

BASt topics

Information from the Federal Highway Research Institute

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Current topics concerning highway equipment



Every day different objects of highway equipment provide an essential contribution to road safety. Therefore, their functionality during the permanent as well as temporary use has to be ensured throughout their entire time of use. At the Federal Highway Research Institute (BASt), section Highway Equipment, these challenges are met in internal and external research projects. Currently several research projects have been launched which deal i.a. with life cycle costs of safety barriers, the safety effects of road markings as well as safety aspects of safety barriers under the impact of motorcyclists. These various research projects focus on the development of practical solutions to improve road safety. To implement the new research results into practice, there is a close contact and technical exchange with federal road authorities.

In this context for example a new guideline for special-purpose solutions to protect cars from impacts on trees and other obstacles at rural roads has

been prepared, in which instructions for a preventative installation of safety barriers within narrow boundaries are given. The guideline is published on the website of BASt (www.bast.de).

This guideline provides the federal road authorities for the first time with precise suggestions how to safeguard trees especially in confined spaces. The corresponding example sheets, showing possible solutions, are frequently updated to add new innovative and positively tested products.

A similar procedure is followed in other fields of highway equipment, where BASt is continuously dealing with the further developments in the product market, the adaptation of testing methods as well as the development of new guidelines. Their elaboration, however, is taking place in the difficult context of the compatibility of national and European interests. Currently almost all European standards concerning highway equipment are

in a revision process with significant participation of BASt.

The Testing Laboratory for Highway Equipment which has been accredited by the Deutsche Akkreditierungsstelle GmbH (DAkkS) is also part of the section Highway Equipment of BASt. Here, regular testing of various items of highway equipment is carried out by order of third parties. Especially the turntable road-marking test system (RPA), where road marking systems are tested in respect of visibility, durability and grip characteristics according to European standards, has to be mentioned in this context. In 2017 about 150 road marking systems produced by 32 different manufacturers from home and abroad were tested.

Concerning the topic automated driving road markings are going to play an important role in the future. That is why BASt will put a special focus on this topic in 2018 in internal as well as external research projects.

Impact of heavy goods vehicles with different payload on crashworthiness of safety barriers

In TRANSFORMERS, a recent co-funded EU project in the Seventh Framework Program, different configurable and adaptable trucks and trailers were developed for optimal transport efficiency. Further information is available at: www.transformers-project.eu.

For an aimed CO₂-reduction of 25% aerodynamic measures and new technologies have been implemented in two prototypes of trailers:

- Energy Efficiency Trailer: "Hybrid on demand" concept with electric driveline (41 t).
- Load Efficiency Trailer: Adaptable cargo optimization with a second cargo floor (40 t).

In most European countries the maximum permissible weight for heavy goods vehicles is 40 t (exemption for combined transport: 44 t). An extra one ton for alternative powertrain can be used in the electric hybrid-on-demand frame according to paragraph (6) and (7) of Directive 2015/719/EC.

These new vehicle configurations might have an influence on infrastructure and needed to be analyzed with regards to their impact on the road and the road equipment. For traffic safety reasons the mechanical impact on different types of safety barriers have been assessed using numerical simulations (instead of cost- and time-expensive crash tests).

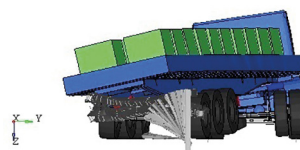
For the simulation activities Finite-Element models of a concrete wall and a steel guardrail with a containment level of H4b were developed. H4b safety barriers traded in Europe have to pass a crash test with a truck according to the European harmonized standard EN 1317. The

test setup requires a vehicle weight of 38 t, an impact velocity of 65 km/h and an impact angle of 20°.

In a first step and for validation reasons a vehicle configuration with 38 t was calculated and compared to real crash tests according to EN 1317. Based on this crash scenario following vehicle configurations were investigated.

Case 1 (41 t): Additional masses for the electric driveline components

Time = 1.499998 s

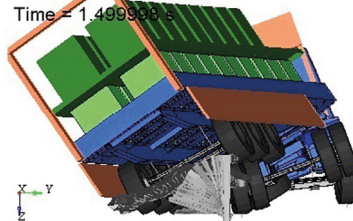


Time = 3.500000 s

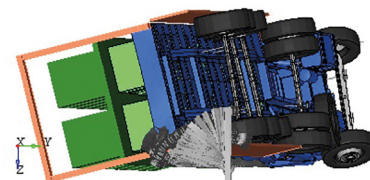


Case 2 (40 t): Additional masses for aerodynamic measures and a second cargo floor

Time = 1.499998 s



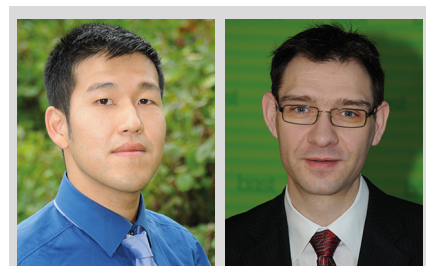
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Investigations showed that the selected H4b safety barriers with the highest containment level available on the market are just able to contain common heavy goods vehicles with different distributions of payload not least because of their double-row installation in the median of highways.

However high centers of gravity of the payload have been identified as a critical issue with regard to the risk of rollover in crashes with safety barriers. Features such as the hybrid driveline concept developed in TRANSFORMERS instead tend to lower the center of gravity, thus improving crash behaviour.

If the trend towards heavier optimally loaded vehicles (case 2) continues and the percentage share of those vehicles exceeds a certain limit and/or higher speed limits for HGV are requested in the future, additional requirements for payload positions will be highly recommended in a further amendment of Directive 2015/719/EC. Alternatively or in addition a potential amendment of EN 1317 might improve the crashworthiness of safety barriers by introducing other vehicle configurations and/or other containment levels.



Xiaochen Yu

Holger Schwedhelm

BAST researchers section Highway Equipment

Russian delegation

Russian experts in the field of asphalt road construction visited BAST on 15 November 2017. The delegation of representatives of the Russian road authorities RovAvtoDor, GK AvtoDor, asphalt manufacturers, road constructors and the RosAsfalt-association was accompanied by employees of the Basalt Actien-Gesellschaft, who organized the visit to

Germany. The interest of the visitors was in BAST as an internationally recognized research institution and in the European standardization work, which was discussed with Rudi Bull-Wasser, BAST head of section Asphalt Pavements.



CEN expert group 'In Situ Concrete Barriers'

The European standardization group CEN/TC226/WG1/TG2/SG 'In Situ Concrete Barriers' met several times at the Federal Highway Research Institute (BAST) in 2016 und 2017. Under the leadership of Ilja Jungfeld from BAST section Highway Equipment experts from eight countries (Austria, France, Belgium, Spain, Great Britain, Italy, Sweden and Germany) discussed different issues concerning in situ concrete barriers, which might be considered for a possible future product certification (CE-marking) in the product and testing standards of EN 1317-series. Experts representing manufacturers, national road authorities, test houses and notified certification bodies were involved in these discussions.

In situ concrete barriers belong to the family of vehicle restraint systems for road equipment just as systems made of steel and precast concrete parts. They consist of concrete and reinforcement elements and are made in situ by a driven slipform machine. Vehicle restraint systems are designed



CEN expert group 'In-Situ Concrete Barriers', 2nd meeting 2017 at BAST

to redirect respectively contain errant vehicles safely in order to prevent a break-through and a rollover of vehicles, for the benefit of the occupants, other road users and third parties.

During the experts' discussions especially the general technical feasibility of a CE-marking for such safety barriers - in Germany often used in the central reservation of federal highways - was analyzed. The experts agreed that the technical issues for in situ concrete barriers could be included in EN 1317 and in a testing and certification

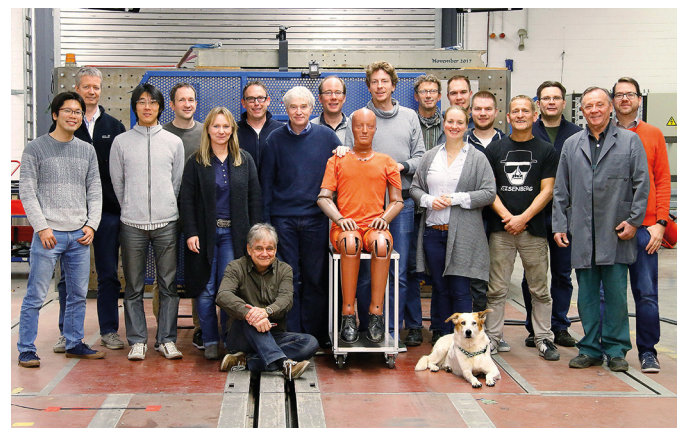
procedure, if modifications of the current procedures - valid for all construction products - can be made. However it became apparent that some questions are still unanswered and cannot be clarified by standardization. Answering these questions will be important for an applicable production and installation of in situ concrete barriers. The results of the expert group work are currently discussed further inside CEN standardization groups as well as between the European Commission and member states.

Successful guest scientist visits



Shoichi Kume, Japanese visiting researcher from Hanshin Expressway (Osaka, Japan), successfully completed his one-year research visit to BAST at the end of June 2017. Mr. Kume conducted numerical studies on smoke propagation in road tunnels using the FDS (Fire Dynamic Simulator) program and comparative measurements on the model tunnel of BAST (see picture). His research results have led to a scientific paper, which he co-authored with BAST researcher Christof Sistenich. The paper was accepted at the International Conference on Tunnel Safety and Security (ISTSS) and will be presented in Sweden in early 2018. Overall, Mr Kume's research stay was very positive for BAST. There was a lively exchange and a lot of possibilities to learn from each other.

From the Korea Transportation Safety Authority (KoTSA), Hochan Lee was on a two-month study visit at BAST. BAST colleagues from departments Automotive Engineering, Behaviour and Safety as well as Traffic Engineering provided him with information and practical experience on a variety of safety related topics.



In 2017 two further Japanese visiting scientists completed their visits in the section Passive Vehicle Safety and Biomechanics. Both supported the BAST colleagues in the EU project SENIORS in the simulation of numerical human models. Takayuki Kawabuchi of Honda R & D Co. (on the left in the photo) stayed for six months and Akihiro Kurita of Toyota Motor Corporation (beside to the right) for one year.



Relaunch of advisory boards

In 2017, BAST made an organizational adjustment of the existing structure of its advisory board leading to an advisory board and two technical advisory councils. The advisory board is dedicated to strategic issues with a cross-BAST character as a superior body. The advisory board includes

personalities with management experience from the scientific, institutional or ministerial field. The advisory board is headed by Professor Ressel, Rector of the University of Stuttgart.

The two technical advisory councils with the topics 'traffic safety' and

'traffic infrastructure' also advise BAST on strategic issues, but with a stronger technical focus.

The first meeting of the advisory board took place on 19 October 2017 at BAST, the first meetings of the two technical advisory councils on 29 and 30 November last year.

BAST launched inhouse competition

In 2017, an in-house competition as a new research funding instrument has been launched for the first time. This method, which has been practiced in other research institutions for quite some time, is a formally controlled BAST internal competition, addressing a given reference topic. The selection of proposals to be supported is made by the President and members of the Advisory Board.

The subject of the call for tenders in 2017 was 'Automation in Road Traffic and Road Construction'. BAST received three applications for this in-house competition. All three applications were well-structured, well-thought-out and well-targeted. Finally, in the proposal 'Requirements of automated vehicles to lane markings' led by section V4 the interdepartmental and interdisciplinary cooperation was most clearly identified. At the same time, the urgency of the research questions raised was particularly evident.

Therefore, the tendered grant 'Requirements for automated vehicles at lane markings' was assigned to the proposal.

The objective of the proposal is to investigate the requirements for lane markings resulting from automated driving. It will also examine the implications of these requirements on the various stakeholders (including the development of initial concepts for future areas of action).

The following research questions are in the focus of the planned activity:

- Which requirements arise from the machine perception on the quality and availability of markings?
- How do the requirements on the vehicle side relate to the requirements relevant to humans as well as the roadside status quo?
- Is there any need for action in quality assurance, the measuring procedure, etc.?

Award for Andre Seeck

One of the most significant vehicle safety conferences, the International Technical Conference on Enhanced Safety of Vehicles (ESV), took place in June 2017 in Detroit (USA). To honor outstanding personalities in the field of vehicle safety, Andre Seeck, head of department Automotive Engineering, was awarded with the "NHTSA Special Award of Appreciation". This award is for special leadership tasks and outstanding contributions in the field of vehicle safety. Andre Seeck received the award for his contributions to the assessment of Euro NCAP vehicles (European New Car Assessment Program) and his presidency of Euro NCAP (2010 to 2014).



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www.bast.de

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