

2020 STANDARD FOR PROTECTIVE HEADGEAR

For Use in Kart Racing

This K2020 standard refers to requirements set forth in in the Snell 2020 Special Applications Standard for Protective Headgear for Use in Competitive Automotive Sports (SA2020) and to the Snell 2020 Standard for Protective Headgear for Use with Motorcycles and other Motorized Vehicles (M2020). SA2020 and M2020 are available from the Snell Foundation.

Special Note to Helmet Users

There are four reasons for you to be interested in this Standard:

1. Kart racing imposes risks of death or permanent impairment due to head injury.
2. The proper use of protective helmets can minimize the risk of death or permanent impairment.
3. The protective capacity of a helmet is difficult to estimate, particularly at the time of purchase or use. Protective capability is currently measured by destructive testing which is beyond the means of most helmet wearers.
4. Snell certification backed by ongoing destructive testing samples taken randomly from dealers and distributors identifies those helmet models providing and maintaining the highest levels of head protection.

Four of the most critical elements affecting a helmet's protective properties are:

1. Impact management - how well the helmet protects against collisions with large objects.
2. Helmet positional stability - whether the helmet will be in place, on the head, when it's needed.

3. Retention system strength - whether the chin straps are sufficiently strong to hold the helmet throughout a head impact.
4. Extent of Protection - the area of the head protected by the helmet.

This Standard describes simple tests for all four of these items. However, the tests for the second item, helmet stability, of necessity presume that the helmet is well matched to the wearer's head and that it has been carefully adjusted to obtain the best fit possible. Unless you take similar care in the selection and fitting of your own helmet, you may not obtain the level of protection that current headgear can provide.

The Foundation recommends the simple, straightforward procedure recommended to consumers by most helmet manufacturers:

Position the helmet on your head so that it sits low on your forehead; if you can't see the edge of the brim at the extreme upper range of your vision, the helmet is probably out of place. Adjust the retention system so that when in use, it will hold the helmet firmly in place. This positioning and adjusting should be repeated to obtain the very best result possible. The procedure initially may be time consuming. Take the time.

Try to remove the helmet without undoing the retention system closures. If the helmet comes off or shifts over your eyes, readjust and try again. If no adjustment seems to work, this helmet is not for you; try another.

This procedure is also the basis of the test for helmet stability described in this Standard. This test performs the same steps but uses standard head forms. However, you must still perform this procedure for yourself when buying a helmet and every time you wear a helmet. Only in this way will you be able to make all the proper

adjustments to get the best fit possible. Furthermore, your test on your own head will be an improvement on ours; you will determine whether the helmet is appropriate for you personally.

There are several other important aspects of helmets to consider. Full face helmets provide a measure of protection from facial injuries. These helmets incorporate a rigid "chin" guard which covers the lower part of the face. The Foundation has devised special tests for the chin bars of full face helmets.

There are two varieties of full face helmets. The chin guard may be an integral, immovable part of the helmet but, in so-called "modular" or "flip-up" helmets the chin guard may be hinged so that, when released, it will pivot or flip up and out of the way for the rider's convenience. Modular helmets must meet all the same requirements as those equipped with integral chin bars with the additional requirement that the chin guard release mechanism must be sufficiently secure to prevent inadvertent opening in a crash impact.

Some helmets come with a separate structure which bolts to the helmet and which is intended to cover the lower part of the face. These removable chin bars are often intended to deflect small stones and debris encountered in some motor sports and may not be effective facial protection in falls and accidents. The Foundation does not test bolt-on chin bars and considers any headgear equipped with them to be an open face helmet.

If a full face helmet is equipped with a face shield, it may also provide a measure of eye protection. The Foundation tests the face shields of full face helmets for particle penetration resistance. Face shields provided with open face helmets

generally do not provide the same levels of eye protection and, for that reason are not considered.

The shells of both open and full face helmets should also provide a measure of protection from penetration. The Foundation tests the shells of both full and open face helmets for penetration resistance.

Effective headgear must be removable. Paramedics and other emergency personnel must be able to quickly remove headgear from accident victims in order to check for vital signs and to perform emergency procedures. The Foundation has devised tests and criteria for helmet removability.

The Foundation tests helmets for visual field. The helmet must provide a minimum range of vision as measured on standard head forms. However, the range of vision you obtain may vary considerably from our measurement.

It is also important to remember that the visual field requirements are based on the needs of people participating in well regulated and controlled events. For this reason, the requirements are considerably less than those the Foundation requires for street use headgear such as for motorcycle helmets. Be absolutely certain that the helmet and face shield permit you adequate vision for every intended use. Specifically, if your kart racing helmet is only sufficient for controlled track events, don't use it for street motorcycling.

There are several important factors which the Foundation does not consider directly but which bear on the effectiveness of protective helmets. Be certain your helmet is wearable, that is, that it's comfortable and adequately ventilated when worn

for prolonged periods. Few people will wear an uncomfortable helmet. A helmet that is not worn won't protect anyone

FOREWORD

In a karting accident, the driver may suffer injury or death. Helmets on the market today offer varying degrees of protection, but the consumer has little basis for judging the relative effectiveness of a given model. This Standard presents rational methods for identifying those helmet models which definitely meet specified standards for impact (crash) protection and retention system strength and, afterwards, identifying those which definitely have ceased to meet those standards.

The Snell Foundation urges that protective helmets be required for all individuals participating in supervised racing events and encourages the general public to wear helmets which meet appropriate performance standards¹.

This 2020 Standard establishes performance characteristics suitable for kart racing. **This Standard does not establish construction and material specifications. The Foundation does not recommend specific materials or designs.** Manufacturers voluntarily submit helmets to be tested to this Standard and if the submitted helmets pass, a certification is issued.

The Foundation will make available the identity of those products which have been Snell certified but will not attempt to rank those products according to performance nor to any other criteria. Neither does the Foundation distinguish

¹The Foundation has also published Standards for headgear used in bicycling, non-motorized sports, automobile racing, karting, competitive skiing, skiing and snowboarding and equestrian activities. Copies of these Standards are available upon request.

between the needs of participants in competitive events and those of the general public.

All of the requirements described herein, including both initial certification and random sample testing, are an integral part of this Standard. No helmet can satisfy the Standard unless it is subject to both certification and random sample testing by the Foundation.

Snell certification for protective headgear requires a specific contractual agreement between the primary headgear manufacturer and the Foundation. Certification procedures may be obtained upon application to the Foundation.

SNELL FOUNDATION is a registered certification mark and K2020 is a certification mark of the Snell Foundation.

INTRODUCTION

This Standard addresses the problem of protecting the head from direct impact with surfaces or objects that might be encountered in a karting accident. The Standard prescribes direct measures of several factors bearing on a helmet's ability to protect the head as well as its general serviceability as karting headgear. Thus, this Standard is directed towards the kinds of performance bearing on head protection that may not readily be discernable by even knowledgeable consumers at the time of purchase.

Some of these performance requirements have been expressed in terms of limitations on the various components and features of the single general helmet configuration currently available. These expressions have been used only for the sake of clarity and should not be misinterpreted as requiring specific configurations or

materials. As newer helmet technologies appear, these limitations will be re-examined and, perhaps, restated.

A karting helmet consists generally of a rigid head covering and a retention system composed of flexible straps and hardware. The rigid covering consists of a strong, stiff outer shell and a crushable liner. The stiff outer shell protects by its capacity to spread a concentrated load at its outer surface over a larger area of the liner and the wearer's head. The crushable liner protects the head from direct impact by its capacity to manage impact energy. Since there is no certain way to anticipate the severity of a head impact or whether the impact surface will be such that it will spread the load over the helmet or concentrate it at a single point, the most generally effective helmet will combine the strongest, stiffest possible outer shell with a liner chosen to limit the peak deceleration of the wearer's head to within tolerable limits.

The retention system holds the headgear in position throughout normal usage and especially during falls and accidents, ensuring that the helmet will be in place to manage a direct impact. This Standard applies two different tests to the retention system. The first of these tests for stability by fitting the headgear to a standard head form and then attempting to displace it by applying tangential shock loadings. The second tests retention system strength by applying a shock load to the system components through a simulated chin.

The quality of the fit and the care taken with the adjustments are absolutely critical elements in these tests. **The manufacturer must provide suitable guidance so that the wearer will be able to select and adjust headgear to obtain the necessary quality of fit and positional stability.**

The capacity for impact protection is determined by direct measurement of the shock delivered through the helmet to a head form when the helmeted head form is dropped in a specified manner onto any of four unyielding anvils.

Most kart helmets are intended to accommodate a range of head sizes and shapes. Various thicknesses of resilient padding are sometimes placed within otherwise identical helmets during production or during fitting to configure the helmet to several different ranges of head size. This resilient padding does not significantly affect the way the helmet absorbs and attenuates impact and is not directly addressed in this Standard.

The helmet must also resist penetration by sharp edged and pointed projections and projectiles. This capacity is tested by placing the helmet on a head form and dropping a metal cone of specified mass and geometry onto the shell. The tip of this cone must not penetrate to the head form.

Similarly, the helmets must resist chemical attack by bodily fluids as well as solvents and chemicals associated with motorsports. This capacity may be tested by applying a solvent mix before further conditioning and testing.

Full face helmets including “modular” or “flip-up” helmets provide a measure of facial protection in addition to the impact protection generally sought. The principle feature of these is a chin bar that extends forward to cover the jaw area converting the facial opening into a visual port. Frequently, a face shield is also provided so that the wearer's face is completely covered.

In traditional full face helmets, the chin bar is an integral, immovable part of the helmet structure. In “modular” or “flip-up” full face configurations, the chin bar may be

released to pivot about a hinge up and away from the face enabling wearers to adjust eyeglasses, eat, drink or converse when not actually driving. Although other helmets may be configured to allow the use of “bolt-on” chin bar elements, these helmets are not considered to be full face and are treated instead as open face configurations.

For full face helmets, this Standard tests the rigidity of the chin bar by dropping a weight onto it at a specified velocity so as to attempt to force the chin bar toward the interior of the helmet. The chin bar must not deflect more than a specified amount.

If a face shield is provided with a full face helmet, then this face shield must resist penetration by small particles. A sharp lead pellet of a specified weight is directed into the face shield at a specified velocity. The pellet must not penetrate into the helmet interior.

This Standard also includes a test intended to determine whether the headgear may be removed from an unconscious accident victim quickly, easily and reliably in spite of any damage the headgear might reasonably be expected to sustain. Traditional helmet architectures have satisfied this requirement so readily that many Standards including previous Snell Foundation Standards have not mentioned it. Even so, it is unthinkable that a headgear might protect its wearer in an accident only to thwart attempts at rescue afterward.

Inadequate ventilation may render a helmet unwearable in hot climates, especially if the helmet is full faced. But this Standard makes no direct demands on either the quantity or quality of air flow to the wearer.

Other general features of motorcycle helmets may include eyeshades and accommodations for goggles, and visibility enhancements such as bright colors and

reflective surfaces. These features all deal with matters of safety and comfort that are not directly addressed in this Standard but which merit the consideration of wearers as well as manufacturers.

Although helmet use has been shown to reduce the risk of head injuries significantly, there are limits to a helmet's protective capability. No helmet can protect the wearer against all foreseeable accidents. Therefore injury may occur in accidents which exceed the protective capability of any helmet including even those helmets meeting the requirements of this Standard.

A helmet's protective capability may be exhausted protecting the wearer in an accident. Helmets are constructed so that the energy of a blow is managed by the helmet, causing its partial destruction. The damage may not be readily apparent and the Foundation strongly recommends that a helmet involved in an accident be returned to the manufacturer for complete inspection. If it is not possible to do so, the helmet should always be destroyed and replaced.

Finally, the protective capability may diminish over time. Some helmets are made of materials which deteriorate with age and therefore have a limited life span. At the present time, the Foundation recommends that motorcycle helmets be replaced after five (5) years, or less if the manufacturer so recommends.

CONSTRUCTION

A. General

The assembled helmet shall have smooth external and internal surfaces. Any feature projecting more than 7 mm beyond the outer surface must readily break away; all other projections on the outer surface shall be smoothly faired and offer minimal frictional resistance to tangential impact forces. Rivets and similar projections into the helmet interior must offer no laceration or puncture hazard. Restraint clips may be used at the rear or on the side of the helmet. The helmet shall provide as nearly uniform impact protection over the entire protected area as is possible.

If the absence of any detachable component of the helmet does not prevent its being worn, then this absence must not compromise either the retention system or the impact protection. If any part of the helmet detaches during testing, it must offer no laceration or puncture hazard nor reduce the coverage of the head.

If the manufacturer provides add-ons such as visors, face shields and neck curtains with the helmet, these add-ons must not lessen the protective capability of the basic helmet nor reduce the visual field below standard requirements nor create a direct hazard for the wearer.

B. Shell

If rivets are used, the heads shall not have sharp edges and shall not project more than 2 mm from the outer surface of the helmet.

C. Materials

Ideally, materials used in the manufacture of the helmet should be of durable quality and not be harmed by exposure to sun, rain, dust, vibration, sweat or products

applied to the skin or hair. Similarly, the materials should not degrade due to temperature extremes likely to be encountered in routine storage or transportation.

Materials which are known to cause skin irritation or are conducive to disease shall not be used for the parts which contact the skin. Materials which support the growth of fungi or algae shall not be used. Fabric lining or padding materials, if used, may be detachable for the purpose of washing so long as their absence does not degrade the protective capabilities of the helmet.

D. Finish

All edges of the helmet shall be smoothed and rounded with no metallic parts or other rigid projections on the inside of the shell that might injure the wearer's head in the event of impact.

E. Retention System

The retention system shall be designed so as to discourage misuse. That is, of all the ways in which the retention system might be used, the design use shall be the simplest and quickest to implement. Helmets shall not be fitted with "non-essential" features which, if misused, can degrade the performance. Quick release buckles, if used, shall not be able to be released inadvertently.

Fabric chinstraps, if used, shall not be secured to the shell by a bolt, pin or rivet passing through the fabric itself. Although other alternatives may be proposed, the preferred method of attachment is that the strap be looped through and sewn about a metal hanger which can then be secured to the shell by bolt, rivet or other appropriate means.

F. Peripheral Vision

The helmet shall provide peripheral visual clearance as measured using a reference head form appropriate to the size of the helmet. This peripheral vision includes a horizontal clearance of at least 180°, an upward clearance of at least 5° and a downward clearance of at least 20°. However, this downward clearance makes specific allowance for breath deflectors. These clearances are described in terms of planes fixed in the reference head forms.

Some competitive applications may require helmets with more restricted visual fields. When justified, special addenda to this Standard will define reduced visual fields, the procedures for determining whether a helmet satisfies the requirement and the additional labeling requirements warning that the headgear may be appropriate only for certain uses.

G. Sizing

The requirements of this standard are such that most helmets will perform optimally only when tested within a range of head circumferences. Outside this range, helmets may still provide a measure of protection but they may not meet requirements for certification. The manufacturer must specify this entire range when helmets are submitted for certification. Later, when helmets are distributed for sale, every helmet shall include a permanent label indicating the range of head circumferences for which it is intended.

QUALIFICATIONS FOR CERTIFICATION

For qualification testing, helmets shall be in the same condition as those offered for sale. No helmet or component which has been subjected to any tests

described in this Standard shall be offered for sale after testing. At least five (5) and as many as nine (9) complete, helmets must be submitted by the manufacturer for a certification test program for each distinct structural configuration of the models offered for sale.

The quantity depends on the sizing and on the testing regimen selected by the manufacturer. Five samples are required for helmets submitted to testing according to the M2020 regimen and which are appropriate for testing on only one of the six standard head forms called out in Snell 2020 standards. Two additional samples are necessary if the helmets are appropriate for testing on more than one of these head forms.

All but one of these samples will be destroyed in testing; the untested sample shall be retained for comparison and reference. If different fit pad configurations are planned in order to accommodate this head gear for different size ranges, the samples ought to be configured for the largest size range excepting only the two additional samples, if necessary, which ought to be configured for the smallest size range. Additional samples representing different fit pad configurations may also be provided at the discretion of the submitter.

MODIFICATIONS

Cosmetic changes to certified headgear are permissible. Such changes are generally limited to marking or trimming the headgear with manufacturer approved paint or tape. Otherwise, modifications to certified headgear effectively create new configurations which shall not have the confidence and certification of the Foundation

until properly evaluated. Manufacturers must not place the Foundation's certification label in any modified headgear without the Foundation's written authorization.

The Foundation recommends that helmet owners not modify or contract with someone else to modify their helmets. Any structural modification may adversely affect a helmet's protective capability. The Foundation's certification and, quite likely, all manufacturer warranties apply to the headgear only in its as manufactured condition.

RANDOM SAMPLE TESTING

In addition to the certification testing, the Foundation will routinely obtain and test samples of previously certified models. These samples will be selected from among those stocks intended for retail sale to consumers. In this manner, the Foundation will attempt to ensure that the helmets made available to the public continue to meet the performance requirements of this Standard.

For those cases in which helmets are provided directly to users and do not pass through a normal sales distribution system, the Foundation will set up alternative procedures to monitor certified products. Specifically, if helmets are provided directly to teams or individuals for use in events, the Foundation must have access to the helmets for spot checking and non-destructive evaluation.

LABELING AND MARKING

Each helmet shall have durable, visible and legible labeling identifying the manufacturer, the month and year of manufacture, the model and the size. Labeling shall be uncoded and either in English or a language common to the area where the

helmets are to be distributed. The headgear shall also be labeled to the following effect:

1. The Certification ID#: This number consists of two alpha characters, four numerics, a hyphen and two more numerics indicating the year in which the certification was awarded. This certification id# is marked on the test reports, cover letter and the certificate awarded to the helmet maker shortly after the helmet met requirements, it identifies the tests and the archive samples on which the certification is based.
2. No helmet can protect the wearer against all foreseeable impacts. However, for maximum protection, the helmet must be of good fit and the retention system must be securely fastened to retain the helmet. The helmet, when fitted and fastened, shall not be removed easily.
3. This helmet is so constructed that the energy of an impact may be absorbed through its partial destruction, though damage may not be visible. If it suffers an impact, it must either be returned to the manufacturer for inspection or be destroyed and replaced.
4. Intended for head circumferences from XX cm through YY cm.

If any of the helmet components are sensitive to common solvents, adhesives, paints or cleansers; the helmet must also bear labels to the following effect:

This helmet can be seriously damaged by some common substances without visible damage. Apply only the following: (Recommended cleaning agents, paints, adhesives and the like) as appropriate.

If the helmet model was certified according to a special addendum to this standard, each helmet shall also include the warning labels required by that addendum.

The Certification ID# label requirement is intended to minimize confusion during standards enforcement. It may be waived at the discretion of the Foundation if the manufacturer can demonstrate that existing brand and model labels will reasonably identify the unit sufficiently. Any such waiver must be obtained in writing.

Each helmet shall also include one of the Foundation's serialized certification labels. The Snell certification label shall be placed either inside or on the outside of the helmet, as appropriate, in such a way that it cannot be removed intact.

The registered trademark (certification label) of the Snell Foundation may be used by the manufacturer only under license from the Snell Foundation. The specifics of licensure may be obtained from the Foundation.

Testing Regimens

Most helmets submitted for K2020 certification will be structures already certified to SA2020. If the only modifications are slight and involve only the FHR or flame resistance performance, the Foundation may accept the SA2020 results obtained for the original submission to determine eligibility for K2020 certification. Helmets certified to M2020 are deemed eligible for K2020 certification. New models intended for K2020 certification may be tested to either of the following test regimens at the manufacturer's option.

SA2020 Test Regimen

Please refer to the Snell 2020 Special Applications Standard for Protective Headgear for Use in Competitive Automotive Sports. Requires at least seven complete samples and as many as nine. Requirements include:

1. Marking and Labeling of Critical Components
2. The following items from the sections on Testing:
 - a. A. Inspection
 - b. B. Head Forms and Helmet Positioning
 - c. C. Marking
 - d. D. Peripheral Vision
 - e. E. Performance Testing... excepting only:
 - i. E8. Frontal Head Restraint (FHR)
 - ii. E9. Flame Resistance Tests

One of several possible ways to accomplish the necessary tests is as follows:

Suggested K2020 Test Matrix – SA2020 Test Regimen		
Helmets Configured for Largest Intended Size		
Helmet	Conditioning (After optional cold cycle)	Appropriate Tests
#1 Archive	Ambient	Not subject to performance testing
#2	Lab Ambient	E2, E5, E7, E4.3.1, E6, E10, E11
#3	Wet	E3, E4.3.1
#4	Any	E3, E4.3.1
#5	Hot	E3, E4.3.1
#6	Lab Ambient	E3, E4.3.1, E4.3.3
#7	Lab Ambient	E4.3.2 (Low Velocity)
When Necessary – Helmets Configured for Smallest Intended Size		
#8	Lab Ambient	E2, E4.3.1
#9	Hot	E4.3.1

M2020 Test Regimen

Please refer to the Snell 2020 Standard for Protective Headgear for Use with Motorcycles and Other Motorized Vehicles. Requires at least five complete samples and as many as seven. Requirements include:

1. Marking and Labeling of Critical Components
2. The following items from the sections on Testing:
 - a. Inspection
 - b. Head Forms and Helmet Positioning
 - c. Marking
 - d. Peripheral Vision, helmets which meet the SA2020 requirements for peripheral vision will also be accepted.
 - e. Performance Testing: the manufacturer may request either the M2020D or M2020R option for impact testing.

One of several possible ways to accomplish the necessary tests is as follows:

Suggested K2020 Test Matrix – M2020 Regimen		
Helmets Configured for Largest Intended Size		
Helmet	Conditioning	Appropriate Tests
#1 Archive	Ambient	Not subject to performance testing
#2	Lab Ambient	E2, E5, E7, E4, E6, E8, E9
#3	Wet	E3, E5, E7, E4, E6, E8, E9
#4	Cold	E3, E5, E7, E4, E6, E8, E9
#5	Hot	E3, E5, E7, E4, E6, E8, E9
When Necessary – Helmets Configured for Smallest Intended Size		
#6	Cold	E2 (prior to cold condition), E5, E4, E6, E8, E9
#7	Hot	E3, E5, E7, E4, E6, E8, E9