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## AMERICAN STANDARDS REAR GUARDS: COMMENTS

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### Introduction

The "Federal Register" of January 24, 1996, which presents the Final Regulation on rear underride guards is quite extensive. It tells the whole history of the attempts at regulation of the subject, and includes comments from several experts in the matter. It is therefore, a true summary of suggestions and past experiences regarding tests made by several entities, and presents citizens opinions on how to improve the protection for car occupants from passenger compartment intrusion (PCI) and the "Guillotine Effect" in case of a collision against the rear end of a truck. It is as a consequence, a valuable source of information.

However, far from leading to a solution which would bring safety for the car occupants, one can see that the ideas from the true experts on what can be called "Collision Engineering" are completely disrespected and disregarded by the authorities at NHTSA (National Highway Traffic Safety Administration) which insist on just giving credit to the opinions of the trucking industry.

Recommendations of respectable entities like IIHS (Insurance Institute for Highway Safety), Public Citizen, and well-known engineers and reconstructionists such as Byron Bloch, Roy Crawford, John Tomassoni, Joseph E. Badger, and George Rechnitzer from Monash University of Australia are completely neglected. As an example, "Item VII - Comments about the 1992 SNPRM - Supplementary Notice for Proposed Rule Making" declares that NHTSA received 2250 comments of individuals. The trucking industry comments were always favorable to the proposed new Standard while Consumer's Defense Organizations, local and state government agents, and independent citizens were generally critical! Why would it be?

### COMMENTS:

We are working now to prepare new Brazilian Standards for rear underride guards and were asked to study the American Standards. Our Government will tend to just copy the American Standards in the comfortable supposition that they should be the best for Brazil as well. The same mistake will likely be made in other Latin American countries.

Based on the experience of UNICAMP's Impact Project and the specialist's opinions above, (with which we had the happiness of living together during the workshop "Heavy Vehicle Underride Protection TOPTEC, organized by International SAE in Palm Springs, California, April 15 to 16 in 1997) and above all, motivated by the desire of saving human lives, whenever possible by applying the logic and philosophy of safety engineering, we present below a critical analysis of the new American Standards. This work is of fundamental importance, since at least in the developing countries, traffic agents will copy the so-called American solutions and in so doing will spread the tragedy worldwide...

This Standard is the second in the American history on rear bumpers. The first regulation in 1953 was a true offense to intelligence and the value to be given to human life, as it only specified: a bar of steel, 1 meter in length, solidly fixed to the chassis. Believe it or not, today this "solution" can be seen by thousands on the American roads! The number of deaths in this guillotine scaffold in the last 46 years, probably, is much larger than in the Vietnam War!

On the height of the bumper, there are several references to the height of the hood of the automobile, as if this represented some approach to define the height of the bumper of the truck. They seem to ignore the fact that the frontal resistance zone of automobiles are located behind their frontal bumpers. It should be obvious, the bumper should be the first part of the car to hit the bumper of the truck. At 56 cm above the ground, the truck's rear bumper is the great INITIATOR of the powerful " WEDGE EFFECT " since even THE SAFEST AND BIGGEST CARS OF THE WORLD have their bumpers beginning approximately 40-45 cm in height when the car is parked and without passengers. This height is substantially reduced during a panic braking of the car while full of passengers. This is the first characteristic of an authentic trap for humans...

What is a real disappointment for us, living in a developing country where the safety culture still must be born, is that the automotive industry apparently never tried to protect their clients by requesting that government traffic agencies stop playing with the lives of the American citizens!

The powerful "Wedge Effect" is very difficult to avoid, and therefore almost inevitable. It results from the forces decomposition according to the incidence angle of the prevailing forces, this was never mentioned in the text, which proves that the Regulation is far from being correct and complete. We could observe in the collision tests made by the Impact Project at the General Motors facilities in Brazil, that a small Corsa weighing 1200 kg at a speed of 50 km/h generated vertical components of 20.4 tons, twice the entire weight of the truck (10 tons). By "ignoring" this basic physical reality the American Standard is a dangerous reference for the rest of the world.

The utilization of a "rigid test fixture" can lead to wrong conclusions as well, by preventing the wedge effect during the test and changing the direction of effects on the structure, thus hiding the consequences of lifting the rear end of the cargo tray. By lifting the cargo tray even a few inches, the entire underride problem is exponentially aggravated, since as a physical reaction, the frontal part of the car is heavily compressed to the ground.

Attending to the citizen's natural clamor to have something to reduce the impact of the collision, NHTSA introduced with great emphasis the concept of "minimally compliant" guard, as if this "minimally" would be of any great help in absorbing a lot of energy. The bumper is allowed to deform a maximum of 125 mm before stopping the car, this deformation would absorb a maximum of 5,650 Joules. This represents only a marginal reduction on the intensity of the deceleration, the main and serious mistake is that this "authorized" deformation in the bumper will happen by bending the main vertical supports of the horizontal member at the point of insertion in the extremities of the main chassis beams. As an obvious consequence, the whole vertical plane of the bumper will lean forming an inclined surface (or wedge shape), exactly what should be avoided by facilitating the entrance of the car under the bumper, which means the terrible "Wedge Effect" again. This absurd allowance simply nullifies any purpose to provide safety, which means a

total lack of coherence of logic and is simple criminal negligence!

Even stranger to us is the deplorable fact that these Standards are applicable only to new trailers and semi trailers, excluding single-unit trucks which may be more dangerous than the heavy semi-trailers because they are easier to be lifted by the "Wedge Effect"! Who could explain this difference in treatment of such a vital safety issue?

According to the works of George Rechnitzer's team (Monash University-Australia), considered the highest authority on the engineering of these collisions, an energy absorbing guard would need a capacity of the order of 100,000 Joules to show some real benefit in reduction of the deceleration rate, and this work suggests completely specific projects as demonstrated in its reports (1) and (2), presented in the workshop "Heavy Vehicle Underride Protection TOPTec" presented by SAE in April of 1997, Palm Springs, California. Of course, other parameters like height in relation to the ground should also be respected. As a logical conclusion, we would rather have some disadvantages in deceleration, but certainly prevent decapitations! Furthermore, car makers have developed collapsible frontal structures to absorb a lot of energy in all kinds of frontal collisions, including trees and posts that never will have absorbing guards around them...

The established forces for the static test, P1=50 kN at a distances of 0.125 L of the extremities, P2=50 kN in the center, and P3=100 kN in the direction of the main chassis beams, were chosen as a result of tests at 30 mph (48km/h) showing some invasion of the passenger compartment, but with some reduction of the deceleration which was the objective for a minimally compliant guard. The tests were made with centered collisions and there is no reference to any suspension locking to simulate hard braking. Then it becomes clear that the guard will easily collapse in a 50% offset collision, even at lower speeds, which would represent the real scenery, and put much more responsibility on the guard supporting structure.

This absurd and dangerous negotiation of absorbing a little bit of energy, in an improvised way, and at the same time wishing to avoid PCI, results in a fake safety for car occupants and truck owners. Besides being deceiving for the automobilists, this regulation obliges trucks to carry useless scraps of steel. This means that millions of trucks are carrying thousands of useless tons of steel and continuing to kill people, sacrificing thousands of families each and every year. As the cumulus of fantasies, crowning the overall negligence, and as a maximum offense to the philosophy of safety to protect human beings, these false bumpers by being born in Government Offices acquire a legal status, even if their collapse causes fatalities. In rough terms, these guards have a license to kill innocents, without previous judgement...

This document presents the recommendations of some of the most renowned experts in the subject, as follows:

George Rechnitzer, Australia: P1 and P2 = 100 KN and P3 = 150 KN (as adopted by the UNICAMP tests)

Byron Bloch (Auto Safety Design), USA: P3 = 222 KN

The allowed 305 mm distance of the guard from the back of the vehicle is another absurdity, since this distance may represent 1/3 to 1/4 of the available distance to separate the car windshield from the rear of truck in the great majority of cars. This is another mistake in negotiating between preserving the escape angle of the trucks versus avoiding PCI, but introducing a great risk for the latter. Of course, this idea is to facilitate trucks negotiating ground obstacles, which is of fundamental importance. However, if this introduces severe risk to the automobilists, then the solution must provide a means to incorporate a lower ground clearance without stiff contact with the ground, like the articulated underride guard tested by the Impact Project from UNICAMP.

As a serious and additional negative consequence, the objective of absorbing a minimum of energy in the intended way, creates the possibility, depending on the impacting energy, of not activating the AIR BAG system, depending on the collision type. Then we would have the coronation of NEGLIGENCE + INCOMPETENCE + CARELESSNESS TO HUMAN LIFE, by applying a false safety measure to disable a true one!

NHTSA indicates that annually 11,551 collisions happen against the back of trucks, trailers, and semi-trailers, resulting in approximately 423 deaths and 5,030 injured people due to underride. In our opinion, these estimates are quite doubtful, since even at very low speeds, and the existing bumpers being useless, the passenger compartment intrusion is a natural consequence. With more than ten thousand accidents, and considering one person per vehicle, "only" 423 fatalities (3.6% of deaths) are almost an impossibility, and it looks like a fabricated statistic... Furthermore, if other statistics indicate that of 20 to 30 percent of the deaths in back collisions were due to alcoholism of the drivers, it is quite unlikely that those unfortunate people were so efficient in braking to avoid excessive underride...

According to the organization Citizens for Reliable and Safe Highways (CRASH) rear collisions resulted in 500 to 700 deaths due to underride, this is a variation that also indicates difficulties with the data collecting system. Lack of correct statistics, in this case, reveals lack of interest to protect society, or fear to confront the reality and the difficulties...

From other sources we know that, due to the different statistical treatments in each American state, there is not a uniformity of approach, which results in a lack of reliable statistics.

This Standard exempts the non-articulated chassis trucks (single-unit trucks) from the obligation to use the new rear underride guards. The reason is that, although they are 72% of the heavy vehicles fleet, they are causing "only" 18% of the fatalities. It is a scandal that bureaucrats place importance only to issues that occur within one calendar year, and "forget" that for society the suffering is cumulative, which means that in ten years you may have 8,000 to 10,000 families still crying for their beloved family members... Are these bureaucrats mad gods, with the power to define who will die or survive?

As a conclusion, from the lack of the government's real concern with the safety of the American family, studies at NHTSA from 1981 already agreed that the lack of rear conspicuity was a very important cause for rear collisions. They estimated that 15% of the collisions could be avoided with easy, simple, and cheap measures to create improved rear conspicuity. However, only in 1993 did it become mandatory to use reflective ribbons for new trucks, and only in 1999 for some of the others!

Conclusion:

The American system of public consultation for proposed rulemaking of Technical Standards is quite democratic. However, as in this case, the final regulation was dictatorially imposed, neglecting the opinion of respectable professionals, which means, using a power that could not be delegated by the American society, for sure. For lack of an energetic positioning of the society, that is generally notable for other cases in the USA, the problem persists, although continually denounced by important organizations like IIHS (Insurance Institute for Highway Safety), Public Citizen, and CRASH (Citizens for Reliable and Safe Highways).

As a tragic consequence for the whole of mankind, if the United States does not present good examples of traffic safety standards, developing countries without safety culture and with weak governments will also do nothing. Considering that JUSTICE and SAFETY ENGINEERING have a common objective in terms of providing a higher quality of life, in physical and in moral aspects, an intriguing question is why judges do not dedicate some time to study a new way to give priority for the weak part, that is, the human body inside a car, instead of continuing to condemn driver's failures, always human failures, some of them unavoidable. If the death of a human, when caused by the rear of a truck, in all circumstances, would be the responsibility of the truck owner, they would automatically look for reliable underride guards without any discussion, and many people would continue to live. In God we trust! Life is God's propriety.

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CRASH press release concerning new guard standard:

SAFETY ADVOCATES DECRY WEAK NEW U.S. REGULATION THAT WILL FAIL TO STEM TIDE OF VIOLENT DEATHS IN REAR IMPACT CRASHES WITH TRUCKS

29Year Delay Ends With Final Rule Requiring Inferior Underride Guard that Won't Curb "Roving Guillotines" Sellout to the Trucking Industry Exempts Most Trucks from Compliance

WASHINGTON, D.C. (Thursday, January 18, 1996) Safety advocates decried a new safety standard issued today by the U.S. government that requires some new tractor trailers to be equipped with an inferior rear impact guard that will prevent only a few deaths caused by cars colliding with the backs of trucks.

After 29 years of delay, the National Highway Traffic Safety Administration (NHTSA) announced the final rule on truck underride guards that Citizens for Reliable and Safe Highways (CRASH) warns:

Will save only 4 14 lives a year, even though more than 500 people are killed annually in rear impact crashes with trucks;

Rejects state of the art rear impact guards that could save scores of passenger vehicle occupants lives each year;

Exempts most trailers and semitrailers;

Exempts all single unit trucks;

Ignores crash deaths above 25 mph that are about 80 percent of annual rear impact fatalities; and Allows the rear impact guard to sit 22 inches off the ground, in spite of extensive research showing the guard should have a clearance of about 16 inches. "NHTSA sided with the trucking industry and turned its backs on the American public by settling for an inferior, cheap and quick fix," said Joan Claybrook, co chair of CRASH.

CRASH cochair Dr. Gerald Donaldson said that "after nearly 30 years of delay, NHTSA's underride guard in the final rule is too high, too weak, too cheap and too late."

Over the past several years, CRASH has been leading a "Stop the Roving Guillotines" campaign urging NHTSA to end "over a quarter century of disgraceful delay and neglect" by issuing a new standard requiring state of the art rear impact guards on all trucks to prevent the many violent deaths and injuries that occur when passenger vehicles collide with back ends of trucks.

Safety advocates have stressed that the rear impact guards found on many trucks today, required by an outdated Interstate Commerce Commission (ICC) regulation from 1953, are far too high for most passenger vehicles and they are made either too weak or too rigid. The ICC guard, which is usually mounted 25 to 30 inches above the ground, can slice through car occupant compartments like guillotines, or they can fail and allow the back ends of big trucks to slash into small vehicles, causing violent death and devastating injury to occupants.

There are 11,551 crashes annually where cars rearend trucks, trailers and semitrailers. CRASH says these collisions result in between 500 and 700 deaths and about 18,000 injuries. Truck trailers represent only 28 percent of heavy vehicles but account for 73 percent of occupant deaths and 80 percent of the injuries. Yet, the safety agency has saddled the trucking industry with a multimillion dollar bill for rear guards that will make almost no difference in the annual death toll of cars crashing into the rear of big trucks.

Safety organizations have repeatedly urged NHTSA to require that all trucks and trailers be equipped with velocity sensitive energy absorbing rear impact guards mounted

lower to the ground (16 inches) to effectively protect car occupants from death and injury in rear impact crashes. This safety technology is proven and well known.

The truck rear impact guard issue was the longest standing unresolved regulatory rulemaking in the federal safety agency's history. NHTSA proposed rear impact guard regulations for trucks in 1969 and 1981 that were never acted upon. In January 1992, the federal safety agency issued another proposal setting the rear underride guard 22 inches off the ground and weakening it even more because they claimed that any other design would be too costly to the trucking industry.

"The final chapter in NHTSA's response to the truck underride problem is a disgrace," Claybrook said. "NHTSA has repeatedly ignored the safety community's pleas for a superior standard that would require a lower to the ground, more energy absorbing, state of the art rear impact guard that costs less than an expensive car stereo system. These devices have been used in Europe with tremendous success."

In 1967, movie star Jayne Mansfield was decapitated in a truck "rear underride" collision that first drew national attention to the dangers of rear impact crashes with big trucks.

Donaldson said the truck underride guard proposed by NHTSA would provide little safety benefit over the ICC guard. "NHTSA admits that only 4 to 14 lives will be saved a year and that the majority of trucks would be exempted from this regulation." Donaldson said that the NHTSA guard "will still allow most people to die in rear impact crashes and to suffer permanently disabling injuries. NHTSA has done almost nothing to change this."

Claybrook said that "roving guillotines will still rule the roads."

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