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This report was developed by the InterAgency Board for Equipment Standardization and Interoperability (IAB) to describe law enforcement and corrections officer needs and requirements related to protective helmets. Contributors are identified in table 1 along with their respective organizations and affiliations.

Table 1. Contributors

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The final report was reviewed and approved by the IAB Standards Coordination SubGroup.
# Table of Contents

1. Introduction .................................................................................................................. 1
2. Overview ....................................................................................................................... 2
3. Officer Roles and Head Protection Needed ................................................................. 2
   3.1. Law enforcement officers ..................................................................................... 2
   3.2. Corrections officers ............................................................................................. 4
4. Helmets and Helmet Elements ...................................................................................... 4
   4.1. Helmets .................................................................................................................. 4
   4.2. Protective helmet elements .................................................................................. 5
5. Ergonomic Requirements ............................................................................................... 5
   5.1. Helmet system requirements .............................................................................. 5
   5.2. Shell requirements .............................................................................................. 6
   5.3. Suspension system requirements ....................................................................... 6
   5.4. Face shield requirements ................................................................................... 7
   5.5. Retention system requirements .......................................................................... 7
   5.6. General requirements ......................................................................................... 7
6. Protection Requirements ............................................................................................... 8
   6.1. Protection against liquids .................................................................................... 8
   6.2. Ballistic protection requirements ...................................................................... 8
   6.3. Ballistic face shield protection requirements .................................................. 9
   6.4. Riot helmet and face shield impact protection requirements ....................... 10
   6.5. Explosives protection requirement ................................................................... 10
   6.6. Area of coverage ............................................................................................... 10
   6.7. Flame resistance requirements ........................................................................ 10
7. Environmental Requirements ...................................................................................... 11
   7.1. Helmet and face shield conditioning .................................................................. 11
   7.2. Suspension system (Internal components) ....................................................... 11
   7.3. Chemical resistance ......................................................................................... 11
7.4. Disinfection and cleaning

7.5. Label durability and permanence

8. Testing and Assessment of Requirements

9. Labeling & Documentation Requirements
   9.1. Helmet system labeling
   9.2. Face shield labeling
   9.3. Helmet system documentation

10. User Guidance: Considerations and Limitations
1. Introduction

The InterAgency Board for Equipment Standardization and Interoperability (IAB) is a collaborative panel of emergency preparedness and response practitioners, federal employees, and subject matter experts representing a wide array of technical expertise. The IAB facilitates the exchange of knowledge and ideas to improve national preparedness and promote interoperability and compatibility among local, state, and federal response communities. One of the missions of the IAB is to advocate for and assist with the development and implementation of performance criteria, standards, test protocols, and technical, operating, and training requirements for all-hazards incident response equipment.

In 2013, the IAB identified a need for a new standard to define performance requirements and test methods for protective helmets worn by United States (U.S.) law enforcement and corrections officers, including protection against bullet threats and blunt trauma. Several performance standards and test methods exist for helmets, but most are outdated and do not address current technologies or threats faced by officers. A partial list of existing standards and test methods is provided below:


None of the above listed documents fully meets the needs of U.S. law enforcement and corrections officers, and the National Institute of Justice (NIJ) requested that the IAB determine and report the current needs and requirements of criminal justice practitioners for protective helmets. In late 2013, the IAB convened a group of officers\(^1\) and subject matter experts...
experts to perform this work, and this report will be used as a starting point for development of one or more new standards.

2. Overview

The discussion topics were divided into three categories:

a) Identification of officer roles and the head protection required when functioning in this role.

b) Identification of types of helmets used and the elements of a helmet.

c) Identification of requirements.

• Ergonomic requirements impacting an officer’s ability to perform required tasks.

• Protection requirements ensuring a level of protection against threats of concern.

• Environmental requirements addressing factors encountered in the operating environment that may impact the protection offered by personal protective equipment (PPE).

• Interoperability requirements addressing the interface or interaction between the PPE and other required equipment, such as duty belts, radios, weapons, etc.

• Labeling and documentation requirements related to the information that must be included on the PPE label or in the documentation provided with the PPE.

3. Officer Roles and Head Protection Needed

3.1. Law enforcement officers

Five types of law enforcement officer roles requiring head protection are described below:

• Tactical officer – An officer in this role is responsible for responding to and operating in high-risk situations, such as tactical entry, crisis negotiation, issuing search warrants, pursuing fugitives, executive protection, and task forces. Although an officer in this role may face many threats, including blunt impact, fragmentation, and puncture, the primary concern for this role is ballistic threats.

Patrol officer – An officer in this role is responsible for maintaining order, responding to emergency situations, protecting people and property, and enforcing motor vehicle and criminal laws. This officer is the first on scene responding to domestic violence,
burglaries, robberies, assaults, and other emergencies. Additionally, due to the urgency of active shooter events, there has been a change in operational procedures for many agencies, and patrol officers are now required to respond to an active shooter event prior to the tactical team arriving on scene. Many patrol officers are being issued rifles as well as handguns, and many agencies are issuing ballistic helmets with removable impact-resistant face shields\(^2\) to all officers. For these reasons, the patrol officer may face similar threats as the tactical officer.

Officers patrolling on bicycles, Segways, or other similar personal vehicles perform the patrol officer function; however, the primary concerns for them are falls and collisions\(^3\).

- **Motor patrol (motorcycle) officer** – An officer in this role is responsible for traffic stops, collision investigation, traffic control at events, and serving as backup for patrol officers. The primary head protection concern for a motor patrol officer is crash or collision protection as addressed in current motorcycle helmet standards\(^4\). In addition to providing crash protection, the full-face modular motorcycle helmet provides some protection for motor personnel to immediately deploy on a skirmish line with the face shield in a down position. Many patrol officers are issued both a motorcycle helmet and a ballistic helmet because they are issued rifles and are expected to respond to active shooter events. It would be beneficial to have a single helmet providing both ballistic and crash protection if the cost is not prohibitive.

- **Riot control (major incident response) officer** – An officer in this role is responsible for controlling, dispersing, and/or arresting individuals during a riot or demonstration. An officer performing riot control requires head protection primarily against blunt impact, and the two types of impact threat most likely to be encountered are identified as:
  - Hand-thrown improvised projectiles (e.g., bottles, bricks, and liquids that are flammable, biological, or corrosive).
  - Hand-delivered weapons (e.g., bats, sticks, wooden rods, or metal bars).

\(^2\) The ballistic helmets have removable face shields to allow the officer to sight a weapon without the obstruction of a face shield. Also, a ballistic-resistant face shield may be desirable from a protection standpoint; however, the increased weight could negatively affect the officer’s performance.

\(^3\) A listing of appropriate published helmet standards may be found at www.helmets.org.


United States Criminal Justice Officer Needs and Requirements for Protective Helmets

It is typically necessary for the helmet to have a face shield that also provides protection against blunt impact.

It would be beneficial for a blunt impact-resistant helmet to also have ballistic protection since firearms are likely to be encountered in a riot control situation; however, the cost and effect on officer performance would be a factor for consideration.

- Mounted patrol officer – An officer in this role is responsible for mounted patrol and crowd control. The mounted patrol officer primarily requires head protection against a fall from the horse. When mounted patrol officers are deployed for crowd control purposes, they are typically provided the same protection as the riot control officer.

- Harbor/marine operations officer – An officer in this role is responsible for patrol in a water craft, ensuring water safety, enforcing water traffic laws and preventing crime, and performing search and rescue. The primary protection concern is blunt impact due to a fall from the water craft.

It would be beneficial for a blunt impact-resistant helmet to also have ballistic protection since firearms are likely to be encountered in marine operations; however, the cost and effect on officer performance would be a factor for consideration.

3.2. Corrections officers

Corrections officers perform similar roles as law enforcement officers and require similar head protection, with the exception that the roles of motor and mounted patrol do not exist in the corrections environment.

4. Helmets and Helmet Elements

4.1. Helmets

Four types of helmets currently in use by criminal justice officers are identified below:

(1) Fragmentation helmets obtained from Department of Defense surplus and intended to provide protection against fragments or shrapnel from explosive devices.

(2) Ballistic helmets intended to provide protection against handgun threats (not rifle).

(3) Riot helmets intended to provide protection against blunt impact and liquid splash.

(4) Crash/collision helmets intended to provide protection against head impacts due to crashing a motorcycle or falling from horse.
4.2. Protective helmet elements

Prior to defining requirements for helmets, the practitioners determined that elements or components of a helmet should be identified in order that requirements for each element could be specified as needed. Four elements of a helmet are listed below:

(1) Shell

(2) Suspension system

(3) Face shield

(4) Retention system

5. Ergonomic Requirements

The following ergonomic requirements were identified for the purpose of ensuring that the officer wearing the helmet is able to function effectively and safely. The requirements in this section apply to any helmet worn by criminal justice officers, except crash/collision helmets.

5.1. Helmet system requirements

- The helmet system must allow adequate sensory awareness for the operator, including unobstructed field of view and unhindered hearing capability. Note: It is not required that the face shield be fully transparent as long as field of view requirements are met.

- The following sizing details for the helmet system must be considered:
  
  o It may beneficial to define sizes of test samples within the standard to ensure that helmets of the sizes made available by a supplier\(^5\) meet performance requirements. Note: A similar helmet requirement is in NIJ Standard-0117.00.

  o A range of sizes from suppliers must be available, such as from small to extra-large. Currently, small helmets do not fit the smallest officers.

  o Related to the above two items, it may be that the sizes are different for the different types of the helmet (i.e., different protections), and that the internal standoff distance may different for each. It may not be necessary to specify standoff distance because performance tests will address whether the standoff distance is enough.

\(^5\) The supplier is the organization responsible for manufacture or certification of the product.
THE INTERAGENCY BOARD | STANDARDS COORDINATION SUBGROUP

United States Criminal Justice Officer Needs and Requirements for Protective Helmets

- The size of face shield must be appropriate to match the size of the helmet. The amount of the face covered is optional, but it is recommended that the face shield cover at least the eye area. The face shield (regardless of size) must be tested to meet other performance requirements.

- The following weight details for the helmet system must be considered:
  - A maximum weight limit is important to the practitioners, but a maximum weight limit has not been quantified.
  - The center of gravity and weight distribution are also factors that must be accounted for.

  *Note: There is currently work ongoing in the U.S. Army medical community to attempt to define the maximum head-borne weight limit.*

- The stability of the helmet system while worn must be addressed, and the helmet must be stable on the head during normal movements, such as running, repelling, and engaging offenders. The helmet must be demonstrated to be stable with any weighted attachments in place.

5.2. Shell requirements

The color and reflectivity of the shell is of concern to the officers using ballistic and riot helmets, and these helmets must be available in subdued, non-reflective colors. *Note: A similar requirement and test method are in NIJ Standard-0116.00.*

5.3. Suspension system requirements

The suspension system must be adjustable to fit the wearer. It is recommended that a functional test be included to simulate typical officer movements, such as achieving a prone position, obtaining a sight picture, and being able to shoot. The suspension system must not negatively impact the officer’s performance. *Note: Similar requirements and test methods are included in NIJ Standard-0116.00.*

  - The helmet must be tested with the suspension system in place.
  - The suspension system must be adjustable and customizable to fit each wearer and must be able to be quickly adjusted by the wearer to accommodate other PPE or items worn on the head. Adjustment could be accomplished via pads, straps, web, or other method, but the adjustment method must be tested.
5.4. Face shield requirements

The face shield must meet the following requirements for an officer to have adequate visibility:

- The face shield must be resistant to distortion, haze, and abrasion; must transmit adequate light; and must have only limited prismatic deviation\(^6\).
- The face shield must be resistant to fogging. It is recommended that military standards for face shields and goggles be reviewed for applicability.
- The face shield must be capable of being removed or flipped up by the wearer using a single hand to allow use of shoulder weapon.

5.5. Retention system requirements

The following retention system factors must be addressed:

- Must allow the helmet to be donned by the user requiring no assistance from another person.
- Must hold the helmet securely on the wearer’s head to prevent movement of the helmet with respect to the wearer.
- Must not release when a minimum amount of force is applied (e.g., must not release when the wearer is running) but must release if a certain amount of force is applied (e.g., an offender pulls the helmet).
- Must be releasable from either side so that either hand can be used to release.
- Must not interfere with sighting or firing a shoulder weapon.
- Must be adjustable.
- Must not negatively impact the officer’s performance.

5.6. General requirements

- The helmet and components should comprise materials that do not cause known skin sensitization or other material hazards to the end user.

\(^6\) NIJ Standard-0117.00, *Bomb Suit Standard for Public Safety*, contains requirements that may be applicable to face shields.
6. Protection Requirements

The requirements in this section apply to any helmet worn by criminal justice officers, except crash/collision helmets. Not every helmet must be able to protect against all hazards listed in this section. It is up to the agency or individual to determine the most appropriate protection for their needs.

6.1. Protection against liquids

Riot helmets and face shields must provide splash protection for the user against the following liquids that may be thrown on the officer: chemicals, acid, chlorine, body fluids, biologicals, and petroleum products. The protective capability of the face shield must not degrade within 20 minutes (worst case) of exposure to give the officer time to get to a safe area.

6.2. Ballistic protection requirements

The requirements in this section apply to any helmet for which the supplier claims ballistic protection. Ballistic protection levels must be consistent with the current NIJ Standard-0101. There must be levels of ballistic protection, such as those described below:

- The lowest level of perforation and blunt trauma protection needed is for handgun rounds. Practitioners believe that the minimum level of protection must be consistent with the highest level of handgun threat specified in the current NIJ Standard-0101.

- The next level of perforation and blunt trauma protection is for rifle rounds. Practitioners believe that the next level of protection must be consistent with that of lowest level of rifle threat specified in the current NIJ Standard-0101.

It was also noted that the following items must be considered:

- Near-edge shots are of concern (i.e., shots within one inch of the helmet edge).

- Multiple shots are of concern, and it is recommended that any test methods require a multi-shot group (possibly two or three) within a specified diameter pattern that can be randomly moved around during testing to be sure that test cannot be manipulated.
Discontinuities or points of apparent weakness must be tested. For this reason, it is important that a build sheet and diagram of construction be provided for the helmet model.

Delamination of the shell lining upon impact must not occur because this can cause secondary injury.

Headforms or test fixtures must be specified in test methods.

In review of the *Department of Defense Advanced Combat Helmet Technical Assessment* ³, consideration should also be given to incorporate a sensor for evaluating when a wearer has been subjected to a force strong enough to cause brain injury.

Helmets must be tested against ballistic threats with the suspension system in place. Any attachments and attachment points of ballistic helmets must be tested:

- External mounting of the face shield must not impact ballistic protection (e.g., ballistic bolts).
- Inner/outer mounted parts must not become secondary projectiles.
- Factory-installed mounting points or attachments for additional equipment must not impact ballistic performance.

### 6.3. Ballistic face shield protection requirements

It would be beneficial if the face shield provided ballistic threat protection; however, this should be an option since weight may be increased significantly. If ballistic protection is provided by the face shield, the following specifications are recommended:

- Minimum level should be lower than NIJ type IIA but exact requirement is not yet specified.
- Next level must be the same as minimum level for the helmet.
- Highest level should be the same as the highest helmet level.

*Note: Face shields are not typically worn during tactical entry or shooting situations; face shields are worn during riots.*

6.4. Riot helmet and face shield impact protection requirements

The anticipated threats during a riot or crowd control event may include frozen water bottles, broken curb pieces, broken wall chunks, broken sign poles, batteries (e.g., C, D, 9 Volt), rocks, bricks, metal spikes, and objects (like spark plugs) launched with a surgical tubing sling shot. The following must be considered:

- Distance to threat: Officers try to keep distance between themselves and rioters, but the distance could be as close as one to three feet.
- Low velocity impact.
- Blunt trauma.

Face shields must be resistant to cracking, crazing, shattering, or other damage from anticipated threats (per ANSI specification Z87).

6.5. Explosives protection requirement

If a helmet is claimed by the supplier to provide explosives protection, the protection against both fragmentation and pressure from explosive devices must be addressed. A helmet may protect against fragments but may not protect against blast overpressure. The concern is that pressure is captured inside helmet and intensified. Further research is needed into the effects of wearing a helmet, blast overpressures, and resulting traumatic brain injuries.

6.6. Area of coverage

The minimum coverage area or specific areas covered by the helmet should be considered; however, this may be an agency decision and not part of the standard. 

Note: If area of coverage is specified, it will be necessary to identify a way to assess it, such as by providing drawings showing areas to be covered.

6.7. Flame resistance requirements

Helmets and helmet elements must be flame resistant (not fire-proof) and must not melt or drip when exposed to flames. The intent of this requirement is to allow the officer to self-evacuate without burn injury caused by the helmet if fire is encountered. Consideration should be given to the amount of time needed for self-evacuation.

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8 Refer to NIJ Standard-0117.00 for requirements and test methods that may be applicable.
7. **Environmental Requirements**

The requirements in this section apply to any helmet worn by criminal justice officers, except crash/collision helmets.

7.1. Helmet and face shield conditioning

1) The helmet and face shield must withstand heat and cold since helmets are typically carried in a vehicle trunk. The helmets must be subjected to hot and cold with testing performed in each condition. Humidity must be included in the conditions.

2) The helmet and face shield must be exposed to salt water spray or salt water immersion prior to testing.

3) The helmet and face shield must be exposed to temperature cycling prior to testing to simulate degradation over time.

4) The helmet and face shield must be exposed to solar radiation prior to testing.

5) The helmet and face shield must demonstrate resistance to dropping by the user, and this may be accomplished by conditioning prior to testing. It may be a good idea to perform 'drop' conditioning prior to salt water spray/immersion of item 2.

6) Consideration should be given to adding compression, vibration, and low velocity impact requirements and tests.

7.2. Suspension system (Internal components)

- The suspension system (including padding) must be replaceable or removable for easy cleaning.

- Internal padding must not freeze or melt.

7.3. Chemical resistance

Helmet elements must be resistant to sweat, deodorizers, gun solvent, gun lubricant, and pepper spray, and these chemicals must not adversely affect the protection of the helmet. Ballistic helmets do not necessarily have to be ballistically tested after exposure.

7.4. Disinfection and cleaning

The suspension system and retention system must be removable from the helmet for disinfection and cleaning.
7.5. Label durability and permanence

Helmet and face shield labels must be durable and permanent to facilitate tracking over their lifecycles. Adhesive labels are not acceptable.

8. Testing and Assessment of Requirements

The requirements in this section apply to any helmet worn by criminal justice officers, except crash/collision helmets. Any standard for protective helmets must include test methods to address all requirements; this does not mean that a helmet must meet all requirements.

9. Labeling & Documentation Requirements

9.1. Helmet system labeling

The helmet must have a permanently fixed label containing the following information:

- Name and legal address of the supplier.
- Address of manufacturing location (city, state/province, country).
- Date of manufacture (i.e., month and year).
- Model number.
- Level of protection.
- Serial number.
- Size.
- Mark of conformity indicating certification by an accredited certification body.
- Space for noting the identification of wearer (i.e., name, rank, and serial number).
- Warranty period.
- Date of issuance and expiration after first issuance to indicate life span.
- Bar code or other encoded information tag that will link the product to additional information.
9.2. Face shield labeling

If the face shield is detachable from the helmet shell, the face shield must have a label permanently fixed in a location that will not interfere with the wearer’s vision and containing at least the following:

- Identification of supplier (either via logo or name).
- Model number.
- Serial number.
- Bar code or other encoded information tag that will link the product to additional information.

9.3. Helmet system documentation

The supplier shall provide at least the following warnings, information, and instructions as part of the written user information:

- Types of threats that helmets are designed to protect against.
- List of components and required accessories provided with the helmet.
- Availability of replacement parts.
- Pre-use information as follows:
  - Safety considerations.
  - Recommendations and precautions regarding the application of public safety agency markings, labels, adhesives, paints, or other items after purchase.
  - Instructions and precautions regarding installation of attachments or modifications to the helmet shell.
  - Warranty information, including time period and what the warranty covers (e.g., performance, workmanship and materials).
- Importance of proper fit and size because these affect the protection of the helmet.
- Sizing and adjustment procedures.
- Instructions for proper use as intended by the supplier.
• Training recommendations for helmets in situations that may be encountered.

• Care and maintenance, as follows:
  o Cleaning instructions and precautions.
  o Recommended decontamination process.
  o Recommended storage conditions and life expectancy under those conditions. (It may be necessary to consider life expectancy of the helmet and its elements individually).
  o Inspection details.
  o Repair methods, where applicable.
  o Recommendations about replacement of the helmet and/or helmet elements.
  o Retirement and disposal criteria and considerations.

10. User Guidance: Considerations and Limitations

It is recommended that a guidance document directed toward the end users be developed explaining details that are not addressed within standards. For example, interoperability and compatibility of helmets with other mission-specific equipment should be considered by agencies when procuring helmets. Such mission-specific equipment includes the following:

• Respiratory protection.

• Shoulder-mounted weapon.

• Goggles and other eyewear.

• Ballistic vest. The helmet must allow the user to get in a prone position.

• Communications gear.
• Helmet-mounted cameras.
• Night vision (i.e., infrared imaging).
• Binoculars or monoculars.