



GARBAGE COLLECTION

May 2009

CHOOSING A TRUCK WITH AN ARTICULATED ARM



This technical fact sheet is intended to designer-manufacturers, potential buyers, as well as for trucks operators.

A previous study¹ on the biological agents and ergonomic constraints related to the use of trucks with articulated arms demonstrated a significant reduction in the main health and safety hazards to which waste collectors doing conventional waste collection are exposed.

However, its also demonstrated new problems related to the physical layout of recent trucks and their maintenance and cleaning operations. The authors had proposed driving station and cab layout criteria, taking into account the manufacturer's potential constraints². This publication presents the evaluation of the improvements made by applying these modifications and proposes others solutions.

These results will also allow garbage trucks with articulated arms to be optimized in relations to the requirements of the waste collectors' new tasks.

The ASTE, IRSST and APSAM use the research results to produce this technical fact sheet describing the improvement criteria and solutions.

Optimal cab

Figure 1 presents illustrations of cabs (A, B, C, D) designed in an ergonomic way for operator sitting and standing positions.

The distances and angles to be respected in order to ensure a good visibility and an appropriate adjustment of the controls according to the size of the seated operator are described in illustrations A and B. The control lever should therefore be easily adjustable to a height varying from 60 cm to 94 cm from the cab floor (illustration A). The distance of the control lever, measured in relation to the centre of the backrest of the operator's seat, is also indicated in illustration A. The steering wheel angle should be between 45° and 55°, and the seat should be adjustable to a height varying from 40 cm to 52 cm.

FIGURE 1
DRIVER'S STATION LAYOUT CRITERIA

- 1 Control lever
- 2 Steering wheel
- 3 Accelerator
- 4 Brake
- 5 Backrest

ILLUSTRATION A
SITTING POSITION
SIDE VIEW

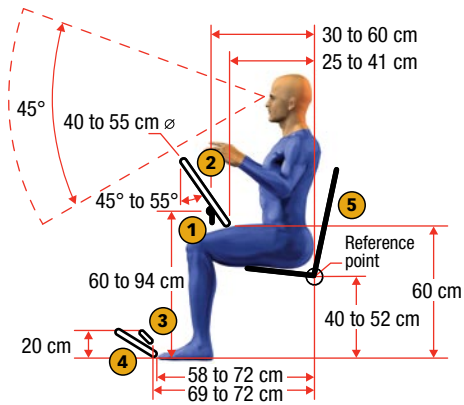


ILLUSTRATION B
SITTING POSITION
TOP VIEW

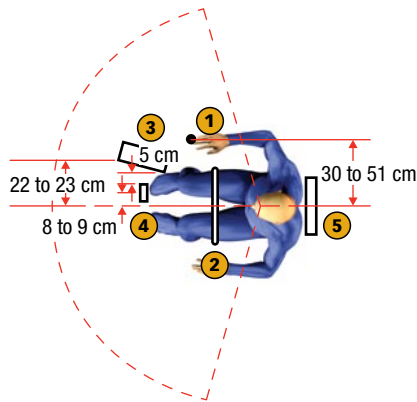


ILLUSTRATION C
STANDING POSITION
SIDE VIEW

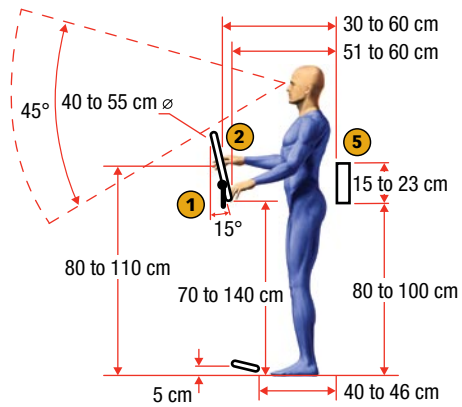
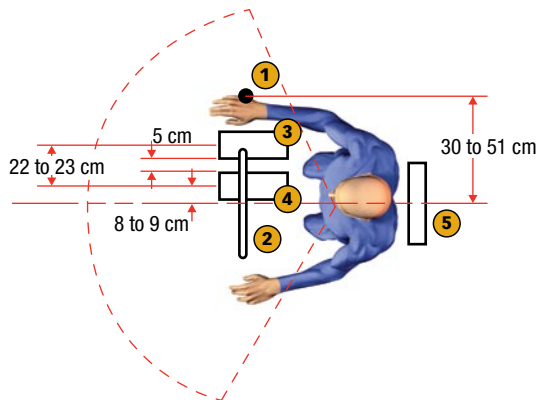


ILLUSTRATION D
STANDING POSITION
TOP VIEW



When the operator is standing, the control lever should be at a height varying from 70 cm to 140 cm (illustration C), depending on the operator's size, and at an adjustable distance of 30 cm to 51 cm in relation to the centre of the backrest (illustration D). For a standing position, the steering wheel should be at an angle of 15° and at a height of 80 cm to 110 cm (illustration C).

The cab should have:

- an air-conditioning system or a door with a window that can be opened;
- soundproofed walls;
- electrically adjustable mirrors;
- a storage space for work articles (pencil, paper, manual, etc.) and for personal effects;
- a movable control lever that can be placed either to the left or right of the operator (photo 1);



PHOTO 1
ADJUSTABLE CONTROL LEVER
AND STEERING WHEEL AT AN
ANGLE OF 15°

- adjustable and retractable seats for the standing position;
- a liquid-crystal colour screen with a sun visor;
- a mechanism for adjusting the floor height for work in the standing position (photo 2).



PHOTO 2
GRATED FLOOR AND
HEIGHT-ADJUSTABLE SEAT

Optimal hopper

An optimal hopper should have a variable compaction cycle and a reliable and robust articulated arm. It should also have little impact on the truck's balancing movement. Its operation and maintenance should be completely safe.

The hopper should have:

- a crusher panel that prevents material from jamming in the hopper, in order to avoid the risk of the worker being crushed by the compactor by trying to remove it (photo 3);

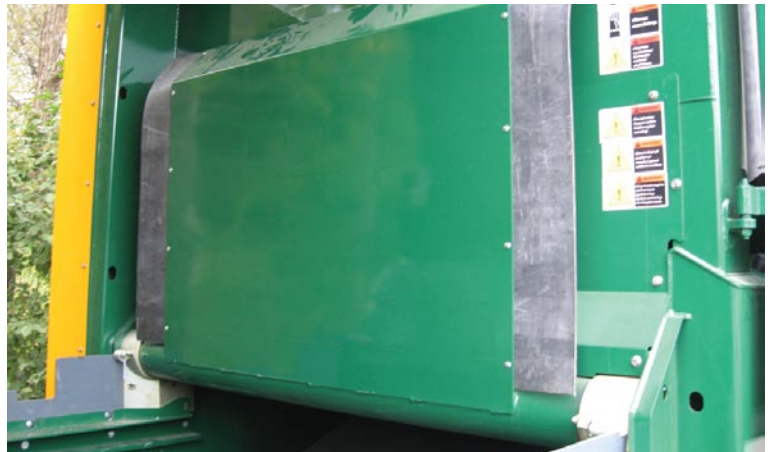


PHOTO 3
CRUSHER PANEL

- a three or a four camera system that provides a 360° view, including a camera at the back and another in the hopper;
- emergency stop buttons;
- an information in French (labels);
- a human presence sensor or a safe distance indicator sensor when the arm is operating;
- an arm with a bright or reflective colour (photo 4);
- an automatic lubricating system for the gripping claw of the articulated arm;



PHOTO 4
ARM IN A BRIGHT COLOUR

- an automatic system for repositioning the arm at its starting point;
- a device that adjusts the compaction cycle;
- lights configured in an optimal way for evening work;
- a rear bumper inclined at 45° for clearing the accumulated waste when emptying (photo 5);



PHOTO 5
REAR BUMPER AT 45°

- a good hose and valve protection (photo 6);



PHOTO 6
LOCATION OF HOSES

- a support foot designed for a loaded hopper in order to prevent crushing risks (photo 7).



PHOTO 7
SUPPORT FOOT
FOR FULL HOPPER

Occupational health and safety advantages of automated collection

- less manual work since there is no garbage to handle:
 - A reduction in the number of accidents means a potential reduction in the contribution rate to the CSST.
- the prevention of health and safety problems;
- the operator's comfort is greatly improved;
- no contact with the waste, and therefore less risk of bioaerosol exposure and fewer injuries (cuts, punctures, slipping and falling, etc.), regardless of the season;
- less injuries due to traffic.

Other advantages:

- the collection operation is more productive;
- the duration of the operators' employment is increased.

Training and information

The appropriate training of operators and mechanics on the risks related to operations and on the maintenance of a truck with an articulated arm to inform about the risks of accidents and prevention measures. The formation is under the responsibility of the employers.

Bibliography

1. Lavoie, J., Guertin, S. (2002)
Étude des agents biologiques et des contraintes ergonomiques lors de l'utilisation de camions avec bras assisté pour la collecte des ordures domestiques. (Study of the biological agents and ergonomic constraints in the use of trucks with articulated arms for collecting household waste)
Études et recherches, IRSST, Rapport R-317, Montréal, 55 pages.
2. Lavoie, J., Guertin, S., Trudel, M., Filion, M. (2006)
Aménagement optimal du camion avec bras assisté pour la collecte d'ordures ménagères. (Optimal layout for a garbage truck with an articulated arm)
Études et recherches, Rapport R-461, IRSST, Montréal, 25 pages.

Production

IRSST

Jacques Lavoie
Laurent Gratton
Christian Sirard
Marjolaine Thibeault

ASTE

Manon Trudel

Ergo-norme inc.

Serge Guertin

Acknowledgements

Special tanks go to Marie-Pierre Boutin, Madeleine Szots of Labrie Groupe Environnemental and to Lisane Picard of APSAM for advices and suggestions.



6455 Jean-Talon Street East, Suite 301
Montréal (Québec) H1S 3E8
Phone: 514-955-0454 or 1-800-361-8906
www.aste.qc.ca



505 de Maisonneuve Blvd West
Montréal (Québec) H3A 3C2
Phone: 514-288-1551
www.irsst.qc.ca



715 Square-Victoria Street, Suite 710
Montréal (Québec) H2Y 2H7
Phone: 514-849-8373 or 1-800-465-1754
www.apsam.com

The English and the French versions of this fact sheet are available at ASTE and on the IRSST's Website at the following address:

www.irsst.qc.ca/files/documents/PUBIRSST/R-608.pdf
www.irsst.qc.ca/files/documents/PUBIRSST/R-609.pdf