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Concrete – the all-rounder: wet-cast monolithic water chambers as spring tapplings

In many corners of the world, a functional supply of clean drinking water is still anything but a given. So it is little wonder that cities and regions with particularly high quality tap water regularly rank highest in international comparative studies on quality of life. Alongside hygiene and health aspects, factors such as reliability and sufficiency of the drinking water supply also play a significant role. Continuous maintenance, regular redevelopment and adjustment of efficiency of the underlying infrastructure are some of the most important tasks for communities and responsible utility companies. The Perfect system for manufacturing wet-cast, individual monolithic manhole bases developed by the Austrian company Schlüsselbauer Technology has established itself worldwide over the course of the last decade. The precast components produced using the Perfect production method are usually installed as part of sewer manholes. The versatility of this innovative production technology is shown in many ways, including the fact that it is increasingly used by various operators in the manufacture of monolithic water chambers. Two current examples of drinking water catchment systems in Switzerland and Southern Germany illustrate the successful use of wet-cast components outside of the usual field of application as part of sewer and drainage systems.

■ Ralph Mitterbauer, Schlüsselbauer Technology ■

Bavaria: Full redevelopment of spring tapplings

Following a decision made by the municipality of Bayerisch-Eisenstein, in the district of Regen in Bavaria, three drinking water sources were fully redeveloped this summer as part a set of comprehensive measures. In order to secure the water supply for generations to come, the planners in charge of the project placed great importance from the very start on finding a solution that would not result in compromises on quality for the company carrying out the project or

for the materials being used. The construction company finally selected to carry out the work in Bayerisch-Eisenstein was H&T Baugesellschaft mbH from Ruhmannsfelden. Over the course of the project selection process, this was the company that ultimately prevailed over the other tenderers with its bid, an essential component of which included the use of three water chambers with DN1000 dimensions produced from SCC to create a water catchment. The concrete water chambers were made exactly to measure by renowned manufacturer of pre-assembled concrete components Josef Heller & Sohn GmbH from Parkstetten and were delivered directly to the construction

site together with two overflow shafts. Over the course of the general redevelopment process, the components produced from a single cast based on the model of the manhole bases manufactured as monoliths were installed in open construction as water catchment tanks. The H&T Baugesellschaft mbH site manager, Dipl.-Ing. Manuel Christl, who is responsible for the work in Bayerisch-Eisenstein, was extremely pleased with how the project was progressing: "I'm really happy that we have been able to carry out this extensive redevelopment of the water source quickly and without any complications. In particular, we have been pleasantly surprised by the water chambers



DN1200 water chamber manufactured from flowing concrete with individually moulded channel and gaskets encased in concrete.



View inside a DN1500 concrete water chamber tailor-made by Wyss AG, with multiple inlets and 4 chambers at the water catchment site in the municipality of Vitznau, on Lake Lucerne.



The massive water chambers were flown by helicopter to the site of the water catchment system in Vitznau, high above Lake Lucerne.



User-friendly steel moulds for manufacturing wet-cast concrete components with individually customised channel configurations.

from Beton Heller. The spherical head anchors installed on the upper side made manoeuvring the massive precast components a piece of cake for our employees. On top of this, the gaskets integrated at the manufacturing plant made it considerably easier to connect the inlets and outlets, meaning construction progressed more quickly, which is, of course, in the interest of our contractor and the local population."

Monolithic water chambers in one pour

The monolithic water chambers installed during the redevelopment of the springs in Bavaria were manufactured by Beton Heller in Parkstetten from self-compacting concrete from a single cast, using plant-integrated gaskets at the lateral connection points. The internal diameter of each of the precast concrete components manufactured in the same way is 1000 mm, with a wall thickness of 150 mm and a construction height of 700 mm. The "centrepiece" of the water chambers used is clearly the cus-

tom-made channel together with the openings for the inlets and outlets. In this particular case, all the water chambers have three similar configurations with a channel diameter of DN150 as well as two inlets and two outlet openings with diameters of 150 and 100 mm respectively.

Change of scene to Switzerland: Vitznau on Lake Lucerne in the Canton of Lucerne. Here, under the supervision of project engineer René Leisibach from HSK Ingenieur AG in Küsnacht, a particularly spectacular installation took place as part of the renovation of the local water supply. As the land underneath the Rigi mountain massif is difficult to access, two DN1200 and DN1500 monolithically cast water chambers with a total weight of over 8.5 t were flown to the site of the water catchment system by helicopter. In addition to their flawlessly smooth surface, the water chambers produced by Swiss manufacturer Wyss AG Betonschächte using the Perfect process stand out above all due to their 4-chamber system, drinking water drainage system

with chrome steel sieve and an integrated overflow. Both water chambers were delivered ready to install as complete assemblies together with inner ladders with entry aids, safety covers and shoe scrapers as well as joint sealing, and were installed as part of the water catchment redevelopment project. Since then, they have been making a significant contribution to the seamless water supply for the municipality of Vitznau.

Wyss AG – Pioneer in the manufacture of wet-cast water chambers

The company Wyss AG Betonschächte, with its registered office in Eggwil in the Canton of Bern, is part of the Swiss group of companies O. Wyss AG Bauunternehmung, which was founded in 1960. At the start of the 1990s, master-builder Othmar Wyss developed a framework for the prefabrication of inspection manholes. What was initially conceived for the purposes of streamlining his own construction firm, was soon in high demand in the region and led



Concrete water chambers manufactured as monoliths using the Perfect process, for use in water catchment systems in Bayerisch-Eisenstein.



Concrete water chambers with seals and overflow shafts integrated in the plant produced by Beton Heller, shortly before being shipped to the construction site.



A label on the finished, cast water chamber providing information on all the relevant product parameters and project data.

to initial sales to different construction firms. Little by little, the range of standard manholes was expanded to cover all standard situations. Thanks to consistent further development, the supplementary, yet economic and low-cost system of custom-made manholes is now available for special cases. By 1998, the demand had grown so quickly that a new, larger production hall in Schüpbach, Emmental was required. A rational production department coupled with an extensive warehouse means Switzerland-wide delivery is possible within a short space of time. The prefabricated concrete product palette is constantly being expanded. The highlight of the Wyss AG range is the prefabricated water chambers, certified by the Swiss Water and Gas Industry Association (SVGW), and which together with the company's many years of experience, justify its excellent reputation as a water catchment specialist.

High component quality thanks to hardening in the mould and pre-integrated gaskets

Strict requirements are particularly placed on the quality of the materials used in the case of drinking water supply. Concrete, which is a cement-bound construction material, has been a tried-and-tested material for these applications for centuries and is characterised, in particular, by its positive properties when in contact with water. This is just one reason why this material is still used today for a large proportion of engineered structures for water catchment, water treatment, storage and transport.

The use of SCC and efficient hardening in the steel mould are essential factors for the high component quality of the monolithic water chambers from the Wyss AG and Beton Heller production process. This leads to a smooth and seamless surface, making additional coatings, which could subsequently peel away again in places due to operational stress, superfluous. A further advantage of the Perfect process used here are the gaskets which are available for several pipe types and are already securely and permanently integrated into the manhole floor during the casting process. These both simplify and speed up the subsequent connecting of the inlets and outlets on the construction site. Furthermore, damage and resulting leakages due to contamination, loss or mix-up of sealing elements can



Production of high quality precast concrete components for the underground construction market has been ongoing at the Josef Heller & Sohn GmbH site in Parkstetten, Straubing, for over 60 years.

be broadly ruled out in advance. The excellent component quality of the precast concrete components manufactured using the Perfect production system was recently reaffirmed in a test report produced by KIWA Bautest GmbH Augsburg published in April 2016. The manhole bases from the production department at Beton Heller were tested in the categories watertightness, water penetration and pressure resistance and were exclusively awarded the best marks (source: KIWA Bautest GmbH 2015-2016).

Perfect method: simple manufacturing of complex components

For the manufacturing of these innovative precast concrete components, the companies Heller and Wyss use the Perfect production system from the Austrian developer Schlüsselbauer Technology. Using this method, which has been successfully implemented for years, customised monolithic manhole bases and special components with individually moulded channel configuration, can be manufactured using an economical and largely automated process. With the Perfect Configurator, you have an easy-to-operate planning program available, enabling individual configuration of water chambers and manhole bases in accordance with specific requirements. The first part of this process involves inputting all the relevant product parameters such as construction height, wall thickness, type and number of inlets and outlets as well as the individual channel configuration required. From these data, the manhole planning software produces a complete and exact configuration that corresponds to the exact blueprint of the precast concrete component to be manufactured.

Customised channel configuration

One of the characteristics of the Perfect production technology is the cleverly-devised form parts program for manufacturing accurately-fitting negative channels. This makes it possible to easily produce any individual channel situations that are required in a single component, with which allowances can also be made for any necessary changes in direction, inlets and outlets and construction heights of the berms, in addition to the desired diameter ranging from DN100



Wyss AG Betonschächte production and warehousing area in Schüpbach, in Emmental, Switzerland.

to DN1000. This results in optimum flow behaviour through which undesirable turbulence and areas of congestion can be virtually ruled out. During production, prefabricated and material-saving parts made from EPS rigid foam are precisely assembled using simple hand tools to create a complete negative channel. This is then used by an employee in the matching steel moulds. The representational examples of the water chambers also feature the prefitted seals on the pipe connection form parts. Next, the fluid concrete used for floors, walls and berms is poured into the moulds in one single step. It results in complete manhole bases with individually formed channels made in only one pour. The products are left to harden in the mould and are usually demoulded the following day. As part of quality assurance, each precast component manufactured is given a product-specific label featuring all the relevant information such as date of manufacture, dimensions, weight, a graphical image of its configuration as well as information on the project and the client, if available. The custom-made monolith can therefore be precisely traced right up until the moment at which it is finally installed.

Optimised cost effectiveness through low consumption of resources and longevity

One of the reasons for the success of the Perfect production system lies in the fact that components with complex configurations can be manufactured quickly and eas-

ily using this process. A further advantage of the Perfect production system is the tremendous cost effectiveness of the production process. In this way, Beton Heller is, for example, able to manufacture up to 30 monolithic concrete manhole bases with individual configurations every day, made by two employees only. The use of free-flowing concrete is also an essential factor in terms of quality. Therefore, Heller developed a special concrete mixture many years ago in close cooperation with Heidelberger Zement: this special mixture guarantees the components have a smooth and pore-free surface. This leads to a longer service life of the concrete products as none of the signs of ageing or fatigue that prove to be relevant in materials comparison arises. In addition, the monolithically manufactured manhole bases are also characterised by their scientifically-proven positive properties with regard to resistance to pressure and wear. The work needed for maintenance and care of the wet-cast components is correspondingly low.

The Perfect process production method, which is resource-efficient both in terms of workload and material usage, in combination with the very high service life of the components produced using this process has already convinced prospective clients worldwide, and will continue to do so.

Beton Heller – Quality thanks to tradition and innovation

The family-owned company, Josef Heller & Sohn GmbH, has a long history. The cornerstone of today's concrete plant was laid in 1919, when the great-grandfather of current owner Helmut Heller founded a stone masonry and concrete goods firm. Its current site in Parkstetten, Straubing, has seen high quality precast concrete components being produced for the underground construction market for over 60 years. The company's declared objective is to bring together high quality standards and continuous product innovation. Since its pioneering entry into the use of Perfect production technology, the company has been able to manufacture accurate monolithic manhole bases and special components with individual channel configurations from a single cast. The underlying production technology originates from Schlüsselbauer Technology. Heller played an essential role as a partner in the development of this technology, using

its more than ten years of expertise in the manufacturing of precast concrete components. Today, Heller continues to be a catalyst for the further development of the production system used by over 35 suppliers worldwide. The current example of the water chambers for the municipality of Bayerisch-Eisenstein once again demonstrates the versatility of the Perfect process, as Managing Director Helmut Heller explains: "In the Perfect production system from Schlüsselbauer, we have a cost-effective and absolutely future-proof technology which enables us to implement customer-specific requests quickly. As the trend for individually moulded and high-quality manhole bases has been growing for years, for us, Perfect is also the production technology with fantastic potential. With regard to the successful spring redevelopment in Bayerisch-Eisenstein, we are proud that we have been able to contribute to the quality assurance of the local drinking water supply with our water chambers."

FURTHER INFORMATION

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