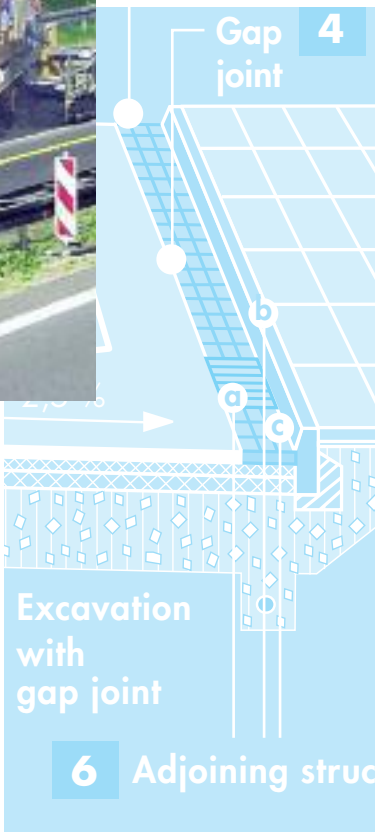
asphalt

Quality.

Right from the Start



asphalt GUIDELINES

Publisher

dav

Deutscher Asphaltverband e.V.
(German Asphalt Paving Association)
Schieffelingsweg 6
53123 Bonn
Germany

Fon +49 228 97965-0
Fax +49 228 97965-11
E-Mail dav@asphalt.de
Internet www.asphalt.de

Author
Bau-Ing. Roland Milster, Regensburg
in cooperation with

Dr.-Ing. Randolf Anger, Hoppegarten
Dr.-Ing. Bernd Dienemann, Essen
Dipl.-Ing. (FH) Walter Emperhoff, Regensburg
Dipl.-Ing. Carsten Lips, Bad Hersfeld
Dipl.-Ing. Stefan Lorenz, Berlin
Dipl.-Ing. Richard Mansfeld, Rodewisch

Design
© Elke Schlüter Werbeagentur, Alfter
Tel. +49 228 647989

August 2007, english translation 2011

Quality. Right from the Start

Introduction

Asphalt pavements are very durable provided they are based on correct planning and executed to specification.

This Guide discusses problems and defects that might be caused, inter alia, by the following factors:

- **Mistakes/errors in the planning and tendering phase,**
- **Poor workmanship in former or parallel jobs,**
- **Non-compliance with implementation guidelines and Technical Specifications,**
- **Poor workmanship in paving asphalt**
- **Wrong traffic load**

The guide facilitates the classification and evaluation of problems and different types of defects. It is also intended to help to select and to implement feasible solutions to mitigate or eliminate such defects or damage. More particularly, however, it aims at providing guidance that will contribute to preventing defects and the damage resulting from them.

The Guide is sub-divided into main sections that refer to the location where the main problem originates. Problems are organized by visual appearance with a brief description of the problem with a picture. This description is followed by several lists indicating possible causes, effects on long-term pavement performance and solutions.

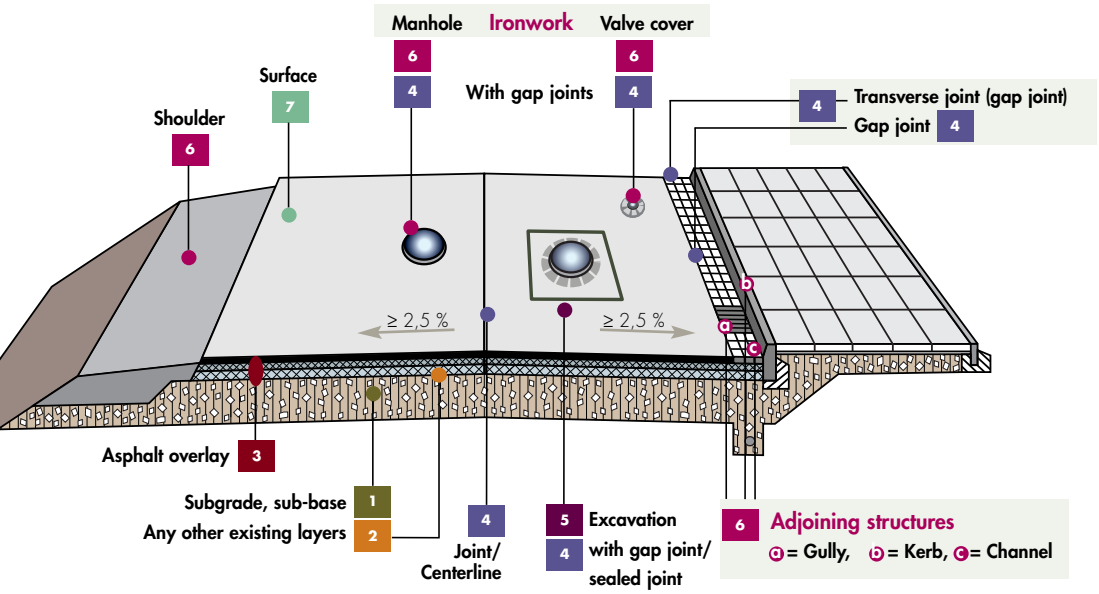
The list with **„Prevention Tips"** is especially important. Avoiding mistakes should be a high priority during the planning phase, as well as in laydown and compaction operations.

Any mistakes identified in the plans or the bids should be communicated to the client in a timely manner and in due form. Any defects identified during laydown and compaction operations must be rectified without delay.

1 Subgrade, sub-base
2 Overlay on existing pavement structure
3 New asphalt overlay
4 Joints, transitions, gap joints
5 Utility excavations/patches
6 Adjoining structures and ironwork
7 Surface appearance

Chapters assigned

to the road structure



The phrase **„Quality. Right from the start"** is thus applicable to all parties working at the job site, offering the most reasonable and cost-effective solution available.

This Guide does not claim to be exhaustive and is based on the authors' current state of expertise, practical experience and existing publications. It focuses on the correct execution and secondary work in laying the asphalt pavement.

Other guidelines and brochures of the DAV provide additional tips and ideas. This information is listed at the end of the brochure.

Table of Contents

. . . . . Severe distortion of the surface course (greater than 30 mm) with displacement of the mixture, large depressions (in vertical and/or transverse direction)

. . . . . Very large, deep cracks, partly with localized deformations

. . . . . Cracking and disintegration of the surface course

. . . . . Cracking and disintegration of the surface course

. . . . . Disintegration and distortion of asphalt course

. . . . . Cracking, disintegration and distortion of surface course

. . . . . Pavement is not laid to the specified level and profile

. . . . . Cracking and disintegration of surface course

. . . . . Cracks in transitions and spandrels

. . . . . Displacement, e. g. upheaval, rutting etc.

. . . . . Degradation of asphalt pavement

. . . . . Rough joint edges

. . . . . Open joint

. . . . . Water along the centerline

. . . . . Open joint

. . . . . Markings on top of longitudinal joints

. . . . . Linear surface depression

. . . . . Joint is opening along the face, loss of reservoir material

. . . . . Loss of joint sealant

Table of Contents

. . . . . Cracks in the surface course that are parallel to the joint of the patch

. . . . . Crack along the joint

. . . . . After rain the surface of the patch stays damp for a longer time than the surrounding area

. . . . . Settlement of asphalt patch and the adjoining areas

. . . . . Displacement of kerb and/or channel system (height, longitudinal and transverse direction)

. . . . . Road distress due to defects in the kerb/channel area, parallel cracks in the roadway adjoining the kerb, spalling in the kerb area

. . . . . No water runoff, water does not flow down the channel, or standing water in channel

. . . . . Overlay on channel

. . . . . Crack formation and settlement around ironwork

. . . . . Loose ironwork, movment under traffic

. . . . . Bulges in front of ironwork

. . . . . Degradation of asphalt edge along road shoulder

. . . . . Non-uniform texture

. . . . . Poor skid resistance

. . . . . Porous pavement, loss of aggregates, fretting, erosion, distressed and failed areas

. . . . . Inadequate Evenness

. . . . . Damp sections, water bleeding or pumping

1 Subgrade,

1.1

Description:
Severe distortion of the surface course (greater than 30 mm) with displacement of the mixture, large depressions (in vertical and/or transverse direction).

Possible causes	Possible effects on performance	Solutions	Prevention tips
■ Poor bearing capacity of granular sub-grade/sub-base ■ Routing of heavy traffic ■ Loads are not transmitted within the structure ■ Subgrade failure	■ Traffic disruptions ■ Entire pavement might be destroyed	■ Remove and replace poor subgrade/ sub-base ■ Fill and/or mill localized de-formations (as intermediate solution)	■ Monitor and verify the load bearing capacity of the subgrade/ sub-base ■ Review the structural design

Sub-base

1.2

Description:
Very large, deep cracks, partly with localized deformations

Possible causes	Possible effects on performance	Solutions	Prevention tips
■ Poor bearing capacity of granular sub-grade/sub-base ■ Routing of heavy traffic ■ Loads are not transmitted within the structure ■ Subgrade failure	■ Degradation of surface course ■ Water ingress damages the pavement structure and the layer bonding	■ Rehabilitate the failed structure ■ Repair cracks and apply a thin overlay (as intermediate solution)	☐ Monitor and verify the load bearing capacity of the subgrade/ sub-base ☐ Review the structural design

2 Overlay on existing

2.1 Asphalt overlay on non rubbleized concrete pavement

Description:
Cracking and disintegration of the surface course

Possible causes	Possible effects on performance	Solutions	Prevention tips
■ Voids forming below concrete slabs ■ Movement of slabs ■ Poor layer bonding with concrete ■ Reflection cracking over the cracks and joints of the underlying concrete pavement ■ Overlay thickness does not serve the intended purpose	■ Disintegration and degradation of asphalt courses	■ Reinstate/ rehabilitate the asphalt overlay ■ single or multiple layers ■ with or without SAMI layer	■ Rubblize concrete pavement before applying overlay ■ Slabjacking as preparatory treatment ■ Crack sealing ■ Application of geocomposite membranes. Ensure that the optimal application rate and type of tack coat (PmB) is determined. Alternative: SAMI layer ■ Ensure that each slab is documented ■ Place surface course joints at the same location as in the underlying pavement ■ Review/remove/ replace joint profiles ■ Review and select the required overlay thickness and material

pavement structure

2.2 Asphalt overlay on hydraulically-bound (roller-compacted) layers (HBL)

Description:
Cracking and disintegration of the surface course

Possible causes	Possible effects on performance	Solutions	Prevention tips
■ Pressure resistance of HBL is too high ■ Lack of/insufficient rubblizing of the hydraulically-bound base ■ Premature overlay ■ Overlay is too thin ■ Non-compliance with the type test for HBL ■ Reflective cracking	■ Destruction, distortion and disintegration of asphalt surface course	■ Crack sealing. Widen cracks with router, if need be. ■ Remove the affected area and apply a new layer	□ Ensure targeted rubblizing (heavy roller, kerbs) □ Observe the minimum curing time for base □ Ensure uniform strength of base course □ Review and select the required overlay thickness and material

2 Overlay on existing

2.3 Asphalt overlay on block paving (bricks)

Description:
Disintegration and distortion of asphalt course

Possible causes	Possible effects on performance	Solutions	Prevention tips
■ Loose blocks ■ Overlay is too thin ■ Insufficient bonding with the block paving ■ Poor bearing capacity	■ Degradation, distortion and disintegration of asphalt course(s)	■ Reinstate/ rehabilitate failed areas ■ Ensure durability of underlying block paving	■ Ensure that surface water is drained off ■ Verify that block paving exhibits uniform bearing capacity ■ Firmly incorporate loose blocks into the structure (gritting, sand, cement) ■ Fill voids in the block paved area with material ■ Review and select the required overlay thickness and material

pavement structure

2.4 Asphalt overlay on existing asphalt surface

Description:
Cracking, disintegration and distortion of surface course

Possible causes	Possible effects on performance	Solutions	Prevention tips
■ Poor layer bonding (with and within underlying structure) ■ Insufficient load-bearing capacity (of entire layer and localized areas) ■ Overlay was placed on existing surface course which had then to take over the function of the binder course ■ Overlay is too thin ■ Reflective cracking following the underlying pavement ■ Inadequate repairs of failed sections in existing pavement	■ Progressive degradation of asphalt surface course	■ Fill cracks with crack-sealing material ■ Reinstate/ rehabilitate failed areas	■ Remove old surface course to the extent possible ■ Review overlay thickness ■ Roughen smooth pavement surface ■ Thoroughly clean the existing surface ■ Repair existing pavement cracks (crack filler, membranes) ■ Select the appropriate type and amount of tack coat material ■ Remove pavement surface defects ■ Remove permanent markings

3 New asphalt

3.1

Description:
Pavement is not laid to the specified level and profile

Possible causes	Possible effects on performance	Solutions	Prevention tips
■ Mistakes during paving operation ■ Non-compliance with specified levels	■ Limited usability ■ Problems with transitions ■ Irregularities	■ Replacement ■ Milling, grinding ■ Leveling	☐ Compare actual values and levels against plan on an ongoing basis ☐ Observe the tolerance range during construction

pavement

3.2

Description:
Cracking and disintegration of surface course

Possible causes	Possible effects on performance	Solutions	Prevention tips

■ Construction mistakes
■ Improper mix design for the intended purpose
■ Non-compliance with type test
■ Material embrittlement
■ Poor layer bonding
	■ Degradation of surface course
	■ Surface course fails to transmit loads to the underlying layer
		■ Reinstate surface course with the following measures:
		  ■ slurry seal,
		  ■ surface treatment,
		  ■ slurry surfacing,
		  ■ thin hot-mix overlay
		■ Remove and replace surface course in the failed sections
			☐ Review the mix type
			☐ Select proper material and technique to produce layer bonding
			☐ Initial visual inspection of mix; reject sub-optimal mix
			☐ Select and use the correct equipment
			☐ Take weather conditions into account.

New asphalt

3.3

Description:
Cracks in transitions and spandrels

Possible causes	Possible effects on performance	Solutions	Prevention tips
■ Paving was performed at different times; poor construction of joint in the surface course or one of the under lying courses in the spandrel area. ■ Excessive cooling of mixture due to handwork	■ Progressive crack formation ■ Spalling/ Degradation ■ Structure will wear away	■ Repair (widen and fill) cracks ■ Reinstatement/ replacement	☐ Paving operations should be carried as simultaneously and continuously as possible ☐ Seal the joint (as a gap joint if required) ☐ Use mastic asphalt for spandrel ☐ Subsequent handwork: Mixture should be delivered in a thermally insulated hopper or use asphalt blended with additives to make handwork easier

pavement

3.4

Description:
Displacement, e. g. upheaval, rutting etc.

Possible causes	Possible effects on performance	Solutions	Prevention tips

■ Improper structural design
■ Improper mix design for the intended purpose
■ Non-compliance with type test
■ Construction mistakes
■ Poor layer bonding
	■ Irregularities
	■ Variations in layer thickness
	■ Puddle formation (bird bath) and ice
	■ Poor riding comfort
	■ Traffic safety hazard
	■ Structure will wear away
		■ Reinstatement with the following measures:
		  ■ milling
		  ■ leveling with thin hot-mix overlay/slurry surfacing
		■ Replacement
			■ Select proper material (type of mix) and technique for the job
			■ Keep in mind the scheduled date for opening the pavement to traffic (cooling time)
			■ Ensure good layer bonding
			■ Take into account special loads near traffic light sections and intersections

3 New asphalt pavement

3.5

Description:
Degradation of asphalt pavement

Possible causes	Possible effects on performance	Solutions	Prevention tips
■ Improper structural design ■ Improper mix design for the intended purpose ■ Non-compliance of mix with type test ■ Defects and damage to the underlying layers	■ Poor pavement performance ■ Damage to underlying layers	■ Replacement	■ Select proper material (type of mix) and technique for the job ■ Refer to the brochure „Guidance for Asphalt Paving Operations“

Joints, transitions, gap joints

Joints

are exposed edges that form when layers with comparable properties are placed alongside each other (longitudinal joints) during asphalt paving or across the pavement whenever paving is interrupted for lengthier periods of time (transverse joints).
When placing hot-mix asphalt joints are created either with the **„hot to hot“** or the **„hot to cold“** technique.

When paving **„hot to cold“** the joint area shall be preconditioned.

Transitions

are exposed edges

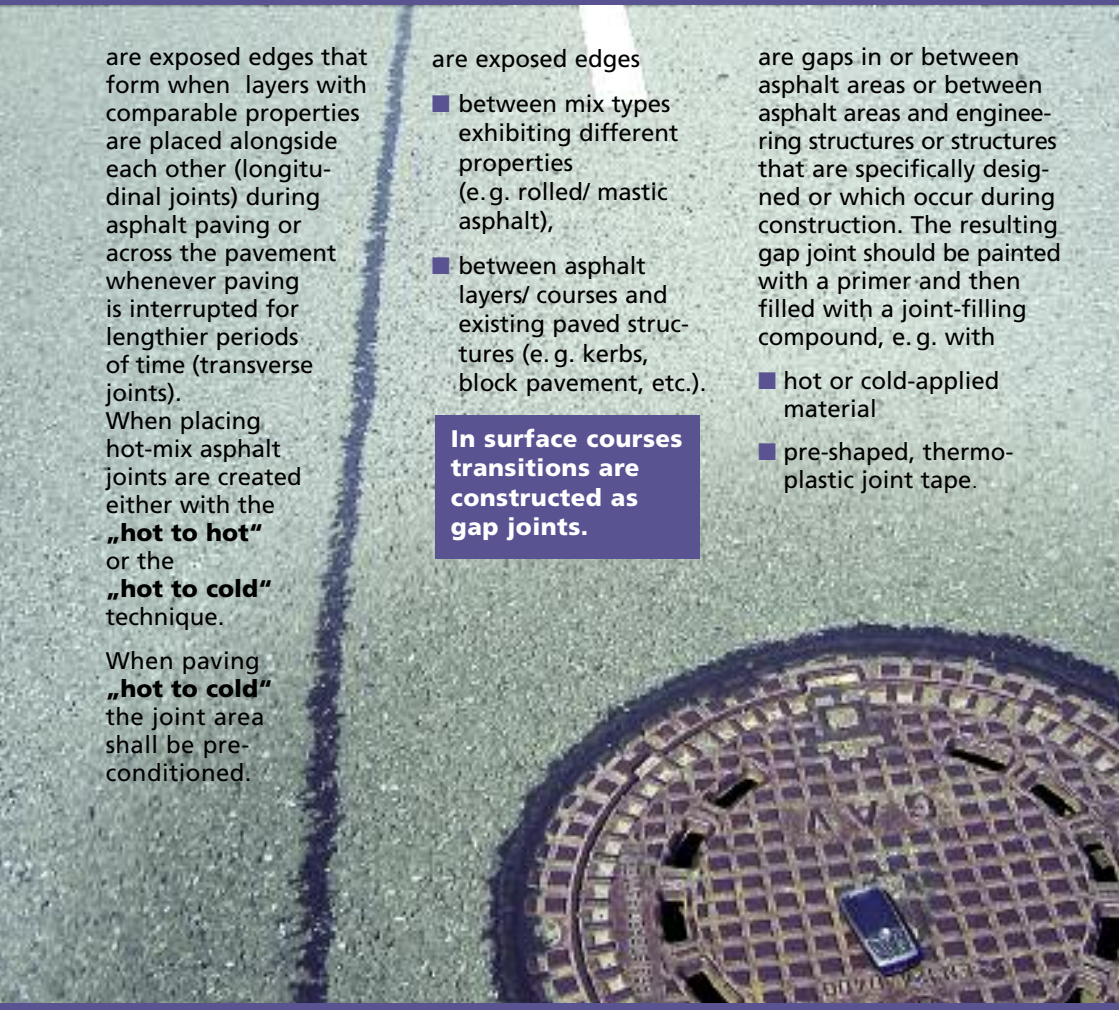
- between mix types exhibiting different properties (e. g. rolled/ mastic asphalt),
- between asphalt layers/ courses and existing paved structures (e. g. kerbs, block pavement, etc.).

In surface courses transitions are constructed as gap joints.

Gap joints

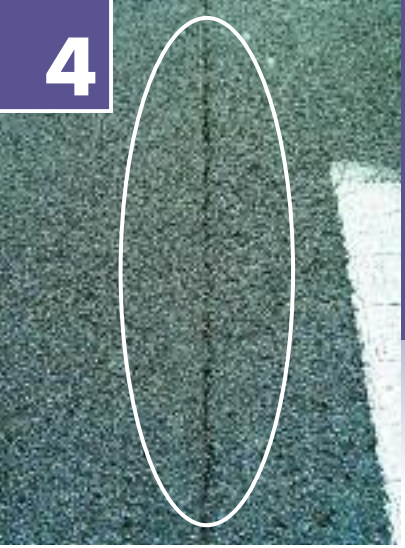
are gaps in or between asphalt areas or between asphalt areas and engineering structures or structures that are specifically designed or which occur during construction. The resulting gap joint should be painted with a primer and then filled with a joint-filling compound, e. g. with

- hot or cold-applied material
- pre-shaped, thermoplastic joint tape.



Use specified compaction technique for the joint area !!!

4 Joints, transitions,



4.1 Longitudinal joints – „hot to hot" method

Description:
Rough joint edges

Possible causes	Possible effects on performance	Solutions	Prevention tips
■ Distance between pavers during echelon paving is too great ■ Segregation ■ No roller pattern or improper roller operation	■ Infiltrating water will open the joint and cause damage to the underlying pavement courses ■ Pavement ravels and erodes along the joint, causing deterioration	■ Reinstatement of joint area through the following measures: ■ apply tack coat and fine aggregates (grit) ■ apply asphalt repair slurry or pore-filling material	■ Define a paving regime and roller pattern ■ Pavers should stay as close to each other as possible during echelon paving

gap joints

4.2 Longitudinal joints – „hot to hot" method

Description:
Open joint

Possible causes	Possible effects on performance	Solutions	Prevention tips
■ Distance between pavers during echelon paving is too great ■ Screed plate has not been preheated ■ Segregated mix and/or excessive cooling of mix ■ No roller pattern or improper roller operation	■ Water infiltration ■ Pavement is raveling and eroding along the joint ■ Damage to underlying layers	■ Over banding of open joint ■ Cut joint and fill with liquid sealant ■ Remix joint area ■ Replace the surface course by applying a longitudinal patch to the distressed centerline area	■ Specify a paving regime and roller pattern ■ Pavers should work at the closest possible distance during echelon paving ■ Pre-heat all parts of the screed plate ■ Make sure that joint edges are compacted

4 Joints, transitions,

4.3 Longitudinal joints – „hot to cold" method

Description:
Water along the centerline

Possible causes	Possible effects on performance	Solutions	Prevention tips
■ Difference in elevation between the two lanes ■ If the road slopes in one direction across its entire width: the upper lane was paved first	■ Backwater in the joint area might allow the joint to open ■ Pavement ravels and erodes along the joint, causing deterioration	■ Ensure that lanes have the same elevation ■ Fine milling, grinding.	☐ Determine elevation of new layer at existing lanes ☐ Ensure compliance with tolerance range ☐ Pave the lower lane first

gap joints

4.4 Longitudinal joints – „hot to cold" method

Description:
Open joint

Possible causes	Possible effects on performance	Solutions	Prevention tips
■ Poor construction of the joint due to insufficient and/or improper priming of the exposed edges ■ Inadequate compaction of the mix placed along the joint ■ No roller pattern or incorrect roller operation	■ The open joint will allow intrusion of water which will destroy layer bonding ■ Pavement ravels and erodes along the joint causing deterioration ■ Damage to underlying pavement courses	■ Over banding of joint ■ Cut joint and fill with liquid sealant ■ Remix joint area ■ Replace the surface course by patching the distressed centerline area	■ Define a roller pattern ■ Restrain the edge of the first lane using the edge-restraining device to form an inclined face (70 - 80°). It is not recommended to cut back the first lane (slurry) ■ Follow the manufacturer's instructions when applying the primer or tack coat ■ Preheat the joint face with indirect heat (avoid naked flame) ■ Create a gap joint and seal it with filling material

4 Joints, transitions,

4.5 Longitudinal joints

Description:
Markings on top of longitudinal joints

Possible causes	Possible effects on performance	Solutions	Prevention tips
■ Incorrect placement and arrangement of paving-widths	■ Markings are destroyed ■ Markings are destroyed during crack repair	■ Repair joint and replace marking	■ Proper layout of paving widths (observe paving specifications!)

gap joints

4.6 Transverse joints

Description:
Linear surface depression

Possible causes	Possible effects on performance	Solutions	Prevention tips
■ Layed mix is not cut back to a sufficient degree ■ Layed mix is cut back prematurely	■ Transition area along the joint wears away	■ Ensure that the upstream and downstream lane have the same elevation ■ Replace transition area along the joint	☐ Verify evenness with a 4 m straightedger ☐ Ensure that joint face is put back enough ☐ Ensure that layed mix is only cut back immediately prior to paving operations

Joints, transitions,

4.7 Gap joints sealed with joint tape

Description:
Joint is opening along the face, loss of reservoir material

Possible causes	Possible effects on performance	Solutions	Prevention tips
■ Adhesion loss on the face due to moisture and dust ■ Non-compliance with manufacturer's instructions ■ While applying the joint tape it was not ensured that the joint tape stood 5 mm above the pavement	■ Water infiltration ■ Loss of layer bonding ■ Pavement is raveling and eroding along the joint causing deterioration ■ Damage to underlying layers	■ Cut faces of joint and apply hot-pour crack filler ■ Replace the distressed joint area by patching	■ Apply primer only when faces are clean and dry ■ Follow the manufacturer's instructions (primer) ■ Attach joint tape according to instructions

gap joints

4.8 Gap joints sealed with hot-pour filler

Description:
Loss of joint sealant

Possible causes	Possible effects on performance	Solutions	Prevention tips
■ Reservoir was not cleaned ■ No preparatory treatment (primer) ■ Sealant degraded due to overheating ■ Excessive amount is applied to joint ■ Reservoir is too narrow or too wide ■ Insufficient amount is applied ■ Wrong location of the joint (in the wheel path)	■ Entry of water and dirt ■ Loss of elasticity and adhesion (sealant) ■ Tracking ■ Pavement is raveling and eroding along the joint ■ Damage to underlying layers	■ Cut faces of joint and apply liquid sealant ■ Replace the distressed joint area by patching ■ Remove any excess material	■ Apply primer only when faces are clean and dry ■ Follow manufacturer's application instructions ■ Locate joint outside the wheel path ■ Ensure that correct amount of filler/sealer material is used for the joint being treated

5 Utility excavations/

5.1

Description:
Cracks in the surface course that are parallel to the joint of the patch

Possible causes	Possible effects on performance	Solutions	Prevention tips
■ Construction joint in the underlying courses ■ Each layer was applied with a notched wedge ■ Excavation has been backfilled with base course mix flush with the adjacent roadway and then milled. The surface to be sealed with asphalt surface course mix is thus larger than the original excavation.	■ Water infiltration will destroy adhesion between the layers, the pavement along the joint and the surface course itself ■ Spalling/ Degradation	■ Remove the entire asphalt patch in full depth, cut back and reseal the section	■ Cut back the section. Then place asphalt layers **without** notched wedges

patches

5.2

Description:
Crack along the joint

Possible causes	Possible effects on performance	Solutions	Prevention tips
■ No gap joint at all ■ No cutting/routing of gap joint	■ Water infiltration will cause degradation of the surface course and underlying pavement courses	■ Rework the gap joint/construct a new joint	■ Apply joint tape or liquid sealant according to the manufacturer's instructions

Utility excavatio

5.3

Description:
After rain the surface of the patch stays damp for a longer time than the surrounding area.

Possible causes	Possible effects on performance	Solutions	Prevention tips
■ Poor compaction due to low tolerance range during paving	■ Loss of cement causing degradation of the surface course due to entry of water and frost	■ Surface dressing ■ Remove and replace damaged surface course material	☐ Ensure compliance with tolerance range when paving ☐ Select appropriate surface course material (if need be mastic asphalt)

ons/ patches

5.4

Description:
Settlement of asphalt patch and the adjoining areas

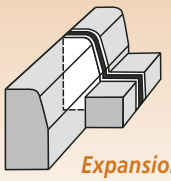
Possible causes	Possible effects on performance	Solutions	Prevention tips
■ No cutback ■ Inadequate compaction of the unbound layers	■ Irregularities ■ Cracking ■ Backwater causing spalling/ degradation	■ Level out the settlement with appropriate material ■ Cut back the material as far as required, remove the patch material, compact un-bound layers and place new asphalt layers	■ Ensure sufficient compaction of subgrade ■ Cut back material to specifications

6 Adjoining structures

6.1

Description:
Displacement of kerb and/or channel system (height, longitudinal and transverse direction)

Possible causes	Possible effects on performance	Solutions	Prevention tips
■ Inadequate setting of kerb into concrete abutment ■ Violent displacement during asphalt paving operations ■ Concrete quality, e. g. use of partially hardened concrete ■ Poor sub-base ■ No expansion joint	■ Tilting, settling, breaking or scaling of kerb ■ Blow up ■ Backwater, no drainage ■ Spalling and erosion of joints	■ Replace the entire concrete bed and backing ■ Construct a gap joint between the roadway and the channel ■ Improve grade and slope (e. g. sloped channel) ■ Renew joints in the channel (use correct filler/sealant) ■ Positioning of expansion joints (see drawing)	☐ Verify load-bearing capacity of sub-base ☐ Build backing to the specified thickness ☐ Do not use partially hardened concrete ☐ Take into account the curing time for concrete ☐ Careful paving and compaction along the kerb ☐ Sufficient number of expansion joints (every 8 meters at a minimum)



Expansion joint in raised kerb and channel filled with flexible plate

and ironwork

6.2

Description:
Road distress due to defects in the kerb/channel area, parallel cracks in the roadway adjoining the kerb, spalling in the kerb area

Possible causes	Possible effects on performance	Solutions	Prevention tips
■ Concrete bed protrudes into the pavement ■ Insufficient laying of mix in the kerb area ■ No longitudinal gap joint along the kerb ■ Poor longitudinal gap joint along the kerb	■ Progressive crack formation ■ Progressive spalling/ degradation	■ Construct the missing gap joint ■ Replace cold/hot pour material ■ Repair cracks ■ Cut back the degraded area, cut off protruding concrete bed vertically ■ Place new asphalt layer and construct gap joints	■ Cut off the concrete along kerb/channel vertically ■ Carefully place and compact mix along kerb/channel ■ Construct gap joints to be filled with sealing/filling material

Adjoining structures

6.3

Description:
No water runoff, water does not flow down the channel, or standing water in channel

Possible causes	Possible effects on performance	Solutions	Prevention tips
■ Roadway level is too low or channel is too high ■ Gradient or cross fall are not sufficient ■ Not enough gullies or incorrect positioning of gullies	■ Degradation of channel area and roadway	■ Adjust channel or raise the level of the road – review positioning and number of gullies	□ Review cross fall, gradient and type of channel in due time before starting the job □ Construct a channel if the gradient is below 0.5 % □ Allow for a sufficient number of gullies/drains □ Place asphalt layer at specified level

and ironwork

6.4

Description:
Overlay on channel

Possible causes	Possible effects on performance	Solutions	Prevention tips
■ No gap joint ■ Mistakes in constructing the channel or in placing the asphalt	■ Degradation of road edge (scaling) ■ Danger to traffic	■ Construct the missing gap joint ■ Adjust cross fall and gradient of channel ■ Lower level of roadway (e.g. fine milling) ■ Subsequent edging of asphalt (cutting, hacking)	☐ Always construct a gap joint ☐ Verify that the sub-base and the channel are layed to the specified level before starting to place asphalt ☐ Ensure compliance with the specified reference level

Adjoining stru

6.5

Description:
Crack formation and settlement around ironwork

Possible causes	Possible effects on performance	Solutions	Prevention tips
■ Poor bearing capacity of sub-grade/sub-base ■ Faulty execution of asphalt place-ment ■ Non-conforming and/or missing construction of gap joints ■ Inadequate compaction of the mix along ironwork edges	■ Backwater in front of ironwork ■ Degradation of roadway around ironwork ■ Degradation of ironwork ■ Danger to traffic	■ Replace roadway around ironwork (e.g. unbound base course, asphalt, block paving) ■ Construct gap joint ■ Repair cracks ■ Replace ironwork	■ Always construct gap joints around ironwork ■ Verify/ensure load-bearing capacity of sub-base ■ Select proper sealing/filler material ■ Take special care when placing asphalt around iron-work

ctures and ironwork

6.6

Description:
Loose ironwork, movement under traffic

Possible causes	Possible effects on performance	Solutions	Prevention tips
■ No underpinning for ironwork ■ Defective bed ■ Ironwork is higher than the existing surface level	■ Degradation of roadway around ironwork ■ Degradation of ironwork ■ Displacement of ironwork ■ Danger to traffic	■ Replace roadway around ironwork (e. g. unbound base course, asphalt, block paving) ■ Construct or replace gap joint ■ Replace ironwork	■ Always construct gap joints around ironwork ■ Verify load-bearing capacity of sub-base ■ Select proper sealing/filler material ■ Take special care when placing asphalt around ironwork ■ Ensure compliance with specified thickness of mortar joint ■ Avoid different levels

Adjoining

6.7

Description:
Bulges in front of ironwork

Possible causes	Possible effects on performance	Solutions	Prevention tips
■ Faulty asphalt placement ■ Compaction errors	■ No or obstructed water runoff ■ Irregularities ■ Dynamic traffic load (crack formation) ■ Danger to traffic	■ Replace asphalt layer around ironwork ■ Fine milling ■ (Grinding)	■ Verify evenness during asphalt placement (e. g. straight-edger) ■ Ensure compliance with specified compaction technique ■ Ensure that paver screed is not raising (verify that ironwork is placed to the specified level) ■ Always construct gap joints around ironwork

6.8

Description:
Degradation of asphalt edge along road shoulder

Possible causes	Possible effects on performance	Solutions	Prevention tips
■ Shoulder is too high (backwater) ■ Poor load-bearing capacity of subgrade/ sub-base in edge section ■ Inadequate compaction of edges during asphalt placement ■ Excessive traffic load on road edge ■ Poor maintenance	■ Crack formation and degradation of roadway ■ Danger to traffic	■ Cut shoulder to 3 cm below the upper edge of the road ■ Replace edges and adjacent areas ■ Reinforce shoulder (e. g. grass pavers)	□ Construct shoulder to the specified height □ Ensure load transfer (take into account the notching of layers) □ Compact area along edges

7 Surface appearance

7.1

Description:
Non-uniform texture

Possible causes	Possible effects on performance	Solutions	Prevention tips
■ Mix is variable in aggregate gradation or binder content ■ Inadequate gritting ■ Varying surface due to handwork versus machine placement ■ Running the paver empty	■ Varying skid resistance of surface ■ Scaling ■ Raveling	■ Reinstatement with the following measures: ■ thin hot-mix overlay ■ slurry surfacing ■ surface treatment ■ (bituminous slurries)	☐ Adjust paver speed to material supply rate ☐ Use correct gritting technique ☐ Use suitable aggregates for gritting ☐ Visual inspection of mix upon delivery

7.2

Description:
Poor skid resistance

Possible causes	Possible effects on performance	Solutions	Prevention tips
■ Aggregates with low Polished Stone Value (PSV) in mix and gritting ■ Excess of binder in the asphalt mixture ■ Binder is too soft for the intended use ■ Gritting is applied too late ■ Aggregates for gritting are moist and not de-dusted ■ Incorrect roller operation and rolling pattern	■ Danger for traffic safety ■ Restrictions of traffic	■ Measures to improve skid resistance (see DAV-guideline Skid Resistance)	■ Use pre-dried, de-dusted, bituminized or heated aggregates for gritting ■ Apply aggregates as soon as possible ■ Visual inspection of mix upon delivery ■ Ensure compliance with specified mix temperature ■ Ensure that appropriate rollers are used and operated to specification ■ Ensure compliance with scheduled time for opening the pavement to traffic

7 Surface appearance

7.3

Description:
Porous pavement, loss of aggregates, fretting, erosion, distressed and failed areas

Possible causes	Possible effects on performance	Solutions	Prevention tips

■ Poor mix quality (segregated, cold, etc.)
■ Wrong settings for paver screed
■ Poor compaction
■ Pockets
■ Adverse weather conditions (wind, temperature, rain, moist and cold base course)
	■ Potholes
	■ Traffic disruptions
		■ Reinstatement with the following measures:
		  ■ thin hot-mix overlay
		  ■ slurry surfacing
		  ■ surface treatment
		  ■ Replace surface course
			☐ Monitor mix temperature
			☐ Visual inspection of mix
			☐ Adjust screed settings and symmetry of screed controls
			☐ Continuous placement
			☐ Do not place cold, non-homogeneous mix!

7.4

Description:
Inadequate Evenness

Possible causes	Possible effects on performance	Solutions	Prevention tips
■ Temperature fluctuations of mix ■ No steady feed of material to paver ■ Wrong settings for paver ■ Incorrect roller operation and compaction technique ■ Handwork ■ Varying surface course thicknesses ■ Inadequate base course ■ Adverse weather conditions	■ Surface irregularities (e. g. washboarding) ■ Traffic disruptions	■ Fine milling ■ Replace surface course	☐ Ensure that base course is even (level out base course, if need be) ☐ Ensure steady feed of material to paver ☐ Run paver further than needed, if need be ☐ Adjust initial compaction in screed unit ☐ Ensure compliance with tolerance ranges ☐ Adjust roller operation and rolling pattern to type of mix and temperature

Surface appearance

7.5

Description:
Damp sections, water bleeding or pumping

Possible causes	Possible effects on performance	Solutions	Prevention tips
■ Aggregate loss on surface course	■ Loss of aggregates	■ Ensure that elevated edge is sealed tight	■ Ensure that the elevated edge is sealed tight
■ Void content is too high	■ Progressive degradation of surface course	■ Apply bituminous slurries	■ Ensure good layer bonding
■ Poor layer bonding	■ Water bleeding/ pumping (ice formation)	■ Drill stress relief holes to drain water	■ Ensure good workmanship when placing each layer
■ Inadequate sealing of edges	■ Danger to traffic	■ Replace course(s)	■ Ensure good workmanship when constructing joints and/ or gap joints
■ Open joints and/or open gap joints			

Annex

Additional information about the German Asphalt Paving Association (DAV) and further DAV-guidelines

More information about the German Asphalt Pavement Association DAV and the German Asphalt Research Institute DAI as well as an overview of their publications (brochures, guidelines and research reports) you will find on the internet:

www.asphalt.de

Further publications in English and in other languages
www.asphalt.de → Literatur → Download → International

Notes

More information on the internet: **www.asphalt.de**

Notes

More information on the internet: **www.asphalt.de**

Notes

More information on the internet: **www.asphalt.de**

Notes

More information on the internet: **www.asphalt.de**

English version sponsored by

J. Rettenmaier & Söhne GmbH + Co. KG

73494 Rosenberg
Germany

Fon + 49 7967 152 297 · Fax + 49 7967 152 500 151

viatop@jrs.de · **www.jrs.de**

www.sma-viatop.com

Deutscher Asphaltverband e. V. · Schieffelingsweg 6 · 53123 Bonn · Germany
Fon +49 228 97 96 5-0 · **Fax** +49 228 97 96 5-11
E-Mail dav@asphalt.de · **Internet** www.asphalt.de