



How to **CHOOSE** **SLIP-RESISTANT** Occupational Footwear

PAMPHLET 1
RF-951

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Source

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Comments

Do you have any comments or suggestions about this pamphlet? Contact webmestre@irsst.qc.ca

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Making an Informed Choice

Choosing work boots and shoes that have adequate slip resistance is not a simple exercise, especially when work surfaces cannot be controlled, such as outdoors, where there can be snow, ice, soil, wet surfaces, etc.

This information pamphlet is addressed to health and safety committee members, purchasers and workers.

To make an informed choice, you must take into account a number of factors related to the worker, the environment and the tasks to be accomplished. It is useful to understand certain concepts such as coefficient of friction ([CoF](#)) and the applicable standards. You should also be aware of the conditions under which “anti-slip” footwear has been tested.

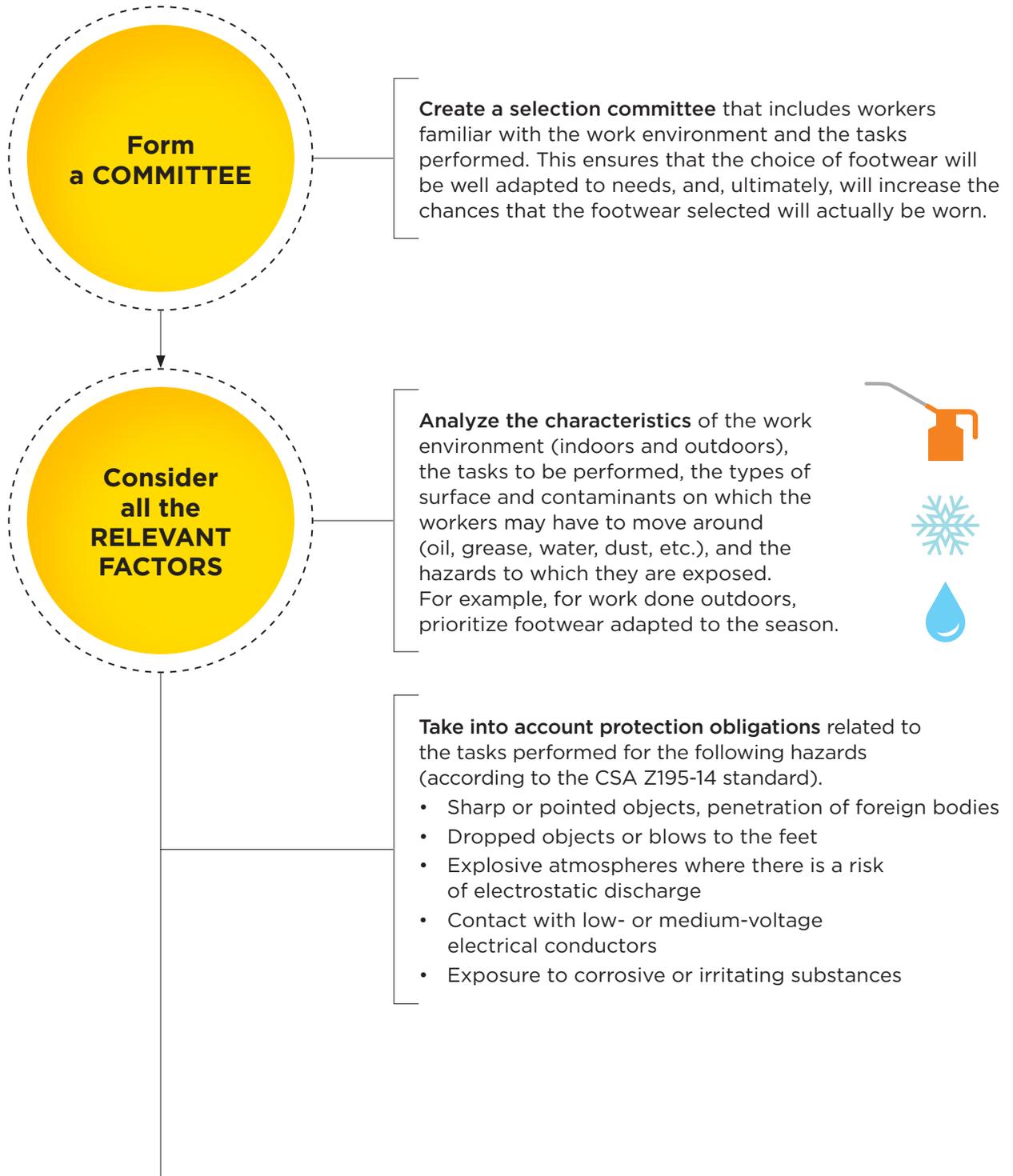
This information pamphlet sets out the [steps](#) to take in selecting footwear that provides good grip as well as adequate protection against other hazards. It also includes a number of [resources](#) to learn more and to determine the type of footwear best adapted to the demands of your workplace.



A careful selection of footwear, one that exceeds the minimal safety requirements, can help reduce the risks of slipping and falling. **However, no shoe or boot can be slip resistant in every situation and none can provide protection against every risk.** Several factors must be considered to prevent slipping (such as environmental, organizational, or individual factors). An analysis of your workplace is indispensable to determine the best ways to eliminate or reduce the risk of slipping. Adequate anti-slip footwear is only one component in the various risk reduction measures implemented by an organization.

STEPS to Take

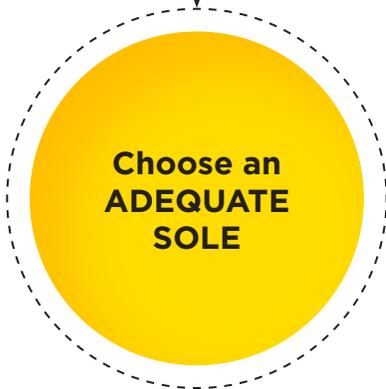
The following will take you through the process of selecting footwear that responds to the requirements of work and reduces the risk of slipping.





Consider every aspect that could influence the choice of footwear.

- Comfort: heat/cold, impermeability and sufficient size range (width and length) to suit all the workers
- Overall cost: takes into account quality and durability, which, in the long term, can reduce the cost of accidents or the frequency of replacement
- Ergonomics: ankle support, if necessary, design compatible with work (for example, adapted for stairs or ladders or for using shoe covers), easy upkeep, etc.
- Esthetic: visual appeal



Inform the supplier of the characteristics of your work environment (ground, contaminants, temperature...).

WARNING! Avoid making your choice based solely on the information provided by advertising brochures, because a shoe marketed as being anti-slip may not fit your specific situation. For example, a shoe that grips well on a wet surface may not be suited to an oily surface.

Consider the parts of the sole that could have an influence on its ability to grip:

- the materials;
- the rigidity (hard or soft sole) according to the ambient temperature;
- the durability;
- the support surface (surface in contact with the ground);
- the shape of the heel and the sole;
- the tread design and pattern (groove depth, width, spacing, etc.).

BEVELLED HEELS (angled) are more effective on slippery surfaces



READING: The pamphlet published jointly by the APSAM and the APSSAP (available in French only): [*Des chaussures adaptées aux types de surface*](#). [footwear adapted to the types of surface]



Request that the supplier

- provide all information possible about the soles' characteristics, i.e., the design, materials used and how they behave in diverse situations (in cold, heat, contact with oil or grease, etc.).
- at a minimum, respect the [CSA Z195-14 standard](#) for slip resistance and provide details on the tests performed and the coefficients of friction (CoF) obtained on recommended surfaces (other standards or methods are also recognized and accepted).
- if necessary, perform additional tests on surfaces representative of your workplace and with the contaminants present there; then provide the CoF obtained.
- provide the CoF of other types of footwear, obtained under the same conditions, so that you can compare them and make an informed choice.



**Validate
the CHOICE
of footwear
BEFORE
PURCHASING**

Select a variety of models with different soles. Ensure that all these models are adapted to the environment and tasks to be performed, and that they can satisfy workers in terms of both comfort and look.

Obtain a few pairs of the models chosen from suppliers and try them out with workers under real working conditions.

- Select a representative sample of workers at risk.
- Have them try each model for a long enough time in the workplace.
- Ensure that the footwear is worn properly.
- Consult with the workers and gather their feedback (periodic meetings, questionnaire, etc.).
- Note if there were any accidents or incidents of slipping, tripping or falling during the tests.



CoF

Look for a HIGH coefficient of friction

Why do slips occur? Above all, they occur because there is not enough friction between the shoe and the ground to ensure the grip necessary for the person to keep their balance.

Friction is the force that resists movement (slipping) of an object on a surface. Among other factors, this force depends on the coefficient of friction (CoF) between materials in contact with one another. The CoF is expressed by a value that is generally between 0 and 1. **The higher the CoF, the greater the resistance to slipping.** Thus, a CoF of 0.4 indicates better resistance to slipping than 0.15.

CoF specifically applies to two materials in contact (the sole and the ground) and the contaminant between them. Thus, the CoF obtained in the laboratory does not necessarily ensure that it is as safe in the work environment. In fact, footwear that doesn't slip in one situation may slip in another.

Slipping can be avoided when the footwear or the walking surface provides good resistance against it (a high CoF footwear/surface/contaminant) or when the person walks slowly or takes short steps. Studies have shown that an adequate CoF for walking varies between 0.15 and 0.31, while it is from 0.48 to 0.83 for running.



TEST METHODS FINDING COMPARABLE VALUES

Several test methods exist throughout the world. Some are designed to assess footwear according to reference surfaces, while others assess ground and floor surfaces compared to a reference material.

Because of their differences, these methods do not necessarily provide comparable results. Furthermore, test conditions are not necessarily representative of your work environment. For these reasons, it is difficult to recommend a minimal CoF that suits all situations. Ideally, to obtain comparable and relevant values, tests should be performed using a single method, with a surface and a contaminant that resembles your work environment.

DID YOU KNOW THAT...

In Québec, at a minimum, CSA Standard Z195-14 on protective footwear, should be applied.

According to the CSA Z195-14 standard, if footwear is identified as being slip resistant, its sole must have been tested in accordance with ISO 13287 test method on water-covered quarry tiles and stainless steel.

The CoF thus obtained must be provided with the product (see example below). The table provides a good comparison of CoF under identical assessment conditions, if they are relevant to your work environment.

SLIP RESISTING RESULTS		
This footwear has been tested in accordance with the slip resisting requirements of CSA Z195-14.		
	HEEL	FLAT
Dry quarry tile	1.09 CoF	1.16 CoF
Wet quarry tile	0.56 CoF	0.70 CoF
Wet stainless steel	0.41 CoF	0.52 CoF

Seek the advice of the footwear manufacturer regarding appropriate application.
Tested at XYZ Laboratory on 2016-04-04

The CSA Z195-14 standard suggests that additional tests be performed on other surfaces or with other contaminants to respond to users' needs.

For our winters, other test methods should be considered, such as the SATRA TM144:2011 and the MAA.

VARIOUS TEST METHODS

Since the 1980s, some thirty test methods have been developed by various organizations. Several of them have been adopted by various countries in Europe and North America.

The test methods listed here are those mentioned in this document.

ISO 13287:2012

Personal protective equipment — Footwear — Test method for slip resistance. European Committee for Standardization, Brussels, 2012.

MAA

Method for Determining the Maximum Achievable Angle (MAA) of Winter Footwear. Fourth edition. iDAPT Research, Toronto Rehabilitation Institute, UHN, Toronto, Ontario

SATRA TM144:2011

Friction (slip resistance) of footwear and floorings. SATRA Technology Centre, 2011 (see also: ASTM F2913-11).

RESOURCES

IN ENGLISH

ASTM International reference guide on safety and occupational footwear (United States - 2014)

https://www.astm.org/DIGITAL_LIBRARY/MNL/SOURCE_PAGES/MNL71.htm [\$]

CCHST fact sheets on safety footwear (Canada - 2016)
<http://www.ccohs.ca/oshanswers/prevention/ppe/footwear.html>

CCHST footwear assessment checklist (Canada - 2016)
http://www.ccohs.ca/oshanswers/prevention/ppe/footwear_assessment.html

HSE elearning package on preventing slips and trips (United Kingdom - 2009)
<http://www.hse.gov.uk/slips/Step/default.htm>

HSE webpage on slip-resistant protective footwear (United Kingdom)
<http://www.hse.gov.uk/slips/footprocure.htm>

IRSST research report: *Risk Factors for Slip Accidents among Police Officers and School Crossing Guards - Exploratory Study* (Québec - 2015)

<http://www.irsst.qc.ca/en/publications-tools/publication/i/100846/n/risk-factors-slip-accidents-police-officers-school-crossing-guards>

Practical handbook for preventing slips, trips and falls (United States - 2009)

<https://www.crcpress.com/Slip-Trip-and-Fall-Prevention-A-Practical-Handbook-Second-Edition/Di-Pilla/p/book/9781420082340> [\$]

Ratings of winter footwear using the MAA method, web site of the iDAPT, Toronto Rehabilitation Institute - University Health Network (Canada - 2016)

<http://www.ratemytreads.com/>

SATRA Slip Resistance Guide-Safety, protective and occupational footwear (United Kingdom - 2010)

https://www.satra.co.uk/portal/pagefiles/slip_resistance_guide_2010.pdf

IN FRENCH

APSAM file on preventing slips and falls (Québec - 2016)
<http://www.apsam.com/theme/risques-la-securite-ou-mecaniques/chutes-et-glissades>

AutoPrévention occupational health column on preventing accidents in winter conditions (Québec - 2009)

https://www.autoprevention.org/images/files/decembre2009/AP_2009-12_chaussures-crampons.pdf

CNESST web-based information sheet on protective footwear (Québec)

http://www.csst.qc.ca/prevention/theme/manutention/glossaire/Pages/chaussures_de_securite.aspx

INRS technical brochure on slips, technical prevention and measurement methods (France - 2015)

<http://www.inrs.fr/media.html?refINRS=ED%206210>

