

**STANDARD METHOD OF IMPACT TEST AND
PERFORMANCE REQUIREMENTS FOR
FOOTBALL FACEGUARDS**

NOCSAE DOC ND087-11M11

Prepared by



**NATIONAL OPERATING COMMITTEE ON
STANDARDS FOR ATHLETIC EQUIPMENT**

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1. Scope

- 1.1. This Standard establishes methods of testing and performance requirements for new football faceguards as supplied by manufacturers.
- 1.2. **All testing and requirements of this standard specification must be in accordance with NOCSAE DOC.001, except where modified herein.**
- 1.3. *This standard does not purport to address all of the safety problems, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

- 2.1. **STANDARD DROP TEST METHOD AND EQUIPMENT USED IN EVALUATING THE PERFORMANCE CHARACTERISTICS OF PROTECTIVE HEADGEAR, NOCSAE DOC.001**

3. Purpose

- 3.1. To test new faceguards and attachment system to determine their fit, deflection, strength, suitability of guard and attachment design and materials, and shock absorbent properties recognition is made that the chinstrap system is part of this system.

4. Requirements

- 4.1. Faceguards must be tested on a helmet that meets the NOCSAE football helmet standard.

5. Performance

- 5.1.1. When an impact attenuation test is conducted in accordance with section 7, the Severity Index (SI) is defined as:

$$SI = \int_0^T A^{2.5} dt \text{ shall not exceed } 1200 \text{ where:}$$

A is the instantaneous resultant acceleration expressed as a multiple of G (acceleration of gravity); dt-time increments in seconds; and the integration is carried out over the essential duration (*T*) of the acceleration pulse.

- 5.1.2. The faceguard shall not contact the face during the 13.89 ft/s drop as determined by carbon paper transfer, electrical contact of any equivalent technique, according to requirements of section 7.
- 5.1.3. The faceguard or any of its component attachment parts shall not fail in terms of cracked welds, broken screws, broken T nuts, strap tears or pull-outs, according to requirements of section 7.
- 5.1.4. The headgear must meet in addition to the above requirements the following;
 - 5.1.4.1. 1200 SI shall not be exceeded on any drop.
 - 5.1.4.2. No structural failure allowed, eg: fracture or cracked weld or broken attachment on any drop this includes chin strap systems.

6. General

6.1. Labeling

Each faceguard shall be reasonably permanent and legibly labeled in a manner such that the following information can be easily read.

1. Name of Manufacturer
2. Month and Year of Manufacture
3. Meets NOCSAE Standard

6.2. The choice of materials shall be such as to combine mechanical strength and durability to impact loading over a temperature range from -20°F (-29°C) to 120°F (49°C). And shall be unlikely to fracture, delaminate or become broken, dislodged or separated in a manner that could result in a sharp object presentation that may induce injury.

6.2.1. Materials in mounting systems shall be compatible with one another and also shall not be a type known to cause skin irritation or disease and shall not undergo significant loss of strength or other physical change as a result of contact with perspiration, blood, oil or grease from wearer' hair, or from exposure to ultra-violet rays.

6.2.2. Finishes – All components shall be well finished and free of sharp edges and other irregularities which would present the potential hazards of scratching and cutting the user or an opposing player. Wire or metallic tubular protectors shall have protective coating.

6.2.3. Attachment System – The method of attaching the faceguard to the helmet shall be such as to prevent the faceguard disengaging while under load and in use and in such a way as to minimize static distortion of attachment straps and helmet.

6.2.4. Welded Wire Faceguards – No wire end terminations shall be on the inner surface of the faceguard within the facial cutout of the shell.

6.2.5. All faceguards – All ends will be terminated with a full radius.

6.3. **Reports**, See Section 14, NOCSAE DOC.001.

7. Test Procedures

Before subjecting a faceguard to the test series, prepare it as follows:

- 7.1. **Helmet Positioning** – Attach a new faceguard to any size 7-¼ helmet that meets the NOCSAE standard for football headgear for which the guard is designed, using attachment equipment and procedures specified by the manufacturer of the faceguard. Prior to each drop, fix the helmet on the standard medium sized headform such that the ear holes are concentric with the model ear index holes and the front rim is located with the HPI supplied by the manufacturer of the helmet or fitted according to the helmet manufacturers fitting instructions. The head model and helmet shall be dry to maximize friction. Secure the helmet with the chinstrap and procedure specified by the manufacturer. Measure and record the distance from nose and chin of the model in the midsagittal plane, and the inside surface of the faceguard (standoff distance). No distance shall be more than 2 ¾ inches (70 mm).

- 7.1.1. **Measurement points and procedure** – The nose and chin points are located on the midsagittal plane on the face of the headform distal from the coronal plane. The nose point is 0.650” below the basic plane on the medium headform; the chin point is located 3.400” below the basic plane on the medium headform. See figure 2 DOC.001. Faceguard standoff measurements will be made parallel to the basic plane to the inside surface of the guard. Should the guard not have a surface on the line projected from the measurement spot toward the faceguard then a surface shall be created using a material that is able to conform to the inside surface of the guard components adjacent to the measurement points in a way that will provide a reference surface at the desired point for the measurement. The thickness of this measurement aid should be as thin as practical and will be accounted for in the measurement so that a very close approximation +/- .025” of the true measure of the stand-off distance is obtained. For headforms with an indicator groove molded in to locate the midsagittal plane, measurements may be made from the immediately adjacent surface so as to avoid the measurement probe from engaging the depth of the groove, or the groove may be filled with a material to prevent the probe from entering. In either case the measurement point on the headform must be flush with the surface of the outward edges of the groove.
- 7.2. **Conditioning** - Immediately prior to the testing sequence, condition the helmet in accordance with the following procedures:
- 7.2.1. Ambient Conditions – Exposed to 72° F, $\pm 5^\circ$ F (22.2° C, $\pm 2.8^\circ$ C), for at least four hours and a maximum of twenty-four (24) hours.
- 7.2.2. High Temperature – Exposed to a temperature of 120°F $\pm 5^\circ$ F (49°C $\pm 2.6^\circ$ C), for at least four hours and a maximum of twenty-four (24) hours.
- 7.2.3. Low Temperature – Exposed to temperature of -20°F $\pm 5^\circ$ F (-29°C $\pm 2.6^\circ$ C), for at least four hours and a maximum of twenty-four (24) hours.
- 7.2.4. If, during testing, the time out of the conditioning environment exceeds five minutes, return the sample to the conditioning environment for a minimum of three minutes for each minute out of the conditioning environment or four hours, whichever is less, prior to resumption of testing.
- 7.3. **Test Conditions**
- 7.3.1. Head Model- physical properties of the NOCSAE headforms are defined in NOCSAE document 001
- 7.3.2. Mechanical Test System- A diagram of the helmet drop test system to be used in these tests is defined in NOCSAE document 001
- 7.4. **Impact Attenuation Tests**
- 7.4.1. Surface – Impact attenuation is measured by determining the head model resultant center of gravity acceleration – time history when the head model – helmet – face guard assembly is dropped in guided free-fall to land with the guard striking a flat, rigid anvil having a diameter of 7 in (180

mm) and padded with a 0.13 in (3.2 mm) thick, 70 Shore “A” durometer, urethane surface¹.

- 7.4.2. Locations, Temperature – Drop tests shall be conducted on a separate model for each of the impact locations, in each of the three temperature conditions, in each of the faceguard sizes offered for sale to fit size 7 ¼ helmets². It is permissible to restore the shape and re-use guards for subsequent tests, after completion of a series at any location. If a guard fails a test after such restoration, the test must be repeated using a new specimen. Two of each guard in each size must pass each test in order for model certification. Time interval between drops in a single location will be 75 ± 15 sec (this is primarily to allow the helmet to restore its shape and provide a consistent format).
- 7.4.3. Faceguards shall be impacted in accordance with Table 1 below and as depicted in Figure 1.
- 7.4.4. Bottom Impact Location- Faceguards that require drop tests on the bottom location must meet the following requirements:
- 7.4.4.1. The helmet with faceguard attached shall be positioned on the headform in accordance with the manufacturer’s fitting instructions. The headform shall be positioned for the Bottom Impact Location, refer to Figure 1 for pin locations.
- 7.4.4.2. A line that is perpendicular to and originates from the top surface of the MEP that is centered on the chin to the lowest point of the chin of the headform must intersect the plane created by the surface of the faceguard. This indicates that the faceguard is intended to offer some protection to the jaw (chin).

Table 1

LOCATION³ – DROP velocities – ft/s (m/s)
(All drop velocities must be within +3% -0%)

	Front	Bottom
72°F ± 5°F (22.2°C ±2.8°C) Drop 1	13.89 (4.23)	13.89 (4.23)
Drop 2	17.94 (5.46)	17.94 (5.46)
120°F ± 5°F (49°C ± 2.6°C) Drop 1	17.94 (5.46)	
-20° ± 5°F (-29°C ± 2.6°C) Drop 1	17.94 (5.46)	

¹ The NOCSAE football drop test anvil with the Standard helmet pad replaced by the faceguard pad, will serve as the impact surface. Elevation by pedestal is necessary to provide clearance for the head model position adjuster for other than front drops.

² Large size faceguards shall be tested on helmets, which encompass the 7 3/8 – 7 7/8 size range, shimmed or pressurized in the rear or side to fit the medium head model.

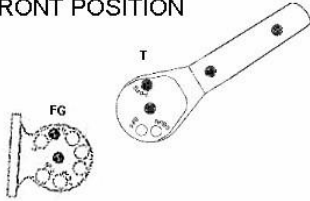
³ See Figure 1 for picture guides to positions.

8. Recertification Procedure For Metal Faceguards

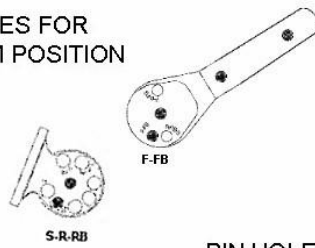
- 8.1. Only those guards which have been previously certified by a manufacturer to have met the NOCSAE Standard may be recertified.
- 8.2. In the reconditioning process, all faceguards must be removed from the helmet for inspection.
 - 8.2.1. Deformed guards must be discarded. Any bar bent more than 1/8 inch (3.2 mm) from its normal shape at any point constitutes deformation.
 - 8.2.2. Each guard is inspected for weld separation, or other crack, by an appropriate non-destructive test. Any guard found with either type failure shall be discarded.
- 8.3. For guards to be re-coated the following specifications must be met:
 - 8.3.1. The method employed to remove old coating/residue must not compromise the integrity of the guard.
 - 8.3.2. A permanent seal of recertification identifying the re-certifier together with the appropriate warning label must be affixed in the same location as the original seals.
 - 8.3.3. The guard is to be re-attached to a helmet, in the same manner as the original faceguard manufacturer's instructions.
 - 8.3.4. A statistically relevant sample⁴ of remanufactured faceguards must be tested according to NOCSAE Standard certification procedure for football faceguards, to provide assurance that all guards that have undergone the recertification process meet the Standard. This will be limited to ambient temperature drops. One impact at 13.89 ft/s on the front to verify no facial contact and one impact from 17.94 ft/s, in the front location to verify no SI over 1200 and no mechanical failure as outlined above.
 - 8.3.5. If a faceguard contacts the face during the 13.89 ft/s drop, determine if the attachment hardware and attachment locations on the helmet are according to section 7.3.3. If not, correct and repeat the test on a fresh guard. If the guard still contacts the face, do not re-certify any guards of that model until the problem is understood and corrected. The stipulation $SI \leq 1200$, must be met in each test, guard models that fail to limit SI to less than 1200 must not be recertified.

⁴ Samples in a sufficient amount in any model, as to insure compliance of all faceguards being reconditioned. Guidance as to how many to test is provided in NOCSAE Doc 001.

PIN HOLES FOR
FRONT POSITION

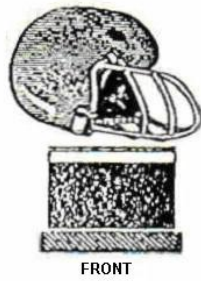


PIN HOLES FOR
BOTTOM POSITION



PIN HOLES FOR
BOTTOM POSITION

POSITION
PEDESTAL TO
CENTER CHIN ON MEP



ROTARY COLLAR IN FRONT POSITION



Figure 1

JULY, 2009 MODIFICATIONS/REVISIONS

- **REVISION-** Specified that chinstrap and associated hardware are subject to the requirements in section 5
- **REVISION-** Changed section 7 to clarify faceguard to face measurement procedure.
- Modified sections 8.3.4 and 8.3.5 to clarify SI requirements

DECEMBER, 2009 MODIFICATIONS/REVISIONS

- Modified conditioning environments to conform with NOCSAE DOC 001 requirements

MAY, 2010 MODIFICATIONS/REVISIONS

- **REVISION-** Changed bottom impact location. Modified figure 1 to specify pinhole locations. Changed requirements for bottom impact location. Deleted faceguard types.

FEBRUARY, 2011 MODIFICATIONS/REVISIONS

- **REVISION-** Change drop heights to drop velocities. Corrected typos