

**“Old Underride Petition”
a 1981 regs.gov link from Clarence Ditlow
Revisited in 2016**

In June 2016, I received a link from Clarence Ditlow to a regs.gov Federal Register 1981 proposed truck underride rule. I just now got a chance to review it in detail and this is what I found:

1. “The safety standard proposed in this notice deals with the problem of rear underride. a problem that has been the concern of the Department of Transportation, the trucking industry, and the public for more than twenty years. Rear underride involves the front of a car or other small vehicle sliding under and colliding with the rear end of a truck or trailer. Underride occurs because the rear end of the struck vehicle is relatively high off the ground and there is too little structure under the rear end to resist the striking vehicle or the structure present is not strong enough to accomplish that purpose.”
2. “Deaths in accidents involving excessive underride usually result from severe head and upper body injuries. It has been estimated that excessive underride occurs in 30-40 percent of the fatal accidents in which passenger cars crash into truck rear ends.”
3. “Federal attempts to deal with the problem of rear underride date back to the early 1950’s. The initial effort was a regulation, 49 CFR 393.86, Rear End Protection. which was established by the Bureau of Motor Carriers of the. Interstate Commerce Commission (now the Bureau of Motor Carrier Safety (BMCS) of the Federal Highway Administration) in 1953. This regulation, which is still in effect today, requires most heavy motor vehicles to have a rear end device designed to help prevent underride.”
4. “The National Highway Traffic Safety Administration (NHTSA) initiated its rulemaking efforts to improve underride protection for passenger car occupants in 1967.”
5. “The agency had tentatively determined that a better regulation was needed because of the **continuing problem of fatalities and serious injuries** occurring in accidents involving excessive underride, and **because of the absence of efforts by the vehicle manufacturers generally to go sufficiently beyond the BMCS requirement.**”
6. “In 1971, after evaluating cost and accident data and reviewing all information received in response to the notices, NHTSA terminated those rulemaking efforts. The Administrator of the agency concluded that the safety benefits achievable with the particular type of underride guard then contemplated would not be commensurate with the cost of implementing the standard.”
7. “The agency had estimated that the proposed rule would save 50-100 lives per year at an annual cost to the consumer of \$500,000,000 .”
8. “Most of the implementation costs estimated by NHTSA were related to the increase in guard weight which it thought was necessary to meet the proposed requirements.”
9. “Efforts to improve underride protection resumed in 1977, after the Auto-Truck Crash Safety Hearing was held by Senator Wendell H. Ford. This hearing was the direct result of a program conducted by the Insurance Institute for Highway Safety (IIHS) in 1976.”
10. “This program focused on the problem of preventing excessive underride. IIHS performed five tests in which passenger car were crashed into the rear of a typical semi-trailer van. Two of the tests involved prototype guards developed by IIHS. These guards were essentially rigid.”
11. “[A rigid guard is one that can withstand a load impact in excess of 100,000 pounds without permanently deforming.] They were lightweight and built with diagonal struts which transmitted the collision forces from the guard bumper to the airframe of the van. These tests demonstrated that high strength underride guard structures can prevent excessive underride with little additional weight.”
12. “As a result of the Oversight Hearing, and of the petition for rulemaking subsequently filed by

IIHS, the Department of Transportation decided. to reexamine the problem of rear underride. BMCS and NHTSA jointly initiated a program to explore achieving improved rear end protection through further regulation.”

13. “Many comments were received from manufacturers of trucks and truck equipment shippers, and the general public. Most of the commenters were in favor of increased underride protection.”
14. “The question of what vehicles (if any) should be exempted from the guard requirement was the issue most frequently raised.”
15. “As parts of this joint program, NHTSA and BMCS let contracts for two research projects.”
16. “The research contracts focused on preventing excessive underride primarily through use of a rigid guard having a low ground clearance. This approach was similar to that followed by IIHS in its 1976 test program. The tests performed by TTI and DSI demonstrated what the IIHS program had shown earlier: that excessive underride could be prevented with rigid guards.”
17. “However, these tests further demonstrated that rigid guards increase the deceleration force experienced by car occupants in a crash and thus increase the risk of injury due to hazards other than underride.”
18. “Restrained dummies placed in passenger car that were crashed into the rigid guards at collision speeds of 35 mph or more experienced injury responses that are not within the ranges allowable under FMVSS No. 208.”
19. “This is significant because accident statistics indicate that at present, most accidents in which a passenger car collides with a heavy vehicle rear end are survivable. Data further indicate that a majority of the fatalities which do occur take place in accidents that do not involve excessive underride.” ??????
20. “In tests of large cars at 30 mph, underride was excessive in offset collisions but not when the collision was centric.”
21. “In addition, the TTI program tested a hydraulic energy-absorbing guard manufactured by Quinton-Hazell Automotive Ltd. ([Quinton-Hazell](#)). (An energy-absorbing guard is one that dissipates the energy of the impact in a controlled manner.)”
22. “The Quinton-Hazell device was very effective both at preventing excessive underride, reducing occupant injury responses, and reducing damage to the colliding vehicle.”
23. “To gain further insight into the consequences of guard design, NHTSA then performed a comparative engineering risk analysis.”
24. “This analysis used a car crash simulation model to determine the relative effectiveness of different underride guards. The model, known as the Underride Crash Analysis Model (SCAM), was used to simulate the crash of an automobile into the rear end of a heavy duty commercial vehicle equipped with an underride guard.”
25. “The output of UCAM was then used as input into the Risk Analysis Model (RAM). RAM computes the probability of a serious or fatal injury to restrained and unrestrained occupants under a variety of conditions which include car size, speed of the automobile, the position of the rear wheels on the truck or trailer, and occupant free travel distance.”
26. “(Occupant free travel distance is the distance that an occupant travels from his or her seating position to his or her point of impact with the vehicle interior.)”
27. “The algorithm used in the RAM to calculate the overall risk of injury under each set of conditions was designed to incorporate the effects of those parameters which have a significant impact on the level of injury suffered by unrestrained and restrained occupants.”
28. Have their conclusions been re-visited with the current crashworthiness of modern vehicles, e.g. the use of airbags among other things?
29. “For unrestrained occupants, the most important parameters are the extent to which the car underrides the truck and the velocity of the occupants with respect to the compartment itself.”

30. "For restrained occupants, the significant parameters are the extent of underride and the combination of the relative velocity and the level of acceleration experienced by the occupants."
31. "The RAM then uses these values and a postulated functional relationship describing the effect of each on the risk of serious injury to compute the overall risk of serious injury to the occupants of the automobile."
32. "This analytical procedure is explained in further detail in "Procedure for Determining the Risk of Injury to Passenger Car Occupants Involved in Rear End Collisions with Heavy Vehicles," a report prepared by Automated Science Group, Inc., "Factors Influencing the Risk of Injury in Passenger Car and Other Vehicle Collisions with Heavy Truck Rear End," by Conrad Cooke, and an SAE publication titled "An Approach to Developing Underride Guard Requirements for Improved Occupant Protection" (SAE No. 801422)."
33. "The objective of the analysis was to learn which type of guard provides the best *overall* protection for passenger car occupants."
34. "The analysis did not concentrate (as the earlier test programs had done] solely on determining which guard most effectively prevented excessive underride. The guards analyzed included rigid, energy absorbing, moderate strength, and current guards."
35. "The extent of occupant injury in truck rear end crashes in which there is no underride guard whatsoever was also analyzed."
36. "The effectiveness of each guard was analytically quantified by determining the risk of injury rated 3 or above on the Abbreviated Injury Scale (AIS), which covers the range of injuries from serious to fatal."
37. "The results of the risk analysis showed that energy-absorbing guards provide the best overall protection for car occupants in accidents in which cars crash into the rear ends of trucks. Conventional guards presently on the market provide the least protection. Moderate strength guards, although not as good as rigid guards in reducing the risk of excessive underride, produced an overall risk of injury for both restrained and unrestrained occupants which was approximately the same as that of the rigid guard. The performance of the moderate strength guard was reasonably comparable to the energy absorbing guard."
38. "In light of the IIHS, TTI, and DSI test programs and the comparative risk analysis, the agency is proposing to mandate the use of underride guards that are at least as strong as moderate strength guards."
39. "The NHTSA's objective in developing the proposed rule was to maximize overall occupant protection while minimizing cost and effect on trucking operations."
40. "The details of the rule were modeled on existing European Economic Community (EEC Directive 79/490/EEC) and Swedish regulations, which basically mandate an underride guard capable of withstanding a load of 45,000 pounds on the vertical support members combined. This harmonization of the proposed standard and European requirements is consistent with the Trade Agreements Act of 1979. "
41. "The proposed rule would apply to most trucks and trailers having GVWR's greater than 10,000 pounds, primarily to vans and platform trailers whose ground clearance at the rear of the vehicle is greater than 55 cm."
42. "As set out in paragraph S3, truck tractors, "low chassis" vehicles, and "wheels back" vehicles would be exempted."
43. "The proposed standard sets out certain configuration requirements in paragraph S5.1. The width, height, ground clearance and longitudinal placement of the guard are specified. The ground clearance of the proposed device must not exceed 55 cm (21.65 inches) at any point along its full width."
44. "This maximum clearance point was chosen for two reasons. First, the guard must be low enough to engage at least some part of the engine in a small car if the guard is to prevent

excessive underride.”

45. “Second the guard clearance must be sufficiently high so that normal trucking operations such as TOFC (Trailer On Flat Car] and RO-RO (Roll On-Roll Off) are not restricted.”
46. “The strength requirements of the rule are set forth in paragraph S5.2. The standard requires that the guard as installed be capable of withstanding separately applied loads without being displaced more than a specified distance..”
47. “The measurement must be made during the force application when the specified force level is reached. The maximum displacement of 40 cm permits energy absorbing guards (such as the hydraulic Quinton-Hazell device) to be used while ensuring that the device does not deflect so far that it fails to resist underride adequately.”
48. “ NHTSA realizes that the proposed rule permits guards to deflect as much as 40 cm, while wheels back vehicles must have the rear-most part of the tires on the rear axle no more than 30 cm from the vehicle rear extremity. However, the agency believes that permitting the use of the energy-absorbing guards that need this extra distance to operate effectively justifies the discrepancy.”
49. “The proposed rule specifies that a new untested guard is to be used for each test. This is the procedure that the agency will follow in performing its compliance tests. However, a manufacturer is not required to follow this procedure in determining in the exercise of due care whether his guard complies with the proposed rule. Thus, a manufacturer may test a particular underride guard more than once. However, the agency believes that in doing so the manufacturer may be subjecting his guard to,requirements that are more stringent than those set out in the rule.”
50. “As long as a manufacturer acts with due care, he can certify that his underride devices comply with the standard based on analytical means also. In making that analysis, the manufacturer must be certain that the design takes into account normal manufacturing variations 30 that his guards will comply with the standard when they are tested by the agency.”
51. “In developing the proposed rule, several alternatives were considered and tentatively rejected. One possible alternative that was urged by IIHS was to require the use of the rigid guard. NHTSA has tentatively rejected this option for two reasons.”
52. “First, while rigid guards are excellent at preventing excessive underride, they increase the deceleration forces experienced by car occupants in a crash, and thus increase the risk of injury due to hazards other than underride.”
53. “As noted above, this is significant because it appears from accident statistics that most crashes of passenger cars into the rear ends of i trucks and trailers do not now result in fatalities. A majority of those crashes that do result in deaths do not involve excessive underride.”
54. “Second, rigid guards that are lightweight have diagonal support members which tend to restrict rearward slider movement.”
55. “(A sliding undercarriage or a slider is a mechanism that permits the rear wheels of a trailer to be positioned in various locations along the longitudinal axis of the vehicle. The slider is positioned by carriers to achieve a preferred balance between regulated maximum axle load and maneuverability as necessary.)”
56. “This was true of the underride devices used by IIHS in their test program.”
57. “Because restricting slider motion causes payload displacement, these rigid guards are more expensive to use. Great Dane Trailers, Inc. contends that for every foot of slider restriction. 1720 pounds of payload are displaced. “
58. “The agency has tentatively decided not to require energy-absorbing guards such as the hydraulic Quinton-Hazell device.”
59. “This energy-absorbing guard is commercially available and is in service today in Europe.”
60. “As evidenced by the TTI tests and the comparative risk analysis, hydraulic guards are very

- effective both at preventing excessive underride and at reducing occupant injury responses.”
61. “Despite their apparent advantages, NHTSA will not mandate the use of energy-absorbing underride devices at this time because the agency feels that they are heavy and costly to use.”
 62. IMAGINE THAT!
 63. “Also, developing test procedures for energy-absorbing guards would require further study on the part of the agency.”
 64. “However, by permitting the guard to deflect as much as 40 cm during the force applications, the proposed rule allows manufacturers to put energy absorbing guards on their vehicles if they so desire.”
 65. But remember what the agency had already stated at the beginning of the proposed rule: “The agency had tentatively determined that a better regulation was needed because of the **continuing problem of fatalities and serious injuries** occurring in accidents involving excessive underride, and **because of the absence of efforts by the vehicle manufacturers generally to go sufficiently beyond the BMCS requirement.**” Did they really expect manufacturers to go beyond the mandate?
 66. “Such guards which are able to move during normal trucking operations may be attractive to manufacturers desiring to reduce damage potential due to docking impacts and obstacle engagement.”
 67. “NHTSA encourages the use of energy absorbing guards in light of their ability to mitigate injuries, as evidenced by the testing and the risk analysis.”
 68. **NHTSA cannot plead ignorance of the fact that their decision would pave the way for countless individual human beings to suffer horrific injuries and deaths due to preventable underride.**
 69. “Another possible solution to the underride problem that was considered by the agency is applying BMCS Regulation 393.80, Rear End Protection, to all trucks and trailers having GVWR’s greater than 10,000 pounds. This option, however, was tentatively rejected for two reasons.”
 70. “First, as noted above, that rule permits underride guards to have a ground clearance as high as 30 inches.”
 71. “Second, the BMCS regulation ab m does not set forth specific, objective load requirements for underride guards. The rule requires only that “the bumpers or devices be substantially constructed and firmly attached.” The BMCS standard thus does not insure that all underride devices are at least minimally capable of preventing excessive underride.”
 72. “In developing the proposed rule, NHTSA also considered the possibility of eliminating rear overhang by requiring back wheels to be located at the extreme rear of the vehicle.”
 73. “As shown in the TTI tests, the rear wheels when located in the extreme aft position provide good protection against excessive underride. Further, the restrained dummies used in these tests experiences injury responses that were within the allowable limits of FMVSS No. 208.”
 74. “The wheels back option also has some cost advantages. First, it negates the need for an underride guard. Second, it requires the rear wheel assembly to be permanently fixed on trucks and trailers. Vehicles so equipped are generally lower in weight and cost than vehicles equipped with a slider.”
 75. “Despite these advantages, the agency has tentatively decided to exempt “wheels back” vehicles from the standard instead of mandating that design for all vehicles. This would have the effect of making the use of the wheels back design an optional method of compliance.”
 76. “NHTSA has decided not to require the rear wheels to be fixed in the extreme aft position because such a requirement eliminates the flexibility provided by the slider. Since the wheels back design places an operational burden on the user, NHTSA has decided not to mandate its use.”

77. "One option that the agency is still considering is making the rear ends of heavy trucks and trailers more conspicuous through the use of lights, reflective tape, etc. The cost of this option is estimated at \$80 to \$200 per vehicle. NHTSA continues to study this option as a requirement in addition to the proposed standard."
78. And later, NHTSA would drag its feet in requiring [amber](#) turn signals instead of red.
79. "NHTSA stresses that the requirements set forth in the proposed rule are minimum requirements. If adopted truck and trailer manufacturers and owners would be able to place any type of underride guard—rigid, energy-absorbing, moderate strength, etc.--on their vehicle that meets the requirements of the rule."
80. Not that again.
81. "In light of the results of the risk analysis, however, the agency **suggests** that manufacturers interested in guards stronger than moderate load design consider using hydraulics or other means to absorb energy rather than merely making the guards more rigid."
82. "Under the proposed rule, truck owners would be able to use hinged guards if they so desire. Such underride devices may enable truck operators to avoid the operational difficulties that might be caused in some situations by a standard guard. Comment is requested . . . "
83. "The agency has analyzed the costs and benefits of the proposed rule as mandated by Executive Order No. 12221. A regulatory evaluation was done and has been placed in the public docket."
84. "NHTSA estimates that the proposed requirements could have prevented as many as 80 fatal injuries per year. if they had been fully implemented in the period from 1977 to 1979."
85. "An even greater number of serious injuries would have been prevented. "
86. "This is the benefit anticipated for passenger car and light truck occupants."
87. "In light of the increasing number of vehicles on the road and the trend toward smaller cars, it is expected that the number of lives saved and injuries avoided in the future will be even greater."
88. "It is estimated that the proposed rule would apply to 339,000 trucks and trailers a year according to 1978 statistics. about 85% of these vehicles would carry guards presently on the market in the absence of the requirements proposed today. The aggregate cost of the guard installation is estimated at \$9,980 million for heavy trucks per year and \$8.840 million per year for trailers."
89. "The cost of installing the proposed device is expected to be on the average \$50 more per guard than the cost of installing current guards. It is estimated that today's guards weigh , approximately 80 pounds and cost the consumer about \$35 per guard It is expected that the proposed guard will weigh 100 pounds and will cost the consumer around \$85 An added fuel cost of about \$500,000 per year at today's fuel prices is projected for the entire fleet of about 339,000 affected vehicles. The penalty for payload displacement is calculated at \$15,000 for the fleet."
90. "Another issue of concern to the agency in developing the proposed rule was the problem of small manufacturers."
91. "NHTSA believes, however, that small manufacturers would be able to comply with the proposed rule at a reasonable cost and without the use of sophisticated guards."
92. "Another option for the small manufacturer would be to purchase underride guards from a component manufacturer who has already done the compliance testing, and install the devices on his vehicles in a manner instructed by the component manufacturer to ensure certification."
93. "Therefore, NHTSA believes that small manufacturers would not experience significant problems in meeting the proposed requirements. However, the agency encourages comments on this issue."

Items not in quotes are my own thoughts and questions. Marianne Karth, 11/16/2016