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## The Quarterly Newsletter of the Snell Memorial Foundation

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This is the thirty-seventh of the Foundation's quarterly newsletters to the helmet manufacturing industry.

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### Manufacturers ♦ Meeting

**T**he Foundation will host a Manufacturer ♦s Meeting at 9:00 AM on Friday, February 13, 2004, at the Westin Hotel in downtown Indianapolis. Snell Certified Manufacturers and other

interested parties should contact the Snell office in California for details.



## Draft M2005 & SA/K2005 Standards

**W**e are well into the drafting process for the 2005 standards for helmets for motorcycle use, for auto racing and for karting. Since the karting and auto racing standards differ only in flame resistance requirements, the draft auto racing, "SA" and karting "K" standards have been combined in a single document.

**T**he second drafts have been available for review on the Snell web site for a few months. A document projecting how and when the new standards will be implemented and summarizing the differences with the previous standards is also available for review.

**A** third set of drafts is projected for early spring and the standards should be in their final form by May 2004. All interested individuals and groups are invited to comment on any aspect of the 2005 programs.



## Children ♦s Motorsports Headgear

**T**he symposium concerning children ♦s needs and motorsports headgear hosted jointly by the Children ♦s Hospital of Philadelphia and the Snell Memorial Foundation took place last April. Although a report is still in preparation, the attendees all seemed to agree on a few central ideas. Young children are currently participating in motocross, kart and quarter midget racing and are likely to continue doing so. Children ♦s neck musculature is disproportionately weak and their heads disproportionately heavy so they cannot reasonably wear headgear intended for adults. Children ♦s neck, head and facial anatomies are sufficiently different from those of adults that scaled down adult headgear may not be sufficient. In particular, full face helmets may require considerable redesign in order to accommodate children ♦s disproportionately shorter face and neck lengths.

**T**he group also agreed that children may be considerably more resilient than adults and their tissues tougher and more flexible so that adult injury criteria may actually underestimate the

risks of serious harm. However, this advantage may well be offset by the consideration that even a minor injury during developmental years could have profound consequences for a child's future.

**T**

he attendees are currently working up a consensus report for general distribution



## Helmet Sizing Considerations

**M**ost all the motorcycle helmet structures currently in the Snell programs are sold in two or more fit padding configurations to accommodate a range of consumer sizes. For example, a helmet may be configured with relatively thin padding and sold as a size XLarge but that same helmet, configured with progressively thicker pads may serve a size Large, a size Medium and, in some cases, proceed all the way to Xsmall.

**C**urrently, the Foundation does not oblige manufacturers to submit different fit pad configurations for test. If a helmet structure has passed certification testing with a particular set of fit pads, there is good reason to suppose that the same helmet will pass with another set of pads. However, the fit pads may introduce some variability in test results that ought to be considered. The fit pads will determine just which headform will be used for Snell testing and, also, bear on how the helmet is positioned on the headform. Depending on the padding configurations, smaller sizings may have a problem with visual field requirements and larger sizings with test lines.

**G**enerally, if the pads do create problems, they will be slight problems with no reasonable effect on the helmet's protective capability. However, such problems will be discovered during the Foundation's random sample testing and the manufacturer will be required to fix them.

**R**epairs may not be too difficult. Visual field might be improved by rearranging the padding to shift the wearer's head a few millimeters forward in the helmet or by trimming a few millimeters from the edges of the face port. Test line problems may be a little more difficult but, if the manufacturer ensures that the largest size of the helmet, the one with the thinnest pads, meets impact requirements, the others will almost certainly do well also.

**H**owever, most manufacturers will prefer to avoid these sorts of problems from the outset. There are three ways in which to proceed. The first is the belt and suspenders approach: send in five samples of each fit pad configuration for separate certification testing. If there are any problems with visual field or test lines, they'll turn up in the testing. The down side is that this approach will double or triple the certification test effort and expense and the additional testing will be mostly redundant.

**A** second way to deal with this problem might be for manufacturers to submit five samples of a helmet configured for the largest possible consumer size and a single additional sample of each smaller sized configuration. This method might require submissions of six, seven, eight or more helmets rather than the current five samples demanded for certification testing. After receiving five samples of the largest size and one each of the smaller sizes, the technicians would position and mark the each size on the appropriate headform and then check the visual field. So long as the visual fields all met requirements, the test lines on all the smaller sizes would be transferred to the largest size. The technician would then test the largest size samples in impact being careful to site the impacts so they fell on or above at least one of the test lines. Generally, the line marked for the largest size would always be the lowest test line on the helmet but a poorly chosen set of fit pads might change things.

**I**f the largest samples passed the impact testing, there would be little doubt that identical structures padded out to the smaller sizes would also pass on smaller headforms. Although the smaller headforms have smaller radii that might conceivably change some of the impact interaction, the effect would be to improve, very slightly, the flat anvil impact response while having almost no effect on the much more localized hemispherical anvil response.

**S**o there are at least three viable approaches to dealing with differing fit pad configurations of otherwise identical helmets. The first being to receive and test a set of identical samples in one fit configuration and accept, for the time being, that other fit pad configurations will do as well. The second is that five samples of each fit pad be tested separately. And the third is that manufacturers submit five samples of the largest size, the configuration with the thinnest fit pads, along with one sample each of the smaller sizes so that test line and visual field measure information from all the sizes can be included in the evaluation. The first of these is in place already and the second has always been available as an option. The third can be offered as an option but it requires that manufacturers have their fit pad configurations for new models worked out beforehand.

**I**t may also be reasonable to discuss whether the Foundation should take stronger measures to verify the capabilities of each separate fit pad configuration, that is: drop approach #1, the current policy, in favor of approaches #2 or #3.

**M**anufacturers and other interested parties are invited to comment on these three approaches and to suggest others.



## Certified Products Lists

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## Headform Selection Procedures

**T**he first and possibly most important operation in Snell helmet test procedures is helmet marking. The test technician examines the helmet, selects the most appropriate headform, positions the helmet on the headform and then marks the test lines that will guide the impact testing that will follow.

**T**he attendees are currently working up a consensus report for general distribution. It's not much drama or excitement, helmets don't start crashing into anvils until later. Most visitors to the lab wait patiently through the marking demonstration for the destruction that follows. However, visiting test technicians scrutinize the operation carefully. A mistake in the helmet marking will usually not allow a bad helmet to pass but it may cause good helmets to fail.

**M**ost Snell testing demands the technician to draw on his experience and imagination to do the worst possible thing to a helmet that the standard will allow. But helmet marking presumes, instead, that a knowledgeable consumer will be wearing a properly fitted unit positioned and adjusted to provide the best protection of which that helmet is capable. The technician must select the proper headform and then position the helmet first to provide the necessary visual field and then to provide the most complete impact protection possible throughout the extent of protection demanded in the standards.

**Snell Standards** allow any of five different headforms ranging from the smallest, the ISO A headform with a 50 cm (19 1/2 inch) circumference to the largest, the ISO O with a circumference of 62 cm (24 3/8 inch). However, unlike most hats, helmets are rigid structures so getting a good fit is quite a bit more complicated than matching circumferences. The helmet must match the shape of the wearer's head. If it pinches anywhere, it will not fit properly and no one could reasonably be expected to wear it. Unfortunately, headforms rarely complain. Technicians can reliably tell when a helmet fits loosely but degrees of pinching that

might draw howls of protest from the most tolerant individual will often seem a good, snug fit on one of our headforms.

Unfortunately, pinching also causes helmets to sit unnaturally high on the headform which, in turn, will cause the test lines to be marked unfairly low on the helmet surface, sometimes as much as twenty millimeters low. Since Snell Standards already require helmet manufacturers to build in all the protection a wearer could reasonably carry on his head, the extra twenty millimeters of coverage a poorly chosen headform might tack on is almost sure to cause a failure.

Since the difference between a good, snug fit and unacceptable pinching is almost imperceptible, the Snell lab has developed an objective procedure for headform selection. Whenever there is any cause for uncertainty. The technician will place the helmet on the smaller of two headforms, square it up and position it to obtain a reasonable visual field. He will then mark the position of the test line at the front and rear centerlines of the helmet.

The technician will then place the helmet on the larger headform, square it up and adjust it so that the mark at the front centerline is at the level of the testline for this particular headform. He will then mark the position of the testline for this headform at the rear centerline and measure the distance to the rear centerline mark made previously. If this distance is greater than a certain value, the indication is that the helmet is not appropriate for the larger headform and should be marked and tested on the smaller. Otherwise, the larger of the two headforms is the most appropriate.

Smaller Headform	Larger Headform	Expected shift	If gap less than this value, use the larger headform
A	E	14.8 mm	17 mm
E	J	13.6 mm	16 mm
J	M	10.6 mm	13 mm
M	O	5.5 mm	8 mm



# Who to Contact at Snell

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