

ADCR-MH23 HELMET CRASH TEST

Model	Unilever
Manufacturer	Muhafiz
Batch/Serial	Unknown
Size	Large
Date Tested	28-04-23
Mfg. Country	Pakistan
Weight	1186 g

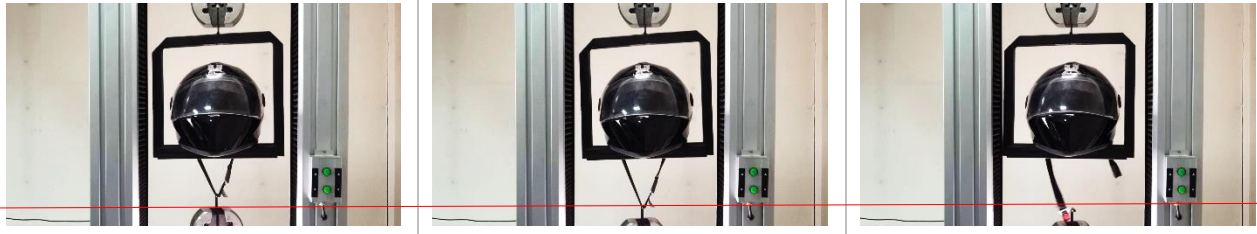


ADCR-MH23-D2 HORIZONTAL AND VERTICAL VISION TESTS




Criteria	Measurement	min/max value	Status	Criteria	Measurement	min/max value	Status
Up Vision	50°	7° min	Pass	Span Left	110°+	105° min	Pass
Down Vision	33°	45° min	Fail	Span Right	110°+	105° min	Pass
Comments	Meters Not Visible, Mirrors not visible			Comments	Side vision limited by peripheral vision of human eye/head, not the helmet.		

ADCR-MH23-D3 STRAP TEST

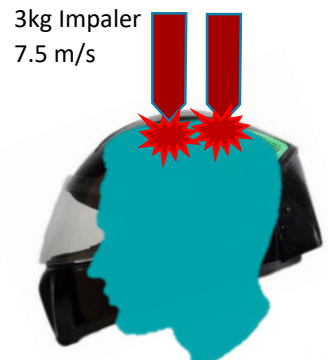

			
Criteria	Measurement	min/max value	Status
Strap Extension at 300N	--	35 mm max	Fail
Breakage Force	120 N	630 N min	Fail
Extension at Breakage	42.051 mm	35+ mm max	Fail
10Kg drop by 75mm	--	40 mm	Not Needed
Strap Width	20mm	25mm min	Fail
Comments	Chin Strap does not adequately restrain the head. The buckle breaks at around 120 N. It also extends beyond the maximum allowable limit at approximately the same force.		


ADCR-MH23-D3 RIGIDITY TEST


	Criteria	Measurement	min/max value	Status
	Deformation at 630N	--	40mm max	Fail
	Highest incremental value for every 100 N increase	11.039 mm	15mm max	Pass
	Maximum Force	560 N	630 N min	Fail
	Deformation at Maximum Force	49.22 mm	40 mm max	Fail
	Comments	The maximum deformation threshold was crossed at only 550 N of applied force. For forces above 500 N, the helmet rapidly deforms much rapidly, shrinking the critical safe space. The visor breaks free at ~520 N. However at no point in time the highest incremental value crossed the max allowable limit.		

ADCR-MH23-D2 PENETRATION TEST

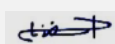

3kg Impaler
7.5 m/s





Criteria	Measurement	min/max value	Status
Outer Shell Damaged	✓	--	Fail
Outer Shell Penetrated	✓	--	Fail
Inner Padding Damaged	✓	--	Fail
Inner Padding Penetrated	✓	--	Fail
Headform Damaged	✓	Should not be damaged	Fail
Headform Penetrated	✓	Striker should not make contact with the headform.	Fail
Comments	Visually the helmet sustains little damage, however for both the impacts, the striker penetrated the outer shell, punched a small hole in the inner liner to significantly damage the head form. Fails on all parameters.		

General Comments and observations			
<p>The helmet exhibited very poor build quality and design. The Chin guard significantly obstructs downward vision. The motorists are unable to view side view mirrors and meters. The internal padding slips under any kind of load. The strap was of inadequate width and attached poorly to the helmet. During the strap retention test, under tension, the strap pulled the internal padding down ripping it. This exposed a protruding bolt on the inside of the helmet near the temple on both sides. This is a massive safety risk as the bolt can fracture or penetrate the skull under side impact. The helmet performed relatively well on penetration test but failed it nonetheless. The headform sustained two types of damage, direct damage from the striker and secondary damage in the form of side fractures as not force was attenuated. The direct damage was small compared to other locally manufactured helmets.</p>			
Tested by	PEC number	Date	Signature
Muhammad AsfandYar Amjad	Aero/02923	28-04-23	
Shiza Kafeel			

Procedures and Protocols

Peripheral Vision Test

- **Equipment Required:**
 - ❖ Helmet to be Tested.
 - ❖ Strings.
 - ❖ Motorbike.
- **Procedure:**
 - ❖ Mark the reference planes on the helmet.
 - ❖ Secure the helmet on the motorist's head.
 - ❖ Mark the reference planes and Motorist Position on the motorbike.
 - ❖ Place the motorbike in front of the white wall with verticle and horizontal markings and objects placed multiple levels.
 - ❖ Place the motorist on the motorbike.
 - ❖ Ask the motorist to look straight ahead and, without moving his head, identify the farthest objects to his left and right that he can see clearly.
 - ❖ Mark the motorist's peripheral field of vision using the strings in the horizontal plane.
 - ❖ Ask the motorist to look straight ahead and, without moving his head, identify the highest and lowest objects he can see clearly.
 - ❖ Mark the motorist's upward field of vision using the strings in the verticle plane.
 - ❖ Mark the motorist's downward field of vision using the strings in the verticle plane.
 - ❖ Check for optical clarity by repeating the test with visor on.
 - ❖ Check for visual obstructions by ensure the helmet's design doesn't obstruct motorist's vision. Look for potential issues, such as thick padding, vents, or other features that might limit your view.
 - ❖ Map the findings for each helmet by creating a visual representation of helmets field of view.
- **Passing Criteria:**
 - ❖ Helmet shall have a peripheral vision of 105° to each side of the vertical reference plane. (210° in total).
 - ❖ Helmet shall have an upward vision of 7° from the horizontal reference plane.
 - ❖ Helmet shall have a downward vision of 45° from the horizontal reference plane.
 - ❖ There shall be no obstruction of vision by helmet's design.
 - ❖ There shall not be any warping, blurring or distortion in vision with the visor on.

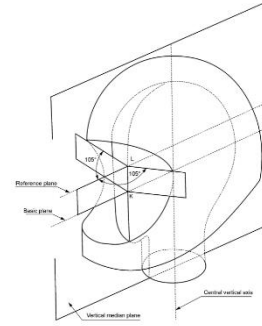
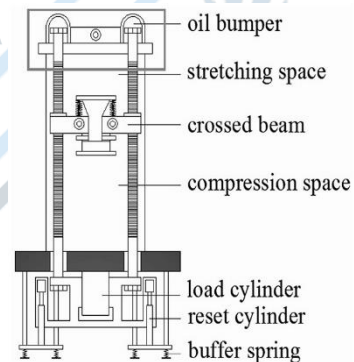


Fig. 20 PERIPHERAL VISION – HORIZONTAL FIELD

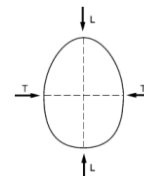
Strap Retention Test

- **Equipment Required:**
 - ❖ Helmet to be Tested.
 - ❖ A test rig to apply tension to the retention system [**Universal Test Machine (UTM)**]:
 - A rig capable of applying controlled tension to the retention system (chinstrap) while measuring the force and displacement. The rig should be able to hold the tension for the required duration.
 - ❖ Helmet Mount, to place the helmet on UTM.
 - ❖ Clamps to secure the helmet mount in place.
- **Procedure:**
 - ❖ Secure the helmet on the helmet mount..
 - ❖ Attach the helmet system to the test rig using clamps.
 - ❖ Fasten the retention system to the test rig so that tension can be applied.
 - ❖ Apply the initial load of 30 N at a speed of 20mm/min and hold for 120 seconds.
 - ❖ Get the displacement.
 - ❖ Gradually apply tension to the strap, up to 300 N (Newtons), and hold for 120 seconds.
- **Passing Criteria:**
 - ❖ Retention System should not detach from the helmet.
 - ❖ The Strap shall not have more than 35 mm of slippage.



Rigidity Test

- **Equipment Required:**
 - ❖ Helmet to be Tested.
 - ❖ A Compression Device [**Universal Test Machine (UTM)**]:
 - A rig designed to apply controlled compressive force to the helmet while measuring the force and corresponding displacement. The rig should be able to release the force after reaching the required level.
 - ❖ Two Plates of equal length, width, and thickness. (L, W > 100mm).
 - ❖ Measuring Scales.
- **Procedure:**
 - ❖ Place the helmet between two parallel plates such that a known load can be applied along the longitudinal axis G/ (line LL in the figure) or the transverse axis (line TT in the figure). position.
 - ❖ Secure the plates in the UTM.
 - ❖ Apply an initial load of 30 N at a speed of 20mm/min. After 2 minutes get the distance between the places using measuring scale. Clear the displacement in UTM. This is the initial position.
 - ❖ Increase the load by increments of 100 N until a load of 630 N is achieved. Get the displacement from UTM and measuring scale after each increment.
 - ❖ The helmet used for the test along the longitudinal axis shall be a new helmet, and another new helmet shall be used for the test along the transverse axis.

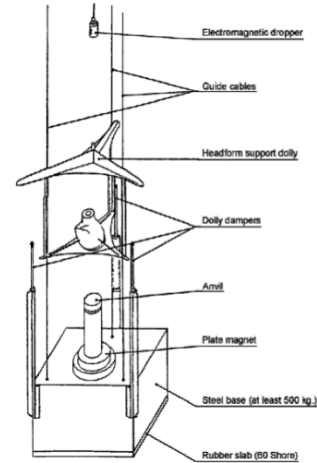


- **Passing Criteria:**
 - ❖ In the test along each axis, the deformation measured under the 630 N load shall not exceed that measured under the initial 30 N load by more than 40 mm.
 - ❖ In the test along each axis, the deformation measured under the 630 N load shall not exceed that measured under the initial 30 N load by more than 40 mm.

Penetration Test

- **Equipment Required:**
 - ❖ Helmet to be Tested.
 - ❖ Headform of the compatible size.
 - ❖ A sharp striker of mass 3 kg with a conical head.
 - ❖ A drop tower rig adapted for penetration tests, featuring a guided free-fall system.

- **Procedure:**
 - ❖ Set up the test area: Choose a flat, stable surface on which to perform the test, such as a concrete floor or a sturdy workbench.
 - ❖ Prepare the helmets: Inspect each of the eight helmets to ensure they are in good condition and have no visible defects. If necessary, remove any accessories or attachments that might interfere with the test, such as visors or communication devices.
 - ❖ Set up the striker: Attach the mild steel striker to the end of the pipe. Make sure it's securely fastened and properly aligned with the pipe.
 - ❖ Position the helmet: Place one of the helmets on a stable surface or helmet holder, ensuring it's level and properly secured. The helmet should be in the same position as it would be when worn, with the crown (top) facing upwards.
 - ❖ Measure the drop height: According to ECE standards, the striker's drop height should be approximately ~9-10 feet. Measure the height from the tip of the striker to the helmet's surface when the pipe is held vertically.
 - ❖ Mark the impact points: Identify the points on the helmet where the striker will make contact.
 - ❖ Perform the penetration test: Raise the pipe and striker to the predetermined drop height, ensuring it's vertically aligned with the impact point on the helmet. Release the pipe, allowing the striker to fall freely onto the helmet.
 - ❖ Assess the damage: Carefully examine the helmet after the impact. Look for signs of penetration, such as cracks, punctures, or deformations on the helmet's surface or inner liner. Check for damage to headform.
 - ❖ Record your observations for each helmet.



- **Passing Criteria:**
 - ❖ The Striker shall not penetrate the inner liner of the helmet.
 - ❖ The headform shall not sustain any damage.