

SA/K2010 is now in its final form. Although there may be some grammatical and typographical corrections when it is published in booklet form, the requirements as described in the current document will not be materially affected. This final draft is effectively the same as that circulated in May of 2008. Publication had been delayed in hopes of including test descriptions and requirements for certain helmet features not traditionally considered in Snell standards but which have become necessary for helmets used in certain events. However, rather than delay any longer, the Foundation will publish the standard as is and will release an SA/K2010 addendum at a later date.

The time line is as follows:

SA/K2010 Introduction

- Certification Testing starts..... Immediately
- SA/K2010 Labels Available..... April 1, 2010
- First SA/K2010 Helmets Available for Sale..... October 1, 2010

SA/K2005 Termination (except, possibly, for helmets homologated to FIA 8860)

- Certification Testing ends..... June 30, 2011
- SA/K2005 Labels last available..... June 30, 2011
- SA/K2005 Production ends..... March 31, 2012

SA/K2010 Addendum

SA/K2010 is incomplete. It lacks test descriptions and requirements for head restraint provisions. The head restraint requirements will be published later in an addendum and will apply to only to suitably equipped helmets.

There are several head restraint systems in use which employ tethers fixed to the rear of the helmet. If a helmet submitted for SA/K2010 testing incorporates appropriate special purpose hardware fixed at specific locations in the helmet shell, the addendum to the standard will call for these fixtures to be tested in various loadings. If the fixtures can support the loads, the model will be eligible for special "SAH2010" or "KH2010" labels which will indicate compliance with the base standard and with the head restraint provisions.

It is intended that FIA will accept this qualification as an alternative to FIA 8858 homologation and that SAH2010 and KH2010 certification will assure compliance with the performance requirements to be set forth in the next FIA 8858 revision which is currently still in draft. For this reason, the specifics of the Snell SA/K2010 head restraint requirements have not been finalized and therefore will be published as an addendum to the base standard.

However, in its current form, the SA/K2010 base standard addresses all the aspects of helmet performance considered in the previous revision, SA/K2005. Manufacturers are encouraged to submit helmet models for testing. Those which meet requirements will be accepted into the Snell programs and need not be affected by the head restraint provisions to come later. Once the head restraint addendum is ready, models already certified to the base standard may continue in the program as is or they may be resubmitted for testing to the head restraint provisions if the manufacturer so wishes.

SA/K2010 – SA/K2005 Incompatibility

This standard introduces a change in the way helmets will be tested rendering SA/K2010 and SA/K2005 incompatible. It may be no surprise that some SA/K2005 qualified helmets will not meet

SA/K2010 but, because of the changes, it is also highly likely that some helmets meeting SA/K2010 will not meet SA/K2005. Since SA/K2005 and SA/K2010 are not compatible, meeting SA/K2010 requirements, of itself, will not qualify a helmet to be produced and distributed with SA/K2005 labeling. Any SA/K2010 helmet distributed with SA/K2005 labeling must also have met requirements in SA/K2005 testing.

Important Differences

- Significant changes to impact testing - see below
- Labeling - helmets must be marked with the largest and smallest appropriate head circumferences in centimeters.
- Numbers of Samples - depending on the helmet's intended size range; eight samples may be required for certification testing.
- Provisional testing and separate "SAH2010" or "KH2010" certification labels for head restraint ready helmets. If a model is not head restraint ready, this provision will not apply but the model may still be considered for SA2010 or K2010 certification.

Impact Test Differences

The differences between SA/K2010 and SA/K2005 all stem from a reevaluation of impact test head forms. SA/K2005 and previous standards required impact testing on head forms with an effective mass of 5.00 kg regardless of head form circumference. SA/K2010 calls for impact testing on head forms for which the effective mass depends on head form size. SA/K2005 invoked head forms meeting the mass and geometries specified in ISO Draft International Standard 6220, the same as those in the British Standards Institute 6658-1985 standard. This BSI 6658 standard was once mandatory for motorcycle helmets in England. SA/K2010 calls out head forms matching the mass specifications in ECE 22-05, the current mandatory motorcycle helmet standard throughout Europe.

This reevaluation of head form mass is supported by a study conducted at the University of Washington by Dr. Randal Ching. Dr. Ching performed measurements on 15 cadaver heads and found a strong correlation between head mass and circumference. This correlation approximates a cubic mass versus circumference relationship and suggests that the ECE 22-05 mass specification would enable a more precise fit between the properties of Snell certified helmets and the needs of their wearers across a broad range of different head sizes.

Imposing this new mass specification on Snell standards requires a host of changes to the testing and to the test criteria as shown in the following table. The second row in the table shows the test head forms. Five of these should be familiar but the C head form is new. It has been added to fill the gap between the A and E head forms. Since the drop mass had been the same for all head forms previously, the 4 cm jump in head circumference between A and E had not been a problem. In SA/K2005, if a helmet met requirements on a larger head form, the same helmet would obtain comparable results on smaller head forms. But for SA/K2010, there will also be a 1.0 kg gap between the A and the E head forms and the difference in test results will be pronounced. For this reason, the C head form has been selected to fill that gap and mass properties have been assigned by interpolation across the ECE 22-05 values.

The impact test criteria are shown in the fifth and sixth rows. The certification test criteria for the medium and smaller sizes, head forms A through J, are all set to 275 G. The value comes directly from ECE 22-05. But this 275 G value, combined with the head form mass changes, would allow larger helmets to transmit more shock than allowed by SA/K2005. So, for the M and O head forms,

the largest sizes, the peak G levels have been reduced even further to assure that SA/K2010 never allows any more shock than the Foundation allowed previously.

The certification velocities replace the impact energy requirements of previous Snell standards. The energy requirements in SA/K2005 effectively demanded impact velocities of approximately 7.75 m/sec followed by 6.62 m/sec. Since there is no reason to believe that impact velocity will depend on a rider's head size, we kept the SA/K2005 impact velocities as a starting point in the development of SA/K2010. However, the different impact masses must necessarily impose progressively greater levels of stress within the helmet structure as head form mass increases. Therefore, smaller sized helmets will be able to satisfy the test criteria in SA/K2010 at higher impact velocity levels than larger helmets. Since, like previous Snell standards, SA/K2010 will call out double impacts, the first certification impact will be at 7.75 m/sec regardless of head form size. The second impacts for the A, C and E head forms are set to 7.09 m/sec but are set progressively lower for the J through O head forms to allow for the limits of current materials and design technology.

| SA/K2010 Impact Testing | | | | | | | |
|--------------------------|---------------|----------|----------|----------|----------|----------|----------|
| Head Form | | A | C | E | J | M | O |
| Circumference | | 50 cm | 52 cm | 54 cm | 57 cm | 60 cm | 62 cm |
| Drop Mass | | 3.1 kg | 3.6 kg | 4.1 kg | 4.7 kg | 5.6 kg | 6.1 kg |
| Test Criteria | Certification | 275 G | 275 G | 275 G | 275 G | 264 G | 243 G |
| | RST | 285 G | 285 G | 285 G | 285 G | 273 G | 251 G |
| Certification Velocities | 1st | 7.75 m/s |
| | 2nd | 7.09 m/s | 7.09 m/s | 7.09 m/s | 6.78 m/s | 5.73 m/s | 5.02 m/s |
| | 3rd | 6.78 m/s | 6.78 m/s | 6.78 m/s | 6.78 m/s | 5.73 m/s | 5.02 m/s |
| Deviation Velocities | 1st | 7.48 m/s |
| | 2nd | 6.85 m/s | 6.85 m/s | 6.85 m/s | 6.55 m/s | 5.54 m/s | 4.84 m/s |
| | 3rd | 6.55 m/s | 6.55 m/s | 6.55 m/s | 6.55 m/s | 5.54 m/s | 4.84 m/s |

The RST test criteria are uniformly higher than the certification criteria in order to ensure that, during standards enforcement, measurement uncertainty will not reasonably cause a good helmet to fail. However, RST testing calls for the same impact velocities as certification and which are also subject to measurement uncertainties. If velocity uncertainty should cause a helmet to fail in RST, the matter will be set tight in a second round of enforcement testing.

When a helmet fails in RST, three more samples are tested to confirm that failure. The same RST criteria apply but these samples are tested at deviation level velocities which are uniformly lower than certification test velocities. If all three samples meet the test requirements, the previous RST failure will be considered anomalous. But if any of the samples fails, the failure cannot reasonably be attributed to velocity or to shock measurement uncertainty. Instead, the sample will be judged non-compliant and the manufacturer will be referred to the designated officer on the Foundation's board of directors for further action.

Retention Strength Testing

The retention strength test now calls for the helmet sample to be supported on its lower edge. This is intended to eliminate and testing artifact due to liner compression. However, if the technician deems that the helmet edges cannot adequately support the helmet for this test, he shall perform the test with the helmet supported by an appropriate head form.

Helmet Sizing Concerns

Helmets must meet requirements over their entire range of head sizes. In previous Snell standards, if a helmet met impact requirements on the largest appropriate head form, it would also meet them reliably on smaller test head forms. But, for SA/K2010, helmets must be tested on the largest and smallest appropriate head forms if there is to be any confidence that helmets will meet requirements reliably throughout their intended size ranges. We have a procedure for determining the largest head form a helmet will fit but, unfortunately, I know of no good way to determine which might be the smallest head form. Instead, SA/K2010 will require manufacturers to declare the intended size range of each helmet submitted for certification.

Helmet sizing information should be in terms of the smallest and largest head circumferences, in centimeters, for which the helmet is appropriate. Fractional values will be rounded down to the next whole centimeter but the largest size will be considered to include head circumferences up to but not including the next whole centimeter value. Once a helmet is certified, all units produced and distributed must be labeled with the size range in terms of centimeters of head circumference. These labels may indicate size ranges narrower than the declaration made for certification but must not indicate any sizes outside the original declaration. If only a single value of circumference is given, it will be accepted as the both the smallest and largest appropriate values.

| Test Head Forms as Determined by Size Specification (Head Circumference in cm) | | | | | | | |
|--|-------|------------------------|---------|---------|---------|---------|------|
| | | Largest Size Specified | | | | | |
| | | 50 -51 | 52 - 53 | 54 – 56 | 57 - 59 | 60 - 61 | ≥ 62 |
| Smallest Size Specified | < 52 | A | A-C | A-E | A-J | A-M | A-O |
| | 52-53 | | C | C-E | C-J | C-M | C-O |
| | 54-56 | | | E | E-J | E-M | E-O |
| | 57-59 | | | | J | J-M | J-O |
| | 60-61 | | | | | M | M-O |
| | ≥ 62 | | | | | | O |

If the helmet is sized so that only a single head form is appropriate for testing, SA/K2010, like SA/K2005, requires six samples fitted for the largest intended head size. But if the helmet's intended size range implies that two or more head forms are appropriate, SA/K2010 demands two additional samples fitted for the smallest appropriate size. The table shows the head forms considered appropriate to head size ranges given in terms of centimeters of circumference. If a helmet's specified size range falls into one of the light gray cells along the table's principal diagonal, only a single head form is deemed appropriate and only six samples fitted to the largest intended size are necessary. Otherwise, two or more head forms are indicated and the manufacturer must provide two additional samples fitted to the smallest intended head size.

FIA 8860 Advanced Helmet Specification

Some helmets currently meeting SA2005 and FIA 8860 may not be able to meet some of the requirements in SA2010. If necessary, the Foundation will continue SA2005 beyond the current projected deadlines for helmets developed for FIA8860 homologation.