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## The Quarterly Newsletter of the Snell Memorial Foundation

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

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### RST Policy Changes

The Foundation's directors have enacted a series of improvements to Snell Standards enforcement. These improvements were discussed at the manufacturers' meeting last February. Afterward, a draft of the new policies were written up and circulated to the industry for comment. Finally, at their April board

meeting, the directors reviewed the industry's advice and made a final determination on just what will comprise Snell Random Sample Test (RST) procedures.

**T**he most important change is that the Foundation will scrutinize recertifications much more carefully. Previously, when a certified helmet was found to have slipped out of compliance, the manufacturer was obliged only to correct the problem and resubmit fresh samples for certification testing. Now, in addition to that, the manufacturer will not be allowed to distribute until a first sampling of the corrected production has passed RST testing. That is, if a Snell certified model fails in RST and that failure is confirmed when any of three samples fails second round RST, the manufacturer will be required to do the following before he can resume distribution: first, he must take any necessary corrective action required by the Foundation's directors, then he must resubmit for and pass certification testing and, finally, he must allow the Foundation to select samples from production for a first round of proof testing.

**T**he difference is that even after he has passed recertification testing, he must warehouse his production until a representative from the Foundation can visit the factory, inspect the first hundred or so samples of the new production, and select samples for testing back at the Snell lab. Then those selected samples must meet the test requirements. The process is likely to be disruptive, time consuming and expensive for the manufacturers. They'll have to pay for transportation and lodging and reimburse the Foundation for the representative's time. For the most part, though, the Foundation will just break even and may actually lose a little to the extra effort and cross checking the new protocols require. The only winners will be the airlines and hotels and, we hope, the helmet wearing public.

**T**he directors also increased the fee for second round RST. This second round RST is performed only if a failure is observed on a sample during normal, first round RST. Three samples of the same model and size are brought in and tested to see if the technician can reproduce the failure. The technician applies a slightly different test protocol. Whereas standard certification and RST test levels are set to identify helmets that meet the standards, second round RST is set to identify helmets that do not meet the standard. If any one of the three samples fails in second round, the first round RST failure is confirmed. The manufacturer is required to stop production and distribution and he will not be allowed to resume until the model has been recertified and passed an inspection and testing of the first run of corrected units.

**T**he RST program, over all, does not quite pay for itself but, since it is a crucial part of Snell programs, it is subsidized out of other revenues. The effect is that manufacturers cover the additional costs of the RST in their sticker fees. However, second round RST is necessary only when a first round failure is observed. The directors have determined that subsidies for this testing constitute an unfair burden on those manufacturers who never have first round failures and have raised the rates for this second round testing to match the per unit charges for certification testing. The new second round test fees may be slightly better than break even but should never become a reliable source of revenue. The penalties for a second round failure have become so severe that manufacturers would do better to build performance margins into their helmets to ensure there would never be a first round failure.



## M2000 Label Increase

**T**he 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.



## No New Labeling Requirement

After reviewing manufacturer comment and advice concerning a proposed label that would trace each Snell certified unit back to a particular set of Snell tests, the directors decided to reject the proposal. The new requirement had been proposed to simplify some of the administrative burden on the staff here at the Snell office but it would have created more problems than it solved. A few of my colleagues here pointed out that the new problems would have been somebody else's but, the directors weren't all that sympathetic.



## Single Impact Capability

The Snell Laboratory now has the capability to test a helmet in a 300 joule impact. That's an impact velocity of about 24.5 mph and calls for a guided fall of better than 6 meters. For comparison, the Foundation's current SA2000 and M2000 Standards call out two impacts: one at 150 joules which equates to an impact velocity of about 17.7 mph or a fall of just over 3 meters followed by a second impact at 110 joules which amounts to 14.8 mph or a fall of about 2.3 meters.

Snell, BSI, ANSI and DOT have traditionally tested motorcycle and motor racing helmets with two successive impacts. Some experts reason that a two impact protocol is appropriate because many crashed helmets show evidence of multiple hits. However, I have become convinced that the real reason is the limited ceiling height in most helmet test laboratories. Rather than cut a hole in the roof, the standards developers decided to hit the helmet twice.

However, Europe is now using a one impact standard for motorcycle helmets, ECE 22/05, and FIA is considering a one impact standard for auto racing. ECE 22/05 calls out 7.5 meters per second impact velocity, about 16.8 mph or about 3 meters of guided fall which is manageable in most labs but FIA is looking for 250 joules or about 22.4 mph and over 5 meters of guided fall.

ECE 22/05 raised the question of just how much single impact management is implied in the Snell two impact test. That is, how hard can you hit a Snell qualified helmet in one shot and still expect protection? The FIA proposal suggested that we needed an answer quickly. So we cut a hole in the laboratory roof and built an extension over two of our four test stands.

We've done some equipment checking but, as yet, have not begun to investigate the single impact capabilities of Snell qualified helmets. But one of our foremost manufacturers has provided some single impact test results on some of the best helmets in the Snell program. The data suggest that 250 joule impacts will require either a considerable advance in helmet technology or headgear substantially bigger and heavier than those in current use.

Over the next few months we hope to determine what levels of single impact Snell helmets can manage and whether single impact testing can be performed economically without damaging the equipment or endangering the technicians. However, we have no plans for switching M2005 or SA2005 to single impact protocols. Even if we find that we can perform these impacts economically and safely, we cannot reasonably anticipate the effect of such a change on the industry and on motorcycle and auto racing headgear. The Foundation has applied two impacts ever since the first Snell standard in 1959. If single impacts are a good idea, they'll still be a good idea in 2010.



## Children's Motorsports Headgear Symposium

The symposium concerning children's needs and motorsports headgear hosted jointly by the Children's Hospital of Philadelphia and the 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.



## FIM Helmet Standard

The Foundation has been cooperating with the Federation Internationale Motocycliste (FIM) to draft requirements for a new FHS motorcycle helmet standard that would be required for crash helmets worn in FIM championship events. This first standard would likely serve as a template for other, event specific FHS requirements that would eventually apply to all FIM competition.

This first FIM helmet standard is intended to apply to helmets for street use as well as competition racing. However, street use implies EC 22/05 qualification in Europe, DOT

qualification in the US and JIS 8133-2000 qualification in Japan. M2000 can coexist with DOT, there are many helmets that fulfill both. Since JIS 8133-2000 appears quite similar to DOT, it is likely that a helmet can also be made to M2000 and Japanese street requirements as well but, presently, I know of no M2000 certified helmet that will also meet EC 22/05. The nature of the impact requirements and the test criteria are very different.

The Snell M2000 test impacts are much more severe than in EC 22/05. Snell applies two impacts at each test site, the first at an impact velocity of 7.74 meters per second and the second at an impact velocity of 6.6 meters per second. The single EC 22/05 impact is at 7.5 meters per second. Although the headform masses are such that the European impact is more severe than the first Snell impact for the two largest headform sizes, XXL and XXXL respectively, they are substantially less than the other three headforms covering the medium and smaller sizes. Furthermore, the European free drop protocol and the anvil shapes assure that the tests are much less severe than impact energy comparisons might imply.

EC 22/05 limits the shock transmitted through to the test headform to 275 g and limits the HIC to 2400. HIC is the Head Injury Criterion, it is the average shock in g's over any time period in the shock recording raised to the 2.5 power times the duration of the time interval. However, HIC was developed for evaluating the outcome of bareheaded impacts into padded automobile interiors. The limit HIC value considered to be safe is 1000. There is considerable doubt whether HIC should be applied to helmeted impacts at all.

The effects of these differences between Snell and EC 22/05 is that Snell qualified helmets will have difficulty meeting EC requirements in flat impacts applied to the crown of the helmet while EC qualified helmets will be overwhelmed by the second Snell impact particularly against the hemispherical anvil. These differences imply that if FIM bases its standard on either one of these two, that helmets qualified to the other may well be eliminated from consideration.

One solution under consideration would be to establish two sets of criteria, one based on Snell M2000 and the other on EC 22/05. Helmets worn in FIM championship events would be required to meet one or the other but not necessarily both. If this solution is adopted, it is expected that FIM would impose other tests and requirements in addition to those of the base standards.

This solution is far from ideal. Since the needs of the riders and the hazards imposed by the event are assumed to be the same, two distinct helmet configurations should not be necessary to assure safety. Although we maintain that Snell certification demonstrates superior protective capability, however, the European Helmet Manufacturers Association holds similarly for EC 22/05. The only clear considerations remaining are commercial and legal. Snell certified motorcycle helmets are manufactured in great numbers and sold for street use throughout the United States and Canada and likely qualify for street use in Japan. EC 22/05 helmets are manufactured in great numbers and are legal for street use throughout Europe. Until there is a single world standard for street motorcycle headgear there may be no single world standard for competition motorcycle headgear.



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