State of California
Department of Industrial Relations
Division of Occupational Safety and Health

Memorandum

Date: October 26, 2026

To: Millicent Barajas, Executive Officer
Kevin Goddard, Principal Safety Engineer
Occupational Safety and Health Standards Board

From: Victor Copelan, Senior Safety Engineer
Jason Denning, Principal Safety Engineer
Eric Berg, Deputy Chief of Health
Division of Occupational Safety and Health

Subject: Evaluation of Petition No. 616 to require workers at height to wear ANSI Z89.1-2014 Type II helmets with chin strap retention systems.

1.0 INTRODUCTION

On June 29, 2026, the Occupational Safety and Health Standards Board (Standards Board) received a petition from Mr. Greg Small, founder of Elevated Insight & Engineering Ltd. (Petitioner), proposing a requirement that workers at height wear helmets meeting ANSI Z89.1-2014 Type II requirements. The petitioner is a Professional Engineer and a fall protection qualified person instructor.

Labor Code Section 142.2 permits interested persons to propose new or revised standards concerning occupational safety and health and requires the Standards Board to consider such proposals. California Labor Code section 147 requires the Standards Board to refer to the Division of Occupational Safety and Health (Cal/OSHA) for evaluation of any proposed occupational safety and health standard.

2.0 PETITIONER'S PROPOSAL AND BASIS FOR AMENDMENT OF TITLE 8 REGULATIONS

The petitioner requests that the Standards Board adopt a safety standard that requires workers at height to wear safety helmets that meet the American National Standards Institute (ANSI) Z89.1-2014 Type II requirements and have a chin strap to keep the helmet on the worker's head during a fall. Currently, title 8 regulations do not specifically address helmet selection criteria for employees exposed to falls from height.

No specific regulatory text was proposed in the petition; however, the petitioner suggests that the standard could be included in the current Walking-Working Surfaces proposal within the title 8 General Industry Safety Orders. The petitioner provided the following rationale for their request:

- During falls from elevation, construction hard hats often come off workers' heads.
- The head is one of the most vulnerable parts of the human body. Head injuries do not heal as readily as injuries to other parts of the body. Brain tissue does not regenerate. At best, other parts of the brain take over the functions lost by the injured part of the brain and are much less effective than the injured brain had been before the injury.

- During a tumbling fall, the greatest risk of head injury, when using a fall arrest system, is prior to full engagement of the fall arrest system. This occurs slightly beyond the free fall phase. When a worker is tumbling, the head can easily strike objects even if the fall is arrested. Once the fall arrest system is engaged the body is jerked upright so that the feet are leading the fall.
- Statistics from Australia show that 75% of fall fatalities involve fatal head injuries.
- In the petitioner's work as an expert witness investigating fall incidents on behalf of various entities, including regulators, the petitioner can confirm that the vast majority of fatalities and serious injuries involved the head striking something.
- The petitioner is a member of the ANSI Z359 Fall Protection committee and referenced a meeting approximately two years ago during which members from the United Kingdom (UK) gave an informal presentation indicating that fatalities from falls per person-hour worked in the UK are only 20% of those recorded in the United States. Although not discussed at the meeting, a key difference between the US and the UK (and many other countries) is that US workers wear construction hard hats instead of ANSI Z89.1 Type II helmets, and thus US workers have significantly less reliable head protection than workers in other countries.
- The Petitioner cites federal OSHA Safety and Health Information Bulletin 11-22-2023 which recommends the use of Type II helmets at construction sites with high risks of falling objects, impacts from equipment, awkward working positions, or slip, trip, and fall hazards.
- California is not working on regulations for head protection at this time and may not do so for many years.
- Fatal fall statistics in the United States and California have not appreciably improved for more than 20 years. For a variety of reasons, the fall protection community struggles to mitigate this hazard. Reasons that are frequently discussed include: complacency; misconceptions; misuse; and fall scenarios (such as residential roof construction) that continue to be difficult to protect. Better head protection will mitigate a lot of the consequence of other controls that have failed to effectively address head injuries caused by falls.
- Cal/OSHA should make the change proactively rather than waiting decades to reactively revise California regulations after federal OSHA fully implements it. In addition to saving California workers' lives immediately, California might assist federal OSHA and the rest of the country if the state is able to show a significant reduction in fall injury statistics as compared to the rest of the country.

3.0 APPLICABLE TITLE 8 REGULATIONS

California Code of Regulations, title 8, section 3381 of the General Industry Safety Orders addresses head protection from the hazard of flying or falling objects and/or electric shock and burns. It does not specifically address protection from head injuries caused by falls.

Subsection 3381(b) requires head protection to meet the requirements of either the 1997, 2003, or 2009 edition of the ANSI Z89.1 American National Standard for Industrial Head Protection standard. Subsection 3381(c)(1) requires that the appropriate impact type helmet is selected and used; and contains a non-enforceable note describing Type I and Type II helmets. The regulation has not been updated to include the 2014 or the 2026 versions of ANSI Z89.1.

Section 3381 also covers construction work as title 8 section 1515 Head Protection in the Construction Safety Orders was repealed in 2000.

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Subchapter 7. General Industry Safety Orders
Group 2. Safe Practices and Personal Protection
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Article 10. Personal Safety Devices and Safeguards

§3381. Head Protection

(a) Employees working in locations where there is a risk of receiving head injuries from flying or falling objects and/or electric shock and burns shall wear approved head protection in accordance with this section.

(b) When head protection is required, the employer shall provide each employee with head protection that meets the criteria in one of the following standards, which are hereby incorporated by reference:

(1) American National Standards Institute (ANSI)/International Safety Equipment Association (ISEA) Z89.1-2009, "American National Standard for Industrial Head Protection;"

(2) ANSI Z89.1-2003, "American National Standard for Industrial Head Protection;" or

(3) ANSI Z89.1-1997, "American National Standard for Industrial Head Protection."

(c)(1) The employer shall ensure that the appropriate impact type helmet is selected and used.

Note: Protective helmets are described by impact type and electrical class. All protective helmets required by subsection (b) meet either Type I or Type II impact requirements. Type I helmets are intended to reduce the force of impact resulting from a blow only to the top of the head. Type II helmets are intended to reduce the force of impact resulting from a blow to the top or sides of the head.

(2) The employer shall ensure that the appropriate electrical class of ANSI designated helmet is selected and used in accordance with the following:

(A) When there is no risk of head injury from contact with electrical conductors, and protective helmets are only required to reduce the danger of injury from flying or falling objects, protective helmets shall be ANSI-Z89.1 designated Class C, E, or G.

(B) When there is a risk of head injury from contact with conductors less than 600 volts, protective helmets shall be ANSI-Z89.1 designated Class E or G.

(C) When there is a risk of head injury from contact with conductors greater than 600 volts, protective helmets shall be ANSI-Z89.1 designated Class E.

(3) The employer shall ensure that the head protection provided for each employee exposed to high-voltage electric shock and burns also meets the specifications contained in Section 9.7 "Electrical Insulation" of any of the consensus standards identified in subsection (b) of this section.

(d) Each approved protective helmet required by subsection (b) shall bear the permanent markings required by the ANSI standard under which it was approved. At a minimum, the marking shall identify the manufacturer, ANSI designated standard number and date, and ANSI designated class and impact type of helmet.

(e) Where there is a risk of injury from hair entanglements in moving parts of machinery, combustibles or toxic contaminants, employees shall confine their hair to eliminate the hazard.

California Code of Regulations title 8 section 1907 includes requirements for personal protective equipment for helicopter ground crews including head protection. Subsection 1907(b) requires approved head protection with chin straps to be worn by members of helicopter ground crews.

> Subchapter 4. Construction Safety Orders
> Article 35. Helicopter Operations
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> §1907. Ground Crew.
> (b) Ground crewmembers shall wear dust goggles for eye protection and approved head protection with chin straps in place. Ear protection and dust protection where required shall be in accordance with applicable safety orders.
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California Code of Regulations title 8 section 8414 includes requirements for personal protective equipment for tunneling operations including head protection. Subsection 8414(b) requires approved head protection be provided to employees.

> Subchapter 20. Tunnel Safety Orders
> Article 5. Personal Protective Equipment
> §8414. Personal Protective Equipment.
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> *****
> (b) Head Protection. Every employee shall be provided with and required to wear approved head protection. Winter liners shall be provided when weather conditions warrant.

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4.0 APPLICABLE FEDERAL OSHA REGULATIONS

Federal OSHA regulations address personal protective equipment for eyes, face, head, and extremities and respiratory protection in Title 29 Code of Federal Regulations (29 CFR) section 1910.132. Pursuant to subsection 1910.132(d)(1), personal protective equipment is required for hazards that are present or likely to be present.

> 1910 Occupational Health and Safety Standards
> 1910 subpart I Personal Protective Equipment
> 1910.132 General Requirements
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> *****
> 1910.132(d)(1) The employer shall assess the workplace to determine if hazards are present, or likely to be present, which necessitate the use of personal protective equipment (PPE). If such hazards are present, or likely to be present, the employer shall:
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> 1910.132(d)(1)(i) Select, and have each affected employee use, the types of PPE that will protect the affected employee from the hazards identified in the hazard assessment;
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> *****

Federal OSHA standard 29 CFR 1910.135 governs general-industry head protection requirements. Subsection

1910.135(b) requires head protection to comply with the 1997, 2003, or 2009 editions of the ANSI Z89.1 standard. Federal OSHA's head protection standards have not incorporated the 2014 or 2026 editions of the standard, nor do they specify the type of helmet that must be used.

> 1910 Occupational Safety and Health Standards
> 1910.135 Head Protection
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> 1910.135(a) General requirements.
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> 1910.135(a)(1) The employer shall ensure that each affected employee wears a protective helmet when working in areas where there is a potential for injury to the head from falling objects.
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> *****
>
> 1910.135(b) ***Criteria for head protection.***
>
> 1910.135(b)(1) Head protection must comply with any of the following consensus standards:
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> 1910.135(b)(1)(i) American National Standards Institute (ANSI) Z89.1-2009, "American National Standard for Industrial Head Protection," incorporated by reference in § 1910.6;
>
> 1910.135(b)(1)(ii) American National Standards Institute (ANSI) Z89.1-2003, "American National Standard for Industrial Head Protection," incorporated by reference in § 1910.6; or
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> 1910.135(b)(1)(iii) American National Standards Institute (ANSI) Z89.1-1997, "American National Standard for Personnel Protection - Protective Headwear for Industrial Workers - Requirements," incorporated by reference in § 1910.6.
>
> 1910.135(b)(2) Head protection devices that the employer demonstrates are at least as effective as head protection devices that are constructed in accordance with one of the above consensus standards will be deemed to be in compliance with the requirements of this section.

OSHA has similar requirements to 1910.135 for head protection in shipyards (29 CFR 1915.155), marine terminals (29 CFR 1917.93), longshoring (29 CFR 1918.103), and construction (29 CFR 1926.100).

5.0 APPLICABLE CONSENSUS STANDARDS

5.1 ANSI/ISEA Z89.1-2014

The 2014 edition of the American National Standards Institute (ANSI) Z89.1 standard (Attachment 1), referenced by the petitioner, establishes minimum performance and labeling requirements for protective helmets used in industrial and occupational settings under normal temperature conditions and optionally at high and low temperatures and when worn in the reversed position. It also includes requirements for high-visibility helmets and specifies test methods for evaluating all requirements.

Helmets conforming to the requirements of this standard are designated both by Type (based on location of penetration/impact force) and Class (based on electrical insulation) as well as certain optional features.

The helmet type is the part of the ANSI Z89.1 standard relevant to this petition (the petitioner requests Type II helmets with chin straps for workers exposed to falls). The types are:

- Type I helmets: designed to reduce penetration and force from impacts to the top of the head; they are not tested for protection to the sides, back, or front of the head.
- Type II helmets: designed to reduce penetration and force from impacts to both the top and lateral areas (front, back, and sides) of the head.

The Type II designation also includes additional testing requirements for chin strap retention if a chin strap retention system is provided with the helmet. However, chin straps are optional and **not** required on Type II helmets.

5.2 ANSI/ISEA Z89.1-2026

ANSI Z89.1-2026 (Attachment 2) introduced Type I+ and Type II+ helmets, which are new designations that do not exist in previous versions of the standard. Both new designations require helmet chin straps and two specific evaluations: 1) chin strap retention system testing and 2) retention system effectiveness (roll-off) testing.

The "+" types in the 2026 standard do not eliminate the previous and less protective Type I and Type II helmets, which remain unchanged from the 2014 version of the standard. Type I helmets do not have a chin strap option or testing for chin straps. Type II helmets have an option for a chin strap, and if included, are tested for chin strap retention. However, standard Type II helmets do not require the retention system effectiveness (roll-off) testing mandated for Type I+ and Type II+ helmets.

Type I+ helmets must pass off-center force-transmission testing (which is not required for Type I helmets) at the front, rear, and side and may not transmit more than 10 kN of force. However, Type I+ helmets are not required to meet the Type II impact-energy attenuation and off-center penetration requirements applicable to Type II and Type II+ helmets.

No helmet types in ANSI Z89.1-2026 or earlier versions include test methods for protection from rotational motion on the head and brain caused by impacts (see part 6.4 of this evaluation for further information on brain injuries caused by rotational motion).

5.3 BS EN 397 and 13087

BS EN 397 and 13087 are British and European Standards for industrial safety helmets. BS EN 397 sets mandatory performance and design requirements for helmets, while BS EN 13087 provides a series of test methods used in a laboratory to measure those performance criteria.

BS EN 397 – Industrial Protective Helmets – specifies minimum physical criteria for safety helmets such as shock absorption, penetration resistance, flame resistance, and retention system (chin strap) effectiveness.

BS EN 13087, Protective Helmets—Test Methods, is a ten-part series specifying test methods for industrial protective helmets. The parts of this standard relevant to this petition are the following:

- Part 2: Test methods for shock absorption
- Part 3: Test methods for resistance to penetration
- Part 4: Test methods for retention system effectiveness
- Part 5: Test methods for retention system strength

BS EN 397 and BS EN 13087 do not include requirements or test methods for protection from rotational motion on the head and brain caused by impacts.

5.4 BS EN 17950:2024

BS EN 17950:2024, titled "Protective helmets - Test methods - Shock absorption including measuring rotational kinematics" (Attachment 3), includes test methods to measure translational (linear) and rotational forces from helmet impacts. The 2024 edition of BS EN 17950 describes helmet test protocols for shock absorption including measuring rotational kinematics.

6.0 CAL/OSHA ANALYSIS

6.1 Traumatic Brain Injuries in Construction

According to the American Journal of Industrial Medicine, 2,210 fatal traumatic brain injuries (TBI) occurred in construction at a rate of 2.6 per 100,000 full-time equivalent (FTE) workers from 2003 to 2010. Based on data extracted from the Bureau of Labor Statistics Census of Fatal Occupational Injuries, workers aged 65 years and older had the highest fatal TBI rates among all workers (7.9 per 100,000 FTE workers). Falls were identified as the most frequent injury event (n = 1,269, 57%) and structural iron and steel workers and roofers had the highest fatal TBI rate per 100,000 FTE workers (13.7 and 11.2, respectively). Fall-related TBIs were the leading cause of death in these occupations. These deaths represented 25% of all construction fatalities and 24% of all work-related TBI fatalities among all industries during that period. [1]

The American Journal of Industrial Medicine also reported that construction workers are at higher risk for TBIs because of their work in dynamic environments where they can be struck by falling and flying objects or fall from elevation. Falls, especially from roofs, ladders, and scaffolds, are a major cause of lost-time TBIs. [2]

A study published in the Annals of Biomedical Engineering journal found that lateral (from the side) impacts in football are likely to cause rotational accelerations in the brain, which is a mechanism of injury leading to concussions among persons experiencing brain trauma.[3]

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[1] Konda S, Tiesman HM, Reichard AA. Fatal traumatic brain injuries in the construction industry, 2003-2010. Am J Ind Med. 2016 Mar;59(3):212-20. pubmed.ncbi.nlm.nih.gov/26765167/.

[2] Konda S, Al-Tarawneh IS, Reichard AA, Tiesman HM, Wurzelbacher SJ, Pinkerton LE, Meyers AR, Hendricks SA, Tseng CY, Lampl MP, Robins DC. Workers' compensation claims for traumatic brain injuries among private employers-Ohio, 2001-2011. Am J Ind Med. 2020 Feb;63(2):156-169. pubmed.ncbi.nlm.nih.gov/31742763/

[3] Rowson S, Duma SM. Brain injury prediction: assessing the combined probability of concussion using linear and rotational head acceleration. Ann Biomed Eng. 2013 May;41(5):873-82. pubmed.ncbi.nlm.nih.gov/23299827/

6.2 ANSI Z89.1-2014 Type I vs. Type II Safety Helmets

Under ANSI Z89.1-2014, industrial safety helmets are classified as Type I or Type II based on their impact protection. Type I helmets are designed and tested to provide protection against impacts to the top of the head only, while Type II helmets provide protection against impacts to both the top and sides of the head, including front, rear, and lateral impacts. Type I (Figure 1) helmets are usually of the "traditional hard hat" style with a suspension system that spreads downward force. They are generally lighter and have fewer internal components than Type II helmets.



Figure 1. ANSI Type I Safety

Type II (Figure 2) helmets often resemble a modern safety helmet rather than a traditional hard hat, typically featuring internal foam liners (like expanded polystyrene or Koroyd[4]) to better absorb and protect from off-center and side impacts. The option and testing requirements for a chin strap retention



Figure 2. ANSI Type II Safety Helmet

system are also included in ANSI Z89.1-2014 for Type II but not for Type I helmets. However, chin strap retention systems are optional for Type II helmets.

Laboratory testing from Virginia Tech estimated that Type II helmets reduce concussion risk by 32.7% and skull fracture risk by 57.5% compared with the Type I helmets tested. However, there is variability among the Type II helmets; the two best Type II helmets had 28.7% and 33.2% lower concussion risk than the two worst-performing Type II helmets. They have not yet tested Type II+ or Type I+ helmets.

Although superior to Type I, Cal/OSHA considers the Type II helmet designation alone as insufficient because the chin strap retention system is optional.

[4] Koroyd is lightweight energy-absorbing impact protection material made from thousands of co-polymer tubes that are thermally welded together without glue.

6.3 ANSI Z89.1-2026 Type I+ and Type II+ Safety Helmets

The new "+" designation in the 2026 standard is important because head protection is ineffective if a worker falls and the helmet does not stay on their head. Both Type I+ and Type II+ helmets must include a chin strap retention system and meet standardized test requirements designed to evaluate the strap and the helmet's ability to remain properly positioned after an impact.

In addition to the mandatory chin strap retention system requirements, Type I+ helmets must pass off-center force-transmission testing at the front, rear, and side and cannot transmit more than 10 kN of force. However, Type I+ helmets are not tested to the Type II lateral impact-energy attenuation and off-center penetration criteria.

Type II+ helmets combine the existing Type II impact-energy attenuation and off-center penetration requirements with the new "+" retention requirements. As a result, Type II+ helmets provide protection from top and lateral impacts while incorporating requirements to improve helmet retention during falls and other incidents involving worker movement.

Based on 1) the lower concussion and skull fracture risk estimated for the Type II helmets compared to the Type I helmet in the Virginia Tech testing, 2) the need for a mandatory helmet retention system, and 3) the enhanced lateral impact and penetration protection of Type II+ helmets compared to Type I+ helmets, Cal/OSHA considers Type II+ helmets meeting ANSI Z89.1-2026 to be the minimum level of head protection that should be required for employees exposed to falls from height.

6.4 Protection Against Rotational Motion Would Further Enhance Worker Safety

Researchers at Virginia Tech test and rate the effectiveness of helmets, including those used by construction workers. The researchers have found that current industrial helmet standards only test for linear (translational) impacts (like an object falling on a stationary worker). However, real-world workplace falls also cause angled (oblique) impacts.[5] These oblique impacts generate rapid twisting or rotational forces on the brain. While linear forces cause skull fractures, rotational forces cause the brain to rotate inside the skull, tearing brain tissue and causing concussions, a type of traumatic brain damage called diffuse axonal injury (tears to brain nerve fibers), and subdural hematoma (blood accumulation between the brain and skull caused by torn blood vessels). These injury mechanisms may occur even when linear accelerations are insufficient to cause skull fracture. [6]

Substantial biomechanical research has identified rotational acceleration as a significant mechanism of concussion, diffuse axonal injury, and other traumatic brain injuries. Research using more than 300,000 head impacts among football players found that rotational acceleration and rotational velocity are strongly associated with concussion risk and other brain injuries based on rotational head kinematics (the measurement and analysis of angular motion, velocity, and acceleration of the head during impact or sudden movement).

Falls from elevation often involve oblique impacts rather than purely vertical impacts. As a worker falls,

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[5] Ibid.

[6] Mips Corp. *Third-party studies*. Mips. Retrieved October 23, 2026, from mipsprotection.com/helmet-technology/third-party-studies/.
Mips Corp. *Rotational Motion*. Mips. Retrieved October 23, 2026, from mipscorp.com/about-mips/rotational-motion/

the head may strike structural members, equipment, building surfaces, or the ground at an angle. These oblique impacts generate both translational and rotational motion and are thus capable of producing rotational loading of the brain. Research supporting the development of modern rotational helmet evaluation methods indicates that both oblique and translational impacts are commonly encountered in real-world injury events and that including both types of impacts may be more representative of actual accident conditions than evaluating helmets only for perpendicular impacts.

ANSI Z89.1-2026 and earlier versions of the standard evaluate helmet performance against penetrative and translational impacts. Although ANSI Z89.1-2026 substantially improves worker protection through the introduction of Type I+ and Type II+ helmets and mandatory retention system testing, the standard does not include evaluation of rotational kinematics associated with oblique impacts.

Recognition of rotational injury mechanisms has resulted in the development of new helmet testing methodologies. The British and European standard BS EN 17950:2024 establishes a test method specifically designed to measure both translational and rotational kinematics during helmet impacts. Similarly, the Virginia Tech Helmet Lab construction helmet rating system evaluates helmet performance using oblique fall-impact scenarios and incorporates both linear and rotational head acceleration measurements when estimating concussion risk.[7]

Because falls from height commonly involve oblique impacts capable of generating rotational motion of the head, consideration should be given to whether employees exposed to fall hazards would benefit from head protection evaluated for both translational and rotational impact performance.

An advisory committee could further evaluate the necessity and scientific basis for incorporating rotational-impact evaluation methods, including BS EN 17950:2024, Virginia Tech's construction helmet rating system, or equivalent methodologies, into future California head protection requirements.

6.5 The Petitioner's Proposal to Include Improved Head Protection in the Walking-Working Surfaces Regulation Alone is Not Sufficient

The petitioner's proposal to include a requirement for ANSI Type II helmets within the current title 8 Walking-Working Surfaces (WWS) rulemaking is not sufficient and would leave gaps in protection without requirements in other title 8 head protection regulations. Cal/OSHA recommends that the requirement for improved head protection be included in title 8 section 3381 with references in the WWS regulations as well as other applicable regulations where employees working at height could be exposed to head injuries from fall hazards.

7.0 CONCLUSION

Cal/OSHA recommends that Petition 616 be GRANTED in part as follows:

- A balanced advisory committee composed of appropriate members should be convened to draft specific language for inclusion of ANSI Z89.1-2026 in section 3381 and other applicable title 8 head protection regulations.

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[7] Virginia Tech Helmet Lab. (2025). *Construction Helmet Ratings*. Virginia Polytechnic Institute and State University. Accessed on October 24, 2026. https://www.helmet.beam.vt.edu/construction-helmet-ratings.html.
British Standards Institution. (2024). *Protective helmets — Test methods — Shock absorption including measuring rotational kinematics* (BS EN 17950:2024). BSI. bsigroup.com

- ANSI Z89.1-2026 Type II+ helmets be required for workers exposed to falls from height rather than the Type II helmets proposed by the petitioner.
- Consider requiring evaluation of Type II+ helmets in accordance with BS EN 17950:2024 or equivalent methodology to address rotational forces related to falls from elevation.

cc: Debra Lee, Cal/OSHA Chief