

## Pipes tight against infiltration, too!

The IKT research report covering the field of "Elimination of infiltration" makes the point: even if a waste-water conduit passes the internal-pressure test, this is by no means a guarantee that it will be tight against external groundwater pressure.

### What new perceptions has the first project phase generated?

#### Infiltration frequent at points of material change and size transitions

Modern acceptance tests for the tightness of waste-water conduits are orientated solely around the internal-pressure test. In the case of waste-water conduits located in the groundwater, however, the internal-pressure test can, in individual cases, result in incorrect assessments of the assumed infiltration tightness of the system, particularly in cases in which the sealing systems involved react differently to internal and external pressure.

The detailed, full-length report and an abbreviated version can be downloaded from the Internet at: [www.ikt.de](http://www.ikt.de) (German Version)

Typical sites of weakness can be found at points of material change and of diameter transitions and also at adhesively bonded joints between existing piping stock and repair materials. Acceptance criteria and test procedures were elaborated for these weak points during Phase I of this multistage IKT project. The results at a glance:

- Overview of all functional principles of jointing technology and of the standards and codes applicable to pipe shapes and sealing systems
- Market surveys of the products used at points of material and/or diameter transition

- Specimen tests of the infiltration tightness of sleeves / couplings for new conduits, connection of manholes in conduits and tube liners, and on expanding sealing materials
- Initial conclusions concerning acceptance criteria for points of material change and model computations on the infiltration capacity of leaking conduits

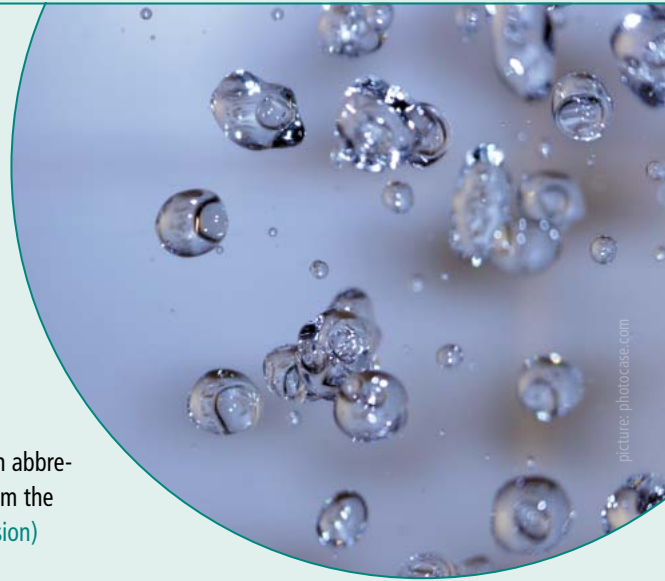
### Where should clients focus at acceptance?

Positive pressure tests using air or water presuppose identical behaviour of the sealing systems under exposure to both internal and external hydraulic pressure. Further provisions at acceptance are advisable, if this is not the case, or is, at least, in doubt:

1. Inclusion of qualification analyses (as early as the award of contract stage), including, for example, verification of infiltration tightness by means of supplementary product tests
2. Examination of on-site documentation, including that applying, for example, to preparation of conduit surfaces, in view of the interaction between old and new material
3. Modification of acceptance-inspection procedures, including the performance, for example, of modified positive pressure tests using test pressures related to the groundwater table, in combination, where appropriate, with negative pressure tests and visual infiltration assessments



Typical weaknesses: points of material change and/or size transition



## Conclusion

The action of jointing systems under exposure to external hydraulic pressure can in many cases be determined only with precise observation of the design details, including bonding effects and thrust mechanisms, for example. These aspects must be taken into account in planning, implementation and project acceptance; the IKT report contains detailed civil-engineering notes concerning installation of jointing systems, taking due account of infiltration tightness criteria.

## Prospects

The NRW environmental ministry's support project should be continued. The aim here is that of obtaining more extensive perceptions concerning the performance, and of the limitations on use, of the product groups intended for elimination of infiltration.

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**IKT - Institute for Underground Infrastructure** is a research, consultancy and testing institute specialized in the field of sewers. It is neutral and independent and operates on a non-profit basis. It is oriented towards practical applications and works on issues surrounding underground pipe construction. Its key focus is centred on sewage systems. IKT provides scientifically backed analysis and advice.

IKT has been established in 1994 as a spin-off from Bochum University, Germany.

The initial funding for setting up the institute has been provided by the Ministry for the Environment of the State of North-Rhine Westphalia, Germany's largest federal state.

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