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LOG OF MEETING
DIRECTORATE FOR ENGINEERING SCIENCES

SUBJECT: Meeting with 3M on Retroreflective Materials for Bicycle Helmets

DATE OF MEETING: April 24-25, 1995 **PLACE:** CPSC Headquarters Bethesda, MD and National Institute for Standards and Technology (NIST), Gaithersburg, MD

LOG ENTRY SOURCE: Scott Heh, ESME SH

DATE OF ENTRY: April 26, 1995

COMMISSION ATTENDEES: Scott Heh-ESME, Celestine Trainor-EPHF, Deborah Tinsworth-EPHA, Mark Kumagai-ESME, George Sushinsky-LSEL, Joe Puskar-LSEL, Brian Lee-HSHE, Terry Karels-ECPA, Frank Krivda-CERM

NON-COMMISSION ATTENDEES: Larry Buckley-3M, David Engler-3M, Lori Kuller-3M, Randy Swart-Bicycle Helmet Safety Institute, Corriece Perkins-Product Safety Letter

SUMMARY OF MEETING

April 24, 1995, 2:00 pm, East West Towers

Mr. Buckley, Mr. Engler, and Ms. Kuller of 3M promoted the idea of adding a provision to the CPSC bike helmet standard that requires retroreflective material on the outer shell of bike helmets. 3M's position is that any measure that adds to a bicyclist's conspicuity will provide increased safety. While it is not practically feasible to mandate retroreflective clothing for bicyclists, 3M feels that a requirement for helmets may be reasonable. In a comment to the CPSC proposed bicycle helmet standard, 3M suggested that helmets be required to meet the provisions of ASTM Standard E 1501-Nighttime Photometric Performance of Retroreflective Pedestrian Marking for Visibility Enhancement. The ASTM E 1501 standard requires minimum retroreflective performance at 15 degree increments all around the helmet. The standard requires retroreflective performance levels under simulated viewing distances of 70 and 230 meters.

The 3M representatives brought six helmets that were modified with various 3M "tapes" that incorporate three different retroreflective technologies (encapsulated, open bead, and prismatic). These helmets were wrapped with tape at the bottom edge of the exterior "microshells." The tape varied in width from 1/2 inch to 1 inch. 3M presented the results of testing the modified helmets in accordance with the ASTM E 1501 standard. The tests showed that some of the helmets could meet the 70 meter

viewing performance requirement of the standard. It was shown that certain types of tape needed a wider band of material than others in order to meet the standard requirements. Testing showed that the helmets could not meet the longer viewing distance (230 meters) requirements. Mr. Buckley stated that it would take a much more retroreflective material to meet the 230 meter viewing requirements

April 24, 1995, 8:00 pm , NIST

CPSC staff observed a demonstration set up by 3M to provide a practical "real world" performance comparison of the six helmets. Approximately 1000 feet of roadway was blocked off on the grounds of NIST to use for the demonstration course. Two bicyclists wore retroreflective helmets and rode in circles at one end of the course. CPSC staff and other observers rode in a car starting at the other end of the course and observed the helmets' retroreflective performance under the car's headlights as they drove slowly toward the bicycles.

Most often, observers first noticed the reflectors on the bicycles before noticing the retroreflective helmets. However, the retroreflective tape on the helmets did help to provide another reference point to aid in identifying the object as a bicyclist. It was observed that the retroreflective helmets performed much better when the bicyclist was traveling perpendicular to the car's path of travel. The helmet retroreflective performance decreased markedly when the bicycle was traveling either directly toward or directly away from the car. In these positions, the smaller width and increased curvature of the helmet shell create a much smaller area of retroreflective tape facing the light source. During one trial, no retroreflection was apparent when the bicyclist was facing the car. It was observed that the rider had the helmet tilted back on her head. The retroreflection improved on the next trial when she positioned the helmet correctly on her head. This indicates that helmet positioning and a rider's head position can influence retroreflective performance.

Bicycle reflectors are placed at the front and rear of the bike, in the spokes of the wheels, and in the pedals. The helmets had a band of retroreflective tape 360 degrees around the helmet. The group observed that much of the retroreflection from the bike reflectors was lost when the face of the reflectors were not pointed directly at the light source, (e.g. that point when a bicyclist is starting to turn either left or right from a position directly facing the car). In these instances, the helmets often provided the main source of visibility enhancement since there was some portion of helmet retroreflective material facing the light source.

In general, it was possible to differentiate the retroreflective performance between helmets that met the 70 meter

requirements of ASTM E 1501 from helmets that did not meet the standard. However, these differences were often minor. Observers agreed that even those retroreflective helmets that failed to meet the standard specifications provided a better means of identifying a bicyclist than a rider wearing no helmet.

April 25, 1995, 8:30 am, East West Towers

The group met again to discuss the Monday night demonstration and discuss the possibility of CPSC considering retroreflective performance requirements for the mandatory bicycle helmet standard.

Possible options for retroreflective performance requirements were discussed. One option is to require that bicycle helmets meet the short viewing distance (70 meter) requirements of the ASTM E 1501 standard. Such a requirement could complicate bicycle helmet standard certification procedures. Manufacturers may have to contract out with photometric test labs or develop the in-house capability to certify retroreflective performance. Another option is to require that bicycle helmets have a minimum area of coverage of retroreflective material that meets a minimum photometric grade.

Increases in helmet manufacturing costs were discussed. 3M estimated that materials costs would increase by 30 to 50 cents per helmet. The effect on manufacturing labor and/or process costs were not as clear. However, Mr. Buckley was confident that retroreflective tape could likely be adapted to an automated application process. Since the majority of helmets have some sort of tape to join the seam between the shell and liner, it may be a negligible cost increase for applying a retroreflective tape in place of the currently used tape.

It was pointed out that the tape on the 3M modified helmets was wider than typical tape used to join the shell/liner seam. It was also noted that retroreflective tape would likely have a limited color options, (probably silver, white, and perhaps yellow). It was not known how these issues could effect current helmet styling and graphic design. Mr. Heh stated that the Commission staff is planning to hold a meeting with industry and other interested parties to discuss the safety benefits and manufacturing and marketing implications of requiring bike helmets to meet retroreflective requirements. Mr. Heh said that he would be in touch with everyone as soon as the meeting is scheduled.

cc

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