

Another important finding of the TTI tests showed that when the rear guard was removed, and readjustable rear wheels on the truck or trailer were set in the rearmost position, the repositioned wheels, by themselves, prevented excessive underride at approximately 35 mph. Further, the restrained dummies in these tests experienced a response which is within the allowable limits of FMVSS No. 208.

NHTSA also employed simulation models for conducting a comparative engineering risk analysis. For details, see Automated Science Group (1980), Cook (1980), and SAE (1980). In contrast to earlier studies supported by NHTSA, these analyses did not concentrate on the question of which guard type is most effective in preventive excessive underride. They evaluated cost/benefits, the risk of "no underride guard at all," and of four types of guards: namely, "rigid," "energy absorbing," "moderate strength" (i.e., one that will permanently deform when subjected to a load of approximately 45,000 pounds), and "current" (ICC).

The effectiveness of each guard (and of "no guard") was quantified by the risk of injury rated 3 or above on the Abbreviated Injury Scale (AIS), which covers the range of injuries from "serious" to "fatal." The results of the risk analysis were as follows:

- (1) "Energy absorbing" guards provide the best protection for car occupants in a rear-end collision with a truck.
- (2) "Current" (ICC) guards provide the least protection.
- (3) "Moderate strength" guards provide an overall risk of injuries to both restrained and unrestrained occupants about the same as "rigid guards" (although "rigid" guards were still superior to "moderate" in reducing the risk of excessive override).

#### Proposed Rule

In light of the IIHS, TTI, and DSI tests, and the comparative risk analyses, NHTSA proposed on January 8, 1981 (*Federal Register*, 1981) to:

**"Mandate the use of underride guards that are at least as strong as 'moderate strength' guards."**

The NHTSA rules were modelled on the existing European Economic Community (EEC Directive 79/490/EEC) and the Swedish regulation which in general mandated an underride guard capable of withstanding a load of 45,000 pounds on the vertical support members combined. NHTSA indicated that these rules were proposed in order to provide American and European rules consistent with