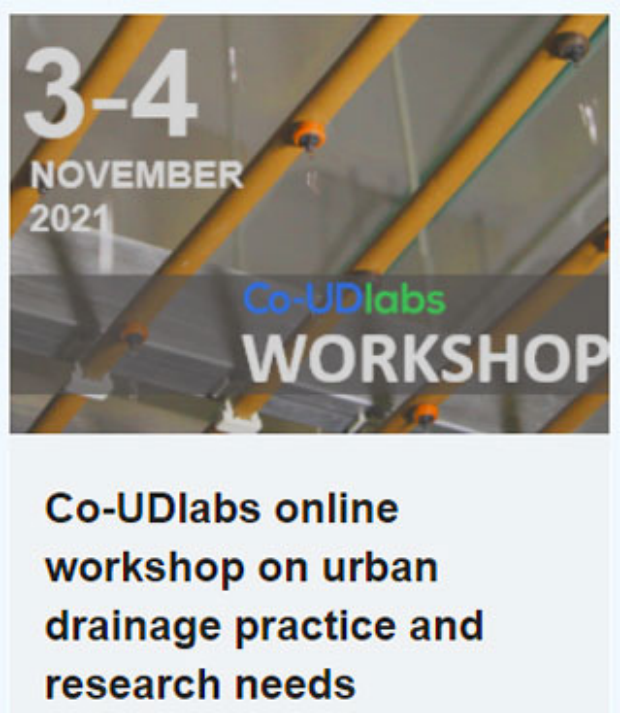
Innovating the Urban Drainage System: a new collaborative approach



IKT is hosting a workshop on identifying good practice and research for optimising the performance of urban drainage assets.

IKT has joined with six other urban drainage labs to form **Co-UDlabs**, a new international "Consortium of Urban Drainage laboratories". Together we are enabling access to our **research facilities**, providing **training** and undertaking **common research activities** with funding by the EU, and will build long term collaboration in urban drainage research. IKT will host a **free workshop** on optimising urban drainage assets.

Background to Co-UDlabs

Existing Urban Drainage Systems are ageing, but they are

critical for protecting public health, reducing pollution impacts and urban flooding risks. The overall aim of Co-UDlabs project is **integrate research and innovation activities** in the field of Urban Drainage Systems (UDS) to address pressing public health, flood risks and environmental challenges.

Blog post: IKT joined EU's Co-UDlabs project

Join our workshop to find out more

IKT is hosting one of Co-UDlabs first activities, a **workshop** over the mornings of 3rd and 4th November 2021 on identifying good practice and research for **optimising the performance of urban drainage assets** and improving their resilience to climate change and **sustainability**. Attendance is free, the agenda is available online and there is a simple registration.

About Co-UDlabs

Nine partners from seven European countries engage in Co-UDlabs.

The consortium is coordinated by Universidade da Coruña (Spain) and comprises 9 partners from 7 European countries. Between us we are making available 17 unique "field scale" urban drainage experimental facilities, providing innovation, collaboration and high-level training opportunities.

How to engage with Co-UDlabs

1. Take advantage of the “Transnational Access” to conduct your research in the facilities
   The project will be enhancing scientific and technical progress in the urban water sector through experiments carried out in 17 unique “field scale” urban drainage experimental facilities of seven research infrastructures: we aim to provide a total number of 29 accesses, with around 1080 days of granted access to the facilities, involving 141 different research users. Click here for more information
2. Join our network and networking activities
   To receive regular information you can complete our contact form. Activities are planned to consolidate the European community of urban drainage researchers, innovators and utilities and to contribute to create a culture of cooperation with the main actors working in UD field. Find out more about our networking activities
3. Engage with the training available
   Co-UDlabs supports education and training in UDS through seminars, advanced workshops, PhD courses, webinars and online videos.
4. Learn from the Joint Research Activities being undertaken by Co-UDlabs
   A set of three Joint Research Activities will support services provided by the different facilities through the transnational access and also to facilitate progress in the urban drainage discipline by the transfer of new technologies, procedures and best practices:
   • JRA1 Smart sensing and monitoring in urban drainage
   • JRA2 Evaluation of assets deterioration in urban drainage systems
   • JRA3 Improving resilience and sustainability in urban drainage solutions

For more information visit the Co-UDlabs website

Co-UDlabs is a Horizon 2020 project funded under the Research

Infrastructures programme (INFRAIA-02-2020 – Integrating Activities for Starting Communities).

Contact the IKT Co-UDlabs Team

- Thomas Brüggemann
  T: +49 (0) 209 17806-18
  E: brueggemann@ikt.institute
- Marcel Goerke
  T: +49 (0) 209 17806-34
  E: goerke@ikt.institute
- Iain Naismith
  T: +44 (0) 7983 605219
  E:naismith@ikt.institute

IKT to take part in €4M Horizon 2020 project to build collaborative Urban Drainage research labs communities

IKT is taking part in a new **4 million euro Horizon 2020 project** that aims to integrate research and innovation activities in the field of **Urban Drainage Systems (UDS)** to address pressing public health, flood risks and environmental challenges.

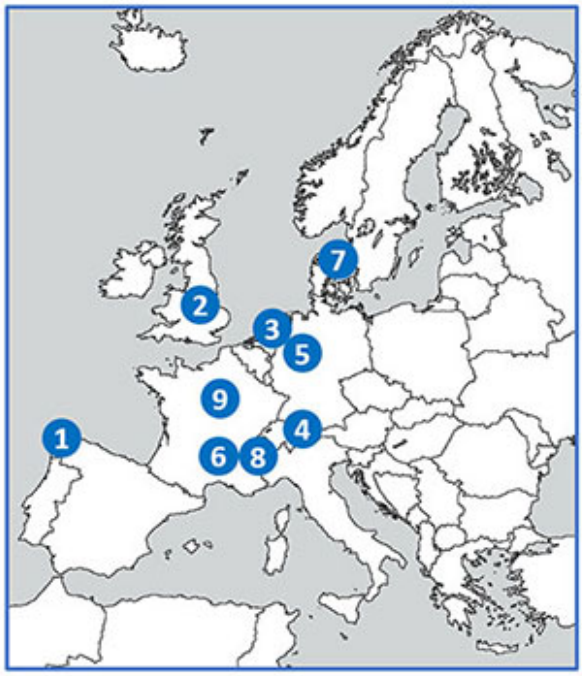
Co-UDlabs
COLLABORATIVE URBAN DRAINAGE RESEARCH LABS COMMUNITIES

The EU's Urban Drainage Systems (UDS) have been valued at €2.5 trillion. They are **essential infrastructures** providing safe sanitation and drainage and environmental protection by collecting and then returning securely to the natural water bodies. Many UDS are **at risk**, their economic life is coming to an end. It is unclear how **limited knowledge** on their state and processes, population growth, climate emergency, untreated stormwater and public health threats caused by emerging pollutants and pathogens can be addressed, and how knowledge innovation and best practice is effectively shared. **Innovative approaches** are urgently needed to tackle these challenges, and **largescale laboratory facilities** are essential to investigate and validate new approaches and provide confidence in their **effectiveness and safety** before implementation in existing UDS.

17 unique experimental facilities across Europe

Co-UDlabs (Collaborative Urban Drainage research labs communities) is a four-year project bringing together **17 unique 'field scale' urban drainage experimental facilities**

hosted by seven research organisations in Europe: University of A Coruña (Spain), University of Sheffield (UK), INSA Lyon (France), Aalborg University (Denmark), Deltares (Netherlands), EAWAG (Switzerland) and IKT (Germany). The experimental facilities are designed for research across a range of disciplines, including **urban flooding**, runoff pollution, physico-chemical and biological in-sewer process, sustainable urban drainage systems (SUDS), performance analysis of urban assets, real time control and asset deterioration.



Co-UDlabs: Please klick on picture for a list of the participating organisations.

The main objective of Co-UDlabs is to provide **transnational access to these facilities** allowing stakeholders, academic researchers and innovators in the urban drainage water sector to come together, share ideas, co-produce project concepts and then benefit from access to top-class research infrastructures to develop, improve and demonstrate those concepts, thereby building a collaborative European Urban Drainage innovation community.

Creating a transnational research infrastructure

The transnational access to research infrastructures or installations is free of charge and includes the **logistical, technological and scientific support** as well as specific training: facility providers will provide free of charge support to access the research infrastructure (physical and knowledge-based) and to undertake **breakthrough engineering and scientific research and innovation** using multi-institutional and multi-sectorial teams. Local teams will help in the preparation of each visit and at least one research assistant and/or laboratory technician will be dedicated to the service of the granted projects. Expert scientific and technical staff will also support user groups during the visits. Accommodation and travel costs of user groups are also covered by the project.

Access to research facilities will be granted to selected applicants through two **calls for applications** that are planned to be opened in October 2021 and October 2023.

Interconnecting our large-scale urban infrastructure testing facilities, and actively create multi-sectorial teams will make it possible to support the take up of novel innovations, mitigating development risk and promoting transition to full scale living labs and urban systems.
Dr Anta Álvarez, the project coordinator at the University of A Coruña (Spain)

IKT is delighted to be part of this important opportunity to co-create better **innovative products** tested at the full-scale level, supporting the EU's drive to deliver a more **knowledge-based economy** as well as improving performance of its own urban water infrastructure.

For **more information** on the project, please visit the Co-UDlabs website, and follow @CoUDlabs on Twitter or Co-UDlabs on LinkedIn.

Contact

Iain Naismith
T: +44 (0) 7983 605219
E: naismith@ikt.institute

The project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101008626.

Rainwater treatment: IKT can now also test systems according to a US regulation

For the first time, IKT has tested a decentralised rainwater treatment facility according to the NJDEP protocol.

For the first time, **IKT's Test Centre for Rainwater Treatment** has tested a decentralised stormwater treatment system

according to the US **NJDEP standard**. The treatment process of the Hydroshark system from 3P Technik Filtersysteme was evaluated in laboratory tests and its performance determined. Prior to this, the product had already been tested by the IKT test centre in accordance with the **Trennerlass NRW** (the surface water separation decree of the State of North Rhine-Westphalia, Germany).
The “New Jersey Department of Environmental Protection (NJDEP) Laboratory Protocol to Assess Total Suspended Solids Removal by a Hydrodynamic Sedimentation Manufactured Treatment Device (MTD)” is a common test procedure in the US for determining the **degree of retention** of water in decentralised stormwater treatment systems. It is a prerequisite for the **approval of treatment facilities** in the State of New Jersey.

Testing in accordance with NJDEP protocol

What comes out the other side? The NJDEP test procedure determines the retention capacity of the system.

The system was tested for **sediment removal efficiency** in accordance with Section 5 of the NJDEP protocol, using a test sediment mixed according to the requirements of the protocol. The following **parameters and performance data** were obtained for the Hydroshark during the seven test runs that are required:

- Maximum Treatment Flow Rate (MTFR): 1.60 cfs (45 L/s)

- Total Suspended Solids (TSS) removal efficiency: > 50 % at MTFR
- Effective treatment area (ETA): 18.94 ft² (equivalent to 1.76 m²)
- Volume: 924 gal (equivalent to 3,498 litres)
- Effective Sedimentation Area (ESA): 8.45 ft² (equivalent to 0.79 m²)
- Volume of sludge chamber: 233 gal (equivalent to 882 litres)

Testing according to Trennerlass NRW

The Hydroshark system has already been tested at the IKT in accordance with the Trennerlass NRW.

A few months before the NJDEP test, the IKT Test Centre for Rainwater Treatment determined the **hydraulic capacity** and the **material retention capacity** of the Hydroshark DN1500 stormwater treatment plant in accordance with the Trennerlass NRW:

- Hydraulic capacity: > 50 l/s
- Retention of fine-grained, filterable mineral substances: 72.55 % retention
- Retention of coarse-grained, filterable mineral substances: > 99.00 % retention
- Retention of floating polyethylene: 62.24 % retention

- Retention of suspended solids from polystyrene: 75.41 % retention
- Retention of mineral oil hydrocarbons: 66.59 % retention

Recognised testing laboratory

The IKT Test Centre for Rainwater Treatment is **recognised** by the German Institute for Construction Technology (DIBt) and offers a range of tests for treatment plants and surface coverings.

- Decentralised stormwater treatment plants for discharge into groundwater
- Decentralised stormwater treatment plants for discharge into surface waters
- Infiltration-capable surface coverings

Would you like **more information** or do you have any **questions**? Please do not hesitate to **contact us**!

Contacts

Iain Naismith
Senior Research Fellow, IKT
T: +44 (0) 1491 712707
M: +44 (0) 7983 605219
E-mail: naismith@ikt.institute
Marcel Goerke, M.Sc.
Head of the IKT Test Centre for Rainwater Treatment
T: +49 (0) 209 17806-34
E: goerke@ikt.de

Online Seminar: The IKT LinerReport 2020

Marking the launch of the 2020 LinerReport we are holding a free to attend 60-minute webinar on 14th April 2021.

This year's IKT LinerReport presents the **results from the evaluation** of installed CIPP gravity sewer liners based on the testing of 2,600 samples taken post-installation. Our **free webinar** marking the launch of the 17th annual review of the **performance of CIPP sewer liners** is presented by Roland Waniek and Barbara Grunewald, two of the authors, and an **international perspective** about the Liner Report will be provided by Dec Downey from Trenchless Opportunities Ltd. It will cover:

- Origins of the LinerReport – why it was requested by German sewer network owners
- The requirements and how tests are undertaken by IKT's Test Center for CIPP liners
- Findings of the 2020 LinerReport
- Trends observed over 17 years
- An international perspective

- Questions

Twice that day – for those far away

This webinar will be presented twice on **14th April 2021** at 9.00 – 10.30 BST and again at 16.00 – 17.30 BST. It is free to attend but you must **pre-register** to obtain the link. Registrations will be considered in the order in which they are received. The number of participants is limited. Early registration is therefore recommended.

Iain Naismith will host the webinar on the results of IKT's 2020 LinerReport.

To register please email Iain Naismith, the webinar moderator stating which of the two times you wish to attend.
download the flyer for this online seminar (PDF)
download the 2020 IKT LinerReport (PDF)
to our page with the downloads of previous LinerReports

Contacts

Iain Naismith
Senior Research Fellow, IKT
T: +44 (0) 1491 712707
M: +44 (0) 7983 605219
E-mail: naismith@ikt.institute

IKT LinerReport 2020: CIPP liners meeting target values at six-year low

The results for all four test criteria dropped in comparison to previous years.

For the 17th time, IKT presents its **annual LinerReport**. This LinerReport for 2020 considers the short-term test results from a total of 2,613 **cured in place pipe (CIPP) liner samples**. The overall test results for 2020 are the **lowest in the past six years**. One CIPP liner sample in eight did not achieve its expected target value for at least one test criterion. However, the requirement is clear and unambiguous: **all four test criteria must be met** simultaneously by a sample. In 2020, this was achieved in only 87.5% of samples.

Sign up for our free Online Seminar on 14th April: The IKT LinerReport!

But, even when looking at the four test criteria individually,

the 2020 results are the lowest in six years. In 2018, the **mean results** for wall thickness were slightly lower than in 2020; otherwise, all the mean results from 2015 to 2019 were better than those of 2020.

2020 test results weaker than 2019

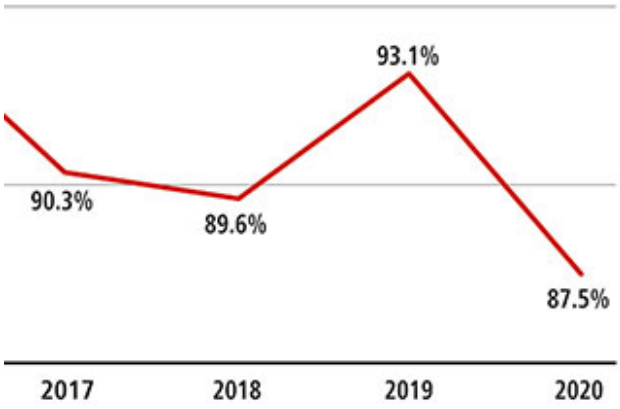


Figure 1: Percentage of CIPP liner samples that met their target values for all four test criteria (click to enlarge)

Overall there is a **downward trend** for all four test criteria, for both glass fibre liners and needle felt liners. On average, the pass rates across all four tests were lower than 2019: by -1.6 percentage points (%P) for **water tightness**, by -1.5%P for **modulus of elasticity**, by -1.1%P for **flexural strength** and even by -2.9%P for **wall thickness**.

All four test criteria must be fulfilled

It makes little sense to consider the test criteria individually for a CIPP liner sample. Rather, it is important to a network owner that for each sample **all four test criteria are fulfilled**, according to the declared or designed target value for that installed liner. Only then can they be very certain that the liner that was delivered and installed actually achieved the material characteristics promised.

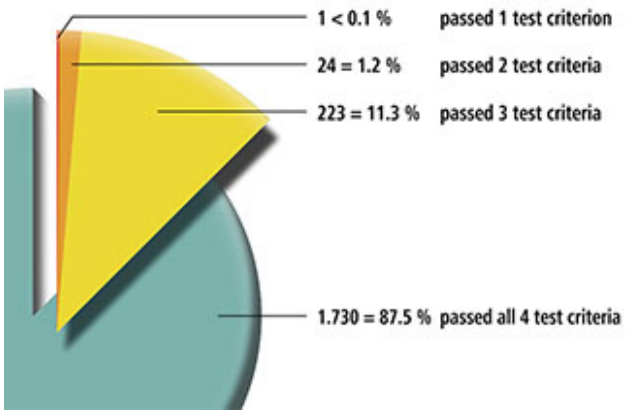


Figure 2: Liner samples by numbers of tests passed (click to enlarge)

Of the samples for which all four target values were provided for all four tests:

- < 0.1% passed only one test criterion
- 1.2% passed only two test criteria
- 11.3% passed three test criteria
- 87.5% passed all four test criteria

Top performers: the “100% Club”

A **high-quality liner** must fulfil all four test criteria simultaneously. In most cases, the target values against which test results were compared derive from declared values in a product approval and in a few cases they were provided by the site-specific static calculations from the customer’s specification. In 2020, five out of 27 rehabilitation companies achieved the target values in all four test criteria for all their samples (the previous year it was three out of 23), so they **meet the quality requirements in full** at each of their installation sites.

Table 3: The 100 % club of 2020 (click to enlarge)

This “100% Club” of 2020 comprises:

- **Bluelight** (D) with the PAA-F-Liner
- **Hamers Leidingtechniek** (NL) with Alphaliner
- **Jeschke Umwelttechnik** (D) with Alphaliner
- **Kanaltechnik Agricola** (D) with Brandenburger Liner 2.5
- **Umwelttechnik und Wasserbau** (D) with Brandenburger Liner 2.5

In Figure 3, these companies receive a star for each year that they have been in the “100% Club”, to highlight their achievements.

As a testing institute, we can only report the findings, but cannot speculate about the reasons for these developments, as we are unable to interpret them in an evidence-based manner. One thing is clear, however: despite the **very high technological development** of the CIPP lining method, despite its position as the leading renovation method and despite intensive staff training, an ever-higher level of samples **meeting target values** in tests is not a given. On the contrary, it has been shown that these can also go down. Therefore, strict application of **quality controls** continues to be necessary, both on the rehabilitation sites and in the testing laboratory.

download full IKT LinerReport 2020

to the download page for all IKT LinerReports

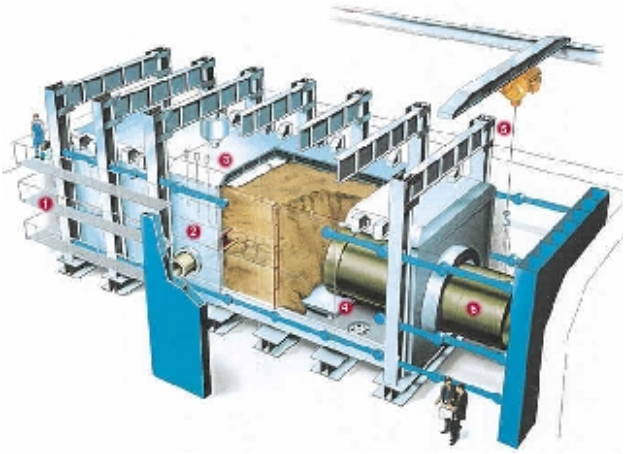
Contacts

Iain Naismith, PhD
T: +44 (0) 7983 605219
E-mail: naismith@ikt.institute
Barbara Grunewald, M.Sc.
T: +49 (0) 209 17806-40
E-mail: grunewald@ikt.institute

Rehabilitation contractors and liner systems matter

Six of the 27 **rehabilitation companies** in this year's LinerReport appear more than once, as they submitted two or three different **CIPP liner systems**. The other 21 appear with one type of CIPP liner system. The six companies with multiple CIPP liner systems achieved **differing test results** with different liners. This shows that the **success of the rehabilitation** depends not only on the rehabilitation company, but also on the CIPP liner system used.

Why have we made a bigger hole in the floor of our laboratory?



IKT’s Large Test Facility – as originally designed for pipe jacking

25 years ago, a hole was dug in the floor of our laboratory, this year we made it **bigger** – why, you may ask? Well, it’s because this **Large (1:1 scale) Test Facility** proved to be very adaptable for successfully comparing solutions to ageing sewer issues for sewer network owners. Extending it, as part of our current investment in improving existing facilities and construction of our new Heavy Rain Lab, will provide **greater flexibility** in addressing current and future issues – including accommodating test rigs for our current project on the **rehabilitation of pressure sewers**.

Making it larger

At 6m wide, 6m deep and 15m long this Large Test Facility was already the **largest of its type anywhere**. Now it has been extended by an additional 3m to 18m in length, across an area that was being used to insert jacked pipe segments. It is sealed against leakage to allow the simulation of loading on buried structures from **rising groundwater** and can simulate surface loads. Its use is focused on allowing underground infrastructure with **simulated damage scenarios** to be installed, buried, rehabilitated by various means under realistic conditions and for the performance of these technologies to be assessed against various loadings. Over the past 25 years this has included **1:1 scale evaluations**

involving re-creating main sewers, lateral sewers, lateral connections, manholes, and house connections. It has also been used to set out pipe networks for comparisons of CCTV inspection techniques and, during 2020, for **comparing flowable backfills** in simulated pipe trenches.

View within the facility of the new 3m extension to the wall

Now, completion of its extension to 18m and re-sealing means it is ready for installation of damaged pressure sewers in 2021 for our current evaluation of their rehabilitation technologies.

Origin in understanding pipe jacking

The existing facility was built particularly with the evaluation of pipe jacking techniques in mind to guide the massive investment in new sewers in the surrounding region since the 1990's. A series of experiments led to **better understanding** of how jacked segments actually behave when changing direction and the vital issue of joint performance under stress.

How well do patch repairs perform?

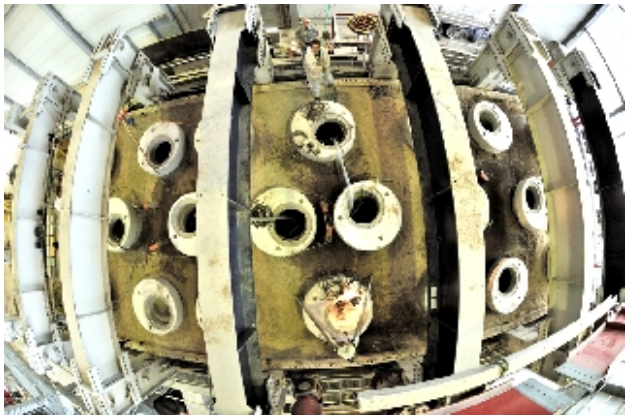
Project Steering Group considers 1:1 scale pipe layout to simulate house connections in the Large Scale Test Facility

The need for German sewer network owners to repair their own **small diameter sewers** and advise property owners on their private connections led to this examination of how effective **patch repairs** are in sealing damaged pipes against groundwater. Changes in pipe material, diameter, damage scenarios and bends were included in test rigs buried in the Large Test Facility and changing groundwater pressures were applied. Whilst **effective repair is possible**, special attention has to be paid to using the right product for some situations, like changes in pipe diameter.

Are flowable backfills really flowable and excavatable?

Our **most recent project** in the Large Test Facility required its division into five separate cells each simulating a pipe trench containing a range of manhole and pipe structures to investigate the performance of **different flowable backfill material**. There was a particular focus on whether the material would self-level, how quickly it could be walked on and built over, how well it supported the pipes and whether it could be subsequently excavated by hand. The results were surprising.

Performance of manhole rehabilitation technologies



Many manholes buried in the Large Test Facility

13 manholes with simulated damage were installed into the Large Test Facility into which different products that are representative of available **rehabilitation technologies** were installed. The experiment also included one new plastic manhole to examine whether it would float out as groundwater rose.
It was proven that it is **possible to seal** against ground water, but results were variable across the range of technologies. There was one **complete failure** of a product against groundwater pressure and various damages/imperfections observed in others. The vital necessity for **good substrate preparation** for products that bond to the wall and advice to wait until groundwater has risen before undertaking acceptance inspections were key findings.

How to seal damaged lateral connections

Project Steering Group members

examine repaired lateral connects in the bottom of the Large Test Facility after excavation following exposure to rising groundwater pressure

The connections of lateral sewers to main sewer are a common cause of **groundwater infiltration** so this project used the Large Test Facility to investigate how repair technologies could seal them in different situations:

- repairs to lateral connections in a CIPP lined sewer
- repairs to lateral connection in un-lined sewers
- laterals joining at different positions and angles
- repairs in pipe half-filled with water

The results ranged from good, to bad, to ugly.

Can lateral sewers be lined against infiltration?

Lateral sewers including material changes, damage scenarios and bends being installed for evaluation of liners

An initial evaluation of lateral sewer lining systems against groundwater infiltration yielded an unexpected result – circumferential **cracking of the liners** at the location of host pipe joints. The cause was determined to be that the **products bonded too tightly** to the host pipe to be able to flex when pipe sections moved relative to each other due to floatation as groundwater levels rose. The industry made **modifications** based on these findings, and satisfactory results were obtained for products submitted in a subsequent evaluation.

What are the limitations of CCTV inspection?

With so much reliance on CCTV inspection for mapping and monitoring **condition of sewer networks** this investigation in the Large Test Facility explored the extent to which:

- cameras could negotiate lateral connections, changes in diameter and bends,
- operators could identify damage scenarios, changes in pipe material and diameter,
- operators could produce a network layout plan.

The pipe networks were buried with access possible from manhole shafts. It was found that camaras could not reach all parts of the network and the accuracy of layout plans was not a good as expected.

Contacts

Want to learn more? Contact Iain Naismith!

Iain Naismith
phone: +44 (0) 7983 605219
email: naismith@ikt.institute