

Insulator

Occupational Analysis Report

June 2014



Commission
de la construction
du Québec

The purpose of this report is to describe as accurately as possible the trade of insulator 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 (CCQ) for their expertise in the trade.

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

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

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The masculine gender is used generically
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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 coming design of qualitative apprenticeship logbooks 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 Québec-France Understanding on the Mutual Recognition of Professional Qualifications.

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

The occupational analysis of the insulator trade belongs to this context³. Its purpose is to describe this trade as currently practiced by journeymen in the construction industry. This report was written in order to collate and organize the information gathered during the occupational analysis workshop held in Laval on May 1 and 2, 2014.

This analysis draws a portrait of the trade (tasks and operations) and its working conditions, and identifies the skills and behaviours required. The report of the occupational analysis workshop is an accurate reflection of the consensus reached by a group of insulators. 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 to amend the Regulation respecting the vocational training of workforce in the construction industry, Schedule A, section 15, “insulator” means anyone who, by spraying or any other regular method, applies thermal insulation to:

- a)
 - i. all existing or new piping systems whether it be in connection with the installation, repair or renovation of such systems, including the application of all types of protective finishes;
 - ii. piping used to convey any fluid (hot water, cold water, steam, gas, oil, fuel, ammonia, etc.);
 - iii. radiators, furnaces, boilers, tanks and other similar equipment, except the erection of brick walls for boilers;
 - b) radiators, furnaces, boilers, tanks and other similar equipment, except the erection of brick walls for boilers.
- An insulator may also apply rigid or semi-rigid insulation.
 - The work described in the first paragraph includes handling related to practicing the trade for immediate and final installation.

The participants agreed with this definition, which represents their tasks adequately. However, they made the following comments:

- Insulators install not only thermal insulation, but also acoustic and flame retardant insulation.
- Scaffolding erection is not mentioned, although it is part of the work of insulators.
- Removal of insulating materials, particularly asbestos, should be mentioned.

1.2 JOB TITLES

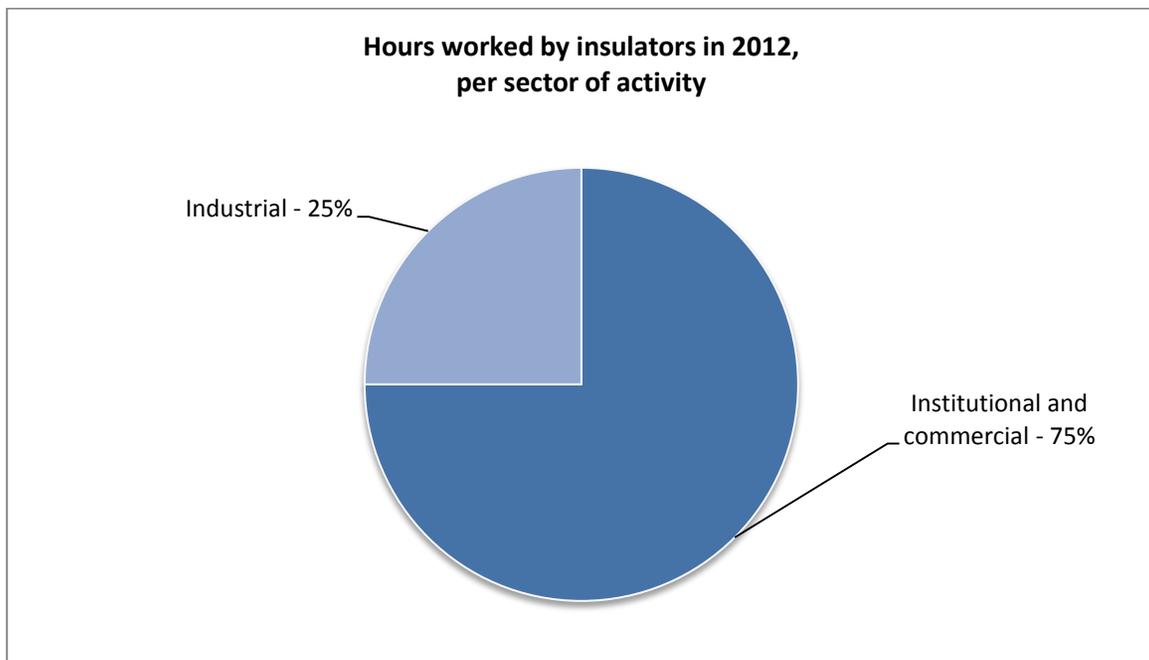
On construction sites, in French parlance “*calorifugeur*” is used but also “insulator” and, in a more familiar tone, “calo.”

Because it is the trade’s official English title, “insulator” will be used in this report.

1.3 SECTORS OF ACTIVITY

According to data collected by the CCQ, insulators are active, to varying degrees, in two sectors of the construction industry: the institutional and commercial sector, and the industrial sector.

The chart below illustrates the allocation of hours worked by all insulators in Quebec in 2012⁴.



After the above graphic was presented, we asked the participants to list the sectors where they had practiced their trade in the last five years. The results appear in Table 1.1 below.

4. Commission de la construction du Québec, *Careers – Construction*, 2013-2014 edition.

Table 1.1 Allocation of Hours Worked per Sector of Activity

Sector	Allocation of Hours Worked per Sector of Activity (%)	
	All Insulators in Quebec	Participants in the Occupational Analysis Workshop
Residential	–	1.5% ⁵
Institutional and commercial	75.0%	46.9%
Civil engineering and roads	–	5.0% ⁶
Industrial	25.0%	46.6%

It can be observed that the work time allocation of the meeting participants differs from that of insulators in Quebec as a whole. The main difference is that the participants allocate more time than insulators as a whole to industrial sector work (46.6% vs. 25.0%). Indeed, according to the participants, industrial sector work (46.6%) requires almost the same percentage of time as institutional and commercial work (46.9%).

Moreover, institutional and commercial work takes up less of the participants' time (46.9%) than that of insulators as a whole (75.0%).

Lastly, insulators as a whole make no mention of work in the residential sector and the civil engineering and roads sector, whereas the participants allocated a slight proportion of work time to those sectors.

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;

5. In the last five years, only two persons have worked in the residential sector.

6. In the last five years, only one person has worked in the civil engineering and roads sector.

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 LAWS AND REGULATIONS

Insulators in the construction industry are subject to:

- the Act respecting labour relations, vocational training and workforce management in the construction industry (S.S.Q., c. R-20);
- the Regulation respecting the vocational training of workforce in the construction industry (R-20, r.6.2);
- the four sector-based collective agreements of the construction industry;
- the National Building Code – Canada 2005 (NBC);
- the Quebec Construction Code, Chapter I, “Building”;
- the Act Respecting Occupational Health and Safety (R.S.Q., c. S-2.1);
- the Safety Code for the construction industry (R.Q. c. S-2.1, r.6);
- municipal by-laws, if applicable.

Moreover, the participants mentioned that some companies add internal regulations, particularly regarding safety, that frequently exceed the requirements of laws and legal regulations.

1.6 WORKING CONDITIONS

The following information provides an overview of the conditions and context of the work of insulators, 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.

Salary⁷

The proportion of insulators who declared at least 500 hours in 2012 is estimated at 83%. In addition, as of April 1, 2014, the daytime hourly wage of a journeyman insulator was as follows:

- Industrial: \$35.49
- Institutional and commercial: \$35.49
- Civil engineering and roads: \$35.91
- Residential (light): \$33.53
- Residential (heavy): \$35.45

Vacations and time off⁸

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 have access to a pension plan. They retain their eligibility for this pension plan throughout their career in construction, even if they change employer, trade or sector.

7. The salary data are taken from the document *Careers – Construction*, 2013-2014 edition, published by the Commission de la construction du Québec, and from the collective agreements of the construction industry sectors.

8. The data on vacations and time off, the pension plan and insurance are taken from the document *La construction au Québec : c'est bien plus payant!*, published in 2009 by the Commission de la construction du Québec.

Insurance

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

Physical requirements

The participants agree that the work requires a certain endurance, suppleness and, in some cases, agility. Indeed, insulators must often work in confined spaces and awkward postures. In addition, insulators must often work outdoors and thus experience difficult weather conditions at times. They must also be able to adapt to extreme temperatures, because they may have to work in areas that are very hot (e.g.: mechanical rooms) or very cold (e.g.: coolers). Lastly, as generally reported, the trade requires average physical strength.

Work schedules

A 40-hour workweek 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. In addition, if the work is done in remote areas, for example north of the 55th parallel, the regular workweeks number 50 hours, from Monday to Friday, with a daily limit of 10 hours.

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, etc. These special schedules confer good flexibility to the work schedules in effect in the construction industry.

Insulators may also have to work in other regions than their own. The length of stays may vary depending on the work to be done. However, according to the participants, an insulator who would want to work only in his region could still practice the trade.

1.7 JOB MARKET ENTRY CONDITIONS

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 obtained the DEP in Insulation⁹, 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 months¹⁰.

Although the construction industry favours graduates for access, labour shortages may at times make it necessary to give non-graduates access to the insulator trade. Thus, candidates without a diploma are eligible to obtain a competency certificate-apprentice only in the event of a labour shortage and must¹¹:

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

Of the 11 meeting participants, none has obtained the DEP in Insulation.

9. To apply, candidates must also supply: proof that they are at least 16 years of age, their social insurance number and home address; present their certificate for having passed the course *Santé et sécurité générale sur les chantiers de construction*; pay the required fees; and indicate the union to which they want to belong. Consult the website http://www.ccq.org/en/GrandPublic/E_CertificatsCompetence/E02_Apprenti.

10. Consult the website http://www.ccq.org/en/GrandPublic/E_CertificatsCompetence/E02_Apprenti/E02_3_CandidatDiplome.

11. Consult the website http://www.ccq.org/en/GrandPublic/E_CertificatsCompetence/E02_Apprenti/E02_6_CandidatNonDiplome.

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

- resourcefulness;
- punctuality and diligence;
- ability to anticipate the work to be done;
- adaptability to different unforeseen situations;
- ability to plan and organize one's work.

1.8 PLACE OF WOMEN IN THE TRADE

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

In 2012, according to the la CCQ¹², 45 women were practicing the trade out of a total of 1,016 insulators, i.e., 4.4%. According to the participants, no factor prevents a woman from practicing this trade; in fact, they are reportedly more and more present.

1.9 CAREER PROSPECTS

The career prospects of insulators are similar to those of all construction workers. Thus, after a variable number of years of experience (depending on the context and the worker), they can become team leaders, foremen, project managers, superintendents, etc. Becoming contractors is also a possibility, although that requires financial resources that are not available to everyone.

12. Commission de la construction du Québec (CCQ), *Careers – Construction*, 2013-2014 edition.

1.10 DEVELOPMENT OF THE TRADE

The main changes that have occurred in recent years and that, according to the participants, are likely to be maintained and even increase, are the following:

- The concern of the general public and companies for energy efficiency has led suppliers to create more and more effective products and methods for preventing heat loss. Thus, new materials have appeared, accompanied by new work methods. Some of those materials are less harmful to workers' health. For example, an insulating product is anticipated that will replace fibreglass wool and not cause itchiness to its handlers.
- The management of construction work has changed a lot in recent years. We observe that performance, productivity and cost-effectiveness requirements continue to increase while deadlines shorten.
- Safety has been and will continue to be a growing concern, which is certainly a good thing, but which may, in some cases, entail exaggerated constraints, according to the participants.
- The removal of asbestos products has become very important in the work of insulators, including the special procedures required.

1.11 IMPACT OF ENVIRONMENTAL STANDARDS ON THE PRACTICE OF THE TRADE

According to the participants, the application of environmental standards can vary substantially from one construction site to another. However, generally, the participants consider that the work of insulators has been modified by certain new environmental standards, particularly those related to the elimination of toxic products and the sorting of recyclable or reusable waste materials.

2. WORK DESCRIPTION

2.1 TASKS AND OPERATIONS

List of tasks

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

- Task 1 Prepare the work
- Task 2 Erect scaffolding
- Task 3 Install rigid or semi-rigid insulation on piping
- Task 4 Install rigid or semi-rigid insulation on fixtures¹³ and walls
- Task 5 Install rigid or semi-rigid insulation on air ducts
- Task 6 Apply sprayed and blown insulation (piping, air ducts, fixtures, walls)
- Task 7 Install insulation sandwich panels on fixtures
- Task 8 Install a flexible protective finish (piping, air ducts, fixtures, walls)
- Task 9 Install waterproof membranes (piping, air ducts, fixtures, walls)
- Task 10 Make parts of a rigid or semi-rigid protective finish for clamps, valves, flashing, etc.
- Task 11 Install a rigid or semi-rigid protective finish (piping, air ducts, fixtures, walls)
- Task 12 Install fire stop systems
- Task 13 Remove insulation materials containing asbestos or mould

13. The term "fixture" means any equipment to which pipes or insulated conduits are attached and that requires thermal, acoustic or flame retardant insulation.

Table of tasks and operations

During the workshop, a table of tasks and operations performed by insulators was presented to the participants. Following discussions, changes were made to the table. The final version is presented in the following pages.

Note:

Insulators install thermal, flame retardant and acoustic insulation products. However, thermal insulation constitutes the major part of their work (95%, according to the participants). Flame retardant insulation reportedly takes up around 5% of their time (although the demand seems to be increasing), and acoustic insulation occupies so little of their time that the latter is difficult to determine; requests for such insulation are special and quite rare.

Table 2.1 Tasks and Operations

TASKS	OPERATIONS					
1 PREPARE THE WORK	1.1 Receive instructions	1.2 Put necessary safety measures in place	1.3 Receive materials and equipment	1.4 Prepare materials, tools and equipment	1.5 Protect surrounding surfaces	
2 ERECT SCAFFOLDING	2.1 Make an inventory of the elements	2.2 Find out about the assembly method	2.3 Put the base in place	2.4 Assemble the elements	2.5 Make sure the scaffolding is stable	
3 INSTALL RIGID OR SEMI-RIGID INSULATION ON PIPING¹⁴	3.1 Thaw the pipes, if applicable	3.2 Dry and clean the pipes, if necessary	3.3 Apply the primer, if applicable	3.4 Measure and cut insulation sections	3.5 Install insulation sections	3.6 Seal the joints, if applicable
	3.7 Attach the insulation sections	3.8 Install the vapour barrier, if applicable	3.9 Clean the work area and store the equipment			
4 INSTALL RIGID OR SEMI-RIGID INSULATION ON FIXTURES AND WALLS¹⁵	4.1 Thaw the fixture, if applicable	4.2 Dry and clean, if applicable	4.3 Measure and cut the insulation	4.4 Prepare the anchors or ties	4.5 Install the insulation	4.6 Fasten the insulation
	4.7 Seal the joints, if applicable	4.8 Clean the work area and store the equipment				

14. It may be thermal or acoustic insulation.

15. It may be thermal, acoustic or flame retardant insulation.

TASKS	OPERATIONS					
5 INSTALL RIGID OR SEMI-RIGID INSULATION ON AIR DUCTS ¹⁶	5.1 Dry and clean the duct, if applicable	5.2 Fasten the anchors	5.3 Measure and cut the insulation	5.4 Install the insulation	5.5 Fasten the retaining washers	5.6 Cut excess anchors
	5.7 Seal the joints, if applicable	5.8 Clean the work area and store the equipment				
6 APPLY SPRAYED AND BLOWN INSULATION (piping, air ducts, fixtures, walls) ¹⁷	6.1 Thaw the pipes or fixture, if applicable	6.2 Dry and clean, if applicable	6.3 Apply primer, if applicable	6.4 Apply the insulation	6.5 Make the insulation surface uniform	6.6 Clean the work area and store the equipment
7 INSTALL INSULATION SANDWICH PANELS ON FIXTURES	7.1 Dry and clean the fixture, if applicable	7.2 Install anchors and fasteners	7.3 Install insulation sandwich panels	7.4 Tighten and seal the joints	7.5 Clean the work area and store the equipment	
8 INSTALL A FLEXIBLE PROTECTIVE FINISH (piping, air ducts, fixtures, walls)	8.1 Install a wire mesh, if applicable	8.2 Install angle irons, if applicable	8.3 Cement, if applicable	8.4 Measure and cut the protective finish	8.5 Apply the coating	8.6 Install the protective finish
	8.7 Reapply the coating	8.8 Clean the work area and store the equipment				
9 INSTALL WATERPROOF MEMBRANES (piping, air ducts, fixtures, walls)	9.1 Measure and cut the membrane	9.2 Install the membrane	9.3 Heat the joints	9.4 Install valves, if applicable	9.5 Clean the work area and store the equipment	

16. It may be thermal or acoustic insulation.

17. It may be thermal, acoustic or flame retardant insulation.

TASKS	OPERATIONS					
10 MAKE PARTS OF A RIGID OR SEMI-RIGID PROTECTIVE FINISH FOR CLAMPS, VALVES, FLASHING, ETC.	10.1 Take required measurements	10.2 Make a pattern	10.3 Trace the parts	10.4 Cut the parts	10.5 Shape the parts	10.6 Assemble the parts
	10.7 Identify the parts	10.8 Clean the work area and store the equipment				
11 INSTALL A RIGID OR SEMI-RIGID PROTECTIVE FINISH (piping, air ducts, fixtures, walls)	11.1 Measure and cut the protective finish	11.2 Install the protective finish	11.3 Fasten the protective finish (strips and ties, screws or rivets, glue, etc.)	11.4 Seal the joints, if applicable	11.5 Clean the work area and store the equipment	
12 INSTALL FIRE STOP SYSTEMS	12.1 Clean the opening	12.2 If applicable, install supports, rails, anchors, etc.	12.3 Measure and cut the fire stop system	12.4 Install the fire stop system	12.5 Fill out a material safety data sheet, if applicable	12.6 Clean the work area and store the equipment
13 REMOVE INSULATION MATERIALS CONTAINING ASBESTOS OR MOULD	13.1 Build necessary enclosures	13.2 Undo strips, ties, anchors, etc.	13.3 Remove the protective finish	13.4 Remove the insulation	13.5 Pick up the debris	13.6 Put the debris in the recommended bags
	13.7 Proceed with the final cleaning	13.8 Apply sealant	13.9 Disassemble the enclosures	13.10 Clean the work area and store the equipment		

2.2 OPERATIONS, SUB-OPERATIONS AND CLARIFICATIONS

In the following pages are presented the sub-operations related to most of the operations¹⁸, as well as a few clarifications made by the participants.

Table 2.2 Sub-Operations and Operation Clarifications

TASK 1 PREPARE THE WORK		
<i>Operations</i>	<i>Sub-Operations</i>	<i>Clarifications</i>
1.1 Receive instructions	1.1.1 Go to the work area 1.1.2 Check the construction site's features 1.1.3 Check the weather conditions (temperature, wind, rain, etc.), if applicable	
1.2 Put necessary safety measures in place	1.2.1 Participate in safety meetings 1.2.2 Learn about the safety measures and risk analysis 1.2.3 Check the safety elements on the work permit 1.2.4 Check the client's internal and specific health and safety rules 1.2.5 Determine the required safety equipment and ensure its availability and good condition 1.2.6 Check the air quality hazards, if applicable 1.2.7 Read the material safety data sheets of products to be used 1.2.8 Set the safety perimeter(s) 1.2.9 Install nets under scaffolding, to prevent the fall of tools, materials, etc. 1.2.10 Lock the machinery, if applicable	
1.3 Receive materials and equipment	1.3.1 Check the condition and quantities of materials and equipment 1.3.2 Plan for a storage area	
1.4 Prepare materials, tools and equipment	1.4.1 Arrange materials, tools and equipment at the correct locations 1.4.2 Organize your work area	
1.5 Protect surrounding surfaces	1.5.1 Cover surfaces or objects to be protected (polythene, net, etc.) 1.5.2 Build shelters	This step is particularly important before insulation is sprayed (task 6).

18. The order of operations may vary according to the company's organization.

TASK 2 ERECT SCAFFOLDING		
Operations	Sub-Operations	Clarifications
2.1 Make an inventory of the elements	2.1.1 Take scaffolding measurements 2.1.2 Identify installation obstacles 2.1.3 Calculate the number of scaffolding elements 2.1.4 Visually inspect the equipment 2.1.5 Detect breakages 2.1.6 Replace damaged components	
2.2 Find out about the assembly method		The assembly method may be indicated on an assembly plan produced by an engineer.
2.3 Put the base in place	2.3.1 Check soil solidity 2.3.2 Install wood bases with screw jacks 2.3.3 Install base plates and wind braces 2.3.4 Check the base's level and the squareness	
2.4 Assemble the elements	2.4.1 Install frames 2.4.2 Install wind braces 2.4.3 Install cross braces 2.4.4 Install platforms 2.4.5 Install ladders 2.4.6 Install guardrails 2.4.7 Install anchors 2.4.8 Install plates (toe-kicks)	
2.5 Make sure the scaffolding is stable	2.5.1 Determine anchor points 2.5.2 Install anchors 2.5.3 Secure the scaffolding 2.5.4 Make a final inspection 2.5.5 Obtain approval from the person responsible, if applicable	Once scaffolding assembly is completed, a safety officer will inspect the work and, if applicable, make recommendations. The insulator will then apply those recommendations to make the scaffolding meet safety requirements.

TASK 3 INSTALL RIGID OR SEMI-RIGID INSULATION ON PIPING		
Operations	Sub-Operations	Clarifications
3.1 Thaw the pipes, if applicable	3.1.1 Ensure deactivation 3.1.2 Heat the pipes (torch) 3.1.3 Use a de-icing product	
3.2 Dry and clean the pipes, if necessary	3.2.1 Remove all traces of: - water - dust - oil - residues - etc. 3.2.2 Ventilate the room to reduce humidity, if applicable	It may be necessary to have the pipes cleaned by sandblasting if it is very rusted. But the insulator is not responsible for this work.
3.3 Apply the primer, if applicable		The primer is applied with a brush or by spraying.
3.4 Measure and cut insulation sections	3.4.1 Take piping measurements 3.4.2 Cut the insulation: - elbows - supports - "T" - "Y" - etc.	
3.5 Install insulation sections	3.5.1 Position the insulation 3.5.2 Fasten with iron wire 3.5.3 Cut joints if necessary	
3.6 Seal the joints, if applicable	For flexible insulation tubes (Armaflex) 3.6.1 Apply contact glue on both parts of the joint 3.6.2 Observe the setting time 3.6.3 Connect both sides together For cellular glass and urethane 3.6.4 Apply sealant on the joints	
3.7 Attach the insulation sections	3.7.1 Install a second and third iron wire on each insulation section 3.7.2 Install a ½ inch stainless steel strip (for pipes of over 300 mm)	
3.8 Install the vapour barrier, if applicable	3.8.1 Cut the vapour barrier 3.8.2 Position the vapour barrier 3.8.3 Fasten the vapour barrier with an aluminum tape	
3.9 Clean the work area and store the equipment	3.9.1 Pick up the debris 3.9.2 Store materials and equipment 3.9.3 Store your personal tools	

TASK 4 INSTALL RIGID OR SEMI-RIGID INSULATION ON FIXTURES AND WALLS

Operations	Sub-Operations	Clarifications
4.1 Thaw the fixture, if applicable	4.1.1 Ensure deactivation 4.1.2 Heat the fixture with a torch 4.1.3 Use a de-icing product	
4.2 Dry and clean, if applicable	4.2.1 Remove all traces of: - water - dust - oil - residues - etc. 4.2.2 Ventilate the room to reduce humidity, if applicable	
4.3 Measure and cut the insulation	4.3.1 Evaluate the necessary quantities 4.3.2 Maximize the use of materials 4.3.3 Use manufacturer data (chart) to measure elbow segments 4.3.4 Prepare the patterns, if applicable	The cuts must be as precise as possible, to avoid heat or cold losses.
4.4 Prepare the anchors or ties	4.4.1 Check the types of anchors 4.4.2 Check the appropriate anchoring tool 4.4.3 Determine the anchor points 4.4.4 Fasten the anchors: - with or without glue - by spot welding, if applicable.	
4.5 Install the insulation	4.5.1 Position the insulation on the fixture or wall	
4.6 Fasten the insulation		Depending on the type of insulation, it may be fastened with clips, iron wire, strips, glue, aluminum tape, reinforced tape, etc.
4.7 Seal the joints, if applicable	For flexible insulation tubes (Armaflex) 4.7.1 Apply contact glue on both parts of the joint 4.7.2 Observe the setting time 4.7.3 Connect both sides together For cellular glass and urethane 4.7.4 Apply sealant on the joints	
4.8 Clean the work area and store the equipment	4.8.1 Pick up the debris 4.8.2 Store materials and equipment 4.8.3 Store your personal tools	

Task 5 INSTALL RIGID OR SEMI-RIGID INSULATION ON AIR DUCTS

Operations	Sub-Operations	Clarifications
5.1 Dry and clean the duct, if applicable	5.1.1 Ensure that the duct can receive anchors or insulation 5.1.2 Remove all traces of: - water - dust - rust - oil - residues - etc. 5.1.3 Ventilate the room to reduce humidity, if applicable	
5.2 Fasten the anchors	5.2.1 Locate the anchor points 5.2.2 Depending on the insulation's type and thickness, install anchors: - with or without glue - by spot welding, if applicable. 5.2.3 Fold down the anchors, if applicable 5.2.4 Ensure the anchors' solidity	Use anchors required by specifications and according to insulation thickness
5.3 Measure and cut the insulation	5.3.1 Evaluate the necessary quantities 5.3.2 Decide on the order of the work 5.3.3 Maximize the use of materials 5.3.4 Use manufacturer data (chart) to measure elbow segments, if applicable 5.3.5 Prepare the patterns, if applicable	
5.4 Install the insulation	5.4.1 Place pre-cut pieces of insulation 5.4.2 Observe the installation sequence: sides, bottom, top	For flexible insulation, place the top of the insulation, glue it with aluminum tape, roll the bottom down, and smooth the aluminum tape.
5.5 Fasten the retaining washers		Carefully fasten the washers with the fingertips, without pushing them in too much.
5.6 Cut excess anchors	5.6.1 Place cutting pliers on the retaining washer 5.6.2 Cut the anchor 5.6.3 Recover the cut part	
5.7 Seal the joints, if applicable	For flexible insulation tubes (Armaflex) 5.7.1 Apply contact glue on both parts of the joint 5.7.2 Observe the setting time 5.7.3 Connect both sides together For cellular glass and urethane 5.7.4 Apply sealant on the joints	

Task 5 INSTALL RIGID OR SEMI-RIGID INSULATION ON AIR DUCTS		
Operations	Sub-Operations	Clarifications
5.8 Clean the work area and store the equipment	5.8.1 Pick up the debris 5.8.2 Store materials and equipment 5.8.3 Store your personal tools	
Task 6 APPLY SPRAYED AND BLOWN INSULATION (piping, air ducts, fixtures, walls)		
Operations	Sub-Operations	Clarifications
6.1 Thaw the pipes or fixture, if applicable	6.1.1 Ensure deactivation 6.1.2 Heat the pipes (torch) 6.1.3 Use a de-icing product	
6.2 Dry and clean, if applicable	6.2.1 Remove all traces of: - water - dust - rust - oil - residues - etc. 6.2.2 Ventilate the room to reduce humidity, if applicable	
6.3 Apply primer, if applicable	6.3.1 Wash with mineral spirit 6.3.2 Allow to dry 6.3.3 Apply the primer 6.3.4 Ventilate, if applicable (poorly ventilated areas)	
6.4 Apply the insulation	6.4.1 Spray the insulation on the base material	To apply foam thermal insulation, the insulator must take into account the following CAN/ULC ¹⁹ standards: <ul style="list-style-type: none"> ▪ CAN/ULC S705.1-01: Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, "Material Specification"; ▪ CAN/ULC S705.2-05: Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, "Application."
6.5 Make the insulation surface uniform	6.5.1 Measure the thickness of the applied insulation (thickness gauge) 6.5.2 Consult minimum and maximum thickness standards 6.5.3 Add or remove insulation (cutting tool)	
6.6 Clean the work area and store the equipment	6.6.1 Pick up the debris 6.6.2 Store materials and equipment 6.6.3 Store your personal tools	

19. Underwriter Laboratories of Canada.

TASK 7 INSTALL INSULATION SANDWICH PANELS ON FIXTURES		
Operations	Sub-Operations	Clarifications
7.1 Dry and clean the fixture, if applicable	7.1.1 Remove all traces of: - water - dust - rust - oil - residues - etc. 7.1.2 Ventilate the room to reduce humidity, if applicable	
7.2 Install anchors and fasteners	7.2.1 Install anchors on the fixture's sides and top 7.2.2 Apply stainless steel strips 7.2.3 Calculate the distance between each anchor, according to received instructions	
7.3 Install insulation sandwich panels	7.3.1 Handle the panels with care 7.3.2 Secure the panel on the support for lifting it with the crane 7.3.3 Measure and cut the necessary panels 7.3.4 Arrange the sandwich panels	
7.4 Tighten and seal the joints	7.4.1 Close the joints with pliers 7.4.2 Rivet the areas where sheet metal has been cut 7.4.3 Plan for expansion joints 7.4.4 Seal and finish around the cuts	Joint tightening is done manually (using pliers) or using a machine designed for that purpose.
7.5 Clean the work area and store the equipment	7.5.1 Pick up the debris 7.5.2 Store materials and equipment 7.5.3 Store your personal tools	
TASK 8 INSTALL A FLEXIBLE PROTECTIVE FINISH (piping, air ducts, fixtures, walls)		
Operations	Sub-Operations	Clarifications
8.1 Install a wire mesh, if applicable	8.1.1 Cut the mesh to the desired shape and dimensions 8.1.2 Fasten the wire mesh with mechanical fasteners	
8.2 Install angle irons, if applicable	8.2.1 Position the angle irons on the insulation 8.2.2 Fasten the angle irons with aluminum tape or an adhesive	
8.3 Cement, if applicable	8.3.1 Prepare the cement mix 8.3.2 Apply the cement with a trowel 8.3.3 Observe the setting time	

TASK 8 INSTALL A FLEXIBLE PROTECTIVE FINISH (piping, air ducts, fixtures, walls)		
<i>Operations</i>	<i>Sub-Operations</i>	<i>Clarifications</i>
8.4 Measure and cut the protective finish	8.4.1 Measure while taking overlap into account 8.4.2 Cut the cotton according to the desired shape and dimensions	
8.5 Apply the coating		This is a flame retardant coating applied with a brush or roller; this coating acts as a glue to secure the protective finish.
8.6 Install the protective finish	8.6.1 Place the cotton while stretching it 8.6.2 Make sure there are no folds	
8.7 Reapply the coating		This second flame retardant coating ensures a smoother finish.
8.8 Clean the work area and store the equipment		
TASK 9 INSTALL WATERPROOF MEMBRANES (piping, air ducts, fixtures, walls)		
<i>Operations</i>	<i>Sub-Operations</i>	<i>Clarifications</i>
9.1 Measure and cut the membrane	9.1.1 Measure while taking into account the overlap 9.1.2 Cut the membrane to the desired shape and dimensions	
9.2 Install the membrane	9.2.1 Check the prevailing winds 9.2.2 Begin the installation at the bottom 9.2.3 Continue the installation on the sides 9.2.4 Complete the installation on the top	For this operation, it is particularly important to ensure that the installed membrane is waterproof.
9.3 Heat the joints		The joints are heated with a torch or a dryer.
9.4 Install valves, if applicable	9.4.1 Make openings in the membrane 9.4.2 Insert valves in the openings 9.4.3 Seal the contour of the valves	The valves' purpose is to allow air exhaust if an air duct is poorly sealed.
9.5 Clean the work area and store the equipment	9.5.1 Pick up the debris 9.5.2 Store materials and equipment 9.5.3 Store your personal tools	

TASK 10 MAKE PARTS OF A RIGID OR SEMI-RIGID PROTECTIVE FINISH FOR CLAMPS, VALVES, FLASHING, ETC.

<i>Operations</i>	<i>Sub-Operations</i>	<i>Clarifications</i>
10.1 Take required measurements	10.1.1 Determine the parts to be built 10.1.2 Note the height, width, depth, diameter and circumference	Parts may be made of sheet metal, fibreglass, etc.
10.2 Make a pattern	10.2.1 Transcribe on the cladding the measurements that were taken 10.2.2 Divide the measurements as necessary to form a "T", a "Y", an elbow, a tank end, etc.	The pattern will serve to reproduce several identical parts.
10.3 Trace the parts	10.3.1 Copy the pattern 10.3.2 Indicate the reference points, if applicable	Tracing is done using a pointer, hammer and marker.
10.4 Cut the parts		The cladding must be cut carefully, with tin snips or electric shears, depending on the thickness and the type of cladding.
10.5 Shape the parts		Different machine tools may be used to shape the parts – for example, a roller, folder, beader-crimper, etc.
10.6 Assemble the parts		Most of the parts built must then be assembled. This mechanical assembly may be done by screwing, folding, etc.
10.7 Identify the parts		Part numbers must be indicated inside the parts, according to where they will be installed.
10.8 Clean the work area and store the equipment	10.8.1 Pick up the debris 10.8.2 Store materials and equipment 10.8.3 Store your personal tools	

TASK 11 INSTALL A RIGID OR SEMI-RIGID PROTECTIVE FINISH (piping, air ducts, fixtures, walls)

<i>Operations</i>	<i>Sub-Operations</i>	<i>Clarifications</i>
11.1 Measure and cut the protective finish	11.1.1 Take measurements and transcribe them on the finish 11.1.2 Trace and cut the finish 11.1.3 Adjust the dimensions of pre-cut parts	
11.2 Install the protective finish	11.2.1 Position the protective finish	
11.3 Fasten the protective finish (strips and ties, screws or rivets, glue, etc.)		It is important to ensure that the protective finish is solidly fastened. To that effect, the insulator will use strips, ties, screws, rivets, glue, etc.

TASK 11 INSTALL A RIGID OR SEMI-RIGID PROTECTIVE FINISH (piping, air ducts, fixtures, walls)		
<i>Operations</i>	<i>Sub-Operations</i>	<i>Clarifications</i>
11.4 Seal the joints, if applicable	11.4.1 Apply silicone on the following joints: - longitudinal - circular - around the cuts.	
11.5 Clean the work area and store the equipment	11.5.1 Pick up the debris 11.5.2 Store materials and equipment 11.5.3 Store your personal tools	
TASK 12 INSTALL FIRE STOP SYSTEMS		
<i>Operations</i>	<i>Sub-Operations</i>	<i>Clarifications</i>
12.1 Clean the opening	12.1.1 Check if there is waste in the opening 12.1.2 Remove the waste, if applicable	
12.2 If applicable, install supports, rails, anchors, etc.		
12.3 Measure and cut the fire stop system	12.3.1 Measure and cut the material according to the frame already installed 12.3.2 Make necessary cuts for wires and pipes passing through the system	
12.4 Install the fire stop system	12.4.1 Position the fire stop system 12.4.2 Apply sealant	
12.5 Fill out a material safety data sheet, if applicable	12.5.1 Write the system's installation date 12.5.2 Write the type of system installed	The material safety data sheet is generally filled out by a foreman. However, when none is present in the work area, the insulator must then fill out the sheet himself.
12.6 Clean the work area and store the equipment	12.6.1 Pick up the debris 12.6.2 Store materials and equipment 12.6.3 Store your personal tools	

TASK 13 REMOVE INSULATION MATERIALS CONTAINING ASBESTOS OR MOULD

Insulators may have to remove any kind of insulation product, but asbestos requires the strictest precautions and procedures. Although it is difficult to evaluate the number of buildings still insulated with this material, the participants mentioned that they will still be removing it for several years.

However, it should be pointed out that construction industry insulators remove insulation products (asbestos and others) only to replace them with new ones. Some companies specialize exclusively in removing asbestos, but their mandates are not considered construction work.

Not all asbestos removal work has the same level of risk. The operations and sub-operations listed below are all performed if the risk is high; otherwise, some are not performed.

Lastly, although removing products containing mould is not as supervised as removing asbestos, companies tend to use a very similar procedure, so task 13 covers both types of situations.

Operations	Sub-Operations	Clarifications
13.1 Build necessary enclosures	13.1.1 Install the structures 13.1.2 Apply protective plastic inside the structure (double layer on the floor) 13.1.3 Install the showers 13.1.4 Calculate the air volume to be treated 13.1.5 Install a negative pressure ventilation system, if applicable 13.1.6 Install signs regarding asbestos	Enclosures must be installed for: - the work area - the decontamination area - the shower room - the cloakroom for street clothes. In some cases, for example to remove insulation materials from piping, insulators use glove bags instead of building enclosures ²⁰ .
13.2 Undo strips, ties, anchors, etc.	13.2.1 Cut the ties 13.2.2 Wet the surfaces	
13.3 Remove the protective finish	13.3.1 Cut the finish 13.3.2 Wet the surfaces 13.3.3 Remove the finish	
13.4 Remove the insulation	13.4.1 Wet the insulation on all its faces 13.4.2 Remove the insulation gradually, while continuing to wet it	
13.5 Pick up the debris	13.5.1 Pick up the debris meticulously 13.5.2 Wet the debris	
13.6 Put the debris in the recommended bags	13.6.1 Place the debris in pre-identified bags 13.6.2 Place the bags in another bag of the same type	The bags are six-thousandth of an inch thick.
13.7 Proceed with the final cleaning	13.7.1 Pass a vacuum cleaner equipped with a HEPA filter ²¹ on all enclosure walls	Some surfaces may also be cleaned with a rag.
13.8 Apply sealant		This sealant serves to encapsulate all eventual asbestos residues on surfaces.

20. For more details on work using glove bags, consult Schedule 3 of the document *Amiante – guide de prévention*, 2012 edition, published by the Joint Sector-Based Construction Association on Occupational Health and Safety.

21. This is a high efficiency particulate air filter.

TASK 13 REMOVE INSULATION MATERIALS CONTAINING ASBESTOS OR MOULD		
Operations	Sub-Operations	Clarifications
13.9 Disassemble the enclosures	13.9.1 Remove the cloths 13.9.2 Disassemble the structures	
13.10 Clean the work area and store the equipment	13.10.1 Pick up the debris 13.10.2 Store the materials 13.10.3 Clean and store the equipment 13.10.4 Store your personal tools	

2.3 ACHIEVEMENT CONDITIONS

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

Table 2.3 Achievement Conditions

ACHIEVEMENT CONDITIONS
<p>Work areas²²</p> <p>The places where insulators work depend on the type of work they do. They work indoors about half the time; they can then experience temperatures that are very hot (e.g.: paper mills, steam in refineries) or very cold (e.g.: in cold rooms). When working outdoors, insulators may experience harsh weather conditions. Lastly, insulators have to work at heights and in enclosed or restricted spaces.</p>
<p>Collaboration and supervision</p> <p>Insulators work alone or in teams, depending on the work to be done. In the industrial sector and the institutional and commercial sector, teamwork is the rule, generally in teams of two. As for erecting scaffolding, teams of three are most efficient. In the commercial sector, insulators often work alone, although they must maintain visual contact with a co-worker or foreman, as a safety measure.</p> <p>Lastly, whatever the sector and type of work, insulators must demonstrate autonomy.</p>

22. Non-exhaustive list.

ACHIEVEMENT CONDITIONS

Instructions and references

Insulators receive verbal instructions from their foreman. They can refer to documents, for example certain standards, material safety data sheets, descriptive sheets provided by material manufacturers, etc. In addition, in the absence of a foreman in the work area, at times insulators have to read necessary plans for doing the work. They can also use the *Best Practices Guide* published by the Thermal Insulation Association of Canada (TIAC).

Stress factors

The main stress factors are:

- tight deadlines, for example when there are production stoppages;
- ambient noise, particularly in the industrial sector;
- etc.

Raw materials, tools and equipment

Insulators use various types of materials. The main ones are:

Surface protection materials

- Plastic (polyethylene) and all other cloths, safety nets, duct tape, masking tape, etc.

Materials commonly used for insulation

- Aluminum, stainless steel, galvanized steel, PVC, elastomer, fibreglass, rock fibre, ceramic fibre, mesh, calcium silicate, silica aerogel, etc.

Joint sealing materials

- Silicone
- Coating for cellular glass
- Coating for urethane
- Aluminum tape
- Adhesive strips

Finishing materials

- Flame retardant or waterproof coatings
- Flame retardant cotton
- Claddings made of PVC, aluminum, stainless steel, galvanized steel, etc.

In addition, Annex 1 of this report contains a detailed list of material resources used by insulators in practicing their trade.

Health and safety hazards

Annex 2 of this report contains a detailed list of the main hazards related to the tasks of the insulator trade, as well as applicable preventive measures.

2.4 PERFORMANCE CRITERIA

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

To draw the list of criteria for each task, the participants worked in teams of two or three. Thus, certain criteria may at times be as relevant to other tasks than those for which they are mentioned, but the team wanted to emphasize certain criteria rather than others.

Table 2.4 Performance Criteria

TASK 1	PREPARE THE WORK
Performance Criteria	
<ul style="list-style-type: none"> - Observance of health and safety rules - Observance of instructions and regulations specific to the client - Diligent participation in safety meetings - Carefully verifying the availability and condition of materials, tools and equipment - Observance of tool and equipment capacities - Efficient layout of materials, tools and equipment - Working methodically - Correct assessment of hazards and of safety measures to put in place - Determining an appropriate safety perimeter - Effective protection of nearby surfaces - Precisely recording the tasks to be performed - Harmonious and effective teamwork - Good coordination with workers in other trades 	
TASK 2	ERECT SCAFFOLDING
Performance Criteria	
<ul style="list-style-type: none"> - Observance of health and safety rules - Observance of instructions and regulations specific to the client - Appropriate levelling of the ground - Careful verification of terrain conditions - Solid base - Observance of bearing capacities - Quick and effective reaction to unforeseen events - Appropriate anchoring of the scaffolding - Observance of the scaffolding plan, if applicable - Observance of the assembly sequence and work methods - Cleared work area during the work - Clean premises after the work - Harmonious and effective teamwork - Good coordination with workers in other trades 	

TASK 3 INSTALL RIGID OR SEMI-RIGID INSULATION ON PIPING**Performance Criteria**

- Observance of health and safety rules
- Observance of instructions and regulations specific to the client
- Observance of the work sequence
- Using appropriate tools for the materials
- Quick and effective reaction to unforeseen events
- Exact positioning and solid fastening of the insulation
- Appropriate quantity of insulation
- Work quality
- Cleared work area during the work
- Clean work area after the work
- Harmonious and effective teamwork
- Good coordination with workers in other trades

TASK 4 INSTALL RIGID OR SEMI-RIGID INSULATION ON FIXTURES AND WALLS**Performance Criteria**

- Observance of health and safety rules
- Observance of instructions and regulations specific to the client
- Observance of the work sequence
- Appropriate preparation of surfaces
- Precise cuts
- Correct alignment of anchors
- Exact positioning and solid fastening of the insulation
- Uniform insulation and joints
- Appropriate quantity and positioning of insulation to prevent heat loss
- Economy of materials
- No open joints
- Cleared work area during the work
- Clean work area after the work
- Harmonious and effective teamwork
- Good coordination with workers in other trades

TASK 5 INSTALL RIGID OR SEMI-RIGID INSULATION ON AIR DUCTS**Performance Criteria**

- Observance of health and safety rules
- Observance of instructions and regulations specific to the client
- Observance of the work sequence
- Appropriate preparation of surfaces
- Precise cuts
- Exact positioning and solid fastening of the insulation
- Uniform insulation and joints
- Appropriate quantity of insulation
- Economy of materials
- Cleared work area during the work
- Clean work area after the work
- Harmonious and effective teamwork
- Good coordination with workers in other trades

TASK 6 APPLY SPRAYED AND BLOWN INSULATION (PIPING, AIR DUCTS, FIXTURES, WALLS)**Performance Criteria**

- Observance of health and safety rules
- Observance of instructions and regulations specific to the client
- Carefully checking the ambient temperature, humidity level, wind velocity, substrate temperature, etc.
- Meeting the standards
- Observance of the work sequence
- No damage to nearby surfaces
- Uniform insulation
- Cleared work area during the work
- Clean work area after the work
- Harmonious and effective teamwork
- Good coordination with workers in other trades

TASK 7 INSTALL INSULATION SANDWICH PANELS ON FIXTURES**Performance Criteria**

- Observance of health and safety rules
- Observance of instructions and regulations specific to the client
- Appropriate use of tools and equipment
- Observance of the work sequence
- Precise measurements and cuts
- Economy of materials
- Exact positioning of panels
- Solid fastening of panels
- Uniform insulation
- Using appropriate tools for the materials
- Quick and effective reaction to unforeseen events
- Cleared work area during the work
- Clean work area after the work
- Harmonious and effective teamwork
- Good coordination with workers in other trades

TASK 8 INSTALL A FLEXIBLE PROTECTIVE FINISH (PIPING, AIR DUCTS, FIXTURES, WALLS)**Performance Criteria**

- Observance of health and safety rules
- Observance of instructions and regulations specific to the client
- Appropriate use of tools and equipment
- Observance of the work sequence
- Mesh and cement covering well the surface to be insulated
- Precise measurements and cuts
- Economy of materials
- Protective finish corresponding to the shape of the component to be covered
- Exact positioning and solid fastening of the protective finish
- Uniformity of the final flame retardant layer
- Using appropriate tools for the materials
- Quick and effective reaction to unforeseen events
- Cleared work area during the work
- Clean work area after the work
- Harmonious and effective teamwork
- Good coordination with workers in other trades

TASK 9 INSTALL WATERPROOF MEMBRANES (PIPING, AIR DUCTS, FIXTURES, WALLS)**Performance Criteria**

- Observance of health and safety rules
- Observance of instructions and regulations specific to the client
- Taking prevailing winds into consideration
- Appropriate use of tools and equipment
- Observance of the work sequence
- Precise measurements and cuts
- Economy of materials
- Exact positioning and solid fastening of the membrane
- Clean, sealed and uniform joints
- Careful installation of valves
- Smooth and waterproof membrane
- Using appropriate tools for the materials
- Quick and effective reaction to unforeseen events
- Cleared work area during the work
- Clean work area after the work
- Harmonious and effective teamwork
- Good coordination with workers in other trades

TASK 10 MAKE PARTS FOR A RIGID OR SEMI-RIGID PROTECTIVE FINISH FOR CLAMPS, VALVES, FLASHING, ETC.**Performance Criteria**

- Observance of health and safety rules
- Observance of instructions and regulations specific to the client
- Effective use of reference works
- Using appropriate tools for the materials
- Observance of the work sequence
- Precise measurements and cuts
- Economy of materials
- Consistently making identical parts
- Cleared work area during the work
- Clean work area after the work

TASK 11 INSTALL A RIGID OR SEMI-RIGID PROTECTIVE FINISH (PIPING, AIR DUCTS, FIXTURES, WALLS)**Performance Criteria**

- Observance of health and safety rules
- Observance of instructions and regulations specific to the client
- Correct use of patterns
- Taking prevailing winds into consideration
- Appropriate use of tools and equipment
- Observance of the work sequence
- Precise measurements and cuts
- Economy of materials
- Exact positioning and solid fastening of the finish
- Clean, sealed and uniform joints
- Waterproof finish
- Using appropriate tools for the materials
- Quick and effective reaction to unforeseen events
- Cleared work area during the work
- Clean work area after the work
- Harmonious and effective teamwork
- Good coordination with workers in other trades

TASK 12 INSTALL FIRE STOP SYSTEMS**Performance Criteria**

- Observance of health and safety rules
- Observance of instructions and regulations specific to the client
- Appropriate use of tools and equipment
- Observance of the work sequence
- Precise measurements and cuts
- Economy of materials
- Carefully cleaning the opening
- Carefully handling the system
- Exact positioning and solid fastening of the system
- Using appropriate tools for the materials
- Quick and effective reaction to unforeseen events
- Complete and precise material safety data sheet
- Cleared work area during the work
- Clean work area after the work
- Harmonious and effective teamwork
- Good coordination with workers in other trades

TASK 13 REMOVE INSULATION MATERIALS CONTAINING ASBESTOS OR MOULD**Performance Criteria**

- Observance of health and safety rules
- Observance of specific rules for handling asbestos
- Observance of instructions and regulations specific to the client
- Regularly checking the air pressure during the work
- Complete removal of insulation
- Carefully planning the work sequence
- Appropriate use of tools and equipment
- Observance of the work sequence
- Cleared work area during the work
- Clean work area after the work
- Harmonious and effective teamwork
- Good coordination with workers in other trades

2.5 FUNCTIONS

Functions are a set of related tasks. That set may be defined by the work's results or by a sequence of steps.

For the insulator trade, five functions appear to be involved:

- a function related to **work preparation** and grouping the following tasks:
 - prepare the work;
 - erect scaffolding;
 - make parts of rigid or semi-rigid protective finish (for clamps, valves, flashing, etc.);
- a function related to **insulation installation** and grouping the following tasks:
 - install rigid or semi-rigid insulation on piping;
 - install rigid or semi-rigid insulation on fixtures²³ and walls;
 - install rigid or semi-rigid insulation on air ducts;
 - apply sprayed and blown insulation (piping, air ducts, fixtures, walls);
 - install insulation sandwich panels on fixtures;
- a function related to **cladding installation on the insulation** and grouping the following tasks:
 - install a flexible protective finish (piping, air ducts, fixtures, walls);
 - install waterproof membranes (piping, air ducts, fixtures, walls);
 - install a rigid or semi-rigid (PVC) protective finish (piping, air ducts, fixtures);
- a function related to **the installation of fire stop systems** and involving the following task:
 - install fire stop systems;
- a function related to **disassembly** and involving the following task:
 - remove insulation materials containing asbestos or mould.

23. The term "fixture" means any equipment to which pipes or insulated conduits are attached and that requires thermal, acoustic or flame retardant insulation.

3. QUANTITATIVE DATA ON TASKS

The data presented in the tables below are averages of the information mentioned by the participants during the workshop.

3.1 OCCURRENCE

Occurrence data concern the percentage of insulators²⁴ who perform each task. The data account not only for the time allocation of the workshop participants, but also for the latter's estimate of the time allocation of all the insulators who work with them. This exercise referred to the last 10 years.

Table 3.1 Task Occurrence

	Task	Occurrence
1	Prepare the work	59.4%
2	Erect scaffolding	36.9%
3	Install rigid or semi-rigid insulation on piping	95.0%
4	Install rigid or semi-rigid insulation on fixtures and walls	87.0%
5	Install rigid or semi-rigid insulation on air ducts	72.0%
6	Apply sprayed and blown insulation	8.0%
7	Install insulation sandwich panels on fixtures	10.0%
8	Install a flexible protective finish	31.0%
9	Install waterproof membranes	54.7%
10	Make parts of a rigid or semi-rigid protective finish	49.8%
11	Install a rigid or semi-rigid protective finish	74.0%
12	Install fire stop systems	19.0%
13	Remove insulation materials containing asbestos or mould	44.5%

24. Including apprentices.

3.2 WORK TIME

Work time, also expressed in percentages, represents the average time allocated to each task by the participants, in the last 10 years.

Table 3.2 Work Time Allocated to Each Task

Task	Work Time
1 Prepare the work	12.0%
2 Erect scaffolding	11.9%
3 Install rigid or semi-rigid insulation on piping	14.1%
4 Install rigid or semi-rigid insulation on fixtures and walls	9.4%
5 Install rigid or semi-rigid insulation on air ducts	8.5%
6 Apply sprayed and blown insulation	1.5%
7 Install insulation sandwich panels on fixtures	1.7%
8 Install a flexible protective finish	4.0%
9 Install waterproof membranes	4.9%
10 Make parts for a rigid or semi-rigid protective finish	11.5%
11 Install a rigid or semi-rigid protective finish	12.1%
12 Install fire stop systems	1.3%
13 Remove insulation materials containing asbestos or mould	7.11%
	100.0%

In examining Table 3.2, we observe that:

- the installation of rigid or semi-rigid insulation on piping (task 3: 14%) occupies the highest percentage of insulators' work time. But it is closely followed by the installation of a rigid or semi-rigid protective finish (task 11: 12.1%), work preparation (task 1: 12.0%) and the erection of scaffolding (task 2: 11.5%);
- work preparation tasks, i.e., tasks 1 and 2, occupy almost one-quarter of insulators' work time (23.9%);
- five tasks occupy more than 10% of insulators' work time, i.e., tasks 1, 2, 3, 10 and 11. Taken together, those tasks occupy more than half of the hours worked (61.6%);
- tasks 6, 7 and 12 occupy the least time of the persons consulted, i.e., less than 2% respectively.

Moreover, several tasks are never performed by some of the participants:

- one person never performs task 2;
- one person never performs task 5;
- nine persons never perform task 6;
- seven persons never perform task 7;
- three persons never perform task 8;
- three persons never perform task 9;
- five persons never perform task 12;
- two persons never perform task 13.

3.3 IMPORTANCE AND DIFFICULTY OF TASKS

The **importance** of a task is estimated according to the more or less harmful consequences of performing a task poorly or not at all. The importance is assessed according to the following scale:

1. Not important at all: A less successful execution of the task has no consequences on the quality of the result, the costs, health and safety, etc.;
2. Not very important: Poor execution of the task could lead to minimal costs, a result of lesser quality, minor injury or accident hazards, etc.;
3. Important: Poor execution of the task could lead to an unsatisfactory result, substantial additional costs, injuries, accidents, etc.;
4. Very important: Poor execution of the task could lead to an unacceptable result and have very major consequences in terms of costs, safety, etc.

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

1. Very easy: The task involves little risk of error; it requires no notable physical or mental effort. Performing the task is less difficult than average;
2. Easy: The task involves a few risks of error; it requires minimal physical or mental effort;
3. Difficult: The task involves many risks of error; it requires a good physical or mental effort. Performing the task is more difficult than average;
4. Very difficult: The task involves a high risk of error; it requires substantial physical or mental effort. The task is among the most difficult in the trade.

Table 3.3 Importance and Difficulty of Tasks

	Task	Importance	Difficulty
1	Prepare the work	3.9	2.0
2	Erect scaffolding	3.7	2.8
3	Install rigid or semi-rigid insulation on piping	3.2	1.9
4	Install rigid or semi-rigid insulation on fixtures and walls	3.1	2.1
5	Install rigid or semi-rigid insulation on air ducts	3.1	2.1
6	Apply sprayed and blown insulation	3.5	3.3
7	Install insulation sandwich panels on fixtures	3.2	2.6
8	Install a flexible protective finish	3.3	2.3
9	Install waterproof membranes	3.3	2.4
10	Make parts for a rigid or semi-rigid protective finish	4.0	3.2
11	Install a rigid or semi-rigid protective finish	3.5	2.6
12	Install fire stop systems	3.8	2.4
13	Remove insulation materials containing asbestos or mould	3.8	3.2

4. KNOWLEDGE, SKILLS AND ATTITUDES

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

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

4.1 KNOWLEDGE

Communication and teamwork

Given that insulators often work in teams, it is essential that they be able to establish and maintain good relations with their co-workers and supervisors, and with workers in other trades. Insulators must also know the basic terminology used on construction sites and common to all trades.

Making parts

Making parts for a rigid or semi-rigid protective finish is among the tasks of insulators, so the latter must know the basic rules for developing parts and have to calculate dimensions, produce patterns, trace and cut parts of various shapes and materials, etc. They must also know how to use necessary equipment for making parts (e.g.: brake).

Lifting

Although the work of insulators only occasionally requires lifting, they need good knowledge of the slinging methods of loads to be lifted and moved by cranes. Insulators must direct the lifting and moving of those loads; knowledge of lifting signals is thus essential, and of the basic principles of radio communications.

Mathematics

Mathematical applications – mainly the four basic operations, the rule of three, the basics of geometry, etc. – are useful to insulators for determining, for example, the diameter and circumference of piping to be insulated, the dimensions of surfaces to be insulated, the necessary quantities of insulation, etc. In addition, when applying sprayed or blown insulation, insulators must calculate the density of the products applied.

Materials

Knowledge of the properties and uses of the different types of insulation products they have to work with is an asset for insulators. In the case of asbestos products, insulators must know and be able to apply the precautions to be taken and the strict procedures to put in place²⁵.

Occupational health and safety

Insulators must know the occupational health and safety rules and standards of prevention. In some cases, they must know the specific measures to apply on certain construction sites and in certain companies²⁶. In such cases, they have to take training sessions specific to those construction sites or companies, and attend meetings in order to be informed about important measures to apply.

Given that insulators use a variety of products, knowledge of the Workplace Hazardous Materials Information System (WHMIS) is very important. That knowledge informs insulators about the precautions for using and transporting the products, and about the measures to take in the event of spillage. Lastly, insulators must know and apply the rules for working in enclosed spaces and at heights.

25. Insulators who have to handle asbestos products are obliged beforehand to take training offered by the Joint Sector-Based Construction Association on Occupational Health and Safety (ASP-Construction).

26. Some companies have internal health and safety policies that exceed legal requirements.

4.2 SKILLS

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

Cognitive skills

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

- problem-solving, to cope with unforeseen events, adapt to particular situations, etc.;
- planning, for example to determine the steps to take in doing certain types of work.

Motor skills

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

- dexterity;
- flexibility, to do work requiring awkward postures.

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 insulators need are the following:

- perception of abnormal noises, to detect construction site hazards;
- good vision, for example to distinguish between certain types of materials;
- perception of abnormal odours, for example to detect a gas leak or an expired product.

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 that insulators need are the following:

- motivation and interest in the work;
- resourcefulness;
- patience, calm and method;
- punctuality and diligence;
- teamwork ability;
- workmanship and pride in work well done.

5. TRAINING SUGGESTIONS

Initial training

The participants made suggestions about various aspects of the initial training; they mentioned that:

- training is important for practicing the trade, and ideally there should no longer be any insulators beginning to practice the trade without having received training;
- the training requirements for apprentices who gain access to the trade through labour-pool openings should be tightened and increased;
- construction site tours would be important to familiarize students with the actual work environment.

Continuous training and professional development

Regarding professional development, the participants suggest the following:

- application of sprayed insulation;
- new materials (e.g. sandwich panels, Roxul wool);
- parts development and pattern production;
- application of protective finishes;
- scaffolding erection;
- asbestos removal;
- teamwork;
- reading plans (particularly for workers aspiring to supervisory positions).

Moreover, the participants suggest that more professional development activities should be organized in the regions, outside large urban areas.

Annexes

Raw Materials, Tools and Equipment

Lists of raw materials, tools and equipment originating from the *National Occupational Analysis of the Insulator Trade* (Red Seal) were presented to the participants during the workshop. The following pages contain, for each task, the list of raw materials, tools and equipment validated by the participants.

Shaded boxes indicate items that are **not** used.

Table A.1 Raw Materials, Tools and Equipment

	Prepare the work	Erect scaffolding	Install rigid or semi-rigid insulation on piping	Install rigid or semi-rigid insulation on fixtures and walls	Install rigid or semi-rigid insulation on air ducts	Apply sprayed and blown insulation	Install insulation sandwich panels on fixtures	Install a flexible protective finish	Install waterproof membranes	Make parts for a rigid or semi-rigid protective finish	Install a rigid or semi-rigid protective finish	Install fire stop systems	Remove insulation materials containing asbestos or mould
Hand Tools													
knife sharpener													
brooms													
rubber band													
bungee cords													
crowbar													
clamps													
wire brush													
chisels													
shears													
tin snips													
aviation snips (M1, M2, M3)													
scissors													
¾ in. wrench													
monkey wrench													
utility knife													
knives and sheaths													
scrapers													
thickness gauges													
easy edgers													

	Prepare the work	Erect scaffolding	Install rigid or semi-rigid insulation on piping	Install rigid or semi-rigid insulation on fixtures and walls	Install rigid or semi-rigid insulation on air ducts	Apply sprayed and blown insulation	Install insulation sandwich panels on fixtures	Install a flexible protective finish	Install waterproof membranes	Make parts for a rigid or semi-rigid protective finish	Install a rigid or semi-rigid protective finish	Install fire stop systems	Remove insulation materials containing asbestos or mould
combination machines (beader/crimper)													
hammers													
mirror													
levels													
shovels													
paint brushes													
lagging brushes													
pliers													
end nippers													
hog ring pliers/C-ring pliers													
caulking guns													
foam guns													
rivet guns													
staple guns													
flare staple guns													
brakes													
scratch awls													
tool pouches													
dust pan													
rasps													
rakes													
rollers													
paint rollers													
glove bags													
tie-down straps													
saws (keyhole and hand)													
band tensioners													
thermometers													
screwdrivers													
trowels (pointer and flat)													
water hose													

	Prepare the work	Erect scaffolding	Install rigid or semi-rigid insulation on piping	Install rigid or semi-rigid insulation on fixtures and walls	Install rigid or semi-rigid insulation on air ducts	Apply sprayed and blown insulation	Install insulation sandwich panels on fixtures	Install a flexible protective finish	Install waterproof membranes	Make parts for a rigid or semi-rigid protective finish	Install a rigid or semi-rigid protective finish	Install fire stop systems	Remove insulation materials containing asbestos or mould
Power Tools													
negative air machines													
high efficiency HEPA vacuum													
portable light													
¾ in. cable													
blow torches													
foot operated shears (guillotine)													
electric shears													
notchers													
nibblers													
sewing machines													
band cutting machines													
safety edge machines													
lock formers													
electric combination machines													
stud welders													
mixers													
grinders													
power-actuated tools													
pneumatic tools													
drills (electric and cordless)													
stud guns													
brake													
8 in. pulley													
pump sprayers													
extension cords													
grinding machine													
slitters													
electric rollers													
mitre saws													

	Prepare the work	Erect scaffolding	Install rigid or semi-rigid insulation on piping	Install rigid or semi-rigid insulation on fixtures and walls	Install rigid or semi-rigid insulation on air ducts	Apply sprayed and blown insulation	Install insulation sandwich panels on fixtures	Install a flexible protective finish	Install waterproof membranes	Make parts for a rigid or semi-rigid protective finish	Install a rigid or semi-rigid protective finish	Install fire stop systems	Remove insulation materials containing asbestos or mould
band saws													
circular saws													
jig saws													
pin welders													
stud welders													
fan													
Layout Equipment													
adhesion test device													
analytic balance (density test)													
calculators													
segment charts													
compasses													
dividers													
trammels													
chalk lines													
crayons													
felt pens													
squares (carpenters', t-squares, tri-squares)													
clamps													
trammel points													
protractors													
circumference rules													
straight edges													
scale rulers													
tape measures													
Spray Equipment													
tip cleaners													
clamps													
hopper guns													
airless sprayers													
spray pumps													
sprayers													
hoses													

	Prepare the work	Erect scaffolding	Install rigid or semi-rigid insulation on piping	Install rigid or semi-rigid insulation on fixtures and walls	Install rigid or semi-rigid insulation on air ducts	Apply sprayed and blown insulation	Install insulation sandwich panels on fixtures	Install a flexible protective finish	Install waterproof membranes	Make parts for a rigid or semi-rigid protective finish	Install a rigid or semi-rigid protective finish	Install fire stop systems	Remove insulation materials containing asbestos or mould
Access Equipment													
scaffolding													
sky jack													
swing stages													
ladders													
6 ft., 8 ft., 10 ft. stepladders													
aerial lifts													
aerial platforms													
scissor lifts													
garage creepers													
Personal Protective Equipment (PPE) and Safety Equipment													
respirators													
safety boots													
hard hats													
acid suits													
disposable coveralls (whites)													
fire and chemical resistant coveralls													
disposable booties													
showers													
eye wash stations													
face shields													
fall arrest equipment (harness, safety snap, life line, etc.)													
fire extinguisher													
gloves													
reflective vests													
dust masks													
hearing protection													
eye protection (goggles, safety glasses)													
wristlets													
first aid kits													

MATRIX OF OCCUPATIONAL HEALTH AND SAFETY HAZARDS

Prepared by: Bernard Teasdale, Prevention Consultant
Commission de la santé et de la sécurité du travail

Table A.2 Occupational Health and Safety Hazards in the Insulator Trade

No.	Hazards	Effects on Health and Safety	Means of Prevention
1	Chemical hazards or dangers <ul style="list-style-type: none"> • Smoke inhalation, smoke, vapour, fog, dust • Contact with corrosive, toxic, etc. products • Asbestos, crystalline silica 	<ul style="list-style-type: none"> • Asbestosis, silicosis • Respiratory problems • Chemical burns • Dermatoses • Fires, explosions • Poisoning 	<ul style="list-style-type: none"> • Wearing an appropriate respirator for contaminants and the risk level • Wearing PPE (gloves, etc.) • Using and maintaining ventilation systems • Wearing work clothes • Using a vacuum cleaner equipped with a HEPA filter • Product substitution
2	Physical hazards or dangers <ul style="list-style-type: none"> • Electric shock (tools, equipment, etc.) • Noise • Cold, heat 	<ul style="list-style-type: none"> • Burns, electrification, electrocution • Deafness • Chilblains, heatstroke 	<ul style="list-style-type: none"> • Work method, etc. • Lockout procedure • Double insulation on tools • Appropriate extension cords in good condition • Observance of minimum approach distances prescribed by the safety code • PPE (earmuffs, etc.)
3	Biological hazards or dangers <ul style="list-style-type: none"> • Mould, pigeon droppings, etc. 	<ul style="list-style-type: none"> • Skin or respiratory infections, histoplasmosis, etc. 	<ul style="list-style-type: none"> • PPE (gloves, respirator, coveralls) • Personal hygiene (shower) • Vaccination • Decontamination of the premises

No.	Hazards	Effects on Health and Safety	Means of Prevention
4	Ergonomic hazards or dangers <ul style="list-style-type: none"> • Posture constraint, static • Repetitive movements • Handling • Task difficulty • Excessive efforts 	<ul style="list-style-type: none"> • Musculoskeletal lesions • Sprains, tendinitis • Hernias • Fatigue, discomfort, pain 	<ul style="list-style-type: none"> • Rotating tasks if possible • Purchasing tools limiting vibrations • Using handling equipment • Using handling techniques
5	Misc. safety hazards or dangers <ul style="list-style-type: none"> • Falling from a height • Falling objects • Slippery work surfaces • Tools (cuts, lacerations, etc.) 	<ul style="list-style-type: none"> • Collisions, internal injuries, fractures, death 	<ul style="list-style-type: none"> • Work method • Appropriate equipment (stepladder, ladder, mobile scaffolding, etc.) • Collective means of protection (guardrail, etc.) • PPE (harness, self-retracting lanyard, tethers, shock absorber, gloves, etc.) • Housekeeping
6	Psychosocial hazards or dangers <ul style="list-style-type: none"> • Time constraint, workload, etc. • Psychological harassment 	<ul style="list-style-type: none"> • Stress, sleep disorders, depression • Psychosomatic illnesses, etc. 	<ul style="list-style-type: none"> • OHS management, etc.

**COMMENTS AND APPROVAL OF THE INSULATOR
PROFESSIONAL SUBCOMMITTEE**

At the meeting held in Montreal on November 20, 2014, the Insulator Professional Subcommittee approved the occupational analysis report modified according to the following comments:

1. Page 13, Point 2.1 *Tasks and Operations, List of Tasks*

Replace Task 11, “Install a rigid or semi-rigid protective finish (piping, air ducts, fixtures)” with “Install a rigid or semi-rigid protective finish (piping, air ducts, fixtures, walls).”

2. Page 13, footnotes 14 and 15

Delete footnote 14, *The CCQ’s Direction de l’application des conventions collectives has published a notice that the insulator trade does not have exclusive jurisdiction over wall thermal insulation work.*

Delete footnote 15, *The CCQ’s Direction de l’application des conventions collectives has published a notice that the insulator trade does not have exclusive jurisdiction over wall acoustic insulation work.*

3. Page 17, Task 11, *Install a rigid or semi-rigid protective finish (piping, air ducts, fixtures)*

Replace Task 11, “Install a rigid or semi-rigid protective finish (piping, air ducts, fixtures)” with “Install a rigid or semi-rigid protective finish (piping, air ducts, fixtures, walls).”

4. Page 26, Task 11, *Install a rigid or semi-rigid protective finish (piping, air ducts, fixtures)*

Replace Task 11, “Install a rigid or semi-rigid protective finish (piping, air ducts, fixtures)” with “Install a rigid or semi-rigid protective finish (piping, air ducts, fixtures, walls).”

5. Page 34, Task 11, *Install a rigid or semi-rigid protective finish (piping, air ducts, fixtures)*

Replace Task 11, “Install a rigid or semi-rigid protective finish (piping, air ducts, fixtures)” with “Install a rigid or semi-rigid protective finish (piping, air ducts, fixtures, walls).”