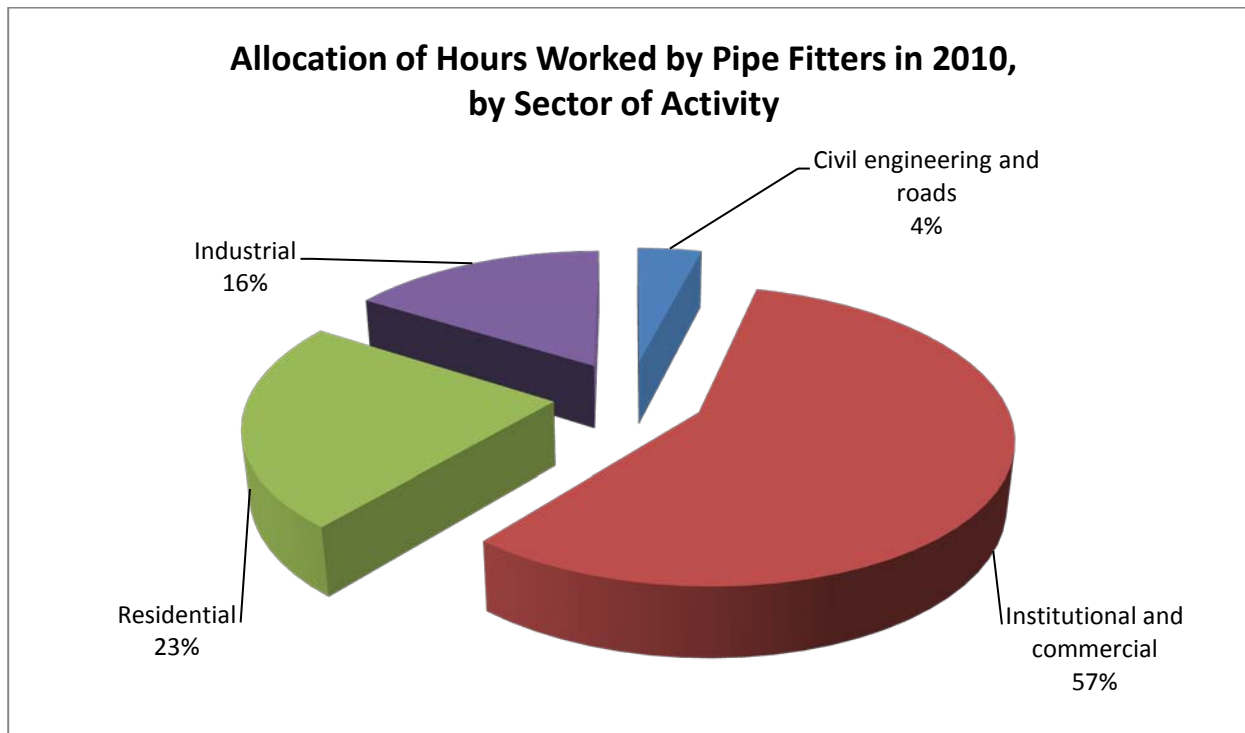
In addition, there is a grey area for bailers, particularly in joining work, for drillers in the field of geothermy, and for irrigation system installers.

1.3 SECTORS OF ACTIVITY

Pipe fitters are active, to varying degrees, in the four sectors of the construction industry:

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

The workload of pipe fitters was allocated in 2010⁴ as follows:



The pipe fitters attending the workshop consider that the above table corresponds well to their perception of their trade's workplaces, although the residential sector may be underestimated. Indeed, employers, who face a workforce shortage in the trade and want to retain their employees, reportedly tend to declare more hours in the other sectors in order to pay a higher salary, even if the work is done in the residential sector.

Asked about the sector of activity where they practice, nine participants stated that they work mainly in the institutional and commercial sector; two participants, in the industrial sector; and two others, in the residential sector.

Nine participants also work in a second sector. Thus, eight participants reported also having worked in the industrial sector, and one in the residential sector.

4. Commission de la construction du Québec, *Careers - Construction*, Québec City, 2011-2012 edition.

1.4 FIELD OF PRACTICE

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

[...] the foundation, erection, maintenance, renewal, repair, alteration and demolition work on buildings and civil engineering works carried out on the job site itself and vicinity including the previous preparatory work on the ground;

In addition, the word “construction” includes the installation, repair and maintenance of machinery and equipment, work carried out in part on the job site itself and in part in the shop, moving of buildings, transportation of employees, dredging, turfing, cutting and pruning of trees and shrubs and laying out of golf courses, but solely in the cases determined by regulation.

1.5 LEGISLATION, REGULATIONS AND STANDARDS

Pipe fitters in the construction industry are subject to:

- the *Act respecting labour relations, vocational training and workforce management in the construction industry* (R.S.Q., c. R-20);
- the *Regulation respecting the vocational training of workforce in the construction industry* (R-20, r.6.2);
- the four sector-based collective agreements of the construction industry;
- the *National Building Code* (NBC);
- the *National Plumbing Code* (NPC);
- the *Quebec Building Code*, Chapter I, “Building”;
- the *Quebec Building Code*, Chapter III, “Plumbing”;
- the *Act Respecting Occupational Health and Safety* (R.S.Q., c. S-2.1);
- the Workplace Hazardous Materials Information System (WHMIS) under the *Hazardous Products Act* and the *Controlled Products Regulations*;

- the *Transportation of Dangerous Substances Regulation*;
- the *Safety Code for the construction industry* (R.Q. c. S-2.1, r.6);
- municipal by-laws, if applicable.⁵

In addition, some of the work of pipe fitters must meet, as the case may be, several standards, notably those pertaining to gas devices (TAG and ITG), those of the CSA on natural gas and propane installation (CAN/CSA-B149.1-10), and those on welding processes.

Finally, it was mentioned that pipe fitters in the construction industry are subject to environmental regulations, particularly in the use of oils.

1.6 WORKING CONDITIONS⁶

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

Salary

The average annual salary of a journeyman pipe fitter having worked at least 500 hours was \$57,698 in 2010. 77% of journeymen worked at least 500 hours in the same period.

A journeyman's daytime hourly wage varies a little according to the sector of activity. As of May 1, 2011, the daytime hourly wage was as follows:

- Industrial, institutional and commercial: \$34.01
- Civil engineering and roads: \$34.09
- Light residential: \$31.91
- Heavy residential: \$33.97

5. Read the comment of the Pipe Fitter Professional Subcommittee in Annex 3, note 1, about the standards.

6. The general data on working conditions are taken from the 2010-2013 collective agreements of the four construction industry sectors, and from the document *Careers – Construction*, 2011-2012 edition, published by the CCQ.

The participants specified that work in the light residential sector is physically demanding because “raw” plumbing work in the basement is often done manually (conduit excavation and infilling). This situation leads to many employers having difficulty retaining personnel for \$31.91 an hour, and thus paying their pipe fitters at the wage prevailing in the heavy residential sector.

Vacations and time off

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

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

Pension plan

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

Insurance

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

Physical requirements

According to the participants, pipe fitters must have good physical endurance and strength (for certain lifting operations) and not be subject to vertigo.

Work schedules

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

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

According to the participants, pipe fitters generally work in the daytime and, occasionally, during evenings and weekends when daytime activities must not be disturbed. Pipe fitters also have flexible schedules in the industrial sector during planned maintenance plant shutdowns.

1.7 WORK ORGANIZATION

Pipe fitters work under the supervision of a team leader or foreman. Those who maintain and repair systems work in cooperation with a dispatcher.

1.8 JOB MARKET ENTRY CONDITIONS⁷

To obtain the competency certificate-apprentice in the trade, candidates must present to the CCQ the original version of an academic transcript or apprenticeship transcript attesting that they have passed a course of study recognized by the CCQ and giving access to the industry – i.e., leading to the DEP in Plumbing and Heating – as well as a guarantee of employment from an employer registered with the CCQ for at least 150 hours within a period of not more than three consecutive months.

7. Other conditions than those listed may apply. For a complete list of entry conditions for this trade, see the *Act respecting labour relations, vocational training and workforce management in the construction industry* (R.S.Q., c. R-20). The CCQ's website may also be consulted:
http://www.ccq.org/E_CertificatsCompetence/E02_Apprenti/E02_3_CandidatDiplome.aspx?sc_lang=en&profil=GrandPublic.

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

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

The apprentice pipe fitter must have completed four apprenticeship periods of 2,000 hours each, for a total of 8,000 hours in his trade, in order to be eligible for the provincial qualification examination, success in which leads to obtaining the competency certificate-journeyman for the trade. Credits are paid into the apprenticeship record book of an apprentice pipe fitter who has obtained his diploma.

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

- versatility in performing tasks;
- experience;
- productivity;
- motivation and dedication;
- resourcefulness.

1.9 PLACE OF WOMEN IN THE TRADE

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

According to the CCQ, 42 women (out of a total of 8,281 pipe fitters, i.e., almost 0.5%) were practicing the trade in 2010.

According to the pipe fitters attending the analysis workshop, the low presence of women in the trade may be explained by:

- the physical requirements of some of the trade's tasks;
- some persistent prejudice on the part of men and employers;
- the low attractiveness of the trade itself due to ignorance of the realities of the trade.

1.10 CAREER PROSPECTS

With experience, pipe fitters can become team leaders, foremen, general foremen, site supervisors, project managers, superintendents or contractors.

Pipe fitters can have access to other professions, notably those of assessors and resource persons for design engineers. They can also pursue a career outside construction sites by performing, for example, maintenance work or by becoming teachers.

1.11 DEVELOPMENT OF THE TRADE

The trade is undergoing major changes, due to:

- disappearance of certain metallic materials and their replacement with plastics or fibre cement, which are lighter and better suited for certain requirements, notably regarding resistance to chemicals or to noise propagation;
- increased use of certain assembly techniques (grooved joints, in particular) and new tools;
- the arrival of new heating systems that are more effective and less energy-consuming;
- increased use of biomass for heating and vapour production;
- development of new, safer work methods;
- tighter protection standards and, notably, the installation of seals, fire stops and paraseismic devices;
- growing environmental concerns.

These technological changes have many consequences. They change the work procedures and increase the productivity of pipe fitters. They also raise the overall performance of plumbing and heating systems, while leading to the establishment of new types of maintenance. Finally, they lead to demands for professional development.

1.12 IMPACT OF ENVIRONMENTAL STANDARDS ON THE PRACTICE OF THE TRADE

Many jobs done by pipe fitters are due to the application of environmental standards.

For example, drinking and waste water management standards are stricter and stricter, thus leading to such actions as the installation of backflow preventers and the tightening of criteria for installing septic tanks and disposal fields.

Moreover, with regard to heating, we see a good number of system modifications and conversions to save energy, along with more and more installations of heat recovery devices.

In addition, facilities containing toxic substances are being dismantled because of environmental standards.

Those standards increase the workload of pipe fitters and the demand for professional development. They require the pipe fitter to work more carefully and be more environmentally aware.

2. WORK DESCRIPTION

2.1 TASKS AND OPERATIONS

List of tasks

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

Task 1	Install plumbing systems
Task 2	Maintain plumbing systems
Task 3	Repair plumbing systems
Task 4	Modify plumbing systems
Task 5	Install heating systems
Task 6	Maintain heating systems
Task 7	Repair heating systems
Task 8	Modify heating systems

Pipe fitters work on the following systems or devices:

Types of plumbing systems

- Grey water disposal system (wastewater and reclamation water)
- Drainage system (storm, sanitary, combined)
- Venting system
- Anti-radon sanitation and depressurization system
- Drinking water distribution system
- Rural plumbing system (septic tank, artesian well, etc.)
- Process water system
- Water treatment system
- Medical gas system
- Vacuum system
- Electro-pneumatic system
- Process piping system: food, pharmaceutical, petrochemical, liquid gas, inert gas, nuclear energy, hydroelectric power, etc.

- Natural gas and propane system
- Clean steam system (e.g.: humidifier, steam boiler)

Types of heating systems

Residential sector

- Hot water
- Thermal fluids (geothermal, solar)
- Forced air (supplied by natural gas or propane, heat transfer fluid, etc.)⁸
- Fluid radiant (water, glycol)
- Water heating and cooling (not frequent)

Institutional and commercial sector

- Water heating and cooling
- Hot water
- High temperature hot water
- Steam (low pressure, high pressure, superheated)
- Forced air (supplied by natural gas or propane, heat transfer fluid, etc.)
- Thermal fluids (geothermal, solar)
- Fluid radiant (water, glycol)
- Energy recovery (co-generation, biogas and biomass)

Industrial sector

- Water heating and cooling
- Hot water
- High temperature hot water
- Thermal fluids
- Steam (low pressure, high pressure, superheated)
- Forced air (supplied by natural gas or propane, heat transfer fluid, etc.)
- Energy recovery (co-generation, biogas and biomass)

The table of pipe fitters' tasks and operations is presented in the following pages.

8. Read the comment of the Pipe Fitter Professional Subcommittee in Annex 3, note 2.

Table 2.1 Tasks and Operations

TASKS	OPERATIONS					
1. INSTALL PLUMBING SYSTEMS	1.1 Find out about the plans and specifications	1.2 Plan and coordinate the work	1.3 Mobilize the construction site	1.4 Take safety measures	1.5 Prepare the passage of the suspension and piping	1.6 Prepare the installation
	1.7 Install supports and anchors	1.8 Put in place production or sanitary devices	1.9 Install piping	1.10 Test the system's tightness	1.11 Finish installing sanitary and water supply devices	1.12 Connect devices, piping and accessories
	1.13 Connect the energy or utility source to the devices	1.14 Activate the plumbing system	1.15 Check the operation of the plumbing system and make necessary adjustments	1.16 Have the work approved	1.17 Demobilize the construction site	1.18 Provide information
2. MAINTAIN PLUMBING SYSTEMS	2.1 Interpret the maintenance program	2.2 Plan the maintenance work	2.3 Mobilize the construction site	2.4 Take safety measures	2.5 Proceed with piping maintenance	2.6 Proceed with device maintenance
	2.7 Perform tests on devices or piping	2.8 Demobilize the construction site	2.9 Write service reports			
3. REPAIR PLUMBING SYSTEMS	3.1 Find out about the work or receive a service call	3.2 Diagnose the problem and find a solution	3.3 Have the repair approved, if applicable	3.4 Plan the repair work	3.5 Mobilize the construction site	3.6 Take safety measures
	3.7 Shut down the plumbing system, if applicable	3.8 Install a temporary branch circuit, if applicable	3.9 Repair or replace piping	3.10 Repair or replace defective devices	3.11 Test the operation of the plumbing system	3.12 Reactivate the plumbing system
	3.13 Turn the branch circuit off, if applicable	3.14 Demobilize the construction site	3.15 Write service reports			
4. MODIFY PLUMBING SYSTEMS	4.1 Find out about the plans and specifications	4.2 Plan and coordinate the work	4.3 Mobilize the construction site	4.4 Take safety measures	4.5 Deactivate the plumbing system	4.6 Dismantle the apparatus
	4.7 Install new supports and anchors	4.8 Install new production or process devices	4.9 Install piping	4.10 Test the system's tightness	4.11 Install new sanitary devices	4.12 Connect the energy or utility source to the devices

TASKS	OPERATIONS					
	4.13 Activate the plumbing system	4.14 Check the operation of the plumbing system and make necessary adjustments	4.15 Have the work approved	4.16 Demobilize the construction site	4.17 Write service reports	
5. INSTALL HEATING SYSTEMS	5.1 Find out about the plans and specifications	5.2. Plan and coordinate the work	5.3 Mobilize the construction site	5.4 Take safety measures	5.5 Prepare the passage of the suspension and piping	5.6 Prepare the installation
	5.7 Install supports and anchors	5.8 Prepare the piping	5.9 Assemble and install the piping	5.10 Put devices in place	5.11 Connect devices, piping and accessories	5.12 Connect the energy source to devices
	5.13 Test the system's tightness	5.14 Activate the heating system	5.15 Check the heating system's operation and make necessary adjustments	5.16 Have the work approved	5.17 Demobilize the construction site	5.18 Provide information
6. MAINTAIN HEATING SYSTEMS	6.1 Interpret the maintenance program	6.2 Plan the maintenance work	6.3 Mobilize the construction site	6.4 Take safety measures	6.5 Check devices, systems and circuits	6.6 Deactivate the heating system, if applicable
	6.7 Proceed with offline or online maintenance of the heating system	6.8 Reactivate the heating system, if applicable	6.9 Demobilize the construction site	6.10 Write reports		
7. REPAIR HEATING SYSTEMS	7.1 Find out about the work or receive a service call	7.2 Diagnose the problem	7.3 Determine the nature and type of repairs to be done and have the work approved	7.4 Plan the work	7.5 Mobilize the construction site	7.6 Take safety measures
	7.7 Install a temporary energy source (as required)	7.8 Deactivate the heating system, if applicable	7.9 Isolate circuits or devices	7.10 Dismantle or separate devices, accessories or piping	7.11 Repair or replace piping	7.12 Replace defective devices

TASKS	OPERATIONS					
	7.13 Connect devices, piping and accessories	7.14 Connect the energy source to devices	7.15 Test the system's tightness, if applicable	7.16 Reactivate the heating system, if applicable	7.17 Test the heating system	7.18 Demobilize the construction site
	7.19 Write reports					
8. MODIFY HEATING SYSTEMS	8.1 Find out about the plans and specifications	8.2 Plan and coordinate the work	8.3 Mobilize the construction site	8.4 Take safety measures	8.5 Prepare the installation	8.6 Deactivate the heating system
	8.7 Dismantle the devices and fittings	8.8 Prepare the passage of the suspension and piping	8.9 Install supports and anchors	8.10 Prepare the piping	8.11 Assemble and install the piping	8.12 Put the new device in place
	8.13 Connect devices, piping and accessories	8.14 Connect the energy source to devices	8.15 Test the system's tightness	8.16 Reactivate the heating system	8.17 Check the heating system's operation and make necessary adjustments	8.18 Have the work approved
	8.19 Demobilize the construction site	8.20 Provide information				

2.2 OPERATIONS, SUB-OPERATIONS AND CLARIFICATIONS

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

Table 2.2 Sub-Operations and Operation Clarifications

TASK 1 INSTALL PLUMBING SYSTEMS		
Operations	Sub-Operations	Clarifications
1.1 Find out about the plans and specifications	1.1.1 Note the specifications and the necessary materials and equipment	
	1.1.2 Locate the modifications	
1.2 Plan and coordinate the work	1.2.1 Establish the work sequence	
	1.2.2 Coordinate with other trades	
	1.2.3 Obtain permits, if applicable	
	1.2.4 Draw a list of tools and equipment	
	1.2.5 Check the condition of tools and equipment	
	1.2.6 Prepare the orders	
1.3 Mobilize the construction site		
1.4 Take safety measures	1.4.1 Obtain information on the preventive program, CSST standards, the task safety analysis, and the employer's or client's requirements	
	1.4.2 Delimit the work area	
	1.4.3 Wear personal protective and safety equipment	
	1.4.4 Put safety shields in place, if applicable	
	1.4.5 Fasten yourself, if applicable	
1.5 Prepare the passage of the suspension and piping	1.5.1 Determine joining locations and methods	
	1.5.2 Locate axes and elevations	
	1.5.3 Locate sleeves	
	1.5.4 Take measurements	
	1.5.5 Draw the sleeves plan and the anchoring plan	

TASK 1 INSTALL PLUMBING SYSTEMS

Operations	Sub-Operations	Clarifications
1.6 Prepare the installation	1.6.1 Receive devices and piping 1.6.2 Install scaffolding	
1.7 Install supports and anchors	1.7.1 Drill 1.7.2 Fasten supports and anchors	
1.8 Put in place production or sanitary devices	1.8.1 Install: – the hot water tank – the pump – the water treatment system – etc.	The sequence of operations 1.8 and 1.9 may be inverted depending on the size of the device.
1.9 Install piping	1.9.1 Determine the length of pipes 1.9.2 Cut pipes 1.9.3 Bore pipes 1.9.4 Thread pipes 1.9.5 Put the pipes in place 1.9.6 Install the floor drain 1.9.7 Install the roof drain 1.9.8 Bond pipes 1.9.9 Weld pipes 1.9.10 Make mechanical joints 1.9.11 Install paraseismic devices, if applicable 1.9.12 Clean the piping	
1.10 Test the system's tightness	1.10.1 Isolate parts of the system 1.10.2 Perform tests 1.10.3 Put fire stops in place ⁹ 1.10.4 Identify the piping	

9. The Direction de l'application des conventions collectives has issued a notice that there is a risk of a work-assignment dispute with the insulator trade.

TASK 1 INSTALL PLUMBING SYSTEMS

Operations	Sub-Operations	Clarifications
1.11 Finish installing sanitary and water supply devices	1.11.1 Install: – the toilet – the bathtub – the washbasin – the sink – the urinal – the bidet – the dilution tank – the pump – control valves – the water treatment system – etc. 1.11.2 Install paraseismic devices	
1.12 Connect devices, piping and accessories	1.12.1 Determine the expansion joint's location 1.12.2 Build and assemble joints and fittings 1.12.3 Connect control instruments in low voltage 1.12.4 Connect humidifiers and pumps	
1.13 Connect the energy or utility source to the devices		The energy sources are usually natural gas, propane and fuel oil.
1.14 Activate the plumbing system	1.14.1 Fill the system 1.14.2 Rinse and clean the system 1.14.3 Activate the system	
1.15 Check the operation of the plumbing system and make necessary adjustments	1.15.1 Adjust or balance: – the pressure – the valves – the controls	
1.16 Have the work approved	1.16.1 Find out about the correction request 1.16.2 Correct deficiencies	The correction request may come from several persons: client, contractor, personnel of the Régie du bâtiment, for example.

TASK 1 INSTALL PLUMBING SYSTEMS

Operations	Sub-Operations	Clarifications
1.17 Demobilize the construction site	1.17.1 Clean the work area 1.17.2 Clean and store the equipment 1.17.3 Make an inventory of tools and equipment 1.17.4 Maintain the tools	
1.18 Provide information	1.18.1 Explain the system's operation and give the user the instruction manual 1.18.2 Update the plans 1.18.3 Produce the list of correctives 1.18.4 Produce the list of valves 1.18.5 Write reports	

TASK 2 MAINTAIN PLUMBING SYSTEMS

Operations	Sub-Operations	Clarifications
2.1 Interpret the maintenance program	2.1.1 Find out about manufacturer recommendations about: – sanitary devices – the hot water heater – the trap primer – the water filter – valves – the backflow preventer – the check valve – the piping – the pressure regulator – the screen – pumps – the holding tank – the expansion tank – retaining basin – the interceptor (oil, grease, etc.) – spraying outlets – etc.	
2.2 Plan the maintenance work	2.2.1 Find out about the client's request 2.2.2 Determine the equipment and tools to be used	
2.3 Mobilize the construction site		

TASK 2 MAINTAIN PLUMBING SYSTEMS

Operations	Sub-Operations	Clarifications
2.4 Take safety measures	2.4.1 Obtain information on the preventive program, CSST standards, the task safety analysis, and the employer's or client's requirements 2.4.2 Delimit the work area 2.4.3 Wear personal protective and safety equipment 2.4.4 Put safety shields in place, if applicable 2.4.5 Fasten yourself, if applicable	
2.5 Proceed with piping maintenance	<i>Wastewater, rainwater, reclamation water (grey water) and French drain</i> 2.5.1 Conduct a camera inspection 2.5.2 Clean the piping with the sewer rod or a pressure washer, etc. <i>Domestic water</i> 2.5.3 Check and clean components 2.5.4 Replace power heads 2.5.5 Replace electric valve batteries 2.5.6 Maintain outside water outlets 2.5.7 Put antifreeze 2.5.8 Flush the piping in case of stagnant water 2.5.9 Replace cartridges 2.5.10 Replace the water hammer arrester <i>Process water</i> 2.5.11 Apply the procedure in effect at the plant	
2.6 Proceed with device maintenance	2.6.1 Clean, lubricate or replace preventively: – packing – a wax seal – a water heater element – an anode – a flush valve – waterless urinal blocks – cartridges – etc.	

TASK 2 MAINTAIN PLUMBING SYSTEMS

Operations	Sub-Operations	Clarifications
2.7 Perform tests on devices or piping	2.7.1 Open or shut the service valve 2.7.2 Read or measure the pressure 2.7.3 Locate: – hisses or other abnormal noises – odours (dry inlets) – leaks – etc.	
2.8 Demobilize the construction site	2.8.1 Clean the work area 2.8.2 Clean and store the equipment 2.8.3 Make an inventory of tools and equipment 2.8.4 Maintain the tools	
2.9 Write service reports	2.9.1 Note the work done and equipment used 2.9.2 Issue recommendations 2.9.3 Order spare components	

TASK 3 REPAIR PLUMBING SYSTEMS

Operations	Sub-Operations	Clarifications
3.1 Find out about the work or receive a service call	3.1.1 Obtain information on the nature of the problem 3.1.2 Check whether or not it is an emergency	
3.2 Diagnose the problem and find a solution	3.2.1 Proceed with a visual inspection 3.2.2 Search for the nature and cause of the problem: – plugging – blockage – lack of pressure – water hammer – hissing – odours – leak – frozen pipe – component wear – etc. 3.2.3 Determine the type of repairs to be made 3.2.4 Determine the equipment to be replaced	

TASK 3 REPAIR PLUMBING SYSTEMS

Operations	Sub-Operations	Clarifications
3.3 Have the repair approved, if applicable		The correction request may come from the client or the contractor.
3.4 Plan the repair work	3.4.1 Check plans and specifications 3.4.2 Determine a work sequence 3.4.3 Determine the tools to be used 3.4.4 Determine the safety measures to put in place	
3.5 Mobilize the construction site		
3.6 Take safety measures	3.6.1 Obtain information on the preventive program, CSST standards, the task safety analysis, and the employer's or client's requirements 3.6.2 Delimit the work area 3.6.3 Apply the lockout procedure 3.6.4 Wear personal protective and safety equipment 3.6.5 Fasten yourself, if applicable	
3.7 Shut down the plumbing system, if applicable	3.7.1 Participate in applying the plant shutdown procedure, if applicable 3.7.2 Apply the lockout procedure, if applicable 3.7.3 Check the operation of valves and shut them 3.7.4 Reduce the pressure 3.7.5 Purge the system 3.7.6 Flush the system	
3.8 Install a temporary branch circuit, if applicable		
3.9 Repair or replace piping	3.9.1 Cut pipes 3.9.2 Bore pipes 3.9.3 Sand 3.9.4 Weld pipes 3.9.5 Bond pipes 3.9.6 Merge pipes 3.9.7 Make mechanical joints	

TASK 3 REPAIR PLUMBING SYSTEMS

Operations	Sub-Operations	Clarifications
3.10 Repair or replace defective devices	3.10.1 Repair a device's defective components 3.10.2 Isolate the device to be replaced 3.10.3 Disconnect the device to be replaced 3.10.4 Remove the device 3.10.5 Replace: – a water heater – a toilet – a drain – a siphon – etc. 3.10.6 Dispose of the defective device and components	
3.11 Test the operation of the plumbing system	3.11.1 Perform a pressure test 3.11.2 Proceed with a visual inspection 3.11.3 Make necessary correctives 3.11.4 Clean and rinse the system	
3.12 Reactivate the plumbing system	3.12.1 Apply the unlocking procedure, if applicable 3.12.2 Open the valve gradually 3.12.3 Check the operation of devices	
3.13 Turn the branch circuit off, if applicable	3.13.1 Plug the branch circuit openings	
3.14 Demobilize the construction site	3.14.1 Clean the work area 3.14.2 Clean and store the equipment 3.14.3 Make an inventory of tools and equipment 3.14.4 Maintain the tools	
3.15 Write service reports	3.15.1 Note the work done and equipment used 3.15.2 Issue recommendations	

TASK 4 MODIFY PLUMBING SYSTEMS

Operations		Sub-Operations		Clarifications
4.1	Find out about the plans and specifications	4.1.1	Note the specifications and the necessary materials and equipment	The modifications are, for example: conversions for reasons of resource economy and protection; replacement of devices after extensions or renovations; increased waterworks capacity.
		4.1.2	Report problems, if applicable	
4.2	Plan and coordinate the work	4.2.1	Establish the work sequence	
		4.2.2	Coordinate with other trades	
		4.2.3	Obtain permits, if applicable	
		4.2.4	Draw a list of tools and equipment	
		4.2.5	Check the condition of tools and equipment	
		4.2.6	Prepare the orders	
		4.2.7	Receive materials	
4.3	Mobilize the construction site			
4.4	Take safety measures	4.4.1	Obtain information on the preventive program, CSST standards, the task safety analysis, and the employer's or client's requirements	
		4.4.2	Delimit the work area	
		4.4.3	Wear personal protective and safety equipment	
		4.4.4	Put safety shields in place, if applicable	
		4.4.5	Fasten yourself, if applicable	
4.5	Deactivate the plumbing system	4.5.1	Proceed with the lockout	
		4.5.2	Shut valves	
		4.5.3	Empty piping and devices	
		4.5.4	Disconnect energy sources	
		4.5.5	Plug the piping	
4.6	Dismantle the apparatus	4.6.1	Cut piping	
		4.6.2	Unbolt the devices	
		4.6.3	Dispose of devices and piping	

TASK 4 MODIFY PLUMBING SYSTEMS

Operations	Sub-Operations	Clarifications
4.7 Install new supports and anchors	4.7.1 Drill at the new location 4.7.2 Install new supports and anchors	
4.8 Install new production or process devices	4.8.1 Install: – pumps – exchangers – control valves – treatment systems – etc.	
4.9 Install piping	4.9.1 Determine the length of pipes 4.9.2 Cut pipes 4.9.3 Bore pipes 4.9.4 Thread pipes 4.9.5 Put the pipes in place 4.9.6 Bond pipes 4.9.7 Weld pipes 4.9.8 Make mechanical joints 4.9.9 Clean the piping	
4.10 Test the system's tightness	4.10.1 Perform water, air or smoke tests on a system 4.10.2 Make necessary correctives 4.10.3 Put fire stops in place ¹⁰ 4.10.4 Identify the piping	
4.11 Install new sanitary devices		
4.12 Connect the energy or utility source to the devices	4.12.1 Connect: – air – water – gas – steam	
4.13 Activate the plumbing system	4.13.1 Remove the plugs 4.13.2 Proceed with unlocking 4.13.3 Open valves gradually 4.13.4 Clean and rinse the system	

10. The Direction de l'application des conventions collectives has issued a notice that there is a risk of a work-assignment dispute with the insulator trade.

TASK 4 MODIFY PLUMBING SYSTEMS

Operations	Sub-Operations	Clarifications
4.14 Check the operation of the plumbing system and make necessary adjustments	4.14.1 Adjust or balance: – the pressure – the valves – the controls	
4.15 Have the work approved	4.15.1 Find out about the correction request 4.15.2 Correct deficiencies	The correction request may come from several persons: client, contractor, personnel of the Régie du bâtiment, for example.
4.16 Demobilize the construction site	4.16.1 Clean the work area 4.16.2 Clean and store the equipment 4.16.3 Make an inventory of tools and equipment 4.16.4 Maintain the tools	
4.17 Write service reports	4.17.1 Note the work done and equipment used 4.17.2 Update the plans 4.17.3 Produce the list of correctives	

TASK 5 INSTALL HEATING SYSTEMS

Operations	Sub-Operations	Clarifications
5.1 Find out about the plans and specifications	5.1.1 Note the specifications and the necessary materials and equipment 5.1.2 Locate the modifications	
5.2 Plan and coordinate the work	5.2.1 Establish the work sequence 5.2.2 Coordinate with other trades 5.2.3 Obtain permits, if applicable 5.2.4 Draw a list of tools and equipment 5.2.5 Check the condition of tools and equipment 5.2.6 Prepare the orders	
5.3 Mobilize the construction site		

TASK 5 INSTALL HEATING SYSTEMS

Operations	Sub-Operations	Clarifications
5.4 Take safety measures	5.4.1 Obtain information on the preventive program, CSST standards, the task safety analysis, and the employer's or client's requirements 5.4.2 Delimit the work area 5.4.3 Wear personal protective and safety equipment 5.4.4 Put safety shields in place, if applicable 5.4.5 Fasten yourself, if applicable	
5.5 Prepare the passage of the suspension and piping	5.5.1 Determine joining locations and methods 5.5.2 Locate axes and elevations 5.5.3 Locate sleeves 5.5.4 Take measurements 5.5.5 Draw the sleeves plan and the anchoring plan	
5.6 Prepare the installation	5.6.1 Receive devices and piping 5.6.2 Install scaffolding 5.6.3 Install lifting anchors	
5.7 Install supports and anchors	5.7.1 Drill 5.7.2 Fasten supports and anchors	
5.8 Prepare the piping	5.8.1 Determine the length of pipes 5.8.2 Cut pipes 5.8.3 Thread pipes 5.8.4 Bend pipes 5.8.5 Groove pipes 5.8.6 Bore pipes 5.8.7 Clean the pipes	
5.9 Assemble and install the piping	5.9.1 Merge the pipes 5.9.2 Weld the pipes (low pressure) 5.9.3 Make a compression joint 5.9.4 Make a mechanical joint 5.9.5 Bond the pipes 5.9.6 Bolt the pipe flanges 5.9.7 Point the pipes 5.9.8 Install the piping guide 5.9.9 Install paraseismic devices	Radiant heating piping is installed before concrete placement. In this situation, the pipe fitter often has to monitor the installations during the placement.

TASK 5 INSTALL HEATING SYSTEMS

Operations	Sub-Operations	Clarifications
5.10 Put devices in place	5.10.1 Install: – the device – the pump support – the pump – the condensation tank – the controls – the water treatment system – the water supply system – the exchangers – etc. 5.10.2 Install antivibration controls 5.10.3 Put seals and fire stops in place 5.10.4 Install the paraseismic device	The sequence of operations 5.9 and 5.10 may be inverted depending on the size of the device.
5.11 Connect devices, piping and accessories	5.11.1 Determine the expansion joint's location 5.11.2 Build and assemble joints and fittings 5.11.3 Connect control instruments in low voltage 5.11.4 Connect humidifiers, pumps, accessories, etc.	
5.12 Connect the energy source to devices		The energy sources are usually natural gas, propane and fuel oil.
5.13 Test the system's tightness	5.13.1 Isolate parts of the system or make a bypass 5.13.2 Perform an air, water, nitrogen or glycol test on a system 5.13.3 Make necessary correctives 5.13.4 Rinse and clean the system 5.13.5 Integrate isolated portions to the system 5.13.6 Identify the piping	
5.14 Activate the heating system	5.14.1 Fill the boiler and piping gradually 5.14.2 Check connections 5.14.3 Evacuate the air	
5.15 Check the heating system's operation and make necessary adjustments	5.15.1 Adjust or balance: – the pressure – the valves – the controls – the burner	

TASK 5 INSTALL HEATING SYSTEMS

Operations	Sub-Operations	Clarifications
5.16 Have the work approved	5.16.1 Find out about the correction request 5.16.2 Correct deficiencies	The correction request may come from several persons: client, contractor, personnel of the Régie du bâtiment, for example.
5.17 Demobilize the construction site	5.17.1 Clean the work area 5.17.2 Clean and store the equipment 5.17.3 Make an inventory of tools and equipment 5.17.4 Maintain the tools	
5.18 Provide information	5.18.1 Explain the system's operation and give the user the instruction manual 5.18.2 Update the plans 5.18.3 Produce the list of correctives 5.18.4 Produce the list of valves 5.18.5 Write reports	

TASK 6 MAINTAIN HEATING SYSTEMS

Operations	Sub-Operations	Clarifications
6.1 Interpret the maintenance program	6.1.1 Find out about manufacturer recommendations for heating systems	
6.2 Plan the maintenance work	6.2.1 Find out about the client's request 6.2.2 Determine the equipment and tools to be used	
6.3 Mobilize the construction site		
6.4 Take safety measures	6.4.1 Obtain information on the preventive program, CSST standards, the task safety analysis, and the employer's or client's requirements 6.4.2 Check hazards: chemicals, burning fluids, working at a height, etc. 6.4.3 Delimit the work area 6.4.4 Wear personal protective and safety equipment 6.4.5 Put safety shields in place, if applicable 6.4.6 Fasten yourself, if applicable	

TASK 6 MAINTAIN HEATING SYSTEMS

Operations	Sub-Operations	Clarifications
6.5 Check devices, systems and circuits	6.5.1 Measure the pressure and temperature 6.5.2 Check the tightness of piping, devices and accessories 6.5.3 Check product levels 6.5.4 Check the condition of: – bag filters – cartridge filters – belts – etc. 6.5.5 Check the condition and operation of the heat generator: – perform an effectiveness test on a combustion burner – check the condition of combustion chambers 6.5.6 Check the burned gas exhaust system 6.5.7 Check the levels of heat transfer fluids (water with glycol, water for heating, water from the water tower, and mixed water) 6.5.8 Report a breakdown	
6.6 Deactivate the heating system, if applicable	6.6.1 Secure the heating system 6.6.2 Proceed with the lockout 6.6.3 Flush the heating system 6.6.4 Recover contaminated fluids (glycol, thermal oil, etc.)	
6.7 Proceed with offline or online maintenance of the heating system	6.7.1 Lubricate: – pumps – motors – ball bearing systems – squirrel-cage drive shafts 6.7.2 Adjust fluid levels (fuel oil, gas, glycol, water) 6.7.3 Adjust the pressure 6.7.4 Adjust the flame 6.7.5 Check and adjust the expansion tank pressure 6.7.6 Adjust the water inlet pressure 6.7.7 Replace bag filters, cartridge filters (catalytic system), etc.	

TASK 6 MAINTAIN HEATING SYSTEMS

Operations	Sub-Operations	Clarifications
	6.7.8 Replace preventively: – the belt(s) – the pressure gauge – the thermometer – the air vent valve – etc. 6.7.9 Clean: – chimneys – combustion chambers – screens – etc.	
6.8 Reactivate the heating system, if applicable	6.8.1 Apply the unlocking procedure 6.8.2 Fill the boiler and piping gradually 6.8.3 Check connections 6.8.4 Evacuate the air	
6.9 Demobilize the construction site	6.9.1 Clean the work area 6.9.2 Clean and store the equipment 6.9.3 Make an inventory of tools and equipment 6.9.4 Maintain the tools	
6.10 Write reports	6.10.1 Note the work done and equipment used 6.10.2 Issue recommendations 6.10.3 Order spare components	

TASK 7 REPAIR HEATING SYSTEMS

Operations	Sub-Operations	Clarifications
7.1 Find out about the work or receive a service call	7.1.1 Obtain information on the nature of the problem	
	7.1.2 Check whether or not there is an emergency	
7.2 Diagnose the problem	7.2.1 Proceed with a visual inspection of: – pumps – piping – accessories	
	7.2.2 Detect the nature of the problem: – lack of heating – leaks – broken devices and accessories – lack of fuel – etc.	
	7.2.3 Search for the cause of the problem: – defective or broken circulator – excessively low system pressure – defective thermostat and aquastat – defective energy source – low fluid levels – pressure variation – inadequate pipe grading (steam) – leak – defect in the system's limiting valve – defect in the circuit breaker or the screwed fuse switch – defect in the expansion tank's diaphragm or supply valve – etc.	
	7.2.4 Request a water analysis (cooling tower, notably)	
7.3 Determine the nature and type of repairs to be done and have the work approved	7.3.1 Locate the isolation valve	
	7.3.2 Locate the piping	
	7.3.3 Validate the piping diameter	
	7.3.4 Check the information on plans and specifications	
	7.3.5 Determine the type of repairs to be made	
	7.3.6 Determine the equipment to be replaced	
	7.3.7 Have the repair approved	

TASK 7 REPAIR HEATING SYSTEMS

Operations	Sub-Operations	Clarifications
7.4 Plan the work	7.4.1 Determine a work sequence 7.4.2 Determine the tools to be used 7.4.3 Determine the safety measures to put in place 7.4.4 Prepare equipment orders	
7.5 Mobilize the construction site		
7.6 Take safety measures	7.6.1 Obtain information on the preventive program, CSST standards, the task safety analysis, and the employer's or client's requirements 7.6.2 Check hazards: chemicals, burning fluids, working at a height, etc. 7.6.3 Delimit the work area 7.6.4 Wear personal protective and safety equipment 7.6.5 Put safety shields in place, if applicable 7.6.6 Fasten yourself, if applicable	
7.7 Install a temporary energy source (as necessary)		The energy sources are usually natural gas, propane and fuel oil.
7.8 Deactivate the heating system, if applicable	7.8.1 Secure the heating system 7.8.2 Proceed with the lockout	
7.9 Isolate circuits or devices	7.9.1 Reduce pressures 7.9.2 Flush the devices	
7.10 Dismantle or separate devices, accessories or piping		
7.11 Repair or replace piping	7.11.1 Measure pipes 7.11.2 Cut pipes 7.11.3 Bend pipes 7.11.4 Bore pipes 7.11.5 Sand the ends of pipes 7.11.6 Weld pipes 7.11.7 Bond pipes 7.11.8 Merge pipes 7.11.9 Make mechanical joints	

TASK 7 REPAIR HEATING SYSTEMS

Operations	Sub-Operations	Clarifications
7.12 Replace defective devices		
7.13 Connect devices, piping and accessories		
7.14 Connect the energy source to devices		The energy sources are usually natural gas, propane and fuel oil.
7.15 Test the system's tightness, if applicable		
7.16 Reactivate the heating system, if applicable	7.16.1 Apply the unlocking procedure 7.16.2 Fill the boiler and piping gradually 7.16.3 Check connections 7.16.4 Evacuate the air	
7.17 Test the heating system	7.17.1 Check the operation 7.17.2 Adjust or balance: – the pressure – the valves – the controls – the burner 7.17.3 Identify the piping, if applicable	
7.18 Demobilize the construction site	7.18.1 Clean the work area 7.18.2 Clean and store the equipment 7.18.3 Make an inventory of tools and equipment 7.18.4 Maintain the tools	
7.19 Write reports	7.19.1 Note the work done and equipment used 7.19.2 Issue recommendations 7.19.3 Order spare components	

TASK 8 MODIFY HEATING SYSTEMS

Operations	Sub-Operations	Clarifications
8.1 Find out about the plans and specifications	8.1.1 Note the specifications and the necessary materials and equipment 8.1.2 Locate the modifications 8.1.3 Analyse the system in place 8.1.4 Locate the connection point	The modifications are, for example: conversion of a system to a new energy source; addition of devices (coils, exchangers, heat reclaimers); replacement of devices for the purpose of modernization, optimization or increase in capacity (water tower, cooler, boilers, pumps, etc.).
8.2 Plan and coordinate the work	8.2.1 Establish the work sequence 8.2.2 Coordinate with other trades 8.2.3 Obtain permits, if applicable 8.2.4 Request a water analysis 8.2.5 Draw a list of tools and equipment 8.2.6 Check the condition of tools and equipment 8.2.7 Prepare the orders	
8.3 Mobilize the construction site		
8.4 Take safety measures	8.4.1 Obtain information on the preventive program, CSST standards, the task safety analysis, and the employer's or client's requirements 8.4.2 Delimit the work area 8.4.3 Wear personal protective and safety equipment 8.4.4 Put safety shields in place, if applicable	
8.5 Prepare the installation	8.5.1 Prepare the equipment 8.5.2 Install scaffolding	
8.6 Deactivate the heating system	8.6.1 Secure the heating system 8.6.2 Proceed with the lockout 8.6.3 Flush the heating system 8.6.4 Recover contaminated fluids (glycol, thermal oil, etc.)	

TASK 8 MODIFY HEATING SYSTEMS

Operations	Sub-Operations	Clarifications
8.7 Dismantle the devices and fittings	8.7.1 Isolate parts of the system or make a bypass 8.7.2 Remove the devices 8.7.3 Dismantle the piping and accessories 8.7.4 Dispose of dismantled devices and piping 8.7.5 Dispose of fluids according to environmental laws	
8.8 Prepare the passage of the suspension and piping	8.8.1 Locate axes and elevations 8.8.2 Mark the locations for drilling and sleeves	
8.9 Install supports and anchors	8.9.1 Drill 8.9.2 Fasten supports and anchors	
8.10 Prepare the piping	8.10.1 Determine the length of pipes 8.10.2 Cut pipes 8.10.3 Thread pipes 8.10.4 Bend pipes 8.10.5 Groove pipes 8.10.6 Bore pipes 8.10.7 Clean the pipes	
8.11 Assemble and install the piping	8.11.1 Merge the pipes 8.11.2 Weld the pipes (low pressure) 8.11.3 Make a compression joint 8.11.4 Make a mechanical joint 8.11.5 Bond the pipes 8.11.6 Bolt the pipe flanges 8.11.7 Point the pipes 8.11.8 Install the piping guide 8.11.9 Install the paraseismic device	Radiant heating piping is installed before concrete placement. In this situation, the pipe fitter often has to monitor the installations during the placement.
8.12 Put the new device in place	8.12.1 Install: – the device – the pump support – the pump – the condensation tank – the controls – the water treatment system – the water supply system – etc. 8.12.2 Install paraseismic devices	

TASK 8 MODIFY HEATING SYSTEMS

Operations	Sub-Operations	Clarifications
8.13 Connect devices, piping and accessories	8.13.1 Determine the expansion joint's location 8.13.2 Build and assemble joints and fittings 8.13.3 Connect control instruments in low voltage 8.13.4 Connect humidifiers, pumps, accessories, etc.	
8.14 Connect the energy source to devices		The energy sources are usually natural gas, propane and fuel oil.
8.15 Test the system's tightness	8.15.1 Test an air, water, nitrogen or glycol system 8.15.2 Make necessary correctives 8.15.3 Rinse and clean the system 8.15.4 Integrate isolated portions to the system 8.15.5 Identify the piping, if applicable	
8.16 Reactivate the heating system	8.16.1 Apply the unlocking procedure 8.16.2 Fill the boiler and piping gradually 8.16.3 Check connections 8.16.4 Evacuate the air	
8.17 Check the heating system's operation and make necessary adjustments	8.17.1 Adjust or balance: – the pressure – the valves – the controls – the burner	
8.18 Have the work approved	8.18.1 Find out about the correction request 8.18.2 Correct deficiencies	The correction request may come from several persons: client, contractor, personnel of the Régie du bâtiment, for example.
8.19 Demobilize the construction site	8.19.1 Clean the work area 8.19.2 Clean and store the equipment 8.19.3 Make an inventory of tools and equipment 8.19.4 Maintain the tools	

TASK 8 MODIFY HEATING SYSTEMS

Operations	Sub-Operations	Clarifications
8.20 Provide information	8.20.1 Explain the system's operation and give the user the instruction manual 8.20.2 Update the plans 8.20.3 Produce the list of correctives 8.20.4 Produce the list of valves 8.20.5 Write reports	

2.3 ACHIEVEMENT CONDITIONS AND PERFORMANCE CRITERIA

2.3.1 Achievement Conditions

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

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

It should be pointed out that for all the tasks, the piping installed may be in cross-linked polyethylene (PEX), steel, copper, brass, clay, lead, plastic, Pyrex, stainless steel, cast iron, fibre cement, etc.

Table 2.3 Achievement Conditions

TASK 1 INSTALL PLUMBING SYSTEMS
Work areas On the construction site. Outdoors and indoors. At the workshop for certain manufacturing activities.
Sectors Civil engineering and roads. Industrial. Institutional and commercial. Residential.
Level of collaboration Alone and as a team (two persons, usually). Under the supervision of the team leader and the foreman.
Instructions and references In plans (such as shop drawings) and specifications. In system device manuals. ¹¹

11. Read the comment of the Pipe Fitter Professional Subcommittee in Annex 3, note 3.

TASK 1 INSTALL PLUMBING SYSTEMS

Health and safety hazards

In a context that poses hazards:

- related to work at a height;
- related to weather conditions;
- related to the presence of hazardous materials, such as silica and asbestos;
- related to work in enclosed spaces;
- related to heavy loads;
- related to welding;
- of eye injuries;
- of crushed hands or jamming;
- of burial;
- of cuts;
- of burns;
- of electrocution;
- etc.

TASK 2 MAINTAIN PLUMBING SYSTEMS

Work areas

On the construction site.

Indoors, usually.

Sectors

Civil engineering and roads.

Industrial.

Institutional and commercial.

Residential.

Level of collaboration

Alone and as a team (often in a team of two).

Under the supervision of the team leader and the foreman.

Instructions and references

In information given by the client.

In the maintenance program and manuals for system devices.

TASK 2 MAINTAIN PLUMBING SYSTEMS

Health and safety hazards

In a context that poses hazards:

- related to work at a height;
- related to weather conditions;
- related to the presence of hazardous materials, such as silica and asbestos;
- related to work in enclosed spaces;
- related to heavy loads;
- of eye injuries;
- of crushed hands or jamming;
- of burial;
- of cuts;
- of burns;
- of electrocution;
- etc.

TASK 3 REPAIR PLUMBING SYSTEMS

Work areas

On the construction site.

Indoors, usually.

Sectors

Civil engineering and roads.

Industrial.

Institutional and commercial.

Residential.

Level of collaboration

Alone and as a team.

Under the supervision of the team leader and the foreman.

Instructions and references

In information given by the client and the dispatcher.

In plans, specifications and system device manuals.

TASK 3 REPAIR PLUMBING SYSTEMS

Health and safety hazards

In a context that poses hazards:

- related to work at a height;
- related to weather conditions;
- related to the presence of hazardous materials, such as silica and asbestos;
- related to work in enclosed spaces;
- related to heavy loads;
- related to welding;
- of eye injuries;
- of crushed hands or jamming;
- of burial;
- of cuts;
- of burns;
- of electrocution;
- etc.

TASK 4 MODIFY PLUMBING SYSTEMS

Work areas

On the construction site.

Outdoors and indoors.

Sectors

Civil engineering and roads.

Industrial.

Institutional and commercial.

Residential.

Level of collaboration

Alone and as a team (often in a team of two).

Under the supervision of the team leader and the foreman.

Instructions and references

In plans (such as shop drawings) and specifications.

In system device manuals.

TASK 4 MODIFY PLUMBING SYSTEMS

Health and safety hazards

In a context that poses hazards:

- related to work at a height;
- related to weather conditions;
- related to the presence of hazardous materials, such as silica and asbestos;
- related to work in enclosed spaces;
- related to heavy loads;
- of eye injuries;
- of crushed hands or jamming;
- of burial;
- of cuts;
- of burns;
- of electrocution;
- etc.

TASK 5 INSTALL HEATING SYSTEMS

Work areas

On the construction site.

Outdoors and indoors.

Sectors

Civil engineering and roads.

Industrial.

Institutional and commercial.

Residential.

Level of collaboration

Alone and as a team (generally in teams of two).

Under the supervision of the team leader and the foreman.

Instructions and references

In plans (such as shop drawings) and specifications.

In system device manuals.

TASK 5 INSTALL HEATING SYSTEMS

Health and safety hazards

In a context that poses hazards:

- related to work at a height;
- related to weather conditions;
- related to the presence of hazardous materials, such as silica and asbestos;
- related to work in enclosed spaces;
- related to heavy loads;
- of eye injuries;
- of crushed hands or jamming;
- of cuts;
- of burns;
- of electrocution;
- etc.

TASK 6 MAINTAIN HEATING SYSTEMS

Work areas

On the construction site.

Outdoors and indoors.

Sectors

Civil engineering and roads.

Industrial.

Institutional and commercial.

Residential.

Level of collaboration

Alone and as a team.

Under the supervision of the team leader and the foreman.

Instructions and references

In information given by the client.

In the maintenance program and manuals for system devices.

TASK 6 MAINTAIN HEATING SYSTEMS

Health and safety hazards

In a context that poses hazards:

- related to work at a height;
- related to weather conditions;
- related to the presence of hazardous materials, such as silica and asbestos;
- related to work in enclosed spaces;
- related to heavy loads;
- of eye injuries;
- of crushed hands or jamming;
- of cuts;
- of burns;
- of electrocution;
- etc.

TASK 7 REPAIR HEATING SYSTEMS

Work areas

On the construction site.

Outdoors and indoors.

Sectors

Civil engineering and roads.

Industrial.

Institutional and commercial.

Residential.

Level of collaboration

Alone and as a team.

Under the supervision of the team leader and the foreman.

Instructions and references

In information given by the client and the dispatcher.

In plans, specifications and system device manuals.

TASK 7 REPAIR HEATING SYSTEMS

Health and safety hazards

In a context that poses hazards:

- related to work at a height;
- related to weather conditions;
- related to the presence of hazardous materials, such as silica and asbestos;
- related to work in enclosed spaces;
- related to heavy loads;
- of eye injuries;
- of crushed hands or jamming;
- of cuts;
- of burns;
- of electrocution;
- etc.

TASK 8 MODIFY HEATING SYSTEMS

Work areas

On the construction site.

Outdoors and indoors.

Sectors

Civil engineering and roads.

Industrial.

Institutional and commercial.

Residential.

Level of collaboration

Alone and as a team.

Under the supervision of the team leader and the foreman.

Instructions and references

In plans (such as shop drawings) and specifications.

In system device manuals.

TASK 8 MODIFY HEATING SYSTEMS

Health and safety hazards

In a context that poses hazards:

- related to work at a height;
- related to weather conditions;
- related to the presence of hazardous materials, such as silica and asbestos;
- related to work in enclosed spaces;
- related to heavy loads;
- of eye injuries;
- of crushed hands or jamming;
- of cuts;
- of burns;
- of electrocution;
- etc.

2.3.2 Performance Criteria

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

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

Table 2.4 Performance Criteria

TASK 1 INSTALL PLUMBING SYSTEMS	
Performance Criteria	
Appropriate choice and use of tools	Meeting client requirements
Appropriate choice of components	Following lockout procedures
Wearing personal protective and safety equipment	Following commissioning procedures
Correct joining of piping and plumbing fixtures	Meeting manufacturer standards

TASK 1 INSTALL PLUMBING SYSTEMS	
Performance Criteria	
Tight installation	Observance of the direction of flow
Sound installation	Observance of gradings
Correct piping alignment	Meeting environmental standards
Correct identification of piping and plumbing fixtures	Observance of the building code
Correct storage of equipment	Observance of occupational health and safety rules
Clean premises	
TASK 2 MAINTAIN PLUMBING SYSTEMS	
Performance Criteria	
Appropriate choice and use of tools	Clean premises
Appropriate choice of components	Meeting client requirements
Wearing personal protective and safety equipment	Following lockout procedures
Appropriate choice of lubricants	Following the maintenance procedure
Compatibility of materials used	Meeting manufacturer standards
Meticulous and complete visual inspection of the plumbing system	Meeting environmental standards
Correct storage of equipment	Observance of occupational health and safety rules
TASK 3 REPAIR PLUMBING SYSTEMS	
Performance Criteria	
Appropriate choice and use of tools	Client satisfaction
Wearing personal protective and safety equipment	Correct storage of equipment
Sound repairs	Clean premises
Tightness of the plumbing system	Meeting client requirements
Meticulous and complete visual inspection of the plumbing system	Following lockout procedures
Sound diagnosis	Following commissioning procedures
Appropriate choice of spare components	Meeting manufacturer standards
Ability to prevent future operating problems	Meeting environmental standards
No client complaints after repairs	Observance of occupational health and safety rules

TASK 4 MODIFY PLUMBING SYSTEMS	
Performance Criteria	
Appropriate choice and use of tools	Clean premises
Wearing personal protective and safety equipment	Meeting client requirements
Sound analysis of the heating system's characteristics	Following lockout procedures
Sound interpretation of operating data	Following commissioning procedures
Appropriate choice of spare components	Meeting manufacturer standards
Correct joining of piping and plumbing fixtures	Observance of the direction of flow
Tight installation	Observance of gradings
Sound installation	Meeting environmental standards
Correct identification of modifications made	Observance of the building code
Correct storage of equipment	Observance of occupational health and safety rules
TASK 5 INSTALL HEATING SYSTEMS	
Performance Criteria	
Appropriate choice and use of tools	Meeting client requirements
Appropriate choice of components	Following lockout procedures
Wearing personal protective and safety equipment	Following commissioning procedures
Correct joining of pipes and heating units	Meeting manufacturer standards
Tight installation	Observance of the direction of flow
Sound installation	Observance of gradings
Correct piping alignment	Meeting environmental standards
Correct identification of pipes and heating units	Observance of the building code
Correct storage of equipment	Observance of occupational health and safety rules
Clean premises	

TASK 6 MAINTAIN HEATING SYSTEMS	
Performance Criteria	
Appropriate choice and use of tools	Correctly distinguishing the heating system's characteristics
Appropriate choice of components	Correct storage of equipment
Wearing personal protective and safety equipment	Clean premises
Appropriate choice of lubricants	Meeting client requirements
Compatibility of materials used	Following lockout procedures
Meticulous and complete visual inspection of the heating system	Following the maintenance procedure
Correctly distinguishing the characteristics of fluids used	Meeting manufacturer standards
Correctly distinguishing the characteristics of fuels used	Meeting environmental standards
Sound interpretation of operating data	Observance of occupational health and safety rules
TASK 7 REPAIR HEATING SYSTEMS	
Performance Criteria	
Appropriate choice and use of tools	Ability to prevent future operating problems
Wearing personal protective and safety equipment	No client complaints after repairs
Meticulous and complete visual inspection of the heating system	Client satisfaction
Correctly distinguishing the characteristics of fluids used	Correct storage of equipment
Correctly distinguishing the characteristics of fuels used	Clean premises
Correctly distinguishing the heating system's characteristics	Following lockout procedures
Sound interpretation of operating data	Following commissioning procedures
Meticulous and complete visual inspection of the heating system	Meeting manufacturer standards
Sound diagnosis	Meeting environmental standards
Appropriate choice of spare components	Observance of occupational health and safety rules
Sound repairs	

TASK 8 MODIFY HEATING SYSTEMS	
Performance Criteria	
Appropriate choice and use of tools	The heating system performing as expected
Wearing personal protective and safety equipment	Correct storage of equipment
Correctly distinguishing the characteristics of fluids used	Clean premises
Correctly distinguishing the characteristics of fuels used	Meeting client requirements
Sound analysis of the heating system's characteristics	Following lockout procedures
Sound interpretation of operating data	Following commissioning procedures
Appropriate choice of spare components	Meeting manufacturer standards
Correct joining of pipes	Observance of the direction of flow
Sound installation	Observance of gradings
Tight installation	Observance of the building code
Correct identification of modifications made	Meeting environmental standards
Appropriately cleaning the inside of piping	Observance of occupational health and safety rules

2.4 FUNCTIONS

Functions:

- are a set of related tasks;
- may be defined by the work's results or by a sequence of steps;
- are natural and concrete sets.

After examining the tasks in terms of the definition of “function,” the workshop participants consider that for the pipe fitter trade, the tasks may be classified according to four functions:

- system installation;
- system maintenance;
- system repairs;
- system modifications.

3. QUANTITATIVE DATA ON TASKS

3.1 OCCURRENCE

Occurrence data concern the percentage of pipe fitters who perform a task in the same work environment on an annual basis. The data presented in the tables below are the average results of the participants. However, they account for the tasks performed not only by the pipe fitters attending the workshop, but also by all pipe fitters working in the companies represented

Table 3.1 Task Occurrence

Task		Occurrence
1	Install plumbing systems	62.9%
2	Maintain plumbing systems	40.4%
3	Repair plumbing systems	64.6%
4	Modify plumbing systems	61.7%
5	Install heating systems	59.1%
6	Maintain heating systems	40.3%
7	Repair heating systems	69.6%
8	Modify heating systems	65.9%

3.2 WORK TIME

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

Table 3.2 Work Time Allocated to Tasks

Task		Work Time
1	Install plumbing systems	30.0%
2	Maintain plumbing systems	6.9%
3	Repair plumbing systems	6.6%
4	Modify plumbing systems	7.6%
5	Install heating systems	23.7%
6	Maintain heating systems	3.0%
7	Repair heating systems	6.0%
8	Modify heating systems	16.3%

4. KNOWLEDGE, SKILLS AND ATTITUDES

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

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

4.1 KNOWLEDGE

Mathematics

Basic knowledge of mathematics is necessary for practicing the trade. This knowledge pertains to the use of the four basic operations, the use of fractions, conversion of measurement units, and the use of geometry and trigonometry concepts for calculating surfaces, volumes, angles and gradings.

Knowledge of mathematics is required when pipe fitters install and modify plumbing and heating systems (tasks 1, 4, 5 and 8).

Computer use

According to the participants, computer use is not currently frequent, but should increase in coming years. They anticipate that computers will be used for consulting information, adjusting systems and saving data (service reports, notably).

The participants point out that more and more journeymen use smart phones to find out about the work to be done.

Plans and technical manuals

Pipe fitters consult a variety of plans, drawings or views: architectural plans, mechanical plans, structural plans, isometric views, elevations, drawings and diagrams. Those plans, drawings or views are useful in all tasks.

Upon completion of installation work, many pipe fitters participate in updating plans by producing plans as built.

Manual machining

As mentioned regarding sub-operations, piping installation requires the application of basic knowledge in manual machining (cutting, chamfering, grooving, threading, tapping, grinding, sanding and boring).

Welding

Pipe fitters must be able to do iron welding with brass¹², silver brazing and tacking work.

The participants in the occupational analysis pointed out that in some sectors and types of work, pipe fitters must have specific welding qualifications to be able to do joining work.

Physics

Basic knowledge about the states of matter and about the properties of heat transfer fluids and of gases enables pipe fitters to understand the phenomena of pressure, steam, temperature, ignition, exchange and heat, to make adjustments, and to proceed with shutdowns or restarting.

Chemistry

Knowledge of acids and bases and of corrosion phenomena is useful for practicing the profession.

This knowledge makes it possible to understand the compatibility of materials as well as certain phenomena of rust and oxidation (pipes that are buried in alkaline or acidic environments or that transport alkaline or acidic products, for example). It also makes it possible to estimate the condition and durability of certain components.

The trade also requires a basic knowledge of the physiochemical properties of natural gas and propane (density and ignition point, notably). This knowledge is essential for observing regulations in effect, recognizing hazards and making adjustments.

12. This type of welding remains less frequent.

Instrumentation

Thermostats, aquastats, pressure gauges, regulators, switches (high level and low level) and valves are control instruments installed and used by pipe fitters.

Instrumentation knowledge is thus important in the trade, by enabling pipe fitters to understand the operation of devices, make adjustments, diagnose operating problems, and restart or shut down the various systems.

Electricity

Knowledge of voltage, intensity and Ohm's law enables pipe fitters to diagnose electrical problems when maintaining and repairing plumbing and heating systems.

4.2 SKILLS

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

4.2.1 Cognitive Skills

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

Problem-solving and decision-making

Problem-solving and decision-making skills are particularly important for performing the two repair tasks, but also for system activation, adjustment and shutdown operations.

Planning activities

This skill is involved in all the tasks, particularly in the choice of tools and materials and in work coordination.

4.2.2 Motor Skills

Motor skills involve gestures and movements.

It was mentioned that for pipe fitters, limb coordination is useful for working on ladders and stepladders and under counters, notably.

In addition, good dexterity is required for handling small objects, working in narrow enclosed spaces or at heights, and handling certain costly devices carefully.

Although pipe fitters have to lift loads weighing up to 50 kilograms, the participants estimate that those lifting operations should always be performed according to health and safety rules, i.e., with someone's help or by using appropriate equipment.

4.2.3 Perceptual Skills

Perceptual skills are sensory skills enabling a person to perceive by his senses what is happening in his environment. The main perceptual skills that pipe fitters need are the following:

Olfactory skills

Perceiving odours makes it possible to detect gas leaks, diagnose exhaust or ventilation problems, and distinguish certain fluids.

Visual skills

Pipe fitters should be able to perceive colours in order to interpret the colour codes frequently used in industrial processes and building mechanics.

Auditory skills

Auditory skills serve to detect equipment operation problems, such as unusual noises or leaks.

Tactile skills

The sense of touch serves to perceive temperature, vibrations, seepage, fissures, surface defects, and alignment problems on devices or piping.

4.3 ATTITUDES

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

Personal attitudes

Showing patience is an attitude appreciated by pipe fitters' co-workers.¹³

Interpersonal attitudes

The work requires teamwork ability. So a pipe fitter must show an ability to listen to and communicate with his colleagues and with clients.

Professional ethics

Professional ethics is manifested by meeting deadlines, being able to coordinate work with other trades, meeting the client's requirements, and observing confidentiality rules regarding, for example, the accessibility of premises or the characteristics of certain industrial processes.

Preventive attitudes and behaviours in health and safety matters

These attitudes and behaviours are demonstrated by:

- the wearing of personal protective and safety equipment;
- alertness;
- effective communication in the workplace, particularly during lifting operations;
- interest in learning and taking training with regard to the operation of new devices and to occupational health and safety;
- following lockout procedures.

13. Read the comment of the Pipe Fitter Professional Subcommittee in Annex 3, note 4.

5. TRAINING SUGGESTIONS

The pipe fitters attending the occupational analysis workshop made suggestions on initial training and the training of journeymen.

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

- workplace internships should be introduced, and possibly an initiation internship and an integration internship;
- teaching institutions should adopt the work-study co-op formula;
- teaching institutions should revise their student selection criteria;
- measures should be taken to counter student dropout rates;
- admission conditions should be revised;
- new devices and technologies should be integrated in training programs.

With regard to the training of journeymen, the participants requested that the Commission de la construction du Québec:

- promote better supervision of young apprentices during their apprenticeship period;
- offer more training in the regions;
- better inform workers about registration procedures and training incentives;
- promote the recognition of competencies.

Annexes

Annex 1

Tools and Equipment

For each task of the pipe fitter trade and according to a list submitted to them¹⁴, the participants determined the tools and equipment they use: hand tools; power tools; lifting, rigging, hoisting and access tools and equipment or ladders, pipe stands and platforms; personal protective and safety equipment; pipe cutting and joining equipment or welding, soldering and brazing equipment; testing, measuring and communication equipment or measuring instruments.

Table A.1 Tools and Equipment

TASK 1 INSTALL PLUMBING SYSTEMS	
Hand Tools	
Utility brushes	Ratchet
Wire brushes	Stud extractor
Cold chisels	Plumb line
Tin snips	Socket set (imperial and metric systems)
Socket wrench	Tap and die sets
Pipe wrench	Flashlight
Torque wrench	Prying tools
Combination wrench	Files
Basin wrench	Rubber mallet
Hex-key wrenches	Claw hammer
Adjustable wrenches	Ball-peen hammer
Chalk line	Sledgehammer
Bolt cutter	Hole saw
Knife	Levels
Square	Striker
Sliding calliper-gauge	Vise-grip pliers
T square	Pliers (lineman, needle nose, water pump, groove lock)
Flaring tool	Pick
Caulking gun	Hand saw
Punch	Hacksaw
Scratch awl	Plasterboard saw
Transfer pump (hand operated)	Screwdrivers

14. This list had been prepared based on the results of the National occupational analysis *Plumber and Steamfitter/Pipefitter* produced for Red Seal in 2010.

TASK 1 INSTALL PLUMBING SYSTEMS	
Power Tools	
Air compressor and accessories	Drill press
Inspection camera	Cordless drill
Core drill	Power drills
Impact wrench	Heat gun
Concrete cutter	Steam pump
Rotary hammer	Booster pump
Task lighting equipment	Transfer pump (electric and pneumatic)
Drain cleaning equipment	Band saw
Hole saw used on a drill	Portable band saw (hacksaw)
Bench grinder	Reciprocating saw
Mini grinder	Circular saw
Powder-actuated tool	Bench hacksaw
Lifting, Rigging, Hoisting and Access Tools and Equipment	
Lifting eyes	Ladders
Boom truck	Slings and chokers
Beam trolley	Shackles (varying sizes)
Forklift	Man/material lift (manual and power)
Telescopic forklift	Block and tackle
Stair cart	Chain block hoist (endless chain)
Tugger (power)	Scissor lift
Wire rope or nylon (synthetic)	Snatch block
Rope/cable	Come-along and grip hoist
Scaffolding	
Personal Protective and Safety Equipment	
Barriers and caution tape	Reflective vests
Safety boots	Safety harness and life line
Rubber safety boots	Safety glasses/goggles
Hard hat	Dust mask
Fire blanket	Hearing protection
Lock-out	Overalls
Face shield	Air quality tester
Fire extinguisher	First aid kit
Gloves (industrial, rubber)	

TASK 1 INSTALL PLUMBING SYSTEMS	
Pipe Cutting and Joining Equipment	
Pipe reamer	Cutting and welding equipment
Propane torch	Copper tube cutter
Tube bender	Tube flaring tools
Tube cutter	Plastic tube cutters
Snap-type cutter	Specialized assembly tools and equipment
Ratchet cutter	Crimpers
Hydraulic pipe cutter	Hot air gun (welding)
Pipe cutter	Pipe grinder
Hot tap equipment	Gas tanks and soldering equipment
Pipe vise	Pipe roller
PEX expander (manual and mechanical)	Gasoline cross-cut saw
Mechanical crimper	Mechanical crimper
Hand-operated oiler	Pipe stand
Half-moon file	
Testing, Measuring and Communication Equipment	
Calculator	Builder's level
Calliper	Laser layout tool
Electronic leak detector	Hand pump and accessories
Differential pressure gauge and level indicator	Hydrostatic pump and gauge (manual or power)
Markers	Two-way radio
Multimeter	Measuring tape
Laser level	
TASK 2 MAINTAIN PLUMBING SYSTEMS	
Hand Tools	
Utility brushes	Socket set (imperial and metric systems)
Socket wrench	Tap and die sets
Pipe wrench	Flashlight
Basin wrench	Files
Hex-key wrenches	Rubber mallet
Adjustable wrenches	Vise-grip pliers
Bolt cutter	Caulking gun
Knife	Hacksaw
Flaring tool	Screwdrivers
Stud extractor	
Power Tools	
Air compressor and accessories	Drain cleaning equipment
Inspection camera	

TASK 2 MAINTAIN PLUMBING SYSTEMS	
Personal Protective and Safety Equipment	
Barriers and caution tape	Fire extinguisher
Safety boots	Safety glasses/goggles
Rubber safety boots	Dust mask
Hard hat	Hearing protection
Fire blanket	First aid kit
Lock-out	
Pipe Cutting and Joining Equipment	
Pipe reamer	T-extracting tool
Propane torch	Hand-operated oiler
Pipe cutter	
Testing, Measuring and Communication Equipment	
Test strips and kits	Markers
Calculator	Multimeter
Electronic leak detector	Hand pump and accessories
Differential pressure gauge and level indicator	Measuring tape
TASK 3 REPAIR PLUMBING SYSTEMS	
Hand Tools	
Utility brushes	Flashlight
Cold chisels	Prying tools
Tin snips	Files
Socket wrench	Rubber mallet
Pipe wrench	Sledgehammer
Combination wrench	Hole saw
Basin wrench	Levels
Hex-key wrenches	Vise-grip pliers
Chalk line	Pliers (lineman, needle nose, water pump, groove lock)
Bolt cutter	Caulking gun
Knife	Punch
Square	Transfer pump (hand operated)
Flaring tool	Ratchet
Stud extractor	Hacksaw
Plumb line	Plasterboard saw
Socket set (imperial and metric systems)	Screwdrivers
Tap and die sets	

TASK 3 REPAIR PLUMBING SYSTEMS	
Power Tools	
Air compressor and accessories	Hole saw used on a drill
Inspection camera	Mini grinder
Core drill	Cordless drill
Impact wrench	Power drills
Concrete cutter	Steam pump
Rotary hammer	Transfer pump (electric and pneumatic)
Task lighting equipment	Reciprocating saw
Drain cleaning equipment	
Lifting, Rigging, Hoisting and Access Tools and Equipment	
Lifting eyes	Scaffolding
Boom truck	Ladders
Skid-steer loader	Slings and chokers
Beam trolley	Shackles (varying sizes)
Forklift	Block and tackle
Telescopic forklift	Chain block hoist (endless chain)
Stair cart	Scissor lift
Tugger (power)	Snatch block
Wire rope or nylon (synthetic)	Come-along and grip hoist
Rope/cable	
Personal Protective and Safety Equipment	
Barriers and caution tape	Reflective vests
Safety boots	Safety harness and life line
Rubber safety boots	Safety glasses/goggles
Hard hat	Dust mask
Fire blanket	Hearing protection
Lock-out	Overalls
Face shield	Air quality tester
Fire extinguisher	First aid kit
Gloves (industrial, rubber)	
Pipe Cutting and Joining Equipment	
Pipe reamer	Copper tube cutter
Propane torch	Tube flaring tools
Tube bender	Plastic tube cutters
Tube cutter	Specialized assembly tools and equipment
Ratchet cutter	Crimpers
Pipe cutter	Pipe grinder

TASK 3 REPAIR PLUMBING SYSTEMS	
Pipe Cutting and Joining Equipment (Cont'd)	
Pipe vise	Gas tanks and soldering equipment
PEX expander (manual and mechanical)	Pipe roller
Mechanical crimper	Gasoline cross-cut saw
Hand-operated oiler	Mechanical crimper
Cutting and welding equipment	Pipe stand
Testing, Measuring and Communication Equipment	
Test strips and kits	Multimeter
Calculator	Builder's level
Calliper	Hand pump and accessories
Electronic leak detector	Hydrostatic pump and gauge (manual or power)
Differential pressure gauge and level indicator	Two-way radio
Markers	Measuring tape
TASK 4 MODIFY PLUMBING SYSTEMS	
Hand Tools	
Utility brushes	Transfer pump (hand operated)
Wire brushes	Ratchet
Cold chisels	Plumb line
Tin snips	Socket set (imperial and metric systems)
Socket wrench	Tap and die sets
Pipe wrench	Flashlight
Torque wrench	Prying tools
Combination wrench	Files
Basin wrench	Rubber mallet
Hex-key wrenches	Claw hammer
Adjustable wrenches	Ball-peen hammer
Chalk line	Sledgehammer
Bolt cutter	Hole saw
Knife	Levels
Square	Striker
Sliding calliper-gauge	Vise-grip pliers
T square	Pliers (lineman, needle nose, water pump, groove lock)
Flaring tool	Pick
Stud extractor	Hand saw
Caulking gun	Hacksaw
Punch	Plasterboard saw
Scratch awl	Screwdrivers

TASK 4 MODIFY PLUMBING SYSTEMS	
Power Tools	
Air compressor and accessories	Drill press
Inspection camera	Cordless drill
Core drill	Power drills
Impact wrench	Heat gun
Concrete cutter	Steam pump
Rotary hammer	Booster pump
Task lighting equipment	Transfer pump (electric and pneumatic)
Drain cleaning equipment	Band saw
Hole saw used on a drill	Portable band saw (Hacksaw)
Bench grinder	Reciprocating saw
Mini grinder	Circular saw
Powder-actuated tool	Bench hacksaw
Lifting, Rigging, Hoisting and Access Tools and Equipment	
Lifting eyes	Ladders
Boom truck	Slings and chokers
Beam trolley	Shackles (varying sizes)
Forklift	Man/material lift (manual and power)
Telescopic forklift	Block and tackle
Stair cart	Chain block hoist (endless chain)
Tugger (power)	Scissor lift
Wire rope or nylon (synthetic)	Snatch block
Rope/cable	Come-along and grip hoist
Scaffolding	
Personal Protective and Safety Equipment	
Barriers and caution tape	Reflective vests
Safety boots	Safety harness and life line
Rubber safety boots	Safety glasses/goggles
Hard hat	Dust mask
Fire blanket	Hearing protection
Lock-out	Overalls
Face shield	Air quality tester
Fire extinguisher	First aid kit
Gloves (industrial, rubber)	

TASK 4 MODIFY PLUMBING SYSTEMS	
Pipe Cutting and Joining Equipment	
Pipe reamer	Cutting and welding equipment
Propane torch	Copper tube cutter
Tube bender	Tube flaring tools
Tube cutter	Plastic tube cutters
Snap-type cutter	Specialized assembly tools and equipment
Ratchet cutter	Crimpers
Hydraulic pipe cutter	Hot air gun (welding)
Pipe cutter	Pipe grinder
Hot tap equipment	Gas tanks and soldering equipment
Pipe vise	Pipe roller
PEX expander (manual and mechanical)	Gasoline cross-cut saw
Mechanical crimper	Mechanical crimper
Hand-operated oiler	Pipe stand
Half-moon file	
Testing, Measuring and Communication Equipment	
Calculator	Builder's level
Calliper	Laser layout tool
Electronic leak detector	Hand pump and accessories
Differential pressure gauge and level indicator	Hydrostatic pump and gauge (manual or power)
Markers	Two-way radio
Multimeter	Measuring tape
Laser level	

TASK 5 INSTALL HEATING SYSTEMS	
Hand Tools	
Pipe reamer (spiral, fluted)	Levels (laser, standard, builder's, digital [smart])
Pin bars	Hand bevelling tool
Calculator	Spacing tool
Pin punch	Flaring tool
Flange alignment pins	Marking tool
Tube bender	Bending tools (hand and hydraulic)
Shear	Vise-grip pliers
Cold chisels	Centre punch
Wrenches (adjustable [crescent], chain, combination [open/closed-end], hammers, hex-keys, non-spark, pin, pipe, socket, torque)	Coil fin straightener
Freeze pack	Ratchet
Bolt cutter	Wrap-around
Pipe cutters (single-wheel, multi-wheel)	Sling
Gasket cutter	Saws (hand, portable band, large band)
Angle finder	Flange spreader (jacks)
Steel rule die	C-clamp
Pipe vises – chain and yokes, tri-stand and bench, power vise (power drive pliers)	Alignment clamps (external and internal)
Tilting gauge	Chain pipe tongs
Prying tool	Bolt tap
Files	Pipe tap
Contour markers	Bolt threader
Hammers (ball peen, chipping, sledge, soft-face)	Pipe threader
Tube cleaner	Screwdrivers
Tip cleaner	
Power Tools	
Hydraulic torque wrench	Impact driver
Air compressor	Bevelling tools (hand, electric drive, pneumatic, oxy-fuel)
Hydraulic jacks	Power-actuated tools
Bolt tensioner	Drills (electric, pneumatic, hammer, bench or stand press)
Threader	Hydrostatic pump
Portable end-prep milling (pneumatic, electric)	Pipe grinder
Bending machine	Saws (circular, cut-off, jig, sabre)
Grinders (electric or pneumatic, angle, bench, die, pedestal)	Hydraulic flange spreaders
Facing tool	

TASK 5 INSTALL HEATING SYSTEMS	
Measuring Instruments	
Calculator	Squares (standard, combination, flange, straightedge)
Feeler gauge	Plumb line
Infrared heat sensor	Pressure gauge
Centre finder	Pressure gauges (temperature, pressure, liquid, vacuum, specialty, differential pressure)
Compasses	Levels (laser, standard, builder's, digital [smart])
Calliper	Hydrostatic test pump
String line	Measuring tape
Holiday detector (GEEP tester)	Thermometer
Continuous line recorders	
Lifting, Rigging, Hoisting and Access Tools and Equipment	
D ring	Shackle
Girder cleat	Grip hoist
Spreader bar	Chain block
Eye bolts	Hand hoist
Tag line	Snatch block
Forklift	Cable tensioner
Rope	cable puller (Tirfor)
Hooks	Portable hand hoist (grip hoist type)
Cable puller	Jacks (hydraulic, ram and piston)
Sling (nylon, wire cable, wire mesh)	
Welding, Soldering and Brazing Equipment	
Compressed gas cylinders (purge, shield, cutting)	Plastic fusion welding equipment
Propane tiger torches (preheating)	Metallic metal soldering equipment
Oxy-fuel cutting, heating and welding torches	Flashback arrestor
Plasma cutters	Fusion welding equipment
Temperature indicating crayon	Regulator
Ladders, Stands and Platforms	
Scaffolding (staging)	Stepladder
Modular scaffolding	Manlifts (electrical, hydraulic, pneumatic, winch [hand and power], one-man, platform, scissor lift, articulating boom)
Platform ladder	Material lifts
Combination ladder	Pipe stands (roller and V type)
Extension ladders	Pipe rack

TASK 5 INSTALL HEATING SYSTEMS	
Personal Protective and Safety Equipment	
Breathing apparatus	Leather gloves and sleeves
Safety boots	Fall arrest harness
Hard hat	Safety glasses
Coveralls (standard and fire retardant)	Welding goggles and helmet
Air quality monitors	Dust mask
Face shield	Hearing protection
Dielectric face shield	Respirator
Fire extinguisher	Leather apron
Vibration-absorbing gloves	First aid kit
Rubber gloves	Safety vest/gauntlet gloves
Dielectric gloves	Chemical protective clothing
TASK 6 MAINTAIN HEATING SYSTEMS	
Hand Tools	
Pin bars	Tube cleaner
Calculator	Computer
Wrenches (adjustable [crescent], chain, combination [open/closed-end], hammers, hex-keys, non-spark, pin, pipe, socket, torque)	Vise-grip pliers
Prying tool	Coil fin straightener
Files	Ratchet
Hammers (ball peen, chipping, sledge, soft-face)	Screwdrivers
Measuring Instruments	
Calculator	Pressure gauges (temperature, pressure, liquid, vacuum, specialty, differential pressure)
Feeler gauge	Multimeter
Infrared heat sensor	Refractometer
Static loads	Measuring tape
Ampere probe	Thermometer
Pressure gauge	
Ladders, Stands and Platforms	
Scaffolding (staging)	Extension ladders
Platform ladder	Stepladder
Combination ladder	Manlifts (electrical, hydraulic, pneumatic, winch [hand and power], one-man, platform, scissor lift, articulating boom)

TASK 6 MAINTAIN HEATING SYSTEMS	
Personal Protective and Safety Equipment	
Breathing apparatus	Fall arrest harness
Safety boots	Safety glasses
Hard hat	Dust mask
Coveralls (standard and fire retardant)	Hearing protection
Air quality monitors	Two-way radio
Face shield	Respirator
Fire extinguisher	First aid kit
Rubber gloves	Chemical protective clothing
Leather gloves and sleeves	
TASK 7 REPAIR HEATING SYSTEMS	
Hand Tools	
Pipe reamer (spiral, fluted)	Hand bevelling tool
Wheel and bearing pullers	Spacing tool
Pin bars	Flaring tool
Calculator	Swaging tool (modelling, tightening)
Pin punch	Marking tool
Flange alignment pins	Bending tools (hand and hydraulic)
Tube bender	Vise-grip pliers
Shear	Centre punch
Cold chisels	Coil fin straightener
Wrenches (adjustable [crescent], chain, combination [open/closed-end], hammers, hex-keys, non-spark, pin, pipe, socket, torque)	Ratchet
Bolt cutter	Wrap-around
Pipe cutters (single-wheel, multi-wheel)	Sling
Gasket cutter	Saws (hand, portable band, large band)
Pipe vises – chain and yokes, tri-stand and bench, power vise (power drive pliers)	Flange spreader (jacks)
Tilting gauge	C-clamp
Prying tool	Alignment clamps (external and internal)
Files	Chain pipe tongs
Contour markers	Bolt tap
Hammers (ball peen, chipping, sledge, soft-face)	Pipe tap
Tube cleaner	Bolt threader
Tip cleaner	Pipe threader
Levels (laser, standard, builder's, digital [smart])	Screwdrivers
Computer	

TASK 7 REPAIR HEATING SYSTEMS	
Power Tools	
Hydraulic torque wrench	Impact driver
Air compressor	Bevelling tools (hand, electric drive, pneumatic, oxy-fuel)
Hydraulic jacks	Power-actuated tools
Bolt tensioner	Drills (electric, pneumatic, hammer, bench or stand press)
Threader	Hydrostatic pump
Portable end-prep milling (pneumatic, electric)	Pipe grinder
Bending machine	Saws (circular, cut-off, jig, sabre)
Grinders (electric or pneumatic, angle, bench, die, pedestal)	Hydraulic flange spreaders
Facing tool	
Measuring Instruments	
Calculator	Pressure gauge
Feeler gauge	Pressure gauges (temperature, pressure, liquid, vacuum, specialty, differential pressure)
Infrared heat sensor	Multimeter
Centre finder	Levels (laser, standard, builder's, digital [smart])
Static loads	Hydrostatic test pump
String line	Measuring tape
Ampere probe	Tachometer
Squares (standard, combination, flange, straightedge)	Thermometer
Plumb line	
Lifting, Rigging, Hoisting and Access Tools and Equipment	
D ring	Shackle
Girder cleat	Grip hoist
Spreader bar	Chain block
Eye bolts	Hand hoist
Tag line	Plasticizers
Forklift	Snatch block
Rope	Cable tensioner
Hooks	cable puller (Tirfor)
Cable puller	Portable hand hoist (grip hoist type)
Sling (nylon, wire cable, wire mesh)	Jacks (hydraulic, ram and piston)
Chain puller	

TASK 7 REPAIR HEATING SYSTEMS	
Welding, Soldering and Brazing Equipment	
Compressed gas cylinders (purge, shield, cutting)	Temperature indicating crayon
Propane tiger torches (preheating)	Plastic fusion welding equipment
Oxy-fuel cutting, heating and welding torches	Metallic metal soldering equipment
Plasma cutters	Regulator
Ladders, Stands and Platforms	
Scaffolding (staging)	Pipe rack
Platform ladder	Manlifts (electrical, hydraulic, pneumatic, winch [hand and power], one-man, platform, scissor lift, articulating boom)
Combination ladder	Material lifts
Extension ladders	Pipe stands (roller and V type)
Stepladder	
Personal Protective and Safety Equipment	
Breathing apparatus	Leather gloves and sleeves
Safety boots	Fall arrest harness
Hard hat	Safety glasses
Coveralls (standard and fire retardant)	Welding goggles and helmet
Air quality monitors	Dust mask
Face shield	Hearing protection
Dielectric face shield	Respirator
Fire extinguisher	Leather apron
Vapour extractor	First aid kit
Vibration-absorbing gloves	Safety vest/gauntlet gloves
Rubber gloves	Chemical protective clothing
Dielectric gloves	

TASK 8 MODIFY HEATING SYSTEMS	
Hand Tools	
Pipe reamer (spiral, fluted)	Levels (laser, standard, builder's, digital [smart])
Pin bars	Hand bevelling tool
Calculator	Spacing tool
Pin punch	Flaring tool
Flange alignment pins	Marking tool
Tube bender	Bending tools (hand and hydraulic)
Shear	Vise-grip pliers
Cold chisels	Centre punch
Wrenches (adjustable [crescent], chain, combination [open/closed-end], hammers, hex-keys, non-spark, pin, pipe, socket, torque)	Coil fin straightener
Freeze pack	Ratchet
Bolt cutter	Wrap-around
Pipe cutter (single-wheel, multi-wheel)	Sling
Gasket cutter	Saws (hand, portable band, large band)
Angle finder	Flange spreader (jacks)
Steel rule die	C-clamp
Pipe vises – chain and yokes, tri-stand and bench, power vise (power drive pliers)	Alignment clamps (external and internal)
Tilting gauge	Chain pipe tongs
Prying tool	Bolt tap
Files	Pipe tap
Contour markers	Bolt threader
Hammers (ball peen, chipping, sledge, soft-face)	Pipe threader
Tube cleaner	Screwdrivers
Tip cleaner	
Power Tools	
Hydraulic torque wrench	Impact driver
Air compressor	Bevelling tools (hand, electric drive, pneumatic, oxy-fuel)
Hydraulic jacks	Power-actuated tools
Bolt tensioner	Drills (electric, pneumatic, hammer, bench or stand press)
Threader	Hydrostatic pump
Portable end-prep milling (pneumatic, electric)	Pipe grinder
Bending machine	Saws (circular, cut-off, jig, sabre)
Grinders (electric or pneumatic, angle, bench, die, pedestal)	Hydraulic flange spreaders
Facing tool	

TASK 8 MODIFY HEATING SYSTEMS	
Measuring Instruments	
Calculator	Squares (standard, combination, flange, straightedge)
Feeler gauge	Plumb line
Infrared heat sensor	Pressure gauge
Centre finder	Pressure gauges (temperature, pressure, liquid, vacuum, specialty, differential pressure)
Compasses	Levels (laser, standard, builder's, digital [smart])
Calliper	Hydrostatic test pump
String line	Measuring tape
Holiday detector (GEEP tester)	Thermometer
Continuous line recorders	
Lifting, Rigging, Hoisting and Access Tools and Equipment	
D ring	Shackle
Girder cleat	Grip hoist
Spreader bar	Chain block
Eye bolts	Hand hoist
Tag line	Snatch block
Forklift	Cable tensioner
Rope	cable puller (Tirfor)
Hooks	Portable hand hoist (grip hoist type)
Cable puller	Jacks (hydraulic, ram and piston)
Sling (nylon, wire cable, wire mesh)	
Welding, Soldering and Brazing Equipment	
Compressed gas cylinders (purge, shield, cutting)	Plastic fusion welding equipment
Propane tiger torches (preheating)	Metallic metal soldering equipment
Oxy-fuel cutting, heating and welding torches	Flashback arrestor
Plasma cutters	Fusion welding equipment
Temperature indicating crayon	Regulator
Ladders, Stands and Platforms	
Scaffolding (staging)	Stepladder
Modular scaffolding	Manlifts (electrical, hydraulic, pneumatic, winch [hand and power], one-man, platform, scissor lift, articulating boom)
Platform ladder	Material lifts
Combination ladder	Pipe stands (roller and V type)
Extension ladders	Pipe rack

TASK 8 MODIFY HEATING SYSTEMS	
Personal Protective and Safety Equipment	
Breathing apparatus	Leather gloves and sleeves
Safety boots	Fall arrest harness
Hard hat	Safety glasses
Coveralls (standard and fire retardant)	Welding goggles and helmet
Air quality monitors	Dust mask
Face shield	Hearing protection
Dielectric face shield	Respirator
Fire extinguisher	Leather apron
Vibration-absorbing gloves	First aid kit
Rubber gloves	Safety vest/gauntlet gloves
Dielectric gloves	Chemical protective clothing

Grid of Occupational Health and Safety Elements

Produced by: **Isabelle Dugré**, Prevention Consultant

ASP Construction

Table A.2 Description of Hazards in the Pipe Fitter Trade

No.	Hazards	Effects on Health and Safety	Means of Prevention
1	Same-level fall hazards - Housekeeping (clutter, risk of tripping on obstacles such as waste, debris, electric cords, pipes, materials) - Slippery surfaces (rain, ice, snow, residues, dust, oil) - Holes, uneven ground	- Collisions - Contusions - Bruises - Fractures - Sprains	- Clean the work area (pick up debris). - Hang up 2.1 m high any equipment that might constitute an obstacle; or protect the walking area. - Apply abrasives to make the surface less slippery. - Absorb oils, recover water. - Level the ground. - Plug holes (install plating).
2	Fall-from-height hazards		
2 a)	Using a stepladder	- Collisions - Contusions - Bruises - Fractures - Sprains - Internal injuries - Psychological and physical after-effects - Paralysis - Death	- Use a class 1 stepladder with a nominal capacity of 113 kg (250 lb.) and: - open the spreader bars fully; - install on a firm level surface; - choose a model according to the height to be attained; - keep the torso within the side rails.

No.	Hazards	Effects on Health and Safety	Means of Prevention
2 b)	Using a ladder	- Collisions - Contusions - Bruises - Fractures - Sprains - Internal injuries - Psychological and physical after-effects - Paralysis - Death	- Use a class 1 ladder. - Position while maintaining a slope of $\frac{1}{4}$ to $\frac{1}{3}$ from the height of the bearing point. - Climb up and down a ladder while: - always having three support points; - holding the bars and not the side rails; - remaining between the side rails; - not holding anything in the hands; - facing the ladder.
2 c)	Using small mobile scaffolding (Baker)	- Collisions - Contusions - Bruises - Fractures - Sprains - Internal injuries - Psychological and physical after-effects - Paralysis - Death	- Apply stability principles, such as: - never exceed three times the smallest support base; - always use the wheel locking mechanism; - climb down the mobile scaffold to move it.

No.	Hazards	Effects on Health and Safety	Means of Prevention
2 d)	Using metal frame scaffolding or tubular, socket and rosette scaffolding	- Collisions - Contusions - Bruises - Fractures - Sprains - Internal injuries - Psychological and physical after-effects - Paralysis - Death	- Stabilize the scaffold by: - using stabilizers on the ground; - tying it to the building; - using guys; - placing the two side rails side by side and fastening them by wind bracing. - When there is a risk of falling more than 3 metres: - install a railing system or be attached to a vertical lifeline complying with the specifications in the Safety Code for the construction industry. - Check the bearing capacity of the ground. - Install beds and jack screws if the ground is sloped or uneven. - For each scaffolding section, install vertical locks. - Use safe means of access. - Install anchors to the structure at intervals not exceeding three times the minimum scaffolding width. - Ensure that the planks are CSA certified, that the floor is wide enough (minimum 470 mm), that the distance between the structure and the floor is less than 350 mm, and that the load resistance is sufficient for the loads borne. - Inspect the scaffolding daily.

No.	Hazards	Effects on Health and Safety	Means of Prevention
2 e)	Using an aerial automotive work platform	- Collisions - Contusions - Bruises - Fractures - Sprains - Electrical hazards - Internal injuries - Intoxication - Psychological and physical after-effects - Paralysis - Death	- Took training in safe use as required by standards and manufacturers. - Wear an energy-absorbing harness for the jib boom platform. - Delimit the work area to avoid collision hazards and prevent objects from falling on other workers. - Keep the feet on the platform floor. - Climb up and down facing the equipment, while maintaining three support points. - Keep the platform accesses and floor clean. - Use a carbon monoxide detector in the case of a combustion appliance used indoors. - Lock hazardous energy sources during use (electrical conduit, switched-on appliance, gantry, garage doors, etc.).
3	Chemical hazards - Silica dust - Asbestos dust - Drilling anchoring holes - Using products such as silicone and sealants - Pipe glue - Cleaning solvent - Lubricant - Fuel for motorized devices - Mineral wool - Poisoning (carbon monoxide) - Asphyxia (lack of oxygen) - Gas leak - Projection of corrosive fluid - Presence of hazardous materials	- Silicosis - Asbestosis - Mesothelioma - Lung cancer - Skin disorders (dermatosis) - Carbon monoxide poisoning - Sensitization - Corrosive burns - Eye injuries, blindness - Fire, explosion	- Took WHMIS training. - Have on-site the specification sheets of products used. - Use less-toxic products or wear PPE prescribed by the product manufacturer (eye protection, gloves, clothing, respirators). - Took asbestos training, as prescribed by the Safety Code, art. 3.23.7. - Be trained in the use of respiratory protection (masks and respirators) if required. - Wear respiratory protection and filters appropriate to contaminants. - Ensure mechanical or natural ventilation. - Wear safety goggles or a visor. - Use tools (e.g. drills) equipped with a vacuum system including a HEPA filter. - Have emergency equipment at hand (eye-wash station, fire extinguisher, etc.). - Apply the lockout procedure.

No.	Hazards	Effects on Health and Safety	Means of Prevention
4	Ergonomic hazards • Posture constraints / statis • Repetitive movements • Handling • Task difficulty • Weight and shape of tools • Vibrations (hand-arm system)	• Musculoskeletal lesions (shoulders, elbows, hand/thumb) • Sprains • Hernias • Fatigue, discomfort, pain • Tendinitis • Low back pain	• Rotate tasks if the situation allows it (reduce repetitive movements). • Use handling equipment. • Know handling techniques. • Favour the purchase of tools limiting vibrations to a minimum. • Provide necessary backup lighting.
5	Electrical hazards • Contact with an overhead electric line • Electric tools • Contact with electric wires or outlets • Contact with a turned-on electric appliance or with conduits in ceilings • Contact with underground electrical conduits	• Electrification • Fibrillation • Burns • Amputation • Paralysis • Electrocution • Fall	• Maintain the minimum distances of approach prescribed by the Safety Code for the construction industry. • Use tools featuring double insulation or grounding. • Use electric cords in good condition and ground protections. • Apply a lockout procedure. • Train the workers in the lockout procedure in effect. • Took the compulsory training for working near electric lines. • Inspect electrical devices (wires) and tools according to manufacturer recommendations. • Have conduits marked by Info-Excavation before digging. • Dig manually near buried conductors.
6	Noise hazards • Tools • Drilling for anchors • Handling scaffoldings • Working on metals • Working in a noisy industrial environment	• Hearing loss • Occupational deafness • Increased stress	• Choose the most silent equipment possible. • Do required preventive maintenance. • Plan for work in the construction site's least noisy areas. • Wear hearing protection (plugs or earmuffs).

No.	Hazards	Effects on Health and Safety	Means of Prevention
7	Mechanical hazards • Moving parts • Breaking blade, bit or tool • Storage of materials • Superimposed work • Trench collapse • Falling object on an older installation	• Contusions • Fractures • Crushing • Amputation • Cuts • Falls • Concussion • Burial • Jamming • Crashing	• Comply with the regulatory grid regarding machine protection. • Do required preventive maintenance. • Collect information and take training in the use of new tools. • Apply the lockout procedure in effect. • Keep a work environment clean, without obstruction. • Prevent the fall of objects. • Eliminate any possibility of superimposed work. • Use shoring or observe the disengagement slopes in trenches. • Use a tool suitable for the task. • Use a tool in good condition.
8	Environmental hazards • Extreme temperature (cold or hot) • Enclosed space • Heat released by tools and equipment	• Discomfort due to cold • Chilblains • Hypothermia • Thermal stresses (heat) • Heat stroke • Burn	• Comply with health and safety rules. • Use a working method and personal protection ensuring protection against burns (water, carpet, gloves, etc.). • Measure gases before each entry in an enclosed space. • Train the workers to work in enclosed spaces. • Ensure adequate ventilation of work areas. • Do preventive maintenance of gas equipment. • Take training in the hazards of carbon monoxide and nitrogen dioxide. • Alternate periods of work and rest. • Drink water.
9	Stress-related hazards • Unrealistic deadlines • Unforeseen events related to existing installations • Client requirements	• Health disorders • Hypertension • Eczema	• Plan the work. • Limit work done under stress.

No.	Hazards	Effects on Health and Safety	Means of Prevention
10	Radiation hazards - Exposure to ionizing radiation (e.g.: X-rays) - Exposure to non-ionizing radiation (e.g.: laser)	Eyes: no permanent lesions	- Have radioactive materials (in laboratories or nuclear power plants) handled by specialists, in accordance with the <i>Nuclear Safety and Control Act</i>. - Carry a dosimeter when using the moisture density gauge or the photographic device. - Have workers likely exposed to such radiation medically supervised by dosimetry (RROHS, sec. 144). - Observe safety perimeters according to the CSA W117.2-94 standard, <i>Safety in Welding, Cutting and Allied Processes</i>. Laser tool: do not leave it on uselessly and do not look directly at the beam.

Comments of the Pipe Fitter Professional Subcommittee

At the Professional Subcommittee meeting held on February 19, 2013, the members made the following comments:

1. Section 1.5 *Legislation, Regulations and Standards*, p. 6

Pipe fitters in the construction industry are also subject to the following standards:

- Canadian Standards Association, B139-09 Installation code for oil-burning equipment;
- Bureau de normalisation du Québec, NQ 3650-900 Code d'installation des appareils sous pression.

2. Types of heating systems, *Residential sector*, p.14

There are also oil-burning forced air systems.

3. Table 2.3 *Achievement Conditions*, p. 41 and following

Under the theme *Instructions and references* for each task, the second line should read:

"In system device manuals as well as applicable codes and standards."

4. Section 4.3 *Personal attitudes*, p. 61

Client relations are also very important at all times, particularly in service.