FOOTBALL HELMET STANDARDS OVERVIEW

NOCSAE, the National Operating Committee on Standards for Athletic Equipment, is an independent and nonprofit standard-setting body with the sole mission to enhance athletic safety through scientific research and the creation of feasible performance standards for protective equipment. Formed in 1969, NOCSAE is a leading force in the effort to improve athletic equipment and provide informational resources to the public, with the goal of improving athlete safety. NOCSAE efforts include the development of performance and test standards for football helmets, gloves and facemasks, baseball and softball batter's and catcher's helmets, baseballs and softballs, ice hockey helmets, soccer shin guards, lacrosse helmets and facemasks, and polo helmets.

Third-Party Helmet Certification

"Meets NOCSAE Standard"

In January 2015, NOCSAE began requiring third-party certification for athletic equipment to meet NOCSAE standards, in accordance with ANSI/ISO international guidelines. Under this requirement, manufacturers will contract with an independent and properly accredited body to audit quality assurance and quality control programs, review internal sample testing certification data, and perform independent certification testing on randomly selected samples. If all of the requirements provided in NOCSAE standards are met, this accredited body will issue a letter of certification for each specific model involved in the process. Over the course of 2015, the transition to third-party certification was staggered based on production seasons for equipment by sport. As of January 31, 2016, all third-party certification for athletic equipment will be implemented.

Pneumatic Ram Impactor

Proposed Additional Test

In 2004 NOCSAE drafted a proposed revision to its helmet-testing standard that would allow helmets to be hit in additional directions and with different speeds, which NOCSAE believes will be necessary if scientists are able to identify a concussion-specific addition to the NOCSAE standard. This proposed standard has been revised and development continues in 2016. This linear impactor is an air-powered ram that was built from plans developed by the NFL and given to NOCSAE in a cooperative effort. It has undergone significant validation and performance testing over the last few years across six different laboratories.

Certification of compliance with the NOCSAE standard will be done by the Safety Equipment Institute (SEI), an independent ANSI/ISO 17065 accredited certifying body. SEI will conduct the NOCSAE standards certification process through several accredited, independent laboratories that will be responsible for testing to determine if products meet NOCSAE standards. SEI also will conduct regular product testing and quality assurance audits of each manufacturer to assure continued compliance.

Manufacturers seeking to certify their products to the NOCSAE standard will submit necessary testing fees, product testing samples, product labels, quality program manuals and other required materials to SEI. Manufacturers also will participate in an on-site quality audit and review of quality systems programs relevant to the product being certified.

Setting the Standard

NOCSAE helmet performance standards are based on accepted and recognized scientific data. By bringing together physicians, academic researchers, coaches, certified trainers, manufacturers and leading scientific experts, NOCSAE establishes standards that assess football helmet performance across all levels of impact.

Helmets either pass or fail the standard based on their ability to reduce impact forces to the head as measured by a Severity Index (SI) value. Because of the very high level of quality assurance required to pass the test, helmets must score substantially less than 1200 SI for all impacts. NOCSAE standards are performance-based and are design neutral so manufacturers are not restricted in design or engineering, which in turn provides freedom for innovation in design.

NOCSAE's Football Helmet Standard Applies To Youth and Adult Players

NOCSAE's football helmet standard applies to helmets of all sizes, worn by players of all sizes from youth to adult. The NOCSAE standards utilize variable-mass biofidelic headforms to account for the different size players. Helmet sizes likely to be worn by players at the youth level are tested on the smallest headform which represents a 10-year-old male in the 50th percentile of head mass and shape. As helmet sizes get larger, headforms with more mass are used in the testing protocol. The largest headform represents the 95th percentile adult male for head mass and shape.

How Football Helmets Are Tested

The NOCSAE helmet testing standards utilize a twin-wire drop impactor that relies on gravity to accelerate the headform and helmet combination to the required impact speeds. The headform is a biofidelic and variable-mass headform scientifically instrumented with triaxial accelerometers at the center of gravity to measure headform accelerations in three different directions.

The test involves mounting a football helmet on an appropriately sized and mass-specific headform. The headform and helmet combination is then dropped at specific speeds onto a steel anvil covered with a ½ inch hard rubber pad. Each helmet being tested is impacted a total of 29 times, including 16 impacts at 12.2 mph on six different locations and one random location, as well as four impacts on two different locations at high temperature. Additionally, there are two impacts at 10.9 mph and two at 9.5 mph. For these 20 impacts, each impact measurement must be below 1200 SI. Finally, each helmet is impacted at 7.7 mph on seven different locations. For each of these lowest speed impacts, the tested helmets must score less than 300 SI.

Recertification of Reconditioned Helmets

Shortly after the first NOCSAE football helmet standard was published, American Reconditioning decided to test helmets they were reconditioned. This testing showed that 84 percent of all helmets currently in use at that time and made before 1973 could not pass the NOCSAE test. As a result, NOCSAE established a standard to permit the recertification of football helmets to the original standard applicable when the helmets were new. There are currently 22 reconditioners nationally that are licensed by NOCSAE to recertify football helmets.

Recertification Requirements under the NOCSAE Standard

The NOCSAE recertification standards and recertification license agreement require the following:

The Facility: The testing laboratory at each reconditioning facility must be in a separate room apart from the general reconditioning work. The room must be temperature controlled at a specified range. Compliance also requires a written quality control protocol that includes issues such as sample selection protocol and documentation of responses to any failures.

The Sample: Helmets selected for testing must be a statistically significant sample of the helmets that particular facility will be recertifying. The helmets selected for testing must be tested prior to any reconditioning or repair

work being done. The helmets selected are tested before any reconditioning is performed, which means they are tested in the condition they were in as of the last play of the last game of the last season. Once the helmet is selected, it is tagged, tested and followed through the entire recertification process. That exact helmet is then tested again after it has finished the reconditioning process. No helmets that are represented by those samples may be recertified or returned to a school or club until all the samples have passed the post-reconditioning testing.

The Test: Reconditioners use the same drop-testing equipment for recertification as is required for newly manufactured helmets. The entire testing process and protocol is controlled by NOCSAE computer software specifically developed to ensure that the recertification testing data is done correctly and the testing data is valid and reliable. The software:

- Requires successful equipment calibration and recalibration both before and after helmets are tested; if the post-test calibration and validation fails, helmet tests cannot be used for recertification, and they must be redone after calibration issues are corrected.
- Dumps all invalid test data generated as a result of a noncalibrated or invalid test into a special file for review by the NOCSAE technical advisor.
- Collects all valid and verified testing data – including date; time of day; temperature; SI results; helmet make and model, age and size; and the last year reconditioned – and stores it in a separate encrypted file, accessible only by specific personnel in the laboratory of the NOCSAE technical advisor.

Reconditioning: Once the pre-reconditioning test is complete, the helmet begins the reconditioning process. Reconditioning includes the complete disassembly of all helmet parts, cleaning, sanitizing, replacement of worn parts and shell inspection. Helmets also may be repainted and have the faceguard, jaw pad and chin strap replaced. Once the helmet has finished the reconditioning process, the shell may be the only original part of the helmet that remains. In a helmet older than five years that has been regularly reconditioned, the only part of the helmet that is *actually* five years old is probably the shell. Helmet shells cannot be replaced as part of the reconditioning process.

Recertification: When the sample helmets have passed the recertification tests, a recertification label is placed on the inside of the helmet with the current year's recertification date and a statement that the helmet has been recertified to the NOCSAE standard. In addition, a permanent label containing the recertification logo may be placed on the outside of the helmet indicating the year of recertification.

Round Robin: Reconditioners also must submit their testing systems to a round-robin calibration program to validate that each reconditioning and recertification laboratory test rig is properly tuned and assembled. The data from round-robin calibration tests is submitted to the NOCSAE technical director in an encrypted file, where the data is examined for consistency and internal validation.

Additional Requirements: Licensed reconditioners are required to maintain a database of information detailing how helmets have been maintained, as well as provide testing data results to NOCSAE when requested. NOCSAE analyzes this data and maintains a database of all recertification tests performed from all reconditioners licensed to recertify helmets.

RFID Technology: NOCSAE has funded the development of a helmet identification system using a passive RFID label technology. This program uniquely identifies each individual helmet and provides an easy method for

inventory, reconditioning, recertification testing, consumer access to model and helmet age information, and the status of the original new helmet certification. This program is ready to start the third year of beta evaluation, and so far the results have been very favorable.

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