HEADS UP

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The Quarterly Newsletter of the Snell Memorial Foundation

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

In This Issue

Draft M2005 & SA/K2005 Standards

We have begun 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 auto racing, "SA" and karting "K" standards have been combined in a single document.

The first drafts have been available for review on the Snell web site for a few months but second drafts of each of these are in preparation and should be posted in early October. However, the drafting process will continue at least through early February, 2004, when the Foundation expects to post final drafts of the 2005 standards. Manufacturers and other interested parties are invited to review these drafts and to send comments and suggestions to the Foundation's directors care of Ed Becker.

The drafts include a number of changes from the current M2000 and SA2000 documents. M2005 includes requirements for "flip-up" type motorcycle helmets. These are full face headgear in which the facial elements are hinged to swing up and out of the way.

The SA and K requirements will drop the cold environmental conditioning in favor of a cold cycle treatment. That is, since auto racing and karting are not performed at sub-zero temperatures, the Foundation will not test helmets under those conditions. Instead, since helmets are often exposed to cold temperatures in storage or transport, a test sample may be cycled through several hours of sub-zero temperatures before being allowed to stabilize to hot, wet or lab ambient conditions for testing. Please note that this change applies only to SA and K. Cold conditioned testing will continue as before for M2005.

Both documents also lower the test line that limits the areas on the helmet subject to test impacts. For the 2005 standards, Snell technicians will be testing closer to the edges of the helmet This represents a small increment in protective benefit to motorcyclists, and auto and kart racers but may be a considerable challenge to the industry. The final placement of this line will change throughout the drafting process. In the first draft, the test line was set low to challenge the industry so that their experts would be encouraged to offer advice. By next February, the line will shift from this challenge setting to the best judgement of the industry elite.

The draft standards also call out two levels of impact test: a certification level and a slightly less severe "deviation" level. The certification level applies to helmets submitted for Snell certification. If a set of samples passes testing at the certification level, the helmet model definitely meets Snell requirements and will be accepted into the programs.

The "deviation" level applies to Snell certified helmets brought in for RST testing. If a helmet fails in first round RST, we will get three more samples and test those in second round RST at the "deviation" level. If any of the samples fails at this "deviation" level, the model definitely does not meet Snell requirements. The directors will demand that the manufacturer stop production immediately and, depending on the circumstances, may require other actions to safeguard the public.

The reason for two tests rather than one is a matter of measurement uncertainty. No matter how carefully tests are performed, there is always some variation in results. That is, if we were to repeat a test many times on perfectly identical helmets, we would not get identical numbers. Instead we'd find that our measurements would cluster around some average value with almost all of them falling within some spread above and below that average. Ideally, we should get that average "perfect" result every time. In the real world, however, the value we measure is always going to be a little higher or a little lower. All we can be sure of is that the perfect reading will be within some small span of uncertainty around the measurement we actually get.

This uncertainty can be estimated and is usually presented as a plus/minus value. With an uncertainty of 5 G, a 297 G value implies that the perfect measurement might have been as high as 302 G but could also have been as low as 292 G. If my test criterion is 300 G, I may wind up passing a helmet that I should have failed. Conversely, if the measurement was 302 G the perfect reading could have been as high as 307 G but could have been as low as 297 G. I may wind up failing a helmet I should have passed.

For most sorts of compliance testing, the manufacturer solves the problem by building additional margins of performance into his products. If the standard calls for 300 G, the helmet would be designed to produce 290 G. Since the highest test measurement expected would be 295 G, measurement uncertainty would never be a problem. However, the Foundation has deliberately pushed impact management to the limits of current technology. It may not be feasible to build additional margins of performance into Snell headgear. For this reason, identical helmets, at or near the state of the art, might pass testing one day and fail the next.

The solution in the Snell programs is two test levels, one set sufficiently high that we can be reasonably confident that passing headgear meet all requirements. The second test level is set just low enough that we can reasonably be confident that failing helmets do not meet requirements.

M2000 Label Increase

The directors also voted to increase the fee for M2000 certification labels. As of October first, 2003, the fee for regular M2000 labels will be 60 cents and M2000 cloth labels will be 65 cents.

Children's Motorsports Headgear

The 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.

The 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.

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

Helmet Sizing Considerations

Most 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.

Currently, 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.

Generally, 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.

Repairs 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.

However, 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.

If 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.

So 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.

It 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.

Manufacturers and other interested parties are invited to comment on these three approaches and to suggest others.

Certified Products Lists

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