Constructa Ltd

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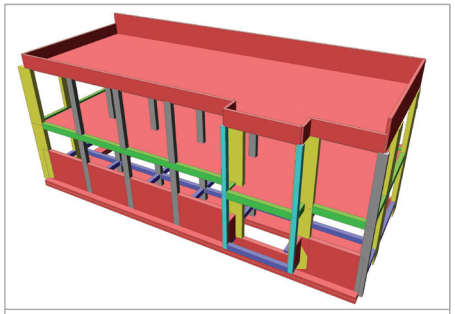
Constructa Ltd is a structural design agency, established in Ruse, Bulgaria.

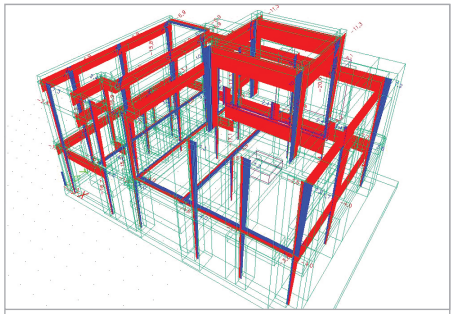
Since its foundation in 2001, the company provides structural consulting to public and private companies.

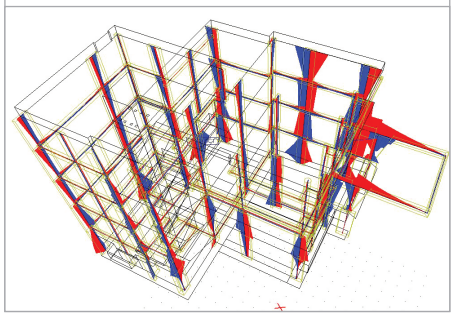
We have good experience in the chemical industry; we worked a lot with physicists, chemists, technologists, physicians, etc. In such projects a structural engineer has to be really inventive and at the same time strictly observe the technology rules. The structural design agency should gather and assimilate a lot of specific information and carefully sift it to extract all the details that affect not just the structure but the entire construction process.

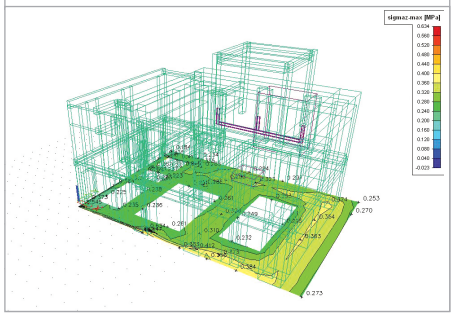
A very important aspect of the industrial design is adapting the technological know how to the local geophysical and climatic conditions and norms.

We are trying to do our best to provide reliable and adequate collaboration to specialized industrial and social initiatives.









Software: Scia Engineer

Extension of the Oncological Hospital - Ruse, Bulgaria

The oncology centre in the region of Ruse, with the support of the municipality of Ruse, planned an extension of the local oncology hospital. The total area of about 1500 square m is composed of three separate buildings - one four-storey polyclinic block, one two-storey hospital block and a specialized treatment bunker. The design of the first two blocks was more or less traditional - concrete structures, 7 degree seismicity by the Medvedev-Sponheuer-Karnik scale, stairs, elevators, shades. A very untraditional task was the block for radiation therapy - we called it “the bunker” because of its size and function. A digital accelerator, that is the source of radiation, had to be situated there. There were three levels of protection - for the personnel, for the adjacent parts of the hospital and for the environment. The vicinity of a big public building was a complication too. Together with the radiation physicists, we chose the combined protection method - steel screens for the roof and heavy concrete for the front wall towards the shopping mall across the street.

Challenges, specific experiences

Unlike other cases, in which the structural elements seem too big and too expensive to the owners, this time the elements of the bunker were too big for us, the designers. The walls were 2.1 m, 1.6 m, 1.4 m thick. The roof slab had a thickness of 1.5 m with a 0.33 m steel implant in the middle. With the help of Scia Engineer we designed the roof slab pouring process in three stages. After the first stage the steel implant was to be mounted. We introduced the characteristics of barytes concrete in the model. The mines produced baryte flour and sand for finishing layers, but we needed a bigger grain diameter. So we took all the scrap from the mine, that is, the leavings after sowing the baryte material. Still the diameter was about 8 mm, and that was introduced in Scia Engineer. At the contact area, the leakage of bigger grains into the barytes concrete was prevented by an implanted steel mesh. Because of the different consistency, leakage of finer grains could not be stopped. So the adjacent elements’ concrete was prepared with barytes sand. We also made some additional models to check the formwork and in particular its tightening ropes for the process of pouring the heavy concrete in it. The building company Glavbulgarstroy did some experimental research on the heavy concrete to configure the time for gathering strength, creeping, and compactness. Because of the radiation admission restrictions, the compactness of both traditional and heavy concrete was to be precisely checked. Additional agents were forbidden. The builders did a great job with pouring the concrete. They managed to reach the necessary quality with simple methods like vibrating, continuous pouring, strict control of the temperature of the concrete and the environment and, of course, perfect organization. For the first time we had to deal with temperature load on the formwork. May be we had to expect that, but on the day after the pouring of the concrete, the formwork of the walls was really hot. Checks showed that the extension of the tightening ropes of the formwork will not result in impermissible geometry changes.

The construction started in November 2009 and was finished in December 2010. The concrete works were performed by Glavbulgarstroy, Ruse and the finishing works by Roan 94, Ruse. All the participants in this project formed a specialized engineering holding for radiation therapy complexes. So far the tests show perfect quality. The UK technology team gave a very high praise of the builders work, but the final results for radiation’s control will be obtained when the digital accelerator starts working at full power.
At its 45th anniversary this year, the Chamber of Bulgarian Architects nominated this project as one of the best for the period.

This project gave us, the designers and the builders, a unique experience. We think of continuing the investigation of radiation diffusion with Scia Engineer fire heat modeling instruments. A more precise research of the material’s characteristics may give us the opportunity to reduce the size of the elements and to guarantee the radiation security not just on the ground, but on upper floors. Composite sections for slabs, steel and concrete, lead and concrete, or lead, steel and concrete, might be of a better economical effect. If we could model a slab to a slab contact, and input friction coefficients, box-formed sections, filled with water, sand, soil, etc. could be part of the structures, as Scia Engineer allows the introduction of any material’s behavior.

Extension of the Oncological Hospital

Ruse, Bulgaria

Project information

Owner	Regional Oncology Complex, Ruse
Architect	Ventsislav Iliev
General Contractor	Radiation Therapy Concortium
Engineering Office	Constructa Ltd
Construction Period	From September 2009 to December 2010
Location	Ruse, Bulgaria

Short project description

The extension of the Ruse Oncology Hospital of 1.500 m² total area concerns a polyclinic block, a hospital block and a specialized radiation therapy bunker. Three levels of radiation protection were executed, namely for the personnel, for the adjacent parts of the hospital and for the environment. The protection method was combined - steel screens for the roof and heavy concrete for the walls. The construction started in November 2009 and was finished in December 2010. The specialized concrete works were performed by Glavbulgarstroy, Ruse.