

NEIGHBOURHOOD POD PEKRSKO GORCO



STANOVANJSKI SKLAD REPUBLIKE SLOVENIJE

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The peak of the investment cycle of the Housing Fund of the Republic of Slovenia

The residential neighbourhood Pod Pekrsko gorco represents the pinnacle of the Housing Fund of the Republic of Slovenia's investment cycle within the

framework of the NSP 2015-2025, both in terms of original design, high-quality construction with BIM-technology and system simplifications, and, most importantly, its purpose for all vulnerable groups, ranging from young people, young families, the elderly, and everyone with special needs. The neighbourhood offers users extremely comfortable, energy-saving, and affordable rental apartments in a unique embrace of nature.it is extremely comfortable and energetic for users. I'd like to take this opportunity to thank all of my colleagues who contributed to our overall success. The number of apartments under the auspices of the Housing Fund of the Republic of Slovenia has now reached 7,247, and with over 2,000 apartments under construction or in the planning stages, we are rapidly approaching the goal of 10,000 public rental apartments.

Mag. Črtomir Remec, director of the Housing Fund of the Republic of Slovenia

ABOUT THE PROJECT

Residential neighbourhood Pod Pekrsko gorco, Studenci district, Maribor

Number of buildings

Number of housing units

g

Number of underground garages

2

Number of serviced apartments

60

Socio-social programme

Two-department kindergarten, day activity centre for the elderly, premises of the residential community for people with special needs.

400

Number of parking spaces in the garage

550

Number of gross above-ground areas

41.300 m² 17.800 m²

Business programme

8 rooms for service and catering activities

Average size of housing unit

66,7 m²

Number of playgrounds and spaces for urban exercise

8

Number of gross underground areas







The Pod Pekrsko gorco neighbourhood is part of Maribor's Studenci district. The district is adorned by its proximity to the city centre and Mariborsko Pohorje.





Technical description

Construction:

K + P + 2 massive masonry construction.

Heating:

District heating from the city's hot water pipeline via residential heating substations. Floor heating with electronic regulation via room thermostats.

Ventilation:

Central mechanical ventilation with heat recovery.

Energy efficiency:

Class A1, annual heat requirement for heating less than 10 kWh/m²a.

Green energy:

Preparation for the installation of a solar power plant on the roofs of buildings up to a total installed capacity of 1.1 MW and 1300 MWh of annual production.

Investment process:

Start of investment: 2019 Start of construction: 2020 Completion of construction: 2022 User move-in: February 2023

Investment value: EUR 58 million.

Financial resources:

Council of Europe Development Bank (CEB) Ioan, Recovery and Resilience Plan (RRP) grant, own resources.

Project designer:

Kostak GIP d. o. o., Jereb in Budja arhitekti d. o. o., Arhitekti Dobrin d. o. o..

Contractor:

Pomgrad d.d. with partners GITRI d. o. o., GH Holding d. o. o. and VG5 d. o. o..

Supervision:

Proplus inženiring, projektiranje d. o. o. with partner Gea Consult d. o. o., Projekt d.d., Nova Gorica with partner DRI upravljanje investicij d. o. o..

Investment management of the project:

Housing Fund of the Republic of Slovenia, Investment sector of the Housing Fund of the Republic of Slovenia.







The Housing Fund of the Republic of Slovenia is trying to achieve maximum optimisation of construction costs by introducing new or forgotten approaches to the construction of multi-apartment buildings.

NEIGHBOURHOOD THAT ADDRESSES FUTURE CHALLENGES

Typification and digitisation as a tool for reducing costs and increasing the production of multi-apartment buildings

Limitations of public investors

When it comes to investing in rental apartments, public housing investors have very limited resources. An expensive investment will result in higher rental costs, and in the case of non-profit apartment construction, rent alone will no longer cover the costs of implementation and maintenance. Lower costs for the purchase and communal equipment of land, where there is usually little opportunity for savings, could reduce investment costs.

At the Housing Fund of the Republic of Slovenia, we strive to achieve maximum cost optimisation by introducing new or forgotten approaches to the construction of multi-apartment buildings. We already have an established typology and structure for apartments, which we defined according to the needs of the users. We promote construction with prefabricated (industrially produced) building elements, which were already common in residential construction in the 1970s and 1980s. We also expect a lot from process digitisation, which includes the use of the BIM-model, the use of a common data environment, and building management with the help of advanced building management programmes (FM – facility management programmes).

Typification of apartments and buildings

The Housing Fund of the Republic of Slovenia has meticulously prepared a typology of apartments for self-construction projects, which includes a range of apartment sizes ranging from one-bedroom to fourbedroom apartments, as well as their share per building or neighbourhood. The type consists of a residential unit with a sanitary block (bathroom, toilet), which can also be typed and installed as a prefabricate, and an associated outdoor area (balcony or loggia). The typology allows for the stacking of similar elements and repetitions at the building and neighbourhood levels, as well as the use of similar type solutions for bathrooms, vertical shafts, balconies, joinery, installations, and the like. As a result, execution times are reduced and errors are reduced.



Prefabricates

- 130 staircase elements
- 400 bathrooms
- 410 installation shafts
- 550 balcony elements
- 200 exterior design elements

Use of prefabricates

When properly planned and managed, using prefabricates in construction can save a significant amount of time. The production of elements in a controlled industrial environment allows for greater precision in planning and implementation, process quality control, and cost control. The implementation is not influenced by construction site conditions, and production can also take place in shifts at critical times. Industrial manufacturing can be much more efficient in terms of sustainability. The amount of waste produced is reduced, and its management is improved. Resource management is also improved.

The Housing Fund of the Republic of Slovenia hopes to encourage industrial production of projects by using prefabricates. We used prefabricated bathrooms, balconies, vertical shafts, stairs, and exterior design elements in the Pod Pekrsko gorco neighbourhood. Given the current state of the industry, we are convinced that prefabricates are also costeffective for both investors and construction firms.









Digitisation of processes in construction projects

The Housing Fund of the Republic of Slovenia, as a promoter of the introduction of new technologies, took a step forward in the field of high-rise building digitisation. All of our projects are designed in BIM-technology to promote interdisciplinary planning and eliminate errors during the design phase. A common data environment (CDE) is also a constant in our projects; it serves as the primary source of data and the exchange point for documentation, but it also includes tools for confirming protocols and reporting deficiencies or guestions. The goal of the Housing Fund of the Republic of Slovenia is to achieve such a level of process digitisation that all construction participants will use only digital processes on a daily basis. We used the BIM-model in all phases of planning and construction in our neighbourhood. During the planning phase, the model was used to check for collisions, extract quantities, and determine optimal line routing. Contractors used it during the construction phase for implementation, dimension and quantity control, and the creation of construction situations. After construction, the building's digital twin will be used for advanced building management.

An incentive to find new solutions

In the implementation of their own building projects, the Housing Fund of the Republic of Slovenia's task is to acquire modern apartments that provide comfortable living for all generations and social groups, are energy efficient and accessible, enable green mobility, and offer everything at a favourable rental price per square metre of surface. Due to limited resources and the current state of the construction market, we are encouraged to seek out and implement solutions that provide a better starting point for achieving lower prices and faster and more accessible construction.

Example of good practice

The Pod Pekrsko gorco neighbourhood exemplifies good practise in introducing new approaches to housing planning, construction, and management. It is critical that this knowledge be applied to future rental housing investments. Regular investment cycles, based on the Housing Fund of the Republic of Slovenia's extensive experience, would realise expectations for stable growth in the number of rental apartments in Slovenia.

Blaž Češka,

Project manager of the Housing Fund of the Republic of Slovenia

ELEMENTS OF A SUSTAINABLE NEIGHBOURHOOD

A good neighbourhood is created rather than built. It is primarily designed with a sense of community in mind, as well as the proper balance of privacy and commonality, which necessitates a suitable space. Urban, architectural, landscape, and design solutions shape this space. A good neighbourhood is defined by a mix of programmes, generations, and resident profiles.









Urban design

Neighbourhood with a beautiful view

The Pod Pekrsko gorco neighbourhood is part of Maribor's Studenci quarter, which has a mix of single-family houses, multi-apartment buildings, and larger shopping centres. The neighbourhood is distinguished by its proximity to the city centre and, on the other hand, Mariborsko Pohorje.

The residential neighbourhood Pod Pekrsko gorco is located on the edge of a single-apartment building, next to a field, with a beautiful view of Pohorje and Pekrska gorca on one side and Kalvarija on the other. The location provides easy access to Maribor's main roads as well as the city's natural and cultural centres.

The neighbourhood is designed as a meandering intertwining of buildings that that form a dynamic interior of semi-circular courtyards. The central traffic axis divides the neighbourhood into two sections, and the buildings are lower, two-story structures. Such a design allows for plenty of natural light and transparency of the internal courtyards.

Following basic urban planning guidelines

The urban planning documents envisioned the structure having longer folded facades interrupted by narrow passages. This typology has been updated within allowable deviations for the client's needs, with the primary goal of improving market and park accessibility. Furthermore, by adding more facilities, we increased the possibility of orientation in the space and enabled residents to form a sensory attachment to their immediate surroundings.

The central square is the heart of the neighbourhood,

around which all public programmes are organised – bars, catering programmes, shops or service activities, a day activity centre, and a two-department kindergarten. Smaller courtyards between the buildings are designated for various activities. The space on the outskirts of the neighbourhood towards Pohorje is intended for recreational programmes and, with its natural orientation, allows for a break from the urban environment. Two courtyards in another part of the neighbourhood are also dedicated to greenery, and the larger, western courtyard also has a basketball court.

The neighbourhood's internal structure allows for a variety of ways to use the outdoor space, and its programmes promise to make it a small social centre of the larger community, improving the quality of life for both new residents and neighbours.

We facilitated:

- 150 tree trunks
- 3000 shrubs
- 70 benches
- · 2 km of walking trails







With its internal structure, the neighbourhood has the potential to become a small social centre within the larger community.

Landscape architectural design

Equivalent use of open space

The residential neighbourhood's landscape architecture is comprehensively designed with the goal of creating a visually appealing and functional outdoor space that improves the quality of life for all residents. The fundamental design measures are based on a universal inclusive approach, with a focus on ensuring equal use of open space for all participants, including the blind and partially sighted, as well as people with limited mobility.

Various programme sets, thoughtfully distributed throughout the neighbourhood, intertwine the multigenerational use of space, creating appealing spaces that encourage cooperation and coexistence while also allowing for privacy and contemplation.

Diversity of outdoor space throughout the seasons

The multifaceted arrangement allows users to use the space throughout the seasons, encourages them to spend their free time outdoors, and allows them to identify with the space, feel a sense of belonging, and create their own home in an organised community. Throughout the year, multipurpose surfaces and overlapping uses enable a variety of activities. Similar consideration is given to the daily use of open spaces as well as their long-term maintenance.

The rich plantation complements the neighbourhood's visual image

The design's integrity is founded on a visually and structurally unified vocabulary of relief formations, natural and built structures. The geometrised topography and the appearance of neat play structures stand out in relation to the sharply defined architectural framework, while the rich planting design, the structured edge of the terraces of the groundfloor apartments, and the gradation of space from the private edge towards the public programme of the central areas draw the artistic image of the surfaces.

Architectural design and social role of the neighbourhood

Architectural guidelines

The architectural design of the buildings adhered to the client's goals: economical construction, as well as highquality, functional apartments and outdoor space. It was necessary to use simple and durable materials while also ensuring energy efficiency. We tried to adhere to the set goals in terms of the morphology of the buildings, the external arrangement, and the arrangement of the apartments, ensuring the transparency of the neighbourhood, the intimacy of the apartments, and the comfort of living.

Targeted building design

The buildings are designed minimally in order to frame the surrounding environment. The three-story buildings with white tactile facades are distinctly horizontal with accentuated bands, separated by vertical entrance caesuras, and linked by wide pergolas. Elegant pergolas above wide passages connect groups of buildings while also dividing them into smaller buildings. They indicate the transition from a public to an intimate community space in an unobtrusive way. Around the neighbourhood, walkways are directed away from balconies and loggias, and the space in between provides privacy with a lush strip of shrubbery. The building entrances are highlighted and covered with vertical blinds that clearly indicate their importance and aid in orientation. They create a vestibule with a larger bench and bike racks, which invite you to socialise. The entrance area of the building is light and airy, with views on both sides. Storage rooms are installed at the entrances, where the buildings 17 break geometrically, so that each apartment has a storage room on the same floor. Simultaneously, unpleasant proximity and views from neighbouring apartments are avoided.

Apartment size

The apartments may become larger than the bare minimum of the regulations due to the economical design of the buildings. In addition to the functional design, they provide suitable outdoor living spaces in the form of prefabricated balconies. During the neighbourhood's construction, such outdoor space proved to be an essential component of a high-quality apartment. The pandemic period clearly demonstrated the deplorability of certain living conditions, which are cruelly dictated by the desire for capital gains in housing construction.

Apartment typology

The apartment typology ranges from studios to three-room apartments. At the same time, the studio apartment type allows for differentiation of the living space with a separate bedroom. The apartments were designed with the goal of providing large, transparent living spaces, suitable rooms that exceed the minimum requirements, and comfortable sanitary facilities for all stages of life.





Floor plan of a 3-room rental apartment





Floor plan of serviced apartment

The structure of rental apartment types:

- 12% 1-room
- 41% 2-room
- 32% 3-room
- 15% 4-room





The architectural design of the buildings adhered to the client's goals: economical construction, high-quality useful apartments, and outdoor space. It was necessary to use simple and durable materials while also ensuring energy efficiency.

Universality of construction, lifelong use and intergenerational connection

Construction friendly to individuals with mobility impairments

The apartments in the neighbourhood are fully adaptable to any changes required by the resident's disability. All bathrooms can be reconfigured for the physically challenged without requiring building interventions, simply by moving the equipment and installing appropriate sanitary equipment, if necessary. There are also additional placement options for household appliances, switches, or equipment, all with the goal of providing the user with flexibility. All of the buildings' interior spaces are barrier-free, and the exterior layout adheres to the highest accessibility standards. This enables people who are forced to make major changes in their lives to maintain their social environment.

Ease of use

The use of solutions that enable ease of use in an unobtrusive manner was given special consideration. The corridors are paved with coloured ceramics, the walls are white, and the ceiling is made of visible concrete. The doors to the common areas are a contrasting colour, and the frames on the residential doors are also contrasting. The use of contrasts and colours allows visitors to intuitively perceive the appropriate use of elements, which aids orientation for residents with disabilities. Everything is topped with pictorial symbols that indicate the common areas' programmes.

Practical technological solutions

The use of technological solutions in apartment furnishing, the planned adaptability of the apartments and other design elements, combined with a suitably designed external arrangement, ensures that the apartments and neighbourhood can be used for the rest of one's life. The apartments are appropriate for all age groups and can be customised to meet the residents' diverse needs. All of this contributes to the neighbourhood's diverse programme and exceptional location.

Intergenerational connection

The rental apartment portfolio, which is primarily aimed at young people and young families, is complemented by 60 serviced apartments. The daycare facilities and day activity centre, as well as the accessible outdoor space, create an environment for intergenerational meeting and connection.









The use of solutions that enable ease of use in an unobtrusive manner was given special consideration.





The modelling of the material allows us to create a slight vertical texture, which creates variability in the graphic image of the surfaces depending on the angle of the day's lighting.

Technologies and materials in connection with economic parameters

The solutions used strive for a balance of durability, simplicity, quality, and economical construction.

It begins with coordinating the requirements of the basement part, which is dedicated to cars, with the above-ground residential parts, which are designed for living. A mathematical analysis of the dimensions produced a result in which the basement and above-ground spaces were linked in a statically simple, repeatable, and logical construction that achieves cost-effectiveness in both cases.

This is why the apartment floor plans are repeated across all floors. In this way, we avoid unnecessary complications in building static design and enable the construction contractor to use simple, repeatable technological solutions such as

formwork reproducibility, prefabricated balconies, stairs, and bathrooms, and, last but not least, improved plan transparency. The use of pre-prepared elements reduces construction time and thus increases construction cost-effectiveness for all parties involved. Because of the controlled environment, as well as the manufacturing and installation processes, the quality of the prefabricates used is higher. Installation concrete elements are also used, which simplify and management of the necessary lines in the facilities and accelerate the construction.

The materials used are proven, technologically simple, and long-lasting. A great deal of emphasis was placed on the search for project solutions that, in addition to all of the above, are also maintenance-friendly and adaptable to local conditions, making them more durable.

Connecting design elements of the neighbourhood

A classic thin-layer contact facade with an added design element is used. The material's modelling allows for the creation of a slight vertical texture, which, when combined with the rhythm of vertical window openings, creates tactility, shadows, and variability in the graphic image of the surfaces depending on the angle of the day's lighting. This design charge is supplemented by vertical, materially understandable fence elements that adhere to steel logic and the element's practical purpose. In the case of bike racks, additional service facilities, and garages, the railing element is emphasised further, and due to its rhythm and repeatability, it achieves a restrained aesthetic value as well as the role of a

The investment cost per square meter of adjusted residential area is EUR 1,870. connecting design element of the neighbourhood. All of the building's added functional elements are white, as is the entrance's vertically articulated concrete facade. Thus, combined with the stronger

columns' shadows, it subtly attracts and directs the visitor's attention. The colour code of the building is the only accent in this understated image. The chosen colour connects the individual building from the entrance to the garage via the stairs.

Material contrasts

The corridors are paved with ceramics in a natural brick colour, all common area doors are steel and durable, and the orientation around the building is regulated by material contrasts and movement towards the light, which is achieved through windows in the corridors and common areas, all of which are lit by natural daylight.

Installations, energy efficiency and comfort

Neighbourhood planning

The neighbourhood was designed to be energy-efficient and sustainable. The buildings have an efficient thermal envelope, including airtight joinery installation, and energy efficiency is supplemented by a central ventilation system with recuperation. As a result, the buildings are classified as A1.

Individual temperature setting

Each apartment has its own heating substation, which allows for automatic temperature control.

Room thermostats allow for individual temperature settings in each room. Flat heaters provide low-temperature and efficient heating. Central ventilation with heat recovery allows for constant air exchange, preventing excessive humidity in the rooms and ensuring fresh air at all times.

Possibility of installing photovoltaic power plants

The buildings' flat and unoccupied roofs allow for the installation of small photovoltaic power plants. Up to 70% of the roof area can be used for this purpose, allowing the construction of power plants with a total installed capacity of 1.1 MW and an annual production of 1300 MWh. When the installation of such a system is economically justified, the design of the facilities allows for upgrades to the system, which would be based on energy storage in battery units. The upgraded system has the potential to meet up to 70% of the neighbourhood's electricity needs.

Parking spaces ready for electric vehicle charging stations

Installations in user parking spaces allow for the installation of an electric vehicle charging station. Own charging stations with advanced management allow users' charging needs to be distributed over a longer period of time. Even with a significant increase in electric vehicles, the needs of all users would be met by proper consumption control.

The installation of public charging stations for electric vehicles as part of the public parking spaces is planned, which will also be intended for the surrounding residents and users of car rental services.

Large bicycle racks are located at the building entrances to encourage residents to ride their bicycles. Residents can meet the majority of their transportation needs on foot or by bicycle, as access to the city centre or the funicular is only a few kilometres away.











BIM-technology

Change is brought about by new technologies. The transition to three-dimensional and multi-dimensional planning, supported by information, is a critical planning milestone.

For the neighbourhood project, we used *Building Information Modelling*. A two-dimensional line is replaced by threedimensional buildings with only their own information, parameters, precise coordinates, and materials. As the number of dimensions increases, the aforementioned facilities receive more information about when they were manufactured, who delivered them, who installed them, and, in later stages, when their warranty period expires and who else replaced them.

New perspective

The management of this information and systematic planning is, of course, a new perspective from the designer's viewpoint, which may initially represent a more timeconsuming work process, but new horizons are emerging with the use of BIM-technologies. We assemble the buildings as they will be built otherwise while still in the planning phase.

The foundations are no longer just a hatched surface; they now represent a connected building that is attached to the wall, has a Z dimension in addition to X and Y, and contains data on strength, installation time, the quantity of concrete and steel needed, as well as the surface area of the formwork. All of this is BIM, which allows for better multidisciplinary work, including checking compliance with various professions, electrical installations, mechanical installations, and more.

We used all of this in the Pod Pekrsko gorco project. With the systematic use of new design technologies, many inconsistencies and inconsistencies in the project can be eliminated during the planning process. In addition, the preparation of inventories of work and material bills is more precise and coordinated, and may even be automated in the future.



BIM – Building Information Modelling BIM is the process of developing and managing a digital model/ data that is used to design, build, and maintain a facility over its entire life cycle.

All participants, all in sync

Project control is also made easier and faster by utilising *co-work*, a synonym for *co-lab*, and cloud technology, in which all current files of individual disciplines are always synchronised and accessible to all participants. The client was always well aware of the workflow, the observance of cut-off dates within the given timeline, and the implementation of the required solutions in the Pod Pekrsko gorco project. All of this also allows for better and easier control of construction costs and meeting deadlines.

Digitalisation in numbers:

- 1 data ecosystem
- 1 combined BIM-model
- 30 regular users
- 585 derived authentication protocols
- 14,000 documents
- 52,000 interactions



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