

## 3M™ Head Protection: Hard Hats 101




### Description

This document provides basic information on hard hat use, testing and standards compliance. In all cases, a risk/hazard assessment should be carried out and use limitations considered to ascertain the protection required.

The main function and purpose for wearing a protective hard hat are to:

- 1) Help protect workers from head trauma due to small objects.
- 2) Help prevent force from transmitting down the spine if an impact from above occurs.
- 3) Help reduce the dangers of contact with low level electrical shock (applies only to hard hats that meet ANSI/ISEA Z89.1-2014 Type I, Class G and E).

How does the hard hat protect workers from each hazard?

Hazard	Main Aspects of Hard Hat that Help Provide Protection
Head trauma from small objects 	Hard outer shell usually made from HDPE (High-Density Polyethylene), ABS (Acrylonitrile Butadiene Styrene) or other Thermoplastic material.
Helps absorb impact that normally would be transmitted 	Inner suspension that is attached to the shell reduces forces that would otherwise be transmitted to the head and spine.
Low level electrical shock 	Hard outer shell. The homogeneous material insulates against low level electrical shock. Not all hard hats provide electrical protection. Always review the hard hat user instructions and warnings to evaluate electrical protection.

Typical applications for hard hats, when used with other appropriate PPE, include:

- Construction work
- Heavy and light industrial
- Petrochemical
- Mining
- Road Construction
- Forestry
- Utilities

In all cases a risk/hazard assessment should be carried out and use limitations considered to ascertain the protection required.

## Key Compliance Standards

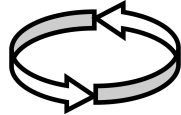
ANSI/ISEA Z89.1-2014	
Overview	Establishes the minimum performance requirements for protective helmets that reduce the forces of impact and penetration and that may provide protection from electrical shock.
Impact Type	<ul style="list-style-type: none"> <li>Type I: Intended to reduce force of impact from blow to top of the head</li> <li>Type II: Intended to reduce force of impact from blow to top or sides of the head</li> </ul>
Electrical Classes	<p>Class C (Conductive)</p> <ul style="list-style-type: none"> <li>Not intended to provide protection against contact with electrical hazards</li> </ul> <p>Class G (General)</p> <ul style="list-style-type: none"> <li>Reduce the danger of contact with low voltage conductors</li> <li>Proof-tested at 2,200 volts</li> </ul> <p>Class E (Electrical)</p> <ul style="list-style-type: none"> <li>Reduce the danger of contact with higher voltage conductors</li> <li>Proof-tested at 20,000 volts</li> </ul>

Test	Compliance to the ANSI/ISEA Z89.1 Standard means...
Force Transmission	Helmets shall not transmit a force to the test head form that exceeds 4450 N (1000 lbf). Maximum transmitted force of each individual test sample shall be averaged. The averaged values shall not exceed 3780 N (850 lbf).
Apex Penetration	The penetrator shall not make contact with the top of the head form.
Flammability	No flame shall be visible 5 seconds after removal of the test flame.
Class C	Class C helmets are not tested for electrical insulation.
Class G (Electrical)	Shall withstand 2200 V (root mean square), AC, 60 Hertz, for 1 minute. Leakage shall not exceed 3 mA.
Class E (Electrical)	Must first pass the Force Transmission Test. Shall withstand 20,000 V (root mean square), AC, 60 Hertz, for 3 minutes. Leakage shall not exceed 9 mA. At 30,000 volts, the test sample shall not burn through.

Test Type	Summary of ANSI/ISEA Hard Hat Testing Guidelines
Force Transmission (Individual tests/Average)	<ul style="list-style-type: none"> <li>• Impactor shall have a mass or 3.64 kg (8 lbs)</li> <li>• Striking face of impactor shall be spherical with radius of 48 mm (1.9 in)</li> <li>• Impactor shall remain rigid upon impact</li> <li>• Impactor shall be dropped from a height that yields an impact velocity of 18 ft/s (12.2 mph)</li> </ul>
Apex Penetration (Pass/Fail)	<ul style="list-style-type: none"> <li>• Penetrator shall have a mass of 1 kg (2.32 lbs), with a steel tip, a 60° included angle and a spherical tip radius of 0.25 mm (0.010 in).</li> <li>• Penetrator shall remain rigid upon impact.</li> <li>• Penetrator shall be guided and electrically insulated from metal head form.</li> <li>• Penetrator shall be dropped from a height that yields an impact velocity of 7 m/s (23 ft/s)</li> </ul>
Flammability (Pass/Fail)	<ul style="list-style-type: none"> <li>• Bunsen burner is adjusted to produce a 50 mm (2.0 in) blue flame with an inner cone of 25 mm (1.0 in).</li> <li>• The temperature of the flame at the tip of the inner cone shall be 800-900 °C (1472 - 1652 °F).</li> <li>• The flame shall be applied so the inner cone is within 2 mm (0.08 in) from the helmet surface. The flame is applied for 5 seconds.</li> <li>• The sample is inspected for any visible flame, 5 seconds after removal of the test flame.</li> </ul>

## ANSI/ISEA Z89.1-2014 Test Guidelines

- Total number of hats for protocol: 36
- All testing shall be performed at room temperature 23 °C (73.4 °F)
- "Hot" test samples shall be placed in forced air circulating oven maintained at 49 °C (120 °F) for at least two hours.
- "Cold" test samples shall be placed in an environmental chamber maintained at 18 °C (0 °F) for at least two hours.
- "Higher Temperature" test samples shall be placed in a forced air circulating oven maintained at 60 °C (140 °F) for at least four hours.
- "Lower Temperature" test samples shall be placed in an environmental chamber maintained at a temperature of -30 °C (-22 °F) for at least four hours.
- All hot, cold and low-temperature samples shall be tested for impact and penetration within 30 seconds after removal from the conditioned environment.

Optional Testing Requirements for ANSI/ISEA Z89.1-2014		
Requirement	Test	Designation on Warning Label
Reverse Wearing	Pass the force transmission test when mounted in the reverse position on the test head form.	
Lower Temperature	Test samples placed in environmental chamber maintained at -30 °C (-22 °F) for at least four hours and then tested to the impact and penetration test requirements.	LT
Higher Temperature	Test samples placed in a forced air circulating oven maintained at 60 °C (140 °F) for at least four hours.	HT
High-Visibility	Hard hat demonstrates chromaticity that lies within one of the areas defined within Table 1 of the ANSI/ISEA Z89.1-2014 standard. (Fluorescent yellow-green, Fluorescent orange-red, Fluorescent red)	HV

## Replacement Recommendations

Hard hat should be immediately replaced if subjected to impact. 3M recommends the wearer replace the hard hat suspension at least every twelve months and the hard hat shell at least within five years depending on work environment. Inspect the hard hat, including the suspension and shell, prior to each use. Replace at first sign of wear. Refer to user instructions for proper installation and replacement of the suspension.

## Hard Hat Inspection

A hard hat shell should be inspected prior to each use. Immediately replace the hard hat if any sign of wear appears or if there is any evidence of damage, abuse or plastic degradation as this may be a sign that protection is reduced. Any hard hat that shows signs of worn or damaged parts should be removed from service immediately and replaced.

Workers in environments with higher levels of exposure to sunlight, heat, cold or chemicals should replace their hard hats more frequently than workers in other environments. If the hard hat shell becomes faded in color, exhibits a chalky appearance, or feels stiff and brittle, degradation of the shell may be occurring. A hard hat should be replaced immediately at the first sign of any of these conditions.

Hard hat suspensions should also be inspected closely for cracks, frayed straps or other signs of wear. Any suspension that is damaged must be removed from service and replaced immediately. It is recommended to replace the entire suspension system at least every 12 months.

## Maintenance and Storage

Clean the hard hat and suspension with mild soap and water. Rinse and wipe dry. Do not use paints, solvents, chemicals, adhesives, gasoline or like substances on this hard hat. Store the hard hat away from direct sunlight, including on the dashboard of a vehicle.

## Frequently Asked Questions

*Q. When should head protection be provided to workers?*

A. When there is potential for:

- 1) Objects fall from above
- 2) Contact with fixed objects (exposed beams, pipes, etc.)
- 3) Contact with exposed electrical conductors

*Q. How does a hard hat help protect the worker?*

A. It helps protect workers in the following main ways:

- 1) Resists and deflects blows to the head
- 2) Reduces shock to help protect the neck and spine
- 3) Can help insulate against electrical shock from contact (Applies only hard hats that meet ANSI/ISEA Z89.1-2014 Type I, Class G and E.)

*Q. Is a hard hat compliant if worn backwards by the worker?*

A. Only if the hard hat was tested to the standard with the suspension in the reverse position and the hard hat is marked with the "reverse donning" symbol.

*Q. What factors can damage a hard hat?*

A. All of the following (but not limited to):

- 1) Impact to the hard hat
- 2) UV exposure
- 3) Chemical exposure
- 4) Abuse
- 5) Care and Maintenance

Always read and follow the User Instructions provided by the manufacturer.

*Q. How often should a hard hat be replaced?*

A. Under any of the following circumstances:

- 1) Immediately if a blow to the hard hat occurs
- 2) Shell - recommended to replace within 5 years dependent on environment and use
- 3) Suspension - recommended to replace at least every 12 months dependent on environment and use

There is currently no official standard or regulatory requirement for replacing a hard hat or suspension - only recommendations.

Q. What about stickers and painting the hard hat shell?

A. Pressure sensitive, non-metallic stickers or tape with self-adhesive backing are acceptable on most of today's hard hats. However there are some general guidelines to follow – do not use stickers to cover up hard hat damage and place stickers at least ½ inch from the helmets edge. Hard hat shells should not be painted unless you receive specific approval by the manufacturer.

## Additional Hard Hat Warnings

- Hard hats are designed to provide limited head protection from small falling objects striking the top of the hard hat.
- Type 1 hard hats are not designed to provide front, side or rear impact protection.
- Hard hat must fit securely on the head and the suspension must be adjusted to a snug fit.
- Never alter, puncture, modify or engrave the shell or the suspension of a hard hat.
- Inspect your hard hat shell and suspension frequently. Check for cracks, frayed straps and any sign of damage before every use. Replace the hard hat immediately if you notice any signs of wear, damage, abuse or degradation.
- If the hard hat has sustained an impact, dispose of it immediately, even if damage is not visible.
- Prolonged exposure to direct sunlight will degrade the hard hat shell. Do not store in direct sunlight (including on car dashboards) when not in use.
- Do not use paints, solvents, chemicals, adhesives, gasoline or like substances on this hard hat. These materials can cause deterioration to the shell's ability to withstand impact and penetration.
- Do not store objects between the suspension and the shell of a hard hat.

## For More Information

Technical Assistance: 1-800-243-4630

Customer Care Center: 1-800-328-1667

Website: [3M.com/WorkerSafety](https://www.3m.com/WorkerSafety)



**WARNING:** 3M™ Hard Hat H-700 Series and 3M™ Hard Hat H-800 Series provide limited protection only. Misuse or failure to follow warnings and User Instructions may result in serious personal injury or death. For correct use and selection, consult Supervisor, User Instructions or call 3M Technical Service in the USA at 800-243-4630. In Canada, call Technical Service at 800-267-4414.

### Personal Safety Division

3M Center, Building 235-2W-70  
St. Paul, MN 55144-1000

3M PSD products are  
occupational use only.

### In United States of America

Technical Service: 1-800-243-4630  
Customer Service: 1-800-328-1667  
[3M.com/workersafety](https://www.3m.com/workersafety)

### In Canada

Technical Service: 1-800-267-4414  
Customer Service: 1-800-364-3577  
[3M.ca/Safety](https://www.3m.ca/Safety)

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