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REQUEST TO LIST IN THE COMPENDIUM OF CANDIDATES THE UNITED STATES OF AMERICA FEDERAL MOTOR VEHICLE SAFETY STANDARD FMVSS No. 108 – LAMPS, REFLECTIVE DEVICES AND ASSOCIATED EQUIPMENT

Transmitted by the representative of the United States of America

Note: The document reproduced below is submitted by the United States of America to the Executive Committee (AC.3) for consideration. It contains a request to include in the Compendium of Candidates FMVSS No. 108 on Lamps, reflective devices and associated equipment.

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REQUEST TO LIST IN THE COMPENDIUM OF CANDIDATES THE UNITED STATES OF AMERICA FEDERAL MOTOR VEHICLE SAFETY STANDARD FMVSS No. 108 – LAMPS, REFLECTIVE DEVICES AND ASSOCIATED EQUIPMENT

The United States of America requests that the Federal Motor Vehicle Safety Standard (FMVSS) No. 108 – Lamps, reflective devices and associated equipment be listed in the Compendium of Candidates.

Background

In 1968, in response to Congressional initiatives, Federal Motor Vehicle Safety Standard No. 108, Lamps, reflective devices, and associated equipment, was established to set, on a national basis, the minimum requirements necessary for motor vehicle safety. Congress determined that the best first step of this action should be the codification of the existing performance levels in industry consensus standards. These were mostly standards and recommended practices written by motor vehicle and motor vehicle lighting engineers under the auspices of the Society of Automotive Engineers. Those standards had evolved since the beginning of motor vehicle lighting, and thus in 1968, were established as national law for motor vehicle lighting and its installation.

As the responsible United States of America Executive Branch agency, the National Highway Traffic Safety Administration (NHTSA) exercised its new authority, it sought to justify and improve safety value of automotive lighting. It initially studied side marker lamps, then only recently adopted by United States of America's Market vehicle manufacturers in 1967. The results of that study showed that side marker lamps on the sides of vehicles were costly. It also began to study performance enhancements of stop lamps, and the improvement of the visibility of large commercial vehicles at night. Both were deemed effective, achieving greater value then they cost. This lead to the requirement that these be mandatory devices to be used in conjunction with all other required lamps.

As the agency grew and matured, so did its Standards, in an attempt to keep performance in the face of ever-changing technology lighting.

Description of the Regulation

The regulation prescribes the photometric, material, environmental, locational and operational performance of all the lighting devices deemed the minimum necessary for reducing the risk of motor vehicle crashes. It applies to all motor vehicles, motorcycles, and trailers. It requires headlighting systems, park, tail, stop, turn, side marker, license plate and backup lamps. It also requires side and rear reflex reflectors. For wider, longer vehicles, it also requires front and rear clearance, and front and rear identification lamps, and for trailers and truck tractors, too, retro-reflective conspicuity treatments.

The regulation has been upgraded dozens of times, to incorporate newer performance criteria, to accommodate newer lighting technology, and to harmonize with other regulations around the World.

Recently, in 2004, the United States of America amended FMVSS No. 108 in order to harmonize and improve the visibility requirements of motor vehicle turn signal lamps, stop lamps, tail lamps and parking lamps. Specifically, this rulemaking will enhance the conspicuity of motor vehicles by improving the ability to see these lamps from wider angles to the front, side, and rear of the vehicles. In addition, to enhancing the conspicuity, this rule will improve compatibility of our lighting requirements with those of United Nations Economic Commission for Europe (UNECE), as well as the industry consensus standards of Society of Automotive Engineers (SAE). Consequently, this rule will reduce lighting variations between motor vehicles produced in various world markets, resulting in lower production costs. More details on this final rule can be found in the Federal Register, Docket number NHTSA-2004-18794.

Lighting and Conspicuity Device Effectiveness Evaluations

NHTSA conducted two studies to evaluate the effectiveness on lighting and conspicuity devices (1) the center high mounted stop lamps evaluation and (2) the effectiveness of retroreflective tape on heavy trailers.

(1) Summary of the Center High Mounted Stop Lamps Evaluation

In 1998, NHTSA published a technical report entitled "The Long-Term Effectiveness of Center High Mounted Stop Lamps in Passenger Cars and Light Trucks." This report describes the effectiveness of the Center High Mounted Stop Lamps (CHMSL) year by year, from 1986 through 1995. CHMSL have been standard equipment on all new passenger cars sold in the United States of America since model year 1986 and all new light trucks since model year 1994, as required by Federal Motor Vehicle Safety Standard No. 108. The purpose of CHMSL is to safeguard a car or light truck from being struck in the rear by another vehicle. When brakes are applied, the CHMSL sends a conspicuous, unambiguous message to drivers of following vehicles that they must slow down. NHTSA was especially encouraged to promulgate the CHMSL regulation in 1983 by three highly successful tests of the lamps in taxicab and corporate fleets, showing 48 to 54 per cent reductions of "relevant" rear-impact crashes in which the lead vehicle was braking prior to the crash, as reported by the study participants. Since nearly two-thirds of all rear impact crashes involve pre-impact braking by the lead vehicle, these results are equivalent to a 35 per cent reduction of rear-impact crashes of all types. The statistical analyses are based on police-reported crash files from eight States. It was found that:

- The lamps were most effective in the early years. In 1987, CHMSL reduced rear impact crashes by 8.5 per cent (confidence bounds 6.1 to 10.9 per cent).

- Effectiveness declined in 1988 and 1989, but then levelled off. During 1989-95, CHMSL reduced rear impact crashes by 4.3 per cent (confidence bounds 2.9 to 5.8 per cent). This is the long-term effectiveness of the lamps.

- The effectiveness of CHMSL in light trucks is about the same as in passenger cars.

- At the long-term effectiveness level of 4.3 per cent, when all cars and light trucks on the road have CHMSL, the lamps will prevent 92,000-137,000 police-reported crashes, 58,000-70,000 non-fatal injuries, and US$655,000,000 (in 1994 dollars) in property damage per year.

- The annual consumer cost of CHMSL in cars and light trucks sold in the United States of America is close to US$206,000,000 (in 1994 dollars).

- Even though the effectiveness of CHMSL has declined from its initial levels, the lamps are and will continue to be highly cost-effective safety devices.

The most important finding of the evaluation is that, in the long term, passenger car CHMSL reduce rear impacts by 4.3 per cent (confidence bounds: 2.9 to 5.8 per cent). Even though that effectiveness is well below the levels in earlier studies, and CHMSL can no longer be considered a "panacea" for the rear-impact crash problem, the benefits of CHMSL still far exceed the modest cost of the lamps, and CHMSL will continue to be a highly cost-effective safety device. The principal findings and conclusions of the study are the following:

Passenger car CHMSL year-by-year trend of overall effectiveness

- The effectiveness of passenger car CHMSL did not have a statistically significant downward trend during 1989-95. The average effectiveness in 1989-95 was 4.3 per cent. It may be concluded that the lamps reached their long-term effectiveness level of 4.3 per cent in 1989. Passenger car CHMSL were significantly more effective for the period 1987-88 than for 1989-95. The effect in 1987, 8.5 per cent, was nearly double the long-term effect.

- Effectiveness of passenger car CHMSL, and its confidence bounds, by calendar year:

CY Group	Rear Impact Reduction (%)	Confidence Bounds
1986	5.1	2.5 to 7.7
1987	8.5	6.1 to 10.9
1988	7.2	4.8 to 9.5
1989-95	4.3	2.9 to 5.8

- There was little State-to-State variation in the effectiveness of passenger car CHMSL.

Passenger car CHMSL long-term effectiveness by crash type, etc.

- The long-term effectiveness of passenger car CHMSL is about equal in property-damage and non-fatal-injury crashes.

- The lamps had little or no effect on fatal rear-impact crash rates at any time during 1986-95.

- locations away from traffic signals than at locations equipped with traffic signals. Since 1989, they have been more effective in preventing two-vehicle crashes than in preventing crashes involving three or more vehicles.

- The lamps may be somewhat more effective in towaway than in non towaway crashes. They may be somewhat more effective on wet roads than on dry roads. Effectiveness may be slightly higher in rural than in urban crashes.

- In general, the simpler the accident scene, the more effective the CHMSL. The more a driver is distracted by other lights or traffic features, the less effective the CHMSL.

- CHMSL effectiveness in the struck vehicle in a front-to-rear collision is about the same whether the driver of the striking vehicle is young or old, male or female.

Light truck CHMSL

- Initial crash data from six States show that light trucks equipped with CHMSL have 5 per-cent lower rear-impact crash rates than light trucks without CHMSL. The reduction is statistically significant (confidence bounds: 0.3 to 9.4 per cent).

- Although the observed point estimate of effectiveness for CHMSL in light trucks (5.0 per-cent) is close to the lamps' long-term effectiveness in passenger cars (4.3 per cent), the uncertainty in the light-truck estimate, at this time, does not yet permit the inference that the lamps are equally effective in cars and trucks.

- These initial analyses did not show any significant variations in CHMSL effectiveness by light truck type (pickup, van, sport utility) or size (full-sized, compact).

Long-term benefits and costs

- At the long-term effectiveness level (4.3 per cent reduction of rear-impact crashes), the public would obtain the following annual benefits when all cars and light trucks on the road have CHMSL:

- The consumer cost of CHMSL averages US$13.60 per vehicle (in 1994 dollars), except in certain multistage trucks where it may be 50 per cent higher. The annual cost of CHMSL in cars and trucks sold in the United States of America is close to US$206 million.

- Since the value of property damage avoided, alone, far exceeds the cost of CHMSL, the lamps still are and will continue to be highly cost-effective safety devices.

(2) Summary of the effectiveness of retroreflective tape on heavy trailers evaluation

In 2001, NHTSA conducted an evaluation on the effectiveness of retroreflective tape in enhancing the visibility of heavy trailers and reducing side and rear impacts by other vehicles into these trailers during dark conditions. The analysis shows that the tape is quite effective. It reduced side and rear impacts into trailers, in dark conditions by 29 per cent. In "dark-not-lighted" conditions, the tape reduced side and rear impact crashes by 41 per cent. Tape is especially effective in reducing injury crashes. In dark conditions, it reduced side and rear impacts that resulted in fatalities or injuries to drivers of any vehicle by 44 per cent.

Background

All heavy trailers manufactured on or after 1 December 1993 must be equipped with red-and-white retroreflective tape, sheeting and/or reflex reflectors around the sides and rear to make

them more conspicuous. The NHTSA established this requirement, with its various options, in December 1992 by amending FMVSS No. 108. However, retroreflective tape has been used almost exclusively for meeting the standard, and it is the subject of this evaluation. Heavy trailers are at least 80 inches wide and have a Gross Vehicle Weight Rating over 10,000 pounds.

The purpose of retroreflective tape is to increase the visibility of heavy trailers to other motorists, especially in the dark. At those times, the tape brightly reflects other motorists' headlights and warns them that they are closing on a heavy trailer. In the dark, without the tape, many trailers do not become visible to other road users until they are dangerously close. The alternating red-and-white pattern flags its bearer as a heavy trailer and at the same time helps other road users gauge their distance and rate of approach. This report evaluates the effectiveness of the tape in reducing side and rear impacts into heavy trailers - primarily in dark conditions where even a vigilant motorist might not see an untreated trailer in time to avoid a crash, and secondarily in daylight, where the tape might alert inattentive drivers that they are approaching a trailer.

In March 1999, the Federal Highway Administration extended the application of this important protection to the entire on-road trailer fleet by directing motor carriers engaged in interstate commerce to retrofit heavy trailers manufactured before December 1993 with tape or reflectors. These older trailers must have some form of conspicuity treatment, by 1 June 2001, in the locations specified by the NHTSA standard for new trailers, except on the rear impact guard. In other words, as of June 2001, almost all heavy trailers on the road will have some form of conspicuity treatment. This Federal Motor Carrier Safety Regulation furthermore gives motor carriers until 1 June 2009 to retire their pre-1993 trailers or retrofit them with treatments that conform exactly to the NHTSA standard with the exception of the rear impact guard.

Since none of NHTSA's crash data at hand (FARS, NASS, or State files) identified whether crash-involved heavy trailers had retroreflective tape, NHTSA worked out agreements with the Florida Highway Patrol (FHP) and the Pennsylvania State Police (PSP) to collect data for this analysis. For a two-year period, each time these agencies investigated a crash involving a tractor-trailer and filed a crash report, they also filled out an "Investigator's Supplementary Truck-Tractor Trailer Accident Report" on every trailer in the crash. The FHP collected 6,095 crash cases from 1 June 1997, through 31 May 1999. The PSP collected 4,864 crash cases from 1 December 1997, through 30 November 1999.

The analysis estimates the reduction of side and rear impacts by other vehicles into tape-equipped trailers in dark conditions - relative to the number that would have been expected if the trailers had not been equipped. It is based on tabulating and statistically analyzing crash involvements of tractor-trailers by three critical parameters: (1) whether or not the trailer is tape-equipped; (2) the light condition - dark (comprising "dark-not-lighted," "dark-lighted," "dawn" and "dusk") vs. daylight; and (3) relevant vs. control-group crash involvements. Relevant crash involvements are those where another vehicle crashed into the side or rear of a heavy trailer, because the tape can help the other driver see and possibly avoid hitting the trailer. The control group consists of single-vehicle crashes of tractor-trailers (where visibility of the tractor-trailer to other road users is not an issue at all) and impacts of the front of the tractor into other vehicles (where conspicuity of the side and rear of the trailer is also not an issue).

The principal conclusion of the study is that retroreflective tape is quite effective, and it significantly reduces side and rear impacts into heavy trailers in the dark. Other findings and conclusions are the following:

Annual benefits of conspicuity tape

- When all heavy trailers have conspicuity tape, the tape will be saving an estimated 191 to 350 lives per year, preventing approximately 3,100 to 5,000 injuries per year, and preventing approximately 7,800 crashes per year, relative to a hypothetical fleet in which none of the trailers have the tape.

Crash reductions by lighting conditions

- In dark conditions (combining the subsets of "dark-not-lighted," "dark-lighted," "dawn," and "dusk"), the tape reduces side and rear impacts into heavy trailers by 29 per cent. The reduction is statistically significant (confidence bounds: 19 to 39 per cent).

- However, the tape is by far the most effective in dark-not-lighted conditions. Here, the tape reduces side and rear impacts into heavy trailers by 41 per cent. The reduction is statistically significant (confidence bounds: 31 to 51 per cent).

- In dark-lighted, dawn, and dusk conditions, the tape did not significantly reduce crashes. The tape also did not significantly reduce crashes during daylight.

Crash reductions for specific subgroups in dark conditions

The effectiveness estimates here are the per centage reductions of various subgroups of the side and rear impacts into heavy trailers in dark conditions. As stated above, tape reduces these crash involvements by 29 per cent, overall.

- The tape is especially effective in preventing the more severe crashes, specifically, injury crashes. Impacts resulting in fatal or nonfatal injuries to at least one driver are reduced by 44 per cent.

- The tape is more effective when the driver of the impacting vehicle is young. The crash reduction is 44 per cent when the driver of the impacting vehicle is 15 to 50 years old, but only 20 per cent when that driver is more than 50 years old. A possible explanation of this difference is that older drivers are less able to see, recognize and/or react to the tape in time to avoid hitting the trailer.

- The tape may be somewhat more effective in preventing rear impacts (43 per cent) than side impacts (17 per cent) into trailers; however, this difference is not consistent in the two states.

- The tape is effective in both clear (28 per cent) and rainy/foggy weather conditions (31 per-cent).

- The tape is especially effective on flatbed trailers (55 per cent). These low-profile vehicles must have been especially difficult to see in the dark before they were treated with tape.

- Dirt on the tape significantly diminished its effectiveness in rear impacts. Clean tape reduces rear impacts by 53 per cent but dirty tape by only 27 per cent.

Status of tape in the 1997-1999 crash data

- Almost 50 per cent of the pre-standard trailers in the study had retroreflective tape. The retrofit of these older, pre-1993 trailers was already well under way in 1997 - 1999.

- More than 60 per cent of the trailers with retroreflective tape had clean tape at the time of the study. About 30 per cent of the trailers with tape had some dirt and less than 5 per cent had "very dirty" tape.

- About 96 to 99 per cent of the retroreflective tape on the side of trailers was intact, while 92 to 95 per cent of the tape on the rear of trailers was intact.

Related documents:

Final Rule - Lamps, reflective devices and associated equipment
The Effectiveness of Retro-reflective Tape on Heavy Trailers
The Effectiveness of Center High Mounted Stop Lamps

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