

SHOCK, IMPACT, & PENETRATION TESTING

Industrial helmets are subjected to many types of testing to provide the best protection possible. Learn about shock and impact testing requirements for ANSI, CSA, and EN.



TYPE I INDUSTRIAL

APPROVALS

ANSI Z89.1-2014 R2019
CSA Z94.1-15

MSA HELMETS

V-Gard® Helmet
V-Gard® 500 Helmet
V-Gard H1® Helmet
Topgard® Helmet
Skullgard® Helmet
SmoothDome® Helmet
Thermalgard® Helmet
Comfo-Cap® Helmet



TYPE II INDUSTRIAL

APPROVALS

ANSI Z89.1-2014 R2019
CSA Z94.1-15 (Super-V® only)

MSA HELMETS

V-Gard H2® Helmet
V-Gard H2® Full Brim Helmet
Super-V® Helmet



EN397 INDUSTRIAL

APPROVALS

EN 397:2012

MSA HELMETS

V-Gard H1® NoVent Helmet
V-Gard H1® BiVent Helmet



EN12492 MOUNTAINEERING

APPROVALS

EN 12492:2012

MSA HELMETS

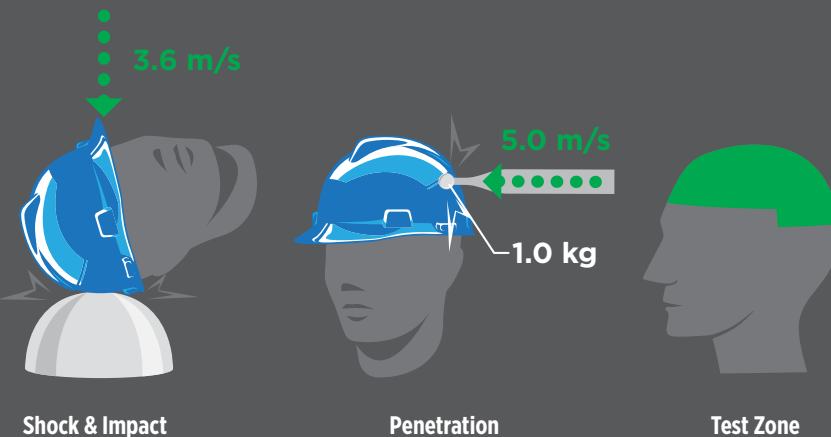
V-Gard H1® TriVent Helmet

ANSI Z89.1-2014 R2019

TYPE I & TYPE II INDUSTRIAL



TYPE II INDUSTRIAL



SHOCK & IMPACT

TYPE I & TYPE II INDUSTRIAL	TYPE II INDUSTRIAL
Test: Force Transmission	Test: Impact Energy Attenuation
Equivalent: Hammer falling from over 21 ft. (6.4 m)	Equivalent: Hammer falling from nearly 12 ft. (3.7 m)
Impact Force: 54.5 Joules (40.2 ft.-lb.)	Impact Force: 30.6 Joules (22.6 ft.-lb.)
Pass Criteria: Transmitted force < 4450 N (1000 lb.) Sample average < 3780 N (850 lb.)	Pass Criteria: Maximum acceleration $\leq 150 \text{ g}^*$
Mandatory Pre-Test Helmet Conditioning:	Optional Pre-Test Helmet Conditioning:**
49°C ±2°C, 2 hours -18°C ±2°C, 2 hours	60°C ±2°C, 4 hours -30°C ±2°C, 4 hours

PENETRATION

TYPE I & TYPE II INDUSTRIAL	TYPE II INDUSTRIAL
Test: Apex Penetration	Test: Off-Center Penetration
Equivalent: Hammer falling from over 10 ft. (3.0 m)	Equivalent: Hammer falling from nearly 4.9 ft. (1.5 m)
Impact Force: 24.5 Joules (18.1 ft.-lb.)	Impact Force: 12.5 Joules (9.2 ft.-lb.)
Pass Criteria: Penetrator shall not make contact with top of test headform.	Pass Criteria: Penetrator shall not make contact with top of test headform.
Mandatory Pre-Test Helmet Conditioning:	Optional Pre-Test Helmet Conditioning:**
49°C ±2°C, 2 hours -18°C ±2°C, 2 hours	60°C ±2°C, 4 hours -30°C ±2°C, 4 hours

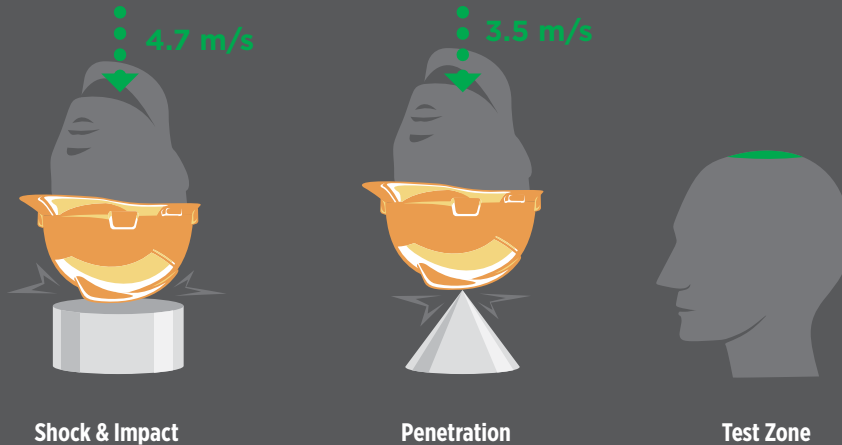
*The lower the g value, the longer it takes your head to slow down, which means the impact will inflict less harsh force on your brain.
 ** Most MSA helmets are tested to this optional standard. Check your approval label to confirm performance specifications.

KEY:

High Temp.	Higher Temp.	Water Immersion	Ambient Temp.
Low Temp.	Lower Temp.	Solvent Wipe	UV Exposure

CSA Z94.1-15

TYPE I & TYPE II INDUSTRIAL



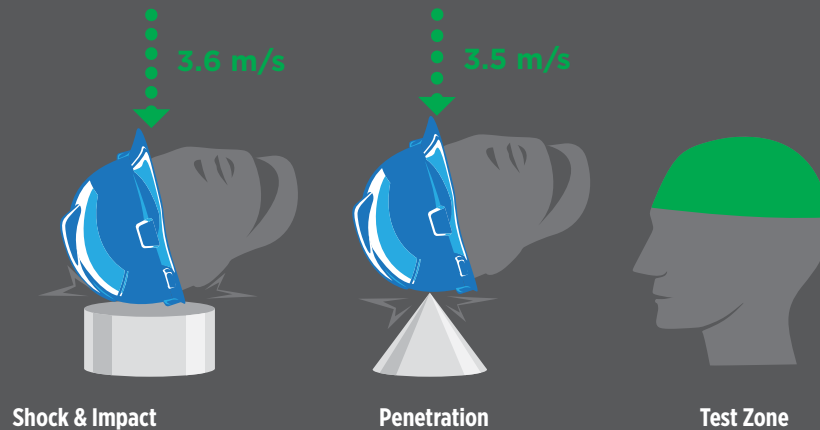
SHOCK & IMPACT

TYPE I & TYPE II INDUSTRIAL	TYPE II INDUSTRIAL
Test: Impact Attenuation	Test: Impact Attenuation
Equivalent: Hammer falling from over 21 ft. (6.4 m)	Equivalent: Hammer falling from nearly 12 ft. (3.7 m)
Impact Force: 55 Joules (40.57 ft.-lb.)	Impact Force: 30 Joules (22.13 ft.-lb.)
Pass Criteria: Maximum acceleration $\leq 85 g^*$	Pass Criteria: Maximum acceleration $\leq 150 g^*$

Mandatory Pre-Test Helmet Conditioning:

50°C ±2°C, 4 hours	23°C ±2°C, 4 hours	50% toluene
-30°C±2°C, 4 hours	18°C-27°C, 4 hours	50% isooctane
		30 seconds

TYPE II INDUSTRIAL



PENETRATION

TYPE I & TYPE II INDUSTRIAL	TYPE II INDUSTRIAL
Test: Penetrational Resistance	Test: Penetrational Resistance
Equivalent: Hammer falling from over 12 ft. (3.7 m)	Equivalent: Hammer falling from nearly 6 ft. (1.8 m)
Impact Force: 30 Joules (22.1 ft.-lb.)	Impact Force: 15 Joules (11.1 ft.-lb.)
Pass Criteria: Penetrator shall not make contact with top of test headform.	Pass Criteria: Penetrator shall not make contact with top of test headform.

Mandatory Pre-Test Helmet Conditioning:

50°C ±2°C, 4 hours	23°C ±2°C, 4 hours	50% toluene
-30°C±2°C, 4 hours	18°C-27°C, 4 hours	50% isooctane
		30 seconds

*The lower the g value, the longer it takes your head to slow down, which means the impact will inflict less harsh force on your brain.

KEY:

High Temp.	Higher Temp.	Water Immersion	Ambient Temp.
Low Temp.	Lower Temp.	Solvent Wipe	UV Exposure

INDUSTRIAL



Shock & Impact



Penetration




Test Zone

SHOCK & IMPACT


TYPE I INDUSTRIAL

Test: Shock Absorption
Impact Force: 49.0 Joules (36.1 ft.-lb.)
Pass Criteria: Transmitted force \leq 5000 N (1125 lb.)

Mandatory Pre-Test Helmet Conditioning:

 50°C \pm 2°C
 4 hours
 -10°C \pm 2°C
 4 hours
 20°C \pm 2°C
 4 hours
 UV aging
 400 hours

Optional Pre-Test Helmet Conditioning:*

 -30°C \pm 2°C
 4 hours

PENETRATION


TYPE I INDUSTRIAL

Test: Resistance to Penetration
Impact Force: 29.4 Joules (21.7 ft.-lb.)
Pass Criteria: Point of striker does not contact headform

Mandatory Pre-Test Helmet Conditioning:

 50°C \pm 2°C
 4 hours
 -10°C \pm 2°C
 4 hours
 20°C \pm 2°C
 4 hours
 UV aging
 400 hours

Optional Pre-Test Helmet Conditioning:*

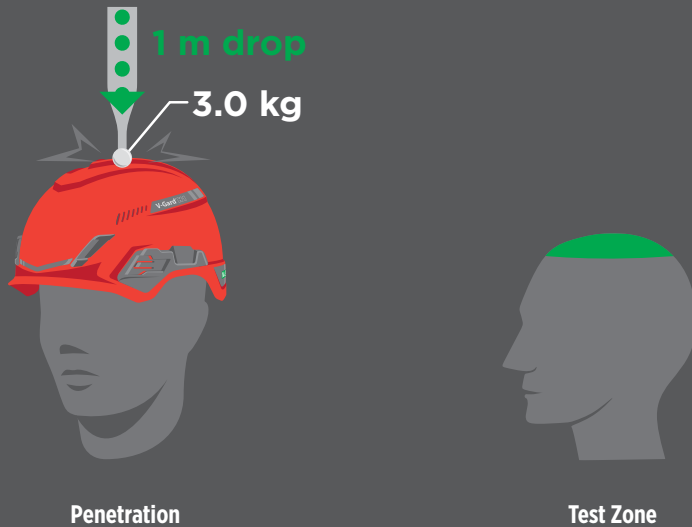
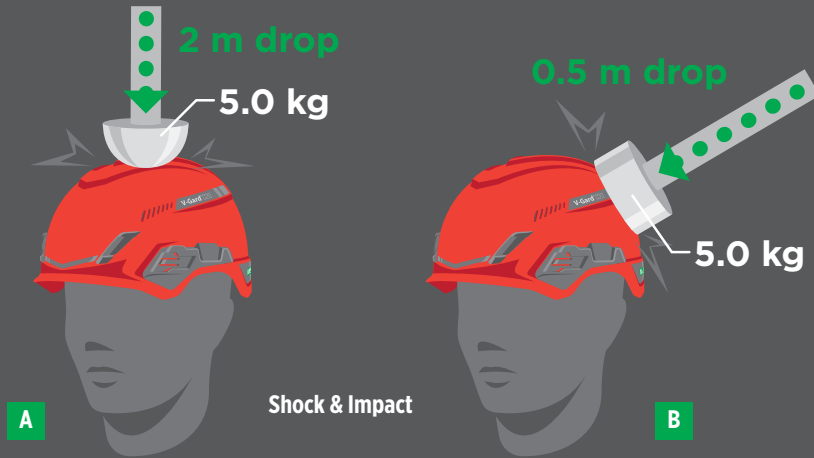
 -30°C \pm 2°C
 4 hours

KEY:

 High Temp.
 Low Temp.
 Higher Temp.
 Lower Temp.
 Water Immersion
 Solvent Wipe
 Ambient Temp.
 UV Exposure

* MSA V-Gard HI NoVent and BiVent Helmets are tested to this optional standard. Check your approval label to confirm performance specifications.

MOUNTAINEERING



SHOCK & IMPACT

INDUSTRIAL

Test: Shock Absorption

Impact Force: **A:** 98.1 Joules (72.35 ft.-lb.)
B: 24.0 Joules (17.70 ft.-lb.)

Pass Criteria: Transmitted force \leq 10000 N (2250 lb.)

Mandatory Pre-Test Helmet Conditioning:

35°C, 2 hours
 -20°C, 2 hours
 23°C \pm 2°C, 4 hours
 UV aging, 400 hours

PENETRATION

INDUSTRIAL

Test: Penetration

Impact Force: 29.4 Joules (21.7 ft.-lb.)

Pass Criteria: Point of striker does not contact headform

Mandatory Pre-Test Helmet Conditioning:

35°C, 2 hours
 -20°C, 2 hours
 23°C \pm 2°C, 4 hours
 UV aging, 400 hours

KEY:

	High Temp.		Higher Temp.		Water Immersion		Ambient Temp.
	Low Temp.		Lower Temp.		Solvent Wipe		UV Exposure

MSA—The Safety Company

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Our Mission

MSA's mission is to see to it that men and women may work in safety and that they, their families and their communities may live in health throughout the world.

MSA: WE KNOW WHAT'S AT STAKE.

Note: This Bulletin contains only a general description of the products shown. While product uses and performance capabilities are generally described, the products shall not, under any circumstances, be used by untrained or unqualified individuals. The products shall not be used until the product instructions/user manual, which contains detailed information concerning the proper use and care of the products, including any warnings or cautions, have been thoroughly read and understood. Specifications are subject to change without prior notice. MSA is a registered trademark of MSA Technology, LLC in the US, Europe, and other Countries. For all other trademarks visit <https://us.msasafety.com/Trademarks>.

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