



# Case study

**EPROPOX FC30 Epoxy Resin System – Preparing For A Rainy Day**



# Introducing EPROPOX FC30

**Trelleborg's trenchless pipe and sewer rehabilitation systems are a practical and cost-effective alternative to traditional pipe rehabilitation methods which require digging and the complete replacement of a pipe or sewer through an open construction site.**

**Developed and tested over many years, our state-of-the-art technologies have been deployed in many successful installations over the years and are 100 % safe to use.**

## Moisture Damage in the Sparkasse Pfalzgrafweiler Branch

The Sparkasse Freudenstadt is savings bank in Germany with a wide network of local branches, one of which is Pfalzgrafweiler Branch, located south-west of Stuttgart in the state of Baden-Württemberg. After heavy rainfall in early 2008, the branch's property managers detected the first signs of moisture damage, which then re-occurred periodically, mainly in Spring and Autumn.

Each time the concrete ceiling slab of the branch's underground carpark would get wet and tenants of a flat belonging to the building would complain about water coming in from the exterior walls.

**A vital component of these technologies are Trelleborg's epoxy resin systems, characterised by their ample processing times as well as their fast (and thus, time- and energy-saving) curing times. The EPROPOX FC30, which cures quickly without heat, has been specially developed for shorter liners and installations where steam and/or hot water curing systems are not desired nor recommended.**

Although the property's management were aware that the water probably came from a rainwater drainage pipe on the second floor, the building owner shied away from the idea of demolishing part of the building's front facade to get access to the damaged drainage pipe.

Klaus Finkbeiner, who is responsible for the construction sites of Sparkasse Freudenstadt, said: "We wished to avoid major construction work as it would be a major inconvenience for our customers." The client, Sparkasse Freudenstadt, thus spent over 18 months searching for a solution that would allow them to continue business as normal while avoiding such major demolition work.

## Background

The EPROPOX FC30 is a fast, ambient curing two-component epoxy resin system without fillers. It was developed specially for projects rehabilitating short distances and/or smaller pipe diameters using the epros® DrainLining method as these do not require heat curing methods.

This makes it ideal for plumbers and small companies who do not want to invest in expensive equipment as ambient curing requires only a basic installation equipment set-up.

With a short pot life and curing time, the EPROPOX FC30 is quick and easy to install, and – like all EPROPOX resin systems developed by Trelleborg Pipe Seals – it impresses with its compatibility with wet surfaces, good mechanical properties, and high chemical resistance.

What's more, the two-component resin system comes in two contrasting colours, making it easier to visually confirm if the resin has been adequately mixed.

EPROPOX Resin Systems are also solvent-free and free of volatile organic compounds (VOCs).

## THE FASTEST AMBIENT CURING RESIN SYSTEM: THE EPROPOX FC30

Perfect for rehabilitating short distances and/or smaller pipe diameters

Pot life (25 °C): 30 minutes

Ambient cure (20 °C): Within 4 hours

No curing equipment required – saving money

Technical approvals from the German DIBt (EPROPOX FC30)



The Sparkasse Freudenstadt commissioned R+M Umweltservice GmbH in Sindelfingen to assess the situation in their building as they had been using Trelleborg technology for several years.



The architect Martin Gunkel remembered having heard about the cured-in-place pipe lining technology offered by Trelleborg Pipe Seals – a method that allows for the rehabilitation of groundwater, house connections, sewers and other pipes without having to demolish or dig up any part of the building premises.

#### THE EXPRESS TEAM

It was a warm midsummer day in June when the R+M Umweltservice team from Sindelfingen, headed by the site manager Ralf Nölscher, drove up to the front of the building and got things started by sending a camera down the drainage pipe to assess the damage.

The footage from inside the pipes revealed very bad damage in the transition zone between the concrete slab of the underground carpark and the building.

The camera inspection also showed that the drainage pipe run from the rainwater inlet on the second floor down into the underground carpark



would pose challenge for the installers as it included two 45-degree bends and another two 90-degree bends over a distance of 13 metres, 7.5 metres of which were vertical. The team also performed a pressure test.

On the basis of their findings, R+M Umweltservice GmbH confirmed that it would be possible (and in fact, preferable) to use the DIBt-approved trenchless technology from Trelleborg to rehabilitate the drainage line.

With the go-ahead from the client, the specialist installers went on to carry out the repair work the very same day.



## THE EPROPOX FC30

### An ambient cure epoxy resin system, tried and tested.

For this project, the EPROPOX FC30 resin system was deployed together with the epros®DrainPlusLiner – the perfect liner for the required pipe diameter of 100 millimetres and the various bends of up to 90 degrees.

The epros®DrainPlusLiner's key feature is its flexibility, which makes it able to negotiate bends of up to 90 degrees and two diameter changes with very little wrinkling.

This project was also the very first application of the rapid ambient-cure epoxy resin system known as epros®EPROPOX FC30, which was the most recent development at the time. With its short curing time at ambient temperatures (i.e., without additional heat being supplied), the EPROPOX FC30 offered the chance to get the job done within a short time and with a comfortable pot life of about 35 minutes, despite the fact that it was about 22 °C in the underground carpark on that day.

The crew used the smallest epros®DrainSystems Inversion Drum (mini), which is recommended for indoor sites such as these, to invert the resin-impregnated liner into the host pipe. This inversion



process was done against the direction of flow, from the carpark up towards the rainwater inlet on the second floor, and covering a height difference of about seven metres.

“This is normally quite a challenge for many inversion systems but no problem at all for the smallest epros®DrainSystems inversion drum,” said the then-European Sales Manager of Trelleborg, Stefan Mühlhlin, who went on to elaborate: “In fact, this inversion drum has been used to invert liners into pipes of up to 32 metres high before.”

As a precaution against future damage and/or defects, the full drainage pipe length was relined using the Trelleborg method.

After about four hours, the epoxy resin mixture had hardened and the previously defective pipe was leak-tight. The R+M specialists then cut the ends off the liner and reconnected the entire drainage system.



Resin Colour	Hardener Colour	Mixing Ratio (weight)	Pot Time (Liner) at 25° C/70° F
neutral	violet	100 : 33	30 min
Curing Time 10 °C/50° F	Curing Time 15° C/59° F	Curing Time 20° C/68° F	Curing Time 25° C/70° F
600 min (10 h)	360 min (6 h)	240 min (4 h)	150 min (2,5 h)



## Non-disruptive and sustainable

Thanks to the trenchless technology deployed by R+M Umweltservice GmbH, the Sparkasse Pfalzgrafweiler Branch was able to continue business as usual without any disruption or impairment. Customers and employees did not even notice that there was renovation work going on.

This would, of course, have been completely different if the damage had been repaired using conventional means; which would have involved the demolition of part of the building front surrounding the damaged drainage pipe.

Two years after the project, the Sparkasse Freudenstadt team responsible for the maintaining the

bank's locations, confirmed that the relining operation (which used the epros® DrainPlusLiner in combination with the then-new ambient cure resin system, the EPROPOX FC30) had "once and for all" eliminated the branch's rainwater drainage problems.

Klaus Finkbeiner, from the Sparkasse Freudenstadt team, said: "Considering the quick and lasting repair-work, without any demolition needed, we cannot help but be happy and grateful that our architect had brought forward this Trelleborg method as the ideal solution to our problems."



## All's well that ends well

A practical and economical alternative to traditional dig-and-replace methods, the epros® DrainLining method is a trenchless rehabilitation system developed to repair damage to sewers and other pipes, both gravity and pressure, employing CIPP technology.

The method features a flexible liner that impregnated with resin before it is "inverted" into a manhole or pipe opening using air pressure or water. The resin-impregnated liner in the pipe section is then cured using heat or at ambient temperatures. The method, if followed according to instruction, guarantees an optimal curing which can be proven by recording the resulting values.

The final product is a cured liner that forms a frictional fit with the host pipe. This pipe-in-pipe system

is fully integrated with the host pipe and meets the hydraulic flow requirements of the host pipe.

Made up of carefully matched components that have been tried-and-tested through countless successful installations worldwide, the epros® DrainLining method is also approved by the German Institute for Construction Engineering (DIBt) and is listed by the German Sewer Construction Quality Protection Association (Güteschutz Kanalbau e.V.).

Ralf Nölscher, of R+M Umweltservice GmbH, said: "We decided to use Trelleborg's epros® DrainLining method in Pfalzgrafweiler as we have had some of our best results with the system in the past. Considering the complicated route of the drainage pipe in Pfalzgrafweiler, the method helped us master the challenge with a high degree of flexibility and within the shortest time."





## The advantages of the EPROPOX FC30 Resin System

The EPROPOX FC30 Resin System is licensed under the epros®DrainLiner method by the German Institute for Building Technology (DIBt) under DIBt Approval No. Z-42.3-466.

Most epoxy resin systems, when used in the context of the CIPP technology, require heat during the curing process for the optimum development of their mechanical properties.

Typically, this heat is provided by either circulating hot water or a steam/air mixture into the installed CIPP liner. This, however, requires time, energy and the appropriate technical equipment.

The use of water or steam for curing might also be undesirable in certain cases, such as in operating rooms (for reasons of sterility) or in cramped areas which do not allow for the transportation and installation of the required curing equipment. Rehabilitating short pipe sections or pipes with small nominal widths under these circumstances is particular challenging.

The cold-curing two-component resin system EPROPOX FC30 is the perfect solution to these challenges.

Developed by Trelleborg in 2010, it is recommended for the cost-effective rehabilitation of shorter pipe sections (of up to about 15 meters) in nominal sizes ranging from DN 70 to DN 250. It does not require heat to cure and provides excellent mechanical values after curing, such as a high flexural modulus of elasticity of nearly 2800 N/mm<sup>2</sup>.

With a working temperature of about 20 °C, it provides the user with an ample pot life of about 35 minutes and hardens – at the same temperature – in just 4 hours, making it the fastest cold-curing epoxy resin system on the market currently.

### FURTHER INFORMATION

[www.trelleborg.com/en/pipe-seals/Products--and--solutions/Pipe--Rehabilitation](http://www.trelleborg.com/en/pipe-seals/Products--and--solutions/Pipe--Rehabilitation)

[www.trelleborg.com/en/pipe-seals/Resources/Videos](http://www.trelleborg.com/en/pipe-seals/Resources/Videos)

Case studies

Technical Data Sheets

Method statement (handed over with training course)

# About Trelleborg Pipe Seals

**Part of the wider Trelleborg Industrial Solutions Business Area of Trelleborg Group, Trelleborg Pipe Seals is a world leading supplier of new and rehabilitation sealing solutions for concrete and plastic pipes, manholes and connectors used for water, sewerage and drainage.**

Trelleborg's Pipe Rehabilitation operation is among the leading specialist companies in innovative technologies for the upkeep of sewer systems.

Thanks to highly qualified engineering services, the company has become a successful global player in its industry. The brand name epros®DrainSystems stands for 20 years of experience. The continuous research and further development of the technical systems is aimed at state-of-the-art trenchless non-demolition maintenance of pipe lines in sewage systems, buildings and industries.

The sophisticated and custom-tailored system solutions from Trelleborg are not only an economically attractive decision for installers, but most of all safe and reliable. The pipe rehabilitation solutions from Trelleborg Pipe Seals were tested and approved by the German Institute for Construction Engineering. The epros®DrainSystems, whether for patch repairs or manhole-to-manhole relining, whether for laterals or junctions, meet all stringent requirements and quality criteria for construction products.

The brand name epros®DrainSystems stands for products of world-renowned quality standards with a long service life. They help promote sustainability and save the environment.





Trelleborg is a world leader in engineered polymer solutions that seal, damp and protect critical applications in demanding environments. Our innovative engineered solutions accelerate performance for customers in a sustainable way. The Trelleborg Group has local presence in over 40 countries around the world.

Trelleborg Pipe Seals is a world leading supplier of new and rehabilitation sealing solutions for concrete and plastic pipes and manholes used for water, sewerage and drainage. We deliver continuous innovation to customers across the globe, with a logistics and sales network. Comprising the most advanced polymer technology, our high performance seals ensure fulfillment of the highest possible reliability standards.

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