

Custom fitted helmets are uniquely fabricated to match a particular head shape as opposed to more traditional helmet configurations which rely on thick layers of soft comfort padding in order to accommodate a broad range of head shapes. Ideally, custom fitting will tailor a helmet to the needs of its user but the helmets will no longer be uniform. For this reason, the certification and enforcement test procedures prescribed for traditional helmet configurations require some modification if they are to be applied to custom fitted units. The object of these modifications is to provide a reasonable assurance that the customization process will yield helmet units such that their intended users will have as much or more protection, coverage and visual field as would be provided by a comparable and well-chosen traditional helmet.

### **Initial Assumptions**

For a given size configuration, the only customized helmet component will be the thick, energy managing liner. The only differences in this liner will be the configuration of the liner interior which will be formed to match the customer's head shape. Although the liner interior will be formed to match individual head shapes, the forming process will be confined to a specified volume within the liner interior. The boundaries of this volume constitute the **certified surface** of the liner component. This surface must never be trespassed. If the forming process indicates that a particular customer cannot be adequately served within this surface, the fitting process must be terminated and no corresponding unit provided.

However, it is expected that a model line will consist of several size configurations, each certified separately and whose certified surfaces bound successively larger volumes within liner interior. If a particular size configuration cannot be customized to fit a particular customer, perhaps the next larger size will serve or, perhaps, the next larger size after that.

### **The Fitting Process**

The primary objectives of the fitting process are:

- The appropriate location of the wearer's eyes within the helmet in order to obtain a reasonably adequate visual field.
- Positioning the crown of the wearer's head as closely to the top of the certified surface of the liner as possible in order to maximize the coverage at the sides and back of the wearer's head.
- Identifies all those cases for which the fitting process will not yield an appropriate helmet.

The helmet maker must demonstrate that the fitting process meets all these objectives before submitting for units for certification testing.

### **Certification Testing**

For certification, the helmet maker submits:

- Depending on the Snell standard, four or more samples formed to the **certified surface** (minimal liner thickness).
  - The critical concern is that the liner be always thick enough to manage hemi impact
- One sample to be marked with test lines according to the standard. These test lines will then be the basis for all further testing on this helmet configuration.
  - At the discretion of the Laboratory Manager, this sample may be either formed to the certified surface or, using the manufacturer's custom fit procedure, to the largest appropriate head form.
  - This sample will be not itself subject to destructive testing and will held in the archive for reference.

- Two samples optimized for the smallest appropriate head form.
  - These will be tested on the smallest appropriate head form
    - whether or not that head form is the same as the largest appropriate
  - The critical concern here is that the liner be sufficiently soft for flat impact

The four certified surface units will be tested according to the appropriate Snell standard on the largest appropriate standard head form and the two units customized for the smallest appropriate head form will be tested on that head form according to the standard. All six units will be tested even if the smallest and largest appropriate head forms are the same.

### **Enforcement Testing**

For Enforcement, the helmet maker provides

- Details of each optimized fit executed
  - These will be checked for reasonable coverage and visual field (at least as much as a well-chosen, comparable, off-the-shelf model would provide to the same customer)
  - The customized surface must not intrude into the minimal liner thicknesses evaluated in certification; i.e. must not go beyond the certified surface
  - These details will be filed for later review and for enforcement testing
- On request the helmet maker will provide a helmet made to Snell's order. This could be
  - A minimal thickness (certified surface) sample, a custom sample matching one made for a customer or a sample optimized for an appropriate head form.
  - Samples will be marked with the same test lines as used in the certification testing.
    - Essentially, the test technician will transfer the shell referenced lines from the archive sample save from initial certification to this enforcement sample.
  - The head forms used in certification may not fit properly inside a unit customized for a particular person. If so, the test technician may resort to a smaller head form and add extra mass to match that of one of the certification head forms.
  - Customized samples might be subjected to dimensional checks to confirm liner thicknesses rather than to physical tests. These samples could be returned for use afterwards