TEST METHODS FOR SENSORS OF ROAD WEATHER STATIONS

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ABSTRACT

Today, the winter service is in the conflict of goals between traffic safety, capacity conservation, cost-efficiency and environmental impact. It should not only eliminate smoothness quickly, but avoid in advance. Therefore the winter service has be active before the occurrence of a smoothness. The corresponding activities cannot be carried out by means of control trips, since the development of the relevant parameters for a smoothness development can only be inadequately observed from a moving vehicle. For this reason, the winter service personnel must obtain the necessary data on the date of origin and the further development of a possible smoothness from other sources.

Special road condition- and weather information systems are now available for this information. They are an indispensable prerequisite for an appropriate winter service to ensure high traffic safety while at the same time providing low resource consumption and low environmental impact.

The quality of the decisions depends on the quality of the predictions and their quality again on the basis of the measurement data of the road weather stations. The data quality must usually be guaranteed by the road construction authorities themselves. To assess the quality of road weather stations, various investigations have been carried out at BASt in recent years.

The correct estimation of the mentioned parameters requires necessary measurement accuracy. The European Standard EN 15518-3 8 (DIN 2011) provides corresponding requirements according to the state of the art. Appropriate procedures have been developed for the verification of the requirements. The procedures are described in a German regulation on data recording on roads (TLS, BASt 2012) and in the European pre-standard CEN/TS 15518-4 (DIN 2013).

The results are based on various investigations with sensors, among others on the test field of the BASt at the BAB A4 for road weather stations as well as experiments with sensors in the BASt laboratory.

Since the second half of 2016, various sensors have been available for assessment purposes in the BASt test field. One focus is the comparison of remote (non-contact) sensors and pavement (in build) sensors for parameters of the roadway. The remote sensors are quite new on the market. Furthermore, sensors for precipitation, air temperature, dew point and relative humidity are tested. A second focus is the verification of test results obtained in the laboratory. This is used to examine the practicability of these procedures.

All remote sensors for the road parameters and for the atmospheric parameters are mounted on masts on the edge of the road (Fig. 1). All pavement sensors are installed in the middle of the left lane.

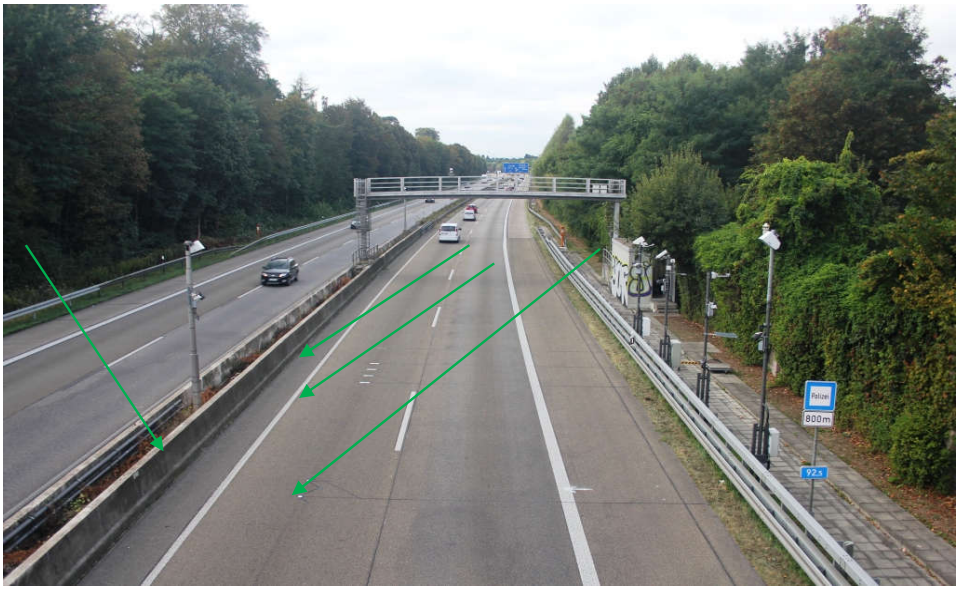

Figure 1: Test field of the BASt for road conditions and weather data (the arrows indicate the center points of the measuring surfaces of the remote sensors)

The data from all sensors on the test field are stored on a server every minute. They can be compiled using customized software. In addition to the sensor data, a photo of the five installed cameras is stored every minute. Data and photos of any time period can be viewed easily in the software. Thus, the situations can be judged qualitatively at a later stage.

With the test field data and associated laboratory tests the most diverse sensors for road weather stations could be evaluated. Different road weather sensors, but not all types of them, can measure the most important parameters (road surface temperature, dew point temperature, moisture on the roadway [yes/no] and precipitation) with a sufficient accuracy. For the decision making process the tolerances which occur must be taken into account in the measurement accuracy for the individual parameters.

Quantitative data on sensors, in particular regarding the water film thickness, freezing temperature or the precipitation intensity, show high differences in comparison tests under the same conditions. This also applies to remote sensors for the road surface temperature. Under practical conditions and partly even under laboratory conditions, it is currently difficult to test the accuracy of the sensors sufficiently. In future, corresponding developments for the sensors them self as well as for their testing under practical conditions are urgently required. Only in this way these sensors can provide further advantages in winter service decisions. They should not be used until proof of a reliable operation.

A precise control of all sensors after a new installation is necessary to ensure the desired accuracy. Continuous control is also necessary during use time. Maintenance can provide automatic plausibility checks, which can indicate possible measurement errors.

With a corresponding control and maintenance management a high reliability and accuracy of the road weather stations can be achieved. A sufficient number of staff should be available. This is the only way to ensure a high quality of the slippery forecasts which are the basis for a purpose-oriented winter service with high profitability for traffic- safety and -capacity at the lowest possible costs.

REFERENCES

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