



## **Protective Headwear Standard: Selection, Use, and Care**

Falling, flying or moving objects, environments with low overhead or fixed objects, or contact with exposed energized electrical conductors can all create a potential for head injury. Although the human skull offers a good degree of natural protection, such hazards must be considered potentially life-threatening. Whenever practicable, these hazards shall be eliminated or mitigated with engineering and/or administrative controls. To protect against those hazards which continue to exist after all such control measures have been implemented, appropriate protective headwear (hard hats or safety helmets) must be used. This standard is based on the Canadian Standards Association (CSA) standard Z94.1-15 (R2020), "*Industrial Protective Headwear – Performance, Selection, Care, and Use*" (hereinafter referred to as "Z94.1").

*Note: In this standard, the term protective headwear applies to both industrial hard hats and safety helmets only. Other types of headwear protection used at the University, including bump caps or sport and recreational helmets are not covered under this standard.*

### **SCOPE:**

This standard applies to any individuals (e.g., faculty, staff, students and visitors) who may be exposed to a head injury from an operation or process conducted during University-sanctioned activities and/or on University owned and operated premises.

### **RESPONSIBILITIES:**

Supervisors / Principal investigators and all others in authority shall:

- Identify situations where head protection is required and communicate this information to their staff/teams through written procedures and/or signage;
- Determine (using this standard or in conjunction with Environmental Health and Safety) the type of protective headwear required for the specific head hazard;
- Provide individuals exposed to head hazards with appropriate protective headwear (where applicable);
- Ensure that individuals are informed and provided instruction (if necessary) on the proper use, care, and maintenance of protective headwear; and
- Ensure that individuals always wear appropriate protective headwear at all times in areas where head hazards exist.

Faculty, staff, students, and visitors shall:

- Wear appropriate head protection at all times in head hazard areas;
- Inspect protective headwear regularly to ensure it is in good condition;
- Notify their PI/supervisor when their protective headwear is damaged and requires replacement, or if they encounter a novel or hazardous situation where different protective headwear may be required;
- Not alter or modify protective headwear; and
- Store and maintain protective headwear in good condition between use.

### **PROTECTIVE HEADWEAR:**

Protective headwear is designed to protect the head against impact, penetration, and/or electrical shock. By wearing the appropriate protective headwear, the likelihood of injuries to the head can be reduced. The

appropriate headwear selected must protect against the specific hazard presented by the workplace environment and work activities, provide a comfortable and secure fit, and comply with CSA Z94.1.

## 1. Components of Protective Headwear

Headwear usually consists of two components, the shell and the suspension, which work together as a system to protect the user. The shell is the material that provides the general outer form of the headwear and whose primary purpose is to distribute the impact load and resist penetration. The suspension is the part of the headwear that holds the headwear in place during use and absorbs the energy of impact. The suspension typically includes the headband, crown straps, nape strap, and tabs (Figure 1).

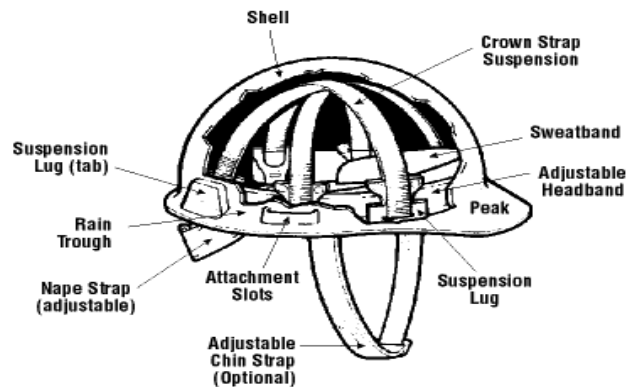


Figure 1. Components of Protective Headwear  
(Ref: [CCOHS - Care of Headwear](#))

## 2. Selection of Protective Headwear

CSA Z94.1 classifies protective headwear according to “Type” and “Class”. The appropriate type and class of protective headwear should be selected based on the hazards present in the workplace.

**Appendix A** provides guidance for selecting the appropriate type and class of protective headwear. The protective capabilities of the headwear are summarized as follows:

### **A. General Impact and Penetration Hazards**

The two types of protective headwear differ in the degree of protection they provide against impact and penetration hazards. It is important that an assessment of potential exposure to impact and penetration hazards be conducted prior to selecting the appropriate type of headwear to use.

#### **Type 1 – Crown Only Protection**

Type 1 protective headwear provides impact and penetration protection for the crown only.

#### **Type 2 – Crown and Lateral Protection**

Type 2 protective headwear provides impact and penetration protection for the crown and laterally (i.e., front, sides, and back).

### **B. Electrical Hazards**

The three classes of headwear differ in the level of protection they provide against electrical shock and burn. It is important that an assessment of potential exposure to electrical hazards be conducted prior to selecting the appropriate class of headwear to use.

### **Class G - Limited Voltage Protection (2200 V electrical rating)**

Class G headwear is made of non-conducting material that provides protection against a maximum voltage of 2200 V  $\pm$  3% for 1 minute. Class G headwear offers some protection against electrical shock.

### **Class E - High Voltage Protection (20,000 V electrical rating)**

Class E headwear is made of high-grade non-conducting material that provides protection against an applied voltage increasing at a uniform rate of 1000  $\pm$  50 V/s up to a maximum of 20,000  $\pm$  100 V with the maximum voltage maintained for 3 minutes. Although Class E headwear offers greater protection against high voltage electrical shock, it is not intended to be used as a primary barrier against live electrical apparatus.

### **Class C - No Voltage Protection (no electrical rating)**

Class C headwear offers no protection against electrical shock and is to be used where there is no possibility of exposure to electric shock or burn.

### **C. Considerations of Other PPE and Accessories**

If protective headwear is required to be worn with other personal protective equipment (e.g., respirator, eye and face protectors, and hearing protectors), ensure that the PPE are compatible with the headwear being worn, does not compromise the level of protection provided by the headwear, and does not displace or interfere with the headwear in any way.

Only attach manufacturer-approved accessories to protective headwear (e.g., chinstraps, hearing protection devices, winter liners). Accessories must be compatible with the headwear, must not incorporate metallic or other electrically conductive components, and not interfere with or alter its fit, form, and function. Do not overload headwear with accessories.

## **3. Fitting of Protective Headwear**

Proper size selection and fitting of headwear is important to ensure the headwear remains secure to the head, provides optimum protection, and is comfortable under normal working conditions. A hard hat or safety helmet that is too large or too small will not provide adequate protection.

When fitting protective headwear, consider the following:

- Select protective headwear that fits the size and shape of the individual's head. Some protective headwear is designed to fit one size while others are adjustable in size.
- Place the headwear on the head and push down until the headband and shell are at a comfortable height.
- Ensure an air gap between the suspension and shell of the headwear. The air gap is a vital part of the shock absorption system for protecting the head against an impact to the shell.
- Gradually tighten or adjust the headband size (using ratchet dial on nape strap) until headband fits securely and comfortably.
- When fitted correctly, the headwear should not fall off when the individual bends over and should not slip when the individual turns their head side to side.

## 4. Inspection of Protective Headwear

Both the shell and suspension require periodic inspection and must be replaced as required.

### A. Component I - Shell

The shell should be inspected before each use for physical damage such as dents, nicks, or gouges from impact, abrasion, or wear that might reduce the degree of protection originally provided. Headwear should be replaced immediately at the first sign of any of these conditions.

Headwear is also susceptible to damage from ultraviolet light, temperature extremes, and exposure to chemicals including solvents, sunscreens, and insect repellents. Degradation of thermoplastic materials may be apparent when the shell becomes stiff, brittle, faded, dull in color, exhibits a chalky appearance, or has hairline cracks.

The following is a simple field test that can be performed by an employee or supervisor to determine possible degradation of shells:

- Compress the shell inward from the sides about 1" (2.5 cm) with both hands and then release the pressure without dropping the shell. The shell should quickly return to its original shape, exhibiting elasticity.
- Compare the elasticity of the sample with that of a new shell. If the sample does not exhibit elasticity similar to that of a new shell, or if it cracks due to brittleness, it should be replaced immediately.

### B. Component II - Suspension

The suspension should also be inspected before every use as it will deteriorate over time. Exposure to dirt, perspiration, natural hair oils, and even chemical hair treatments can speed up the process.

Suspension straps can become stretched, twisted, cut, torn, or frayed. The plastic adjustment slots and attachment clips may become cracked or torn. Any headwear that shows these signs of worn or damaged parts should be removed from service and replaced immediately.

### C. Component III - Liner

Headwear (including Type 2 headwear) that uses a liner made of foam or other materials should be checked regularly for cracks or other signs of damage. If a liner shows any signs of damage, the entire helmet should be replaced because the shell will usually be damaged as well.

## 5. Replacement Guidelines for Protective Headwear

Personal protective equipment such as headwear do not have an indefinite service life. It must be inspected regularly, maintained appropriately, and replaced as required. Generally, the manufacturer's instructions for maintaining and replacing headwear should be followed.

Some headwear have manufacturer date codes molded on the underside brim of the headwear so the age can easily be determined. If no expiry date is provided by the manufacturer, the headwear should be replaced **at least every five years** regardless of its outward appearance.

All headwear is susceptible to damage from ultraviolet light, temperature extremes, and chemical degradation. If there is high potential exposure to these conditions in the workplace, headwear should be replaced routinely **after two years** of use.

Any headwear that either shows significant damage upon inspection or that has been subject to a forceful impact, even if there are no signs of damage, **should be replaced immediately**.

## 6. Guidance on the Use and Care of Protective Headwear

1. Inspect the headwear (including the shell, suspension, liner and accessories) before each use and replace if there are signs of damage.
2. Use and care for the headwear per manufacturer's instruction. Regularly clean the shell to remove dirt and stains that can hide small cracks. Clean the suspension and liner regularly to remove dirt, perspiration, and hair oils.
3. Retention system supplied or fitted to the headwear should be fastened and under tension at all times to ensure the security of the headwear.
4. Chin straps (used with Class E headwear) should not be drawn over the brim or peak as the strap may allow current to flow from the conductor to the user during contact with a live electrical conductor.
5. Do not change or alter the headwear or accessories. Headwear should not be drilled or otherwise modified in order to attach accessories or decorations.
6. If adding accessories to the headwear, use only accessories approved by the manufacturer.
7. No objects should be placed in between the shell and suspension as this may transmit large forces to the head and neck during an impact.
8. Protective headwear is certified as a complete assembly (shell, suspension, straps, etc.). Do not interchange components from different manufacturers.
9. Only use liners that are specifically designed to be compatible with the headwear. Winter liners intended for use in Class G and Class E headwear should be flame-retardant. Baseball caps should not be worn underneath protective headwear as it interferes with the suspension.
10. Keep headwear clean and dry to maximize protection against electric shock. Headwear that is wet or contaminated with oil, grease, or other conducting chemicals, or that is fitted with inappropriate accessories, may suffer a dramatic reduction in its protective capabilities against electric shock.
11. Do not apply insect repellent or paint to the headwear as chemicals can degrade the headwear material and affect its protective properties.
12. Do not store headwear in direct sunlight (e.g., near windows of vehicle) as UV light and extreme heat can degrade the headwear.
13. Decals, laminates, and retroreflective stickers/tape are allowed to be applied to the headwear shell provided they are compatible with the shell material, does not affect the dielectric characteristics of the headwear, or compromise the ability of the user to inspect the shell for damage. Place them at least 13 mm (1/2 in) above the edge of the brim.

## CSA-CERTIFIED PROTECTIVE HEADWEAR:

Only protective headwear products that are certified by the CSA Group (conforming to CSA Z94.1 standard) should be purchased and used. A protective headwear product that is certified by the CSA Group will be permanently marked or labelled with the following information (Figure 2):

- Manufacturer's name;
- Certification body and certification identification number (if certified);
- Model name/number;
- Class and Type (e.g., Class E, Type 2);
- Reverse orientation performance mark (if applicable);
- Year and month of manufacture (date code);
- Size or size range; and
- The following wording (attached as sticker label),  
"This protective headwear is designed to absorb some of the energy of a blow through destruction of its component parts and, even though damage may not be apparent, any partial protective headwear subjected to severe impact should be replaced. This protective headwear must not be painted or cleaned with solvents. Any decals applied to the protective headwear must be compatible with the surface material and known not to affect adversely the characteristics of the materials used in the protective headwear. Any addition or structural modification may reduce the protective properties afforded by this protective headwear."

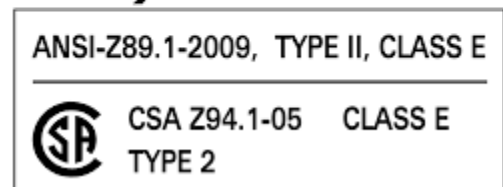


Figure 2. Example of a Type 2 Class E hard hat with permanent marking located under the brim of the shell.

(Ref: [IHSA Construction Health and Safety Manual](#))

## REVERSIBLE PROTECTIVE HEADWEAR:

Protective headwear should normally be worn facing forward. However, some job tasks may necessitate wearing headwear backwards (e.g., when wearing a face shield or welding helmet together with hard hat).

A protective headwear may be worn backwards only if it has a reverse orientation marking verifying that the product has been certified to meet the requirements of CSA Z94.1 for impact and penetration when the suspension system is mounted in the reverse direction (Figure 3).

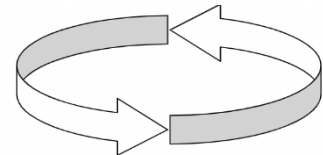


Figure 3. Reverse orientation performance mark.

## BUMP CAPS:

Bump caps are intended to be used to protect the individual's head against small impacts with stationary objects (e.g., overhead pipes, low ceilings, etc.), whereas hard hats and safety elements are best suited for protection against impacts caused by falling or moving objects.

Bumps caps do not meet CSA requirements and do not provide the same level of protection against impacts as hard hats or safety helmets. They provide protection for the scalp only. Some bump caps look like traditional baseball caps with a hard plastic shell and foam inside. Other styles look like simplified plastic hard hats.

At the University, bump caps may be worn in areas where a hazard assessment has determined that there is no risk of falling or moving objects within the work environment.

## REFERENCES:

Canadian Centre for Occupational Health and Safety: Personal Protective Equipment – Headwear – Selecting Protective Headwear: <https://www.ccohs.ca/oshanswers/prevention/ppe/protective-headwear.html>

Canadian Centre for Occupational Health and Safety: Personal Protective Equipment – Care of Headwear: <https://www.ccohs.ca/oshanswers/prevention/ppe/headwear.html>

CSA Z94.1-15 (R2020): Industrial Protective Headwear – Performance, Selection, Care, and Use: <https://www.csagroup.org/store/product/Z94.1-15/>

Infrastructure Health and Safety Association: Construction Health and Safety Manual: [https://www.ihsa.ca/rtf/health\\_safety\\_manual/pdfs/equipment/Head\\_Protection.pdf](https://www.ihsa.ca/rtf/health_safety_manual/pdfs/equipment/Head_Protection.pdf)

## Appendix A

### GUIDE TO SELECTION OF PROTECTIVE HEADWEAR

The two types of protective headwear differ in the degree of protection they provide against impact and penetration hazards. To determine the appropriate type of headwear to use, an assessment of potential exposure to crown and lateral impact hazards must be conducted.

DEGREE OF IMPACT/PENETRATION HAZARD	TYPE OF PROTECTIVE HEADWEAR	
	Type 1	Type 2
Only crown impact/penetration hazards exist	Yes	Yes
Both crown and lateral impact/penetration hazards exist	Not suitable	Yes

Note: Type 2 headwear can be used in any situation where Type 1 headwear is permitted.

The three classes of protective headwear differ in the degree of protection they offer against electrical hazards. To determine the appropriate class of headwear to use, an assessment of potential exposure to electrical hazards must be conducted.

DEGREE OF ELECTRICAL HAZARD	CLASS OF PROTECTIVE HEADWEAR		
	Class G General Usage	Class E Electrical Trades	Class C Conducting Headwear
No Electrical Hazards	Yes	Yes	Yes
Limited Electrical Hazards (up to 2200 V)	Yes	Yes	Not suitable
High Voltage Electrical Hazards (up to 20,000 V)	Not suitable	Yes	Not suitable

NOTE: If a hazard assessment has not been completed, Type 2, Class E headwear must be selected since it provides the highest level of electrical, crown, and lateral protection.