

Heavy Equipment Operator

Occupational Analysis Report

November 2010



Commission
de la construction
du Québec

The purpose of this report is to describe as accurately as possible the heavy equipment operator 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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INTRODUCTION

In early 2009, the Commission de la construction du Québec's (CCQ) Direction de la formation professionnelle 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 Québec-France Understanding on the Mutual Recognition of Professional Qualifications.

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

The analysis of the heavy equipment operator trade belongs to this context³. Its purpose is to describe the 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 February 22, 23 and 24, 2010.

This occupational analysis aims to draw a portrait of the trade, including its tasks and their operations and sub-operations, its entry requirements, the skills and behaviours required, etc. The report reflects the consensus reached by a group of experienced heavy equipment operators. 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 and its four specialties.

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 (Sched. A, sec. 5), the term “heavy equipment operator” means:

[...] Anyone who operates equipment included in any of the following specialties:

1. **Specialty of the tractor operator:** Is part of the specialty of the tractor operator, the operation of wheel or track-mounted tractors with booms, buckets or attachments, “pépine” backdiggers, concrete breakers, bulldozers, scrapers, overhead and front-end loaders, trench-cutting machines, sideboom and endboom tractors, wheel-mounted tractors with excavating or forked attachment [*sic*].
2. **Specialty of the grader operator:** Is part of the specialty of the grader operator, the operation of graders.
3. **Specialty of the spreader operator:** Is part of the specialty of the spreader operator, the operation of grader-spreaders and asphalt or concrete spreaders.
4. **Specialty of the roller operator:** Is part of the specialty of the roller operator, the operation of rollers and power compactors.

The operators of equipment included in the 4 specialties mentioned above also operate the equipment when it is electrically-driven.

The heavy equipment operators attending the occupational analysis workshop estimate that this definition represents quite well the practice of the trade for persons who work on construction sites.

They specified that many of those machines now have electronic driving assistance systems (GPS and sensors, notably) for more precise work.

The participants also pointed out that operators can drive other types of machines than those mentioned in the definition. Following a discussion, they agreed to describe the work with the following machines:

- Loader-backhoe (backdigger)
- Front-end loader
- Bulldozer
- Grader
- Concrete or compacted concrete spreader
- Asphalt spreader
- Stabilizer sprayer
- Cold milling machine (leveller)
- Power compactor⁴

1.2 JOB TITLES

The job title used for describing the practice of the trade in this occupational analysis is “heavy equipment operator”, but often the operator is designated according to the machine he is operating: “grader operator”, “loader operator”, etc.

Job titles not to be confused with that of the heavy equipment operator trade are:

- shovel operator;
- dump truck or dumper;
- mining machine operator.

4. The participants also mentioned the trench excavator and the motorized transfer vehicle. However, those machines were not retained by the Heavy Equipment Operator Professional Subcommittee as among equipment most used in Quebec.

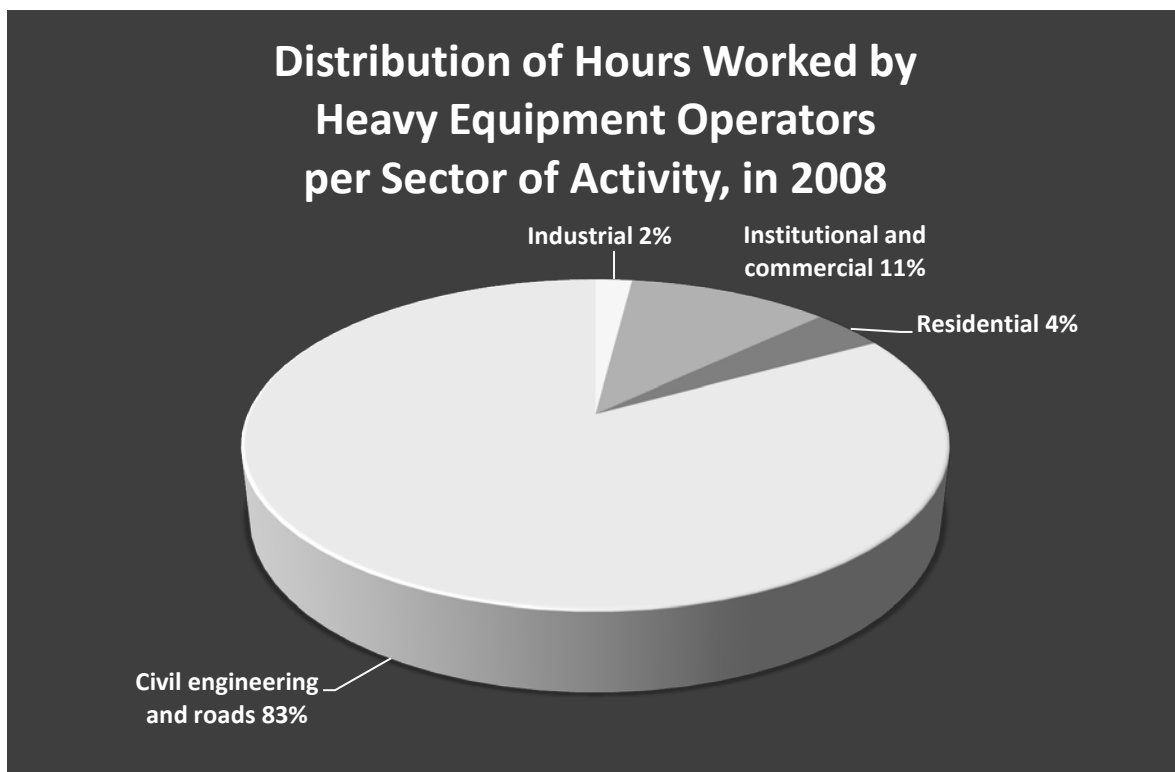
1.3 SECTORS OF ACTIVITY

Heavy equipment operators are active in all four sectors of the construction industry:

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

However, it should be noted that the civil engineering and roads sector accounted for almost 83% of the hours worked by heavy equipment operators in 2008⁵.

Table 1.1 Work Time Distribution per Sector



The heavy equipment operators who attended the workshop consider that this table corresponds well to their perception of the places where their trade is practiced.

5. Commission de la construction du Québec, *Carrières construction*, Québec City, 2009-2010 edition.

Asked about the sector of activity in which they work, all the heavy equipment operators in attendance, except one⁶, stated that they work mainly in the civil engineering and roads sector. Three participants work in the industrial and commercial 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;

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

1.5 LEGISLATION AND REGULATIONS

Les heavy equipment operators 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 for the construction industry;
- the National Building Code – Canada 2005 (NBC);
- the Quebec Building Code, Chapter I – "Building";
- the Act Respecting Occupational Health and Safety (R.S.Q., c. S-2.1);
- the Safety Code for the construction industry (R.Q. c. S-2.1, r.6).

6. That person works in the residential sector.

1.6 WORKING CONDITIONS

The following information provides an overview of the conditions and context of the work of heavy equipment operators, 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 for the construction industry sectors.

Salary

According to the collective agreements, a journeyman's daytime hourly wage in May 2009⁷ was as follows:

Salary	Industrial, Institutional and Commercial	Civil Engineering and Roads	Light Residential	Heavy Residential
Class AA	\$30.97	\$31.08	–	–
Class A	\$29.97	\$30.15	\$27.04	\$30.14
Class B	\$29.21	\$29.45	\$26.38	\$29.43

Vacations and time off

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

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

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.

7. The salary data are taken from the 2007-2010 sectoral collective agreements and from the document *Carrières construction*, 2009-2010 edition, published 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 heavy equipment operator trade involves particular physical requirements. The person must have:

- physical coordination;
- dexterity;
- physical endurance.

Stress factors

The work can be stressful. The sources of stress mentioned by the heavy equipment operators are:

- high precision requirements;
- working under pressure and with tight deadlines;
- the productivity required by the employer;
- the consequences of inadequate execution (ruptured conduit or broken electric wire, for example);
- interpersonal relations within a large team.

Work schedules

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

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

The schedule of heavy equipment operators is variable and often depends on weather conditions and cities' requirements for the daily opening and closing of construction sites.

The participants emphasized that persons working in excavation or in road construction or repair may work during the day, evening or night, with a schedule of 45 hours or more per week. In addition, work on large construction sites are sometimes organized in 10-hour shifts.

Finally, from July to October, the work schedule is often intensive.

Work autonomy and organization

Depending on the type of machine and the work to be done, heavy equipment operators work alone or in a team. Thus, operators driving a bulldozer or sprayer often work individually. Those who do asphaltting work may do so in teams of 16, and those who do infrastructure work in teams of 8 to 10.

Heavy equipment operators work under a foreman's supervision.

1.7 JOB MARKET ENTRY CONDITIONS

To obtain the competency certificate-apprentice in the trade (CCA), candidates must present to the CCQ the original version of an academic transcript or apprenticeship transcript attesting that they have passed the course of study for the DEP in operating construction machines⁸, 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 months⁹.

8. To apply, candidates must additionally: supply proof that they are at least 16 years of age; supply their social insurance number and their home address; present their certificate for having passed the course *Santé et sécurité générale sur les chantiers de construction*; pay the required fees; and designate the union association to which they wish to belong. Source: http://www.ccq.org/E_CertificatsCompetence/E02_Apprenti/E02_3_CandidatDiplome.aspx?sc_lang=en&profil=GrandPublic.

9. Source: 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 admit candidates without a diploma. Thus, candidates without a diploma¹⁰ are eligible to obtain a competency certificate-apprentice only during a labour shortage and must¹¹:

- Supply proof that they have the academic prerequisites for the program leading to a vocational studies diploma (DEP) in the trade referred to in the application or pledge, by signing a consent letter, to take the necessary training to obtain a DEP;
- Present a guarantee of employment registered during a labour-pool opening by an employer registered with the CCQ, for at least 150 hours over a period of at most three consecutive months¹².

The apprentice heavy equipment operator must have completed an apprenticeship period of 2,000 hours in order to be eligible for the four provincial qualification examinations that lead to obtaining the competency certificate-journeyman for each specialty. Credits are paid into the apprenticeship record book of an apprentice heavy equipment operator who has obtained his diploma.

Moreover, certain qualities are sought by employers hiring new heavy equipment operators. The following list presents some of those qualities, in the order they were mentioned and not in order of importance:

- versatility, i.e., the ability to operate several types of machines;
- reliability;
- precision, particularly in doing finishing work.

10. Of the 14 heavy equipment operators who participated in the workshop, 4 took the training in operating construction machines.

11. Source:

http://www.ccq.org/E_CertificatsCompetence/E02_Apprenti/E02_6_CandidatNonDiplome.aspx?sc_lang=en&profil=GrandPublic

12. The CCQ must have received the employee's complete file within 14 working days following the date of reservation of a place authorized by an employer in a situation of labour shortage and labour-pool opening in order for the employee to obtain the competency certificate applied for.

1.8 PLACE OF WOMEN IN THE TRADE

According to the CCQ¹³, the proportion of women active in the heavy equipment operator trade was 0.52% in 2008 (33 women out of 6,329 persons).

According to the heavy equipment operators attending the occupational analysis workshop, there is no explanation for the low proportion of women in the trade.

They point out that the “strong man” image associated with the trade by analogy with the machines’ large size is not justified, since the trade does not involve particular physical requirements.

1.9 CAREER PROSPECTS

Depending on their fields of interest and skills, heavy equipment operators who want to advance in their career will, out of a desire to meet a challenge, seek to work on machines of greater tonnage and more complex operation. The new technologies have a certain attraction.

With experience, operators can also become, for example, team leaders, foremen, superintendents or contractors.

1.10 DEVELOPMENT OF THE TRADE

In recent years, electronics have been integrated into machine operation. Sensors, GPS systems and data display screens are thus present in machines.

The new technologies make it possible to program certain operations and assess the progress of work. The participants think they can therefore understand and assess their work better, and thus improve the quality and precision of their work.

New materials, such as plant mixes and new types of aggregate, are also available.

13. Commission de la construction du Québec, *Carrières construction*, Québec City, 2009-2010 edition.

In addition, the size of machines is changing; small machines are now appearing on construction sites. Nowadays it is possible to work in areas that used to be inaccessible, or to work inside large-area buildings.

1.11 IMPACT OF ENVIRONMENTAL STANDARDS ON THE PRACTICE OF THE TRADE

The execution of some environmental protection work and the observance of environmental standards are more and more prevalent in the trade. The heavy equipment operators attending the workshop gave the following examples of the impact of environmental concerns on the practice of the trade:

- preservation of wetlands;
- installation of membranes inside curves, to lessen the consequences of accidental spills;
- measures for preventing sedimentation when digging ditches, for preventing excess asphalt and bitumen as well as oil leaks, and for recovering waste oil;
- greater precautions to be taken for cleaning machines and servicing them roadside.

2. WORK DESCRIPTION

2.1 TASKS AND OPERATIONS

List of tasks

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

1. Drive a loader-backhoe
2. Drive a front-end loader
3. Drive a bulldozer
4. Drive a grader
5. Drive a concrete and compacted concrete spreader
6. Drive an asphalt spreader
7. Drive a stabilizer sprayer
8. Drive a cold milling machine (leveller)
9. Drive power compactors (double drum, combined and pneumatic)
10. Load and unload a machine on a long-load dolly or a platform

The table of tasks and operations performed by heavy equipment operators is presented in the following pages.

Table 2.1 Tasks and Operations

TASKS	OPERATIONS					
1. Drive a loader-backhoe	1.1 Take instructions from one's supervisor	1.2 Inspect the machine and report defects	1.3 Take safety measures and apply safety standards	1.4 Plan the work	1.5 Start the machine	1.6 Stabilize the machine
	1.7 Break materials (hydraulic rock-breaker)	1.8 Clear the ground	1.9 Load materials or pile them	1.10 Transport materials	1.11 Pick up materials (mobile lip bucket, grapple or fork)	1.12 Equalize surfaces (bucket)
	1.13 Dig trenches and holes and detect infrastructures	1.14 Deposit and spread materials as necessary in trenches and holes	1.15 Handle pipes, fire hydrants, sumps, etc.	1.16 Backfill the excavation	1.17 Compact the ground (back bucket)	1.18 Sweep surfaces (mechanical broom)
	1.19 Store various construction materials	1.20 Park the machine at the prescribed location	1.21 Clean the machine	1.22 Maintain the machine	1.23 Stop the machine	1.24 Write reports and records and report defects
2. Drive a front-end loader	2.1 Take instructions from one's supervisor	2.2 Inspect the machine and report defects	2.3 Take safety measures and apply safety standards	2.4 Plan the work	2.5 Start the machine	2.6 Clear the ground
	2.7 Load materials or pile them	2.8 Pick up materials (fork)	2.9 Transport materials	2.10 Equalize surfaces	2.11 Deposit and spread materials as necessary in trenches and holes	2.12 Handle pipes, fire hydrants, sumps, etc.
	2.13 Spread gravel on the shoulder (body/spreader)	2.14 Sweep surfaces (mechanical broom)	2.15 Park the machine at the prescribed location	2.16 Clean the machine	2.17 Stop the machine	2.18 Maintain the machine
	2.19 Write reports and records and report defects					

TASKS	OPERATIONS					
3. Drive a bulldozer	3.1 Take instructions from one's supervisor	3.2 Inspect the machine and report defects	3.3 Take safety measures and apply safety standards	3.4 Plan the work	3.5 Start the machine	3.6 Install and check the electronic system, if applicable
	3.7 Grub fields	3.8 Rip hard surfaces (ripper)	3.9 Clear the ground	3.10 Scarify the work platform	3.11 Shape the construction while observing foundation profiles	3.12 Spread and grade materials
	3.13 Dig trenches for conduits or wires (mole or torpedo)	3.14 Handle pipes (side boom)	3.15 Backfill the terrain	3.16 Check elevation levels	3.17 Push other machines	3.18 Tow other machines (winch)
	3.19 Park the machine at the prescribed location	3.20 Remove the electronic system, if applicable	3.21 Clean the machine	3.22 Maintain the machine	3.23 Stop the machine	3.24 Write reports and records and report defects
4. Drive a grader	4.1 Take instructions from one's supervisor	4.2 Inspect the machine and report defects	4.3 Take safety measures and apply safety standards	4.4 Plan the work	4.5 Start the machine	4.6 Install and check the electronic system, if applicable
	4.7 Scarify the work platform	4.8 Shape the construction while observing foundation profiles	4.9 Do the finish grading	4.10 Spread gravel on the shoulder (body/spreader)	4.11 Report detected abnormalities in the aggregate and the structure profiles	4.12 Park the machine at the prescribed location at the end of work
	4.13 Remove the electronic system, if applicable	4.14 Clean the machine	4.15 Maintain the machine	4.16 Stop the machine	4.17 Write reports and records and report defects	

TASKS	OPERATIONS					
5. Drive a concrete and compacted concrete spreader	5.1 Take instructions from one's supervisor	5.2 Inspect the machine and report defects	5.3 Take safety measures and apply safety standards	5.4 Plan the work	5.5 Install and check the electronic system, if applicable	5.6 Start the machine
	5.7 Use an escort to move the machine to its work area and position the machine	5.8 Prepare the machine for operations	5.9 Lay the concrete	5.10 Monitor the safety of personnel on the ground	5.11 Put the machine in the stop position	5.12 Remove the electronic system, if applicable
	5.13 Clean the machine	5.14 Maintain the machine	5.15 Use an escort to move the machine to its parking platform	5.16 Stop the machine	5.17 Write reports and records and report defects	
6. Drive an asphalt spreader	6.1 Take instructions from one's supervisor	6.2 Inspect the machine and report defects	6.3 Take safety measures and apply safety standards	6.4 Start the machine	6.5 Heat the smoothing bar	6.6 Install and check the electronic system, if applicable
	6.7 Plan the work	6.8 Use an escort to move the machine to its work area and position the machine	6.9 Prepare the machine for operations	6.10 Lay the plant mix	6.11 Monitor the safety of personnel on the ground	6.12 Remove the electronic system, if applicable
	6.13 Put the machine in the stop position	6.14 Clean the machine	6.15 Maintain the machine	6.16 Use an escort to move the machine to its parking platform	6.17 Stop the machine	6.18 Write reports and records and report defects

TASKS	OPERATIONS					
7. Drive a stabilizer sprayer	7.1 Take instructions from one's supervisor	7.2 Inspect the machine and report defects	7.3 Take safety measures and apply safety standards	7.4 Start the machine	7.5 Inspect the drum and teeth	7.6 Plan the work
	7.7 Use an escort to move the machine to its work area and position the machine	7.8 Prepare the machine for operations to be performed	7.9 Carry out the work	7.10 Use an escort to move the machine to its parking platform	7.11 Clean the machine	7.12 Maintain the machine
	7.13 Stop the machine	7.14 Write reports and records and report defects				
8. Drive a cold milling machine (leveller)	8.1 Take instructions from one's supervisor	8.2 Inspect the machine and report defects	8.3 Take safety measures and apply safety standards	8.4 Start the machine	8.5 Install and check the electronic system, if applicable	8.6 Inspect the drum and teeth
	8.7 Fill the tank with water to be sprayed	8.8 Check the operation of water sprinklers	8.9 Plan the work	8.10 Use an escort to move the machine to its work area and position the machine	8.11 Prepare the machine for operations to be performed	8.12 Monitor the safety of personnel on the ground
	8.13 Carry out the work	8.14 Remove the electronic system, if applicable	8.15 Park the machine at the cleaning location	8.16 Clean the machine	8.17 Use an escort to move the machine to its parking platform	8.18 Maintain the machine
	8.19 Stop the machine	8.20 Write reports and records and report defects				

TASKS	OPERATIONS					
9. Drive power compactors (double drum, combined and pneumatic)	9.1 Take instructions from one's supervisor	9.2 Inspect the machine and report defects	9.3 Take safety measures and apply safety standards	9.4 Plan the work	9.5 Start the machine	9.6 Install the electronic system, if applicable
	9.7 Fill the water tank for spraying (plant mix)	9.8 Check the operation of water sprinklers (plant mix)	9.9 Move the machine to the place of work	9.10 Select vibration amplitude and frequency (plant mix and aggregate)	9.11 Select the tire pressure and speed (plant mix)	9.12 Proceed to compaction
	9.13 Disengage the vibration system before each change in direction (plant mix and aggregate)	9.14 Park the machine at the prescribed location	9.15 Remove the electronic system, if applicable	9.16 Clean the machine	9.17 Stop the machine	9.18 Maintain the machine
	9.19 Write reports and records and report defects					
10. Load and unload a machine on a long-load dolly or a platform	10.1 Clean the machine of any mud, clay, etc.	10.2 Ensure the cleanliness and adhesion of the long-load dolly's or platform's floor	10.3 Ensure the solidness of access ramps, if applicable	10.4 Mount the machine on the long-load dolly or platform	10.5 Put the machine in the stop position and lower the accessories	10.6 Apply the machine's parking brakes
	10.7 Unload the machine from the long-load dolly or platform					

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.

Task 10, “Load and unload a machine on a long-load dolly or a platform,” was not matched with a description of sub-operations or clarifications by the participants.

Table 2.2 Sub-Operations and Operation Clarifications

TASK 1 DRIVE A LOADER-BACKHOE		
Examples of work outcomes: loading and handling; preparation of curbs and sidewalks; installation of sumps, conduits, posts; embankments; excavation; surface preparation; etc.		
Operations	Sub-Operations	Clarifications
1.1 Take instructions from one’s supervisor	1.1.1 Obtain information about: <ul style="list-style-type: none"> • the nature of work to be done • obstacles on the ground 1.1.2 Interpret plans, if applicable	
1.2 Inspect the machine and report defects	1.2.1 Inspect the machine’s mechanisms and accessories 1.2.2 Check oil and fluid levels 1.2.3 Inspect cutting blades and the front and back buckets 1.2.4 Check the condition, air pressure and rims of tires 1.2.5 Check the automatic back-up horn	
1.3 Take safety measures and apply safety standards		
1.4 Plan the work	1.4.1 Identify the nature of soils to work on 1.4.2 Read and interpret data written on grade stakes: <ul style="list-style-type: none"> • interpret grade stakes • find out about required elevation levels 1.4.3 Detect underground conduits or wires	

TASK 1 DRIVE A LOADER-BACKHOE

TASK 1 DRIVE A LOADER-BACKHOE		
Operations	Sub-Operations	Clarifications
1.5 Start the machine	1.5.1 Put the main switch on "on" position 1.5.2 Apply the startup procedure while taking the outdoor temperature into account 1.5.3 Check the smoke	In cold weather, the machine has to warm up and the operator has to start it as soon as he arrives at work. Under these circumstances, the sequence of operations is inverted and the work is planned after startup.
1.6 Stabilize the machine	1.6.1 Position the machine 1.6.2 Lower the outriggers 1.6.3 Lower the front bucket	
1.7 Break materials (hydraulic rock-breaker)		
1.8 Clear the ground		
1.9 Load materials or pile them	1.9.1 Raise back accessories to their highest level 1.9.2 Place the locking detent on accessories 1.9.3 Use the front bucket 1.9.4 Maintain an equal work platform	
1.10 Transport materials		
1.11 Pick up materials (mobile lip bucket, grapple or fork)		Accessories are in the front of the machine.
1.12 Equalize surfaces (bucket)		The bucket may be in the front or rear of the machine.
1.13 Dig trenches and holes and detect infrastructures	1.13.1 Unlock the arm 1.13.2 Extend the boom 1.13.3 Open the bucket 1.13.4 Lower the boom, retract and close the bucket 1.13.5 Raise the boom 1.13.6 Make the bucket pivot to the side 1.13.7 Unload bucket contents in a truck or on the ground	This operation must be performed with care to avoid breaking infrastructures.

TASK 1 DRIVE A LOADER-BACKHOE

TASK 1 DRIVE A LOADER-BACKHOE		
Operations	Sub-Operations	Clarifications
1.14 Deposit and spread materials as necessary in trenches and holes		
1.15 Handle pipes, fire hydrants, sumps, etc.	1.15.1 Check and install slings, if applicable 1.15.2 Attach the equipment, if applicable 1.15.3 Place the equipment at the prescribed location	
1.16 Backfill the excavation		Backfilling must be done in uniform layers.
1.17 Compact the ground (back bucket)		
1.18 Sweep surfaces (mechanical broom)		This operation is usually performed to clean the shoulders after asphaltting or concrete surfacing.
1.19 Store various construction materials	1.19.1 Choose flat dry ground located in a safe area 1.19.2 Ensure that the area is accessible to other machines 1.19.3 Pile the materials up 1.19.4 Ensure the stability of materials	The materials used may be pipes, manholes, sewers, wood, street lamps, sumps, wire rolls, etc.
1.20 Park the machine at the prescribed location		
1.21 Clean the machine	1.21.1 Clean the anchor points 1.21.2 Clean the buckets	Bucket cleaning prevents soil contamination and can be done at any time during the work if circumstances require it.
1.22 Maintain the machine	1.22.1 Lubricate the components 1.22.2 Replace the back bucket teeth, if applicable ¹⁴ 1.22.3 Reclose and block the accessories	

14. The CCQ's Direction de l'application des conventions collectives has issued a notice to the effect that the heavy machinery mechanic is responsible for this sub-operation.

TASK 1 DRIVE A LOADER-BACKHOE

Operations	Sub-Operations	Clarifications
1.23 Stop the machine	1.23.1 Lower the accessories 1.23.2 Apply the closing procedure 1.23.3 Put the main switch on "off" position	
1.24 Write reports and records and report defects		

TASK 2 DRIVE A FRONT-END LOADER

Examples of work outcomes: loading and unloading; spreading of aggregate; preparation of surfaces; etc.

Operations	Sub-Operations	Clarifications
2.1 Take instructions from one's supervisor	2.1.1 Obtain information about: <ul style="list-style-type: none"> the nature of work to be done obstacles on the ground 2.1.2 Interpret plans, if applicable	
2.2 Inspect the machine and report defects	2.2.1 Inspect the machine's mechanisms and accessories 2.2.2 Check oil and fluid levels 2.2.3 Inspect the front bucket's cutting blades 2.2.4 Check the condition, air pressure and rims of tires 2.2.5 Check the automatic back-up horn	
2.3 Take safety measures and apply safety standards		
2.4 Plan the work	2.4.1 Identify the nature of soils to work on 2.4.2 Read and interpret data written on grade skates <ul style="list-style-type: none"> interpret grade skates 2.4.3 Adjust the balance for loading work	

TASK 2 DRIVE A FRONT-END LOADER

Operations		Sub-Operations	Clarifications
2.5	Start the machine	2.5.1 Put the main switch on "on" position 2.5.2 Apply the startup procedure while taking the outdoor temperature into account 2.5.3 Check the smoke	In cold weather, the machine has to warm up and the operator has to start it as soon as he arrives at work. Under these circumstances, the sequence of operations is inverted and the work is planned after startup.
2.6	Clear the ground		
2.7	Load materials or pile them		
2.8	Pick up materials (fork)		
2.9	Transport materials		
2.10	Equalize surfaces		
2.11	Deposit and spread materials as necessary in trenches and holes		
2.12	Handle pipes, fire hydrants, sumps, etc.	2.12.1 Check and install slings, if applicable 2.12.2 Attach the equipment, if applicable 2.12.3 Place the equipment at the prescribed location	
2.13	Spread gravel on the shoulder (body/spreader)		
2.14	Sweep surfaces (mechanical broom)		This operation is usually performed to clean the shoulders after asphaltting or concrete surfacing.
2.15	Park the machine at the prescribed location		

TASK 2 DRIVE A FRONT-END LOADER

Operations	Sub-Operations	Clarifications
2.16 Clean the machine	2.16.1 Clean the anchor points 2.16.2 Clean the bucket	Bucket cleaning prevents soil contamination and can be done at any time during the work if circumstances require it.
2.17 Stop the machine	2.17.1 Lower the accessories 2.17.2 Apply the closing procedure 2.17.3 Put the main switch on "off" position	
2.18 Maintain the machine	2.18.1 Lubricate the components	
2.19 Write reports and records and report defects		

TASK 3 DRIVE A BULLDOZER

Examples of work outcomes: topsoil stripping and preparation; civil engineering work, for example roads, parking lots, terrepleins, shoulders, overpass approaches, etc.

Operations	Sub-Operations	Clarifications
3.1 Take instructions from one's supervisor		
3.2 Inspect the machine and report defects	3.2.1 Inspect the machine's mechanisms and accessories 3.2.2 Check oil and fluid levels 3.2.3 Check the fuel 3.2.4 Inspect the cutting blades 3.2.5 Check the automatic back-up horn	
3.3 Take safety measures and apply safety standards		
3.4 Plan the work	3.4.1 Identify the nature of soils to work on 3.4.2 Read and interpret data written on grade skates <ul style="list-style-type: none">• interpret grade skates• find out about required elevation levels• adjust electronic grading instruments	

TASK 3 DRIVE A BULLDOZER

Operations		Sub-Operations	Clarifications
3.5	Start the machine	3.5.1 Put the main switch on «on» position 3.5.2 Apply the startup procedure while taking the outdoor temperature into account	In cold weather, the machine has to warm up and the operator has to start it as soon as he arrives at work. Under these circumstances, the sequence of operations is inverted and the work is planned after startup.
3.6	Install and check the electronic system, if applicable	3.6.1 Adjust compensation settings, if applicable	
3.7	Grub fields	3.7.1 Use the winch 3.7.2 Use the cutting blade	
3.8	Rip hard surfaces (ripper)	3.8.1 Adjust the ripper's tooth according to the work to be done 3.8.2 Move forward while gradually lowering the tooth	
3.9	Clear the ground	3.9.1 Back up to the prescribed location 3.9.2 Lower the blade 3.9.3 Move forward while raising the blade 3.9.4 Spread the materials or pile them	The purpose of this operation is to clean the working area.
3.10	Scarify the work platform		This operation is performed with the corner of the blade.
3.11	Shape the construction while observing foundation profiles	3.11.1 Continually adjust the blade's horizontal and vertical angles 3.11.2 Continually adjust blade elevation to ensure uniform grading 3.11.3 Estimate the required quantity of materials 3.11.4 Spread and grade materials 3.11.5 Ensure that elevation levels are observed	

TASK 3 DRIVE A BULLDOZER

Operations		Sub-Operations		Clarifications
3.12	Spread and grade materials	3.12.1	Determine cutting blade angles	The angles vary according to the nature of work to be done.
		3.12.2	Adjust cutting blade angles	
3.13	Dig trenches for conduits or wires (mole or torpedo)			
3.14	Handle pipes (side boom)			
3.15	Backfill the terrain			This operation can be performed with on-site or addition materials.
3.16	Check elevation levels			
3.17	Push other machines	3.17.1	Slowly approach the other machine	
		3.17.2	Move in position	
		3.17.3	Move forward	
3.18	Tow other machines (winch)	3.18.1	Ask for assistance from another worker to run the cable	
		3.18.2	Apply the machine's brakes	
		3.18.3	Ensure that no workers are near the cable when the winch is used	
3.19	Park the machine at the prescribed location			
3.20	Remove the electronic system, if applicable			
3.21	Clean the machine	3.21.1	Clean the undercarriage	This operation prevents soil contamination and can be performed at any time if circumstances require it.
		3.21.2	Clean the blade	
3.22	Maintain the machine	3.22.1	Lubricate the components	
		3.22.2	Clean the cab and windows	

TASK 3 DRIVE A BULLDOZER

Operations	Sub-Operations	Clarifications
3.23 Stop the machine	3.23.1 Lower the accessories 3.23.2 Apply the closing procedure 3.23.3 Put the main switch on «off» position	
3.24 Write reports and records and report defects		

TASK 4 DRIVE A GRADER

Examples of work outcomes: site preparation; grading of roads, parking lots, shoulders, airport runways; scarifying work; etc.

Operations	Sub-Operations	Clarifications
4.1 Take instructions from one's supervisor		
4.2 Inspect the machine and report defects	4.2.1 Inspect the machine's mechanisms and accessories 4.2.2 Check oil and fluid levels 4.2.3 Inspect the cutting blades 4.2.4 Check the condition, air pressure and rims of tires 4.2.5 Check the automatic back-up horn	
4.3 Take safety measures and apply safety standards		
4.4 Plan the work	4.4.1 Identify the nature of soils to work on 4.4.2 Read and interpret data written on grade skates: <ul style="list-style-type: none"> • interpret grade skates • find out about required elevation levels • adjust electronic grading instruments 	
4.5 Start the machine	4.5.1 Put the main switch on «on» position 4.5.2 Apply the startup procedure while taking the outdoor temperature into account	In cold weather, the machine has to warm up and the operator has to start it as soon as he arrives at work. Under these circumstances, the sequence of operations is inverted and the work is planned after startup.

TASK 4 DRIVE A GRADER

Operations	Sub-Operations	Clarifications
4.6 Install and check the electronic system, if applicable	4.6.1 Adjust compensation settings, if applicable	
4.7 Scarify the work platform		
4.8 Shape the construction while observing foundation profiles	4.8.1 Continually adjust the blade's horizontal and vertical angles 4.8.2 Continually adjust blade elevation to ensure uniform grading 4.8.3 Estimate the required quantity of materials 4.8.4 Spread and grade materials 4.8.5 Ensure that elevation levels are observed	
4.9 Do the finish grading	4.9.1 Continually adjust the blade's horizontal and vertical angles 4.9.2 Continually adjust blade elevation to ensure uniform grading 4.9.3 Estimate the required quantity of materials 4.9.4 Ensure that materials are discharged beyond the passage of the machine's rear wheels 4.9.5 Spread and grade materials 4.9.6 Ensure that elevation levels are observed	
4.10 Spread gravel on the shoulder (body/spreader)		
4.11 Report detected abnormalities in the aggregate and the structure profiles	4.11.1 Check whether the aggregate is too dry or too moist 4.11.2 Check the possibility of incorrect surveying reference points 4.11.3 Notify the persons concerned	

TASK 4 DRIVE A GRADER

Operations	Sub-Operations	Clarifications
4.12 Park the machine at the prescribed location at the end of work		
4.13 Remove the electronic system, if applicable		
4.14 Clean the machine	4.14.1 Clean the windows	
4.15 Maintain the machine	4.15.1 Lubricate the components	
4.16 Stop the machine	4.16.1 Lower the blade 4.16.2 Apply the closing procedure 4.16.3 Put the main switch on «off» position	
4.17 Write reports and records and report defects		

TASK 5 DRIVE A CONCRETE AND COMPACTED CONCRETE SPREADER

Work results: surfacing of concrete roads, parking lots; building cement concrete safety barriers (New Jersey type barrier).

Operations	Sub-Operations	Clarifications
5.1 Take instructions from one's supervisor		
5.2 Inspect the machine and report defects	5.2.1 Check oil and fluid levels 5.2.2 Check the water level 5.2.3 Check the tracks adjustment 5.2.4 Check the automatic back-up horn	
5.3 Take safety measures and apply safety standards	5.3.1 Check whether the work area is secured 5.3.2 Ensure the presence of signs	

TASK 5 DRIVE A CONCRETE AND COMPACTED CONCRETE SPREADER

Operations	Sub-Operations	Clarifications
5.4 Plan the work	5.4.1 Read and interpret data written on grade skates: <ul style="list-style-type: none"> • interpret grade skates • find out about required elevation levels • adjust electronic grading instruments 5.4.2 Determine the starting and arrival points	
5.5 Install and check the electronic system, if applicable	5.5.1 Adjust compensation settings, if applicable	Depending on the type of machine, the electronic system can be installed after 5.7.
5.6 Start the machine		
5.7 Use an escort to move the machine to its work area and position the machine		
5.8 Prepare the machine for operations	5.8.1 Adjust the electronic system: <ul style="list-style-type: none"> • level • steering shaft 5.8.2 Ensure that all work team members are in position 5.8.3 Spray vegetable oil on the mould, the screw, etc. 5.8.4 Order the machine's hopper to be loaded 5.8.5 Make sure to have a sufficient volume of concrete before it is laid	
5.9 Lay the concrete	5.9.1 Depending on surface configuration (road, parking lot, intersection, etc.), adjust: <ul style="list-style-type: none"> • the machine's speed • paving thickness • paving width (concrete paver only) 	Paving thickness and width are set in cooperation with the grading labourers.

TASK 5 DRIVE A CONCRETE AND COMPACTED CONCRETE SPREADER

Operations		Sub-Operations	Clarifications
5.10	Monitor the safety of personnel on the ground		
5.11	Put the machine in the stop position		
5.12	Remove the electronic system, if applicable		
5.13	Clean the machine	5.13.1 Wash with water 5.13.2 If the concrete is set, scratch or break it with a sledgehammer	
5.14	Maintain the machine	5.14.1 Lubricate the gantry and the endless screw, or check and activate the automatic lubrication system	
5.15	Use an escort to move the machine to its parking platform	5.15.1 Start the machine 5.15.2 Go to the parking platform	
5.16	Stop the machine	5.16.1 Apply the closing procedure 5.16.2 Put the main switch on «off» position 5.16.3 Install security bars	
5.17	Write reports and records and report defects	5.17.1 Enter the machine's hours of use	

TASK 6 DRIVE AN ASPHALT SPREADER

Work results: asphaltting of roads, parking lots, runways, etc.

Operations		Sub-Operations	Clarifications
6.1	Take instructions from one's supervisor		
6.2	Inspect the machine and report defects	6.2.1 Inspect the machine's mechanisms and accessories (conveyors, screws, doors, etc.) 6.2.2 Inspect the table 6.2.3 Check the fuel 6.2.4 Check oil and fluid levels 6.2.5 Check the vibrators 6.2.6 Check the condition, air pressure and rims of tires 6.2.7 Check the automatic back-up horn	The number of vibrators varies according to table width.
6.3	Take safety measures and apply safety standards	6.3.1 Check whether the work area is secured 6.3.2 Ensure the presence of signs	
6.4	Start the machine		
6.5	Heat the smoothing bar	6.5.1 Start the table's heating system 6.5.2 Check the table's temperature	The table's heating system can operate on diesel, propane or electricity.
6.6	Install and check the electronic system, if applicable	6.6.1 Adjust the table's compensation settings, if applicable	
6.7	Plan the work	6.7.1 Read and interpret data written on grade skates: <ul style="list-style-type: none"> • interpret grade skates • find out about required elevation levels • adjust electronic grading instruments 6.7.2 Determine the starting and arrival points	

TASK 6 DRIVE AN ASPHALT SPREADER

Operations	Sub-Operations	Clarifications
6.8 Use an escort to move the machine to its work area and position the machine		
6.9 Prepare the machine for operations	6.9.1 Adjust the electronic system: <ul style="list-style-type: none"> • level • steering shaft 6.9.2 Activate the chain drive and spreading screws for laying the plant mix 6.9.3 Ensure that all work team members are in position 6.9.4 Install the thickness guide 6.9.5 Lower the smoothing bar 6.9.6 Adjust the alignment guide 6.9.7 Adjust the approach angle of the smoothing bar 6.9.8 Order the machine's hopper to be loaded Make sure to have a sufficient volume of plant mix before it is laid	
6.10 Lay the plant mix	6.10.1 Depending on surface configuration (road, parking lot, intersection, etc.), adjust: <ul style="list-style-type: none"> • machine speed • paving thickness • paving width • slope percentages 	Paving thickness, paving width and slope percentages are set in cooperation with grading labourers.
6.11 Monitor the safety of personnel on the ground		
6.12 Remove the electronic system, if applicable		
6.13 Put the machine in the stop position		

TASK 6 DRIVE AN ASPHALT SPREADER

Operations	Sub-Operations	Clarifications
6.14 Clean the machine	6.14.1 Stop the machine 6.14.2 Clean the machine of any plant mix 6.14.3 Spray the hopper, screw feeder, spreading screws and smoothing bar with a washing agent 6.14.4 Leave the smoothing bar raised and fasten it	
6.15 Maintain the machine	6.15.1 Lubricate the gantry and the endless screw, or check and activate the automatic lubrication system	
6.16 Use an escort to move the machine to its parking platform	6.16.1 Start the machine 6.16.2 Go to the parking platform	
6.17 Stop the machine	6.17.1 Apply the closing procedure 6.17.2 Put the main switch on «off» position 6.17.3 Install security bars	
6.18 Write reports and records and report defects	6.18.1 Enter the machine's hours of use	

TASK 7 DRIVE A STABILIZER SPRAYER

Work results: recycling road surfaces with aggregate and plant mix; spraying aggregate.

Operations	Sub-Operations	Clarifications
7.1 Take instructions from one's supervisor		
7.2 Inspect the machine and report defects	7.2.1 Check oil and fluid levels	
7.3 Take safety measures and apply safety standards		

TASK 7 DRIVE A STABILIZER SPRAYER

Operations		Sub-Operations	Clarifications
7.4	Start the machine		
7.5	Inspect the drum and teeth		
7.6	Plan the work	7.6.1 Inspect the path (manholes, rail, expansion joint, other obstacles) 7.6.2 Mark obstacles with paint	
7.7	Use an escort to move the machine to its work area and position the machine		
7.8	Prepare the machine for operations to be performed	7.8.1 Activate the drum 7.8.2 Gradually lower the drum to the desired cutting depth 7.8.3 Adjust the binder's flow rate, if applicable	The binder is used for doing road stabilization work.
7.9	Carry out the work	7.9.1 Adjust the machine's advance according to the nature of work to be done 7.9.2 Gradually raise the drum back up 7.9.3 Disengage the drum 7.9.4 Check the wear of the teeth, teeth holders and drum	On certain occasions, aggregate can be added to modify the granulometry of materials.
7.10	Use an escort to move the machine to its parking platform		
7.11	Clean the machine		
7.12	Maintain the machine	7.12.1 Replace teeth and teeth holders 7.12.2 Arc weld (SMAW) the teeth holders ¹⁵	

15. The CCQ's Direction de l'application des conventions collectives has issued a notice to the effect that the heavy machinery mechanic is responsible for sub-operations 7.12.1 and 7.12.2.

TASK 7 DRIVE A STABILIZER SPRAYER

Operations	Sub-Operations	Clarifications
7.13 Stop the machine		
7.14 Write reports and records and report defects		

TASK 8 DRIVE A COLD MILLING MACHINE (LEVELLER)

Work results: recycling plant mix and concrete road surfaces.

Operations	Sub-Operations	Clarifications
8.1 Take instructions from one's supervisor		
8.2 Inspect the machine and report defects	8.2.1 Check oil and fluid levels	
8.3 Take safety measures and apply safety standards		
8.4 Start the machine		
8.5 Install and check the electronic system, if applicable	8.5.1 Adjust compensation settings, if applicable	
8.6 Inspect the drum and teeth		
8.7 Fill the tank with water to be sprayed		
8.8 Check the operation of water sprinklers		
8.9 Plan the work	8.9.1 Inspect the path (manholes, rail, expansion joint, other obstacles) 8.9.2 Mark obstacles with paint	

TASK 8 DRIVE A COLD MILLING MACHINE (LEVELLER)

Operations		Sub-Operations	Clarifications
8.10	Use an escort to move the machine to its work area and position the machine		
8.11	Prepare the machine for operations to be performed	8.11.1 Activate the drum countersink 8.11.2 Activate the conveyor and place it over the truck box 8.11.3 Gradually lower the drum countersink to the desired depth 8.11.4 Adjust the water flow rate	
8.12	Monitor the safety of personnel on the ground		
8.13	Carry out the work	8.13.1 Adjust the machine's advance according to the nature of work to be done 8.13.2 Gradually raise the drum countersink back up 8.13.3 Disengage the drum countersink 8.13.4 Check the wear of the teeth, teeth holders and drum	
8.14	Remove the electronic system, if applicable		
8.15	Park the machine at the cleaning location		
8.16	Clean the machine		
8.17	Use an escort to move the machine to its parking platform		
8.18	Maintain the machine	8.18.1 Replace teeth and teeth holders 8.18.2 Arc weld (SMAW) the teeth holders ¹⁶	

16. The CCQ's Direction de l'application des conventions collectives has issued a notice to the effect that the heavy machinery mechanic is responsible for sub-operations 8.18.1 and 8.18.2.

TASK 8 DRIVE A COLD MILLING MACHINE (LEVELLER)

Operations	Sub-Operations	Clarifications
8.19 Stop the machine		
8.20 Write reports and records and report defects		

TASK 9 DRIVE POWER COMPACTORS (DOUBLE DRUM, COMBINED AND PNEUMATIC)

Work results: plant mix rolling; plant mix compacting; aggregate compacting; concrete compacting.

Operations	Sub-Operations	Clarifications
9.1 Take instructions from one's supervisor		There are also rolling patterns that inform on the nature of work to be done [number of passes, nature of the material and frequency of vibrations (high, low or static)].
9.2 Inspect the machine and report defects	9.2.1 Check oil and fluid levels 9.2.2 Check the condition of tires and rims 9.2.3 Check the automatic back-up horn	
9.3 Take safety measures and apply safety standards		
9.4 Plan the work		
9.5 Start the machine	9.5.1 Put the main switch on «on» position 9.5.2 Apply the startup procedure while taking the outdoor temperature into account	In cold weather, the machine has to warm up and the operator has to start it as soon as he arrives at work. Under these circumstances, the sequence of operations is inverted and the work is planned after startup.
9.6 Install the electronic system, if applicable		

**TASK 9 DRIVE POWER COMPACTORS
(DOUBLE DRUM, COMBINED AND PNEUMATIC)**

Operations		Sub-Operations	Clarifications
9.7	Fill the water tank for spraying (plant mix)		
9.8	Check the operation of water sprinklers (plant mix)		
9.9	Move the machine to the place of work		
9.10	Select vibration amplitude and frequency (plant mix and aggregate)		
9.11	Select the tire pressure and speed (plant mix)		
9.12	Proceed to compaction	<p style="text-align: center;">Aggregate</p> <p>9.12.1 Adjust the rolling speed and vibration according to the pattern</p> <p>9.12.2 Make sure of the required moisture level</p> <p>9.12.3 Make the required number of passes</p>	It is important not to compact aggregate more than necessary, because that would cause their segregation. In addition, too many passes on moist ground may make water resurface and wet the materials.
		<p style="text-align: center;">Plant mix</p> <p>9.12.4 Adjust the amplitude, speed and vibration</p> <p>9.12.5 Take the mix's temperature and behaviour into account</p> <p>9.12.6 Compact</p> <p>9.12.7 Make the required number of passes</p>	
9.13	Disengage the vibration system before each change in direction (plant mix and aggregate)		To avoid creating a hole, it is important to make a stop with an angle of at least 10 degrees while the plant mix is being compacted.
9.14	Park the machine at the prescribed location		

**TASK 9 DRIVE POWER COMPACTORS
(DOUBLE DRUM, COMBINED AND PNEUMATIC)**

Operations	Sub-Operations	Clarifications
9.15 Remove the electronic system, if applicable		
9.16 Clean the machine	9.16.1 Clean the windows 9.16.2 Clean roller scrapers	
9.17 Stop the machine		
9.18 Maintain the machine	9.18.1 Lubricate the components 9.18.2 In cold weather, drain the pumps and fill them with antifreeze	
9.19 Write reports and records and report defects		

TASK 10 LOAD AND UNLOAD A MACHINE ON A LONG-LOAD DOLLY OR A PLATFORM

This task was not matched with a description of sub-operations or clarifications by the participants.

2.3 ACHIEVEMENT CONDITIONS AND PERFORMANCE CRITERIA

2.3.1 Achievement Conditions

Data on achievement conditions were collected for the heavy equipment operator trade as a whole. The data pertain to aspects such as work areas, level of collaboration, work instructions, reference documents consulted, raw materials used, and health and safety hazards. In Annex 1 is a list of tools and equipment used for each task.

Table 2.3 Achievement Conditions

TASK 1 DRIVE A LOADER-BACKHOE

Work areas On the construction site. Outdoors and indoors.
Level of collaboration In a team. Under the supervision of the foreman or team leader.
Instructions and references Based on plans, specifications, contractor instructions, Info-Excavation data and survey data.
Raw materials Aggregate, sand, concrete, plant mix, stone, humus (topsoil) and infrastructure elements.
Health and safety hazards In a context involving hazards: <ul style="list-style-type: none">• of personal falls;• related to weather conditions (cold and intense heat);• related to dust;• related to gasses;• of explosion;• of electrocution;• of collapse;• related to road traffic;• of the machine turning over;• of crushing someone;• related to the loss of an accessory.

TASK 2 DRIVE A FRONT-END LOADER

Work areas

On the construction site.
Outdoors and indoors.

Level of collaboration

Individually.
In a team (for example, in cooperation with the power shovel operator during work with aggregate).
Under the supervision of the foreman or team leader.

Instructions and references

Based on plans, specifications, contractor instructions and survey data.

Raw materials

Aggregate, sand, concrete, plant mix, stone, humus (topsoil) and infrastructure elements.

Health and safety hazards

In a context involving hazards:

- of personal falls;
- related to weather conditions (cold and intense heat);
- related to dust;
- related to gasses;
- of explosion;
- of electrocution;
- related to road traffic;
- of the machine turning over;
- of burial;
- related to the loss of an accessory.

TASK 3 DRIVE A BULLDOZER

Work areas

On the construction site.

Outdoors and indoors.

Level of collaboration

Individually.

In a team (for example, in cooperation with the power shovel operator during sewer and aqueduct construction work).

Under the supervision of the foreman or team leader.

Instructions and references

Based on plans, specifications, contractor instructions and survey data.

Raw materials

Aggregate, sand, clay, stone, humus (topsoil).

Health and safety hazards

In a context involving hazards:

- of personal falls;
- of the machine turning over;
- related to weather conditions (cold and intense heat);
- related to dust;
- related to gasses;
- of explosion;
- of deafness;
- of injuries while the machine is being cleaned.

TASK 4 DRIVE A GRADER

Work areas

On the construction site.

Outdoors and indoors.

Level of collaboration

In a team.

Under the supervision of the foreman or team leader.

Instructions and references

Based on plans, specifications, contractor instructions and survey data.

Raw materials

Aggregate, sand and, occasionally, plant mix to spread a corrective layer.

Health and safety hazards

In a context involving hazards:

- of personal falls;
- related to weather conditions (cold and intense heat);
- related to dust;
- related to road traffic;
- of the machine turning over;
- of injuries to persons near the machine.

TASK 5 DRIVE A CONCRETE OR COMPACTED CONCRETE SPREADER

Work areas

On the construction site.
Outdoors and indoors.

Level of collaboration

In a team.
Under the supervision of the foreman or team leader.

Instructions and references

Based on plans, specifications, contractor instructions and survey data.

Raw materials

32 mPa concrete, 35 mPa concrete, reinforced concrete, roller-compacted concrete (RCC), etc.

Health and safety hazards

In a context involving hazards:

- of personal falls;
- related to weather conditions (cold and intense heat);
- related to dust;
- related to gasses;
- of explosion;
- of electrocution;
- of the machine turning over;
- of concrete in the eyes;
- of contact burns;
- of being hit on the head;
- of deafness.

TASK 6 DRIVE AN ASPHALT SPREADER

Work areas

On the construction site.
Outdoors and indoors.

Level of collaboration

In a team.
Under the supervision of the foreman or team leader.

Instructions and references

Based on plans, specifications, contractor instructions and survey data.

Raw materials

Various types of plant mixes: for the surface (EG-10), the base (GB-20), a single layer (ESG-14), corrective work (EC-10), etc.

Health and safety hazards

In a context involving hazards:

- of personal falls;
- related to weather conditions (cold and intense heat);
- related to dust;
- related to gasses;
- of explosion;
- of electrocution;
- of burns;
- of crushing;
- related to inhaling bitumen fumes;
- related to road traffic;
- of the machine turning over.

TASK 7 DRIVE A STABILIZER SPRAYER

Work areas

On the construction site.

Outside.

Level of collaboration

Alone.

Under the supervision of the foreman or team leader

Instructions and references

Based on specifications, on instructions from the contractor and the civil engineering technician, and on mix recipes.

Raw materials

Aggregate, plant mix and binders.

Health and safety hazards

In a context involving hazards:

- of personal falls;
- related to weather conditions (cold and intense heat);
- related to dust;
- of electrocution;
- related to road traffic;
- of the machine turning over;
- of crushing someone;
- of hand and face injuries;
- of deafness;
- related to the machine backing up while the drum is lowered.

TASK 8 DRIVE A COLD MILLING MACHINE

<p>Work areas</p> <p>On the construction site. Outside.</p>
<p>Level of collaboration</p> <p>In a team. Under the supervision of the foreman or team leader.</p>
<p>Instructions and references</p> <p>Based on plans, specifications and instructions from the contractor and the civil engineering technician.</p>
<p>Raw materials</p> <p>Aggregate, plant mix.</p>
<p>Health and safety hazards</p> <p>In a context involving hazards:</p> <ul style="list-style-type: none">• of personal falls;• related to weather conditions (cold and intense heat);• related to dust;• of electrocution;• related to road traffic;• of the machine turning over;• of crushing someone;• of hand and face injuries;• of deafness;• related to the machine backing up while the drum countersink is lowered.

**TASK 9 DRIVE POWER COMPACTORS
(DOUBLE DRUM, COMBINED AND PNEUMATIC)**

Work areas

On the construction site.
Outdoors and indoors.

Level of collaboration

Alone, for aggregate compaction work.
In a team, for plant mix compaction work.
Under the supervision of the foreman or team leader.

Instructions and references

Based on plans, specifications and a rolling pattern.

Raw materials

Plant mix, aggregate, sand, concrete and clay (with a tamping foot).

Health and safety hazards

In a context involving hazards:

- of personal falls;
- related to weather conditions (cold and intense heat);
- related to dust;
- of electrocution;
- related to road traffic;
- of the machine turning over;
- of injuries to persons near the machine;
- of deafness;
- of drowsiness.

TASK 10 LOAD AND UNLOAD A MACHINE ON A LONG-LOAD DOLLY OR A PLATFORM

<p>Work areas</p> <p>On the construction site. Outside.</p>
<p>Level of collaboration</p> <p>Alone or in a team.</p>
<p>Instructions and references</p> <p>Based on contractor instructions.</p>
<p>Raw materials</p> <p>None.</p>
<p>Health and safety hazards</p> <p>In a context involving hazards:</p> <ul style="list-style-type: none">• of personal falls;• related to weather conditions (cold and intense heat);• related to dust;• of the machine turning over;• of injuries to persons during fastening.

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 related to each task, the participants worked in teams of three. The teams' results were then collected and presented in full session.

Table 2.4 Performance Criteria

TASK 1 DRIVE A LOADER-BACKHOE	
Performance Criteria	
Using appropriate hand signals	Observing the road safety code
Vigilance	No materials contaminated
Dexterity	No handled materials broken
Wearing personal safety equipment	Observing the machine's capacity
Observing elevation levels	Observing the bucket's load capacity
Correct machine maintenance	Observing speed limits on the construction site
Using the machine carefully	Observing distances between machines
Piling materials safely and according to requirements	Observing rights-of-way and data indicated by grade stakes
No broken infrastructures	Observing deadlines
Machine cleanliness	Respecting the environment
Observance of slopes	Observing occupational health and safety rules
Driving carefully	
TASK 2 DRIVE A FRONT-END LOADER	
Performance Criteria	
Using appropriate hand signals	Driving carefully
Vigilance	Observing the road safety code
Dexterity	No contaminated materials
Wearing personal safety equipment	No handled materials broken
Observing elevation levels	Observing the machine's capacity
Correct machine maintenance	Observing the bucket's load capacity

TASK 2 DRIVE A FRONT-END LOADER	
Performance Criteria	
Using the machine carefully	Observing speed limits on the construction site
Piling materials safely and according to requirements	Observing distances between machines
No broken infrastructures	Observing rights-of-way and data indicated by grade skates
Machine cleanliness	Observing deadlines
Observance of slopes	Respecting the environment
	Observing occupational health and safety rules
TASK 3 DRIVE A BULLDOZER	
Performance Criteria	
Using appropriate hand signals	No aggregate segregation
Attention	Clear instructions to dump truck operators regarding the location for discharging materials
Dexterity	Machine cleanliness
Wearing personal safety equipment	Observing the machine's capacity
Uniform grading	Observing speed limits on the construction site
Observing elevation levels	Observing distances between machines
Correct machine maintenance	Observing rights-of-way
Using the machine carefully	Observing deadlines
Working according to requirements	Respecting the environment
No contaminated materials	Observing occupational health and safety rules
TASK 4 DRIVE A GRADER	
Performance Criteria	
Using appropriate hand signals	Machine cleanliness
Attention	Observing the machine's capacity
Dexterity	Driving carefully
Wearing personal safety equipment	Observing the road safety code
Uniform grading	Observing speed limits on the construction site
Scarifying according to requirements	Observing distances between machines
Shaping according to requirements	

TASK 4 DRIVE A GRADER	
Performance Criteria	
Overlapping passes in final grading: half on ground already graded and half on ground to be graded	Observing rights-of-way
Using the machine carefully	Observing deadlines
No aggregate segregation	Respecting the environment
Observing elevation levels	Observing occupational health and safety rules
Correct machine maintenance	
TASK 5 DRIVE A CONCRETE AND COMPACTED CONCRETE SPREADER	
Performance Criteria	
Using appropriate hand signals	Machine cleanliness
Attention	Observing the machine's capacity
Dexterity	Observing speed limits on the construction site
Wearing personal safety equipment	Observing distances between machines
Concrete thickness according to requirements	Observing rights-of-way
Spreading width according to requirements	Observing deadlines
Observing elevation levels	Respecting the environment
Correct machine maintenance	Observing occupational health and safety rules
Using the machine carefully	
TASK 6 DRIVE AN ASPHALT SPREADER	
Performance Criteria	
Using appropriate hand signals	Machine cleanliness
Attention	Observing the machine's capacity
Dexterity	Observing speed limits on the construction site
Wearing personal safety equipment	Observing distances between machines
Plant mix thickness according to requirements	Observing rights-of-way
Spreading width according to requirements	Observing deadlines
Observing elevation levels	Respecting the environment

TASK 6 DRIVE AN ASPHALT SPREADER	
Performance Criteria	
Correct machine maintenance	Observing occupational health and safety rules
Using the machine carefully	
TASK 7 DRIVE A STABILIZER SPRAYER	
Performance Criteria	
Using appropriate hand signals	Using the machine carefully
Attention	Machine cleanliness
Dexterity	Observing the machine's capacity
Wearing personal safety equipment	Observing distances between machines
Observing elevation levels	Observing rights-of-way
Granulometry according to requirements	Observing deadlines
Working according to requirements	Respecting the environment
Correct machine maintenance	Observing occupational health and safety rules
TASK 8 DRIVE A COLD MILLING MACHINE	
Performance Criteria	
Using appropriate hand signals	Machine cleanliness
Attention	Observing the machine's capacity
Dexterity	Observing distances between machines
Wearing personal safety equipment	Observing rights-of-way
Observing elevation levels	Observing deadlines
Correct machine maintenance	Respecting the environment
Using the machine carefully	Observing occupational health and safety rules
Working according to requirements	
TASK 9 DRIVE POWER COMPACTORS (DOUBLE DRUM, COMBINED AND PNEUMATIC)	
Performance Criteria	
Attention	Using the machine carefully
Dexterity	Machine cleanliness
Wearing personal safety equipment	Observing the machine's capacity

TASK 9 DRIVE POWER COMPACTORS (DOUBLE DRUM, COMBINED AND PNEUMATIC)	
Performance Criteria	
Passes overlapping half on the surface already compacted and half on the surface to be compacted	Correct machine maintenance
No roller vibration on the entire concrete structure	Observing speed limits on the construction site
Uniform compaction	Observing distances between machines
Starting the passes at the lowest point	Observing rights-of-way
Rolling method adapted to longitudinal and transverse joints	Observing deadlines
Respecting the environment	Observing occupational health and safety rules
Using the machine carefully	
TASK 10 LOAD AND UNLOAD A MACHINE ON A LONG-LOAD DOLLY OR A PLATFORM	
Performance Criteria	
Using appropriate hand signals	Machine cleanliness
Attention	Observing the long-load dolly's capacity
Dexterity	Observing deadlines
Wearing personal safety equipment	Respecting the environment
Using the machine carefully	Observing occupational health and safety rules

2.4 FUNCTIONS

A function:

- is a set of interrelated tasks;
- may be defined by work outcomes or a procedure;
- is a natural and concrete set of tasks.

The heavy equipment operators identified four functions for their trade:

- a function related to building a road surface and including task 6, "Drive an asphalt spreader," and task 5, "Drive a concrete and compacted concrete spreader;"
- a function related to loading and handling operations and including task 1, "Drive a loader-backhoe," and task 2, "Drive a front-end loader;"

- a function related to earthmoving operations and including task 4, “Drive a grader,” and task 3, “Drive a bulldozer;”
- a function related to material recycling operations and including task 8, “Drive a cold milling machine (leveller),” and task 7, “Drive a stabilizer sprayer.”

Tasks 9 and 10 – “Drive power compactors” and “Load and unload a machine on a long-load dolly or a platform” – are different and cannot be grouped by affinity.

3. QUANTITATIVE DATA ON TASKS

3.1 OCCURRENCE

Occurrence data concern the percentage of heavy equipment operators¹⁷ who perform a task in the same work environment. The data presented in the tables below are the average results of the participants. However, they account for the use of time not only of the heavy equipment operators attending the workshop, but also of all heavy equipment operators working in the companies represented.

Table 3.1 Occurrence of Tasks

Task	Occurrence
1. Drive a loader-backhoe	35.3%
2. Drive a front-end loader	44.1%
3. Drive a bulldozer	27.7%
4. Drive a grader	13.7%
5. Drive a concrete and compacted concrete spreader	12.5%
6. Drive an asphalt spreader	5.7%
7. Drive a stabilizer sprayer	0.6%
8. Drive a cold milling machine (leveller)	13.7%
9. Drive power compactors	37.7%
10. Load and unload a machine on a long-load dolly or a platform	65.4%

¹⁷ The data do not include apprentices.

3.2 WORK TIME

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

Table 3.2 Work Time Allocated to Tasks

Tasks	Work Time
1. Drive a loader-backhoe	9.5%
2. Drive a front-end loader	16.1%
3. Drive a bulldozer	11.4%
4. Drive a grader	11.2%
5. Drive a concrete and compacted concrete spreader	0.1%
6. Drive an asphalt spreader	8.5%
7. Drive a stabilizer sprayer	0.1%
8. Drive a cold milling machine (leveller)	12.8%
9. Drive power compactors	19.7%
10. Load and unload a machine on a long-load dolly or a platform	2.7%

3.3 IMPORTANCE AND DIFFICULTY OF TASKS

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

1. Not important at all: Poor execution of the task has no consequences on the overall quality of the product or service.
2. Not very important: Poor execution of the task could have minimal consequences on the overall quality of the product or service.

- 3. Important: Poor execution of the task could have major consequences on the overall quality of the product or service.
- 4. Very important: Poor execution of the task could have very major consequences on the overall quality of the product or service.

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;
it is less difficult than average.
- 2. Easy: The task involves a few risks of error;
it requires minimal mental or physical effort;
it is of average difficulty.
- 3. Difficult: The task involves many risks of error;
it requires a major mental or physical effort;
it is more difficult than average.
- 4. Very difficult: The task involves a very high risk of error;
it requires a very major mental or physical effort;
it is among the most difficult in the trade.

The data presented in the following table are the average results for the heavy equipment operators who participated in the workshop.

Table 3.3 Importance and Difficulty of Tasks

Task	Importance	Difficulty
1. Drive a loader-backhoe	3.4	2.8
2. Drive a front-end loader	3.2	2.3
3. Drive a bulldozer	3.3	2.7
4. Drive a grader	3.7	3.5
5. Drive a concrete and compacted concrete spreader	3.8	2.8
6. Drive an asphalt spreader	4.0	3.3
7. Drive a stabilizer sprayer	3.5	2.6
8. Drive a cold milling machine (leveller)	3.6	3.0
9. Drive power compactors	3.8	2.4
10. Load and unload a machine on a long-load dolly or a platform	2.5	1.8

3.4 TASKS PERFORMED

The participants answered the following question: “In the past year, did you perform the task regularly, occasionally or not at all¹⁸?”

Table 3.4 Tasks Performed

The data are presented according to the number of persons.

Task	Regularly	Occasionally	Not at all
1. Drive a loader-backhoe	3	6	2
2. Drive a front-end loader	4	7	0
3. Drive a bulldozer	2	5	4
4. Drive a grader	2	3	6
5. Drive a concrete and compacted concrete spreader	0	1	10
6. Drive an asphalt spreader	2	1	8
7. Drive a stabilizer sprayer	0	2	9
8. Drive a cold milling machine (leveller)	2	0	9
9. Drive power compactors	5	5	1
10. Load and unload a machine on a long-load dolly or a platform	5	5	1

¹⁸ Three questionnaires were not compiled because they contained errors.

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 heavy equipment operator.

4.1 KNOWLEDGE

Mathematics

Heavy equipment operators must be able to perform the four basic operations, to calculate slope percentages, estimate the volumes and quantities of materials, and convert units of measurement (imperial and metric systems).

Soil properties

Knowledge of materials (classes and properties) and soil types (organic and mineral) is essential for practicing the trade, i.e., for:

- choosing materials and spreading them in the required order;
- performing sorting and loading operations;
- performing various excavation and filling tasks;
- anticipating the reaction of materials and, for example, avoiding their segregation or the formation of mud;
- understanding the importance of soil non-contamination;
- doing compaction work;
- doing scarifying work.

Mechanics

Heavy equipment operators are not mechanics, but they must have some knowledge of this field. They can thus detect breakages, describe a malfunction, report information on possible causes of a problem, and interpret machine data to adapt their conduct to the machine's capacity.

Mechanical knowledge is also useful for inspecting and maintaining the machine.

Characteristics of constructions built

Basic knowledge of engineering and roadwork aspects enable operators:

- detect certain defects (for example, a missing membrane);
- do drainage work;
- anticipate problems (for example, a line buried for many years could crack following compaction work);
- understand the nature of work to be done and thus plan it better.

Surveying

The trade requires surveying knowledge. The worker must understand and interpret the meaning of much surveying data and related codes. Concepts of chaining, elevations, reference points and elevation points are thus useful on many occasions.

Surveying data and grade stakes indicate the physical markers of work to be done in tasks 1 to 6, i.e., "Drive a loader-backhoe," "Drive a front-end loader," "Drive a bulldozer," "Drive a grader," "Drive a concrete and compacted concrete spreader" and "Drive an asphalt spreader."

Reading plans

In the absence of surveying data or to locate buried infrastructure elements, heavy equipment operators must be able to interpret plans in order to plan the work to be done.

Laws and regulations

In addition to the laws and regulations mentioned in Section 1.5, the operators attending the workshop specified that knowledge of the road safety code is important for practicing the trade. That knowledge pertains to safe driving rules, registration fees and the various machine driving restrictions.

Loader-backhoe (task 1), front-end loader (task 2) and grader (task 4) operators are more concerned by the road safety code, since they drive more on the road.

4.2 SKILLS

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

4.2.1 Cognitive skills

Planning activities

This skill is useful for facing contingencies, coordinating work, choosing work methods and improving the productivity of operations.

Problem-solving

This skill is useful for facing contingencies.

4.2.2 Motor skills

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

- fine dexterity, to handle hydraulic controls;
- coordination of feet, hands and sight, to perform distinct operations with pedals, the steering wheel and hydraulic controls;

- physical strength, i.e., the ability to lift, carry, push and pull loads of 25 kg to 50 kg, particularly in certain maintenance work and to assist the mechanic when there is a malfunction.

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 heavy equipment operators need are the following: vision, hearing and touch.

Good peripheral vision is important for practicing the trade, not only in doing the work, but also in preventing accident hazards (hitting personnel on the ground, for example).

Good hearing is useful for perceiving abnormal noises and thus detecting the machine's abnormal operation or breakages.

Tactile skills are used for handling hydraulic controls, feeling abnormal vibrations, sensing the machine's spatial position, and perceiving slopes.

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 heavy equipment operators need are the following:

Personal and interpersonal attitudes

With regard to personal attitudes, the operators mentioned that an open mind and a positive attitude are important in doing the work. They also pointed out that certain tasks can be very repetitive (driving a bulldozer, grader or power compactor) and therefore require vigilance and patience.

Good interpersonal skills are essential for practicing the trade, because the work is often done in a team of many persons.

Professional ethics

Professional ethics is demonstrated by respect for others, courtesy in client relations, and good relations with other operators.

Preventive attitudes and behaviours in matters of health and safety

These attitudes and behaviours are particularly demonstrated by:

- wearing personal protection equipment;
- mutual assistance between workers;
- active participation in the various meetings of occupational health and safety committees;
- regular consultation of material safety data sheets;
- constant concern for the safety of personnel on the ground;
- cautioning a co-worker who has violated occupational health and safety rules;
- cautious use of machines.

5. TRAINING SUGGESTIONS

The heavy equipment operators attending the occupational analysis workshop made suggestions on initial training and the training of apprentices.

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

- Equipment driving training should be lengthened.
- Student evaluation could be improved, because after their training certain graduates have developed few skills in driving heavy equipment.
- Student selection and the use of skill tests should be improved.
- Training should include a beginning of specialization in certain machines.
- There should be training in the workplace.

As for the training of apprentices, the participants stated that the employment guarantee of at least 150 hours that is given by an employer registered with the CCQ does not enable the apprentice to demonstrate his skills sufficiently, or the employer to assess the worker's potential and productivity.

Finally, given the large number of machines and accessories, heavy equipment operators pointed out the importance of development courses for practicing the trade.

Annexes

Annex 1
TOOLS AND EQUIPMENT

For each task of the heavy equipment operator trade, and on the basis of a list submitted to them¹⁹, the participants determined the tools and equipment they use: construction site machines and accessories; tools and instruments; light accessories and equipment; raw materials; small tools and accessories; safety equipment and accessories; equipment maintenance accessories.

Table A.1 Tools and Equipment

TASK 1 DRIVE A LOADER-BACKHOE

Construction Machines and Accessories	
Loader-backhoe	Trench bucket
Broom	Mobile lip bucket
Hydraulic rock-breaker	Grapple
Ripper tooth	
Forks	

Tools and Instruments	
Pen knife	Sledgehammer
Combination wrench	Line level
Adjustable wrench	Square and narrow shovels
Toolbox	Hose clamp
Sockets	Measuring tape

Light Accessories and Equipment	
Gun adapter	Mobile radio
Transport chain	
Load chain	Portable radio

19. This list is based on that of the *Guide d'organisation* developed by the ministère de l'Éducation, du Loisir et du Sport for the program of study 5220, *Conduite d'engins de chantier*, Quebec City, 1998.

TASK 1 DRIVE A LOADER-BACKHOE

Raw Materials	
Mason's line	Windshield washer fluid
Absorbent paper towel	Glass cleaner
Grease	Aerosol paint
Penetrating oil	

Small Tools and Accessories	
Teeth (wheel-type loader)	Flat tip screwdriver
Grease gun	

Safety Equipment and Accessories	
Fire extinguisher	Safety glasses
Gloves	Road safety vest

TASK 2 DRIVE A FRONT-END LOADER

Construction Site Machines and Accessories	
Front-end loader	Body/spreader
Mechanical broom	Grapple
Forks	Boom
Bucket for aggregate, for sand, with teeth, with blade, V-shaped	

Tools and Instruments	
Combination wrench	Socket
Adjustable wrench	Sledgehammer
Connector tightening wrenches	Line level
Toolbox	Hose clamp
Knife	Measuring tape

Light Accessories and Equipment	
Adapter (for grease gun)	Mobile radio
Load chain	Portable radio

Raw Materials	
Mason's line	Penetrating oil
Shop towel	Hand cleaner
Grease	Glass cleaner
Oil (diesel engine)	Aerosol paint

Small Tools and Accessories	
Pin (roller)	Flat tip screwdriver
Grease gun	

Safety Equipment and Accessories	
Safety boots	Safety glasses
Hard hat	Hearing protector
Fire extinguisher	First aid kit
Gloves	Road safety vest

TASK 3 DRIVE A BULLDOZER

Construction Site Machines and Accessories	
Bulldozer	Mole
Ripper tooth et Ripper teeth	Torpedo
Side boom	Winch

Tools and Instruments	
Stationary laser beam detector	Hand level
Mobile laser beam detector (<i>ROD-EYE 4</i>)	Square and narrow shovels
Laser emitter	Hose clamp
Tripod level (transit)	Measuring tape

Light Accessories and Equipment	
Laser system fastener	Vox earphone
Sliding hook	Sling
Grapple hook	Mobile radio

Raw Materials	
Diesel fuel	Windshield washer fluid
Absorbent paper towel	Glass cleaner
Grease	Coolant
Oil (diesel engine)	

Small Tools and Accessories	
Corner bit and cutting edge (for bulldozer blade)	Grease gun
Ripper tooth (for bulldozer)	Grease gun connector

Safety Equipment and Accessories	
Safety boots	Safety glasses
Hard hat	Hearing protector
Fire extinguisher	First aid kit
Gloves	Road safety vest

Equipment Maintenance	
Dipper in case of turning over	

TASK 4 DRIVE A GRADER

Construction Site Machines and Accessories	
Grader	Ripper teeth
Scarifier	

Tools and Instruments	
Combination wrench	Hand level
Adjustable wrench	Electronic level
Laser emitter	Square shovel
Funnel	Measuring tape
Sledgehammer	

Light Accessories and Equipment	
Adapter (for grease gun)	Mobile radio

Raw Materials	
Diesel fuel	Windshield washer fluid
Mason's line	Gear lubricant
Absorbent paper towel	Hand cleaner
Grease	Glass cleaner
Oil (diesel engine)	Survey stake
Hydraulic oil	Coolant
Penetrating oil	

Small Tools and Accessories	
Flexible hose	Grease gun
Teeth	Grease gun connector

Safety Equipment and Accessories	
Safety boots	Fire extinguisher
Hard hat	Safety glasses
Gloves	Road safety vest

TASK 5 DRIVE A CONCRETE OR COMPACTED CONCRETE SPREADER

Construction Site Machines and Accessories	
Concrete spreader	Compacted concrete spreader
Conveyor	

Tools and Instruments	
Track binder adapter	Sledgehammer
Toolbox	Hand level
Combination wrench	Electronic level
Adjustable wrench	Level
Pipe wrench	Crowbar
Scaling hammer or impact hammer	Measuring tape

Raw Materials	
Mason's line	Oil (diesel engine)
Shop towel	Hydraulic oil
Ether (to remove moisture from sensors)	Coolant
Grease	

Small Tools and Accessories	
Grease gun	

Safety Equipment and Accessories	
Safety boots	Fire extinguisher
Hard hat	Hearing protector
Safety glasses	Road safety vest

TASK 6 DRIVE AN ASPHALT SPREADER

Construction Site Machines and Accessories	
Asphalt spreader	

Tools and Instruments	
Adjustable wrench	Sledgehammer
Toolbox	Hand level
Gypsum knife	Electronic level
Sockets	Square and narrow shovels
Funnel	Electric drill
Long spout funnel	Crowbar
Scraper	Curved jaw locking pliers
Marker	Impact extension
Pressure gauge	Impact extension (square)
Universal impact joint, square, SAE	Measuring tape

Light Accessories and Equipment	
Adapter (for grease gun)	Transport chain
Laser system fastener	Mobile radio

Raw Materials	
Battery (for electric lamp)	Gear oil
Diesel fuel	Hydraulic oil
Mason's line	Penetrating oil
Grease	Hand cleaner
Oil (diesel engine) / 4 litres	

Small Tools and Accessories	
Pin	Grease gun
Scraper	Flat tip screwdriver
Steel file	Machine screws
Round file	

Safety Equipment and Accessories	
Safety boots	Safety glasses
Hard hat	Hearing protector
Fire extinguisher	First aid kit
Gloves	Road safety vest

TASK 7 DRIVE A STABILIZER SPRAYER

Construction Site Machines and Accessories	
Stabilizer sprayer	

Tools and Instruments	
SAE socket adapter	Drawplate (for threading nuts and bolts)
Impact socket adapter, SAE	Marker
Trouble light	Universal impact joint, square, SAE
Angled pry bar	Electronic ranger limiter
Combination wrench	Air hammer
Cartridge wrench	Sledgehammer
Adjustable wrench	Cutting wheel (abrasive saw)
Connector tightening wrenches	Square shovel
Toolbox	Electric drill
Calibrating compass	Crowbar
Bolt cutter	Curved jaw locking pliers
Impact socket	Measuring wheels
Deep twelve-sided socket	Measuring tape
Deep six-sided socket	Hacksaw
Universal joint sockets	AC/DC electric welder
Hex drivers	Hand winch
Oxy-acetylene set	Steel pipe (used as a boom)
Funnel	Circuit tester
Long spout funnel	Hydraulic jack

Light Accessories and Equipment	
End piece	Shackle
Adapter (for grease gun)	Tire gauge
Eye bolt	Steatite carrier
Pneumatic pipe	Electrode holder
Air nozzle	Female welder plug
Welding cable	Male welder plug
Transport chain	Quick coupler
Grapple hook	Free air blowgun

TASK 7 DRIVE A STABILIZER SPRAYER

Raw Materials	
Acetylene and oxygen	Oil (gasoline engine)
Locking adhesive (Loctite)	Gear oil
Light bulb (for trouble light)	Hydraulic oil
Battery (for electric lamp)	Penetrating oil
Diesel fuel	Gear lubricant
Covered electrode	Grinding wheels
Bronze-covered electrode	Hand cleaner
Gasoline	Glass cleaner
Absorbent paper towel	Spark lighters
Shop towel	Coolant
Tin (for electric soldering iron)	Electrical tape washer
Grease	Teflon washer
Oil (diesel engine)	Welder's helmet glass

Small Tools and Accessories	
Nail claw	O rings
Wood block	Steel file
Bolts	Grease gun
Pin	Grease gun connector
Circlips	Grease fittings
All-purpose rings	Tie wrap (Ty-Rap)
Electric thimbles	Lock washers
Teeth	Flat washers
Nuts	Flat tip screwdriver
Dowel pins	Machine screws

Safety Equipment and Accessories	
Safety boots	Welding gloves
Welder's helmet	Safety glasses
Hard hat	Hearing protector
Fire extinguisher	Road safety vest
Gloves	

Equipment Maintenance	
Waste oil recovery container	

TASK 8 DRIVE A COLD MILLING MACHINE

Construction Site Machines and Accessories	
Cold milling machine (leveller)	Conveyor

Tools and Instruments	
SAE socket adapter	Long spout funnel
Impact socket adapter, SAE	Drawplate (for threading nuts and bolts)
Trouble light	Marker
Angled pry bar	Universal impact joint, square, SAE
Oil-squirt	Air hammer
Booster cable	Sledgehammer
Pen knife	Cutting wheel (abrasive saw)
Combination wrench	Level
Cartridge wrench	Square and narrow shovels
Adjustable wrench	Electric drill
Connector tightening wrenches	Crowbar
Toolbox	Curved jaw locking pliers
Bolt cutter	Measuring wheels
Cable cutter	Measuring tape
Impact socket	Hacksaw
Deep twelve-sided socket	AC/DC electric welder
Deep six-sided socket	Hand winch
Universal joint sockets	Steel pipe (used as a boom)
Hex drivers	Circuit tester
Oxy-acetylene set	Hydraulic jack
Funnel	

Light Accessories and Equipment	
End piece	Shackle
Adapter (for grease gun)	Grounding clamp
Eye bolt	Steatite carrier
Pneumatic pipe	Electrode holder
Air nozzle	Female welder plug
Welding cable	Male welder plug
Transport chain	Quick coupler
Grapple hook	Free air blowgun
Sling	

TASK 8 DRIVE A COLD MILLING MACHINE

Raw Materials	
Acetylene and oxygen	Oil (gasoline engine)
Locking adhesive (Loctite)	Gear oil
Light bulb (for trouble light)	Hydraulic oil
Battery (for electric lamp)	Penetrating oil
Diesel fuel	Hacksaw blade
Covered electrode	Gear lubricant
Bronze-covered electrode	Grinding wheels
Gasoline	Hand cleaner
Absorbent paper towel	Spark lighters
Shop towel	Electrical tape washer
Grease	Teflon washer
Oil (diesel engine)	Welder's helmet glass

Small Tools and Accessories	
Nail claw	Dowel pins
Wood block	O rings
Bolts	Steel file
Flexible hose	Round file
Pin	Grease gun
Wire rope	Grease gun connector
Nylon rope	Grease fittings
All-purpose rings	Tie wrap (Ty-Rap)
Teeth	Lock washers
Nuts	Flat washers
Sling	Flat tip screwdriver
Metal drill bits	Machine screws

Safety Equipment and Accessories	
Safety boots	Safety glasses
Welder's helmet	Overhang signs
Hard hat	Hearing protector
Fire extinguisher	First aid kit
Gloves	Road safety vest
Welding gloves	

Equipment Maintenance	
Waste oil recovery container	

TASK 9 DRIVE POWER COMPACTORS

Construction Site Machines and Accessories	
Double roller power compactor	Roller and pneumatic power compactor
Pneumatic power compactor	Sheepsfoot power compactor

Tools and Instruments	
Hand level	Electronic level

Raw Materials	
Diesel fuel	Windshield washer fluid
Absorbent paper towel	Hand cleaner
Grease	Glass cleaner
Oil (diesel engine)	Coolant
Hydraulic oil	

Small Tools and Accessories	
Flexible hose	Grease gun
Sprinkler filter	Grease gun connector
Spare sprinklers	

Safety Equipment and Accessories	
Safety boots	Safety glasses
Hard hat	Hearing protector
Fire extinguisher	Road safety vest
Gloves	

TASK 10 LOAD AND UNLOAD A MACHINE ON A LONG-LOAD DOLLY OR A PLATFORM

Construction Site Machines and Accessories	
Truck and platform	Winch
Long-load dolly	

Tools and Instruments	
Trouble light	Measuring tape
Broom	Load binder
Square shovel	Steel pipe (used as a boom)

Light Accessories and Equipment	
Transport chain	Mobile radio

Raw Materials	
Grease	Wood block

Small Tools and Accessories	
Grease gun	

Safety Equipment and Accessories	
Safety boots	Safety glasses
Hard hat	Overhang signs
Fire extinguisher	Road safety vest
Gloves	

GRID OF OCCUPATIONAL HEALTH AND SAFETY ELEMENTS

Produced by: **Serge Massé**, Consultant
 Representative of the Commission de la santé et de la sécurité du travail

Table A.2 Description of Hazards

No.	Hazards	Effects on Health and Safety	Means of Prevention
1	<p>Fall hazards (persons and objects)</p> <ul style="list-style-type: none"> • Sliding / losing balance (in or on the machine, or on the ground) • A worker's fall • Fall of machine components • Fall of material processed by the machine • Overturning / tipping over of the machine • Sliding of the machine in a trench, ditch or other • Ground slumping 	<ul style="list-style-type: none"> • Contusions • Fractures • Bruises • Strains • Internal injuries • Burial • Crushing • Permanent, physical and psychological after-effects • Death 	<ul style="list-style-type: none"> • Keep the cab interior clean and ensure that the floor is not slippery. • Wear safety boots with anti-slip soles. • Make sure of the solidity and stability of support points to climb on or off the cab. • Wear a hard hat. • Never allow anyone to be under a machine component (shovel) or the load that is lifted and transported. • Avoid slopes that are too steep. • Ensure the ground is solid. • Do not move too near the edge of shoulders or trenches. • Use shores.

No.	Hazards	Effects on Health and Safety	Means of Prevention
2	<p>Mechanical hazards</p> <ul style="list-style-type: none"> • Ejection of a machine part or an object processed by the machine (branches, trees, stones, processed material) • Sudden release of accumulated energy (Extended chains and cables, branches, roots, etc.) • Quick or slow descent of machine parts lifted beforehand for an intervention • The machine's sudden acceleration related to ill-timed activation of a working mechanism (drum) • Malfunction of the slowdown or braking mechanism, so that it is impossible to slow down or stop the machine under the best possible conditions • Access to moving parts (including in the stopping phase) • Inertia of rotating parts (rotated by hand, by imbalance or other) 	<ul style="list-style-type: none"> • Fractures • Sprains • Strains • Cuts • Lacerations • Amputation • Perforations • Pricks • Crushing • Scrapes • Scratches • Bruises • Contusions • Open wounds • Irritation, including to the eyes • Permanent, physical and psychological after-effects • Death 	<ul style="list-style-type: none"> • Wear a hard hat and safety glasses. • Safely use chains, steel cable and other means of attaching loads to lift them or keep them in place. • Drive with care and safely. • Check the machine and maintain it regularly. • Before an intervention, stop the machine (engine stop) and its parts and keep them stopped. • Mechanically block lifted parts. • Work cautiously.

No.	Hazards	Effects on Health and Safety	Means of Prevention
3	<p>Risks related to the movement of vehicles, pedestrians or workers near the machine</p> <ul style="list-style-type: none"> • Collision with a vehicle of the public or of the construction site • Hitting or crushing a worker or a member of the public who is walking 	<ul style="list-style-type: none"> • Scrapes • Scratches • Bruises • Contusions • Open wounds • Crushing • Amputation • Cuts • Lacerations • Fractures • Sprains • Strains • Internal injuries • Permanent, physical and psychological after-effects • Death 	<ul style="list-style-type: none"> • Drive with care on construction sites. • Require roadwork signs. • Require sign observance to be monitored.
4	<p>Electrical hazards</p> <ul style="list-style-type: none"> • Contact with components that are live (direct contact) • Electric arc triggered by proximity to high-tension parts 	<ul style="list-style-type: none"> • Electric discharges • Electrical burns • Electrification • Electrocutation • Death 	<ul style="list-style-type: none"> • Make sure to have correct information on the presence of live underground or overhead electrical conducts. • Ensure that electrical conducts are turned off. • Observe safe distances between overhead lines and machine parts.
5	<p>Weather hazards</p> <ul style="list-style-type: none"> • Intense heat • Intense cold • Ice/frost: falling • Snow/rain: falling • Wind: losing balance or falling 	<ul style="list-style-type: none"> • Chilblains • Hypothermia • Dehydration • Collisions • Contusions • Fractures • Bruises • Losing control of the vehicle or equipment (see fall hazards) 	<ul style="list-style-type: none"> • Wear appropriate clothing. • Observe safety rules for preventing heat stroke (working time, rest, drinks, etc.). • Wear adequate boots. • Drink water, keep hydrated. • Have cab heating and air conditioning. • Be very vigilant. • Be accompanied.

No.	Hazards	Effects on Health and Safety	Means of Prevention
6	<p>Heat and radiation hazards</p> <ul style="list-style-type: none"> • Contact with very hot objects or materials • Non-standard prolonged exposure to sources of heat or cold, or to very hot or cold areas • Exposure to intense light (welding) 	<ul style="list-style-type: none"> • Burns from heat (including fire, flames, hot gas) or from hot material • Effects of heat or light • Chilblains • Hypothermia • Eye irritation 	<ul style="list-style-type: none"> • Wait for intervention areas to cool down or warm up. • Wear appropriate clothing. • Wear appropriate personal protective equipment (PPE). • Observe safety rules for working in hot areas (working time, rest, drinks, etc.). • Be supervised.
7	<p>Noise and vibration hazards</p> <ul style="list-style-type: none"> • Non-standard exposure to a source of noise or vibrations 	<ul style="list-style-type: none"> • Deterioration of hearing acuity and balance • Fatigue • Stress • Loss of vigilance • Discomfort (for example, numbness) 	<ul style="list-style-type: none"> • Have the cab soundproofed. • Wear hearing protectors. • Follow noise exposure rules.
8	<p>Chemical hazards</p> <ul style="list-style-type: none"> • Exposure to dust • Exposure to contaminant gasses from petroleum products, lubricant, oil, fuel oil, bitumen • Contact due to splashes of concrete or bitumen • Access to cleaning and degreasing products • Leak or spill • Fire, explosion or chemical reactions • Presence of an ignition source with dust, gas or fumes • Asbestos 	<ul style="list-style-type: none"> • Prolonged damage to health • Death • Chemical burns • Damage from fire or explosions • Damage to the eyes • Respiratory illnesses • Cancer 	<ul style="list-style-type: none"> • Make sure to have correct information about the presence of gas lines and other dangerous underground products. • Make sure that electrical conduits are turned off, and that products transported in the conduits are cut off and drained. • Ensure that the premises or cab are well ventilated. • Wear a respirator mask (gas or dust). • Wear safety glasses. • Wear adequate gloves. • Observe safety rules for working in areas where hazardous products are present.

No.	Hazards	Effects on Health and Safety	Means of Prevention
9	<p>Ergonomic hazards</p> <ul style="list-style-type: none"> • Posture stress • Handling, lifting or moving heavy loads • Task difficulty / stress • Drowsiness, losing control of the machine or having it tip over 	<ul style="list-style-type: none"> • Physiological effects (for example, musculoskeletal disorders, or MSDs) of stressful postures, excessive or repetitive efforts, etc. • Sprains • Hernias • Fatigue • Discomfort • Pain • Psychophysiological effects (effects of mental overload, notably stress): anxiety, insomnia, exhaustion, nervousness • Multiple injuries • Death 	<ul style="list-style-type: none"> • Require a more suitable workstation. • Perform relaxation exercises often. • Use tools or request help to lift heavy loads. • Take short breaks often. • Divide one's work into several small steps.

Table A.3 Sources of Danger per Task and Operation

Legend

0	The risk is nil
+	The risk is low
++	The risk is average
+++	The risk is high

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

N°	Operations and sub-operations	Fall hazards (persons and objects)	Mechanical hazards	Risks related to the movement of vehicles, pedestrians or workers near the machine	Electrical hazards	Weather hazards	Heat and radiation hazards	Noise and vibration hazards	Chemical hazards	Risques ergonomiques Ergonomic hazards
TASK 1 DRIVE A LOADER-BACKHOE										
1.1	Take instructions from one's supervisor	x	0	0	0	x	0	0	0	0
1.1.1	Obtain information about: <ul style="list-style-type: none"> the nature of work to be done obstacles on the ground 	x	0	0	0	x	0	0	0	0
1.1.2	Interpret plans, if applicable	0	0	0	0	0	0	0	0	0
1.2	Inspect the machine and report defects	x	x	0	x	x	0	0	0	x
1.2.1	Inspect the machine's mechanisms and accessories	x	0	0	0	x	0	0	0	x
1.2.2	Check oil and fluid levels	x	0	0	0	x	0	0	0	x
1.2.3	Inspect cutting blades and the front and back buckets	x	x	0	0	x	0	0	0	x
1.2.4	Check the condition, air pressure and rims of tires	x	0	0	0	x	0	0	0	0
1.2.5	Check the automatic back-up horn	0	0	0	x	0	0	0	0	0
1.3	Take safety measures and apply safety standards	0	0	0	0	0	0	0	0	0
1.4	Plan the work	x	0	x	0	x	0	0	0	0
1.4.1	Identify the nature of soils to work on	x	0	x	0	x	0	0	0	0

N°	Operations and sub-operations	Fall hazards (persons and objects)	Mechanical hazards	Risks related to the movement of vehicles, pedestrians or workers near the machine	Electrical hazards	Weather hazards	Heat and radiation hazards	Noise and vibration hazards	Chemical hazards	Risques ergonomiques Ergonomic hazards
1.4.2	Read and interpret data written on grade skates: • interpret grade skates • find out about required elevation levels	x	0	x	0	x	0	0	0	0
1.4.3	Detect underground conduits or wires	x	0	x	0	x	0	0	0	0
1.5	Start the machine	0	0	0	x	0	0	0	0	0
1.5.1	Put the main switch on «on» position	0	0	0	x	0	0	0	0	0
1.5.2	Apply the startup procedure while taking the outdoor temperature into account	0	0	0	0	0	0	0	0	0
1.5.3	Check the smoke	0	0	0	0	0	0	0	0	0
1.6	Stabilize the machine	x	0	x	0	x	0	0	0	0
1.6.1	Position the machine	x	0	x	0	x	0	0	0	0
1.6.2	Lower the outriggers	0	0	0	0	0	0	0	0	0
1.6.3	Lower the front bucket	0	0	x	0	0	0	0	0	0
1.7	Break materials (hydraulic rock-breaker)	x	xx	x	xx	x	0	xx	xx	x
1.8	Clear the ground	x	xx	xx	0	xx	0	xx	x	x
1.9	Load materials or pile them	xx	xx	x	x	xx	x	x	xx	x
1.9.1	Raise back accessories to their highest level	0	0	x	0	0	0	0	0	0
1.9.2	Place the locking detent on accessories	x	xx	x	0	x	x	0	x	x
1.9.3	Use the front bucket	xx	xx	x	x	xx	x	x	x	x
1.9.4	Maintain an equal work platform	x	0	x	0	x	0	x	xx	x
1.10	Transport materials	xx	xx	xx	x	xx	0	xx	xx	x
1.11	Pick up materials (mobile lip bucket, grapple or fork)	xx	xx	xx	0	xx	x	x	xx	x
1.12	Equalize surfaces (bucket)	xx	x	xx	0	x	0	xx	x	x
1.13	Dig trenches and holes and detect infrastructures	xx	xxx	xx	xx	xx	xxx	xx	xxx	x
1.13.1	Unlock the arm	x	x	0	0	x	x	0	0	x

N°	Operations and sub-operations	Fall hazards (persons and objects)	Mechanical hazards	Risks related to the movement of vehicles, pedestrians or workers near the machine	Electrical hazards	Weather hazards	Heat and radiation hazards	Noise and vibration hazards	Chemical hazards	Risques ergonomiques Ergonomic hazards
1.13.2	Extend the boom	0	0	xx	x	0	0	0	0	0
1.13.3	Open the bucket	0	0	x	0	0	0	0	0	0
1.13.4	Lower the boom, retract and close the bucket	xx	xx	0	xx	x	xxx	0	xxx	x
1.13.5	Raise the boom	xx	xxx	x	xx	x	xxx	0	xxx	x
1.13.6	Make the bucket pivot to the side	x	xx	xx	xx	x	0	0	xx	x
1.13.7	Unload bucket contents in a truck or on the ground	x	xx	xx	0	x	0	0	x	x
1.14	Deposit and spread materials as necessary in trenches and holes	xx	xx	xx	xx	x	xx	xx	xx	x
1.15	Handle pipes, fire hydrants, sumps, etc.	xx	xx	xx	x	x	x	xx	x	x
1.15.1	Check and install slings, if applicable	x	x	x	0	x	0	0	0	x
1.15.2	Attach the equipment, if applicable	x	x	x	x	x	x	0	x	x
1.15.3	Place the equipment at the prescribed location	x	xx	x	x	x	x	x	x	x
1.16	Backfill the excavation	xx	x	xx	x	x	x	x	x	x
1.17	Compact the ground (back bucket)	x	0	x	0	x	0	xx	x	x
1.18	Sweep surfaces (mechanical broom)	x	xx	xx	0	x	0	xx	x	x
1.19	Store various construction materials	xx	xxx	xx	xx	xx	0	xx	xx	xx
1.19.1	Choose flat dry ground located in a safe area	x	0	0	0	x	0	0	0	0
1.19.2	Ensure that the area is accessible to other machines	0	0	0	0	0	0	0	0	0
1.19.3	Pile the materials up	xx	xxx	xx	x	xx	0	x	xx	x
1.19.4	Ensure the stability of materials	x	xx	0	0	x	0	x	x	xx
1.20	Park the machine at the prescribed location	x	0	0	0	x	0	0	0	0

N°	Operations and sub-operations	Fall hazards (persons and objects)	Mechanical hazards	Risks related to the movement of vehicles, pedestrians or workers near the machine	Electrical hazards	Weather hazards	Heat and radiation hazards	Noise and vibration hazards	Chemical hazards	Risques ergonomiques Ergonomic hazards
1.21	Clean the machine	x	x	0	0	x	x	0	0	x
1.21.1	Clean the anchor points	x	0	0	0	x	x	0	0	x
1.21.2	Clean the buckets	x	0	0	0	x	0	0	0	x
1.22	Maintain the machine	x	xx	0	0	x	x	x	x	x
1.22.1	Lubricate the components	x	x	0	0	x	x	0	x	x
1.22.2	Replace the back bucket teeth, if applicable ²⁰	x	xx	0	0	x	x	x	0	xx
1.22.3	Reclose and block the accessories	x	x	0	0	x	0	0	0	x
1.23	Stop the machine	0	0	0	x	0	0	0	0	0
1.23.1	Lower the accessories	0	0	0	0	0	0	0	0	0
1.23.2	Apply the closing procedure	0	0	0	0	0	0	0	0	0
1.23.3	Put the main switch on «off» position	0	0	0	x	0	0	0	0	0
1.24	Write reports and records and report defects	0	0	0	0	0	0	0	0	0
TASK 2 DRIVE A FRONT-END LOADER										
2.1	Take instructions from one's supervisor	x	0	0	0	x	0	0	0	0
2.1.1	Obtain information about: <ul style="list-style-type: none"> the nature of work to be done obstacles on the ground 	x	0	0	0	x	0	0	0	0
2.1.2	Interpret plans, if applicable	0	0	0	0	0	0	0	0	0
2.2	Inspect the machine and report defects	xx	xx	0	x	x	0	0	0	x
2.2.1	Inspect the machine's mechanisms and accessories	xx	xx	0	0	x	0	0	0	x
2.2.2	Check oil and fluid levels	x	0	0	0	x	0	0	0	0
2.2.3	Inspect the front bucket's cutting blades	x	x	0	0	x	0	0	0	x
2.2.4	Check the condition, air pressure and rims of tires	x	x	0	0	x	0	0	0	0

20. The CCQ's Direction de l'application des conventions collectives has issued a notice to the effect that the heavy machinery mechanic is responsible for this sub-operation.

N°	Operations and sub-operations	Fall hazards (persons and objects)	Mechanical hazards	Risks related to the movement of vehicles, pedestrians or workers near the machine	Electrical hazards	Weather hazards	Heat and radiation hazards	Noise and vibration hazards	Chemical hazards	Risques ergonomiques Ergonomic hazards
2.2.5	Check the automatic back-up horn	0	0	0	x	0	0	0	0	0
2.3	Take safety measures and apply safety standards	0	0	0	0	0	0	0	0	0
2.4	Plan the work	x	0	x	0	x	0	0	0	0
2.4.1	Identify the nature of soils to work on	x	0	x	0	x	0	0	0	0
2.4.2	Read and interpret data written on grade skates • interpret grade skates	x	0	x	0	x	0	0	0	0
2.4.3	Adjust the balance for loading work	x	0	0	0	x	0	0	0	0
2.5	Start the machine	0	0	0	x	0	0	0	0	0
2.5.1	Put the main switch on «on» position	0	0	0	x	0	0	0	0	0
2.5.2	Apply the startup procedure while taking the outdoor temperature into account	0	0	0	0	0	0	0	0	0
2.5.3	Check the smoke	0	0	0	0	0	0	0	0	0
2.6	Clear the ground	x	x	x	x	x	0	x	0	0
2.7	Load materials or pile them	xx	x	x	x	x	0	x	x	x
2.8	Pick up materials (fork)	xx	x	x	x	x	0	x	x	x
2.9	Transport materials	xx	x	xx	x	x	0	x	x	x
2.10	Equalize surfaces	xx	x	x	xx	x	x	x	xx	x
2.11	Deposit and spread materials as necessary in trenches and holes	xx	x	0	xx	x	x	x	x	x
2.12	Handle pipes, fire hydrants, sumps, etc.	xx	x	x	x	x	x	x	xx	x
2.12.1	Check and install slings, if applicable	x	x	x	0	x	0	0	0	x
2.12.2	Attach the equipment, if applicable	xx	x	x	x	x	x	0	x	x
2.12.3	Place the equipment at the prescribed location	xx	x	x	x	x	x	x	xx	x

N°	Operations and sub-operations	Fall hazards (persons and objects)	Mechanical hazards	Risks related to the movement of vehicles, pedestrians or workers near the machine	Electrical hazards	Weather hazards	Heat and radiation hazards	Noise and vibration hazards	Chemical hazards	Risques ergonomiques Ergonomic hazards
2.13	Spread gravel on the shoulder (body/spreader)	xx	x	x	x	x	x	x	xx	x
2.14	Sweep surfaces (mechanical broom)	x	xx	xx	0	x	0	xx	xx	x
2.15	Park the machine at the prescribed location	x	0	0	0	x	0	0	0	0
2.16	Clean the machine	x	x	0	0	x	x	0	0	x
2.16.1	Clean the anchor points	x	0	0	0	x	x	0	0	x
2.16.2	Clean the bucket	x	x	0	0	x	0	0	0	x
2.17	Stop the machine	0	0	0	x	0	0	0	0	0
2.17.1	Lower the accessories	0	0	0	0	0	0	0	0	0
2.17.2	Apply the closing procedure	0	0	0	0	0	0	0	0	0
2.17.3	Put the main switch on «off» position	0	0	0	x	0	0	0	0	0
2.18	Maintain the machine	x	xx	0	0	x	x	0	x	x
2.18.1	Lubricate the components	x	x	0	0	x	x	0	x	x
2.19	Write reports and records and report defects	0	0	0	0	0	0	0	0	0
TASK 3 DRIVE A BULLDOZER										
3.1	Take instructions from one's supervisor	x	0	0	0	x	0	0	0	0
3.2	Inspect the machine and report defects	xx	xx	0	x	x	0	0	0	x
3.2.1	Inspect the machine's mechanisms and accessories	xx	xx	0	0	x	0	0	0	x
3.2.2	Check oil and fluid levels	x	0	0	0	x	0	0	0	x
3.2.3	Check the fuel	x	0	0	0	x	0	0	0	x
3.2.4	Inspect the cutting blades	x	xx	0	0	x	0	0	0	x
3.2.5	Check the automatic back-up horn	0	0	0	x	0	0	0	0	0
3.3	Take safety measures and apply safety standards	0	0	0	0	0	0	0	0	0
3.4	Plan the work	x	0	x	0	x	0	0	0	0
3.4.1	Identify the nature of soils to work on	x	0	x	0	x	0	0	0	0

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3.4.2	Read and interpret data written on grade skates <ul style="list-style-type: none"> interpret grade skates find out about required elevation levels adjust electronic grading instruments 	x	0	x	0	x	0	0	0	0
3.5	Start the machine	0	0	0	x	0	0	0	0	0
3.5.1	Put the main switch on «on» position	0	0	0	x	0	0	0	0	0
3.5.2	Apply the startup procedure while taking the outdoor temperature into account	0	0	0	0	0	0	0	0	0
3.6	Install and check the electronic system, if applicable	x	0	0	0	x	0	0	0	x
3.6.1	Adjust compensation settings, if applicable	x	0	0	0	x	0	0	0	x
3.7	Grub fields	xx	xxx	x	0	xx	0	xx	x	xx
3.7.1	Use the winch	xx	xxx	0	0	xx	0	x	x	xx
3.7.2	Use the cutting blade	x	xx	0	0	x	0	x	x	x
3.8	Rip hard surfaces (ripper)	x	x	x	0	x	0	xx	x	x
3.8.1	Adjust the ripper's tooth according to the work to be done	x	xx	0	0	x	0	0	0	x
3.8.2	Move forward while gradually lowering the tooth	0	0	0	0	x	0	x	x	x
3.9	Clear the ground	x	x	x	0	x	0	x	x	x
3.9.1	Back up to the prescribed location	x	0	x	0	x	0	x	x	x
3.9.2	Lower and curve the blade	0	0	0	0	0	0	0	0	0
3.9.3	Move forward while raising the blade	x	0	x	0	x	0	x	x	x
3.9.4	Spread the materials or pile them	x	0	x	0	x	0	x	x	x
3.10	Scarify the work platform	xx	xx	x	0	xx	0	xx	xx	x

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3.11	Shape the construction while observing foundation profiles	xx	0	x	0	x	0	xx	xx	x
3.11.1	Continually adjust the blade's horizontal and vertical angles	xx	0	x	0	x	0	xx	xx	x
3.11.2	Continually adjust blade elevation to ensure uniform grading	xx	0	x	0	x	0	xx	xx	x
3.11.3	Estimate the required quantity of equipment	xx	0	x	0	x	0	xx	xx	x
3.11.4	Spread and grade materials	xx	0	x	0	x	0	xx	xx	x
3.11.5	Ensure that elevation levels are observed	xx	0	x	0	x	0	xx	xx	x
3.12	Spread and grade materials	xx	0	x	0	x	0	xx	xx	x
3.12.1	Determine cutting blade angles	0	0	0	0	0	0	0	0	0
3.12.2	Adjust cutting blade angles	0	0	0	0	0	0	0	0	0
3.13	Dig trenches for conduits or wires (mole or torpedo)	xxx	xx	x	xx	x	0	xx	xx	xx
3.14	Handle pipes (side boom)	xx	xx	x	x	xx	0	xx	x	x
3.15	Backfill the terrain	xx	x	x	0	xx	0	xx	x	x
3.16	Check elevation levels	0	0	0	0	0	0	0	0	0
3.17	Push other machines	xx	x	0	0	x	0	x	0	0
3.17.1	Slowly approach the other machine	xx	x	0	0	x	0	x	0	0
3.17.2	Move in position	x	0	0	0	x	0	x	0	0
3.17.3	Move forward	xx	x	x	0	x	0	x	0	0
3.18	Tow other machines (winch)	xx	xx	0	0	xx	0	x	0	x
3.18.1	Ask for assistance from another worker to run the cable	xx	x	0	0	xx	0	x	0	x
3.18.2	Apply the machine's brakes	0	0	0	0	0	0	0	0	0
3.18.3	Ensure that no workers are near the cable when the winch is used	0	0	0	0	0	0	0	0	0
3.19	Park the machine at the prescribed location	x	0	0	0	x	0	0	0	0

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3.20	Remove the electronic system, if applicable	0	0	0	0	x	0	0	0	0
3.21	Clean the machine	xx	xx	0	0	xx	0	0	x	xx
3.21.1	Clean the running gear	xx	xx	0	0	xx	0	0	x	xx
3.21.2	Clean the blade	x	0	0	0	xx	0	0	0	x
3.22	Maintain the machine	x	xx	0	0	x	xx	x	x	x
3.22.1	Lubricate the components	x	0	0	0	x	0	0	x	x
3.22.2	Clean the cab and windows	x	0	0	0	x	0	0	x	0
3.23	Stop the machine	0	0	0	x	0	0	0	0	0
3.23.1	Lower the accessories	0	0	0	0	0	0	0	0	0
3.23.2	Apply the closing procedure	0	0	0	0	0	0	0	0	0
3.23.3	Put the main switch on «off» position	0	0	0	x	0	0	0	0	0
3.24	Write reports and records and report defects	0	0	0	0	0	0	0	0	0
TASK 4 DRIVE A GRADER										
4.1	Take instructions from one's supervisor	x	0	0	0	x	0	0	0	0
4.2	Inspect the machine and report defects	x	x	0	x	x	0	0	0	x
4.2.1	Inspect the machine's mechanisms and accessories	x	x	0	0	x	0	0	0	x
4.2.2	Check oil and fluid levels	x	0	0	0	x	0	0	0	0
4.2.3	Inspect the cutting blades	x	x	0	0	x	0	0	0	x
4.2.4	Check the condition, air pressure and rims of tires	x	x	0	0	x	0	0	0	0
4.2.5	Check the automatic back-up horn	0	0	0	x	0	0	0	0	0
4.3	Take safety measures and apply safety standards	0	0	0	0	0	0	0	0	0
4.4	Plan the work	x	0	x	0	x	0	0	0	0
4.4.1	Identify the nature of soils to work on	x	0	x	0	x	0	0	0	0

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4.4.2	Read and interpret data written on grade skates: <ul style="list-style-type: none"> • interpret grade skates • find out about required elevation levels • adjust electronic grading instruments 	x	0	x	0	x	0	0	0	0
4.5	Start the machine	0	0	0	x	0	0	0	0	0
4.5.1	Put the main switch on «on» position	0	0	0	x	0	0	0	0	0
4.5.2	Apply the startup procedure while taking the outdoor temperature into account	0	0	0	0	0	0	0	0	0
4.6	Install and check the electronic system, if applicable	x	0	0	0	x	0	0	0	0
4.6.1	Adjust compensation settings, if applicable	x	0	0	0	x	0	0	0	0
4.7	Scarify the work platform	xx	0	x	0	x	0	xx	x	x
4.8	Shape the construction while observing foundation profiles	x	0	x	0	x	0	xx	x	x
4.8.1	Continually adjust the blade's horizontal and vertical angles	0	0	0	0	0	0	0	0	0
4.8.2	Continually adjust blade elevation to ensure uniform grading	0	0	0	0	0	0	0	0	0
4.8.3	Estimate the required quantity of equipment	0	0	0	0	0	0	0	0	0
4.8.4	Spread and grade materials	x	0	x	0	x	0	xx	x	x
4.8.5	Ensure that elevation levels are observed	0	0	0	0	0	0	0	0	0
4.9	Do the finish grading	x	0	x	0	x	0	x	x	x
4.9.1	Continually adjust the blade's horizontal and vertical angles	x	0	x	0	x	0	x	x	x
4.9.2	Continually adjust blade elevation to ensure uniform grading	x	0	x	0	x	0	x	x	x

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4.9.3	Estimate the required quantity of equipment	0	0	0	0	0	0	0	0	0
4.9.4	Ensure that materials are discharged beyond the passage of the machine's rear wheels	0	0	0	0	0	0	0	0	0
4.9.5	Spread and grade materials	x	0	x	0	x	0	x	x	x
4.9.6	Ensure that elevation levels are observed	0	0	0	0	0	0	0	0	0
4.10	Spread gravel on the shoulder (body/spreader)	xx	0	x	0	xx	0	x	x	x
4.11	Report detected abnormalities in the aggregate and the structure profiles	x	0	x	0	x	0	0	0	0
4.11.1	Check whether the aggregate is too dry or too moist	x	0	x	0	x	0	0	0	0
4.11.2	Check the possibility of incorrect surveying reference points	x	0	0	0	x	0	0	0	0
4.11.3	Notify the persons concerned	0	0	0	0	0	0	0	0	0
4.12	Park the machine at the prescribed location at the end of work	x	0	0	0	x	0	0	0	0
4.13	Remove the electronic system, if applicable	x	0	0	0	x	0	0	0	0
4.14	Clean the machine	xx	x	0	0	x	0	0	0	x
4.14.1	Clean the windows	xx	0	0	0	x	0	0	0	x
4.15	Maintain the machine	xx	xxx	0	x	xx	x	x	x	x
4.15.1	Lubricate the components	xx	x	0	x	xx	0	0	x	x
4.16	Stop the machine	0	0	0	x	0	0	0	0	0
4.16.1	Lower the blade	0	0	0	0	0	0	0	0	0
4.16.2	Apply the closing procedure	0	0	0	0	0	0	0	0	0
4.16.3	Put the main switch on «off» position	0	0	0	x	0	0	0	0	0
4.17	Write reports and records and report defects	0	0	0	0	0	0	0	0	0

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TASK 5 DRIVE A CONCRETE AND COMPACTED CONCRETE SPREADER										
5.1	Take instructions from one's supervisor	x	0	0	0	x	0	0	0	0
5.2	Inspect the machine and report defects	x	x	0	x	x	0	0	0	xx
5.2.1	Check oil and fluid levels	x	0	0	0	x	0	0	0	x
5.2.2	Check the water level	x	0	0	0	x	0	0	0	x
5.2.3	Check the tracks adjustment	x	x	0	0	x	0	0	0	x
5.2.4	Check the automatic back-up horn	0	0	0	x	0	0	0	0	0
5.3	Take safety measures and apply safety standards	x	0	0	0	x	0	0	0	0
5.3.1	Check whether the work area is secured	x	0	0	0	x	0	0	0	0
5.3.2	Ensure the presence of signs	x	0	0	0	x	0	0	0	0
5.4	Plan the work	0	0	0	0	0	0	0	0	0
5.4.1	Read and interpret data written on grade skates: <ul style="list-style-type: none"> interpret grade skates find out about required elevation levels adjust electronic grading instruments 	x	0	x	0	x	0	0	0	0
5.4.2	Determine the starting and arrival points	0	0	0	0	0	0	0	0	0
5.5	Install and check the electronic system, if applicable	x	0	0	0	x	0	0	0	0
5.5.1	Adjust compensation settings, if applicable									
5.6	Start the machine	0	0	0	0	0	0	0	0	0
5.7	Use an escort to move the machine to its work area and position the machine	x	0	xx	x	x	0	0	0	x

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5.8	Prepare the machine for operations	x	xx	x	0	x	0	x	x	x
5.8.1	Adjust the electronic system: <ul style="list-style-type: none"> level steering shaft 	0	0	0	0	0	0	0	0	0
5.8.2	Ensure that all work team members are in position	0	0	0	0	0	0	0	0	x
5.8.3	Spray vegetable oil on the mould, the screw, etc.	x	xx	0	0	x	0	0	x	x
5.8.4	Order the machine's hopper to be loaded	x	xx	x	0	x	0	x	x	0
5.8.5	Make sure to have a sufficient volume of concrete before it is laid	0	0	0	0	0	0	0	0	x
5.9	Lay the concrete	x	xx	xx	x	xx	0	xx	xx	x
5.9.1	Depending on surface configuration (road, parking lot, intersection, etc.), adjust: <ul style="list-style-type: none"> the machine's speed paving thickness paving width (concrete paver only) 	0	0	0	0	0	0	0	0	0
5.10	Monitor the safety of personnel on the ground	0	0	0	0	0	0	0	0	x
5.11	Mettre la machine en position d'arrêt Put the machine in the stop position	0	0	0	0	0	0	0	0	0
5.12	Remove the electronic system, if applicable	x	0	0	0	x	0	0	0	x
5.13	Clean the machine	xx	xx	0	0	x	x	x	xx	x
5.13.1	Wash with water	x	xx	0	0	x	0	x	xx	x
5.13.2	If the concrete is set, scratch or break it with a sledgehammer	xx	xx	0	0	x	0	x	xx	x
5.14	Maintain the machine	x	xx	0	0	x	xx	0	x	x
5.14.1	Lubricate the gantry and the endless screw, or check and activate the automatic lubrication system	x	xx	0	0	x	x	0	x	x

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5.15	Use an escort to move the machine to its parking platform	x	0	xx	x	x	0	0	0	x
5.15.1	Start the machine	0	0	0	0	0	0	0	0	0
5.15.2	Go to the parking platform	x	0	xx	x	x	0	0	0	0
5.16	Stop the machine	x	x	0	x	x	0	0	0	x
5.16.1	Apply the closing procedure	0	0	0	0	0	0	0	0	0
5.16.2	Put the main switch on «off» position	0	0	0	x	0	0	0	0	
5.16.3	Install security bars	x	x	0	0	x	0	0	0	x
5.17	Write reports and records and report defects	0	0	0	0	0	0	0	0	0
5.17.1	Enter the machine's hours of use	0	0	0	0	0	0	0	0	0
TASK 6 DRIVE AN ASPHALT SPREADER										
6.1	Take instructions from one's supervisor	x	0	0	0	x	0	0	0	0
6.2	Inspect the machine and report defects	xx	xx	0	x	x	0	0	0	x
6.2.1	Inspect the machine's mechanisms and accessories (conveyors, screws, doors, etc.)	x	xx	0	0	x	0	0	0	x
6.2.2	Inspect the table	xx	0	0	0	x	0	0	0	x
6.2.3	Check the fuel	x	0	0	0	x	0	0	0	x
6.2.4	Check oil and fluid levels	x	0	0	0	x	0	0	0	x
6.2.5	Check the vibrators	x	x	0	0	x	0	0	0	x
6.2.6	Check the condition, air pressure and rims of tires	x	x	0	0	x	0	0	0	0
6.2.7	Check the automatic back-up horn	0	0	0	x	0	0	0	0	0
6.3	Take safety measures and apply safety standards	x	0	x	0	x	0	0	0	0
6.3.1	Check whether the work area is secured	x	0	x	0	x	0	0	0	0
6.3.2	Ensure the presence of signs	x	0	x	0	x	0	0	0	0

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6.4	Start the machine	0	0	0	0	0	0	0	0	0
6.5	Heat the smoothing bar	0	0	0	0	0	x	x	x	0
6.5.1	Start the table's heating system	0	0	0	0	0	x	x	x	0
6.5.2	Check the table's temperature	0	0	0	0	0	x	x	x	x
6.6	Install and check the electronic system, if applicable	x	0	0	0	x	0	0	0	x
6.6.1	Adjust the table's compensation settings, if applicable	x	0	0	0	x	0	0	0	x
6.7	Plan the work	0	0	0	0	0	0	0	0	0
6.7.1	Read and interpret data written on grade skates: <ul style="list-style-type: none"> interpret grade skates find out about required elevation levels adjust electronic grading instruments 	x	0	x	0	x	0	0	0	0
6.7.2	Determine the starting and arrival points	0	0	0	0	0	0	0	0	0
6.8	Use an escort to move the machine to its work area and position the machine	x	0	xx	x	x	0	0	0	x
6.9	Prepare the machine for operations	x	x	x	0	0	x	x	x	x
6.9.1	Adjust the electronic system: <ul style="list-style-type: none"> level steering shaft 	0	0	0	0	0	0	0	0	0
6.9.2	Activate the chain drive and spreading screws for laying the plant mix	0	x	0	0	0	0	0	0	0
6.9.3	Ensure that all work team members are in position	0	0	0	0	0	0	0	0	x
6.9.4	Install the thickness guide	0	0	0	0	0	0	0	0	0
6.9.5	Lower the smoothing bar	0	0	0	0	0	0	0	0	0

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6.9.6	Adjust the alignment guide	0	0	0	0	0	0	0	0	0
6.9.7	Adjust the approach angle of the smoothing bar	0	0	0	0	0	0	0	0	0
6.9.8	Order the machine's hopper to be loaded	0	x	x	0	0	x	x	x	0
	Make sure to have a sufficient volume of plant mix before it is laid	0	0	0	0	0	0	0	x	x
6.10	Lay the plant mix	x	x	xx	x	xx	xx	xx	xx	xx
6.10.1	Depending on surface configuration (road, parking lot, intersection, etc.), adjust: <ul style="list-style-type: none"> • machine speed • paving thickness • paving width • slope percentages 	0	0	0	0	0	0	0	0	0
6.11	Monitor the safety of personnel on the ground	0	0	0	0	0	0	0	0	x
6.12	Remove the electronic system, if applicable	x	0	0	0	x	0	0	0	0
6.13	Put the machine in the stop position	x	0	0	0	x	x	x	x	0
6.14	Clean the machine	xx	xxx	0	0	x	xx	0	xx	x
6.14.1	Stop the machine	0	0	0	0	0	0	0	0	0
6.14.2	Clean the machine of any plant mix	xx	xx	0	0	x	xx	0	xx	x
6.14.3	Spray the hopper, screw feeder, spreading screws and smoothing bar with a washing agent	xx	xxx	0	0	0	xx	0	xx	x
6.14.4	Leave the smoothing bar raised and fasten it	x	xx	0	0	0	x	0	x	x
6.15	Maintain the machine	x	xx	0	x	0	xx	0	x	xx
6.15.1	Lubricate the gantry and the endless screw, or check and activate the automatic lubrication system	x	xx	0	0	0	x	0	x	0

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6.16	Use an escort to move the machine to its parking platform	x	x	xx	x	x	0	x	0	x
6.16.1	Start the machine	0	0	0	0	0	0	0	0	0
6.16.2	Go to the parking platform	x	0	xx	0	x	0	x	0	x
6.17	Stop the machine	x	xx	x	x	x	0	0	0	x
6.17.1	Apply the closing procedure	0	0	0	0	0	0	0	0	0
6.17.2	Put the main switch on «off» position	0	0	0	x	0	0	0	0	0
6.17.3	Install security bars	x	xx	x	0	x	0	0	0	x
6.18	Write reports and records and report defects	0	0	0	0	0	0	0	0	0
6.18.1	Enter the machine's hours of use	0	0	0	0	0	0	0	0	0
TASK 7 DRIVE A STABILIZER SPRAYER										
7.1	Take instructions from one's supervisor	x	0	0	0	x	0	0	0	0
7.2	Inspect the machine and report defects	x	xx	0	0	x	0	0	0	x
7.2.1	Check oil and fluid levels	x	0	0	0	x	0	0	0	x
7.3	Take safety measures and apply safety standards	0	0	0	0	0	0	0	0	0
7.4	Start the machine	0	0	0	0	0	0	0	0	0
7.5	Inspect the drum and teeth	xx	xx	0	0	x	0	0	0	xx
7.6	Plan the work	x	0	x	0	x	0	0	0	0
7.6.1	Inspect the path (manholes, rail, expansion joint, other obstacles)	x	0	x	0	x	0	0	0	0
7.6.2	Mark obstacles with paint	x	0	x	0	x	0	0	0	0
7.7	Use an escort to move the machine to its work area and position the machine	x	0	xx	x	x	0	x	0	x
7.8	Prepare the machine for operations to be performed	x	xx	0	x	x	0	x	x	x
7.8.1	Activate the drum	0	0	0	0	0	0	x	0	0

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7.8.2	Gradually lower the drum to the desired cutting depth	x	xx	0	x	x	0	0	x	x
7.8.3	Adjust the binder's flow rate, if applicable	0	0	0	0	0	0	x	0	0
7.9	Carry out the work	xx	xx	xx	0	x	x	x	xx	xx
7.9.1	Adjust the machine's advance according to the nature of work to be done	x	xx	xx	0	x	0	x	xx	x
7.9.2	Gradually raise the drum back up	0	x	0	0	0	0	x	0	0
7.9.3	Disengage the drum	0	0	0	0	0	0	0	0	0
7.9.4	Check the wear of the teeth, teeth holders and drum	xx	xx	0	0	x	x	0	x	xx
7.10	Use an escort to move the machine to its parking platform	x	0	xx	x	x	0	x	0	x
7.11	Clean the machine	xx	xx	0	0	x	xx	0	x	xx
7.12	Clean the machine	xx	xx	0	x	x	xx	0	x	xx
7.12.1	Replace teeth and teeth holders	xx	xx	0	0	x	0	0	0	xx
7.12.2	Arc weld (SMAW) the teeth holders ²¹	xx	xx	0	x	x	xx	0	x	xx
7.13	Stop the machine	0	0	0	0	0	0	0	0	0
7.14	Write reports and records and report defects	0	0	0	0	0	0	0	0	0
TASK 8 DRIVE A COLD MILLING MACHINE (LEVELLER)										
8.1	Take instructions from one's supervisor	x	0	0	0	x	0	0	0	0
8.2	Inspect the machine and report defects	x	0	0	0	x	0	0	0	0
8.2.1	Check oil and fluid levels	x	0	0	0	x	0	0	0	0
8.3	Take safety measures and apply safety standards	0	0	0	0	0	0	0	0	0
8.4	Start the machine	0	0	0	0	0	0	0	0	0

21. The CCQ's Direction de l'application des conventions collectives has issued a notice to the effect that the heavy machinery mechanic is responsible for sub-operations 7.12.1 and 7.12.2.

N°	Operations and sub-operations	Fall hazards (persons and objects)	Mechanical hazards	Risks related to the movement of vehicles, pedestrians or workers near the machine	Electrical hazards	Weather hazards	Heat and radiation hazards	Noise and vibration hazards	Chemical hazards	Risques ergonomiques Ergonomic hazards
8.5	Install and check the electronic system, if applicable	x	0	0	0	x	0	0	0	0
8.5.1	Adjust compensation settings, if applicable	x	0	0	0	x	0	0	0	0
8.6	Inspect the drum and teeth	xx	xx	0	0	x	0	0	0	x
8.7	Fill the tank with water to be sprayed	xx	0	0	0	0	0	0	0	x
8.8	Check the operation of water sprinklers	x	0	0	0	0	0	0	0	x
8.9	Plan the work	0	0	0	0	0	0	0	0	0
8.9.1	Inspect the path (manholes, rail, expansion joint, other obstacles)	x	0	x	0	x	0	0	0	0
8.9.2	Mark obstacles with paint	x	0	x	0	x	0	0	0	0
8.10	Use an escort to move the machine to its work area and position the machine	x	0	xx	x	xx	0	0	0	0
8.11	Prepare the machine for operations to be performed	x	xx	xx	0	x	0	0	0	0
8.11.1	Activate the drum countersink	0	0	0	0	0	0	0	0	0
8.11.2	Activate the conveyor and place it over the bed of the truck	x	0	0	0	0	0	0	0	0
8.11.3	Gradually lower the drum countersink to the desired depth	x	xx	0	0	0	0	0	0	0
8.11.4	Adjust the water flow rate	0	0	0	0	0	0	0	0	0
8.12	Monitor the safety of personnel on the ground	0	0	0	0	0	0	0	0	0
8.13	Carry out the work	x	xx	xx	x	x	x	x	x	x
8.13.1	Adjust the machine's advance according to the nature of work to be done	0	0	0	0	0	0	0	0	0
8.13.2	Gradually raise the drum countersink back up	0	0	0	0	0	0	0	0	0
8.13.3	Disengage the drum countersink	0	0	0	0	0	0	0	0	0

N°	Operations and sub-operations	Fall hazards (persons and objects)	Mechanical hazards	Risks related to the movement of vehicles, pedestrians or workers near the machine	Electrical hazards	Weather hazards	Heat and radiation hazards	Noise and vibration hazards	Chemical hazards	Risques ergonomiques Ergonomic hazards
8.13.4	Check the wear of the teeth, teeth holders and drum	xx	xx	0	0	x	x	0	0	x
8.14	Remove the electronic system, if applicable	x	0	0	0	0	0	0	0	0
8.15	Park the machine at the cleaning location	x	0	x	0	0	0	0	0	0
8.16	Clean the machine	xx	x	0	0	x	x	0	x	x
8.17	Use an escort to move the machine to its parking platform	x	0	xx	0	x	0	0	0	0
8.18	Maintain the machine	xxx	xx	0	x	x	xx	0	x	xx
8.18.1	Replace teeth and teeth holders	xxx	xx	0	x	0	xx	0	x	0
8.18.2	Arc weld (SMAW) the teeth holders ²²	x	x	0	x	0	xx	0	x	x
8.19	Stop the machine	0	0	0	0	0	0	0	0	0
8.20	Write reports and records and report defects	0	0	0	0	0	0	0	0	0
TASK 9 DRIVE POWER COMPACTORS (DOUBLE DRUM, COMBINED AND PNEUMATIC)										
9.1	Take instructions from one's supervisor	x	0	0	0	x	0	0	0	0
9.2	Inspect the machine and report defects	x	x	0	x	x	0	0	0	x
9.2.1	Check oil and fluid levels	x	0	0	0	x	0	0	0	x
9.2.2	Check the condition of tires and rims	x	0	0	0	x	0	0	0	0
9.2.3	Check the automatic back-up horn	0	0	0	x	0	0	0	0	0
9.3	Take safety measures and apply safety standards	0	0	0	0	0	0	0	0	0
9.4	Plan the work	x	0	0	0	x	0	0	0	0
9.5	Start the machine	0	0	0	x	0	0	0	0	0
9.5.1	Put the main switch on «on» position	0	0	0	x	0	0	0	0	0

22. The CCQ's Direction de l'application des conventions collectives has issued a notice to the effect that the heavy machinery mechanic is responsible for sub-operations 8.18.1 and 8.18.2.

N°	Operations and sub-operations	Fall hazards (persons and objects)	Mechanical hazards	Risks related to the movement of vehicles, pedestrians or workers near the machine	Electrical hazards	Weather hazards	Heat and radiation hazards	Noise and vibration hazards	Chemical hazards	Risques ergonomiques Ergonomic hazards
9.5.2	Apply the startup procedure while taking the outdoor temperature into account	0	0	0	0	0	0	0	0	0
9.6	Install the electronic system, if applicable	x	0	0	0	x	0	0	0	x
9.7	Fill the water tank for spraying (plant mix)	x	0	0	0	x	0	0	0	x
9.8	Check the operation of water sprinklers (plant mix)	x	x	0	0	x	0	0	0	x
9.9	Move the machine to the place of work	x	x	xx	x	x	0	0	x	0
9.10	Select vibration amplitude and frequency (plant mix and aggregate)	0	0	0	0	0	0	x	0	0
9.11	Select the tire pressure and speed (plant mix)	0	0	0	0	0	0	0	0	0
9.12	Proceed to compaction	xx	x	xx	0	xx	xx	xx	xx	xxx
	Aggregate	xx	0	xx	0	xx	0	x	xx	xxx
9.12.1	Adjust the rolling speed and vibration according to the pattern	x	0	0	0	x	0	x	x	0
9.12.2	Make sure of the required moisture level	0	0	0	0	x	0	x	x	0
9.12.3	Make the required number of passes	xx	0	xx	0	xx	0	x	xx	xx
	Plant mix	xx	x	xx	0	xx	xx	xx	xx	xxx
9.12.4	Adjust the amplitude, speed and vibration	x	0	0	0	x	x	x	x	0
9.12.5	Take the mix's temperature and behaviour into account	0	0	0	0	0	x	x	x	x
9.12.6	Compact	xx	x	xx	0	xx	xx	xx	xx	xxx
9.12.7	Make the required number of passes	xx	0	xx	0	xx	xx	xx	xx	xxx
9.13	Disengage the vibration system before each change in direction (plant mix and aggregate)	0	0	0	0	0	0	0	0	0

N°	Operations and sub-operations	Fall hazards (persons and objects)	Mechanical hazards	Risks related to the movement of vehicles, pedestrians or workers near the machine	Electrical hazards	Weather hazards	Heat and radiation hazards	Noise and vibration hazards	Chemical hazards	Risques ergonomiques Ergonomic hazards
9.14	Park the machine at the prescribed location	x	0	xx	0	x	0	0	0	0
9.15	Remove the electronic system, if applicable	x	0	0	x	x	0	0	0	0
9.16	Clean the machine	xx	0	0	0	x	x	0	0	x
9.16.1	Clean the windows	x	0	0	0	x	0	0	0	x
9.16.2	Clean roller scrapers	xx	0	0	0	x	x	0	0	x
9.17	Stop the machine	0	0	0	0	0	0	0	0	0
9.18	Maintain the machine	xx	0	0	0	x	x	x	x	x
9.18.1	Lubricate the components	x	x	0	0	x	0	0	0	0
9.18.2	In cold weather, drain the pumps and fill them with antifreeze	xx	0	0	0	x	x	0	x	x
9.19	Write reports and records and report defects	0	0	0	0	0	0	0	0	0
TASK 10 LOAD AND UNLOAD A MACHINE ON A LONG-LOAD DOLLY OR A PLATFORM										
This task was not matched with a description of sub-operations or clarifications by the participants.										
	Load and unload a machine on a long-load dolly or a platform	xxx	xx	x	x	xx	x	0	0	x