What Goes Back Into the Sewer Trench? – Flowable Backfill Materials Put to the Test

Test setup: One of a total of five chambers before the Temporarily Flowable Self-Compacting Backfill (TFSB) was filled. Set up in the IKT's large-scale test rig with dimensions 6 x 6 x 15 m.

Settlement damage, uneven bedding, and poor re-excavation capability – these are common issues on sewer construction sites. Often, the cause lies in the backfill.
Temporarily Flowable Self-Compacting Backfill (TFSB) materials promise better performance – but which ones actually deliver?

We tested five different TFSB products in full-scale sewer trench simulations. The aim: to evaluate how these materials perform under realistic construction conditions.

The Approach: Large-Scale Testing, Real-Site Conditions

At the IKT's large-scale test facility in Gelsenkirchen, we set up actual sewer construction scenarios, including pipes, manholes, trench shoring, and bedding layers.

Pipe enclosure without defects (DN 100)

We tested the materials for:

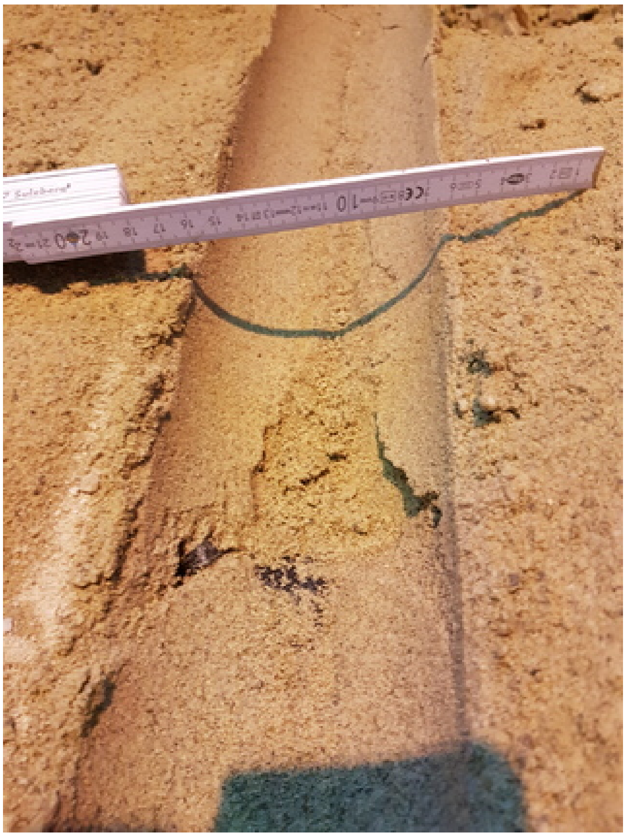
- Flowability and installation quality
- Walkability and early load-bearing capacity
- Re-excavatability after hardening
- Volume stability and risk of subsidence
- Environmental performance and recyclability

We used innovative inspection tools like the MAC system for pipe-soil stiffness and a walkability test after 3 hours to assess real-life performance.

Key results for sewer construction:

- Not all flowable backfills are created equal: Some harden too much, while others remain unsuitable for overbuilding, e.g. for road construction, for up to 56 days.
- Re-excavation is a challenge – for good excavation, TSFB must not exceed a compressive strength of 0.3 N/mm²

after 28 days.
- New test methods like the Mini-MAC and walkability test ensure practical and measurable evaluation.
- Environmental compliance, shrinkage, and recyclability vary widely between products.
- Two materials stood out: RSS® Flüssigboden and carbofill® showed the best balance between performance, usability, and long-term suitability.



Pipe enclosure with minor defects (DN 100)

Comparative Test Results: Two Materials Performed Best – Others Failed Key Criteria

We graded each material on a scale from 1.0 ("very good") to 6.0 ("inadequate").

Special emphasis was placed on **re-excavation capability** and **early workability**, both essential for practical use.

Top performers:
RSS® Flüssigboden – well-balanced, walkable, easy to re-excavate
 carbofill® – strong technical performance and consistent usability

We observed critical issues with:
 Terrapact© – hardened too much, impossible to excavate
 WBM-Flüssigboden® – excessive shrinkage, ammonia emissions, and safety concerns

Materials that failed key performance or environmental criteria **were ruled out** for sewer construction use.

Pipe enclosure with minor defects (DN 300)

Why This Matters for Sewer Network Owners and the Industry

Our study provides clear guidance for sewer network operators, planners, and contractors:
✔️ Backfill material can now be selected systematically and criteria-based
✔️ Supports long-term performance and maintainability
✔️ Promotes safer, more cost-effective, and more sustainable construction

Especially in urban environments, where tight schedules and complex infrastructures are the norm, choosing the right backfill is critical – not just technically, but also economically and environmentally.

Access the Full Study

The full paper is published in the journal:

Tunnelling and Underground Space Technology (Open Access)
Published: July 2025
Authors: Nicole Kimmling, Matteo Rubinato, Bert Bosseler et al.
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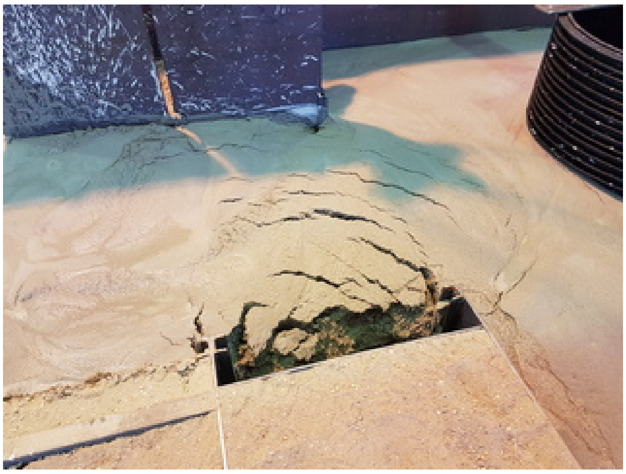

Inspection of the installation track: The TFSB has broken into the cavity of the installation box and does not show the desired flush cavity filling.

Read also:
Liquid > Solid > Ready? Comparison of Five Flowable Backfills for Sewer Pipe Trenches

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