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PROJECT PRESENTATION

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Creating a Fire Station in Bujanovac, Serbia

Fatlinda Veliu

Abstract

The inspiration to work in such an institution is the fact that there is no fire station in Bujanovac at all. As an architecture student, it has been essential to work at the fire station that fulfills all needs, both functional and aesthetic. The primary focus was on organizing access to the institution to create quick, free entry or exit in emergency cases and to give the institution a more beautiful, modern look. Such a station was critical and was required in the city where I live, because in emergency cases, you always have to wait 25-30 minutes for the firefighters to arrive from the nearest city, Vranje.

With a population of around 50-60 thousand people, I think it is a serious problem that this city lacks a building like this one, which is primary and which affects the safety of the citizens who live here. In my creative design, the primary focus was on security and building a comfortable space for the employees of this institution. The building has three emergency exits and is designed with sustainability in mind. The materials are selected from local ones that do not require long transport, natural ventilation, greenery, a solar system, or a geothermal system. For this project, I used various methods of analysis, including site visits, site analysis, interviews with employees of this institution, discussions with urban planners, sketches, analyses of fire stations across Europe, consultations with various professors, etc.

Introduction

The fire station is a vital institution because it serves the needs of the city's citizens. As architects, our job is not only to create beautiful buildings but also to design buildings that are essential to the community and to improve people's safety. The location I chose for this project was well thought out. It is surrounded by many public buildings, including the Kindergarten, two primary schools, a secondary school, a university, the sports hall, the city stadium, the police station, the ambulance, the municipality, the law office, and many restaurants, as well as residential buildings. Given this urban context, it was necessary to build this building at this location so that I can serve citizens more quickly in emergency cases. The current situation in Bujanovac isn't satisfactory for the citizens. In many emergency cases, due to the lack or delay of the fire brigade, the city has lost many buildings, people's lives have been endangered, and, in some cases, the situation has escalated into disasters in which people's lives are lost. This shows that the city lacks basic services that a complete and safe city should have. In addition, the design of a fire station became not only an academic project but also a necessary contribution to insurance and the city's development.

Project Description

Location

The project site is located in the city of Bujanovac, along the main road K. Petrovica, which connects the city center directly. The area is surrounded by two secondary roads on both sides, which makes circulation and access to the building easier and more effective. The entire area is 7500 m2, of which approximately 30% is used for construction, and 70% is dedicated to rotation, training areas, greenery, relaxation areas, and parking for staff and fire trucks.

The fire station has a main entrance for fire trucks that is connected directly from the main road, a private entrance for staff vehicles in the parking area, and three entrances for pedestrians: a public entrance, a private entrance for personnel, and an entrance that is direct to the sports area, which citizens can also use for different activities.

Figure 1.
Site plan



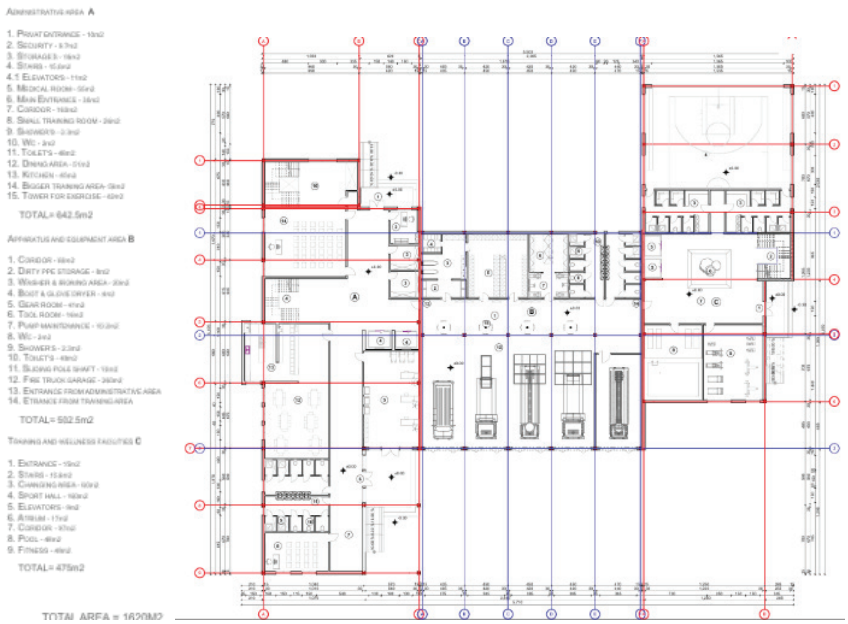
Program and Functional Layout

The building is separated into three essential parts, designed to complete the requirements for a modern station:

1. The first part is the administrative part, where there are a total of two floors. So, on the first floor are the kitchen and tableware, security room, medical room, two training rooms, toilets and bathrooms, storage, and vertical communication.
2. The second part is the central part of the station, which includes the garages for fire trucks and all the necessary rooms, such as equipment storage, changing rooms, and technical spaces.
3. The last part includes a fitness area, swimming pool, and sports hall designed not only for the employees of this institution but also for the citizens

Figure 2.

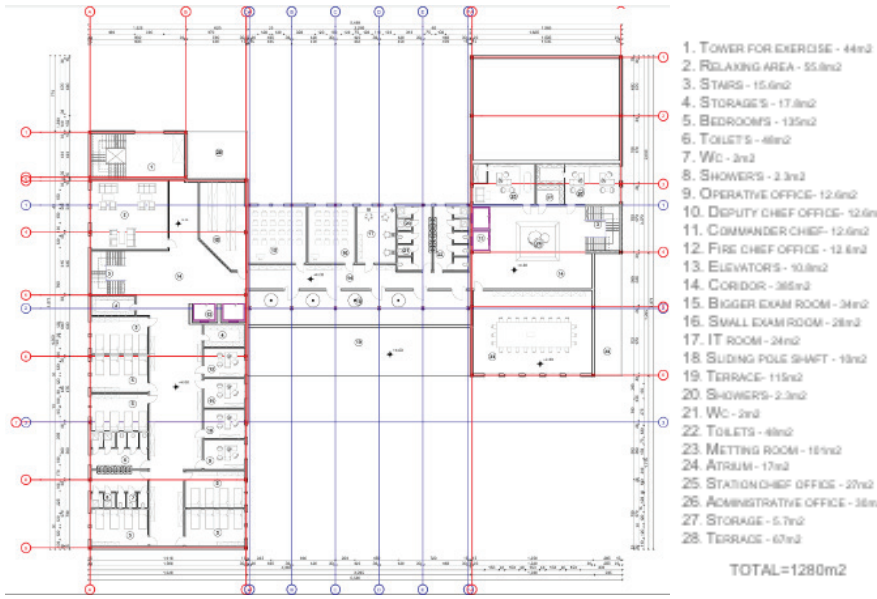
Ground floor plan



Regarding the first floor plan, the program includes sleeping rooms, a library, a relaxation area, two terraces, administrative offices, IT rooms, exam rooms, meeting rooms, and a fire pole for quick access in any emergency.

Figure 3.

First floor plan

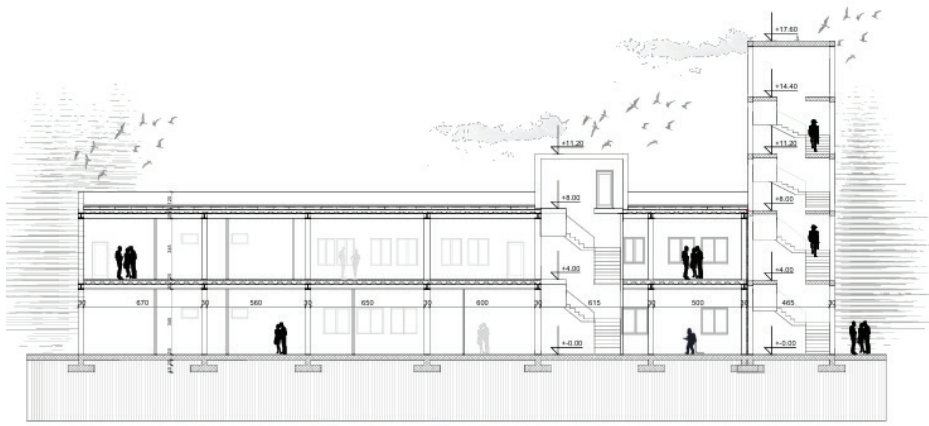


Structure and Materials

The building has a steel structure combined with a concrete foundation. The training tower is built entirely of reinforced concrete to ensure stability and safety during physical training. In the structure, it is worth noting that there are also three dilatations, which serve to connect the structure and maintain stability during temperature changes or structural movements.

Figure 4.

Section of the building



The materials are selected carefully based on functionality, sustainability, and local availability. The primary materials include reinforced concrete facades, anthracite panels, and red metal cladding on the exterior. The red color gives the building a strong, recognizable identity that clearly conveys its function as a fire station.

Figure 5.

3D model of a building



Figure 6.

Front elevation of the building



Methodology

The design process for the fire station in Bujanovac follows several significant stages, from research and analysis to development and final design concept. Each step helps create the most justifiable function, security, and a building that responds to the needs of the citizens.

Site Analysis

The first step was to study the location and surroundings to gain an effective idea. This includes topography, traffic connections, site entries, building orientation, and neighborhood buildings. The analysis has helped me choose the best placement for site entrances, parking spaces, and fire truck circulation, and to position and design spaces for training and relaxation.

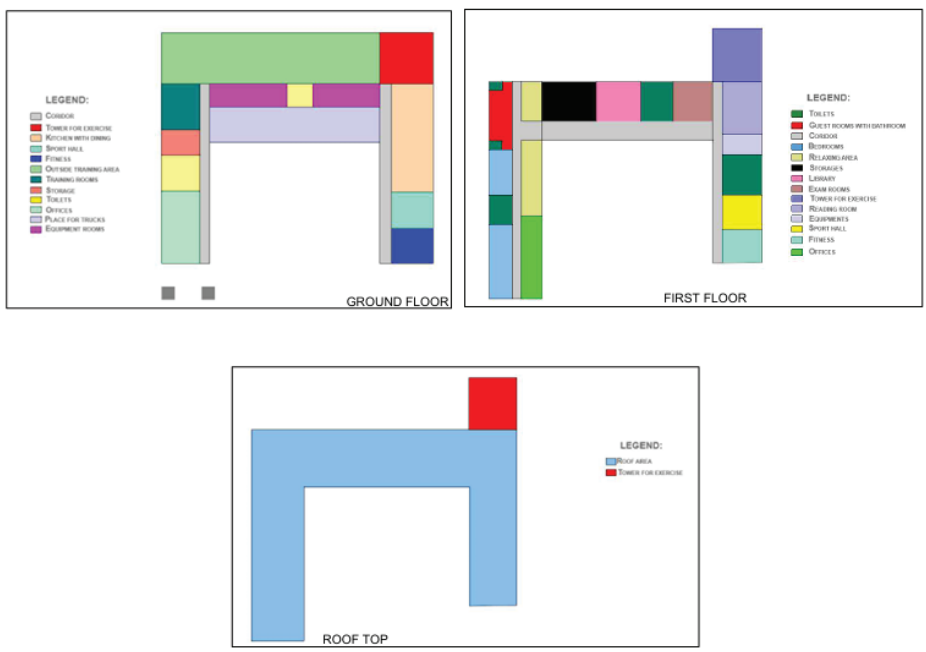
Research and Case Studies

To make a clear sense of how a fire station should function and what such an institution should contain, I have studied examples of fire stations in various European countries, as well as in different books on rules, m^2, necessary spaces, etc. Those different examples and analyses from different books helped me understand how spatial organization, safety systems, and architectural approaches work. By comparing these designs, I really understood how a fire station in Bujanovac can function best and created the final design.

Functional and Spatial Analysis

The research was analyzed in general, and I then created a functional diagram by organizing all the spaces by use: operational, residential, administrative, and training. From this process, we can clearly see a smooth internal movement and quick response times in emergencies, as well as which spaces should have direct access to the main space.

Figure 7. *Proposal plans*



Concept Development

Based on the collected information, I have developed the most crucial concept, which combines private aspects into a design framework, including Function, Security, and Sustainability. The idea is to support firefighters' daily activities and, to make this building even more valuable and interesting, connect the local community with the building itself.

Design Process

The design was developed through sketches, a floor plan, interviews with employees who work in such buildings, visits to different fire stations in Macedonia and Kosovo, speeches, and research by various architects. I also had to analyze many different designs until we reached the final design and function. Special attention had to be devoted to natural lighting, the orientation of the rooms to get more natural light, the use of local materials, the elimination of long waits for transport, and the integration of as many spaces with greenery as possible, as well as spaces for spending free time and staying.

Evaluation

During the process, I also reviewed the design against the fire station's standards and the project goals. Feedback from the professor and others who really understand how these things work helped me improve the organization of the function and safety system, as well as the aesthetic quality of the project.

Review of Examples

Before starting the design process, I have analyzed lots of examples of the modern fire station in Europe, and to have a clearer view of how the function should be as effective as possible, have fast access, security in construction and function, and also, an important thing is the comfort of firefighters in the space where they spend plenty of time. With a background of many references, I have chosen two that have an impact on the design of my project: Fire Station Saragossa in Spain and Fire Station in Munich, Germany.

Fire Station Saragossa No.4, in Spain

The Saragossa fire station is famous for its modern design, which includes its simplicity. The institution is well designed to have access as fast as possible in emergent cases. Large open spaces and easy circulation are the main points of this building. In the architectural aspect, concrete and metal materials are used, which reflect on strength and durability, and also large windows that provide natural daylight. This building also included green spaces and training areas around it, from which I drew inspiration to implement in my project as well.

From this excellent job, I learned more about the importance of the most functional areas, the separation of the administrative part from the operational one, and, at the same time, the well-connected nature of both, with quick and straightforward access.

Figure 8.

Fire station Saragossa, IDOM Architects (ArchDaily, 2018)



Fire Station 4, Munich, Germany

This project is also an example of and an inspiration for efficiency and technical organization. It is designed to support a 24-hour working schedule, with clean circulation and well-planned spaces for cars, training, and administration. The institution's structure is steel and concrete. The idea of three main areas came from this one because it also has three main areas: the garage and technical area on the ground floor, the living and administrative areas on the first floor, and the exercise tower directly bordering the building.

The design is focused, let's say, more on safety, access, and natural lighting, which have influenced my design for the project in Bujanovac. I have also made progress on many things from this example. Still, some of the most important were: direct access to the main road for fire trucks, divided spaces for living and working, and entrances to the building dedicated to the public and private, and from a simple geometric shape and modern materials taught me that materials should be used to express a strong and functional identity of the institution.

Figure 9.

Fire Station 4, Munich , AG Niederberghaus & Partner GmbH , (Canzler, n.d.)



Results and Outcomes

_The final design of the Fire Station in Bujanovac successfully meets the primary goal, intended from the beginning, to build a building that fulfils Function, safety, and sustainability, serving both workers and citizens.

The organization of spaces allows fast and direct movement between the main areas, the garage, administrative areas, and training spaces. It is planned so that firefighters respond immediately in emergencies, thereby reducing the risk of injury and loss of life. Vertical communication and emergency exits improve security and ensure easy access in the event of an emergency. The building's shape is simple; I used clean lines and a compact U shape, and the surrounding space features areas for relaxation and greenery. Natural lighting is provided on all the building's facades, with large openings that improve the working environment and reduce the need for artificial lighting. The combination of materials and colors, such as red, anthracite, and concrete, gives the building a strong, recognizable character that clearly conveys its function.

Sustainability was also an essential part of this project. I decided to use local materials to reduce transportation costs and environmental impact. The project also includes a geothermal system, solar panels, green areas, natural ventilation, and natural materials in the building's interior. More than 70% of the site is dedicated

to circulation, outdoor training areas, and green areas for relaxation, creating a healthy space for firefighters. The project is not only a technical building but also a socially necessary space for the citizens of this country. Since parts of my project, such as the sports hall, fitness center, and swimming pool, are open to the public, this also strengthens the connection between the fire brigade and the community. This helps us to make this station a symbol of safety, service, and community care, a place where people will feel safe and proud to have it.

Discussion

The design of the Fire Station in Bujanovac was a valuable learning experience that combined architecture, functionality, and urban responsibility. The project, with a successful conclusion, addressed the city's primary needs by providing practical functionality, clean circulation, quick access in emergency cases, and well-organized areas for operations, training, and administration. The building is safe, built with modern materials and techniques, and sustainable. At the same time, this also serves the citizens by allowing the use of spaces inside and outside the building and by strengthening their connection to this object as much as possible.

As for construction, it was the best solution for durability and safety, and the training tower section can also serve as an emergency exit.

Despite all the successes, during the design, I encountered many difficulties with the combination of private and public spaces. But after some research and consultation with professors, I concluded that the partitioning of spaces with specified entrances is the end. On the other hand, the chosen location has its own limitations, such as traffic flow along the main road and around the surrounding apartment buildings, which should be considered even more in areas such as garages, parking lots, and outdoor training areas.

Through this project, I learned more about the importance of safety in an object, its function, and the need to consider the urban context. Another important thing that I knew was how sustainable materials and green spaces can improve the working environment and strengthen the building's relationship with the community.

Overall, this project demonstrates how a functional, sustainable Fire Station can improve safety, efficiency, and community life in a mid-sized city such as Bujanovac.

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