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TRACTUELL

Newsletter from TRACTO-TECHNIK

Soil displacement

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GRUNDOMAT:
Perfect service line installation ‘through the keyhole’

Customer:
MichCon Gas, Detroit, USA

Machine/equipment:
Grundomat 45 and 55

Special features:
Use of a special “keyhole” technique which limits disruption and saves costs for the installation of service lines

Keyhole Ø:
450 mm

Launch pits (L x W X H):
650 x 100 x 350

MichCon Gas is one of the USA’s largest and oldest providers of natural gas, having served the city of Detroit and surrounding areas for over 150 years. Currently the utility supplies natural gas to approximately 1.3 million families and businesses in over 500 communities throughout Michigan. They maintain over 30.000 km of natural gas pipeline and have the ability to store 130 billion cubic feet of natural gas.

Service installations keep MichCon Gas crews particularly busy. With over 150 service installations per month (either new service, upgrade or rehab/replacement) how maintenance crews approach them can have a significant effect on time and money. Arioli says the company has looked at many different construction techniques for facilitating these installations.

While new service or rehab/replacement installation is common, Arioli has seen a consumer demand trend in his area that began after the blackout in the summer of 2003. Since that event, customers have been requesting larger services to accommodate gas-powered generators in the event of another electrical power loss. The gas-powered generators require a 28 mm service to operate, much larger than the area’s 12 - 20 mm standard services.

As the name implies, keyhole installations utilize small excavations. While each installation is different, 15 m is the average length. Crews begin by excavating a small hole in the road above the main. Meanwhile at the house, another minimal excavation is performed to allow the launch of the piercing tool. According Arioli the launch pit is typically 100 mm wide, 650 mm long and 350 mm deep. From there the piercing tool is launched to the 450 mm diameter core (keyhole) in the street. Crews position the piercing tool using a telescopic Grundoscope aiming frame and surveyor stake before launching in order to ensure that the tool starts out on the proper line and grade. Still, working with such small targets, the precision and accuracy of the piercing tool is an absolute must.

MichCon crews use 45 mm and 55mm piercing tools for keyhole operations. Once the tool arrives at the 450 mm diameter core in the sidewalk, street or roadway, crews attach the new Medium Density Polyethylene (MDPE) service to the front of the piercing tool. Because the diameter of the keyhole is so small, the tool cannot be removed through it. Instead, the new pipe is attached to the front of the tool and the tool is placed in reverse and backed out to the launch pit. As the tool is backing out it pulls the MDPE in place.

MichCon dedicates three crews to fulltime keyhole installations. Crews are typically able to finish two or three installations per day.

The extremely accurate Grundomat makes the keyhole process possible. Crews shoot the tool from the house to an 450 mm diameter hole, usually in the street at distances averaging 15 m

MichCon performs over 150 service line/keyhole operations a month. The company dedicates three crews for fulltime service line installations.

The Grundomat’s reciprocating stepped cone chisel head moves independently from the main casing, powering through obstacles and creating a pilot bore for the main tool body to follow. This design ensures the tool’s accuracy.

Piling made easy with GRUNDOMAT

Customer:	Tube Lines Ltd
Place:	Mill Hill East Station, London UK
Machine:	Grundomat 95 mm
Job:	Installation of 14 mini sheet piles
Ø of sheet piles:	114 mm
length of sheet piles:	3 to 5 m each
Installation depth	2,0 to 4,0 m
Special features:	7 of the piles were driven vertically and 7 at a 45° angle. The piles each had 300mm of fill material
Duration:	approx. 17 minutes per pile

The Operators ensuring the pile is driven plumb by using a spirit level

TT UK recently received a telephone call from Tube Lines Ltd - the company responsible for modernising and maintaining the Jubilee, Northern and Piccadilly Lines in London/England.

On one particular section of a Northern Line embankment, just south of Mill Hill East Station, there is a problem with ground movement on the embankment. The line itself was constructed in the early 1900s and the ground is a mixture of clay and ash. Remedial works were deemed necessary to minimise the risk of the embankment slipping.

Mott MacDonald, the consultants for the above project, approached Tube Lines to drive 14 no 114mm diameter steel mini piles to allow them to carry out various load tests.

Tube Lines then contacted TT UK to ascertain whether they could provide the special equipment to drive these mini piles.

After a site meeting between Mott MacDonald, Tube Lines and TT UK staff, it was decided that a 95mm GRUNDOMAT would be ideally suited for the job.

Mott MacDonald then produced the specification to which the piles had to be driven. This varied from anything between 2.0 to 4 Metres in depth. Seven of the piles were driven vertically and seven at a 45 degree angle. The 114mm piles each had 300mm of fill material at the base of the pile as they were designed to support concrete beams which will retain the embankment.

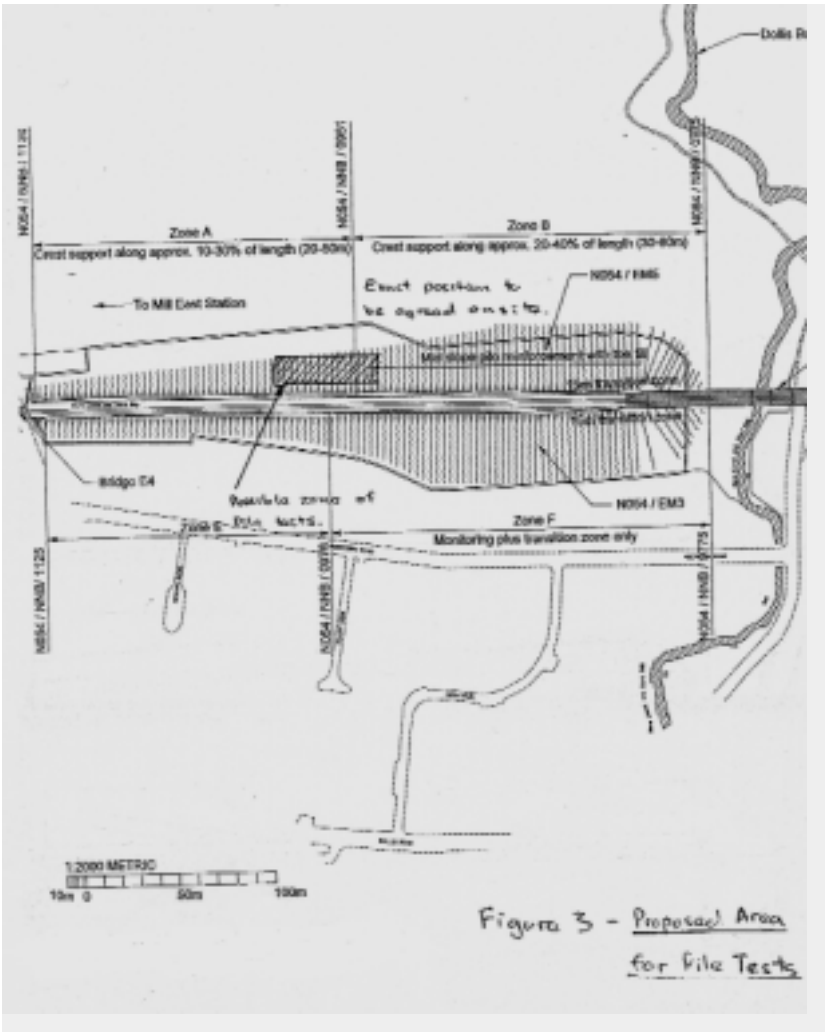
TT UKs engineers positioned the 95mm GRUNDOMAT into the 114mm pile. The pile was placed in the vertical position and with the air supply turned on the GRUNDOMAT then locked itself into the plug material and started

to drive the pile down into the embankment. On average it was taking 17 minutes to drive a 3 – 5 Metre pile including the welding time. The piles were driven to approximately 1 Metre centres.

On reaching the required depth the GRUNDOMAT was put into reverse by simply turning the airline a quarter turn to the left. Once the machine had broken away from the plug material at the base of the pile it was simply lifted out.

As can be seen by the photograph the pile were then filled with concrete in readiness for the vertical/lateral and tension capacity tests which were to be conducted by a specialist company. ●

GRUNDOMAT being removed from the pile



The jobsite sketch shows the embankment and the position of the 14 mini sheet piles to be installed (top view).

Reinforced concrete piles now firmly in place

Contractor Kelbore makes GRUNDOMAT history

From early February 2004 to mid March 2004 Kelbore Horizontal Boring of Port Elizabeth Republic of South Africa, specialists in Under Road Horizontal Boring achieved a number of world firsts in their field of speciality.

Kelbore successfully installed 9 UPVC and HDPE service ducts accross the National Route 2, (Section 11), a dual carriage two lane highway adjacent to the Coega Development Project approximately 30km east of Port Elizabeth. These under road crossings were done with Kelbore's Grundomat 180 P Series thrust boring machines. This was from the installation of 5 x 160mm and 4 x 110 mm ducts to accommodate communication and electrical services for the future development.

The uniqueness of these crossings and installations is in the distances over which they were successfully done.

According to information at hand the longest distance over which the Grundomat technology has been used in Europe and the United Kingdom is 35 m. The ducts on the Coega Project were successfully installed over distances varying between 50 mand 71 m!!
The points of entry into the embankment were ±3m below the road surface. The point of exit were also ±3m below road surface. The horizontal spacing between the 110mm ducts at point of entry was 300mm. On exit the spacing was 400mm after a run of 71 m. The horizontal spacing between the 160mm ducts was 1,2m at the points of the entry and ±500mm at the points of exit after runs varying between 50 metres and 70 metres. The enclosed photographs visually confirm the results achieved.

Finally, the ducts were installed into fills compacted to 93 Mod. AASHTO density, pavement layers compacted to 95% Mod. AASHTO

Customer:
Kelbore Construction, South Africa

Place:
Port elizabeth, SA

Machine:
Grundomat 108 P

Job:
Undercrossing of 4-lane highway
National Route 2

Pipe:

Installation length:

Installation time:
February - March 2004

Entry of the crossing.

density as well as into insitu material. The insitu material consisted of calcrete and sand stone and were classified as intermediate material in terms of the Standard Specifications for Roads and Bridge Works for State Road Authorities. (Colto)

The average time spent per run was 18 hours.

Exit of the 180mm crossing at ±3.2m below road level:

Large diameter pipe ram in Illinois:

Powers Lake Construction powers through

Customer:	Meyer Materials, ILL, USA
Contractor:	Powers Lake Constructio, twin Lakes; WI
Machine:	Grundram TAURUS and APOLLO
Job:	Installation of steel pipe OD 2000 mm as a conveyer for between gravel pit and crushing equipment for the expansion of a gravel operation
Installation length:	45 m
Pipe:	Steel OD 2000 mm in 3 sections of 15 m each
Ø of ram cones:	800 mm nd 600 mm

The world's largest rammer GRUNDORAM Apollo. .

Skill, attention to detail, solid preparation and confidence are a few characteristics of any successful contractor. Powers Lake Construction Co. Inc., Twin Lakes, WI., embodies these important qualities and more. According to Aaron Karow, Powers Lake Construction Project Manager, everything all relates back to the goals of the company. He said, "We are always trying to improve. Our goal is to become a full service company. We really want to get to the point where, not only can we do a little bit of everything, we excel at everything we do." It is that dedication that proved invaluable on a recent ramming project.

The project was completed for Meyer Materials, an aggregate company located in McHenry, Ill. The company was looking to expand its gravel operation. To facilitate the expansion a conveyor system needed to be installed between the new gravel pit and the crushing equipment. The company faced one major obstacle to the expansion, the crushing equipment was located on one side of State Highway 120 and the new pit was on the other.

The solution to the problem was to install a casing underneath the highway that would allow for the conveyor system to travel from one side of the road to the other without inhibiting traffic. The project was specified as pipe ramming and Powers Lake chose the a 60 mm diameter Grundoram Taurus for the job. Powers Lake crews set to

Once in place, the casing ND 2000 would facilitate the expansion of a gravel operation. A conveyor system will be placed through casing to carry gravel from a new pit on one side of the highway to the crushing facility on the other.

work preparing the jobsite for the large diameter casing by fabricating a rail system to facilitate the ramming. The rail system consisted of a 200 mm wide I-beam set in concrete with cross beams every 5 m. The configuration was positioned at a 1.5% downhill grade. Grade was critical to avoiding a high-pressure gas main 9 m into the ram.

The pipe arrived on the jobsite in three sections. Each piece of the 2000 mm O.D. steel casing weighed in excess of 20 tons. Using a 70-ton mobile crane crews moved the pipe sections into position on the rail system. Welding the sections took approximately one day per joint. After the sections were welded together, a cutting shoe was welded on the lead casing. Two 1/2-inch bentonite lines were added along the top of the casing.

Next, crews used the crane to place the Taurus ramming tool in position and made the connection between the tool and the casing. A series of ram cones were used to accomplish this. An 2000 mm diameter ram cone reduced the overall diameter from 2000 mm to 800 mm. A second ram further reduced the overall diameter from 800 mm to 600 mm to make the connection with the tool. Two Ingersol Rand 1300 CFM compressors were connected to the tool and ramming was ready to begin.

At a total weight of 58.500 kg, ramming the 45 m of 2080 mm casing was no easy task, even for the former world's largest pipe ramming. At the 28 m mark the Taurus was removed and sent on to another jobsite. Schwager then brought in the reigning world's largest pipe rammer, the Grundoram Apollo. The 800 mm diameter tool has a 900 mm rear flair and measures4400 mm in length. It weighs 11.500 kg and delivers over 40 tons of impact energy at 180 strokes per minute.

The Powers Lake crew removed the Taurus and removed some of the spoil from the installed casing before moving the Apollo into position. Once all the connections were made with the new tool, ramming was underway. Within two and a half hours the remaining 18 m of the casing was installed on grade.
Karow said, "I believe everyone was really impressed with the project. It was a big ram. Meyer Materials was very happy to have the casing installed on line and grade and we were pleased to be able to successfully complete the project."

Two pipe rammers were used on the project. The Grundoram Taurus started the project then moved to another jobsite. The Grundoram Apollo was brought in to finish the job.

Powers Lake Construction prides itself on quality work and attention to detail. Here Powers Lake Construction President Mark Karow (left) and Project Manager Noel Karow pose next to the world's largest pipe rammer.

Pipe ramming under prestigious building in Bangalore/India

Bangalore is the capital of Karnataka, located in South India. It has 4.3 million inhabitants, or 5.7 million including its suburbs. Bangalore is called the "Silicon Valley of India" due to the large number of computer and technology companies, as well as the related infrastructure, located there.

Vidhana Soudha, built almost entirely of dressed Bangalore granite, is a tribute to Temple architecture. Housing the Legislative Chambers of the state government, this 46 meter high seat of the government is Bangalore's best known landmark. It is one of Bangalore's most important buildings and was designed by Kengal Hanumanthaiah, who intended it to "Reflect the Power and Dignity of the People". It was constructed in 1956 entirely along Indian style of architecture. There are four domes on all the four corners. The main entrance is overshadowed by the four headed lion, the symbol of Indian sovereignty. It houses 22 departments and 300 rooms.

The Public works department Karnataka in Bangalore was constructing the south block of Vidhana Soudha. The above block had to be connected to Cubbon Park by installing two steel pipes ND 900m for a storm water drain line and a steel pipeND 600mm steel for a sewerage line.The paipes had to be laid together for a length of 40 Mtrs. Each.

Vidhana Soudha is situated in the heart of city with busy roads and constant VIP movement. PWD and its main contractor Shrike construction (P) Ltd had no possibility of using open cut method only to lays these lines. Since this process would take a minimum of 2-3 months including reinstatement and the traffic could not be diverted for this long period. They turned to KRITA ENGG.(P).LTD to provide a trenchless solution.

Survey:

- A preliminary physical survey of the area was carried to determine the physical obstruction like trees, electric posts, roadside Berms etc.
- A GPR survey was carried out to determine the under ground utilities like HT Power cables, Telecommunication lines water & sewer pipes.
- Geo tech consideration :- The soil strata are hard Muram generally found in most parts of Bangalore with chunks of rock & boulders.

Site organisation

The pipe had to be laid at 1m apart. The depth required was to be 4 mtrs. and the gradient had to be within 200 mm, i.e. 5 mm per meter.

Equipoment

The equipment to be used had to be a powerful machine, which could insert Ø 900 mm pipes to a length of 40 m. Also it was important to avoid

Customer:	Shrike construction (P) Ltd
Contractor:	Krita Engineering Ltd.
Place:	City of bangalore, India
Machine:	Grundram KOLOSS
Job:	Installation of three steel pipes for a storm water drain line an one steel pipe for a sewage line as connection of block of the legislative building "Vidhana Soudha" to a park nearby
Installation length:	40 m each
Installation depth:	40m
Gradient:	200 mm
Pipe:	3 x Steel ND 900 mm 1 x Steel ND 600 mm
Duration:	40 working days

any disturbance or change in physical property of road like crack formation etc., on the surface due to heavy traffic.

Krita Engg. used the Tracto Technic pipe raming machine KOLOSS for this job with very high dynamic thrust backed by 750 CFM, ELGI compressor.

Site preparation

- Entry bit of 14 mts length x 9 mtrs. Width was excavated upto depth of 4.5mts. This had to accommodate all the 4 pipes.
- A concrete retainer wall was constructed at the face of the pit to seal any collapse while raming.
- All the other 3 sides of the entry pit was sealed with shuttering sheets & channels.
- Gradient was the most difficult and important aspect of the job, hence concreating was done as a foundation in the pit.
- Pipe Ø 900 mm having 14mm wall thickness were welded with additional stiffness provided at the welding joints so as to avoid any breakage of joints while raming.
- Dewatring pumps were installed as a safety precaution.
- The complete area was barricaded with sheets to avoid any untoward accidents.

Jobsite

After all the preparations were completed the job execution had to be started, pipe string of 5 mtrs. Length was lowered and strapped with machine. After checking the necessary angel required to obtain around 5mm upward incliation at every mtrs. The rammer was started. First pipe was very critcle as it would guide the direction of other pipes. First 30 m (6 pipes) took not more than 2 hrs.each for insertion the complete string of 40 m was done in less than a weektime. The result obtained was perfectly matching with the requirement. The second pipe was positioned at roughly 1 m difference and was completed in the similar fashion Ø 60 0mm pipe of 10mm wall thickness was placed at around 3 m depth and was inserted with the same accuracy. The whole project was completed within 40 working days including cleaning of pipes. The gradient was within 200 mm limit.

After completion of the job the PWD decided to use this technology more frequently and effectively for there other projects

Renewal of concrete sewage line through ancient woodland with Grundoburst 1000G

K'Nex Pipelines is a South Wales based company who specialise in all forms of pipe bursting and trench less renewal. The company was established in the 1990's carrying out work directly to the utility industries. From early days, K'Nex have strived to promote the use of trench less techniques to these industries and in recent years has been recognized as the leading contractor within Wales for alternative solutions.

In early 2000 the company recognized the need for increased diameters and pipe burst lengths to advance pipe bursting in general. This resulted in the purchase of a Grundoburst 1000G pipe bursting rig. This rig in brief, comprises of a pull unit which is capable of achieving a 100t pulling thrust whilst using a QuickLock rod system. This equipment was far in advance of any of its contemporaries and offered a solution where previously there was none.

This major capital investment allowed us to promote our services to Dwr Cymru Welsh Water (DCWW) strategic Capital Alliance Partners.

Due to the capabilities of this equipment the client recognized that pipe bursting had now become a serious alternative technique for the renewal of pipes, where often location and environmental factors negate the use of traditional open-cut methods.

Aerial photograph showing route through ancient wood land

Part of the scheme passed through a golf course, this resulted in understandable anxiety from club members concerning damage, however the surface and condition of the fairway is still in its original condition.

The Gwendraith capital project consisted of approximately 7 kilometres of sewer upsize. Although the existing concrete pipeline was in good condition the system could not cope with the flows and had been discharging through the combined sewer out falls (CSO) into the river that run adjacent for a number of years. The existing pipeline runs down the valley to the treatment works through heavily ancient woodlands, and areas of special scientific interest. The initial scheme was detailed as an open cut off line replacement which would have had significant effect on both the local ecology and residents of the area. From the outset it became evident that traditional open cut methods were not an option in a large section of the scheme without significant environmental impact.

At the feasibility stage, Knex pipelines where approached by the Welsh Water capital alliance partners, Morrison Construction to investigate the possibility of trench less replacement. It was our feeling on inspection of the main and the flows within the existing system that an on-line pipe burst replacement would prove both environmentally and commercially viable.

The design requirements were that the existing 9" and 12" sewer were to be replaced with 450mm and 560mm pipe. A presentation was drafted detailing the location of pits, method of works and proposed solutions which was presented to the Environment Agency(EA), Countryside Council for Wales(CCW) and the local ecological representatives . In addition, it was felt that that a physical demonstration witnessed by all parties would further demon-

Customer:	Welsh Water (DCWW) Caüital alliances, UK
Contractor:	K'Nex Pipelines is a South Wales, UK
Place:	Gwendraith, Wales, UK
Machine:	Grundoburst 100G
Pulling force:	100 t
Job:	Replacement and upsizing of a concrete sewer line which could not cope with the flows through ancient woddlands to a treatment plant
Advance investigation:	Camera survey and flow monitoring analysis
Bursting length:	3 kilometres
Old pipe:	9" and 12 "
New pipe:	Ø 450 mm and Ø 560 mm
Date:	April 2003

strate both the capabilities of the company and the significant reduced effect of the replacement option on the surrounding area. This demonstration proved to be the deciding factor in the method proposed pulling in over 100mts of butt welded 560mm Diameter new pipe in forty five minutes with no damage or disruption caused.

On the strength of the above K'nex were awarded the on line replacement contract through the more sensitive areas of the Gwendraeth Scheme. This involved th replacement of approximately 3km of main with a contract value of approx £750,000.

Due to the environmental constraints imposed by the adjacent watercourses and the local wildlife habitat the scheme was programmed to be carried out through the winter months. Whilst this provided access constraints these were minimised by the bursting option with plant movements and excavation etc kept to an absolute minimum. The advance investigation works, which included a full 3000m camera survey and flow monitoring analysis, ensured that we had thought through and prepared for every eventuality

Unfortunately the contract started over the winter months and dealing with existing sewer flows was only one of the problems to over come. However all the up front investigation and the liaison with the relevant authorities and affected land owners and members of the public paid off.

The project became a total success story and even now after K`nex has gone on to install in excess of 10 kilometres of large diameter sewer using pipe bursting, the story of Gwendraith still seems to be the one that set pipe bursting on its way in the Welsh Water Alliance as a serious alternative to open cut.

GRUNDOBURST 1250 G replaces concrete pipe ND 400

Customer:	Civil engineering office Freudenberg/Germany
Contractor:	Firma Sommer, Dillenburg
Place:	Freudenberg/Germany
Machine:	Grundoburst 1250 G
Pulling force:	125 t
Damage:	Corrosion / misalignment / fragmentation
Bursting length:	2 x 120 m
Expander:	610 mm
Old pipe:	Concrete ND 400
New pipe:	PE-HD DN 500 resp. OD 560 x 31,7 (Simona) Long pipes 12,0 m / butt welding
Coverage:	1,40 m (trees along the pipe path / lake nearby)
Rod pushing time:	80 min.
Effective pulling time:	90 min. per section
Date:	September 2003

Rohrankunft in Zielgrube.

Der zum Einzug vorbereitete Rohrstrang mit Berst- und Aufweitkopf, 610 mm Durchmesser.

Das verlegte Neurohr.

Der GRUNDOBURST wurde inzwischen demontiert. Zu sehen ist der Berst- und Aufweitkopf. Gut erkennbar auch das eigens betonierte Widerlager mit einem eingebauten 600er-Beton-Rohrstück, um den Rohreinzug zu erleichtern.

Pipe renewal with GRUNDOBURST 2500 G

Customer:	Portland Construction
Machine:	GRUNDOBURST 2500 G
Ø bursting rods:	140 x 150 mm
Total rod length:	120 m

Pipe path

Total length:	890 m
Length of sections:	90 resp. 110 m
Pipe depth:	between 5 and 8 ft
Machine pit:	2,5 x 9 m
Intermediate pits:	yes

Old pipe

Type of line:	Sewage
Material:	Concrete
Nominal diameter:	400 mm

New pipe

Material:	PE-HD
Nominal diameter:	600 mm

Accessories

Winch:	10 Tons
Bentonite tank:	1900 l

Description:
The sewage pipeline ran between several houses, most of them having open-air swimming pools.
The distance from the swimming pools to the pipline was approx. 10 ft.

New TIP technique:

Short pipe relining with GRUNDOBURST

By using the new Tight-In-Pipe method (TIP-method) short sewage pipes can be installed trenchlessly from manhole to manole tightly adjacent to the old pipe wall. As the outer diameter of the new pipe is only slightly smaller than the inner diameter of the old pipe, there is no necessity for filling the annulus, which is often required for standard relining. The cross-section deficiency is minimal and a trenchless connection of house connections is possible.

An essential advantage of the Tight-In-Pipe method is the fact that during the installation small to medium sized offsettings can be evened out. Furthermore the method can be applied when damages occur, such as e.g. tears, leakages or in-growing of roots. In such a case a solid girder, prepared at the factory, is built into the old pipe canal. Generally speaking, in this connection the term relining is used instead of calibre pipe bursting. This totally new and innovative method of technique from TRACTO-TECHNIK can be carried out without any underground construction works.

The special winch construction with the GRUNDOBURST, as well as the special proven pipe installation technique ensure a safe installation (patent pending).

The hydraulically operated GRUNDOBURST 400GT with cable pulling device is set up in the target pit before starting the sanitation, the winch boom is lowered into the pit manually.

Inside the starting pit the guiding sleeve is threaded via the steel cable and brought into the old canal. Then the short pipes are pushed into the old pipeline, one after another. This is done by pulling the steel cable, which is connected to a pushing adapter. The new pipes are therefore not pulled in, but pushed in. This ensures a safe and tightly sealed connection of the pipe sockets.

Due to the new type cable boom the pulling force of the GRUNDOBURST 400 GT can be increased from 50 KN to 160 KN if required. The TIP method is really worthwhile, especially for renewing sewage and mixed water canals.

The propulsion speed is between 15 m and 20 m per hour, so that it is possible to redevelop two canal reaches per day.

Before

After

The advantages of the TIP method:

- small to medium sized deformations and offsettings can be evened out
- restoration of the circular profile
- up to 2 canal reaches per day can be renewed.
- solid girder, prepared ex factory with new limit of wear and long service life
- no annular filling required
- min. reduction of the cross-section
- applicable for various types of damages, e.g. tears, root infestations, leakages, forming of fragments
- safely applicable according to acknowledged technical standards
- no injection of the damaged area required for ground water infiltration, due to the method
- low jobsite set-up requirements: less personnel and space required
- trechchless connection of house service lines from old pipe diameter ND 250 on
- no underground construction works (except long pipes)

Not only the contractor himself, but also the applier of the static pipe bursting system GRUNDOBURST profits from this advanced development.

GRUNDOBURST can be used for the pipe bursting method as well as for the TIP-method and also for regular relinings (short and long pipes). ●

TIP demonstration jobsite

Customer:	City of Olpe/Germany, Civil engineering office
Execution:	TRACTO-TECHNIK GmbH, 57368 Lennestadt
Place:	City of Olpe / Gördeler Weg
Altrohr:	Stoneware ND 250
Medium:	Sewage
Installation length:	30 m
Damage:	Deformations / cracks and fragmentation
House connections:	non
New pipe	
- Type:	PP-HM
- Pipe size:	OD 242 x 13,0 mm
- Pipe section length:	0,5 m
Machine and equipment:	
- Machine type:	GRUNDOBURST 400 GT
- Guiding sleeve:	OD 245 mm

WMZ installs lake retrieval pipe:

Spectacular underwater achievement

Lake Constance is the deepest (250 m) and largest (580 km²) lake in Germany, it is alos a huge drinking water reservoir which supplies extensive areas of Southern Germany. The University of Constance uses the lakewater for cooling their climate control and research units.

The lakewater is taken from a grey cast iron pipe over a 400 m length at a depth of 45 m which is in turn supplied from a retrieval shaft. The neighbouring pumping station sucks water out of the retrieval shaft and conveys it via a 500 m length, 250 mm grey cast iron pipe into a raised container. From there the university is supplied with cooling water at 5 °C through a 900 m length of 250mm cast iron pipe, which after usage in a natural manner, can flow back into the Lake Constance.

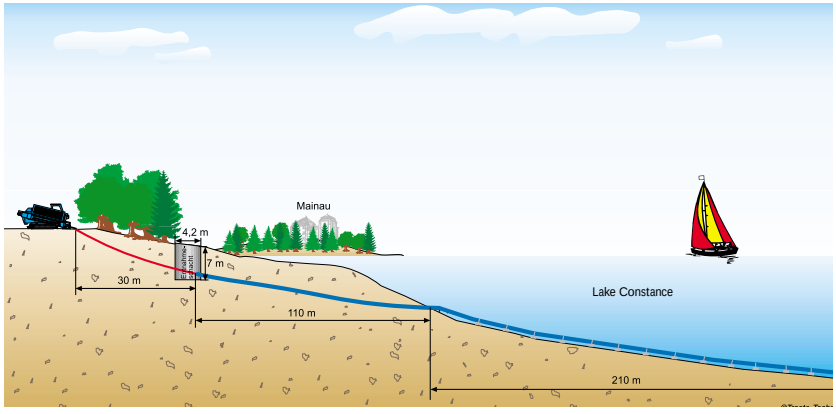
As the university's library was extended with a further building there is an increased requirement for cooling water. The capacity of the existing cooling water supply system is 60 l/s and insufficient to cover the requirements all year round. Therefore, additional fresh water had to be fed from the network. In addition the 90 year old land pipeline between the pumping factory Egg, the raised container at Allmannsorf and the University Constance, as well as the 400 m long lake pipeline were in a poor condition, which called for a renewal of the pipes.

The overland pipeline was already replaced in the Winter of 2002/ 2003 with a 400 mm grey cast iron pipe. The renewal of the lake intake pipe was scheduled for Winter 2003/ 2004 and was to be installed over a 100 m length from the retrieval shaft right into the Lake Constance using the HDD method.

The new retrieval shaft, with a base approx. 7 m below the ground and a diameter of 4,20 m, was surrounded by an open cut sheet pile wall and would later be installed with two drain pumps and kept in a dry condition.

The drilling company WMZ from Lauingen, as sub-contractor, was to carry out the drilling work and Klumpp GmbH from Offenburg the pipe installation work.

The new HDPE OD 500 mm lake pipe with aa wall thickness of 45,4 mm had a total length of 320 m and should be laid over a distance of 210 m at an approx. depth of 40 m on the lakebed. The topographical and geological conditions within the bore path required a bore depth of 20 m. The ground exploration samples identified soft sandstone in the top layers and clay and marl in the deeper layers.



The bore itself showed no unsolvable problems. The challenge was seen in controlling the buoyancy and lowering and installation of the pipes below water. The following measures were agreed upon:
For the installation a multi-layer pipe was used. The 12 m pipes were to be joined together by butt-welding.
The part of the welded pipe string, which is to be lowered onto the lakebed, had to be ballasted on the embankment by means of 50 concrete blocks with a weight descendancy of 400 kg each, placed at distances of 4 m on each of the pipes.
A controlled flooding of the pipe was required for the lowering process.
To hold the pipe string above water in a stable position and under water, floating at the installation height of about 20 m, 6 pontoons at distances of 55 m each apart were necessary. The pontoons were equipped with winches for lowering the pipe string to a depth of approx. 20 m .
The max. pulling of the Grundodrill boring unit of 20 t had to be taken into account. With a dead weight of 15 t and an additional 20 t concrete weight a max. pulling force of 10 t was expected underwater.
A diving team was ready for action to carry out any retrieval or assembly work under water.
The city works Constance had a ferry with a cable dredger waiting.
After constructing the retrieval shaft the pilot bore could begin. The Grundodrill bore unit (Manufacturer: Tracto-Technik, Lennestadt) was positioned approx. 30 m away from the retrieval shaft, to be able to reach the installation depth at the invert of the retrieval shaft. After 70 m the bore head suddenly met a difficult to penetrate sandy stone layer, which required the use of a GRUNDOROCK rock drilling mud motor. The pilot bore took 2 days to complete.

The pontoons which were necessary to hold the pipe string above water in stable postion.

Upsizing back reaming bores followed, in diameters of 250, 350, 500 and 625 mm. After 6 working days these were completed. After the final upsizing bore the 640mm backreamer was pushed far out to lake with the drill rods through the bore hole, to keep the strain of the drill rods to a minimum for the retrieval process. The divers were required once again, to fasten a tension chain to the backreamer. In the meantime the pipe string was aligned at lake and ready for pipe installation.

The tension rose with all the participants. An engineer was in position on each of the pontoons. The pipe string was flooded. Simultaneously the lowering procedure at all pontoons began. The planners had got their sums right. The pipe disappeared slowly below the water surface, until only the pontoons were visible. A sense of relief was felt by all. But the last hurdle - the pipe installation itself – was still ahead. During the pulling-in process a sudden resistance was clearly detected in the bore hole. The pulling force was already at 12 t. The WMZ team guessed that a rock must have got jammed in front of the pipe. With a great amount of sensitivity and support from the drilling fluid the resistance slackened off after 2 further drill rod lengths. The pulling force dropped drastically to 7 - 8 t. There were no further problems. The cycle time for each drill rod was 3 minutes. The arrival of the pipe string in the retrieval shaft signalled great applause and appreciation from all the attendees. After the installation process the corresponding connection works were carried out. The retrieval line was finally lowered to the bottom of the lake and the pontoons were disassembled.

Due to the application of the HDD technology the ecology of the flat water zone and the immediate neighbouring coastal garden of the university in Constance had hardly been disturbed and therefore met with great approval from the council, the fishing supervisor, the university biologists and the lake research institute in Langenargen.

Bore path:	Pumping factory Egg, to the west, adjacent to the existing pipe at a distance of approx. 17 m
Total length:	320 m
Length of the pipe section laid on ground in the flat water zone (bore):	110 m
Length of the pipe section laid on the lake floorin the area between dump and deep zone:	210 m
Water depth at withdrawal point:	approx. 50 m
Product pipe:	OD 500, wall thickness 45,5 mm, coating PP 3 mm
Shaft depth:	7 m
Shaft diameter:	4,20 m

The loaded pipe string with the swimming bodies is pushed into the lake with the help of a cable dredger. Then it is connected to the backreamer.

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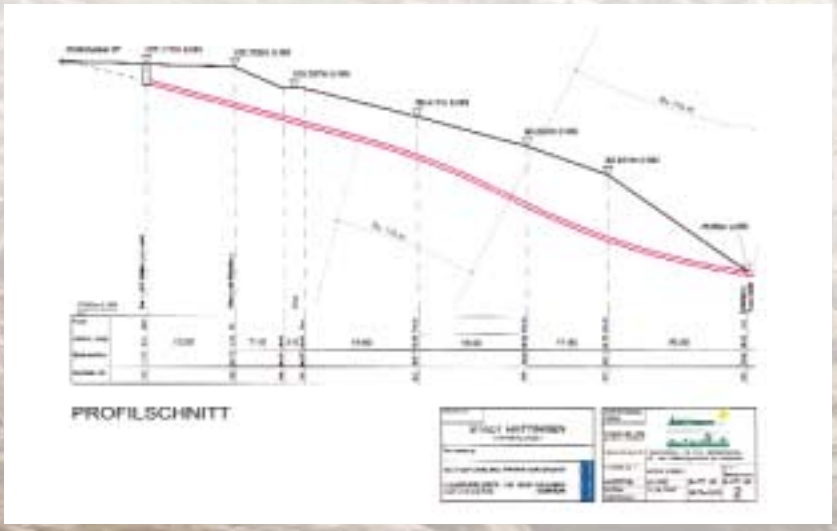
Beermann installs rainwater sewer pipe ND 560 through rock

The existing mixing draining plant in Hattingen/Germany and the open-air swimming pool were no longer up to latest technical standards and had to be renewed. In connection with this renewal a collector will be produced, which will divert the rainwater to the river Ruhr. This collector reaches a slope of 50% in the centre, or to be more precise, over a length of 97,50 m a height variation of 30 m. To stop the energy speed arising, a whirlpool shaft at the end of the steep slope is to be erected.

By installing this collective line the public works in Hattingen are able to completely control the diversion into the Ruhr river.

The extremely steep terrain with many old trees was very dense containing shrubbery The ground inspections showed that there was a strong chance of meeting fissured clay, compact rocks with high texture firmness and coal particles in the planned bore path at a depth of about 8 to 10 m. Due to these soil

conditions a penetration without a bore hole motor for rock was not possible. Therefore a tender was placed. The company Beerman from Riesenbeck/Germany was awarded the task, due to their competence and experience. The duration of the job was set at two weeks.



The jobsite took almost 2 days to set up and included the production of the Bentonite collection pits, the installation of the whole bore equipment as well as preparations, such as fresh water supply and mixing of Bentonite. Rock-drilling requires a high Bentonite consumption of up to 300 l/min. Taking this into account a mixed Bentonite quantity was held in a 20 m³ buffer tank. Added to this

Customer:	City of Hattingen/Germany
Contractor:	Beermann, Hörstel/Germany
Machine:	Grundodrill 20 S and PD 50/33
Equipment	Grundorock mud motor, mixing and recyling unit
Job:	Installation of a rainwater canal from a draining plant into the river Ruhr with a height variation of 30 m
Soil conditions:	Dense soil with shrubbery in extremely steep terrain; Fissured clay, compact rocks with high texture firmness and coal particles in the area of thr bore path
Installation length:	97,50 m
Product pipe:	PE-pipe 560 x 50,8 SDR 11
Weight of pipe string:	8 tons
Total installation time:	2 weeks

there was a mixing tank with a further 7 m_ capacity, as well as the attached recycling system, in which used Bentonite was re-produced for re-use by separating any particles and preparation in the mixing tank with approx. 10 kg/m³ Swell Gel. The proportion for a new mixture has in comparison 30 – 50 kg/m³ Swell Gel. At the end of the operation a gigantic amount of 900m³ used Bentonite was recycled and mixed.

For the pilot bore Beermann chose the Grundodrill 20S mainly down to economical reasonsnd the flexiblity of the drill rods. Because the 20-t bore rig was going to be taken to its limits for the clearance bores and the pipe installation, a 50t unit PD 50/33 from Prime Drilling was used for back reaming and pipe installation.

Close to the bore unit and also in the target area Bentonite collecting pits were dug up. The used Bentonite was pumped via an overhead installed pipe to the recycling unit. The stony material which broke out and was rinsed out remained in the pit and if necessary was excavated. As a further preparation measure the bore axis for the drilling fluid was measured and a profile cross-section was produced. The measuring team was then able to measure the intended depths and compare them to the actual depths and, if necessary, make any corrections.

The first upsizing bore with a 280 mm backreamer was carried out surprisingly without any problems and took approx. 6 hours. The second expanded bore with a 450 mm backreamer took approx. 24 hours though

and showed that after approx. 50 m at approx. 6 m length harder stone layers had to be penetrated. Therefore the next expanded bore was carried out with a 560 mm backreamer and successfully carried out after approx. 7 hours. The last expanded bore with a 680 mm backreamer took a little longer again, approx. 14 hours. On two occasions the backreamer had to be driven back in a difficult section and the worn-off bits renewed. After this expanded bore the backreamer was not disassembled, but driven back into the bore for the pipe installation. A total of 38 m³ rock was displaced out of the bore hole.

At last the bore canal was ready for the pipe installation. On the other side of the River Ruhr the pipe string, weighing 8 t was already welded together and aided by a cable winch, as well as supported by a wheel loader, moved to the other side of the Ruhr. There a crane set the pipes into position for connection to the backreamer and held it during the entire pulling-in process at about 3 m height above the railway tracks. The pipe installation took less than 2 hours.

Willy Paukstat, subsidiary manager, wanted to be sure that the pipe would not slide backwards and decided to carry out an annulus compaction process. This rounded off the pipe installation. Now work could be started on the whirlpool shaft and the connection to the old shaft. ●

Below: The new whirlpool shaft.

The Grundodrill 12 G-bore unit during the pipe installation

The pontoon carrying the boring equipment.

Boring in the mud-flats

The holm "Nordstrandischmoor" with its 18 inhabitants is a small North Sea island in the mud-flats. A small passage leading through a dam connects the island to the mainland 5 km away. On the other side of the island the company Paasch, from Damendorf, a subsidiary of Gü-strow, had to accomplish an unusual job.

In front of the dyke on the mainland a large jobsite sign was erected to notify the public that the water supply board Oeversee is installing a drinking water pipe 225 x 17,3 mm over a length of 5.200 m to the holm Nordstrandischmoor. The reason for this project is that an existing 225 mm asbestos cement pipe laid in 1964, had to be renewed because of its age. Two PE-steel armoured sea pipes, installed in 1990, were to be connected to the newly installed pipes at the transfer shaft at Hallig and to the mainland. The 355 mm pipes have already been installed into the transfer shaft from the sea below the dykes by employing the HDD method.

The owner of the executing company, Benno Paasch, explains: "Since the middle of June we have only been able to work at ebb-tide. The tides determine our operating time and the flood-tide is always bearing down on us. First of all using the plow method the pipe was installed at a depth of 1,50 m over approximately 400 m towards Hallig. A cable and plow unit was used from Föckersperger, who developed, constructed and successfully applied the first hydraulically adjustable plow for the installation of pipes in Bavaria. With this technique up to 24 cables or pipes up to 355 mm pipe diameter can be trenchlessly installed simultaneously.
The installation unit consists of a winching unit suitable for terrains and the cable plow. With the plow plate, which is lowered to the required depth into the starting pit, the penetration for the hollow space for the installation is produced. The pipe itself is fed in via the installation shaft and pulled in parallel to the plow route.

For this application the unit had to be adapted to meet the prevailing conditions in the mud-flats. The winching unit with cable winch and anchoring plate was equipped with an undercarriage with rubber tracks. The undercarriage of the pipe and cable plow with it's four all-round hydraulically adjustable extensions with runners was adapted to overcome the uneven surfaces and keep the soil load to a minimum. Even though this conversion work took several

Customer:	Water supply board Oveversee/Germany
Contractor:	Company Paasch, Damendorf/Germany
Machine:	Pipe and cable plow from Föckersperger and Grundodrill 12 G from TractoTtechnik
Job:	Installation of a drinking water pipe from the mainland through the mud-flats to the holm "Nord strandischmoor" in the North Sea
Characteristics.	The pipe was actually installed applying the plow method, the last 400 meters were imstalled using the Grundodrill. Work was only possible at low tide
Product pipe:	PE pipe 225 x 17,3 in sections of 12 m
Installation length:	5200 m
Installation depth:	1,50 m
Total installation time:	June - Septemner 2003

The pipes are ready for installation. The pontoon in the background with the bore rig.

Pipe pulling.

weeks, the installation of the drinking water pipe itself only took 8 working days to cover a distance of 4 km. Having almost reached the target the ground conditions suddenly became softer with less load bearing capacity for the vehicles, which slowly sank despite all precautions. It was a dramatic act retrieving the cable and plow unit and the vehicle before the flood set in. Due to the very soft ground conditions the plow could not be used any more. It was decided that the last 400 m would be installed by using HDD methods."

The Grundodrill bore unit type 12 G (manufacturer: Tracto-Technik, Lennestadt) was working on a pontoon adjacent to the jobsite. The first pilot bore over 200 m length was completed without any problems. The bore was carried out from the Hallig dyke in the direction of the pipe installed by the plow, which had immerged from the mudflats and was visible from the shore.

The bore head submerged at the marked exit point. It was equipped with wider steering plates so that it could be steered more easily in the soft ground. The pipe string was ready for installation. The 12 m pipe lengths were welded together with an automatic butt fusion machine as requested to a total length of 200m. The undercarriage pulls the pipe length into the mud-flats. Over half the pipe length has to be separated, as the vehicle became stuck in the mud-flats because of the load. The drilling crew quickly removed the bore head from the drill rods and attached a 355mm backreamer to the pipe string. Close team-work was essential as the pipe had to be installed before the tide came in. Meanwhile the automatic butt fusion machine is driven into the mud-flats and during a break the welders successfully welded the two pipe lengths together. Everything went to plan without any unforeseeable interruptions. At high-tide the pontoon set off and drove out to the "connection area" 200 m away. As soon as ebb-tide set in the last bore began.

The connection of the pipe ends at a depth of 1,50 m was a real challenge. The line was cut free over a length of 25 m and 3 – 4 m width at 1,80 m depth. The team were able to connect both pipe ends without any problems during ebb-tide.Benno Paasch, described the special motivation behind this project and how his company won the tender. "This project was very special – a once in a lifetime job. Out here there are different elements and you always have to expect the worst. Once we had a storm and the 8 m wide pontoon drifted 4 m away, despite being anchored down. This shows the elements we have to fight against here. Paasch were in third place for submission of the public tender, however the company in second place postponed their bid due to an administration error. The company in first place had offered a plow method, which did not meet the approval of the mud-flat protection regulations, which meant that we were given the official go-ahead by the committee.

Initially a pontoon with a captain on board was supposed to be hired, but Paasch recommended an amphibian type vehicle, which they hired specially. It can carry a load of 14 t and be used either as a driving or floating vehicle. If it becomes stuck, then you only have to wait for the tide. This was much more flexible and cost-saving and proved to be the best decision. The pontoon was only required for a short time for the planned bores.

The water supply board took care of all the licenses. Rangers from the national park kept a close check that all provisions were met and everything was documented in great detail. Any damages to the surface had to be levelled out. Every movement of the amphibian vehicle had to be authorised. A GPS detection system was used to ensure that the pipeline was constantly surveyed in case of any damage.

The project was completed at the end of September. We have met the time schedule extremely well, although with a project of this nature you have to expect a surprise or two all the time." ●

The pipe end in the mud-flats, which were installed with the "plow"

450 m bore - Air traffic remains undisturbed

Above: The Grundodrill 20 S bore rig establishing an upsizing bore

Left: Aerial photo of the Friedrichshafen airport with the bore path indicated

The air traffic remained undisturbed.

Customer:	Rohrleitungsbau Lohr, Ravensburg/German
Contractor:	Fa. Max Wild, Berkheim-Illerbachen /Germany
Job:	Installation of a drinking water pipe in a protection pipe over 444 m length under a runway
Pipes:	Drinking water pipe OD 224 Protection pipe HD-PE OD 355 mm
Machine:	Grundodrill 20S
Soil conditions:	Drifted clay and especially drifted marly ground showing sand contents up to the surface. At depths from 2,5 to 3m increasingly limnic chalk.

Special characrteristics:
On the west side of the airport there were underground obstacles such as concrete wall remains, which stem from the first runway and it's exact position is unknown. They even suspected battle means in the ground. Furthermore various drainage and sewage canals in various cross-sections and depths to the right and parallel to the runway. The bore was carried out under the strictest safety criteria. At first a terrain was marked and secured with a 1200 m fence and was approved by the German air aviation office. It was not possible to enter the terrain without a pass.

Duration: 5 days

All-weather protection for GRUNDODRILL X series

Poor weather should not have to cause expensive interruptions during jobsites. Therefore, Tracto-Technik has reacted to numerous customer requests for the Grundodrill X series and has built a flexible all-weather protection, which can be assembled when the weather gets bad and disassembled just as quickly when the weather improves.

The all-weather protection is also a working protection for the operator, as it keeps out the wind, rain and snow and reduces the possible danger of illness.

Advantages of the all-wheather protection

- can be retro-fitted for all X-types
- suits the machine design optically
- simple and quick to assemble with only a few steps
- Light construction with low weight of approx. 85 kg
- Plexiglass at front, rear and right
- Entrance with slide foil
- Available upon request in your company colours
- Integrated into the control stand and swivable
- Surrounding view to all sides
- equipped with 2 additional spotlights

Note: The machine width with weather protection enlarges for approx. 30 cm.

Free all-round view

bauma 2004 – The trenchless

concept on 800 m²

Jubilee bauma broke all records!

With 410.000 the number of trade visitors increased once again in comparison to 2001 – exhibitors were pleased with internationality of the trade fair and the number of concluded deals.

- Best result in the 50 year history of the trade fair - visitors from 171 countries (2001: 406.000 visitors from 157 countries)
- Share of international visitors rose from 27 to 31 percent
- Higly frequented by visitors from Middle/Eastern Europe and the Eastern Europe/Central Asia as well as from overseas
- Again very high share of decision makers – growing number of visitors representing a company
- Exhibitors report numerous concluded deals and expect extensive after exhibition business
- 86 percent of the visitors rank the integration of the **bauma** mining into the trade fair concept as „excellent to good"
- Record jubilee **bauma**:
  - 20 percent more exhibitors altogeher
  - International participation icreased by 26 percent
  - 14 more exhibitors from germany
- **bauma** + mining 2004 initiates slight optimism about further business activities worldwide and in Germany

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Partnership with the ISTT

Nodig-Construction, the international trade platform for trenchless pipe installations and pipe-replacements has now established a partnership with the International Society for Trenchless Technologies ISTT.

The coopearion aims at offering additional value for ISTT members and providing more and detailed specialist information to be made available on nodig-construction.com.

From october 2004 on nodig-construction.com. will provide a lot of new and revised information. For example the ISTT will have its own news section on nodig-construction. The techniques section will be updated according to the latest ISTT standard technical papers and ISTT members will have exlusive access to a large download area providing NoDig conference papers from the last decades.

The ISTT website www.istt.com will appear in a complety new layout with several direct links to the information sources on nodig-construction.com.

two new members to join the ISC in Hamburg.

If you would like to see the new draft Bylaws or to influence the selection of members for the ISC, you should contact your own Society first, since it will be your chairman or international director who will be representing you at the board meeting.

The ISTT Web Site

The ISTT Web site is now just two years old, but the rate of development of online graphics and the facilities on Web sites has already made it look dated. We have also found keeping information on the site up-to-date difficult and adding more material, so far, almost impossible.

The ISTT is therefore starting a partnership with a well-established trenchless technology portal, www.nodig-construction.com to provide a news service and to develop the other services available on www.istt.com. When you get a chance, have a look at www.nodig-construction.com, you will not be disappointed.

Membership Value

The finances of ISTT were audited in February 2004 to comply with regulations in the United Kingdom. Due to the success of the No-Dig in March in Las Vegas and Trenchless Technology Middle East in November in Dubai, the Society had an excess of income over expenditure of just under $54,222. The ISTT is also now into its third year of the Strategic Plan "2K5" (2000 to 2005) in which one of the key aims is to increase "membership value."

At the February 2004 meeting of the ISC, the committee decided to spend some of the surplus directly on "membership value" activities.

- **The ISTT Glossary of Terms**, last updated in January 1999, is being updated and expanded to take account of the growth in both techniques and practices. The glossary will be republished this summer, free to ISTT members and to the general public.
- **The ISTT Trenchless Technology Guidelines**, were published in 1998. There are now just less than 100

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