1. Introduction

The Environmental Health and Safety Standard Operating Procedure for foot protection was developed by the Department of Environmental Health and Safety in accordance with the University's Policy Statement on Health and Safety and to ensure compliance with all applicable legislation.

In workplaces, falling or rolling objects, sharp objects, exposed energized electrical conductors, chemical or corrosive contact, burns, hot or cold environments or other hazards can create a potential for foot injury. Whenever practicable, these hazards shall be eliminated or reduced through the use of proper engineering and/or administrative controls. To protect against those hazards that continue to exist after all such control measures have been implemented, appropriate protective footwear must be used.

2. Scope

This SOP applies throughout the University and all off campus sites. This SOP also applies to all faculty, staff, and students who are undertaking studies, doing research, or carrying out any other work that takes place off-campus and is under the purview of the University.

3. Applicable Legislation

Occupational Health and Safety Act
(R.S.O. 1990)

Canadian Standards Association (CSA)
Z195-02 Protective Footwear

Canadian Standards Association (CSA)
Z195.1-02 Guideline on Selection, Care and Use of Protective Footwear

Canadian Nuclear Safety Commission
General Nuclear Safety and Control Regulations

Canadian Nuclear Safety Commission
Radiation Protection Regulations

Health Canada
Laboratory Biosafety Guidelines 3rd Edition - 2004

4. Responsibilities

4.1 Responsibilities of Directors, Department Heads and Managers

Each has the following responsibilities under this standard operating procedure

- Identify situations where foot protection is required and in conjunction with Environmental Health and Safety determine the type of protective footwear required for the hazards present.
- Ensure that this SOP is implemented in all facilities under his/her authority.
- Ensure that all pertinent supervisors, employees and students are aware of this SOP and have been informed of the proper use care and maintenance of protective footwear.

4.2 Responsibilities of Supervisors

Supervisors must be knowledgeable about the hazards in their area. They must:

- Ensure that all staff and students are aware of the hazards present and have been informed of the proper use care and maintenance of protective footwear
- Ensure that workers wear protective footwear at all times in areas where foot hazards exist.

4.3 Responsibilities of Staff and Students

Staff and Students must

- wear protective footwear at all times in areas where foot hazards exist
- Maintain protective footwear in good condition.

5. Types of Footwear Protection

Injuries to the foot may be prevented by the use of appropriate protective footwear. Appropriate protective footwear must protect against the specific hazards presented, provide a comfortable and secure fit, and comply with CSA Standards Z195-02 and Z195.1-02. CSA approved Protective footwear will have markings at ankle height outside right upper or tongue of the boot/shoe (Appendix 1).

- **Protective Toe Cap** - a shield incorporated into a boot or shoe that provides protection against impact to the toes. Protective toe caps must be worn by those exposed to potential impact injury to the toes.

There are two grades of protective toe caps.

Grade 1 - withstands an impact of 125 joules (equivalent to a 50 pound object dropped at a height of 22 inches)

Grade 2 - withstands an impact of 90 joules (equivalent to a 50 pound object dropped at a height of 16 inches)

- **Protective Sole** - a plate incorporated into the sole of a boot or shoe that provides protection against penetration of sharp objects into the bottom of the foot. Footwear with protective soles must be worn by those who are exposed to potential puncture to the foot.

- **Metatarsal Protector** - a shield over the top of the foot, attached to the shoe or boot, that provides protection against impact to the metatarsal area of the foot. Footwear with metatarsal (top of the foot between the toes and ankle) protection must be worn by those who are exposed to potential impact injury to the metatarsal.

- **Electric Shock-resistant Sole** - a sole constructed of electrically insulating materials that provides protection against electric shock to the bottom of the foot. Electric shock resistant soled footwear must be worn by those who may be exposed to potential live electrical conductors.

- **Static Dissipative Footwear** - a boot or shoe that incorporates a sole that allows a small charge of electricity to be dissipated into the walking surface. Static dissipative footwear may be required in some workplaces such as where flammable or explosive materials are present or where the buildup of static electricity must be minimized.

- **Conductive Sole Footwear** - a boot or shoe that incorporates a sole that is constructed of a conductive material designed to electrically ground the foot. Conductive sole protective footwear must be worn in workplaces where there is a hazard of static ignition. In addition to wearing conductive sole footwear, all containers and equipment in the area should be grounded.

- **Chainsaw Protective Footwear** - a boot designed to prevent a chainsaw from cutting into the shin, ankle, foot and toes.

Inside Protection Code

A 5-place alphanumeric code indicates the protection offered by the footwear:

1	**P**	**M**	**E**	**X**

Position 1 indicates the level of toe protection (**1** for Grade 1, or **2** for Grade 2, **0** if not).
Position 2 indicates the presence of a puncture-resistant sole (**P** if present, **0** if not).
Position 3 indicates that metatarsal protection is provided (**M** if present, **0** if not).
Position 4 indicates the type of electrical protection (**E** if shock resistant, **S** if static dissipative, **C** if conductive, **0** if no electrical protection).
Position 5 indicates that the footwear is chainsaw protective (**X if chainsaw protective, 0** if not).

6. Other Protection

Shoe materials, including soles and uppers, must be compatible with the work environment and the tasks conducted. Depending on the potential hazards encountered in the workplace, workers may be required to wear footwear which provides further specific protection. This may include footwear made with soles that are resistant to slip, abrasion, oils, chemicals, or heat. Manufacturers of individual footwear can provide data on the performance of their specific products against these hazards and should be consulted when selecting appropriate protective footwear.

Appendix 3 provides a summary of the general resistance properties of a variety of sole materials.

7. Protective Footwear in Chemical, Radioactive and Biohazard Laboratories

Appropriate protective footwear must be worn at all times in laboratories where chemicals, radioisotopes or biohazardous materials are used and stored. Perforated shoes, sandals and the like must not be worn in these laboratories. Appropriate shoes must cover and protect the **entire** foot (toes, heels and top of foot). Shoe materials, including soles and uppers, must be compatible with the laboratory environment, the materials handled, and the tasks conducted.

Depending on the types of hazards in the laboratory, footwear which provides additional protection may be warranted. Shoes with soles that are resistant to slip, abrasion, oils or heat may need to be considered. Where the potential exists for foot injury due to impact, puncture, electrical shock, or static electricity, appropriate CSA-approved footwear must be worn (see above).

8. Hazard Assessment

Prior to the selection of protective footwear, a hazard assessment and analysis should be conducted. This assessment is based upon the workplace environment and specific work activities. The following potential hazard areas should be considered:

- Materials handled by the employee during the normal course of his/her job:
  (i) Evaluate the risk of objects falling onto or striking employees' feet.
  (ii) Consider any material or equipment that might roll over employees' feet.
  (iii) Consider any sharp or pointed objects that might cut the top of employees' feet

- Foreign objects that may penetrate the bottom or side of the foot;

- Exposure to corrosive or irritating substances;

- Exposure to explosive atmospheres: evaluate the risk of static electrical discharges igniting an explosion or fire;

- Risk of damage to sensitive electronic components or equipment due to the discharge of static electricity;
  Note: Check with protective footwear suppliers or manufacturers regarding the level of electrical resistance provided by the footwear.

- Risk of coming into contact with energized conductors of low to moderate voltage (eg, 220 V or less);

- Risk to ankles from uneven walking surfaces or, rough terrain (in which case ankle support is required);

- Risk of foot injury due to exposure to extreme hot or cold environments/substances/surfaces;

- Risk of slips and falls on slippery walking surfaces;

- Exposure to water or other liquids that may penetrate the footwear causing damage to the foot and the footwear; and

- Risk of exposure to rotating or abrasive machinery (eg, chainsaws or grinders).

9. Selection Guide

After completing the hazard assessment, refer to Appendix 2 which identifies the recommended footwear selections for various workplace hazard categories. It also indicates types of footwear that are not recommended for certain hazardous situations.

For example: if your workplace assessment indicates the following hazards:

- uneven work surface
- falling objects
- sharp objects on the ground
- live electrical conductors

you would select a boot which gives ankle support, with both a green triangle and a white rectangle label. The inside protection code on the boot would be **1PME0** which indicates Grade 1 toe protection, puncture resistant sole metatarsal protection, and electrical protection.

For hazards not specifically covered, contact the Department of Environmental Health and Safety for advice on appropriate protection.

10. Fit and Care of Safety Footwear

Fit

- Walk in new footwear to ensure it is comfortable.
- Boots should have ample toe room (toes should be about 12.5 mm from the front)
- Make allowances for extra socks or special arch supports when buying boots.
- Boots should fit snugly around the heel and ankle when laced.
- Lace up boots fully. High-cut boots provide support against ankle injury.

Care:

- Use a protective coating to make footwear water-resistant.
- Inspect footwear regularly for damage.
- Repair or replace worn or defective footwear.
- Electric shock resistance of footwear is greatly reduced by wet conditions and with wear.

Appendix 1

Protective Footwear Markings

Outside Labels	Criteria	Intended Application
	Green triangle indicates sole puncture protection with a Grade 1 protective toe to withstand impacts of up to 125 joules.	For any industrial environment, especially that of construction, where sharp objects (such as nails) are present; heavy work environments.
	Yellow triangle indicates sole puncture protection with a Grade 2 protective toe to withstand impacts of up to 90 joules.	For light industrial work environments requiring puncture protection as well as toe protection.
	White rectangle with orange Greek letter omega indicates soles that provide resistance to electric shock.	For any industrial environment where accidental contact with live electrical conductors can occur. **Warning:** *Electrical shock resistance* deteriorates with wear and in a wet environment.
	Yellow rectangle with green "SD" and grounding symbol indicates soles are static dissipative	For any industrial environment where a static discharge can create a hazard for workers or equipment.
	Red rectangle with black "C" and grounding symbol indicates soles are electrically conductive.	For any industrial environment where low-power electrical charges may create a hazard for workers or equipment.
	White label with green fir tree symbol indicates chainsaw protective footwear	For forestry workers and others exposed to hand-held chainsaws or other cutting tools.

Footwear Protection Guide

Appendix 2

Hazard Types	Hazardous Activity Examples	Protection: Protective Toe	Protective Sole	Metatarsal Protection	Electrical Insulation	Static Dissipation	Conductive Sole	Chainsaw Protection	Comments
Falling Objects	- Construction sites - Handling heavy materials, equipment or machinery - Handling large heavy animals - Machine shops - Woodworking shops	✓✓		✓✓					Metatarsal guards are recommended where heavy objects may fall on foot
Rolling Objects	- Construction sites - Handling heavy materials, equipment or machinery - Handling large heavy animals - Machine shops - Woodworking shops	✓✓		✓✓	✓				Select Grade 1 toe protection
Sharp Objects	- Construction sites - Presence of sharp objects on ground - Machine shops	✓✓	✓✓	✓✓					Protect against sharp objects penetrating sole and top of foot
Hot Objects		✓	✓	✓					Select thermal-insulating footwear in high-heat conditions
Electrical Shock	- Presence of live electrical conductors - Construction sites				✓✓	✗	✗		SD and conductive footwear offer no protection
Static Discharge Micro-circuits	- Handling of sensitive electronic equipment				✗	✓✓			Insulating footwear is hazardous to circuits
Static Ignition	- Presence of flammable or explosive materials - Handling of sensitive electronic equipment				✗		✓✓		In addition, ground all containers and equipment
Saw Cutting	- Construction sites - Cutting of timber	✓✓	✓	✓				✓✓	Select footwear for environmental conditions

✓✓ Highly Recommended ✓ Recommended (depending on degree of hazard) ✗ DO NOT USE

Prepared by: The Department of Environmental Health and Safety

Performance Ratings of Footwear Soles

Appendix 3

Sole Material	Resistance properties E: Excellent G: Good F: Fair P: Poor								
	Abrasion	**Metal Chips**	**Chemical**	**Cushion**	**Cement**	**Slipping**	**Water**	**Oil**	**Heat**
Blown Rubber	G	F	F	E	E	G	G	G	F
Vulcanized PVC	G	G	F	G	G	F	G	G	G
Vibram	E	E	G	E	E	E	E	G	E
Leather	F	F	F	G	G	G	P	F	P
Vinyl Flex	G	F	F	E	E	E	G	G	F
Chemigum (Ambergum)	E	G	G	E	E	E	E	E	E
Neoprene	E	G	E	G	E	G	E	E	G
Krayton	E	F	F	E	G	G	G	F	F
Neo Crepe	G	F	F	E	G	E	G	G	P
Rubber (Vulcanized Rubber)	E	G	G	E	E	G	E	G	G
Nitrile (Nitrilegum)	E	G	E	G	E	E	E	E	G
Dynatread	E	E	G	G	E	E	E	G	G
Sur-Sport Rubber	G	G	E	E	G	E	E	E	G
Polyurethane	E	F	E	E	E	G	E	E	G
Vylyt	F	P	E	G	G	E	E	E	F
Crepe	G	E	G	G	E	G	E	G	G

Adapted from Safety Infogram produced by the Canadian Centre for Occupational Health and Safety