Faculty of Civil Engineering University of Maribor

Ludvik Trauner

The study of civil engineering began at the Maribor Higher Technical School in 1960. At first, one hundred and twenty-eight freshmen started studying in cramped rooms that did not belong to the school, without laboratories and with very modest equipment and logistic support. There was an insufficient number of teachers, and therefore skilled practitioners from construction companies and offices dominated. We could not even think about real research work.

Eight years later the Department of Civil Engineering got its first laboratory. Since then, the development of civil engineering studies has made great progress. In 1973 the Higher Technical School transformed into the High Technical School and in 1975 the first students were enrolled in second degree studies. In that year we became equal partners with the newly established University of Maribor; seven years later postgraduate study was introduced. In 1985 the school was renamed the Technical Faculty of the University of Maribor.

Dean,
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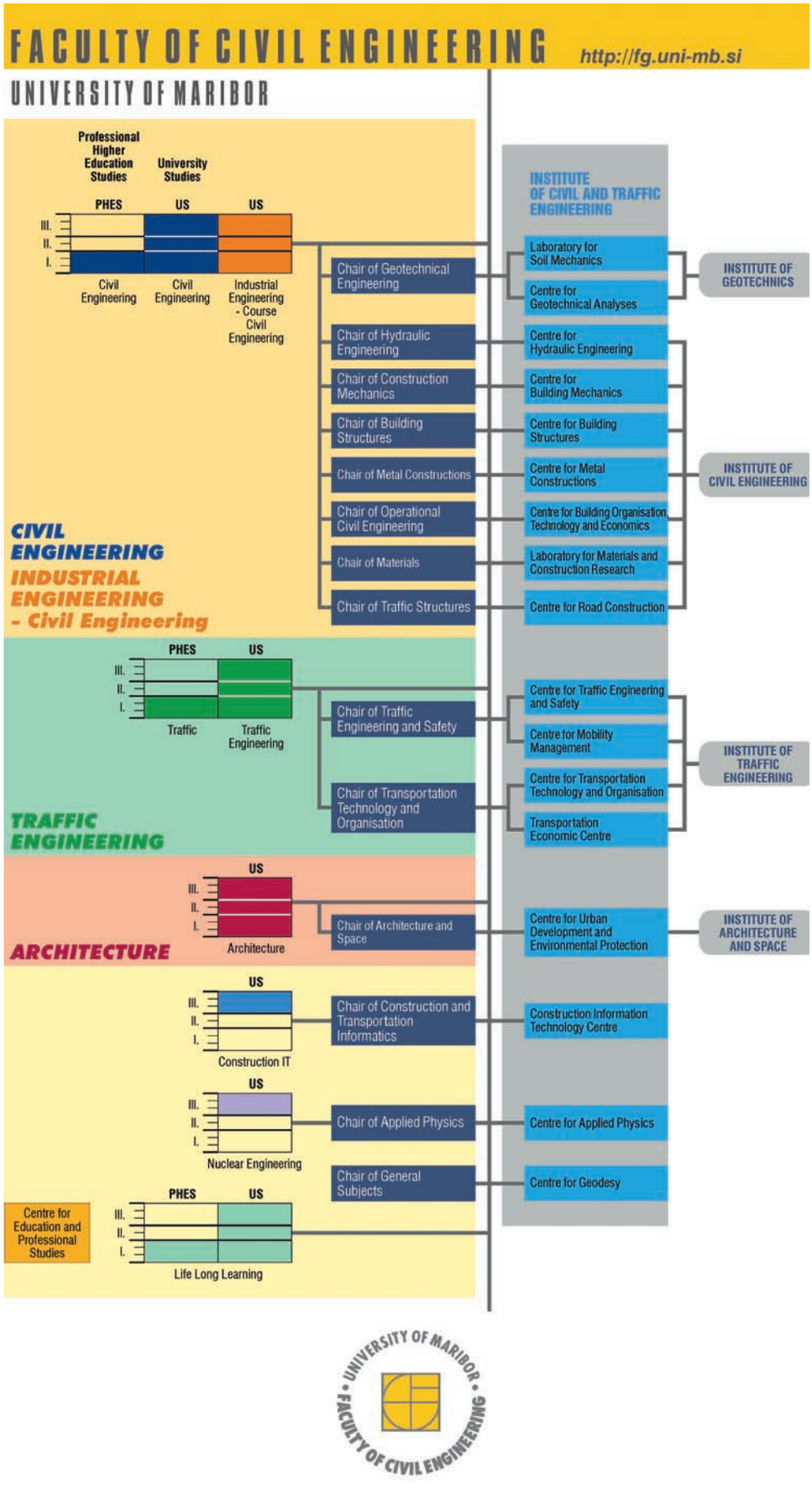
A very important evolutionary moment occurred in 1993, when besides the traditional civil engineering programme two new programmes were introduced – Traffic Engineering and Business Engineering, which was a course in civil engineering given in cooperation with the Faculty of Economics and Business in Maribor. In 1995 the four departments of the Technical Faculty agreed to reorganise into independent faculties. One of them was Faculty of Civil Engineering. In the last ten years the latter has been quickly developing, and the number of students and graduates has rapidly increased – there have been more than 3000 considering all the stages and study levels from the very beginning in 1960 till today. Also, scientific research work and inclusion of the Faculty in international courses have developed promptly.

In 2007 another very important leap was made – the study programmes were reformed according to the Bologna Declaration and new study programmes were introduced. An important step forward was taken with the introduction of an architecture programme, which we hope will develop into an integrated study programme in our Faculty.

Nevertheless, we are aware that satisfaction with our achievements means the end of our development. So, we are looking into the future. We think that our development results as well as the connection of the natural and engineering sciences in Maribor will be encouraged by the new organisation (as shown in the figure).

Scientific research at the Faculty of Civil Engineering is implemented under the research programme and basic, applied and targeted research projects financially supported by the Slovenian Research Agency, Ministry of Transport, and Ministry of the Environment and Spatial Planning. It should be pointed out that research activities at the FCE are also supported by other ministries; however, in such cases, they concern mostly entirely specific tasks related primarily to the use of knowledge, including the creation of new knowledge only to a smaller degree and therefore they concern applied and developmental tasks. Experts regularly publish their research results in international scientific publications and present them as papers at international (and domestic) congresses and symposia.

International cooperation is implemented through numerous forms of bilateral cooperation with foreign universities and research institutions as well as through (primarily) European projects, either under the EU Framework Programmes or international projects such as INTERREG, COST, ESPON, KNET, etc.



Dean Ludvik TRAUNER,

The Statute of the University of Maribor determines the Chairs, i.e. the organisational units of the university, as the holders (among other tasks) of basic research activities under a specific scientific discipline, with an aim to transfer, in the appropriate manner, scientific research achievements and new findings into the educational process at all study levels. In this respect, 14 Chairs have been established in the Faculty of Civil Engineering, the scientific research work of which is presented in further descriptions and additional web links. It should also be pointed out that most of the members from the various Chairs are very active in the profession; however, this part of the activities and achievements of the university teachers and assistants is presented separately in another, more appropriate place.

In this way, university study creates conditions for creative thinking leading directly to the growth of the cultural and material welfare of people, along with continuous and simultaneous accumulation of knowledge and with an awareness of the need to decrease the harmful recurrent impact of increasing welfare on the living and non-living environment.

Lecturer Milan KUHTA, BSc

THE PUCH'S BRIDGE IN PTUJ

V. Markelj, M. Kuhta :

Cable-stayed bridges are the most demanding engineering structures. If a cable-stayed bridge is built using free-cantilever construction at a sharp radius across a wide lake, it is surely worthy of worldwide attention. Such a structure is Puhov Most (Puh Bridge) in Ptuj, which crosses an artificial lake on the Drava River. The new bridge is a part of the southern highway into the town of Ptuj, which was built as part of the G1-2 main road in the Hajdina – Ptuj section. The road has solved many traffic problems in Ptuj since there was just a single road bridge over the Drava River prior to the bridge's construction.

Lecturer Viktor MARKELJ, BSc

Bridge design

Finding the optimal bridge design was not a simple task. On the one hand, large spans were needed (lake bridging, waterproof canal bank wall and other obstacles), while on the other hand, very thin construction had to be used (low street level line, navigable profile and preserving the view of the oldest Slovenian town).

The longitudinal disposition, with spans of 65 + 100 + 100 + 100 + 65 = 430 m, was suitable for the given street geometry and morphology of obstacles; therefore, the innovative "extrados bridge" construction system was selected, which is a cross between a cable-stayed bridge and a girder bridge. The depth of the box girder deck is only 2.7 m, whereas a normal free cantilever, without cable stays, would necessitate a deck depth of 5.5 m. The girders of "extrados" bridges is still the main girder element, but with a depth of 2.70 m it is not rigid enough for a span of 100 m (L/H=37) and thus the cable stays, prestressed post-tensioned?????? over short pylons, add to the structure's stiffness. Also, the cables have an important function in the construction phase because 50-m-long girders with such a small structural depth cannot be built.

The structural parts of the upper construction are also short pylons of a height of 9.0 m, two for each support. The pylons are inclined at 7.5: 1 so that the cables do not reach road clearance. The concrete rating used for the deck and pylons is high-quality C45/55 MPa.

The substructure consists of 2 abutments and 4 piers, three of which are in the lake with one on land; all are supported by 150-cm-diameter piles which are 25 to 30 m long.

Erection

Erection of the bridge, undertaken between October 2005 and May 2007, was a very demanding task. The first phase included displacement of high voltage transmission lines and sewage lines, as well as construction of a foundation in the wide accumulation lake to a depth of 5 metres.

The foundation in the lake was carried out with the help of artificial islands built with the help of sheet piles. This was followed by driving 150-cm-diameter piles 150 cm in diameter with a

The Puch's bridge in Ptuj.

length of 30 m in order to reach the marl base. Normal piling was not possible because of the problems with extracting the casings. Therefore, the contractor was forced to use the technology of bentonite flushing. Excavation was accomplished with boring equipment on a special dredger through steel casings to a depth of 8m; the stability of the well was assured with the help of a bentonite suspension. All transport of equipment and material was achieved with heavy barges.

The bridge deck was built as a free-cantilever structure with the addition of inclined extrados cables. A movable scaffolding (handcart) with a segment length of 5m (manufactured by Wito and Doka) was used for erection. Since the superstructure is of constant height, the scaffold did not have to be adjusted as with the usual condition of variable height. This aspect saved time, with the setting and prestressingpost-tensioning???? of the cable stays performed within the single construction stage of one week, as is usual.

One of the particularities of the construction is also the inclined cable stays, which consist of three basic components: a free part, two anchorages in the beam and a deviator in the short pylon. The cable itself, i.e. the free part, consists of 31 tendons made from high-strength steel with high-quality anticorrosive protection. Each tendon is first coated with zinc, then protected with grease and a plastic wrapping. Thirty-one such tendons, each 1.5 cm in diameter, are put into a tube of solid resistant plastic 18 cm in diameter, and the interstices are filled with cement.

This cable can sustain a maximum stress of up to 820 tonnes, while the actual stress in each is 4000 kN (400 tones). A unique solution is the pylon cable saddle, which accommodates 40 cable stays.

The biggest problems in the project were the demanding sharp-curvature geometry of the structure, construction of anchorages and cable details. Another extraordinary story is also the monitoring of deformations in all phases of construction. The construction of such a bridge would be impossible without the most modern software and the most accurate geodetic equipment.

This demanding project represented an extraordinary technological challenge for the client, designers and contractors and is a reference work of world scope. With the new bridge, Ptuj has gained a unique engineering example, one which not only solved traffic problems but which has also become a new feature of the skyline and modern symbol of the town in the southern outskirts near Ptuj Castle and the medieval town centre.

SOUTH-EASTERN DOMAIN OF SLOVENE ARCHITECTURE

Uroš LOBNIK

Lecturer Uroš LOBNIK, BSc.

With the beginning of the study programme in architecture at the Faculty of Civil Engineering, University of Maribor, a new era in the development of Slovenian architecture began. The architecture programme at the Faculty of Civil Engineering in Maribor is being established at a time of intense change in the profession of architecture, when numerous new architecture schools are being opened and brought into force in the spotlight of the regional European architectural scene. The spreading of architecture schools and high-quality study programmes brings much more good than bad as a rule.

At the Faculty of Civil Engineering, within which the Chair for Architecture and Space was established in 2000, preparations for a new study programme in architecture began in 2003. For decades there were deliberations about the connection of the fields of construction and architecture, as well as about the domain of supplementing the technical knowledge of Slovenian architecture and the need for developing another recognised regional school of architecture in Slovenia. For this purpose, the goal was the creation of an architecture programme which would be configured according to the Bologna Declaration and capable of reacting to the needs of society and its space with “regional specifics”. In the new study programme, students will gain and use knowledge from the field of civil engineering, spatial planning and urbanism or opt for gaining new knowledge with the help of specialisation in specific technical fields after three years.

Study programme in architecture

Higher education of engineers in architecture in European countries is conceived according to the Bologna Declaration in the form of consecutive undergraduate and postgraduate programmes of study. Undergraduate and postgraduate studies constitute a unified programme of qualification, in the sense of European and international standards of acquiring licences, and assure a high level of mobility of students of architecture, academic and administrative staff. This principle means a change in the existing system of higher educational study in Slovenia, comparable to restructured programmes in the related cultural space of Europe (Austria, Italy and Croatia).The architecture programme at the Faculty of Civil Engineering of the University