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bauaufsichtliche
Zulassung/
Allgemeine
Bauartgenehmigung**

Zulassungsstelle für Bauprodukte und Bauarten

Bautechnisches Prüfamt

Eine vom Bund und den Ländern
gemeinsam getragene Anstalt des öffentlichen Rechts

Mitglied der EOTA, der UEAtc und der WFTAO

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Geltungsdauer

vom: **1 September 2021**

bis: **1 September 2026**

Antragsteller:

I.S.T.

Innovative Sewer Technologies GmbH

Rombacher Hut 19

44795 Bochum

Gegenstand dieses Bescheides:

**Construction products and their use for the execution of short liners with the designation
"Spot Repair System" for the rehabilitation of underground defective waste water pipes in the
nominal width range from DN 100 to DN 500**

The above-mentioned subject of regulation is hereby generally approved/approved by the building
authorities.

This decision comprises 17 pages and eleven annexes.

DIBt

I GENERAL PROVISIONS

- 1 This notice proves the usability or applicability of the subject matter of the regulation in terms of the state building regulations.
- 2 This notice does not replace the permits, approvals and certificates required by law for the implementation of building projects.
- 3 This notice is issued without prejudice to the rights of third parties, in particular private property rights.
- 4 The user of the subject matter of the regulation shall be provided with copies of this notice, irrespective of further provisions in the "Special Provisions". In addition, the user of the subject matter of the regulation must be informed that this notification must be available at the place of use or application. Copies must also be made available to the authorities involved upon request.
- 5 This notice may only be reproduced in full. Publication of excerpts requires the consent of Deutsches Institut für Bautechnik. Texts and drawings of advertising material must not contradict this notice, translations must contain the note "Translation of the original German version not checked by Deutsches Institut für Bautechnik".
- 6 This notice is issued revocably. The provisions may be subsequently supplemented and amended, in particular if new technical findings so require.
- 7 This notice refers to the information provided and documents submitted by the applicant. Any change in these basic principles is not covered by this notification and must be disclosed to Deutsches Institut für Bautechnik without delay.
- 8 The general type approval encompassed by this notification shall also be deemed to be the general technical approval for the type.

II SPECIAL PROVISIONS

1 Object of regulation and scope of use or application

This notice applies to the production and use of short liners with the designation "Spot Repair System" (Annex 4) with the three-component silicate isocyanate resin systems of the designation "EasyPur" as well as for the fixed resin systems with the designations "EasyPur 2K Slow", "EasyPur 2K Summer", "EasyPur 2K Winter" and "EasyPur 2K Fast" for the repair or rehabilitation of underground wastewater pipes with circular cross-sections in nominal widths DN 100 to DN 500. Repair or rehabilitation of damaged underground wastewater pipes with circular cross-sections in the nominal sizes DN 100 to DN 500.

This notice applies to the rehabilitation of wastewater pipes intended to discharge wastewater in accordance with DIN 1986-31.

The short liners can be used for the repair or rehabilitation of waste water pipes made of concrete, reinforced concrete, stoneware, asbestos-free fibre cement, cast iron, GRP and PVC-U, provided that the cross-section of the waste water pipe to be rehabilitated meets the requirements of the process and the static requirements.

The short liners can be used for the repair or rehabilitation of crack formations (e.g. radial cracks and longitudinal cracks as well as combinations of longitudinal and radial cracks) and leaking pipe joints under the condition that the old pipe-floor system alone is still load-bearing (e.g. longitudinal cracks with low pipe deformation with verified functional lateral bedding, if necessary this is to be verified e.g. by long-term observations and/or pile driving).

Damaged sewage pipes are rehabilitated with a short liner by moving a resin-impregnated glass fibre fabric mat consisting of random fibre fabric layers to the damaged area of the sewage pipe by means of an inflatable packer and pressing it positively against the pipe wall by inflating the packer. The packer is left in this position until the curing process is largely complete.

2 Provisions for the construction products

2.1 Properties and composition

2.1.1 Component materials

2.1.1.1 Glass fibre material (Annex 1)

Only E-CR woven glass fibre mats and E-CR woven glass fibre mats according to DIN 1259-12 and DIN 61853-13 and DIN 61853-24 as well as DIN 61854-15 may be used as substrate material for the resin system in accordance with the recipe specifications deposited at Deutsches Institut für Bautechnik.

The glass fibre fabric mats consist of three layers, two fabric layers each offset by 90° and a random fibre layer, which are sewn together.

- | | | |
|---|-------------|---|
| 1 | DIN 1986-3 | Drainage systems for buildings and sites - Part 3: Rules for operation and maintenance; Edition:2004-11 |
| 2 | DIN 1259-1 | Glass - Part 1: Terms for glass types and glass groups; Issue:2001-09 |
| 3 | DIN 61853-1 | Textile glass ; textile glass mats for the reinforcement of plastics; technical delivery conditions; Edition:1987-04 |
| 4 | DIN 61853-2 | Textile glass ; textile glass mats for plastic reinforcement; classification, application; Edition:1987-04 |
| 5 | DIN 61854-1 | Textile glass ; textile glass fabrics for plastic reinforcement; filament fabrics and Roving fabric; Technical delivery conditions; Edition:1987-04 |

The glass fibre fabric mats have the following properties, among others, before processing (Appendix 1):

1. Glass fibre fabric mat for two-ply short liner:

Basis weight	: $\approx 1,387 \text{ g/m}^2 \pm 4 \%$
Thickness:	approx. 1.8 mm
Width:	approx. 1,300 mm

2. Glass fibre fabric mat for three-layer short liner

Basis weight	: $\approx 1,086 \text{ g/m}^2 \pm 4 \%$
Thickness:	approx. 1.2 mm
Width:	approx. 1,300 mm

2.1.1.2 Resin components

The three-component silicate isocyanate resin systems "EasyPur" and the fixed resin systems "EasyPur 2K Summer", "EasyPur 2K Winter" and "EasyPur 2K Fast" consist of components A (resin), B (hardener) and C (catalyst). "EasyPur 2K Slow" consists of components A (resin), B (hardener) and C (emulsifier). The composition of these components must comply with the formulation details deposited with Deutsches Institut für Bautechnik.

• **Component A (resin):**

Before processing, the resin has the following properties, among others:

- Density following
DIN EN ISO 2811⁶ at +25 °C: $1.490 \text{ g/cm}^3 \pm 10 \%$.
- Viscosity following
DIN EN ISO 3219⁷ at +25 °C: $270 \text{ mPa} \times \text{s} \pm 100 \text{ mPa} \times \text{s}^{\text{A})}$
- pH value: ≈ 12.5
- colour: colourless

• **Component B (hardener):**

Before processing, the hardener has the following properties, among others:

- Density following
DIN EN ISO 2811⁶ at +25 °C: $1.13 \text{ g/cm}^3 \pm 10 \%$.
- Viscosity following
DIN EN ISO 3219⁷ at +25 °C: $150 \text{ mPa} \times \text{s} \pm 50 \text{ mPa} \times \text{s}^{\text{A})}$
- colour: black brown

• **Component C (catalyst):**

Before processing, the catalyst has the following properties, among others:

- Density following
DIN EN ISO 2811⁶ at +25 °C: $1.120 \text{ g/cm}^3 \pm 10 \%$.
- Viscosity following
DIN EN ISO 3219⁷ at +25 °C: $40 \text{ mPa} \times \text{s} \pm 5 \text{ mPa} \times \text{s}^{\text{A})}$

⁶ DIN EN ISO 2811-1 Coatings - Determination of density - Part 1: Pycnometer method
(ISO 2811-1:2016); German version EN ISO 2811-1:2016; Issue:2016-08

⁷ DIN EN ISO 3219 Plastics - Polymers/resins in liquid, emulsified or dispersed admix-
stand - Determination of viscosity with a rotational viscometer at a defined velocity
gradient (ISO 3219:1993); German version EN ISO 3219:1994; Ausgabe:1994-10

^{A)} Measurement cylinder / concentric, shear rate 50 rpm

- pH value : ≈ 12.5
- colour: light brown
- **Component C (emulsifier):**
Before processing, the emulsifier has the following properties, among others:
 - Density following
DIN EN ISO 2811⁶ at +25 °C: $1.159 \text{ g/cm}^3 \pm 10 \%$.
 - Viscosity following
DIN EN ISO 3219⁷ at +25 °C: $3.167 \text{ mPa} \times \text{s} \pm 316 \text{ mPa} \times \text{s}^{\text{A}}$
 - colour: colourless
- **Factory addition of component C (catalyst) to component A (resin) of the resin system "EasyPur" (fixed resin systems):**
 - "EasyPur 2K Summer": 1.0 %
 - "EasyPur 2K Winter": 3.0 %
 - "EasyPur 2K Fast": 3.5 %

The potting times according to Annexes 6 and 7 (the three upper tables) must be observed.

- **Factory addition of component C (emulsifier) to component A (resin) of the resin system "EasyPur" (fixed resin system):**

- "EasyPur 2K Slow": 1.0 %

The potting times according to Appendix 7 (the lowest table) must be observed.

The silicate isocyanate resin systems shall comply with the formulations and IR spectra deposited with Deutsches Institut für Bautechnik. The IR spectra shall also be deposited with the third party inspection body by the applicant for this certificate.

2.1.2 Environmental compatibility

The construction products comply with the requirements of the "Principles for assessing the impact of construction products on soil and groundwater" (version: 2011; publications of the German Institute for Construction Technology). This statement only applies if the specific provisions of this notice are complied with.

The reservation of permission, especially in water protection zones, by the competent water authority remains unaffected.

2.1.3 Physical characteristics of the silicate-isocyanate resin mixture of the resin systems "EasyPur 2K Summer", "EasyPur 2K Winter" and "EasyPur 2K Fast" (catalyst)

The cured resin mixture of components A, B and C has the following characteristic values:

- Density according to DIN EN ISO 1183-18: $1.270 \text{ g/cm}^3 \pm 10 \%$.
- Tensile strength following DIN EN ISO 527-29: $\geq 11 \text{ N/mm}^2$
- Tensile modulus of elasticity according to DIN EN ISO 527-29: $\geq 90 \text{ N/mm}^2$
- Compressive strength following DIN EN ISO 60410: $\geq 35 \text{ N/mm}^2$
- Pressure modulus according to DIN EN ISO 60410: $\geq 500 \text{ N/mm}^2$

⁸ DIN EN ISO 1183-1Plastics - Method for the determination of the density of non-foamed synthetic materials substances - Part 1: Immersion method, liquid pycnometer method and titration method (ISO 1183-1:2012); German version EN ISO 1183-1:2012, Publication:2013-04

⁹ DIN EN ISO 527-2Plastics - Determination of tensile properties - Part 2: Test conditions for Moulding and extrusion compounds (ISO 527-2:1993 including Cor.1:1994); German version EN ISO 527-2:1996; Publication:1996-07

¹⁰ DIN EN ISO 604Plastics-Determination of compressive properties (ISO 604:2002); German version EN ISO 604:2003; Ausgabe:2003-12

- Shrinkage according to ISO 257711: $\leq 0,1 \%$.
- Shore D hardness according to ISO 7619-112: ≥ 60
- Bending stress at 2 % elongation in contact with the ground
to DIN EN ISO 17813: $\geq 9 \text{ N/mm}^2$

2.1.4 Physical characteristics of the silicate-isocyanate resin mixture of the resin system "EasyPur 2K Slow" (emulsifier)

The cured resin mixture of components A, B and C has the following characteristic values:

- Density according to DIN EN ISO 1183-18: $1.241 \text{ g/cm}^3 \pm 10 \%$.
- Tensile strength following DIN EN ISO 527-29: $\geq 6.7 \text{ N/mm}^2$
- Tensile modulus of elasticity according to DIN EN ISO 527-29: $\geq 500 \text{ N/mm}^2$
- Compressive strength following DIN EN ISO 60410: $\geq 70 \text{ N/mm}^2$
- Pressure modulus according to DIN EN ISO 60410: $\geq 370 \text{ N/mm}^2$
- Shrinkage according to ISO 257711: $\leq 0,1 \%$.
- Shore D hardness according to ISO 7619-112: ≥ 60
- Bending stress following DIN EN ISO 17813: $\geq 18 \text{ N/mm}^2$

2.2 Production, packaging, transport, storage and labelling

2.2.1 Production of the short liner

The glass fibre fabric mats for the minimum wall thicknesses specified in sections 2.1.1.1 and 3.1.2.1 shall be produced in the sub-supplier's factory. The applicant shall satisfy himself of the supplier's compliance with the specified dimensions of the woven glass fibre mats.

At least the following properties of the resin components A, B and C must be checked during the incoming goods inspection:

Properties of the resin:

- Density
- Viscosity

2.2.2 Packaging, transport, storage

The applicant shall ensure that the woven glass fibre mats supplied by the subcontractor are stored on his premises or those of the contractors in such a way that the mats are not damaged.

The applicant shall ensure that the components of the systems "EasyPur", "EasyPur 2K Slow", "EasyPur 2K Summer", "EasyPur 2K Winter" as well as "EasyPur 2K Fast" for resin impregnation on the respective construction site are stored in suitable, separate, airtight containers on the premises of the applicant or the supplier until further use. The temperature range of $+10 \text{ }^{\circ}\text{C}$ to $+30 \text{ }^{\circ}\text{C}$ must be observed. The permissible storage time is approx. six months after delivery and must not be exceeded. The containers must be protected from direct sunlight. The containers must be designed in such a way that the resin components A, B and C are stored in separate individual containers.

¹¹ ISO 25771Plastics - Thermosetting moulding plastics - Determination of shrinkage;
Edition:2007-12

¹² ISO 7619-1Elastomers or thermoplastic elastomers - Determination of hardness - Part 1:
Durometer method (Shore hardness); Edition:2004-05

¹³ DIN EN ISO 178Plastics - Determination of flexural properties (ISO 178:2019); German
Version EN ISO 178:2019; Issue:2019-08

The quantities of the components required for the remediation measures are to be taken from the storage containers and transported to the respective place of use in suitable, separate and hermetically sealed containers. During transport and at the place of use, the containers must be protected from the weather. The woven glass fibre mats must be transported in suitable transport containers in such a way that they are not damaged.

If the resin components are filled at the exporter's premises, the applicant shall ensure that this is done only in suitable transport containers (e.g. plastic canisters).

During storage and transport, the relevant accident prevention regulations and the explanations in the applicant's procedure manual must be observed.

2.2.3 Labelling

The glass fibre fabric mats and the respective transport containers of the resin components A, B and C must be marked with the mark of conformity (Ü mark) according to the conformity mark regulations of the federal states, including the notification number Z-42.3-388. The marking may only be carried out if the requirements according to section 2.3 Confirmation of conformity are fulfilled.

The manufacturer must indicate the hazard symbols and H and P phrases on the containers, on the packaging, on the instruction leaflet or in the delivery note in accordance with the Ordinance on Hazardous Substances and the EU Regulation No. 1907/2006 (REACH) as well as the respective current version of the CLP Regulation (EC) 1272/2008/14. The packaging must be labelled in accordance with the rules of the ADR15 in the respective applicable versions.

In addition, the transport containers of the glass fibre fabric mats shall indicate:

- Designation of the glass fibre fabric mats 1,387 g/m² and 1,086 g/m²
- Length and width
- Batch number

In addition, the transport containers for resins, hardener, catalyst and emulsifier must be marked with at least the following:

- Component designation A (resin), B (hardener), C (catalyst or emulsifier)
- Temperature range for processing +5 °C to +25 °C
- Container content (volume or weight)
- Batch number

2.3 Confirmation of conformity

2.3.1 General

The confirmation of conformity of the construction products with the provisions of the general building approval covered by the notification shall be made for each manufacturing plant with a declaration of conformity on the basis of a factory production control and a certificate of conformity of a certification body recognised for this purpose as well as a regular external surveillance by a recognised surveillance body including an initial test of the construction products in accordance with the following provisions.

For the issuing of the certificate of conformity and the external surveillance including the product tests to be carried out, the manufacturer of the construction products shall involve a certification body recognised for this purpose as well as a surveillance body recognised for this purpose.

- | | |
|----|--|
| 14 | 1272/2008 Regulation (EC) No. 1272/2008 on classification, labelling and presumptive use of certain substances. |
| 15 | ADREuropean Agreement concerning the International Carriage of Dangerous Goods by Road (Accord européen relatif au transport international des marchandises Dangereuses par Route) |

The manufacturer shall submit the declaration of conformity by marking the construction products with the mark of conformity (Ü mark) with reference to the intended use.

The certification body shall provide the Deutsches Institut für Bautechnik with a copy of the certificate of conformity issued by it.

The Deutsches Institut für Bautechnik shall also be provided with a copy of the initial inspection report.

2.3.2 In-house production control

In each manufacturing plant, a factory production control shall be established and carried out. Factory production control means the continuous surveillance of production to be carried out by the manufacturer to ensure that the construction products manufactured by him conform to the provisions of this general technical approval.

The factory production control shall include at least the measures listed below.

Description and verification of the source material

The applicant shall satisfy himself with each delivery of the components glass fibre fabric mats, resin, hardener, catalyst and emulsifier that the required properties according to section 2.1.1 are met.

For this purpose, the applicant shall obtain corresponding works certificates 2.2 from the respective supplier of the raw materials of the resin components and works certificates 2.1 in accordance with DIN EN 10204:16 from the manufacturing plant of the respective supplier of the glass fibre fabric mats.

Within the scope of the outgoing goods inspection, the properties specified in Section 2.1.1.1 and Section 2.1.1.2 shall additionally be checked for each batch in accordance with the formulation data deposited with Deutsches Institut für Bautechnik.

Furthermore, the bending stress and the Shore D hardness according to sections 2.1.3 and 2.1.4 of the ready-to-use resin mixture shall be tested on at least three test specimens.

The shrinkage according to sections 2.1.3 and 2.1.4 shall be tested in accordance with ISO 2577:11 on at least three test specimens per batch or according to DIN 16946-1:17 by determining the mass loss. The test shall be carried out on test specimens after conditioning for 24 hours at +23 °C ± 2 °C. The use of a demountable metal mould is recommended for the production of the test specimens.

- Checks and tests to be carried out during manufacture: The requirements according to section 2.2.1 shall be checked.

- Checking the containers:

For each batch of resin, the requirements for labelling according to section 2.2.3 shall be checked.

The results of factory production control shall be recorded and evaluated. The records shall contain at least the following information:

- Designation of the construction products or the basic materials and the components,
- Type of control or audit,
- Date of manufacture and testing of the construction products or of the basic materials or of the constituents,

¹⁶ DIN EN 10204:2004 Metallic products - Types of inspection certificates; German version
EN 10204:2004; Issue:2005-01

¹⁷ DIN 16946-1 Reactive resin moulding materials; casting resin moulding materials; test methods;
Ausgabe:1989-03

- Result of the checks and tests and, where applicable, comparison with the requirements,
- Signature of the person responsible for factory production control.

The records must be kept for at least five years and submitted to the inspection body responsible for third-party inspection. They shall be submitted to Deutsches Institut für Bautechnik and the competent supreme building supervisory authority upon request.

If the test result is unsatisfactory, the manufacturer shall immediately take the necessary measures to remedy the defect. Construction products which do not comply with the requirements shall be handled in such a way that confusion with matching products is excluded. After the defect has been remedied, the test in question must be repeated without delay, insofar as this is technically possible and necessary to prove that the defect has been remedied.

2.3.3 External monitoring

In each manufacturing plant, the factory and the factory production control shall be inspected regularly by an external inspection, but at least twice a year.

An initial test of the process components must be carried out as part of the external monitoring. The factory production control shall be checked by random tests within the scope of the external surveillance. The requirements of sections 2.1.1 and 2.2.3 shall be checked.

In addition, the requirements for manufacture according to section 2.2.1 shall be randomly checked. This also includes checking the curing behaviour, the density of components A, B and C according to section 2.1.1.2, the storage stability and the weight per unit area of the glass fibre fabric mats, as well as the IR spectroscopies.

Sampling and testing are the responsibility of the recognised inspection body. During the external inspection, the works certificates 2.1 and the works certificates 2.2 must also be checked in accordance with DIN EN 1020416.

The results of certification and external surveillance shall be kept for at least five years. They shall be submitted by the certification body or the inspection body to Deutsches Institut für Bautechnik and the competent supreme building supervisory authority upon request.

3 Provisions for the application of the subject matter of the regulation

3.1 Planning and dimensioning

3.1.1 Planning

The necessary pipe data must be checked, e.g. routing, depth, location of side inlets, shaft depths, groundwater, pipe connections, hydraulic conditions, inspection openings, cleaning intervals. Existing video recordings must be evaluated in relation to the application. The accuracy of the information must be checked on site. The condition of the existing wastewater pipe of the property drainage system must be evaluated with regard to the applicability of the rehabilitation procedure.

The hydraulic efficiency of the wastewater pipes must not be impaired by the installation of a short liner. Proof of this must be provided if necessary.

3.1.2 Dimensioning

3.1.2.1 Wall thickness and wall construction

Due to the system, resin-impregnated short liners are used for a rehabilitation measure, which have a minimum wall thickness of 3 mm after installation and curing, regardless of the nominal width. The wall structure of the short liner must consist of an outer liner.

and inner random fibre layer with a woven glass fibre layer in between (Annex 2, Figure Y)

3.1.2.2 Physical characteristics of the cured short liner with the catalyst

After curing, the glass fibre fabric mats (laminate) impregnated with the resin systems "EasyPur 2K Summer", "EasyPur 2K Winter" and "EasyPur 2K Fast" (catalyst) must have the following characteristic values:

- Density according to DIN EN ISO 1183-18: $1.424 \text{ g/cm}^3 \pm 10 \%$.
- Residue on ignition following DIN EN ISO 117218: $\geq 50 \%$.
- Circumferential E-module (short-time 1-hour value) based on DIN EN 16869-219 or DIN EN 122820: $\geq 4,500 \text{ N/mm}^2$
- Bending modulus of elasticity according to DIN EN ISO 17813: $\geq 4,500 \text{ N/mm}^2$
- Bending stress of B following DIN EN ISO 178¹³: $\geq 100 \text{ N/mm}^2$

3.1.2.3 Physical characteristics of the cured short liner with the emulsifier

After curing, the glass fibre fabric mats (laminate) impregnated with the resin system "EasyPur 2K Slow" must have the following characteristic values:

- Density according to DIN EN ISO 1183-18: $1.6391 \text{ g/cm}^3 \pm 10 \%$.
- Residue on ignition following DIN EN ISO 117218: $\geq 50 \%$.
- Circumferential modulus of elasticity according to DIN EN 122820: $\geq 5,900 \text{ N/mm}^2$
- Bending modulus of elasticity according to DIN EN ISO 17813: $\geq 5,500 \text{ N/mm}^2$
- Bending stress of B following DIN EN ISO 178¹³: $\geq 102 \text{ N/mm}^2$

3.2 Version

3.2.1 General

Defective wastewater pipes are rehabilitated using the short lining method, in which a resin-impregnated glass fibre fabric mat consisting of random fibre fabric layers is moved to the defective area of the wastewater pipe by means of an inflatable packer and pressed positively against the pipe wall by inflating the packer. The packer is left in this position until the curing process is largely complete.

The "Spot Repair System" short liners can be used for the following structural conditions:

- a) From the starting point to the destination
- b) Starting from the starting point in a waste water pipe with a defined length, without the need for a further manhole opening
- c) Side inlets, starting from the starting point to the connection point in the main channel

The starting point or target point can be a shaft, an inspection or cleaning opening or an open pipe section.

An arch up to 45° can be rehabilitated with an arch-going packer.

If wrinkling occurs, it must not be greater than that specified in DIN EN ISO 11296-421.

- ¹⁸ DIN EN ISO 1172 Textile glass reinforced plastics - Prepregs, moulding compounds and laminates - Determination of the Textile glass- and mineral filler content; Calculation method (ISO 1172:1996); German version EN ISO 1172:1998; Issue:1998-12
- ¹⁹ DIN EN 16869-2 Pipes made of glass fibre reinforced polyester resin (UP-GF), centrifuged, filled - Part 2: General quality requirements, testing; Issue:1995-12
- ²⁰ DIN EN 1228 Plastic piping systems - Pipes of glass fibre reinforced thermosetting plastics (GRP) - Determination of initial specific annular stiffness; German version EN 1228:1996; Ausgabe:1996-08

The applicant shall prepare a manual describing the individual steps related to the execution type of the remediation procedure and make it available to the contracting authority.

The applicant must also ensure that the contractors are sufficiently familiarised with the procedure. The sufficient expertise of the company carrying out the work can be certified, e.g. by a corresponding quality mark of the Güteschutz Kanalbau (quality protection for sewer construction).

e. V.²², can be documented.

3.2.2 Equipment and facilities

Minimum equipment, components and facilities required to carry out the repair or remediation procedure:

- Sewer cleaning equipment
- Dewatering equipment
- Devices for sewer inspection (DWA-M 149-223)
- Rehabilitation facilities:
 - Glass fibre fabric mats 1,387 g/m² and/or 1,086 g/m² for the nominal widths to be renovated
 - Container with the individual components A (resin) and B (hardener) as well as C (catalyst) or the pre-mixed resin systems "EasyPur" and/or "EasyPur 2K Slow" and/or "EasyPur 2K Summer" and/or "EasyPur 2K Winter" and/or "EasyPur 2K Fast
 - Dosing device for filling the resin components
 - Mixing container with mixing tool (agitator)
 - Weather protected impregnation point
 - Working/construction foils
 - Pipe rehabilitation equipment for the appropriate nominal pipe sizes (inflatable packer and/or bendable packer) and accessories
 - Release agent (Vaseline, floor polish or similar) and PE films (stretch films) for the packer
 - Camera, control unit with screen
 - Locking air push rods for positioning the packer
 - Securing and retracting ropes
 - Compressed air hoses for connection to the packer with pressure monitoring device
 - Compressor, compressed air hoses, pressure regulator
 - Shut-off bladders or shut-off discs suitable for the respective nominal size
 - Water supply
 - Power supply
 - Container for residues
 - Temperature sensor
 - Temperature monitoring and recording device

²¹ DIN EN ISO 11296-4 Plastic piping systems for the renovation of buried non-pressure pipelines
Drainage networks (gravity sewer systems) - Part 4: In-situ cured-in-place hose lining (ISO 11296-4:2009, corrected version 2010-06-01); German version EN ISO 11296-4:2011; Publication:2011-07

²² Güteschutz Kanalbau e. V.; Linzer Str. 21, Bad Honnef, Phone: (02224) 9384-0, Fax: (02224) 9384-84

²³ DWA-M 149-2 German Association for Water, Wastewater and Waste e. V.
(DWA) - Merkblatt 149: Zustandserfassung und -beurteilung von Entwässerssystemen außerhalb von Gebäuden - Teil 2: Kodiersystem für die optische Inspektion; Ausgabe:2013-12

- Small devices, e.g. pneumatic cutting tool
- Pneumatic drill
- Hand tools, e.g. scissors, spatula, distribution rollers, etc.
- Social and sanitary rooms, if applicable

If electrical devices, e.g. video cameras (or so-called remote sewer eyes), are inserted into the pipe to be rehabilitated, then these must be designed in accordance with VDE regulations.

3.2.3 Implementation of the rehabilitation measure

3.2.3.1 Preparatory measures

Prior to the repair or rehabilitation measure, it must be ensured that the pipeline in question is not in operation; if necessary, appropriate shut-off bubbles must be set and diversions of the wastewater must be carried out.

In order to prepare for the repair or rehabilitation measure, the intake, including the associated side inlets, must be taken out of operation. Afterwards, the pipe must be cleaned by means of high-pressure flushing. In the case of smooth-walled inner surfaces of the damaged pipeline and in the case of pipelines where high-pressure flushing cannot remove the deposits (the so-called "sewer skin") to the extent necessary for the procedure, surface removal (removal of the "sewer skin") should be carried out depending on the type of damage. Discharge obstacles must be removed.

The inner pipe surfaces in the area of the pipe shut-off devices must be level.

In the cleaned pipe section, the location of the existing damage and that of the side inlets must be measured.

Before starting work, the ambient temperature must be measured. It shall be assessed whether the temperature limits required for the process can be maintained.

The accident prevention regulations applicable to the use of the repair or renovation procedure must be observed.

Devices of the repair or renovation procedure that are to be inserted into the pipe section to be renovated may only be used if it has first been ensured by testing that no flammable gases are present in the pipe section.

For this purpose, the relevant sections of the following regulations must be observed:

- GUV-R 12624 (previously GUV 17.6)
- DWA-M 149-223
- DWA-A 199-1 and DWA-A 199-225

The correctness of the information given in section 3.1.1 must be checked on site. For this purpose, the pipe section to be rehabilitated is to be cleaned with standard high-pressure flushing equipment to such an extent that the damage can be detected perfectly on the monitor during the visual inspection in accordance with Code of Practice DWA-M 149-223.

In addition, the relevant accident prevention regulations must be observed when people enter shafts of the wastewater pipes to be rehabilitated and during all work steps of the rehabilitation process.

²⁴ GUV-R 126 Safety rules : Working in enclosed spaces of waste water engineering systems
Installations (previously GUV 17.6); Edition:2008-09

²⁵ DWA-A 199-1 German Association for Water, Wastewater and Waste e. V.
(DWA) - Worksheet 199: Service and operating instructions for the personnel of
waste water plants, - Part 1: Service instructions for the personnel of waste water
plants; Edition:2011-11
DWA-A 199-2 Deutsche Vereinigung für Wasserwirtschaft, Abwasser und Abfall e. V.
(DWA) - Worksheet 199: Service and operating instructions for the personnel of
wastewater systems, - Part 2: Operating instructions for the personnel of sewer
networks and stormwater treatment plants; Edition:2020-04

The formatting of the glass fibre fabric mats according to section 3.2.3.3, the resin mixing according to section 3.2.3.4 and the resin impregnation according to section 3.2.3.5 shall be carried out in a weather-protected enclosure (e.g. in the renovation vehicle) on level surfaces that must be free of any kind of contamination.

The pot life according to Annexes 6 and 7 shall be set for the respective rehabilitation measure by means of the resin mixture according to Section 3.2.3.4 in such a way that the short liner is in positive contact with the surface of the area of the waste water pipe to be rehabilitated within this time, i.e. without incipient hardening.

The steps required to carry out the procedure shall be recorded using record sheets for each impregnation and remediation.

3.2.3.2 Incoming inspection of the process components at the construction site

The transport containers of the process components must be checked to ensure that the markings mentioned in section 2.2.3 are present. The cut of the glass-fibre fabric mats in relation to the respective renovation object must be measured before impregnation with the resin. Compliance with the resin, hardener and catalyst storage temperature of +10 °C to +30 °C must be checked before impregnation.

3.2.3.3 Formatting the glass fibre fabric mats (Appendix 1)

The rolled-up glass fibre fabric mat is to be laid on site on a work table located in the weather-protected or air-conditioned room or in the renovation vehicle in a length of approx. 0.6 m to a maximum of 3.0 m (depending on the planned maximum individual renovation length according to Annexes 8 to 10, short liner-side C according to Annexes 2 and 3, Figure A) multiplied by 3.5 times the diameter (according to Annexes 8 to 10, glass fibre side B according to Annexes 2 and 3, Figure A), but overlapping by at least 10 cm. The glass fibre mesh mats should have a width of at least 1.30 m (according to Annexes 8 to 10, glass fibre side A according to Annexes 2 and 3, Figure A). Make sure that the glass fibre fabric mats are cut in such a way that the start and end areas of the subsequent short liner lie at least 5 cm outside the damage area on the wastewater pipe to be rehabilitated.

3.2.3.4 Resin mixture

The resin quantities required for each application shall be determined taking into account the information given in Appendices 8 to 10.

The resin system "EasyPur" consists of the resin component A, the hardener component B and the catalyst component C. Mix 100 parts by volume of component A with 200 parts by volume of component B and 1 to 5 parts by volume (appendix 6 for the catalyst) of component C. Component C is to be mixed first with component A and only then component B is to be added to the resin mixture A and C. The resin quantities required for each application must be determined in accordance with the information in Appendices 7 and 8. When installing short liners that require a longer or shorter application time, components A, B and C are to be mixed in a mixing vessel using a stirrer (e.g. electrically operated) in such a way that a bubble-free resin mixture with homogeneous colouring is achieved.

The resin systems "EasyPur 2K Summer", "EasyPur 2K Winter" and "EasyPur 2K Fast" are fixed resin systems with a 1% (Summer), 3% (Winter) or 3.5% (Fast) addition of the C-component (catalyst) in the A-component (resin). The upper three tables in Appendix 7 for the application time must be observed.

The resin system "EasyPur 2K Slow" is a fixed resin system with a 1% (slow) addition of the C component (emulsifier) in component A. The application time according to appendix 7, bottom table, must be observed.

The mixing of the resin system as well as the temperature conditions are to be recorded in a protocol according to section 3.2.3.1. In addition, a test sample of each resin mixture must be taken on site to check the curing behaviour.

3.2.3.5 Resin impregnation

After mixing the resin, apply it by means of a suitable tool, e.g. a spatula, to the spread glass fibre fabric mat with the basis weight of

Apply 1.387 g/m^2 for a two-ply short liner (first ply) evenly into the top-lying random fibre side in cross and transverse movements (Annex 2, pictures A and B). Then turn the glass fibre fabric mat over (appendix 2, picture C) and also apply resin in the direction of the fibres to the fabric side that is now on top (appendix 2, picture D) until no more resin is absorbed.

Then fold over approx. one third of the glass fibre fabric mat once (Annex 2, Fig. E) and then fold over the second third (Annex 2, Fig. F), taking into account an overlap of approx. 10 cm, and press the now folded over top tangled side firmly onto the underlying layer by longitudinal and transverse movements using a spatula. The layers are to be pressed in by longitudinal and transverse movements until the enclosed air has escaped. The folded two-layer glass fibre fabric mat is now to be turned over (appendix 2, figure G) and the tangled side is also to be pressed into the underlying layer by longitudinal and transverse movements with a spatula until the trapped air has escaped.

For a three-ply short liner (Annex 3), a glass fibre fabric mat with a weight per unit area of $1,086 \text{ g/m}^2$ is used. In this case, a second previously impregnated glass fibre fabric mat (approx. $1/3$ of the length of the first glass fibre fabric mat, in Annexes 7 and 8; short liner side C according to Annex 3, Figure A) is placed centrally on the first mat (Annex 3, Figure E) before folding. Then follow the same steps as for the production of a two-layer short liner (Annex 3, pictures F to H).

Due to the previously described folding to form a two- or three-layer short liner, one tangled side of the woven glass fibre mat forms the side facing the waste water and the other the side facing the old pipe. The glass fabric side of the glass fibre fabric mat thus lies between the tangled fabric layers (Appendix 2, Figure Y).

The curing time and the temperature curve shall be recorded in the protocol (e.g. Annex 11) according to section 3.2.3.1.

3.2.3.6 Insertion of the short liner into the wastewater pipe to be rehabilitated

The impregnated short liner is inserted by means of a packer (Appendix 5).

The rubber body of the packer suitable for the wastewater pipe to be rehabilitated must be rubbed with a separating agent and additionally wrapped with a PE protective film (Annex 4, Fig. C). The PE protective film serves as a separating layer for the subsequent removal of the packer from the cured short liner and the sewer pipe. When selecting the packer, make sure that the outer diameter of the packer is approx. 50 mm to approx. 80 mm smaller than the inner diameter of the wastewater pipe to be rehabilitated.

The resin-soaked or impregnated glass fibre fabric mat must be placed on the packer in such a way that the random fibre side and the overlaps are visible. The glass-fibre fabric mat must be secured against shifting and slipping (Annex 4, pictures A and B). Only packers equipped with rollers may be used for the renovation. The rollers must be arranged in such a way that the resin-impregnated glass fibre fabric mat does not touch the inner pipe wall when the packer is inserted and moved in the wastewater pipe to be rehabilitated.

Before the packer is pulled into the sewer line to be rehabilitated, a compressed air hose from the compressor or other compressed air generating device must be connected to the packer. The packer is to be pulled in and positioned at the previously measured point of damage in the sewer pipe by means of previously fastened ropes or locking air push rods. By applying compressed air, the rubber body of the packer expands and thus causes the resin-impregnated or impregnated glass fibre fabric mat to be pressed positively against the inner wall of the wastewater pipe to be rehabilitated.

pipe. Maintain the contact pressure until the resin system has cured (appendices 6 and 7). Make sure that no excess resin escapes. The pressure must then be released from the packer and the packer retracted to the starting point.

3.2.3.7 Lettering in the shaft

In the start or end shaft of the repair or rehabilitation measure, the following inscription should be permanently and easily legible:

- Type of rehabilitation
- Designation of the line section
- Nominal width
- Wall thickness of the short liner
- Year of renovation

3.2.3.8 Final inspection and leak test

After completion of the work, the rehabilitated pipeline section must be visually inspected and documented. (e.g. Appendix 11). It must be determined whether any material residues have been removed and no hydraulically detrimental folds are present.

After the short liner has cured, the tightness must be tested according to DIN EN 161026. The rehabilitated wastewater pipe can then be put back into operation.

3.2.4 Testing on samples taken

3.2.4.1 Curing

At least four times a year, the contractor shall construct a short liner in the nominal width last rehabilitated, using a support pipe (e.g. in a PVC-U pipe) on the respective construction site. Short-term E-modulus values (1-hour value, 24-hour value) must be determined at least twice a year on the circular ring obtained in this way.

With the help of the 1-hour value and the 24-hour value, it must be determined whether the creep tendency in accordance with DIN EN ISO 899-227 of Kn 9% is adhered to according to the following relationship:

$$K_n \frac{E_{1h} E_{24h}}{E_{1h}} 100$$

3.2.4.2 Waterproofness of the samples

The waterproofness of the cured short liner can be tested either on a short liner section (circular ring) or on test pieces taken from the cured short liner. For the test, the foil of the short liner section or the test piece must either be removed or perforated.

The test on test pieces can be carried out either with overpressure or underpressure of 0.5 bar.

For the negative pressure test, the sample must be impacted with water on one side. At a negative pressure of 0.5 bar, no water leakage must be visible on the unpressurised side of the sample during a test period of 30 minutes.

When testing by means of overpressure, apply a water pressure of 0.5 bar for 30 minutes. Also with this method, no water leakage must be visible on the unimpacted side of the sample.

²⁶ DIN EN 1610 Installation and testing of waste water pipes and sewers; German version
EN 1610:2015; Issue:2015-12

²⁷ DIN EN ISO 899-2 Plastics - Determination of creep behaviour - Part 2: Creep-bending test
under three-point load (ISO 899-2:2003); German version EN ISO 899-2:2003;
Ausgabe:2003-10

3.2.5 Declaration of conformity on the executed refurbishment measure

The confirmation of conformity of the executed repair or refurbishment measure with the provisions of the general design approval covered by this notice shall be made by the executing company by means of a declaration of conformity based on the specifications in Tables 1 and 2. The declaration of conformity shall be accompanied by documents on the properties of the process components according to section 2.1.1 and the results of the tests according to Tables 1 and 2.

The head of the remediation measure or a competent representative of the head must be present on the construction site during the execution of the remediation. He shall ensure the proper execution of the work in accordance with the provisions of Section 3.2.2 and, in particular, carry out or arrange for the inspections in accordance with Table 1 and arrange for the inspections in accordance with Table 2. The number and scope of the determinations carried out are minimum requirements.

The tests on test specimens according to Table 2 shall be carried out by an inspection body recognised by the building authorities (see List of testing, inspection and certification bodies according to the building regulations of the federal states, Part V, No. 9).

Once every six months, the sampling from a short liner of an executed remediation measure must be carried out by the aforementioned monitoring body. In addition, the monitoring body must check the documentation of the remediation measures according to Table 1.

Table 1: "In-process audits

Subject of the examination	Type of requirement	Frequency
Visual inspection of the pipe	according to section 3.2.3.1 and DWA-M 149-223	Before any renovation
Visual inspection of the pipe	according to section 3.2.3.8 and DWA-M 149-223	After each renovation
Equipment	according to section 3.2.2	every construction site
final inspection	according to section 3.2.3.8	
Labelling of the containers of the remediation components	according to section 2.2.3	
Resin mixture, resin quantity and curing behaviour per short liner	Mixing protocol according to section 3.2.3.4	
Curing temperature, curing time, and pressure in the packer	according to section 3.2.3.6	

The tests listed in Table 2 are to be arranged by the head of the remediation measure or his competent representative. For the tests listed in Table 2, samples are to be taken from the abridged guidelines.

Table 2: "Tests on test pieces

Subject of the examination	Type of requirement	Frequency
Short-term E-modulus (1-hour and 24-hour value) and creep tendency	according to section 3.2.4.1	every 6th month of manufacture per performer
Physical characteristics	according to sections 3.1.2.2 and 3.1.2.3	
Waterproofness of the sample	without mounting foil according to section 3.2.4.2	
Wall thickness and wall construction	according to section 3.1.2.1	
Resin identity by means of IR spectroscopy	according to section 2.1.1.2	

The test results shall be recorded and evaluated; they shall be submitted to Deutsches Institut für Bautechnik upon request. The number and scope of the specifications listed in the tables are minimum requirements.

Christina Pritzkow
i. V. Head of Department

Certified

E-CR Glasfasergewebematte

Beschreibung

Glasfasergewebematte für zweilagige Kurzliner

Flächengewicht ca. $1400 \text{ g/m}^2 \pm 4 \%$

Dicke ca. 1,8 mm

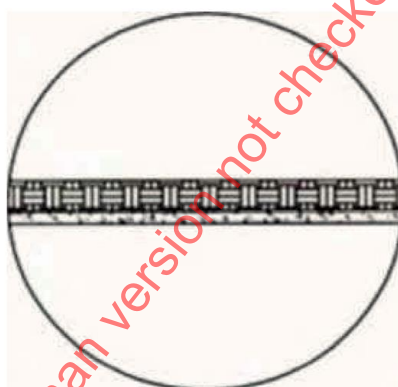
Breite (Standard) ca. 1300 mm

Glasfasergewebematte für dreilagige Kurzliner

Flächengewicht ca. $1100 \text{ g/m}^2 \pm 4 \%$

Dicke ca. 1,2 mm

Breite (Standard) ca. 1300 mm

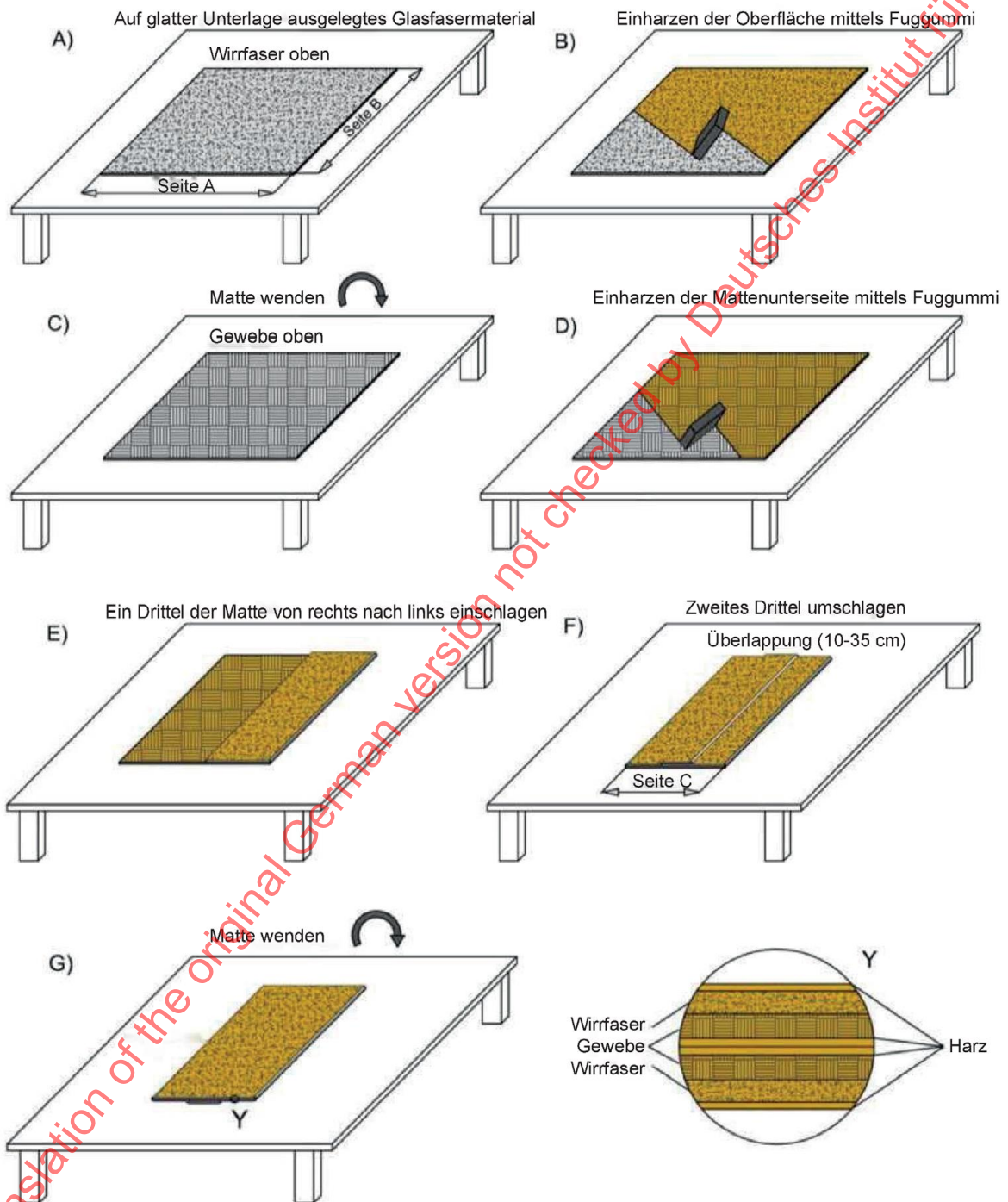


Gewebe-faserschicht
Wirrfaserschicht

Bauprodukte und deren Verwendung zur Ausführung von Kurzlinern mit der Bezeichnung "Spot Repair System" zur Sanierung erdverlegter schadhafter Abwasserleitungen im Nennweitenbereich von DN 100 bis DN 500

Die Glasfasermatte

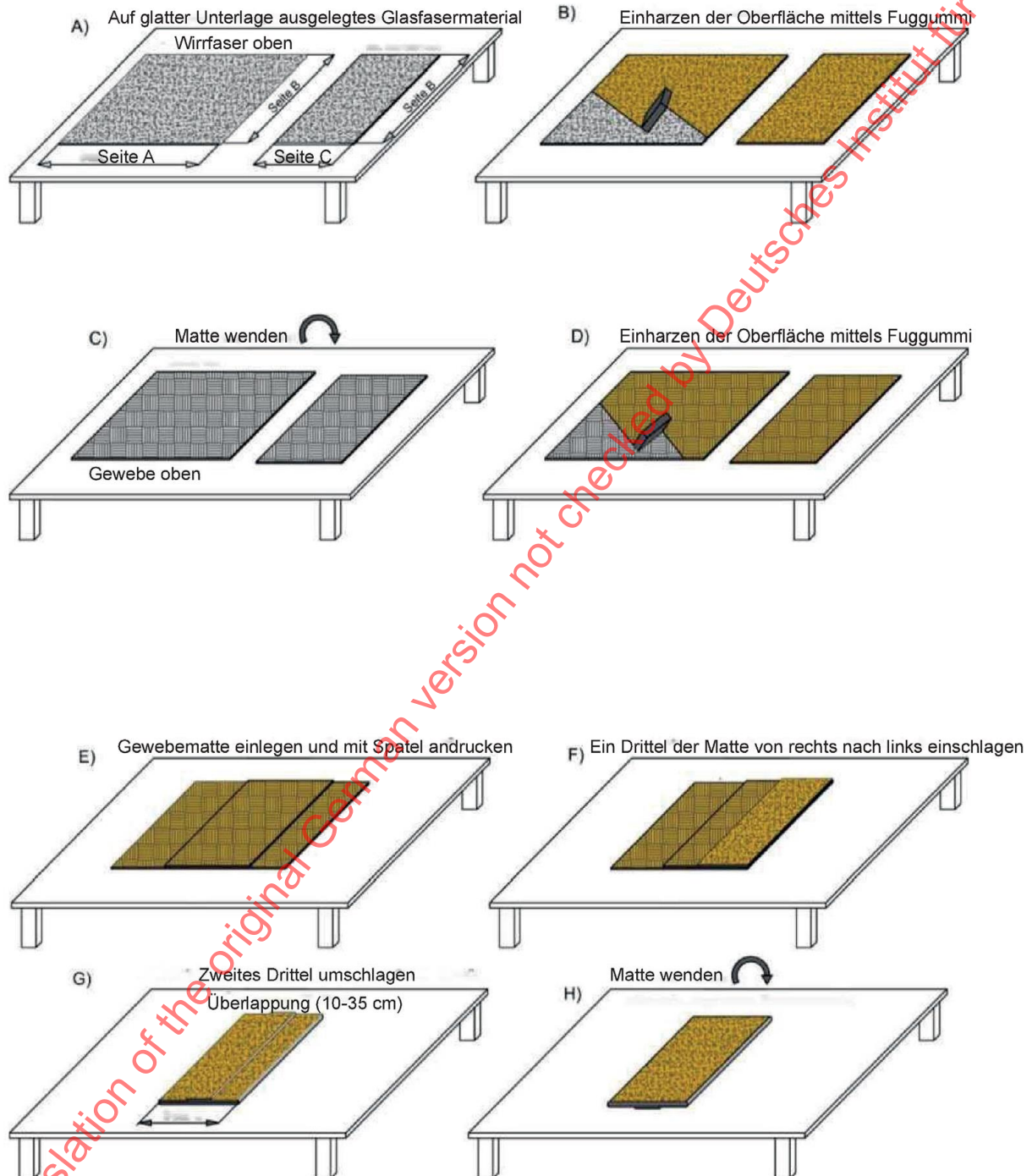
Anlage 1



Bauprodukte und deren Verwendung zur Ausführung von Kurzlinern mit der Bezeichnung "Spot Repair System" zur Sanierung erdverlegter schadhafter Abwasserleitungen im Nennweitenbereich von DN 100 bis DN 500

Tränken und Falten der Glasfasermatte, 2 lagig

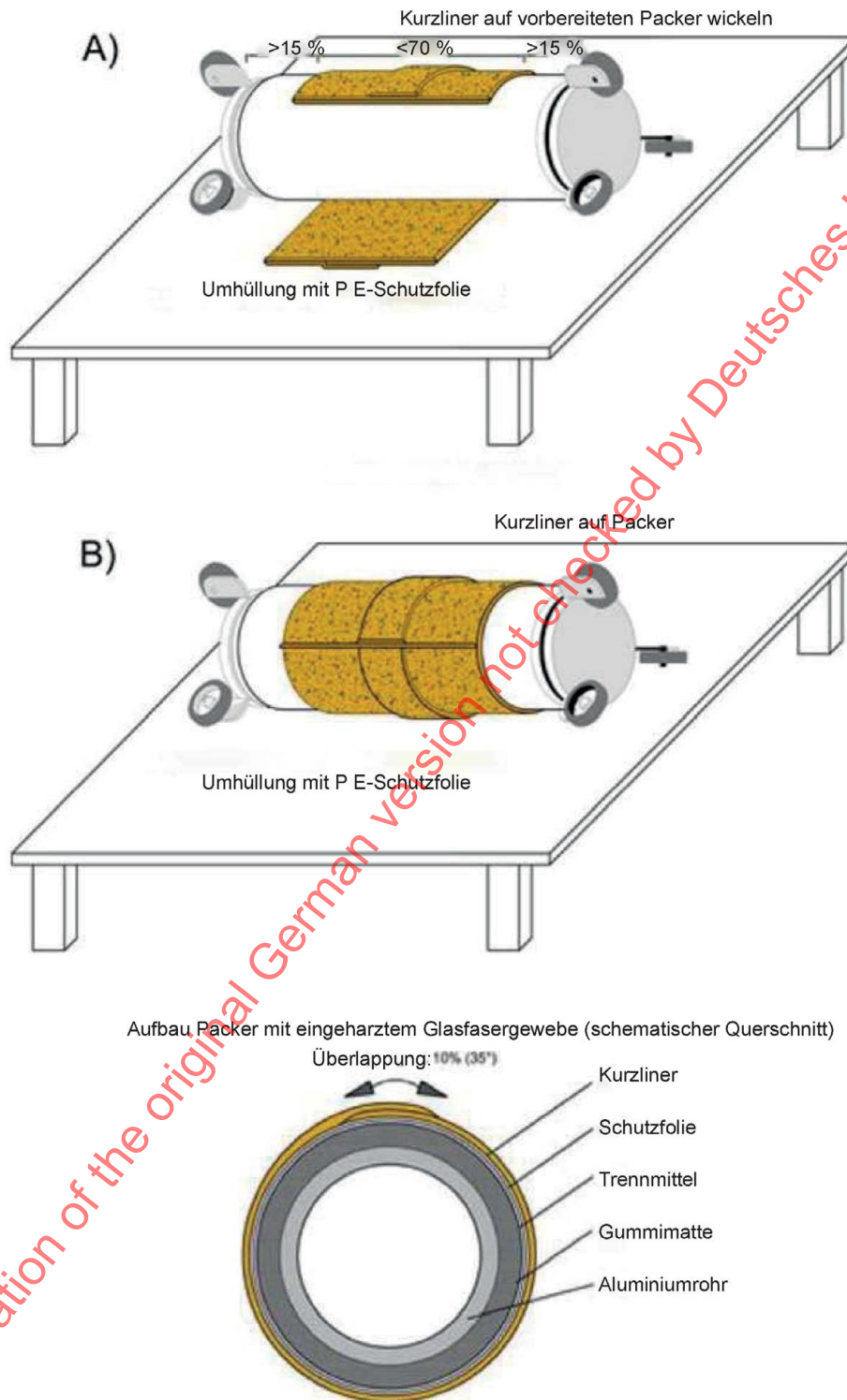
Anlage 2



Bauprodukte und deren Verwendung zur Ausführung von Kurzlinern mit der Bezeichnung "Spot Repair System" zur Sanierung erdverlegter schadhafter Abwasserleitungen im Nennweitenbereich von DN 100 bis DN 500

Tränken und Falten der Glasfasermatte, 3 lagig

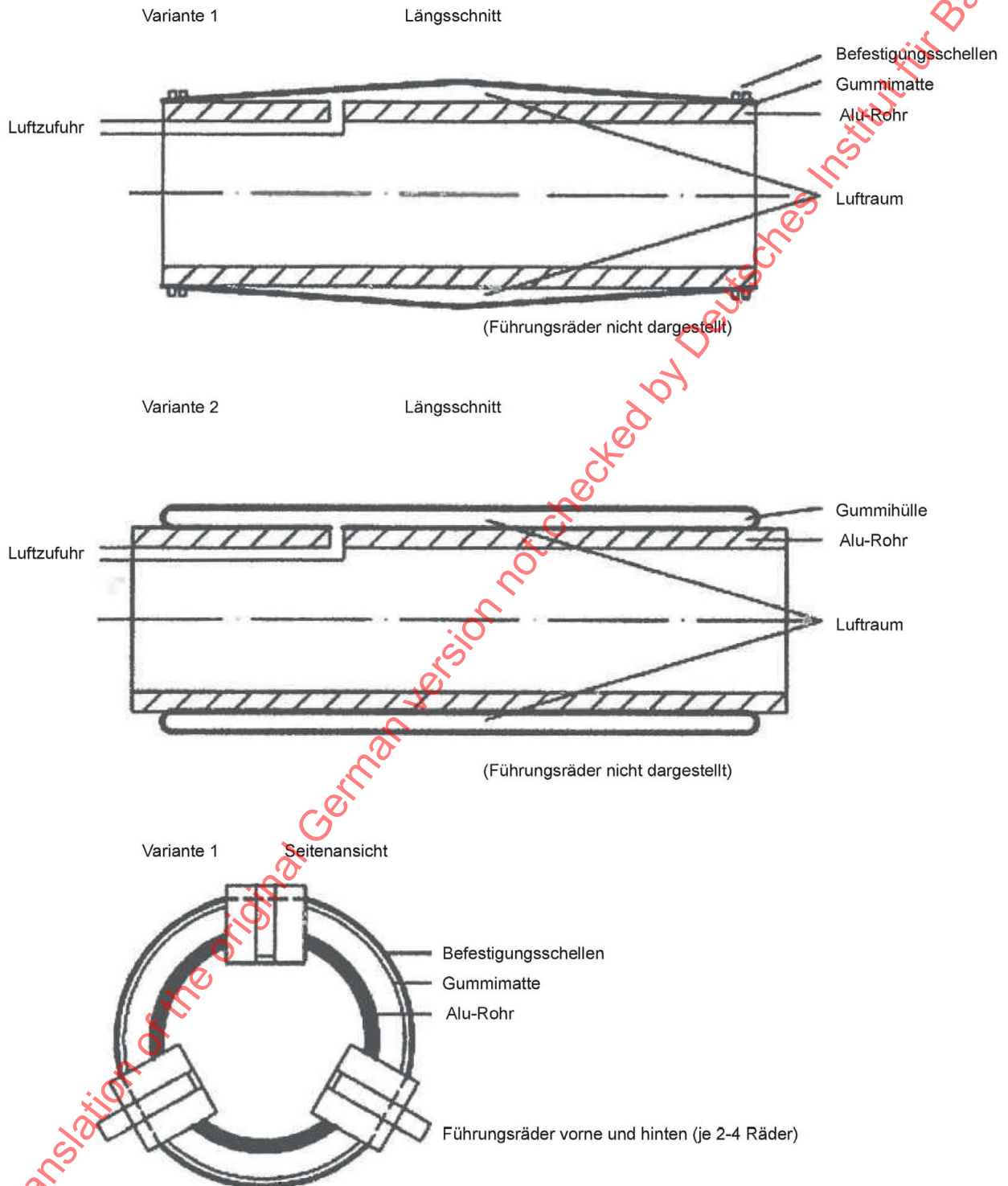
Anlage 3



Bauprodukte und deren Verwendung zur Ausführung von Kurzlinern mit der Bezeichnung "Spot Repair System" zur Sanierung erdverlegter schadhafter Abwasserleitungen im Nennweitenbereich von DN 100 bis DN 500

Aufbringen der Glasfasermatte

Anlage 4



Bauprodukte und deren Verwendung zur Ausführung von Kurzlinern mit der Bezeichnung "Spot Repair System" zur Sanierung erdverlegter schadhafter Abwasserleitungen im Nennweitenbereich von DN 100 bis DN 500

Packerarten

Anlage 5

Produkttemperatur 5° C

Zugabe von Komponente C (Katalysator) Volumen-% von Komponente A	5,00 %	4,50 %	4,00 %	3,00 %	2,50 %	2,00 %	1,00 %
Topfzeit <i>min</i> (Verstreichbarkeit)	10	11	12				
Einbringzeit <i>min</i>	20	20	25				
Entschalungszeit <i>min</i>	60	75	90				

Produkttemperatur 10° C

Zugabe von Komponente C (Katalysator) Volumen-% von Komponente A	5,00 %	4,50 %	4,00 %	3,00 %	2,50 %	2,00 %	1,00 %
Topfzeit <i>min</i> (Verstreichbarkeit)	8	9	10	12			
Einbringzeit <i>min</i>	15	15	20	25			
Entschalungszeit <i>min</i>	50	55	60	90			

Produkttemperatur 15° C

Zugabe von Komponente C (Katalysator) Volumen-% von Komponente A	5,00 %	4,50 %	4,00 %	3,00 %	2,50 %	2,00 %	1,00 %
Topfzeit <i>min</i> (Verstreichbarkeit)			8	9	11	12	
Einbringzeit <i>min</i>			10	20	20	25	
Entschalungszeit <i>min</i>			50	60	75	90	

Produkttemperatur 20° C

Zugabe von Komponente C (Katalysator) Volumen-% von Komponente A	5,00 %	4,50 %	4,00 %	3,00 %	2,50 %	2,00 %	1,00 %
Topfzeit <i>min</i> (Verstreichbarkeit)				8	9	10	
Einbringzeit <i>min</i>				10	15	20	
Entschalungszeit <i>min</i>				55	55	60	

Produkttemperatur 25° C

Zugabe von Komponente C (Katalysator) Volumen-% von Komponente A	5,00 %	4,50 %	4,00 %	3,00 %	2,50 %	2,00 %	1,00 %
Topfzeit <i>min</i> (Verstreichbarkeit)						8	10
Einbringzeit <i>min</i>						15	20
Entschalungszeit <i>min</i>						50	60

Die Zugabe der C-Komponente (Katalysator) bezieht sich in Volumenprozent auf die A-Komponente. In begründeten Fällen (siehe Handbuch) kann man von den Vorgaben abweichen.

Die C-Komponente (Katalysator) muss homogen in die A-Komponente eingerührt werden. Alle Zeitangaben in Minuten ab Mischbeginn mit der B-Komponente. Die Mischzeit von 2 Minuten ist unbedingt einzuhalten. Die Mischung muss schlierenfrei und homogen sein.

Die angegebenen Zeiten sind Laborwerte mit einer Streuung von $\pm 15\%$. Sie können sich bei der Anwendung durch Wärmetausch zwischen Harz und Untergrund, so wie Oberflächenbeschaffenheit und anderen Faktoren beeinflusst werden.

Bauprodukte und deren Verwendung zur Ausführung von Kurzlinern mit der Bezeichnung "Spot Repair System" zur Sanierung erdverlegter schadhafter Abwasserleitungen im Nennweitenbereich von DN 100 bis DN 500

Dosierung der C-Komponente (Katalysator) im System "EasyPur"

Anlage 6

EasyPur 2K Summer

Harztemperatur °C	20	25	30
Topfzeit <i>min</i> (Verstreichbarkeit)	15	12	8
Einbringzeit <i>min</i>	25	20	10
Entschalungszeit <i>min</i>	90	60	50
Mischungsverhältnis A : B (C)	100 : 200 (C-Katalysator 1,00 % von A)		

EasyPur 2K Winter

Harztemperatur °C	10	15	20
Topfzeit <i>min</i> (Verstreichbarkeit)	12	10	8
Einbringzeit <i>min</i>	25	20	10
Entschalungszeit <i>min</i>	90	60	50
Mischungsverhältnis A : B (C)	100 : 200 (C-Katalysator 3,00 % von A)		

EasyPur 2K Fast

Harztemperatur °C	10	15	20
Topfzeit <i>min</i> (Verstreichbarkeit)	8	6	4
Einbringzeit <i>min</i>	15	10	5
Entschalungszeit <i>min</i>	50	40	35
Mischungsverhältnis A : B (C)	100 : 200 (C-Katalysator 3,50 % von A)		

EasyPur 2K Slow

Harztemperatur °C	10	15	20
Topfzeit <i>min</i> (Verstreichbarkeit)	35	30	25
Einbringzeit <i>min</i>	45	40	35
Entschalungszeit <i>min</i>	210	150	120
Mischungsverhältnis A : B (C)*	100 : 200 (C-Emulgator 1,00 % von A)*		

Die Zugabe der C-Komponente (Katalysator) bezieht sich in Volumenprozent auf die A-Komponente.

Die C-Komponente (Katalysator/ Emulgator) ist bereits in der A-Komponente enthalten. Alle Zeitangaben in Minuten ab Mischbeginn der A-Komponente mit der B-Komponente. Die Mischzeit von 2 Minuten ist unbedingt einzuhalten. Die Mischung muss schlierenfrei und homogen sein.

Die angegebenen Zeiten sind Laborwerte mit einer Streuung von $\pm 15\%$. Sie können sich bei der Anwendung durch Wärmetausch zwischen Harz und Untergrund, so wie Oberflächenbeschaffenheit und anderen Faktoren beeinflusst werden.

* Die C-Komponente (Emulgator) ist nicht separat erhältlich.

Bauprodukte und deren Verwendung zur Ausführung von Kurzlinern mit der Bezeichnung "Spot Repair System" zur Sanierung erdverlegter schadhafter Abwasserleitungen im Nennweitenbereich von DN 100 bis DN 500

Festgestellte Harzsysteme "EasyPur 2K Summer", "EasyPur 2K Winter", "EasyPur 2K Fast" und "EasyPur 2K Slow"

Anlage 7

Rohrdurchmesser <i>mm</i>	Schadenlänge <i>m</i>	Zuschnittlänge Glasfaser Seite A <i>m</i>	Zuschnittlänge Glasfaser Seite B <i>m</i>	Länge Kurzliner Seite C <i>m</i>	Harzmengen für zweilagige Matte (1387 g/m² ± 4 %) <i>l</i>
100	0,20	1,30	0,41	0,60	0,9
100	0,80	2,50		1,20	1,9
100	1,40	3,70		1,80	2,8
100	2,00	4,90		2,40	3,7
100	2,60	5,10		3,00	4,7
125	0,20	1,30	0,49	0,60	1,1
125	0,80	2,50		1,20	2,2
125	1,40	3,70		1,80	3,3
125	2,00	4,90		2,40	4,4
125	2,60	5,10		3,00	4,6
150	0,20	1,30	0,57	0,60	1,3
150	0,80	2,50		1,20	2,6
150	1,40	3,70		1,80	3,9
150	2,00	4,90		2,40	5,2
150	2,60	5,10		3,00	6,4
200	0,20	1,30	0,73	0,60	1,6
200	0,80	2,50		1,20	3,3
200	1,40	3,70		1,80	4,9
200	2,00	4,90		2,40	6,6
200	2,60	5,10		3,00	8,2
250	0,20	1,30	0,89	0,60	2,0
250	0,80	2,50		1,20	4,0
250	1,40	3,70		1,80	6,0
250	2,00	4,90		2,40	8,0
250	2,60	5,10		3,00	10,0
300	0,20	1,30	1,05	0,60	2,4
300	0,80	2,50		1,20	4,7
300	1,40	3,70		1,80	7,1
300	2,00	4,90		2,40	9,5
300	2,60	5,10		3,00	11,8
400	0,20	1,30	1,40	0,60	3,2
400	0,80	2,50		1,20	6,3
400	1,40	3,70		1,80	9,5
400	2,00	4,90		2,40	12,6
400	2,60	5,10		3,00	15,8
500	0,20	1,30	1,75	0,60	4,0
500	0,80	2,50		1,20	7,9
500	1,40	3,70		1,80	11,8
500	2,00	4,90		2,40	15,8
500	2,60	5,10		3,00	19,7
Bauprodukte und deren Verwendung zur Ausführung von Kurzlinern mit der Bezeichnung "Spot Repair System" zur Sanierung erdverlegter schadhafter Abwasserleitungen im Nennweitenbereich von DN 100 bis DN 500					Anlage 8
Harzmengenbedarf für zweilagige Anordnung der Glasfasermatten mit einem Flächengewicht von 1387 g/m² ± 4 %					

Rohr- durch- messer <i>mm</i>	Schadenlänge <i>m</i>	Zuschnittlänge Glasfaser Seite A <i>m</i>	Zuschnittlänge Glasfaser Seite B <i>m</i>	Zuschnittlänge Mittellage <i>m</i>	Zuschnittbreite Mittellage <i>m</i>	Länge Kurzliner Seite C <i>m</i>	Harzmengen für dreilagige Matte (1387 g/m ² ± 4 %)
100	0,2	1,30	0,41	0,60	0,41	0,6	1,4
100	0,8	2,50		1,30		1,2	2,6
100	1,4	3,70		1,80		1,8	4,2
100	2,0	4,90		2,40		2,4	5,6
100	2,6	5,10		3,00		3,0	7,0
125	0,2	1,30	0,49	0,60	0,49	0,6	1,7
125	0,8	2,50		1,30		1,2	3,3
125	1,4	3,70		1,80		1,8	5,0
125	2,0	4,90		2,40		2,4	6,7
125	2,6	5,10		3,00		3,0	8,3
150	0,2	1,30	0,57	0,60	0,57	0,6	1,9
150	0,8	2,50		1,30		1,2	3,9
150	1,4	3,70		1,80		1,8	5,8
150	2,0	4,90		2,40		2,4	7,7
150	2,6	5,10		3,00		3,0	9,7
200	0,2	1,30	0,73	0,60	0,73	0,6	2,5
200	0,8	2,50		1,30		1,2	4,9
200	1,4	3,70		1,80		1,8	7,4
200	2,0	4,90		2,40		2,4	9,9
200	2,6	5,10		3,00		3,0	12,3
250	0,2	1,30	0,89	0,60	0,89	0,6	3,0
250	0,8	2,50		1,30		1,2	6,0
250	1,4	3,70		1,80		1,8	9,0
250	2,0	4,90		2,40		2,4	12,0
250	2,6	5,10		3,00		3,0	15,0
300	0,2	1,30	1,05	0,60	1,05	0,6	3,6
300	0,8	2,50		1,30		1,2	7,1
300	1,4	3,70		1,80		1,8	10,7
300	2,0	4,90		2,40		2,4	14,2
300	2,6	5,10		3,00		3,0	17,8
400	0,2	1,30	1,40	0,60	1,40	0,6	4,7
400	0,8	2,50		1,30		1,2	9,5
400	1,4	3,70		1,80		1,8	14,2
400	2,0	4,90		2,40		2,4	19,0
400	2,6	5,10		3,00		3,0	23,7
500	0,2	1,30	1,75	0,60	1,75	0,6	5,9
500	0,8	2,50		1,30		1,2	11,8
500	1,4	3,70		1,80		1,8	17,8
500	2,0	4,90		2,40		2,4	23,7
500	2,6	5,10		3,00		3,0	29,6
Bauprodukte und deren Verwendung zur Ausführung von Kurzlinern mit der Bezeichnung "Spot Repair System" zur Sanierung erdverlegter schadhafter Abwasserleitungen im Nennweitenbereich von DN 100 bis DN 500							Anlage 9
Harzmengenbedarf für dreilagige Anordnung der Glasfasermatten mit einem Flächengewicht von 1387 g/m ² ± 4 %							

Rohr- durch- messer <i>mm</i>	Schadenlänge <i>m</i>	Zuschnittlänge Glasfaser Seite A <i>m</i>	Zuschnittlänge Glasfaser Seite B <i>m</i>	Zuschnittlänge Mittellage <i>m</i>	Zuschnittbreite Mittellage <i>m</i>	Länge Kurzliner Seite C <i>m</i>	Harzmengen für dreilagige Matte (1086 g/m ² ± 4 %)
100	0,2	1,30	0,41	0,60	0,41	0,6	1,1
100	0,8	2,50		1,30		1,2	2,2
100	1,4	3,70		1,80		1,8	3,3
100	2,0	4,90		2,40		2,4	4,4
100	2,6	5,10		3,00		3,0	5,5
125	0,2	1,30	0,49	0,60	0,49	0,6	1,3
125	0,8	2,50		1,30		1,2	2,6
125	1,4	3,70		1,80		1,8	3,9
125	2,0	4,90		2,40		2,4	5,3
125	2,6	5,10		3,00		3,0	6,6
150	0,2	1,30	0,57	0,60	0,57	0,6	1,5
150	0,8	2,50		1,30		1,2	3,0
150	1,4	3,70		1,80		1,8	4,6
150	2,0	4,90		2,40		2,4	6,1
150	2,6	5,10		3,00		3,0	7,6
200	0,2	1,30	0,73	0,60	0,73	0,6	1,9
200	0,8	2,50		1,30		1,2	3,9
200	1,4	3,70		1,80		1,8	5,8
200	2,0	4,90		2,40		2,4	7,8
200	2,6	5,10		3,00		3,0	9,7
250	0,2	1,30	0,89	0,60	0,89	0,6	2,4
250	0,8	2,50		1,30		1,2	4,7
250	1,4	3,70		1,80		1,8	7,1
250	2,0	4,90		2,40		2,4	9,4
250	2,6	5,10		3,00		3,0	11,8
300	0,2	1,30	1,05	0,60	1,05	0,6	2,8
300	0,8	2,50		1,30		1,2	5,6
300	1,4	3,70		1,80		1,8	8,4
300	2,0	4,90		2,40		2,4	11,2
300	2,6	5,10		3,00		3,0	14,0
400	0,2	1,30	1,40	0,60	1,40	0,6	3,7
400	0,8	2,50		1,30		1,2	7,5
400	1,4	3,70		1,80		1,8	11,2
400	2,0	4,90		2,40		2,4	14,9
400	2,6	5,10		3,00		3,0	18,7
500	0,2	1,30	1,75	0,60	1,75	0,6	4,7
500	0,8	2,50		1,30		1,2	9,3
500	1,4	3,70		1,80		1,8	14,0
500	2,0	4,90		2,40		2,4	18,7
500	2,6	5,10		3,00		3,0	23,3
Bauprodukte und deren Verwendung zur Ausführung von Kurzlinern mit der Bezeichnung "Spot Repair System" zur Sanierung erdverlegter schadhafter Abwasserleitungen im Nennweitenbereich von DN 100 bis DN 500							Anlage 10
Harzmengenbedarf für dreilagige Anordnung der Glasfasermatten mit einem Flächengewicht von 1086 g/m ² ± 4 %							

Reparaturprotokoll der Baumaßnahme

Blatt von

Auftraggeber.....
Ort.....
Straße.....
Kontaktperson.....
Telefon.....
Baumaßnahme
Ort.....
von Schacht.....
Haltung.....
Kanalrohr Nennweite.....
Datenträger (CD; Videokassette; USB-Stick; Speicherkarte).....

Auftragnehmer.....
Ort.....
Straße.....
Kontaktperson.....
Telefon.....
Straße.....
bis Schacht.....
Rohrmaterial.....
Position/Reparaturalage.....
Fotos

Wetter

Wetterbeschreibung.....
Trockenwetter: ja ☐ nein ☐
Regen: ja ☐ nein ☐
Temperatur der Umgebung..... °C
Temperatur im Kanal..... °C
Voraussetzungen
Genehmigung eingeholt: ja ☐ nein ☐
Wasserhaltung eingerichtet: ja ☐ nein ☐
StVO-Absicherung: ja ☐ nein ☐
Reparaturbereich vorbereitet: ja ☐ nein ☐
Hochdruckreinigung am:.....
TV-Inspektion/ Querschnittskontrolle: ja ☐ nein ☐

HD-Reinigung ☐ mech. ☐ Roboter ☐ Schleifen ☐

Verwendetes Material

EasyPur - Komp. A - Chargennummer:.....
EasyPur - Komp. A Summer - Chargennummer:.....
EasyPur - Komp. A Winter - Chargennummer:.....
EasyPur - Komp. A Fast - Chargennummer:.....
EasyPur - Komp. A Slow - Chargennummer:.....
EasyPur - Komp. B - Chargennummer:.....
EasyPur - Komp. C - Chargennummer:.....
Glasfaser - Qualität/ Werkzeuge:.....
Kurzliner-Länge:..... m

Rückstellmuster ja ☐
Rückstellmuster ja ☐
Rückstellmuster ja ☐
Rückstellmuster ja ☐
Rückstellmuster ja ☐
Rückstellmuster ja ☐
Rückstellmuster ja ☐
Rückstellmuster ja ☐
Rückstellmuster ja ☐
Anzahl der Lagen

Verwendete Materialmengen

Harzbedarf EasyPur Sollwert:..... ml (gem. Anlage DIBt)
Produkttemperatur Sollwert:..... 15° C bis 20° C
Mischungsverhältnis Sollwerte:..... A : B = 100 : 200
Mischungsverhältnis Istwerte: A = ml B = ml
Mischbeginn:..... Uhr
Mischzeit Sollwert:..... 2 min

Harzbedarf EasyPur Istwert:..... ml (Gesamtvolumen)
Produkttemperatur Istwert:..... °C
C = Istwert:..... % von A (gem. Anlage DIBt)
C = ml
Ende Tränkvorgang..... Uhr
Mischzeit Istwert:..... min

Aufstelldruck und Aushärtezeit des Blähpackers

Packer aufblähen:..... Uhr
Verarbeitungszeit Sollwert:..... min (gem. Anlage DIBt)
Aushärtezeit Sollwert:..... 50 bis 90 min
Aufstelldruck Sollwert:..... 1 bis 2 bar
TV Endabnahme: ja ☐ nein ☐

Packer entspannen:..... Uhr
Eingehalten:..... ja ☐ nein ☐
Aushärtezeit Istwert:..... min
Aufstelldruck Istwert:..... bar

Datum:..... Unterschrift:

Operateur:.....

Bauprodukte und deren Verwendung zur Ausführung von Kurzlinern mit der Bezeichnung "Spot Repair System"
zur Sanierung erdverlegter schadhafter Abwasserleitungen im Nennweitenbereich von DN 100 bis DN 500

Reparaturprotokoll

Anlage 11