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### **Jacking of Rectangular Reinforced Concrete Pipes**

Within the last years the jacking of circular pipes has become an important method for installation and renewal of sewer systems. Due to international research and development it is now accepted as an alternative to open trench technology.

For rectangular pipes, however, efficient jacking methods are not available. Although in many cases considerable technical and economical advantages could be achieved in comparison to the jacking of circular pipes, e.g.:

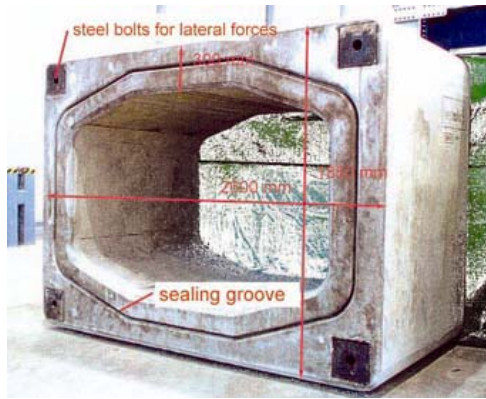
- *Crossing of railways, highways and rivers at low coverage*
- *Rain water retention pipes in combined sewerage systems*
- *Double pipes*
- *Multifunctional Collectors*
- *Pipes with non circular inner cross section*
- *Enlargement of river crossings*

To reach the benefits of these fields of application, since 1997 the Institute of Underground Infrastructure is addressing the subject in various research activities. After the development of a new type of rectangular reinforced concrete pipe, a prototype was realised to experience the practical usage of such pipes.

In the first construction phase the objectives were:

- Design of the pipe connection,
- Design of the sealing,
- Selection and Optimisation of the stress-transmitting-material,
- Design of the cross section and
- Static calculation.

Eventually, the prototype (fig.1) was tested in full scale on water tightness and load capacity (fig.2).



**Fig. 1** The prototype of a new rectangular reinforced concrete pipe



**Fig. 2** The testing of water tightness

As a result of these investigations a new pipe connection has been developed with the following main constructional features:

- Symmetrical design,
- Plain surface for stress transmission,
- Transmission of lateral forces by steel bolts,
- Sealing system in the middle of the pipe wall,
- Two-part stress-transmitting-ring,
- Stress-transmitting-material as a sandwich-construction.

At present the new prototype is tested under laboratory conditions that are comparable to the common practise of pipe jacking (Fig.3).



**Fig. 3:** Fitting of the soil for pipe jacking under laboratory conditions

Like in the testing of load capacity and water tightness the designed prototype will again be tested in full scale. Numerous measuring systems will help monitoring the interaction between the soil and the jacking pipe with the purpose of further optimisation of the first-stage prototype. The tests will be finished in September 2001. **First results will be presented on IWA-Berlin 2001.**