Road and Transportation Research Association (FGSV)
Working Group “Asphalt constructions”

FGSV

H VVA

Notes

on reopening asphalt pavements to traffic

Editon: 2022

W 1

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Note:

The “Notes on reopening asphalt pavements to traffic” (H VVA), edition 2022, have been prepared by the Road and Transportation Research Association as part of the working party “Earlier reopening to traffic” and finalised by the working committee “Construction technology” (head: Dipl.-Ing. Lars Keller).

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1 General

According to the “Additional technical terms of contract and guidelines for the construction of road surfacing from asphalt” (German designation: ZTV Asphalt-StB 07/13), Section 1.3 Construction Principles, asphalt base courses must cool down for 24 hours or 36 hours before being reopened to traffic if the base layer has not cooled down sufficiently. These times can be described as standard cooling periods and have proven their worth over many years.

However, according to ZTV Asphalt-StB 07/13, Section 1.3, earlier reopening to traffic can be agreed in the construction contract and is justified in exceptional cases when at least one night has elapsed between construction and reopening of the section of road to traffic.

This option regularly leads to uncertainties in construction contracts.

For construction execution, especially for structural maintenance measures, it can make sense from a traffic point of view, but also economically, to reduce the length of these cooling periods. To do so, the placed asphalt layer must have sufficient resistance to deformation to ensure it can be reopened to traffic. In terms of determining the required and sufficiently long cooling period, it is not enough to simply measure the surface temperature of the placed asphalt layer. The surface temperature generally deviates considerably from the inner temperature of the asphalt layer due to weather-related issues.

Determination of an earlier time for reopening to traffic depends on the development of the resistance to deformation during the cooling phase of the placed asphalt layer. This requires that the deformation behaviour of the asphalt layer is continuously measured during the cooling phase. The

“Notes on reopening asphalt pavements to traffic” (H VVA) describe a method with which, depending on the deformation behaviour of a rolled asphalt base course determined by in situ testing, an earlier time for reopening a section of road to traffic can be derived and used instead of the well-known fixed cooling periods. The method utilises a “Modified Light Weight Deflectometer” (Mod. LWD) to test the deformation behaviour. The instructions for performing this procedure are described in Annex A. Notes on the invitation to tender are contained in Annex B.

Information documents are suitable neither as a basis for contracts nor as a policy tool in connection with their main (primary) purpose. According to their secondary purpose, information documents can also be used, in excerpts or in a modified form, as an integral part of the contract in the technical specifications for construction work, supplies, services and freelance services (see FGSV 2018: “Basic principles for the creation of technical regulations and knowledge documents for road and traffic engineering”, edition 2018).

2 Definition of terms

The definitions of all key road and traffic engineering terms can be found in the current version of “Definition of road and traffic engineering terms” (BBSV) published by FGSV. The following explanations are based on the said document and in some cases provide supplementary comments. Further, additional terms are explained that are important to H VVA.

Cooling rate
describes the decrease in temperature per time unit within an asphalt layer.

Dynamic deformation
comprises both a plastic and an elastic deformation component that is caused by a load impact with the Mod. LWD.

Release coefficient A_{VF}
is the measured value determined by in situ testing with the Mod. LWD, which is intended to enable the reopening to traffic when a corresponding requirement value is reached.

Earliest possible time for reopening to traffic
designates a time for reopening to traffic which has been determined on the basis of the deformation behaviour of the placed asphalt layer as determined by in situ testing. The time determined in this manner enables deviation from the specified standard cooling times.

Standard cooling times
are the minimum cooling times of 24 hours or 36 hours according to ZTV Asphalt-StB.

Tropical night
describes the period between 8 pm and 8 am when the temperature does not fall under 20 °C.

3 Field of application

ZTV Asphalt-StB regulates standard cooling periods (24 hours or 36 hours), which have proven effective in many practical applications.

According to ZTV Asphalt-StB, these periods may not be shortened without special measures being in place. In extreme weather conditions (e.g. tropical nights), these periods may also be too short. In both cases, the earliest possible time for reopening to traffic can be determined according to this information document.

There may be different reasons for not adhering to the standard cooling periods stipulated by ZTV Asphalt-StB.

For example:

a) The intention of the client to avoid congestion, for example, by reopening to traffic earlier (see Section 3.1)

b) The intention of the contractor to make faster headway with construction (see Section 3.2)

c) The impact of a tropical night (see Section 3.3)

Due to the effective depth of a load impact with the Mod. LWD, the application is limited to asphalt base courses. As yet, there is no experience of the method in practice for asphalt base courses of mastic asphalt and porous asphalt, and this is not regulated by H VVA.

Sufficient experience with airfields, logistics and industrial areas is not yet available and must be considered separately due to the special nature of the traffic demands placed on these areas.

3.1 Intention of the client to seek an earlier reopening to traffic

The client may want to reopen earlier to traffic if:

- Traffic conditions do not allow for prolonged closure
- Closures have a significant impact on the use of diversion routes
- Construction measures, especially at traffic junctions, would lead to extreme traffic congestion

The client shall bear the contractual risk for any damages resulting from an earlier reopening to traffic initiated by the client.

3.2 Intention of the contractor to seek an earlier reopening to traffic

An earlier reopening to traffic may also be of interest to the contractor.

This might be the case if:

- Alternative bids with the aim of making faster headway with construction are to be prepared
- Various phases of construction are combined (reduction of daily rates, placement of continuous bituminous mixtures) to improve quality
- There is a need to cut traffic routing costs in small areas, e.g. trenching work and pot hole repairs, which are to be carried out at short notice without full road closure and then reopened to traffic as soon as possible

The contractor shall bear the contractual risk for any damages resulting from an earlier reopening to traffic initiated by the contractor.

3.3 Event Tropical night

The standard cooling periods (24 hours or 36 hours) of ZTV Asphalt-StB do not take into account the special case of a tropical night. In this particular case, it may be necessary to extend the cooling periods to allow sufficient time for the bitumen to form an internal structure (Arand, W.; Zander, U., 1998). Otherwise, there is a risk of permanent deformation (grooves) and initial structural damage forming as soon as the road is reopened to traffic. If the client does not initiate such measures, the contractor can raise substantiated concerns regarding a reopening to traffic as a result of the tropical night.

4 Construction principles

4.1 General

An earlier reopening to traffic may be benefited by:

- Reducing the temperature of bituminous mixtures when using bitumen according to the “Technical delivery conditions for paving grade bitumen and ready-to-use polymer-modified bitumen” (TL Bitumen-StB) within the permissible limits of the applicable technical regulations
- Further reducing the temperature of the asphalt during production and placement according to the “Code of practice for reducing the temperature of asphalt” (M TA) by using modified bitumen based on the “Recommendations for classification of viscosity modified binders” (E KvB) or by using additives according to M TA
- Modifying the bitumen in the bituminous mixture with suitable additives (see also M TA) or by using modified bitumen according to E KvB with the aim of increasing the level of stiffness of the asphalt when reopening to traffic
- Increasing the level of stiffness of the asphalt by adjusting the formula of the bituminous mixture

4.2 Effectiveness of viscosity-modifying organic additives

When the asphalt is cooling down after placement, some viscosity-modifying organic additives form a lattice-like structure, which also has a stiffening effect, in the bitumen below a temperature range of 80 to 120 °C. Consequently, asphalts modified in this manner can achieve a defined level of stiffness at a higher temperature compared to non-modified asphalts. Further, the bituminous mixture placement temperature can be reduced by a certain amount. Both aspects result in the possibility of earlier loading (reopening to traffic) of an asphalt base course.

4.3 Effectiveness of viscosity-modifying mineral additives

A mineral additive contains physically or chemically bound water. When added to the bituminous mixture during the production process, the bound water (e.g. water of crystallisation) escapes steadily and without changing the crystal structure. This results in slight foaming of the bitumen in the bituminous mixture, thereby ensuring the reduction of mixing and placement temperatures. Therefore, an earlier reopening to traffic is possible along with correspondingly reduced bituminous mixture placement temperatures.

4.4 Influencing factors on the cooling rate and the resistance to deformation

The asphalt cooling rate after placement depends on numerous factors. These include:

- Layer thickness
- Weather conditions (ambient temperature, wind speed, sunshine, rain, etc.)
- Temperature and condition of the base layer (especially any moisture that might be present)
- Bituminous mixture temperature upon delivery or at the time of placement
- Type of bituminous mixture
- Composition of the bituminous mixture
- Topographical location

The ambient temperature and the associated temperature of the base layer exert a decisive influence on the cooling rate. During extended periods of summer heat, on very hot summer days or especially when directly overlaying still warm layers of asphalt, the asphalt cools down very slowly. In contrast, a much faster cooling is observed on cold days and especially in windy weather. Wind causes increased heat exchange and, therefore, decisively influences the cooling rate of an asphalt layer. The thickness of the placed asphalt layer is also a significant influencing factor. A greater layer thickness results in slower cooling down due to its greater heat capacity.

Besides the various cooling rates, the resistance to deformation is influenced by other factors. Thus, asphalts with higher viscosity bitumen may offer sufficient resistance to deformation even at “higher” temperatures. Due to the said influences, a thinner asphalt base course optimised in terms of its resistance to deformation can presumably be reopened to traffic on cold days in less than 24 hours. In contrast, thick asphalt base courses designed to be less resistant to deformation may require cooling periods of more than 24 hours on hot days.

Since the cooling rate depends on numerous parameters and the resistance to deformation is influenced by various other factors besides the asphalt temperature, reliable conclusions regarding the resistance to deformation cannot be drawn, neither from the time period after placement nor from measurements of the surface temperature. This is only possible by directly addressing the deformation behaviour through suitable in situ testing. Based on previous findings, testing with a Mod. LWD has proven reliable in the past.

4.5 Execution

Special measures are not required for the production of the bituminous mixture in the mixing plant.

If viscosity-modifying organic or mineral additives are used in the bituminous mixture, the M TA regulations should be observed; also note the classifications of the E KvB when using viscosity-modified bitumens.

If the temperature limits stipulated by ZTV Asphalt-StB are not adhered to, it must be noted accordingly in the construction contract.

Regardless of this, a lower temperature limit for the bituminous mixture to be placed should be specified as part of the work preparation.

5 Determining the time of reopening to traffic

5.1 Basic principle

If the fundamental regulations of ZTV Asphalt-StB (24 or 36-hour standard cooling periods) are not to be adhered to because

- the road is to be reopened to traffic as soon as possible or
- a tropical night is possibly expected after placement,

the earliest possible time for reopening to traffic should be determined according to Annex A of these notes.

5.2 Procedure

5.2.1 Planning an earlier reopening to traffic in the invitation to tender

The contractor is required to provide an assessment of sufficient resistance to deformation for the time of the earliest possible reopening to traffic according to H VVA in the tender documents. In addition to the standard service catalogue (STLK-StB), the technical specifications must include the corresponding ordinal numbers that regulate the provision of site safety and personnel (for examples, see Annex B).

When planning a construction project, it must be taken into account that the method of in situ testing makes it impossible to estimate in advance the exact time when a road can be reopened to traffic. As a result, the duration of site safety and the associated costs have to be calculated variably.

5.2.2 Method of in situ testing

The aim of the method of in situ testing with the Mod. LWD is to determine release coefficients, which can be used to assess the earliest possible time of reopening to traffic. The method and organisation of the individual work steps within a measuring field to be created are described in Annex A.

As a rule, tests performed at the end of the day scheduled for earlier reopening to traffic are sufficient. Possible temperature differences between the most recent bituminous mixture deliveries must be taken into account. For area sections that are to be partially used, it is recommended to perform testing in these areas too. The boundary conditions listed in Annex A, Fig. 2, need to be observed.

For road surfaces measuring more than 6,000 m2 or lengths of road equivalent to a day's work, i.e. more than 1,000 m, it is recommended to perform measurements as the work progresses. With a sufficient number of results and constant boundary conditions, the said measurements (through extrapolation of the test results determined during construction) can be used to specify a more precise expected time for reopening to traffic.

5.2.3 Test protocol

A separate test protocol needs to be prepared for each measuring station, an example of this is described in Annex A.

The test protocol must include at least the following data:

- Construction site, location, position of the measuring station, date and time of testing
- Type of bituminous mixture, number of the initial test in the proof of suitability
- Company performing placement
- Weather conditions
- Asphalt surface temperature
- Evaluation of the measurement results with indication of the release coefficients for each measuring point according to Table A 1

Alternatively, the evaluation can be computer-assisted according to Table A 2.

5.2.4 Evaluation of test results

At each measuring point of each measuring station, the requirement value for release coefficient A_{VF} must be at least 100 %.

Then, according to current knowledge, the release criterion for reopening to traffic is reached.

5.2.5 Managing documents and reopening to traffic

The test protocol for determining the release coefficient must be handed over to both the client and the contractor. The regulations to be derived from this with regard to reopening to traffic must be signed in a legally binding form by an authorised construction representative of the initiator.

6 Literature references

Arand, W.; Zander, U.: Einfluss von Temperatur und Temperaturrate auf den Verformungswiderstand frisch verlegter Asphaltdeckschichten während Abkühlung und Wiedererwärmung. AiF research project no. 9,975, Braunschweig, April 1998

Ehrhardt, C.-C.: Kriterien für die frühestmögliche Verkehrsfreigabe von Asphaltbefestigungen, dissertation, Technische Universität Braunschweig, 2007

Radenberg, M.; Gehrke, M.: Einfluss viskositätsverändernder Zusätze auf den Zeitpunkt der Verkehrsfreigabe, Federal Road Research Institute (BASt), report, page 131, 2019

7 Technical regulations

FGSV	BBSV	Definition of road and traffic engineering terms (FGSV 005/1)	1)
	E KvB	Recommendations for classification of viscosity modified binders (FGSV 727)	1)
	M TA	Code of practice for reducing the temperature of asphalt (FGSV 766)	1)
	STLK-StB	Standard service catalogue for road and bridge construction STLK LB 113: Asphalt constructions	1)
	TL Bitumen-StB	Technical delivery conditions for paving grade bitumen and ready-to-use polymer-modified bitumen (FGSV 794)	1)
	TP BF-StB	Technical test specifications for soil and rock in road construction (FGSV 591)	1)
		– Part B 8.3: Dynamic plate load testing with the light drop-weight tester (FGSV 591/B 8.3)	1)
		– Part B 8.4: Calibration rules for the light and medium weight drop-weight tester (FGSV 591/B 8.4)	1)
	ZTV A-StB	Supplementary technical contract provisions and guidelines for excavations and digging-up in traffic areas (FGSV 976)	1)
	ZTV Asphalt-StB	Supplementary technical contract provisions and guidelines for the construction of asphalt road surfaces (FGSV 799)	1)
	ZTV BEB-StB	Supplementary technical contract provisions and guidelines for the structural maintenance of asphalt pavements (FGSV 798)	1)

Reference sources

1) **FGSV Verlag GmbH**
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Annex A

Description of the method

Method for evaluating the deformation behaviour of an asphalt base course – immediately after placement – with the Modified Light Weight Deflectometer (Mod. LWD) to evaluate the trafficability for reopening to traffic

General

The method for evaluating the deformation behaviour is based on a defined number of single tests that are carried out according to defined systematics within a construction area.

This measurement method enables the determination of both plastic and elastic deformation components of an asphalt base course. The aim is to determine at what point the plastic deformations are negligible and are outweighed by the elastic ones. Safe reopening to traffic can be derived from this.

A 1 Testing at a measuring point

The test for evaluating the deformation behaviour of an asphalt base course in order to assess trafficability is performed on the principle of an axial-dynamic plunger indentation test, in which five consecutive load impacts are applied at a measuring point. Based on the resulting deformations and differences in deformation, the deformation behaviour of a placed asphalt base course can be assessed at this measuring point immediately after placement.

The test device used in accordance with this method to evaluate the deformation behaviour of an asphalt base course for the assessment of trafficability is referred to as a Mod. LWD (Fig. 1).

Due to its mode of operation, the test device corresponds to the light drop-weight tester according to TP BF-StB, Part B 8.3. For use as an asphalt test device, in deviation from TP BF-StB, the test plunger (non-bevelled, flat, diameter 50 ± 0.1 mm) is loaded by a falling 15 kg weight, producing an impact force of 9.42 kN and an impact duration of 17 ± 1.5 ms.

Calibration of the test device

The Mod. LWD is calibrated in accordance with TP BF-StB, part B 8.4, taking into account the modifications described here.

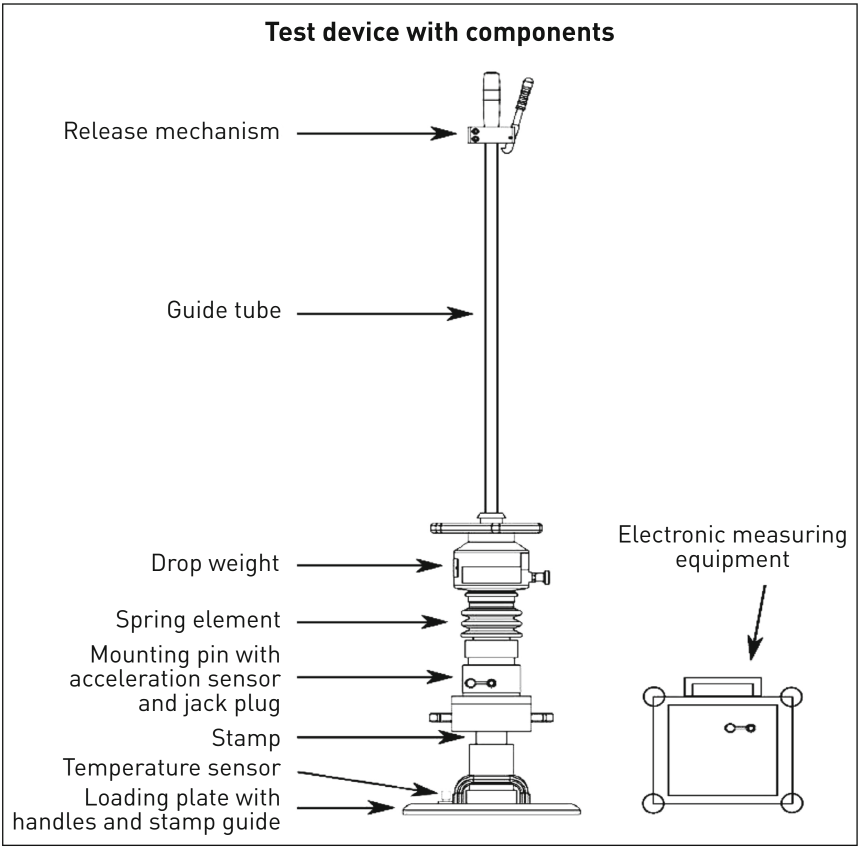


Figure 1: Components of the Modified Light Weight Deflectometer (Mod. LWD)

Principle for performing a single test

The basic principle of the test (single test) is to stress an asphalt base course by dynamic, impact loads with the Mod. LWD perpendicular to the asphalt surface. The deformation amplitudes determined under the defined load are used to estimate the deformation behaviour of an asphalt base course immediately after placement and compaction.

The asphalt surface must be cleared of loose particles at each measuring point using a broom or hand brush before performing measurements. Testing of the deformation behaviour by dynamic load with the Mod. LWD must be carried out on a flat test surface, i.e. the guide tube (see Fig. 1) of the Mod. LWD must always be aligned as perpendicular as possible to the test surface (asphalt surface) before each impact. It must be ensured that the loading plate is in full contact with the asphalt surface.

The method is suitable for common longitudinal and transverse gradients for asphalt pavements. Experience with gradients of up to 7 % is available.

The load is applied to the asphalt surface via a round test stamp with a flat loading surface, measuring 50 ± 0.1mm in diameter. During the impact, the drop weight falls from the height required by the system onto the spring element (see Fig. 1). This places a load on the stamp. Immediately after the impact, the rebounding drop weight is to be caught – without impacting the spring further – and returned to the start position.

To assess the deformation behaviour at a measuring point, five consecutive load impacts are applied to the surface. After the fifth load impact, the single test at this measuring point is considered finished.

The impact load defined by the fall height, the drop weight and the spring causes the test stamp to penetrate the asphalt base course being tested. From a construction perspective, it has proven to be useful to record the temporal course of test stamp movement with an acceleration sensor inside the test stamp. In this case, the speed is calculated through simple temporal integration of the speed and the relative movement (dynamic deformation) of the stamp is calculated by further integration.

Result of a single test

With the Mod. LWD, the maximum dynamic deformation $\gamma_{max,i}$ in mm is measured after each load impact and recorded as a measured value. The deformation amplitudes and the differences in deformation between the load impacts provide information about the deformation behaviour, which allows conclusions to be drawn about the resistance to deformation of the asphalt base course during the cooling phase.

If, during the cooling phase of the asphalt base course, the differences in deformation between the consecutive load impacts tend towards zero, this represents the transition from predominantly viscous to predominantly elastic deformation behaviour under a defined test load.

The average dynamic deformation γ_m at the tested measuring point – as the result of the single test – is to be calculated from the individual measured values of the five load impacts:

$$\gamma_m = \frac{1}{5}\sum_{i=1}^{5} \gamma_{max,i}$$

with

γ_m = average dynamic deformation in [mm]

$\gamma_{max,i}$ = maximum dynamic deformation during the load impact i in [mm].

A 2 Checking a measuring field

To be able to evaluate a construction site with regard to its earliest possible reopening to traffic, an adequate measuring field must first be defined. Within this measuring field, three measuring stations each with five measuring points are arranged according to specific systematics (see Fig. 2). As described above, dynamic deformations are measured at each measuring point by applying five load impacts with the Mod. LWD and are then used to calculate a release coefficient A_{VF} (single test) (see A 3). The evaluation of all release coefficients determined within the measuring field form the basis for whether or not the criterion for reopening to traffic is met.

Systematics of the method (measuring systematics)

The test to determine the individual release coefficients begins after placement of the asphalt base course, after completion of the roller compaction, but at the earliest after the asphalt base course has cooled down to a surface temperature of 60 °C. The reason for this temperature limit is the possibility of excessive plastic deformation of the asphalt base course at higher temperatures. The aim is to ensure that no significant permanent deformation is left on the asphalt base course once the test has been carried out.

The terms measuring field, measuring station, measuring point and load impact, which are used in the course of the measuring systematics, are explained in more detail below and, in addition, the systematics of the procedure is illustrated in Fig. 2.

Measuring field

The measuring field for evaluating a previously created construction site should be at least 100 m (if the length of the construction site permits it) and extend over the entire placement width. The measuring field should cover the area of a paver lane within a construction site where the most unfavourable deformation behaviour is to be expected. This is usually at the end of the created construction site. The measuring field needs to be divided into at least three measuring stations, each of which should be at least 50 m apart in order to record the asphalt deliveries from several transport vehicles. Measuring station 1 should be positioned furthest away from the end of the construction site. Even when dealing with smaller construction sites (< 100 m in length), at least three measuring stations should always be installed for each measuring field. In these cases, the said minimum distance between the measuring stations is reduced accordingly and uniformly.

Measuring station

A measuring station consists of five measuring points (single tests) evenly distributed over the transverse profile of a paver lane. If two staggered pavers are used, at least six measuring stations, i.e. three measuring stations for each paver lane, must be recorded.

The measuring stations should preferably be located in areas where a low cooling rate is to be expected. This is particularly the case, for example, in areas with direct sunlight, no wind, greater layer thickness or adjacent buildings.

Measuring point

Within a measuring station, five measuring points (single tests) are to be arranged in the transverse profile at an even distance to each other (at least 50 cm) for each paver lane in order to record any uneven temperature distribution in transverse direction.

Load impact

The measurement at a measuring point consists of five consecutive load impacts and the recording of five measured values.

After the five load impacts, the single test at a measuring point has been finished.

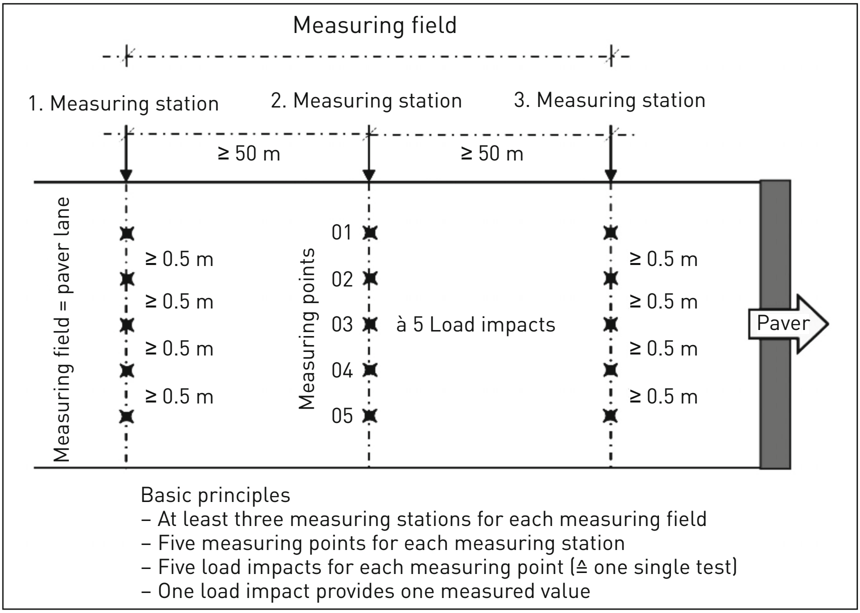


Figure 2: Measuring systematics and illustration of the terms measuring field, measuring station, measuring point and load impact (with measured value)

A 3 Checking a release criterion

When checking the release criterion, all release coefficients of each measuring point determined in the measuring field must be calculated and documented in a test protocol.

The release coefficient A_{VF} is determined with the aid of the average dynamic deformation γ_m and a defined reference deformation γ_{ref} according to the following formula:

$$A_{VF} = \left(1 - \frac{\gamma_m - \gamma_{ref}}{\gamma_m + \gamma_{ref}}\right) \cdot 100$$

with

A_{VF} = release coefficient in [%]

γ_m = average dynamic deformation in mm at a tested measuring point (result of the single test)

γ_{ref} = reference deformation in [mm].

The reference deformation γ_{ref} is an empirically determined value which, according to current knowledge, corresponds to the elastic deformation component typical for rolled asphalt. According to experience gained in the past, the reference deformation γ_{ref} for rolled asphalt base courses can be assumed to be 0.3 mm.

If the release coefficient is determined to be at least 100 % at all five measuring points, the requirements for continuation of the measurements at the next measuring station are met. Otherwise, after at least half an hour, five measuring points at this measuring station, which must be located outside the sphere (each ^{3} 0.5 m from the previous measuring point) of the measurements already carried out, must be tested again and the measured values documented. Once again, the release coefficient must be at least 100 % at all measuring points in order to meet the prerequisites for continuation of the measurements at the next measuring station.

It should be proceeded in the same way at the next measuring station. According to current knowledge, the release criterion is only met and earlier reopening to traffic is only possible if the release coefficient is at least 100 % at each measuring point of all three measuring stations.

The precision of the method is unknown.

The procedure for determining the release criterion for a measuring field (construction site) is illustrated in a flow chart (see Fig. 3).

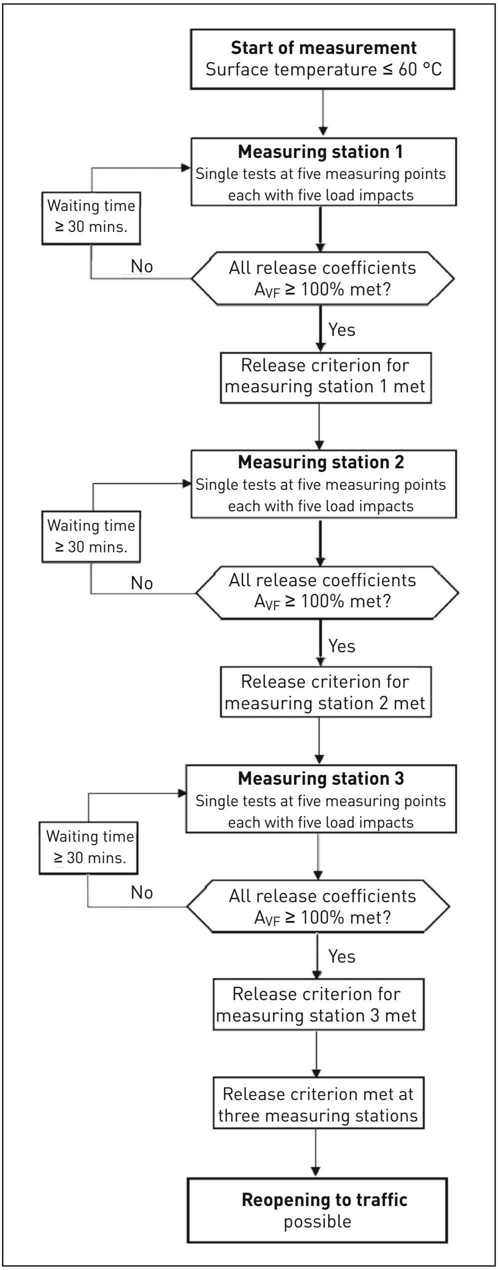


Figure 3: Flow chart – prerequisites for obtaining the release criterion

Examples of handwritten and computer-assisted test protocols are given in Tables A 1 and A 2.

Table A 1: Example of a test protocol for determining the release coefficients at a measuring station (handwritten record)

Test protocol for determining the release coefficients at the measuring station NN				
Modified Light Weight Deflectometer (Mod. LWD)				
Construction project				
Date		Time		
Company performing placement		Mixing plant		
Type/Grade of asphalt		Proof of suitability to be assigned		
Weather conditions		Asphalt temperature [°C] (surface)		
Station/Construction km		Measuring station		
Measuring point 1				
A_{VF} [%]	Test result		Test result ≥ 100	Yes/No
Measuring point 2				
A_{VF} [%]	Test result		Test result ≥ 100	Yes/No
Measuring point 3				
A_{VF} [%]	Test result		Test result ≥ 100	Yes/No
Measuring point 4				
A_{VF} [%]	Test result		Test result ≥ 100	Yes/No
Measuring point 5				
A_{VF} [%]	Test result		Test result ≥ 100	Yes/No
Requirement for the release coefficient A_{VF} met at all measuring points and thus at the measuring station				Yes/No

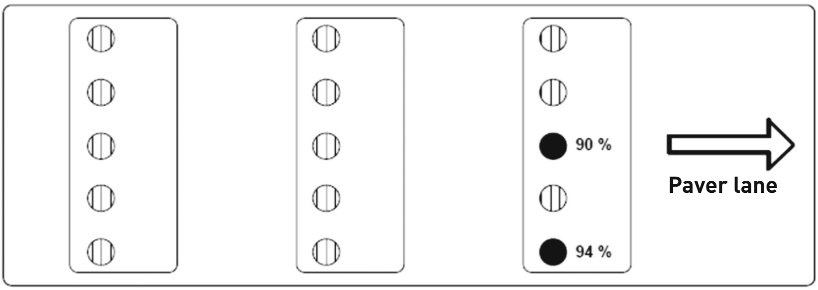
Table A 2: Example of a computer-assisted test protocol for determining the release coefficient in a measuring field

Test protocol for reopening a rolled asphalt base course to traffic according to H VVA
with the Modified Light Weight Deflectometer (Mod. LWD)

Construction project		Device manufacturer Test device (type/no.)	
Company performing placement		Measuring field	
Tester Test institute		Position Coordination	52.608213°N 11.853980°E
Mixing plant		Weather	---
Type of bituminous mixture Binder		Asphalt temperature	30 °C 32 °C 30 °C
Proof of suitability		Measuring time	07.10.2019 12:23:06 07.10.2019 12:28:06 07.10.2019 14:16:18

● A_{VF} < 100% (not met) ◍ A_{VF} ≥ 100% (met)

A_{VF}: Release coefficient (reopening asphalt to traffic)



Measuring station 1 Measuring station 2 Measuring station 3

Test result

No reopening to traffic

Annex B

Notes on invitation to tender,
Examples for preparing technical specifications

Examples for creating technical specifications for earlier reopening of asphalt pavements to traffic (H VVA)

Annex B contains recommendations for details in the technical specifications if the opportunities for the earliest possible reopening to traffic are to be used.

Details in the specifications

The construction periods and the desired time of the earliest possible reopening to traffic should be specified taking into account the information in H VVA, including the regulations that deviate from ZTV Asphalt-StB. This should preferably be done in a separate sub-section.

An earlier reopening to traffic can benefit, among other things, from the use of viscosity-modified bitumens according to E KvB. If viscosity-modified bitumen is to be used in the bituminous mixture, this must be taken into account when preparing the technical specifications. In this context, the specifications should include a note that the viscosity-modified bitumen is applied with the aim of reopening to traffic earlier.

The “Standard service catalogue for road and bridge construction (STLK-StB), STLK LB 113 Asphalt constructions” can be used to create the corresponding ordinal number (OZ). The type and grade of the bitumen are to be selected as free text.

Example of an ordinal number in a specification of works for a link road (inner city), an industrial estate road, main business street:

> Create …… m^2 asphalt base course of SMA 8 S
>
> Create asphalt base course of mastic asphalt with chippings SMA 8 S Asphalt-StB. Delivery of the bituminous mixture in insulated transport containers.
>
> On road surfaces of load class 10.
>
> | | | |
> |---|---|---|
> | Placement thickness | = | 3.5 cm. |
> | Binder | = | viscosity-modified polymer-modified bitumen PmB 25/45 VL. |
> | Rough stone aggregate | = | category C 95/1. |

If the determination of the earliest possible time of reopening to traffic is planned with the Mod. LWD, the following ordinal number should be provided in the specification of works:

1 Standard measurements for the earliest possible time of reopening

Performance of measurements to determine the time of the earliest possible reopening to traffic.

Application of the in situ test method according to H VVA, edition 2022, section 5, including documentation and evaluation of the measurement results.

… hour(s) of providing traffic safety

Providing traffic safety during measurements for the earliest possible reopening to traffic, including on-call times for service personnel. Billing according to actual expenditure.

Remarks on the system of technical publications of the FGSV

R stands for regulations:

These publications either specify the technical design or realization (R1) or give recommendations on the technical design or realization (R2).

W stands for information documents:

These publications represent the current state-of-the-art knowledge and define how a technical issue shall be practicably dealt with or has already been successfully dealt with.

Category R1 indicates 1st category regulations:

R1-publications contain the contractual basis (Additional Technical Conditions of Contract and Directives, Technical Conditions of Delivery and Technical Test Specifications) as well as guidelines. They are always coordinated within the FGSV. R1-publications – in particular if agreed on as integral part of the contract – have a high binding force.

Category R2 indicates 2nd category regulations:

R2-publications contain information sheets and recommendations. They are always coordinated within the FGSV. Their application as state-of-the-art technology is recommended by the FGSV.

Category W1 indicates 1st category documents of knowledge:

W1-publications contain references. They are always coordinated within the FGSV but not with external parties. They represent current state-of-the-art knowledge within the respective responsible boards of the FGSV.

Category W2 indicates 2nd category documents of knowledge:

W2-publications contain working papers. These may include preliminary results, supplementary information and guidance. They are not coordinated within the FGSV and represent the conception of an individual board of the FGSV.

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