



Surfing: close to nature and environmentally friendly – and always riding the perfect wave. "The Riverwave" in Ebensee, Austria, is also an extraordinary project for engineer Benjamin Di Qual (photo). © Aerial photo: Nico Walz / concon, surfer Benjamin Di-Qual: Buro 36

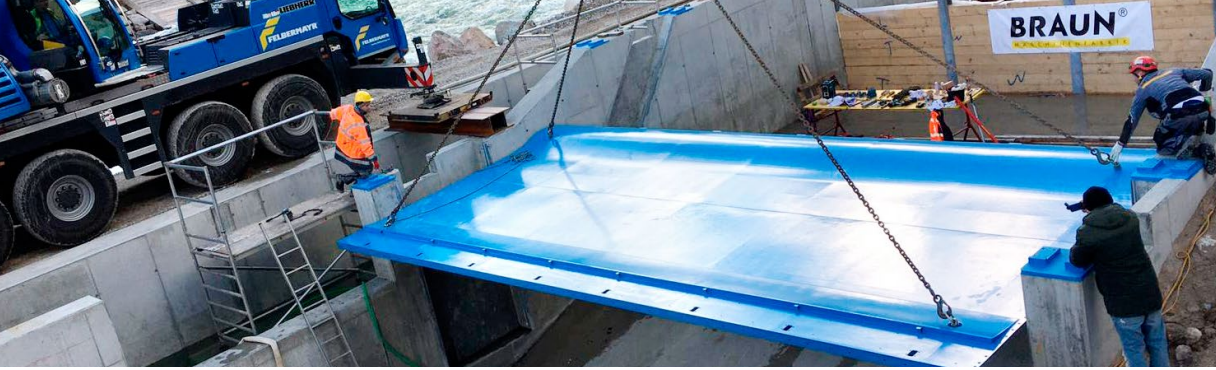
Allplan in practice

PLANNING AND CONSTRUCTION OF THE WORLD'S LARGEST STANDING WAVE IN AUSTRIA

When it comes to the professional planning of a surfable river wave, it's hard to get past the concon office. Allplan supported the engineers with the project planning of the technically and constructively demanding hydraulic structure in Austria.

The biggest wave ever surfed in Nazaré on Portugal's Atlantic coast was as high as an average eight-story building: surfing legend Rodrigo Koxa shot down 24.38m on November 8, 2017. And he was going over 80km/h in the process. Before a wave ride, however, there is often a long wait and high mental tension, because the optimal entry into the "big wave" is the base. But whenever the ocean is further away than a cool sea breeze can reach, surfing standing river waves is the perfect balance

to belly paddling with sharks and seals. Experts like Benjamin Di-Qual and his engineering firm concon create such unique sports facilities wherever natural conditions and environmental protection on rivers permit. Allplan supported him with the planning of his technically and structurally demanding hydraulic structure in Ebensee, Austria. In particular, the accuracy of the mass and quantity takeoff and the flexibility of the program for the project application facilitated the processes.



A multidisciplinary planning team was involved in "The Riverwave". The complex structure made of concrete and steel is 120m long. © concon

There are construction projects for which you have to make an elaborate bid – and there are those that are so unique that specialist architects or engineers are commissioned directly. When it comes to the professional planning of a surfable river wave and the steel and reinforced concrete structure to be developed for it, you can hardly overlook the office of concon and Benjamin Di-Qual. His fledgling office for structural design was able to prove that near-natural, environmentally compatible river surfing is possible with the project "The Riverwave" in Ebensee, Austria. The impact on the landscape was designed to be as minimal as possible; neither the annual fish migration to the important spawning grounds nor river fishing are restricted by the structure..

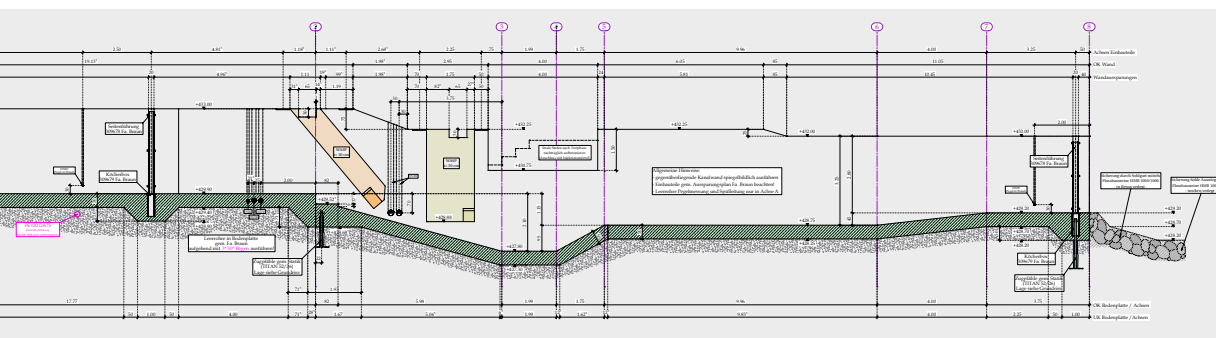
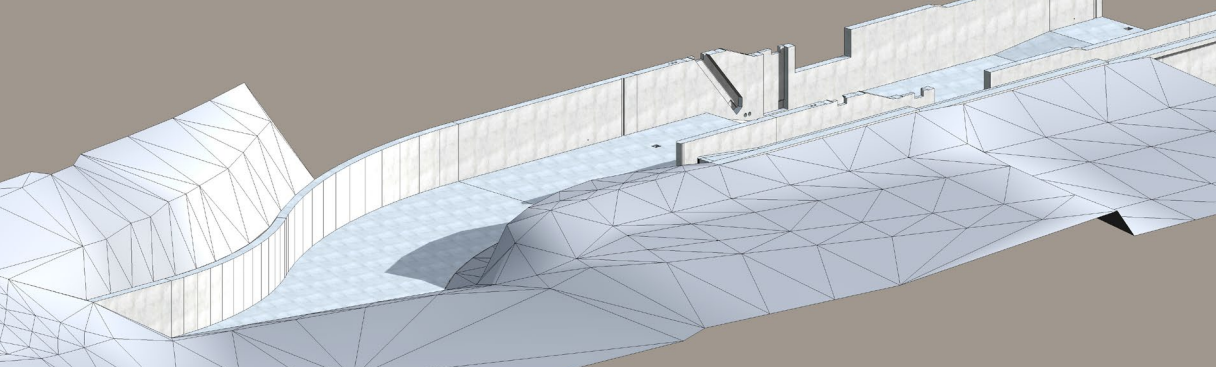
NEW TYPE OF PROJECT AND NUMEROUS PARTNERS

The client of "The Riverwave" is a long-time acquaintance of Benjamin Di-Qual and a passionate surfer. They know each other from the "Forum Riverwaves" of the Bavarian Chamber of Civil Engineers, which Benjamin Di-Qual started many years ago to promote a targeted exchange of knowledge on the subject. Building owner Maximilian Neuböck was already convinced of the concept back then. Today, he operates his standing wave commercially, which has been successful and a role model for many other such projects in Austria and throughout Europe.

"The Riverwave" was the first river wave project for concon's structural engineers. The implementation from the idea to the inauguration in spring 2020 took four and a half years. The concrete and steel structure is 120m long, and located on a diversion of the Traun near Ebensee with a width of 10m. For a project of this size, the planning and implementation period seems long at first glance. However, it must be remembered that the local authorities were not aware of all the permits required for such a river structure, nor did they have any experience in implementing the construction project. The procedure in Austria also differs from the procedure in Germany. Concon therefore worked with a local partner who assisted the project. The planning came from Benjamin Di-Qual and his colleagues, and the partner ensured it met Austrian hydraulic engineering standards. In addition, MEP planning and surveyors were involved, as were biologists, geologists, and the fisheries and environmental protection authorities..

COLLABORATION WITH AN INTERNATIONAL NETWORK OF PLANNERS

The multidisciplinary team was thus primarily based in Germany and Austria. An optimal exchange of planning information and data across national borders was imperative. In addition, McLaughlin Whitewater and Ben Nilsen, an international partner from Denver, Colorado, joined the project. The engineering firm, which specializes



There are only a few offices that can accurately calculate a standing wave. McLaughlin Whitewater and Ben Nilsen from Denver/Colorado worked out the hydraulic design and the dimensioning of "The Riverwave".
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in watersports structures, prepared the hydraulic design and calculated the dimensions of the standing wave. The conversion from inches to the metric system proved to be straightforward thanks to technical routines, including those in the Allplan planning software used. It was much more difficult for the engineers to convert between different units, for example, when specifying the flow rate in gallons per second instead of liters per second. For this, the partners in the USA and Germany had to jointly develop a feeling for the units, which became increasingly better over the course of the project. "Our projects should remain feasible despite their high technical and constructability demands. Nevertheless, in principle, everything must be planned through to after service phase 4 (construction.) For this, we need a high degree of precision in the planning and the necessary design depth at an early stage. This is the only way to still implement short-term adjustments in a timely manner later in the construction phase," says Benjamin Di-Qual, Managing Director concon construction consulting, Traunstein.

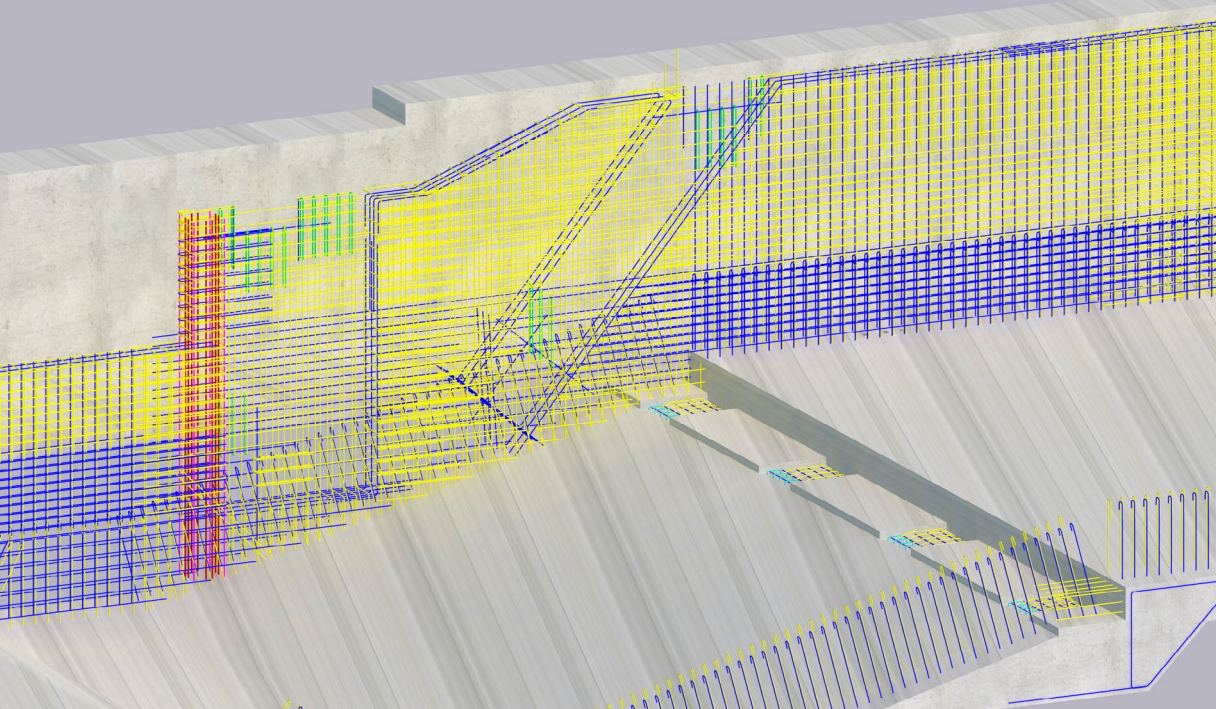
PLANNING AND TECHNICAL KNOW-HOW COMBINED

The work in the riverbed of the Traun placed high demands on the civil engineers on site. Essentially, four aspects had to be taken into account: the 120-metre-long concrete channel was constructed in a sheet pile box, for which excavation and dewatering were necessary. It quickly became apparent

PROJECT INFORMATION AT A GLANCE

- > **Focus:** Hydraulic engineering / Engineering
- > **Software used:** Allplan, FRIL0
- > **Client:** Neuböck GmbH & Co KG
- > **Service phases:** 1 – 8
- > **Total construction costs:** € 2 million (net)
- > **Start of construction:** August 2019
- > **Construction completion:** April 2020

during the construction phase that the soil was far more permeable than had been assumed after the geological survey. Further stabilizing measures and pumping were therefore necessary on the construction site in order to support the loads from the riverbed water and from the slope. In addition, a high-pressure sewage line crosses the structure – which is routed from the adjacent village through the river to the treatment plant – and had to be accounted for in the design. The third point concerned flooding during the construction phase: a sheet pile box, which is a technical standard for many hydraulic structures, has a defined height. If the river rises above the edge, the structure completely fills up. Benjamin Di-Qual explained the issue this caused. "We had a flood in the Traun River during which our construction site was submerged. However, we were able to prepare for it and clear everything beforehand. We had to flood-proof the construction site several times anyway – even if nothing happened after all." The fourth important



The entire reinforcement was designed three-dimensionally in Allplan to avoid collisions between the complex intersections and wall recesses in advance.

© concon

aspect is the maintenance of the structure, a steel and concrete hydraulic engineering structure. At regular intervals, The Riverwave must be checked for safety and functionality. Gates at the inlet and outlet of the 120-metre-long channel and powerful water pumps make it possible to drain it completely. However, the channel then becomes a hull and strives to float on the riverbed. To prevent this, the construction is fixed with tie rods.

ALLPLAN AS A CENTRAL PLANNING TOOL

concon chose Allplan as the design software for the project planning of the challenging structure. The advantages of the solution are clear for Benjamin Di-Qual. "For us, the added value of Allplan lies in the fact that civil engineering is also covered by the software, not just structural engineering. And we have a lot of freedom when it comes to editing. Everything in the project is planned in 3D – the steel hydraulic engineering, the embankments, the river bed, etc. I think this has worked so well because we have and use the necessary and important degrees of freedom in the software," he explains.

The data exchange between the planners in the project was based on DWG and DXF files and was therefore not 3D-based; a central project space or cloud solution for data exchange were not yet used in this project. Nevertheless, concon's 3D model played a major role during the entire course of

the project. The complete volumes and quantities were derived from the model, which meant a high degree of cost accuracy even in early planning phases and before the groundbreaking ceremony. The engineers worked with 3D objects that were created with specific attributes. This proved to be an advantage during the tendering process, as volumes, quantities, and the properties of the components could be incorporated directly into the tender documents.

VOLUMES AND QUANTITIES EARLY IN THE PLANNING PHASE

The modeling went even further: not only was the structure itself implemented on the basis of a model. There was also a supplementary excavation model to derive the exact quantities, as well as a precise terrain model. The time invested in advance proved to be extremely valuable. The final measurement of the quantities used showed that the calculations of concon's structural engineers were always correct. "Allplan provides an important and, above all, correct basis for volumes and quantities that we derive directly from the planning. This simply has to be correct, because we are responsible for the quantities and the bidders' offers are based on our figures. But we know that we are very good at this, and so it was right on the Riverwave project," says Benjamin Di-Qual.



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Benjamin Di-Qual, Managing Director,
concon construction consulting, Traunstein

THE CUSTOMER

concon is an independent engineering, planning and consulting company that develops holistic construction solutions for its clients. The focus is on combining all aspects of construction in order to generate economic added value for the client's project. The company works with clients through all project phases without losing sight of the big

picture on the one hand and a feel for detail on the other. It sees itself as a modern service company that focuses on modern and effective working methods with coordinated project processes.

ABOUT ALLPLAN

ALLPLAN is a global provider of BIM design software for the AEC industry. True to our "Design to Build" claim, we cover the entire process from the first concept to final detailed design for the construction site and for prefabrication. Allplan users create deliverables of the highest quality and level of detail thanks to lean workflows. ALLPLAN offers powerful integrated cloud technology to

support interdisciplinary collaboration on building and civil engineering projects. Around the world over 500 dedicated employees continue to write the ALLPLAN success story. Headquartered in Munich, Germany, ALLPLAN is part of the Nemetschek Group which is a pioneer for digital transformation in the construction sector.

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