

Two-post Above-ground Automotive Lifts and Vehicle Falls: A Better Understanding for More Effective Prevention

Technical guide for the research report entitled “Utilisation des ponts élévateurs de véhicules hors terre à deux colonnes : identification de déterminants techniques de stabilité et des déterminants du travail des techniciens automobiles”

(Use and Inspection of Two-post Above-ground Automotive Lifts: Identification of Technical Determinants for Stability and Work Determinants for Mechanics)

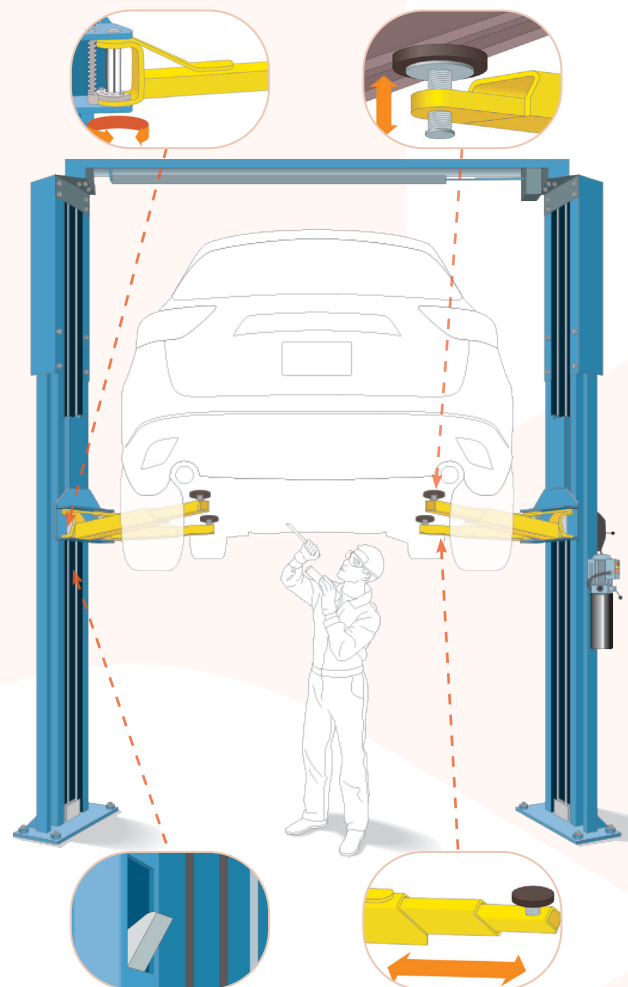
Primary target audience: preventionists in the automotive maintenance and repair sector

Secondary target audience: OHS committee members

Overview

The job of mechanic is more dangerous than it may appear. In 2014, an 18-year-old mechanic died following an accident involving a two-post above-ground (2PAG) lift. This event led Auto Prévention to create the “Groupe de prévention Maxime-Fortier” (Maxime Fortier accident prevention group), so named in memory of the young man, to ensure the safety of automotive lifts. In 2017, the group conducted a survey on the use of automotive lifts, which showed that 14% of the 124 participating companies had recorded the fall of at least one vehicle installed on a lift in the previous 10 years. Given this, Auto Prévention asked the IRSST to study 2PAG lifts. Ergonomists and engineers teamed up to better understand the ways in which vehicles are lifted, identify the risk factors in vehicle falls and suggest possible solutions.

The study confirms that lifting vehicles is a risky and complex operation and that it is a multifactorial problem. To ensure staff safety, action must be taken on a number of fronts, such as providing lifts adapted to the vehicles and tasks, properly maintaining them and encouraging a culture of accident prevention in the garage.



Key points

- Responsibility is shared: everyone in the sector must be involved.
- Those responsible for assigning work play a crucial role. For example, they should refuse vehicles that are too heavy or too rusty, and they must check the compatibility of the lift with the work to be done and the mechanic's experience.
- In the case of large vehicles, such as pickup trucks, it is not enough to simply take the lift's load capacity into account.
- The risk of a vehicle slipping on the lift pads is real. Therefore, the right pads must be used and placed correctly (e.g., centred under the lifting point).
- Pay attention to wear and tear of the lift, as this can increase the risks during lifting.

Results

To ensure that vehicles are lifted safely, the compatibility of the following must be ensured:

- the lift
- the vehicle
- the work to be performed
- the expertise of the mechanic



Important: Those four elements must be taken into consideration when work is being assigned.

Whatever Can Happen Will Happen

All sorts of more or less complicated and risky lifting situations can occur.

There are many types of vehicles, each with its own specific challenges, such as rusty lifting points. Even new vehicles can be difficult to lift because of their design.

“[From the outside, these two vehicles look] similar, but underneath the configuration is completely different.”

The load capacity, pad types or wearing of 2PAG lifts can also vary. However, some more versatile lifts provide more adjustment possibilities for lifting different types of vehicles. These include interchangeable pads and arms with a wider range of length adjustments.

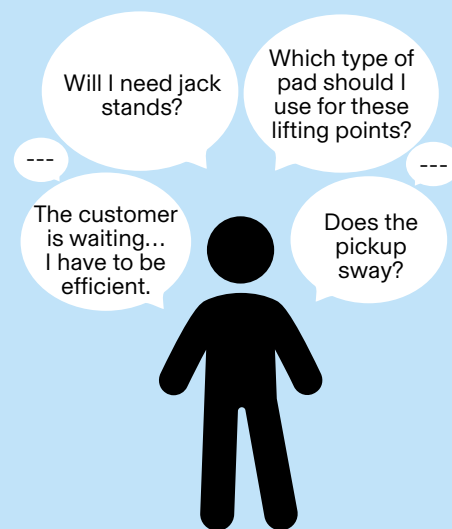
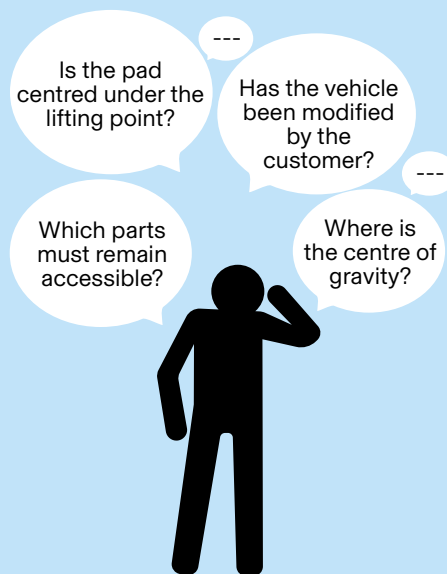
And that's not all! The type of work to be done can influence the lifting method, for example, to render certain parts accessible or to avoid having to get into uncomfortable positions.

Lifting a Vehicle Takes Expertise

Mechanics use their expertise to assess and manage each lifting situation, always aiming to combine safety and efficiency.

“Often, we have to use lifting points other than those [...] recommended by the manufacturer [...] When you use another lifting point, you have to make sure that what you're doing is right.”

Mechanics must consider a number of things before getting to work.



There's more than one way to skin a cat!

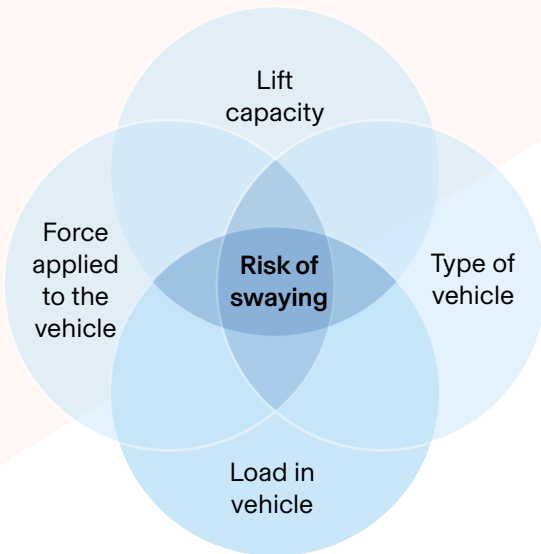
Mechanics gain experience over time, which helps them to better analyze situations and properly assess risks.

Risks: A Case in Point

Pickup trucks and vans are difficult to lift on some 2PAG lifts because of their weight and length.

Consequences of lifting point positions:

1. A sizable portion of the truck's rear hangs in space once it has been lifted, which can overload the rear arms of the lift.
2. To reach the lifting points, the rear arms must be maximally extended, which could cause them to bend once the truck has been lifted.



Large vehicles and lift capacity

“Every pickup is unique in its class.”

With the truck's rear end overhanging, bending of overloaded rear arms poses a risk: any force applied to the rear of the vehicle can immediately cause it to **rock**

“We have to use jack stands [...] because it's the rocking motion which means that the pads are going to clearly slip or not, even if there are stops [on the pads]”



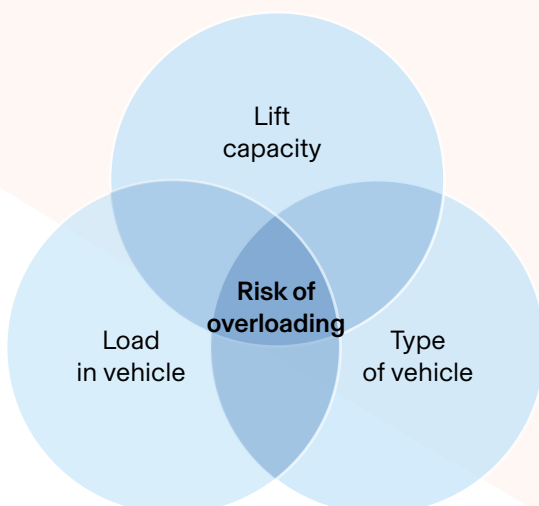
Be aware of added weight in the pickup box



Example of a vehicle with a box of unknown weight



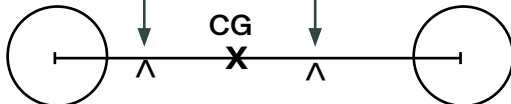
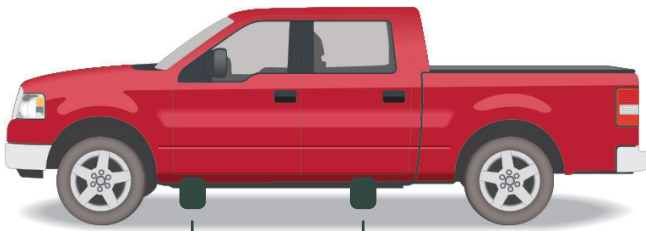
Example of a vehicle with a fifth wheel trailer hitch



Customers sometimes leave things in the truck box. In tests with a loaded Ford F-150 and a lift capacity of 7000 lb., the weight on each rear arm (2102 lb.) exceeded their maximum capacity (1750 lb.). Adding weight to the box shifts the centre of gravity (CG) towards the back. As a result, the rear pads must support more weight.

F-150

Approximately 5370 lb.



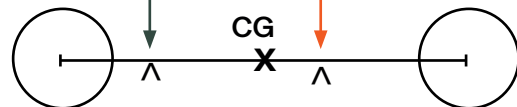
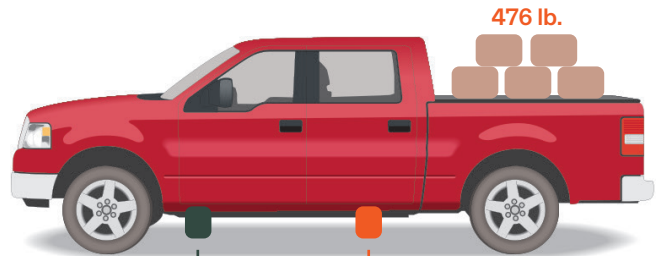
Front pads
2489 lb.
46% of
total weight

Back pads
2926 lb.
54% of
total weight

Lift capacity: 7000 lb.

F-150

Approximately 5370 lb.



Front pads
1684 lb.
29 % of
total weight

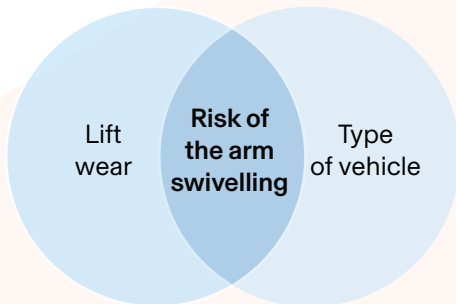
Back pads
4204 lb.
71 % of
total weight

Lift capacity: 7000 lb.

Overloading can also wear out the lift prematurely.

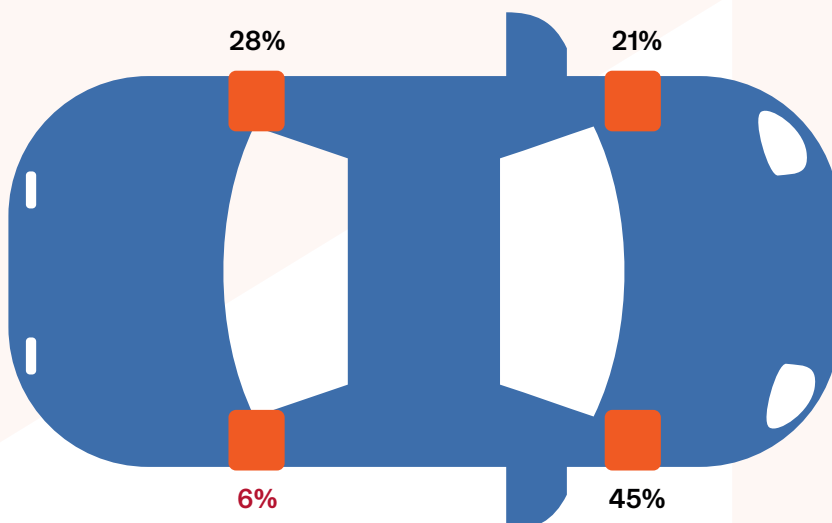


Pay attention to wear and tear of the lift! For example, during tests to lift a compact vehicle using a lift showing wear (play in the arms), the most deteriorated arm carried less of the load than the others, which could cause it to swivel.



Lift capacity... the tip of the iceberg!

"[...] It doesn't take much before it's no longer able to lift your truck."



Distribution of the weight of a compact vehicle on the pads of a lift showing wear

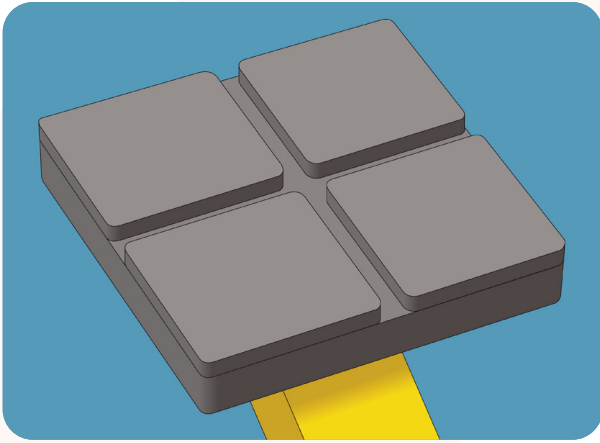


Risk: loss of contact between the pad and the vehicle

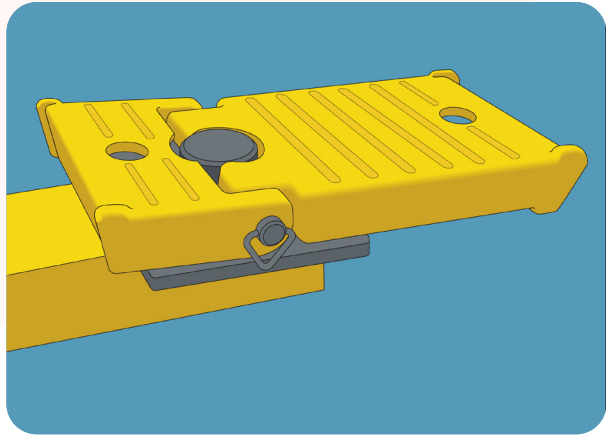


Watch out for slipping! The study measured several centimetres of slipping on the pads when loaded. The main factors behind this are as follows:

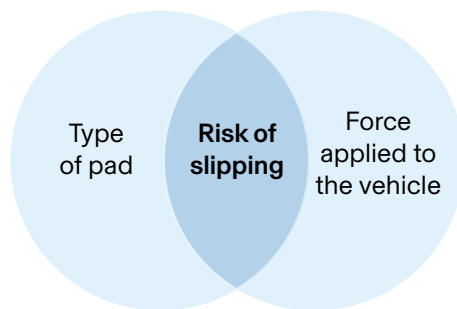
The amount of slipping measured was less with rubber pads than with metal pads.



Rubber pads



Metal pads



Type of force: Slipping is more frequent under the effect of lateral force (e.g., loosening a wheel), than under application of a vertical force (e.g., pulling on a part under the vehicle).

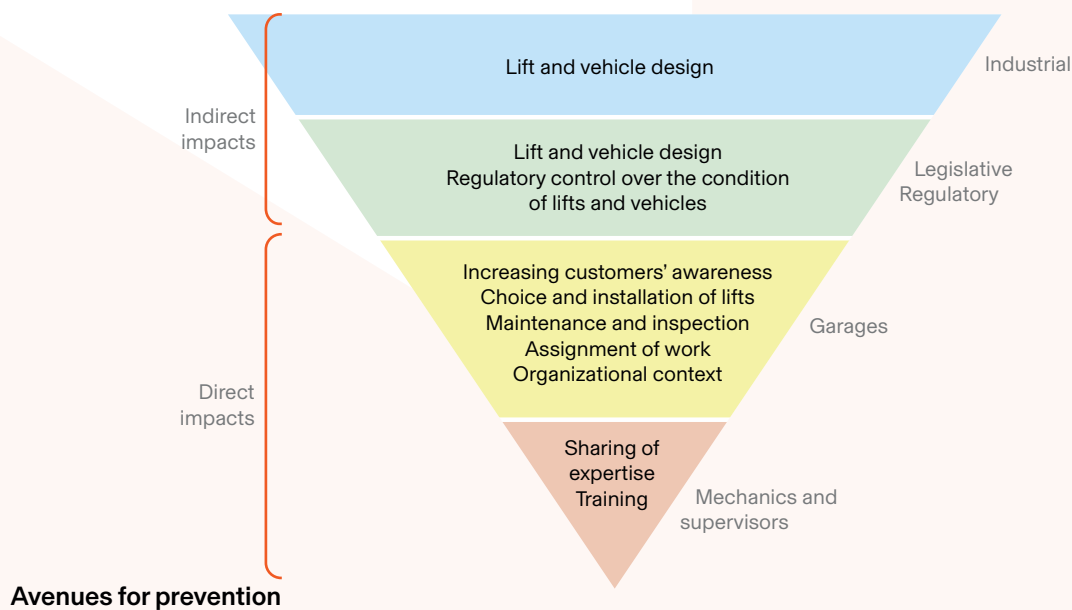
A functional **arm locking** system contributes to safe lifting. However, on its own, it cannot prevent all vehicles from falling.

Accidents caused by a pad slipping are the result of a combination of factors, such as pad placement and covering, an arm that is insufficiently loaded, and force exerted on the vehicle.

Lock the arms to keep them from swivelling

Possible Solutions to Preventing Accidents

The study identified a number of possible solutions, with the participation of mechanics, among others.



The following are some examples applicable to garages:

Purchase and installation

- Choose more versatile lifts, adapted to the garage's current and future needs: interchangeable pads, adjustable screw pads, arms with sufficiently flexible reach to enable vehicles to be lifted close to or far away from the column, etc.
- Involve experienced mechanics in lift selection.

Maintenance and inspection

- Set aside time for lift inspection and maintenance.
- Facilitate communication, especially about lift breakdowns.

“Your life is at stake under the lift. It's not working properly? Get it fixed. Tell your boss.”

To consult the **inspection sheet** resulting from the research project: see Section 6 and Appendix C.II

Lifting

Before

- Assign the work according to the compatibility of the vehicle to the lift and work to be done, and the mechanic's expertise.
- Refuse to lift the vehicle if it seems that it will be risky (e.g., a pickup with objects in the box); require the customer to unload it.

“When we have a truck that's loaded, we'll put it directly on the ramp.”

Lifting

During

- Allow sufficient time to lift riskier vehicles.
- Do a stability test on all vehicles, not only the larger ones, before completely lifting them.

“I'll test the front and the back, to try to shake it, rock it a bit [...]. I'll make sure that the pads don't move and if they don't move when they're two feet off the ground, they should be good to go. That's my “feeling” of security.”

For other possible solutions: Section 7.2 of the research report.

Source

Burlet-Vienney, D., Beaugrand, S., Galy, B., Gonella, M., Gauthier, F., Ledoux, É., Berger, I., Armas Marrero, I., Cusson Bertrand, K. Utilisation et inspection des ponts élévateurs de véhicules hors terre à deux colonnes : identification de déterminants techniques de stabilité et des déterminants du travail des mécaniciens (Report no. R-1179-fr). IRSST. [R-1179-fr.pdf \(irsst.qc.ca\)](#) (English summary: *Use and Inspection of Two-post Above-ground Automotive Lifts: Identification of Technical Stability Determinants and Determinants of Mechanics' Work*)

Scope and Limits

Other aspects of this issue may be studied in greater depth (e.g., lifting electric vehicles). It should also be noted that the situations observed and their context may not be entirely representative of the entire automotive maintenance and repair sector in Québec.

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