



## PROJECT REPORT NO. 2/2017

Pioneering sewage system of polyethylene (PE) in the  
"Am Hitzenhof" development area, Buchenbach

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In Buchenbach near Freiburg, special drainage solutions were required for the new sewers in the “Am Hitzenhof” development area.

## THE INITIAL SITUATION

On an inspection tour, District Administrator Manfred Wagner of Breisgau-Hochschwarzwald explained the special conditions: “The Am Hitzenhof development area is only about a thousand metres away from the central drinking water well of Himmelreich-Verband Buchenbach, Falkensteig und Burg, in a Zone IIIa Water Conservation Area (WCA).” (Fig 1)

In other words, public sewers and private waste water pipes must be tight. Neither outside water may enter these pipes, nor waste escape into groundwater.

## THE LEGAL SITUATION

The whole is regulated in the German Federal Water Act (WHG). Guidelines for the practical implementation are to be provided by DIN, DWA, and DVGW technical rules. For these applications, the Technical Rule DWA-A 142 (sewage lines and sewers in water catchment areas) regulates the additional requirements that new systems, their

operation, and their maintenance must fulfil, providing important information for the planning and construction work.

This information often directs attention to potential problems, yet provides enough leeway for the design, necessitating a high degree of situational risk assessment during the planning phase.

This can fuel lively discussions among experts as to whether e.g. industrial waste water should be rated higher than domestic.

In practice, for instance, industrial waste water flows at a defined, constant rate, and so can be handled often with relative ease. Generally undisputed, however, is the considerable hazard potential posed to groundwater by waste with high microbial concentrations.

The instructions in the Technical Rule DWA-A 142 were specified for practical implementation as early as 2005. A number of district administration bodies in Baden-Württemberg drew up the guideline “Waste water lines in water conservation areas – Principles, requirements, information for domestic waste water in Baden-Württemberg”. The object was to define and support the practical implementation of these measures.

## THE CHOICE OF SYSTEM

In the runup to the plans for the Am Hitzenhof construction project, it was primarily soil analyses that revealed the high hazard potential posed by sewer operations. According to the estimates, discharging waste water could easily enter and pollute the groundwater through the permeable soil strata.

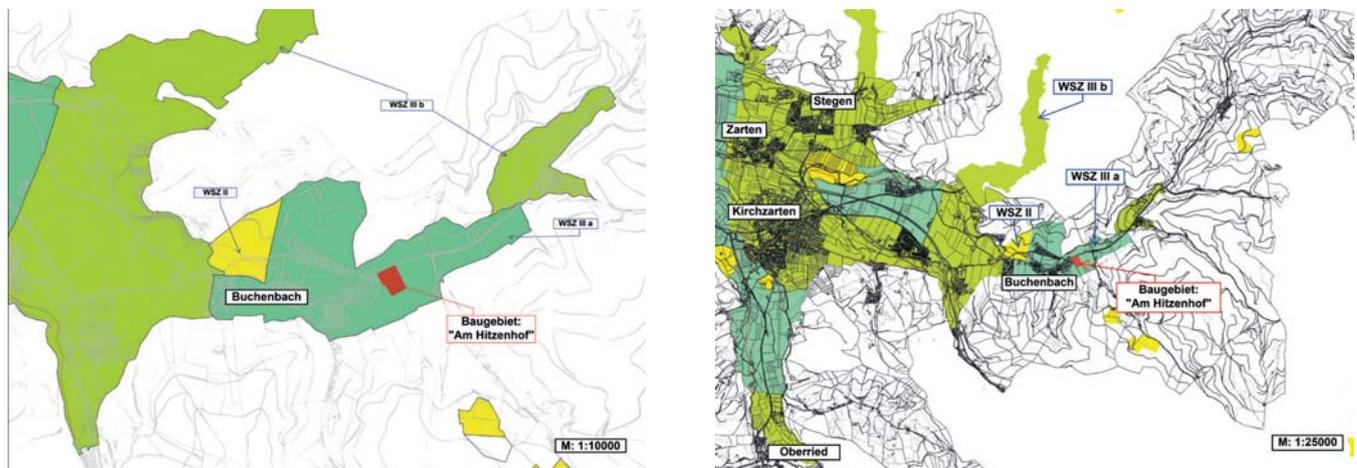


Fig 1 – Overview of water conservation areas (not to scale)



Analyses of groundwater levels over a period of months confirmed these estimates and provided limits for the development plan. Now detailed specifications could be elaborated for basements and underground garages. The main task, however, was to define the requirements for the waste water drainage system.

A number of variants were drawn up and discussed with the involved institutions, the district administration, the Kirchzarten utility ewk, and the inter-communal association for waste water treatment AZV Breisgauer Bucht. Also the future inspection and maintenance intervals had to be observed on the planned drainage system. In the end, the decision went to a single walled, continuously fused pipe shaft system of polyethylene (PE) extending into the new buildings. On the one hand, these two tone, coextruded PE pipes exhibit a light coloured internal surface ideal for TV inspections, and on the other they can withstand a high water pres-

sure of up to 10 bar.

Also the PE shaft sections, usually assembled with plug-in connections, were fused to a tight monolithic shaft structure before leaving the plant.

This system is flexible and can take high loads. Besides its environmental safety, also its long service life makes this economically appealing.

According to DIN 8074 "Polyethylene (PE) pipes", the predicted service life of fused lines is a verified hundred years.

#### THE FUSION PROCEDURE

Electrofusion (EF) generates a homogeneous material bond between the pipe and the fitting (Figs 2a and 2b). The temperature of about 210 °C needed for fusion is provided by heating wires, so called heating coils, across which a defined voltage as high as 48 V is applied depending on the thickness of the pipe wall. The two parts for joining (pipe and fitting) melt into each

other to form a homogeneous unit. Seals, the crucial weakpoint on plug-in connections, then become superfluous. The connecting area is level with the passage for the optimally smooth hydraulic surface, without coupler gaps and without beads. Obstructions and malfunctions in the sewer are eliminated from the outset.

Domestic drainage connections are realised with sewage saddle fittings. These are installed with the specially developed clamping and tapping unit FWFIT. Here, the sewage saddle ASA TL is first clamped on the pipe and then fused homogeneously to the main sewer. Afterwards, access to the pipe is cut out (Fig 3a).

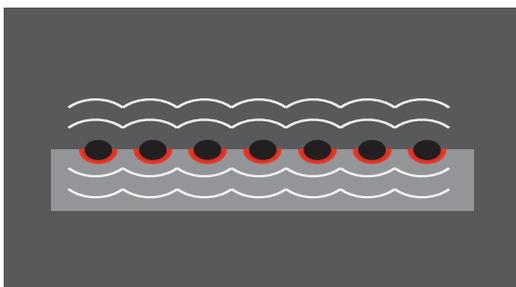


Fig 2a - Direct heat transfer from exposed heating coil



Fig 2b - Completed pipe connection

The pipe cutout is held firmly and removed together with the device (Fig 3b). The result is a level passage outlet, smooth on the inside for unobstructed flow, as shown in the section through the assembly (Fig 4).

Now the domestic service pipe is connected to the sewage saddle ASA TL. Available for this are special sewage bends ABM (coupler-coupler) and ABMS (coupler-pipe spigot), each with 15°, 30°, and 45° (Fig 5).

### TO SUM UP

The development project was concluded in September 2016. On a tour of the site with all involved in the project, Mayor Harald Reinhard praised the good work by all. Virtually the entire Dreisam valley has been designated a water conservation area, so Buchenbach served as a pilot project. Further measures with analogous implementations are in the planning stages.

Although appearing novel and innovative at first glance, this procedure is actually quite long in the tooth. PE piping has been used in domestic service installations for over sixty years. Gas distribution systems have been benefiting from PE piping

since the mid 1970s, and today PE has become the standard pipe material.

In the waste water field, the FRIAFIT sewage system could prove its practicability as early as 1994. At that time, the main sewers and about 300 domestic sewer service pipes of PE were installed in a Göttingen development area. About 2000 components of the FRIAFIT sewage system have been installed in total. The following decades saw many other projects nationwide, and the fittings range was expanded successively.

What lends the Buchenbach development a unique feature, however, is the consistency with which the advantages of a homogeneously fused PE waste water system could be extended into the buildings.

Hence the state of the art now safeguards the maximum possible environmental safety for future generations as well.



Fig 3a - Tapping with the FWFIT



Fig 3b - Pipe cutout being removed

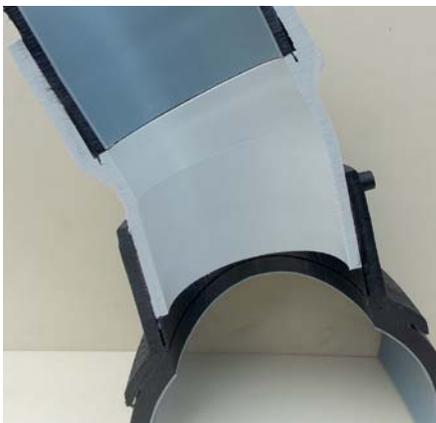


Fig 4 - Section through a sewage saddle model ASA TL with connections between saddle and pipe section and between outlet and domestic service pipe



Fig 5 - Connection with sewage saddle ASA TL and bend ABMS

### Details on the project

Measure	Am Hitzenhof development area
Building site	Buchenbach, Black Forest
Main contractor	Johann Joos Tief- u. Straßenbauunternehmung GmbH & Co. KG
Installed by	Tecoba GmbH Technik Consult Baden, Endingen am Kaiserstuhl
Planner	F. S. Ingenieure GmbH, Ettlingen
FRIAFIT fittings	AM couplers SDR 17, ASA TL sewage saddle top-loading, ABMS sewage bends (coupler / pipe spigot)
FRIATOOLS Technical equipment	FRIAMAT universal fusion unit, FWFIT clamping and tapping unit

The wide, sun filled Dreisam valley is framed in an impressive mountain setting. Buchenbach is one of the three Dreisam communities, with its Himmelreich and Falkensteig districts extending over the famous lower section of Hell's Valley.

The new development Am Hitzenhof will be built with a view of the Kreuzberg Chapel, encouraging young families to remain in their home surroundings instead of moving away.



**Aliaxis**

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