A SUSTAINABLE ALTERNATIVE PROPOSAL FOR THE OLYMPIC GAMES IN TURIN 2006

FACING POST-OLYMPIC REUSE WITH A CIRCULAR ECONOMY APPROACH

ALEKSANDRA CHEREMUCHINA
FABRIZIA MUCI

POLITO | POLIMI | EPFL
TORINO MILANO LAUSANNE

POLITECNICO
DI MILANO

Department of
Architecture

POLITECNICO
DI TORINO

Department of
Architecture and Design

ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE

ENAC | School of Architecture,
Civil and Environmental
Engineering

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in Architecture Construction City

A Sustainable Alternative Proposal for the 2006 Turin Olympic Games

Facing post-Olympic reuse with a circular economy approach

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THESIS SUPERVISORS

Corentin Fivet **EPFL**

Manuela Mattone **POLITO**

Martina Landsberger **POLIMI**

CANDIDATES

Aleksandra Cheremuchina

Fabrizia Muci

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INTRODUCTION TO THE THESIS

The Olympic Games are a mega-event lasting only two weeks, for which a host city must be prepared to face a series of urban planning challenges in order to deliver a successful event. But what is left behind in terms of venues is not always used by the city to its full potential, leading to a waste of investments and materials. This is especially the case for Olympic villages and sports infrastructures, built over-sized for the big event, that end up underused or in some cases completely abandoned after the Games.

Although we are seeing a change in mentality in the proposals of candidate cities, which are nowadays more focused towards environmental and economic sustainability, recent cases still show how some cities have troubles dealing with consequences of the Games. First steps were taken by the IOC in promoting a more sustainable vision for the post-Olympic heritage by introducing the Olympic Agenda 2020, a set of recommen-

dations aimed at achieving a positive impact on cities and communities in the decades that are to follow. However, it would be advisable to have guidelines that help cities develop a project not only focused on delivering a successful event, but to ensure that the investments are durable and offer the sustainable kind of city development today's metropolitan areas actively need.

Thesis proposal

This Master Thesis wants to address the issues that showed up in the city of Turin, host of the 2006 Winter Olympic Games, a few years after its closing ceremony. At the center of the metropolis, the vast Olympic Village area fell into disuse immediately after the event, due to uncertain future uses and poor construction quality, which caused high maintenance costs right from the beginning.

Taking into consideration practical modern urban needs and bearing in mind the secondary use of the structures built for the 2006 Winter Olympic Games, we suggest an alternative project for the Olympic Village built in Turin for these games. We want to solve the abandonment problem right after the end of the Games, by applying sustainable reuse strategies and thorough future planning, which were possible at the time but were not taken into consideration by the planning organization.

Structure of the work

The thesis is divided into five parts:

An introduction chapter regarding the Olympic Games in general, their history and their importance in influencing urban transformations.

Part One, composed of a preliminary overview of the area before the Olympic transformations and an analysis of the project carried out for the Winter Games and its results.

Part Two analyses the planning process of the 2006 Olympics, assessing key strengths, weaknesses as well as consequences which emerged some time after the end of the Games. For the negative effects, we mainly try to determine possible causes pertaining to the design process, planning of post-Olympic uses and management issues.

In Part Three we sum up the points which will be the object of our alternative project and we set up the theoretical framework, based on the topic of building flexibility. We analyse previous historical experiences, their applications in new and existing constructions and what benefits can be brought into a flexible Olympic Village.

Finally, in Part Four, we describe in detail our sustainable alternative proposal for the 2006 Olympic Village. This design part develops the theoretical principles articulated in Part Three, applying them to the case of our alternative Olympic Village. Our aim is to provide an substiture project where part of the structures can be resized according to the expected future uses. Particular attention is paid to the existing buildings connected to the area, the ex-General Market, as to recover the historical industrial building for future purposes and fulfil both city and neighborhood needs.

INTRODUCTION: OLYMPIC GAMES

Olympic Games, IOC & the Olympic Movement

The Olympics are an international sporting event that is considered the foremost sports competition in the world. Every four years the world comes together to watch athletes from around the globe compete for medals and recognition. It unifies people's spirits, creating ubiquitous entertainment while making individuals proud of their own unique culture.

Celebrating both sporting spirit and fair competition among sportsmen, the Olympic Games grew bigger in the XXth century, and is differentiated today between Summer and Winter Games. These Olympics, which comprises also of the Paralympic and the Youth Games, are held independently of one another every four years.

The first modern Olympic Games took place on April 6th in 1896 in their ancient birthplace of Athens, Greece. With 241 athletes from 14 countries participating, this was the largest and the most international sporting event at that time (**Figure 1**).

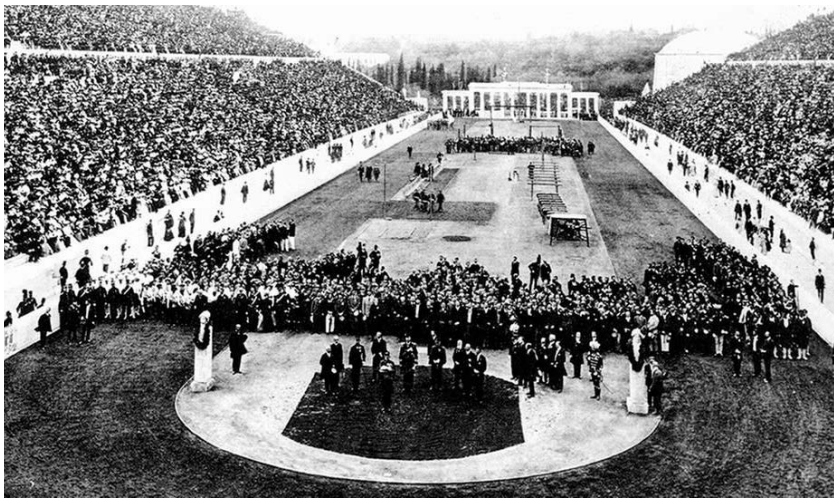


Figure 1 *The opening ceremony of the first modern Olympics in the Panathenatic Stadium in Athens, Greece. Probably originated in 778 B.C. in Olympia, the ancient Games featured only one sport: a foot race.*

Starting from these first modern Games, all events have been organized by the International Olympic Committee (IOC). The IOC is a non-profit independent organization based in Geneva, Switzerland, whose objective is not only to control the organization of the Olympic Games all over the world, but also selecting future hosting countries. It was formed by Pierre de Coubertin on June 23rd, 1894, just two years before the first modern Games (IOC: Who we are 2019). The same year, their first meeting was held in Paris, France to choose the first modern host city. Today, the IOC consists of around 100 members, including former and active athletes as well as members of the National Olympic Committees (NOC) and International Sports Federations (ISF).

At a high level, the Olympics' aim is to promote a global movement of unification between body, will, and mind, blending sport with culture and education. Thus, the Olympic Movement was born together with the modern Games for all individuals and entities who support the values of Olympism. According to the IOC's Olympic Charter, the goal of the Olympic Movement is *'"to contribute to building a peaceful and better world by educating youth through sport practiced in accordance with Olympism and its values"* (IOC 2019). As this has resonated more and more with participants and viewers alike, the Games have become a global experience that transcend sports to become one of the world's most important cultural phenomenons.

Winter Olympics and their impact on host cities

The Winter Olympics are a younger event than the Summer ones, being created 30 years after the first modern Summer Olympics, in 1924. A week of winter sports was held for the first time in Chamonix, France, six months before the Summer Games of Paris, to rousing success. In 1925, it was therefore retroactively recognized by the IOC as the first Winter Olympics, launching a tradition still in place today. These were originally hosted in the same country of the Summer Games and staged in the same year. It was only in 1948 that their location became independent, with the 5th Winter Olympics held in St. Moritz, Switzerland. Starting with the 1992 edition in Albertville, France, the IOC decided to organize them two years after the Summer Games to maximize broadcasting revenues (Gold and Gold 2017).

At the very beginning, the Winter Games were hosted in small mountain towns of fewer than 5,000 inhabitants, using preexisting sports and accommodation facilities for the approximately 500 athletes participating in the competitions. As a result, the effort was mostly concentrated towards the organization of the Games, not towards investments for infrastructure.

With the increase of athletes and nations wanting to participate in the Winter Games, and the location being independent of Summer Olympics, medium sized settlements started to express interest in hosting following editions. Eventually, the need for specific infrastructure and venues began to arise, but as the relatively small home localities had no use for such over-dimensioned venues, a strategy aimed at using temporary constructions was adopted, as it happened for the Olympic Village in Squaw Valley 1960, USA (Gold and Gold 2017).

Figure 2 *View of one Olympic Village built in Käpylä for the 1952 Olympics in Oslo. The Village was able to host 700 athletes.*

The first Winter Olympic Village was built for Oslo 1952, the largest city to have hosted the Winter Games at that time. The Village was fragmented into several suburban towns around the city, that were later converted for functions such as education, health, housing, and retirement homes (**Figure 2**)

As the Games' proportions and complexity grew bigger with every edition, it started to be seen as a driver for territorial development and urban transformation. From this period on the Games began to be hosted in large centers and Olympic Villages started to be implemented in the long-term urban plan for many uses or even towards the constitution of whole new neighborhoods.

The Games' impact spread out on a regional level and, for this reason, a new concern for more durable transformations became voiced to organizers and the IOC (Gold and Gold 2017). Moreover, the environmental outcomes of these transformations had to be assessed and controlled officially from the beginning of candidature process, as the Winter Games, due to their nature, need to be settled in delicate alpine environments.

Today, the Winter Olympics are regarded as being equally important and relevant to the Summer ones, as well as bearing the same impact factor for urban and regional development programs.

Previous Olympics: Negative and Positive Examples of Olympic Constructions

The organization of the Games is a meticulous and complex process, staged between the IOC and the selected hosting cities. The partnership between them has often been turbulent, due to different points of view on how the Games could be used as a vehicle of development for the hosting cities (Gold and Gold 2017). Cities quickly saw in the Games an opportunity to carry out urban development policies that would take advantage of the great investment needed to stage such a big event. Therefore the organization of the Olympics became a process with possible high profits but also high risks, as lack of proper planning could lead to terrible consequences for the city and its inhabitants (Gold and Gold 2017).

It is hard to determine the general outcome of the Olympics to be either positive or negative as there are many different metrics to be assessed, and even judging the whole Games process and its long-term consequences, holistically, will reflect one's political preferences. Despite that fact, we want to mention some of the aspects of previous Games which could be considered positive or negative organizational features. The examples mentioned below do not represent the final effects of the cited Games but are rather to be used as particular examples of decisions made during the organization process.

Calgary 1988

The Olympics in 1988 was a multi-sport event for Winter Games, held in and around Calgary, Alberta, Canada. These Games are a good example of implementing sporting venues construction in long-term urban planning by controlling the after-use of sports structures. For example, the speed skating facility - Olympic Oval - was constructed on the campus of the University of Calgary which, after the end of the Games, was still frequently used by the students of the university. The program for the Oval was established shortly after the Games, identifying a need for training Canadian and international athletes (High Performance Programs 2019).

Beijing 2008

Several Olympic sports venues for the Beijing 2008 Summer Games were also built on university areas, including six sports facilities. Such constructions as the Peking University Arenas (nicknamed China's Spine) and the University of Science and Technology are good examples of well-performing after-use program. After the Games, some facilities were renovated, adding several new functions. All six venues are continuously being used, by students and citizens alike. Considering the reuse of the Olympic facilities for students, the after-use program of the Olympic Village in Beijing is also worth mentioning. The village itself is the world's largest green neighborhood, where smaller halls were reused as student dormitories (Helbling 2015). But the Beijing Olympics are also an example of the negative outcomes after the Games. A lot of the city's traditional architecture was destroyed in order to build new modern constructions promising, in turn, affordable housing for the citizens. Yet new constructions became, for the most part, luxury apartments. Additionally, a lot of people were forced to move from their neighborhoods, leaving their jobs, and causing an increase in the poverty level (Helbling 2015).

Sochi 2014

Another example of negative organizational aspects can be seen from the outcome of the 2014 Winter Olympics in Sochi, Russia. These Games had one of the biggest cost overruns in the history of the Olympics, after the 1980 Olympics in Lake Placid, USA. One of the biggest problems, apart from the budget, was a lack of a long term view of the city after the Games. Many facilities were constructed hastily and with poor quality materials. Some zones were destroyed and completely rebuilt, and others were left after the Games without any maintenance. All this led to a poor image of the city, with many problems that were left unsolved (Helbling 2015).

London 2012

The plan of the 2012 London Olympics had the opposite outcome from the one in Sochi. The sustainable strategy for London 2012 included constructing as little as possible for the Olympics - just six new permanent sports venues were built. The organization of the London Games heavily was based on the lessons learned from Athens 2004, after which most venues were abandoned and are nowadays not in use. The London Basketball Arena is a great example of temporary, lightweight construction. It was one of the largest short-term constructions in the history of the Olympic Games (Hartman 2012). The stadium could be easily reduced in size for a smaller legacy seating thanks to the inflatable outside shell. Additionally, the seating of the arena was leased on the private market, so it was returned right after the Games.

Goals of the Olympics Today

Due to some negative outcomes of several recent Olympic Games and the 2008 financial crisis and its consequences, many cities nowadays do not want to apply as hosts anymore, as governments fear of not being able to handle such a financial burden, and citizens distrust the usefulness of such extensive spending of public money. To ensure the continuity of the Games in the future and promote more candidatures, the IOC, under the guidance of President Thomas Bach, developed in 2014 a new set of guidelines: the Olympic Agenda 2020 (**Figure 3**).

It redefines the way the IOC helps bidding cities in laying out strong candidatures, improving the effectiveness of the organization process, minimizing negative effects and ensuring a durable legacy from the Games. During the organization process, the IOC works with local organizers to make sure that the coming Games are fitting the city's long-term urban planning agenda, which is now considered central in the plan for the Olympics.

The new mentality of the Olympic organization is to ensure that the large sports event is adapting to the host city, and not the other way around (IOC 2014). The investments for the organization and operation of the Games can be used to either build new infrastructures or improve the existing ones, leading to benefits for the city, but without extreme programs aimed only at fulfilling the short-term success of the Games. Hence, the construction of new Olympic venues is not required anymore, and the IOC suggests instead a temporary extension of stadiums and arenas already present, or the recovery of underused and abandoned facilities. Additionally, the infrastructure or venues located in other cities or even

countries can be used for hosting some of the competitions (IOC 2014). If any new constructions have to be built for the Games, the masterplan has to guarantee sustainability and durability for all the works. All new developments should have an afterlife plan, clearly specifying the post-Olympic use, as to avoid underused facilities or 'white elephants'. Today, the post-Olympic plans are the key elements to ensure a prosperous future of a hosting city and a positive memory of the Olympic experience.

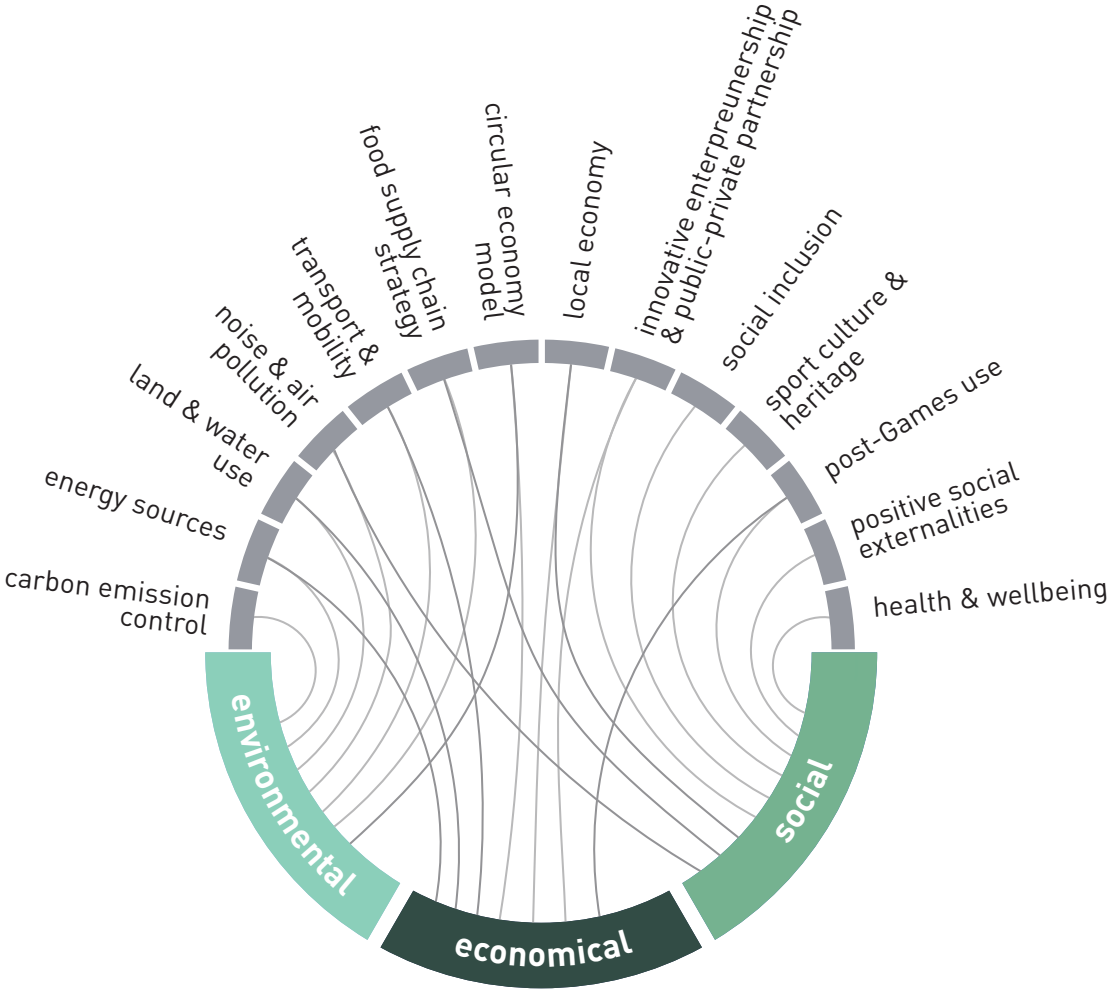


Figure 3 *All the aspects related to the three direction of improvement led by the Olympics, addressed by the Olympic Agenda 2020*

Thus, the Olympic Games have become not only entertainment, but also now have the power to deeply influence urban economies. Organized in a smart way, the Olympics can be used for economic regeneration and sustainable development for host cities, and even countries, by revamping their international image, boosting tourism, promoting urban transformation and infrastructure improvements, engaging communities over a major sports event, and laying a solid base for future Olympic candidatures (Gold and Gold 2017).

PART ONE: TURIN WINTER OLYMPIC GAMES

BEFORE THE OLYMPICS

History of the Olympic Site

The first information concerning the area that will become the future Olympic Village is dated back to the XVIIIth century, describing the region as a rural one with farmsteads, small villas, and fields located between the ancient roads to Nice and Stupinigi (Grossi 1968)

While the first industries of the XIXth century were settling in the northern part of the city, the southern part remained mainly agricultural, with the first real urban development appearing in the middle of the century, pushed by the construction of Turin – Genoa rail line (1846) and the first city tollgate (1853). Small industries started to move just outside the city walls, along with worker residences and low-income housing.

Figure 4 *The Lingotto factory and the immense railway system in the '50s. In the background, Turin's central area. (Historical Archives)*

Starting from the XXth century, with the industrial revolution gathering speed, the area changed deeply: due to the expansion of the railway and the construction of numerous factories – including the FIAT Lingotto factory (**Figure 4**) completed in 1923 and later FIAT Mirafiori in 1936 – the area shifted from suburban-agricultural to an industrial one. The Western part of the Lingotto area across the rail line was the property of families supporting the Fascist regime, which during that period was promoting important public works and transformation on a large scale in big cities to increase economic growth and counter the 1929 American financial crisis (Bianchetti 2006). Due to the investments of public and private actors, the new General Markets, were built, bringing new social life to the area, one very distinctive from the one of Lingotto (Gambino 1998).

During this decade, several other relevant public works were built such as the Molinette hospital by Eugenio Mollino and Michele Bongiovanni (1926-1934), the Olympic Stadium "Grande Torino" and its sporting facilities (1933), the Turin-Milan highway financed by Giovanni Agnelli (1929-1932), the rebuilding of Via Roma in the city center (1931-1937). This great amount of public competitions issued by the Regime was a great opportunity for architects to experiment with new languages on uncommon typologies (Bianchetti 2006). The modernist movement was spreading over Europe, and during the '20s the industrial city of Turin, with its ongoing urban transformations, became an ideal workshop for all those figures that were taking part in the movement's diffusion.

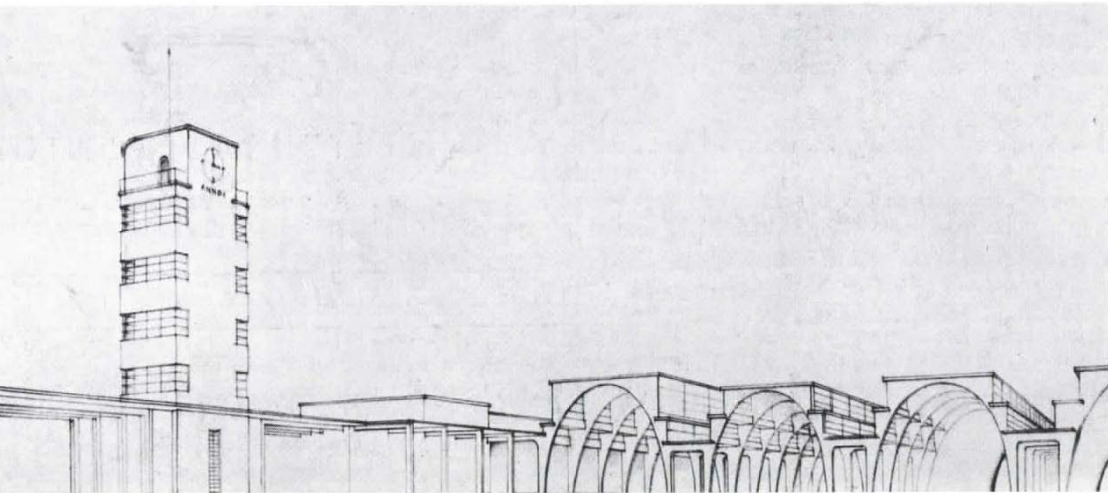


Figure 5 *A drawing showing the internal courtyard, the gates and the tower. ('Nuovo Mercato in Grosso Di Frutta e Verdura a Torino' 1933)*

MOI - Mercati Ortofrutticoli all'Ingrosso

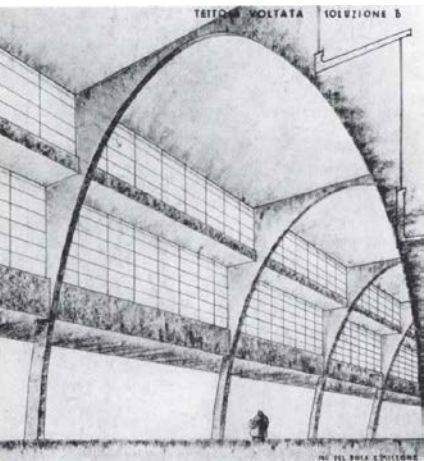
In 1931 a public competition was set to build a fruits and vegetables wholesale market - Mercati Ortofrutticoli all'Ingrosso (MOI) or Mercati Generali (General Markets) - in the agricultural southern part of Turin. The MOI was located on a 44.500 sqm area, close to the toll-gate and directly connected to the west side of the Lingotto railway. Nowadays the market is located in Via Giordano Bruno 181, in the "Circoscrizione 8" district.

Won by engineer Umberto Cuzzi (Parenzo 1891 – Torino 1973), the market's project was finished by Christmas 1931 and construction lasted from 1932 to 1933, realized by the Del Duca & Miccone construction company (Nuovo mercato 1933). Umberto Cuzzi, among other architects such as Ottorino Aloisio, Giuseppe Pagano and Ettore Sottsass, was one of the main proponents of the rationalist movement in Turin, inspired by international architecture. Cuzzi had already ten years of activity in the city when he won the competition for the Market, but this work was recognized as one of the highest outcomes of the Rationalist movement in Turin, widely published in architecture magazines of that period (Mercato di Torino 1933).

The construction of the General Market did not bring immediate changes to this area, but in order to give access to this important public infrastructure, new roads and tramways were laid down and, subsequently, new residential blocks were constructed.

The building of the General Market features two single-storey units composed of repeating rows of seven reinforced concrete arches, 11-meters-high ones on the opposite sides and 9-meters ones in between them, which support a stepped roof with vertical skylights (**Figure 7**). Consisting of an array of thin parabolic arches, the load-bearing structure seems light while made of reinforced concrete, achieving a perfect bond between elaborate structure and simple form (**Figure 6**).

Figure 6 *Internal view drawing of the thin parabolic arches, by Umberto Cuzzi. ('Nuovo Mercato in Grosso Di Frutta e Verdura a Torino' 1933)*



In the center of the area, between the two specular units, there is a 200 sqm square with a cantilevering roof, held by portals in reinforced concrete. Built three years after the MOI, the structure resembles the wings of an aircraft and was therefore nicknamed 'the airplane'. It was constructed to accommodate several loading platforms. The project was not officially signed by Umberto Cuzzi, though it is highly probable he had a participating role in its conception. A heavy renovation followed only two years after due to poor quality works and errors in the structural calculations.

The entrance, placed along the symmetry axis of the compound, is marked by a water tower with a clock (**Figure 5**). The offices were located in two long wings facing the main road and directly attached to the galleries. Originally, the long wings had two storeys, containing a cafe, a restaurant, a post-telegraphic service, cash desks and meeting rooms on the ground level, while offices and the accommodation for the guards were located on the first one. The back of the Market was directly connected to the railroad, with lines arriving alongside the galleries. The right part was used for storage with special access for the trains bringing goods to the market, covered by a roof running along the whole wing.

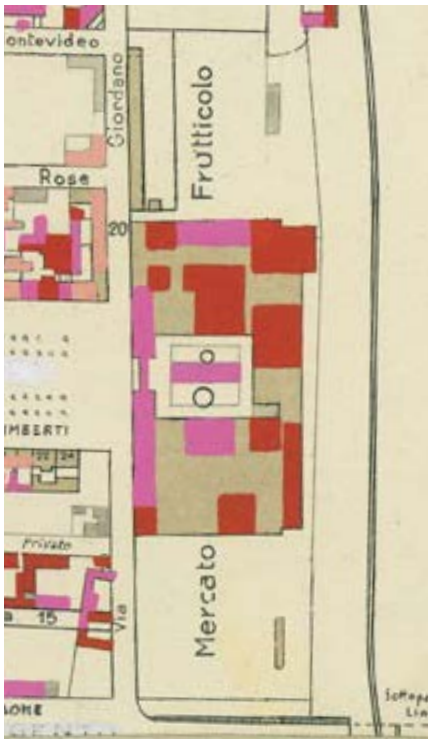
Several minor modifications were made in order to satisfy the needs of the market's users, such as an addition to the first level of the offices facing via Giordano Bruno or another volume to enclose the central area (**Figure 15**).

The market needed some reconstructions after the 1943 and 1945 WWII bombing (**Figure 8**). Apart from that, it operated continuously for nearly seventy years, until it ceased to be used in 2002, when Turin's wholesale market was transferred to the newly built C.A.A.T. (Centro Agro Alimentare Torino) in Grugliasco.

The General Market is one of the few rationalist architecture constructed in the city, blending complex structural solutions with elegant and slender forms. Its composition recalls the Lawrence Hall in central London, built in 1928 by Easton & Robertson and owned by the Royal Horticultural Society (Taroni and Zanda 1998). This uncommon and daring technical solution is very different from typical industrial constructions based on a square outline, yet it retains a simple plan that fulfills its function. The General Market is still recognised as a great example of bold rationalist architecture language and for its importance to Turin's Rationalist movement, it was listed as Cultural Heritage in 1999.

Figure 7 *Historical photograph of MOI during its daily activity. (Historical Archives)*

Figure 8 *The damages caused by WWII. In dark red are shown structural collapses, while the critical damages are noted in light magenta. (Historical Archives)*






1.
The original buttresses on MOI's back , serving as covered access for trains.

2.
The buttresses on the front were used as offices and shops. Originally they had only a ground floor.

3.
The central roof was built few years after the Market's completion to cover the trucks' loading platforms

4.
As more space for administration was required, a second storey was added to the two front wings.

5.
The curved section on the offices' first floor was completed afterwards in order to have more available space for administration.

6.
Many other informal modifications were made to better adapt the Market to its users' needs, such as the closure of the central space.

Figure 9 *Internal view of the galleries.*

Figure 10
Figure 11 *Two pictures showing the front facade on Via Giordano Bruno.*

Figure 12 *The Market in the '80s.*

Figure 13
Figure 14 *The severe damages caused by WWII bombing on the Market. (All pictures from Historical Archives)*

1931-1933 — General Market construction
by Umberto Cuzzi (1891-1973)

1937 — Addition of the "Airplane"
a reinforced concrete roof inside the central square used for loading goods

1943-1945 — WWII Bombing damages
and following recostructions

1999 — General Market becomes a Cultural Heritage site
proteted by the architectonic restriction D.D.R. 27/11/2008 according to D.L. vo 29.10.1999 n°490

Turin selected as host city for XXth Olympic Winter Games

2002 — General Market ceased to be used
wholesare market is transferred to C.A.A.T. in Grugliasco

2003 — Olympic Village's construction start
General Market serves multiple functions: from administration to leisure and commerce for athletes and organizators, during the 2-weeks event.
The restoration project is guided by Albert Constantin, Benedetto Camerana and Giorgio Rosental.

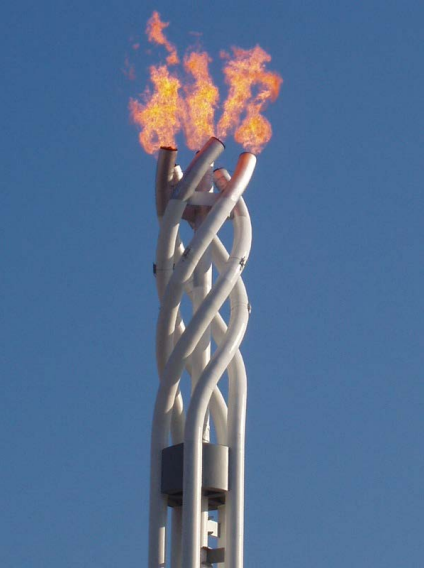
10 feb 2006
19 mar 2006 — **Turin 2006 Winter Olympics**

2012
2013 — Paratissima art fair
hosted inside the General Market

2014 — General Market's property is transferred to the University of Turin and Politechnic of Turin
as a conjoint university's pole for Biotechnological research

Figure 15
(on other page)
The state of the art of the ex General Market before the Olympic modifications.

Figure 16 *The evolution of MOI status and uses throughout its life.*



XXth OLYMPIC WINTER GAMES IN TURIN, 2006

When, Where, Who

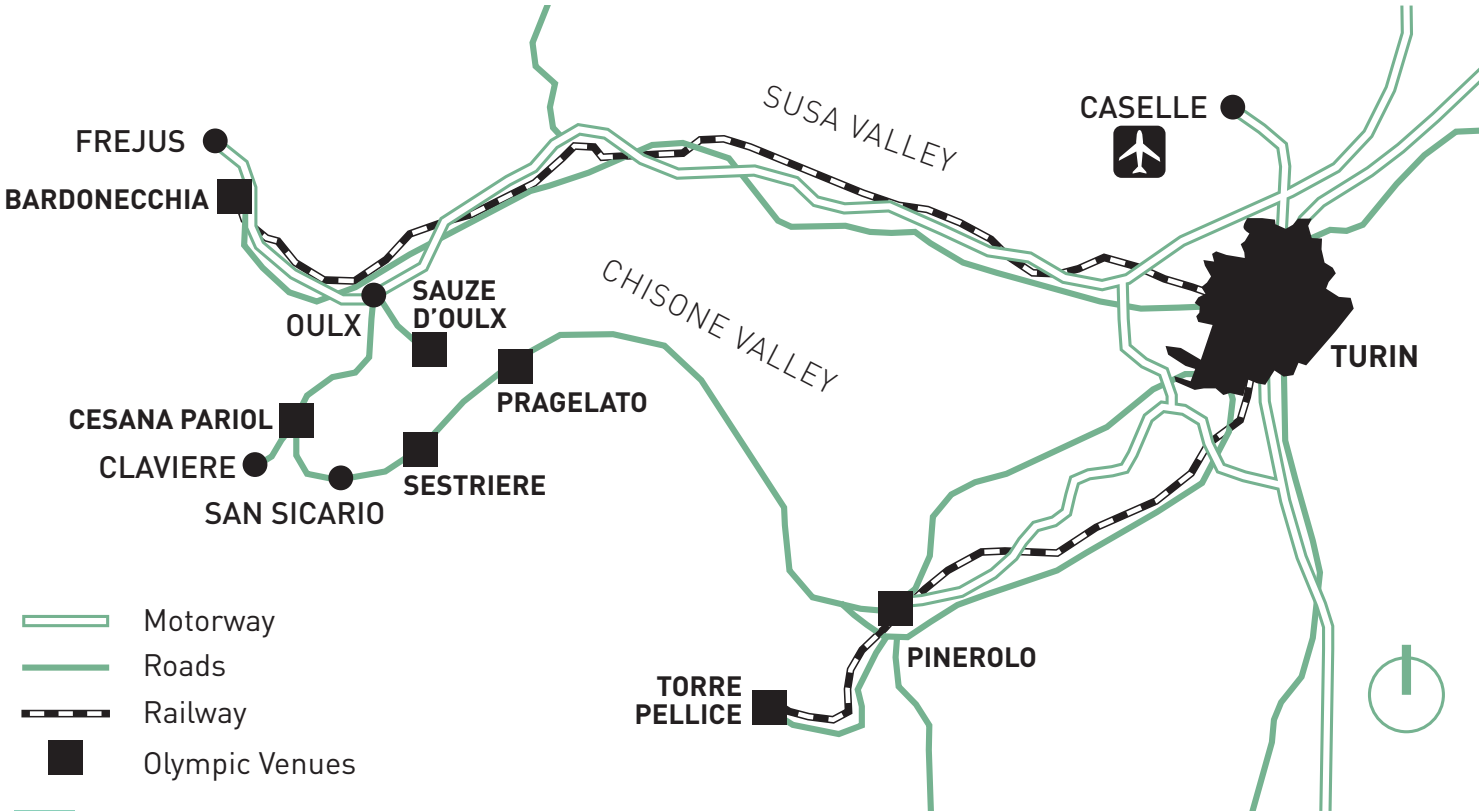
The 2006 Winter Olympics, also known as the XXth Olympic Winter Games, were held from February 10th to 26th 2006 in the city of Turin and the nearby mountain arc of Val di Susa. The 2006 Winter Paralympic Games, or IXth Winter Paralympics, were held from March 10th to 19th of the same year, using the same Olympic infrastructure. Italy had already hosted its first Winter Olympics in 1956 in Cortina d'Ampezzo, Veneto, thus marking Turin's as its second Olympic experience after just 50 years.

Figure 17 *The Olympic Flame burning in Stadio Olimpico.*

Turin presented its candidature as host city in March 1998, supported by the Municipal Council, local institutions, CONI (the Italian National Olympic Committee) and the Italian board of the IOC, competing against Helsinki (Finland), Klagenfurt (Austria), Poprad-Tatry (Slovak Republic), Sion (Switzerland) and Zakopane (Poland). Later that year the IOC Evaluation Commission discussed the candidacy in a visit to the city. On 19th June 1999, at the 109th IOC session held in Seoul, South Korea, Turin was chosen as the host city with 53 votes, against 36 votes for Sion, Switzerland.

The sport venues, composing the so-called Olympic System, were divided into two poles: the metropolitan city of Turin hosted ice games (**Figure 18**), with an appendix in Pinerolo and Torre Pellice as its training site, while snow disciplines were distributed in the Val di Susa region, in Cesana, San Sicario, Pragelato, Sauze d'Oulx, Bardonecchia, Susa, with Sestriere as the main hub along with training areas in Prali, Claviere, and Chiomonte. To connect these sites, a transportation system was provided, comprised of a motorway, state highways and two rail lines, as well as the construction of new infrastructure to strengthen the link between city and mountain and to comply with IOC requirements (TOROC 2006).

Figure 18 *The Olympic System spreading out in the alpine region of Turin's province. The Olympics were the key factor for infrastructure improvement.*



Turin was the first metropolitan city, with a population of 1.4 million inhabitants at that time, to bid for the Winter Olympics. Its candidature was based on the division of sports venues between urban and alpine areas, as previously they were held in a single mountain locality in a closed system. The idea was innovative and granted Turin the IOC's favours (Gold and Gold 2017).

In Turin, the main Olympic Stage was located in the Medals Plaza, installed in Piazza Castello in the historical city center. The biggest stage in Europe – the Medals Plaza – was designed by Studio Gio Forma, in collaboration with the architect Italo Rota. The Plaza hosted 55 out of 84 awarding ceremonies, 20 concerts during the Olympics and the closing ceremony of the IXth Paralympics. The opening ceremonies (**Figure 17, 19**) for both Games were held in Stadio Olimpico, as well as the Winter Olympics' closing ceremony.

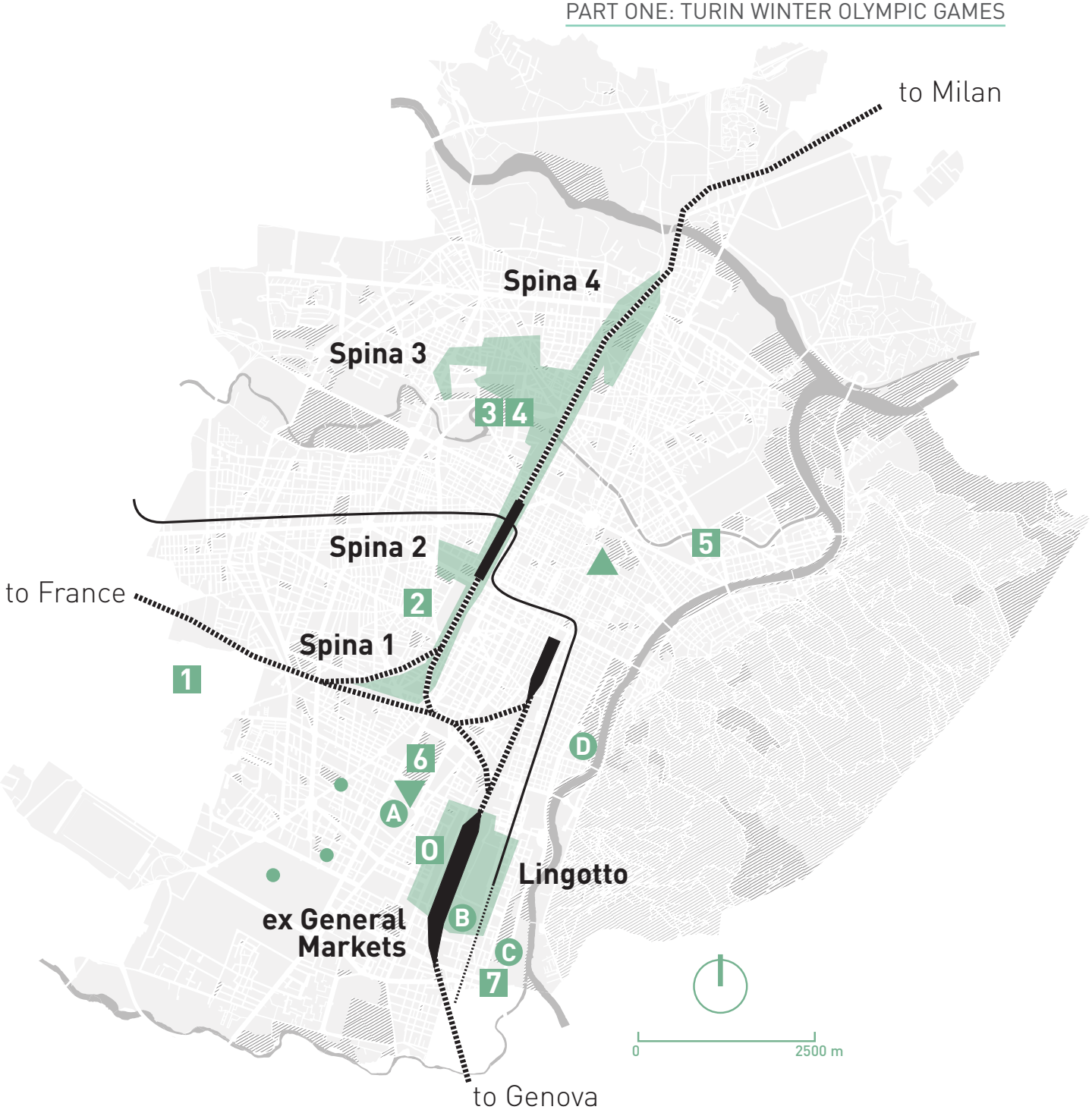
Figure 19 *A scene of the performance staged for the opening ceremony of the XXth Olympics in Stadio Olimpico, Turin.*

The Olympic District was located in the Lingotto area, in the southern part of the city, with the former FIAT factory being used as the Main Media Center. Not far from it were the ice hockey stadium in Torino Esposizioni and Palasport Olimpico, the speed skating stadium in Oval Lingotto, the figure-skating and short-track skating stadium in Palavela, and the Olympic Village in the ex MOI area. Three Olympic Villages hosted the athletes: Turin, Sestriere, and Bardonecchia, while seven Media Villages were scattered in the city and in temporary hotel structures (TOROC 2006).

The key actor for the organization and delivery of the Games in Turin was a private non-profit foundation, TOROC (Torino Organizing Committee). It was responsible for the planning of both the Olympic Games and the Paralympic ones. During the organization process of the Games, TOROC had to control many aspects in order to provide a great service, for the IOC, viewers, athletes, sponsors and media (TOROC 2006). TOROC was functioning under the guidance of Rinaldo Bontempi and consisted of multiple associations and collaborations, such as Amnesty International, which protects human rights and supports millions of people all over the world; UNICEF, which protects children and minors and their rights; ILO for the protection of the rights of workers and employers, and many more. The foundation was financed by private sponsors and suppliers, broadcasting rights, ticket sales, licensing and the sale of goods and services during and after the Games. Due to the involvement of various organizations, the Games were carried out under homogeneous ethical strategies for such large sporting events (TOROC 2006). The goal of the Committee was to transmit the spirit of the Games to the participants and spectators while passing the Olympic heritage to the city and the public.

Another important participant was Agenzia Torino 2006, the public institution in charge of the construction of the Olympic venues. Differently from TOROC, which was funded by private resources, the Agenzia Torino 2006 used public investments from the state government and other public authorities to materially execute the interventions scheduled by TOROC and approved by the Italian Government. Specifically, it was in charge of the financial and contractual management of the 65 Olympic works, comprising sports venues in the city and in the mountains, territorial infrastructure and residential buildings for athletes and the Media (TOROC 2006).

Total investment was set at 1'700 million euros, with 1'200 millions supported by the Italian Government and the remaining part distributed between the Regional institution, the Municipality of Turin and other private investors.



- Medal Plaza
- Stadio Olimpico
- O Olympic Village
- Railway
- Metro line
- Redevelopment areas

1 Grugliasco Media Village
2 Spina 2 Media Village
3 Spina 3 Media Village - Vitali
4 Spina 3 Media Village - ex Michelin
5 Italgas Media Village
6 Ospedale Militare Riberi Media Village
7 ITC-ILO Media Village

A Palasport Olimpico
B Oval Lingotto
C Palavela
D Torino Esposizioni
- Training centers

The Olympic Project for the City

The Olympic Games are a great opportunity to stage new architecture, but the project for the 2006 Winter Olympics took a different route, as one of the key aspects was a transformation of the legacy of a city with a strong industrial past. In 1993 the city Mayor Valentino Castellani promoted a regeneration agenda towards a more international future development. Following this intention, in 1995 an urban master plan was prepared to deeply transform the urban tissue along the 'Spina Centrale' and create an opportunity for renovation of the abandoned brownfields. This had a profound effect in helping the city win the bid for the Olympics, and to use this event to fund its redevelopment.

Figure 20
(on other page)
The location of the 'Spine', the sites of post-industrial redevelopment of the last 20 years in Turin.
Most of the Olympic works are located in the southern part of the city.

The master plan for the 2006 Olympics was covering not only the mountain areas around Turin but also large portions of the city. The construction of various Olympic facilities all around the city in a dispersed way was an opportunity to rehabilitate multiple areas suffering from the post-industrial crisis (**Figure 20**).

The Strategy Plan defined six strategies and goals for urban transformation: evolve as an international city; attract new firms and tertiary businesses; promote cultural and sports tourism; create a solid research and innovation pole at the European level; and improve the overall city's image and quality of life (Dansero, Segre, and Mela 2003).

At the center of the Olympic Project was the Medal Plaza, located in Piazza Castello, in the heart of the city. This is where some of the most representative moments of the Olympics were held, such as the awarding ceremonies. It follows the Olympic base concept of using the 'Plaza', a typical italian urban space, as a symbol of gathering, sharing and positive bonding of people over a common human value, the sport competition. The 'Plaza' became the recurrent symbol of the Turin Olympics and was used for communication purposes in posters, Media relations and even in the medal design (TOROC 2006). The choice of staging the ceremonies in one place was strategically motivated by providing the unique background given by Palazzo Reale, Palazzo Madama and the whole historic square. The Medals Plaza was featured in broadcasts and television reports from all over the world (TOROC 2006) and could host more than 10,000 spectators.

The Village system was requested to provide accommodation to athletes, staff, organizing committees, NOCs and Media staff. In addition to the Olympic Village in the ex-General Markets, dedicated exclusively to athletes, there were seven more Media Villages in Turin and its proximities. Only one was located outside Turin's perimeter, the Media Village 'Villa Claretta' in Grugliasco. The other six were occupying brownfields all around the city or were connected to the Spina Centrale, the urban long-term transformation backbone: Media Village Spina 2, Ospedale Militare Riberi, Italgas, ITC-ILO, Spina 3 - Area Vitali and Spina 3 - Area Michelin.

The facilities for ice sports were located inside purpose-built or upgraded venues in the Olympic District, comprising the speed skating track, the ice hockey stadium and the figure skating and short track arenas.

Located directly south of the Lingotto building, the Oval Lingotto (**Figure 21**) hosted the speed-skating competitions. It was designed by Hok Sport group and Studio Zoppini Associati and had a total of 8,500 seatings on a surface of 26,500 sqm, with the oval ice track measuring 400 m in length, evaluated by

the athletes as one of the best in the world for performance. It was equipped with demountable stands and after the Olympics, this large space can be easily divided for other events.

Figure 21 *The Oval Lingotto, now used as exhibition center.*

Figure 22 *The Palalsozaki has been used extensively as a concert arena after the Olympics.*

Figure 23 *The Palavela now hosts the city's basketball team.*

The Palasport Olimpico (**Figure 22**), also called Palalsozaki - referring to its designers, Arata Isozaki and Pier Paolo Maggiora - was located north-west of the Olympic Village on the same ground as the Olympic Stadium. It hosted several matches and finals for the ice hockey competitions. A 183x100m box volume cladded with glass and steel with 14,500 seatings, it's the biggest covered structure in Italy. Thanks to its movable partitions and tribunes, the Palalsozaki can be converted from ice hockey arena to a versatile multifunctional center for post-Olympic uses, and has since become one of Italy's biggest concert halls. For the same discipline was also used Torino Esposizioni, the already existing exhibition building inside Valentino Park, by the river.

The Palavela (**Figure 23**) hosted the figure skating and short track competitions inside a venue already existing and renovated for the Games, situated south-east from the Olympic District. Built in 1961 by Franco Levi as an exhibition pavilion for the centennial of the Unification of Italy, it features three 29m high reinforced concrete vaults in an hexagonal-shaped plan. The renovation was carried out by architect Gae Aulenti and engineer Arnaldo De Bernardi, which inserted an independent building under the existing vaulted roof.

The construction of large transport infrastructure of Turin was also brought into action by the Olympics, such as with the building of a high-speed rail line to Milan and Lyon, and a doubling of motorways (Bianchetti 2005) to benefit tourism and daily-life. The capillary system of provincial roads was enhanced with 533 km of highways, reaching a total of 3,183 km for the province of Turin (TOROC 2006). In the urban area, the strategy of spreading out the Olympic sites around the city, such as sites for ceremonies, Media Villages, and the Olympic District, was another incentive to promote improvements on public transport connections, road maintenance and revisions to the whole network viability system.

An urban mobility plan was prepared, including the identification of access points and routes in the whole city, for athletes and visitors. The plan also involved the development of various tourist routes all around the city, to be used after the Games. The whole territory of Turin went under preparation for the Olympics with the help of all the departments and sectors of the city government. After the identification of the areas of Olympic interest, each of them was analyzed for potential improvements. The safety of many streets was improved by a new lightning systems and improved traffic lights. New urban furniture was placed in public spaces and green areas. Street cleaning and waste collection management was improved as well. All zones had special Olympic decorations, created for the occasion by several international artists and designers to highlight the spirit of the Games.

The Olympic Village

The 2006 Olympic Village was erected in an area once characterized by the historical General Markets, located in the southern part of the city. The multi-functional complex of Lingotto, on the opposite side of the city split by the railroad, was an additional attraction pole to the area, as it was hosting the Media Center. The selection of this specific site was also a great opportunity for the city to harvest Olympic investments in order to fund a new metro line and to revitalize a peripheral part of the city with new housing and services.

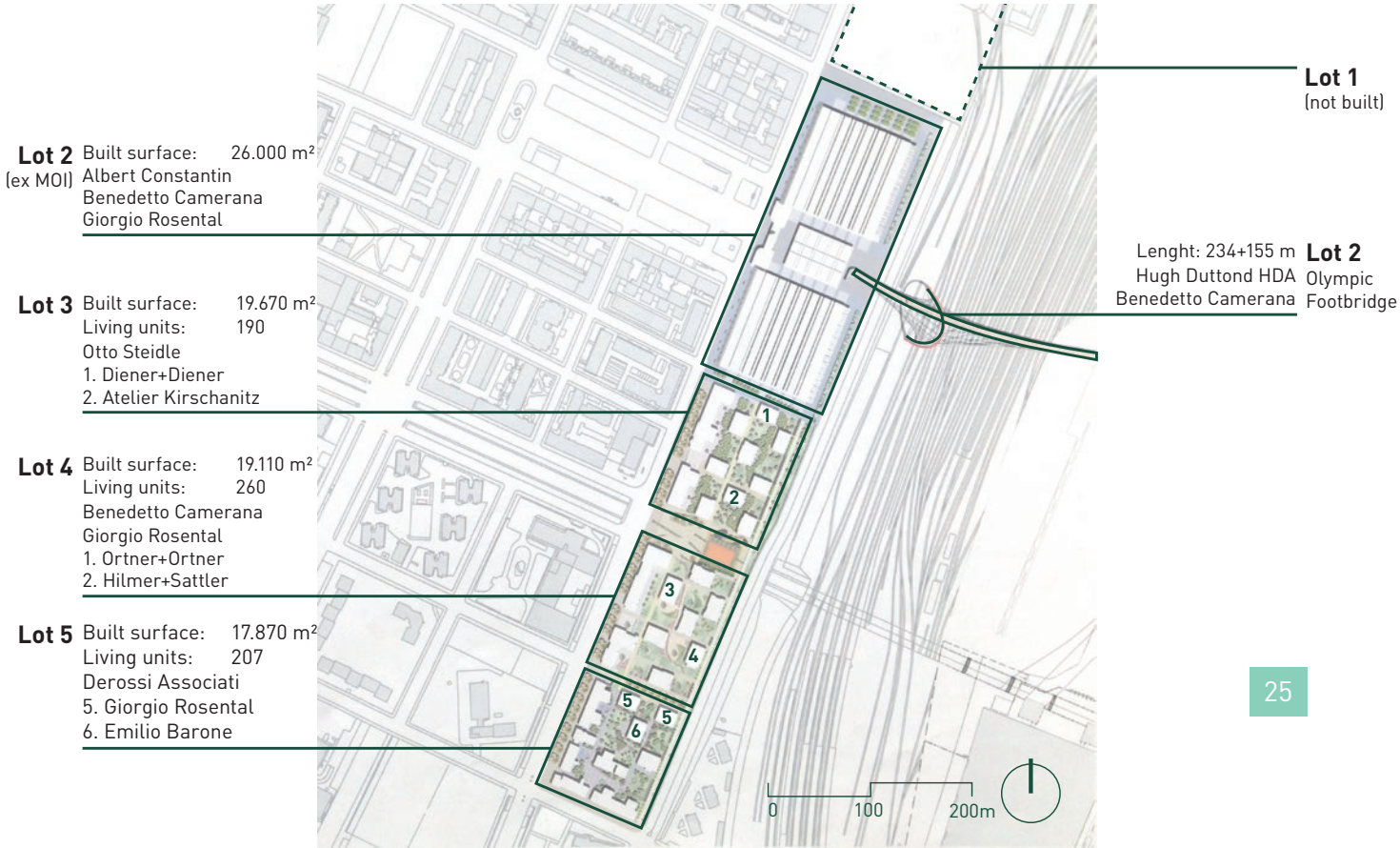
The long and narrow area was divided into six lots but eventually, only five were intervened on, each one allocated to different projects carried out by a team of architects (**Figure 24**).

Lot 1 was the empty area north of General Market, owned by Agenzia delle Dogane e dei Monopoli - the Italian Customs Agency. It was originally designated for a Media Village, but in the end, the project was discarded (Agenzia Torino 2006 2003).

Lot 2 comprised the entire ex-General Market building, with 26,000 sqm of built surface. The 52,000 sqm unoccupied lot in the south was divided into Lot 3, 4, and 5. Lot 6 belonged to the Olympic Footbridge running from MOI to the Lingotto building across the rail area.

The historical General Markets, in Lot 2, became the main focus of the long-term urban project for the 2006 Olympics. The restoration process was carried out under the supervision of a joint group of architects led by Benedetto Camerana, Albert Constantin and Giorgio Rosental. The main principle behind the rehabilitation was the creation of a new identity for the Market, so as to make the neighborhood recognizable in the future as the Olympic District, while also guaranteeing maximum preservation of the original structure (**Figure 26**) (TOROC 2006). The interventions were aimed at closing the existing volumes to gain more surface, while opening the whole site to the city towards Via Giordano Bruno, thereby reversing the previous system of permeability of the market.

Figure 24 *The Olympic Village Masterplan was designed by Benedetto Camerana in collaboration with other architects. (Domus, February 2006, p.37)*



In order to adapt the ex-Market to future needs, the following modifications were made:

Figure 25 *The 'boxes' behind the Market.*

The structural supports for the concrete arches, placed at the front and back of the Market, had to be demolished and replaced to ensure structural stability. This intervention was justified by the fact that the analysis on the existing buttresses had not been sufficiently detailed to demonstrate their stability, due to budget limitations. Consequently, the two long wings facing Via Giordano Bruno had to be completely removed to replace the reinforced concrete buttresses inglobated within with steel portals. The two wings were rebuilt as single-storey buildings in steel and glass, that echoed the original volumes but with new materials. The lower height made visible the great red arch of the Olympic footbridge and the MOI's stepped roof from the street. Only the two sections with curved walls next to the gates were kept, as they didn't have a structural role.

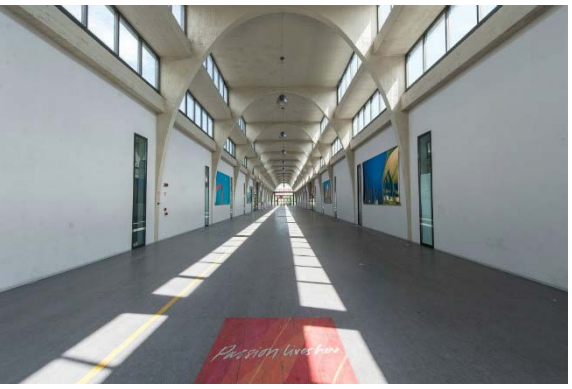


Figure 26 *The interventions inside the galleries: internal space division (above), and addition of demountable mezzanine floors (bottom).*

The porticos on the back of the MOI were demolished for the same reason, a need for more rigid supports for the arches. The new stability structure, called 'scatole' or 'boxes' (**Figure 25**), was composed of steel portals supported by concrete blocks and cladded with perforated metal sheets. The box effect is achieved by leaving a 1.50 meters gap between the metal structures, which is covered in lime plaster. The new structure created a barrier between the building and the rail lines, isolating the building from the high-speed Via Zino Zini line adjoining it. The final report of the Olympic project insists that the box look works harmoniously with the new metal finishing on the rooftop of the ex-MOI, creating matching compositions visible from the pedestrian bridge (Agenzia Torino 2006 2003b).

The central part of the MOI, or so-called 'airplane', had to keep its features of central circulation, as in the past. The lead architects suggested a very light intervention, showing the original structure of the cantilevering roof while recovering additional space for the Olympic facilities. The main materials used for new constructions were wood, glass and steel, in order to create a contrast between the past and the present. The glass panels were used to close the space of the 'airplane' roof to preserve the 'floating' effect. The panels were fixed to the existing cantilevered roof, placed at some distance from the borderline of the roof thereby creating an overhang for the longer facades. The glass elements consisted of two modules, inclined in a diverse manner generating rectangular or trapezoidal forms. The zig-zag disposition of the self-supporting glazed elements resembles a piece of sheet, folded to be able to stand and support its own weight.

The vacant area south of the Markets was once occupied by warehouses which were demolished for the Olympics. As the commercial complex had been the aim of bombings in WWII, a war ordnance clearance was performed on the whole area before starting the works on the Athlete Village .

The final project of the 100,000 sqm Village consisted of operational, international and residential areas, comprising several facilities for the

staff, visitors and athletes. The operational, international areas and some facilities for the residential part were located under the arcades of the ex-General Market. The athlete residence itself was placed on the previously empty lot south of the Market.

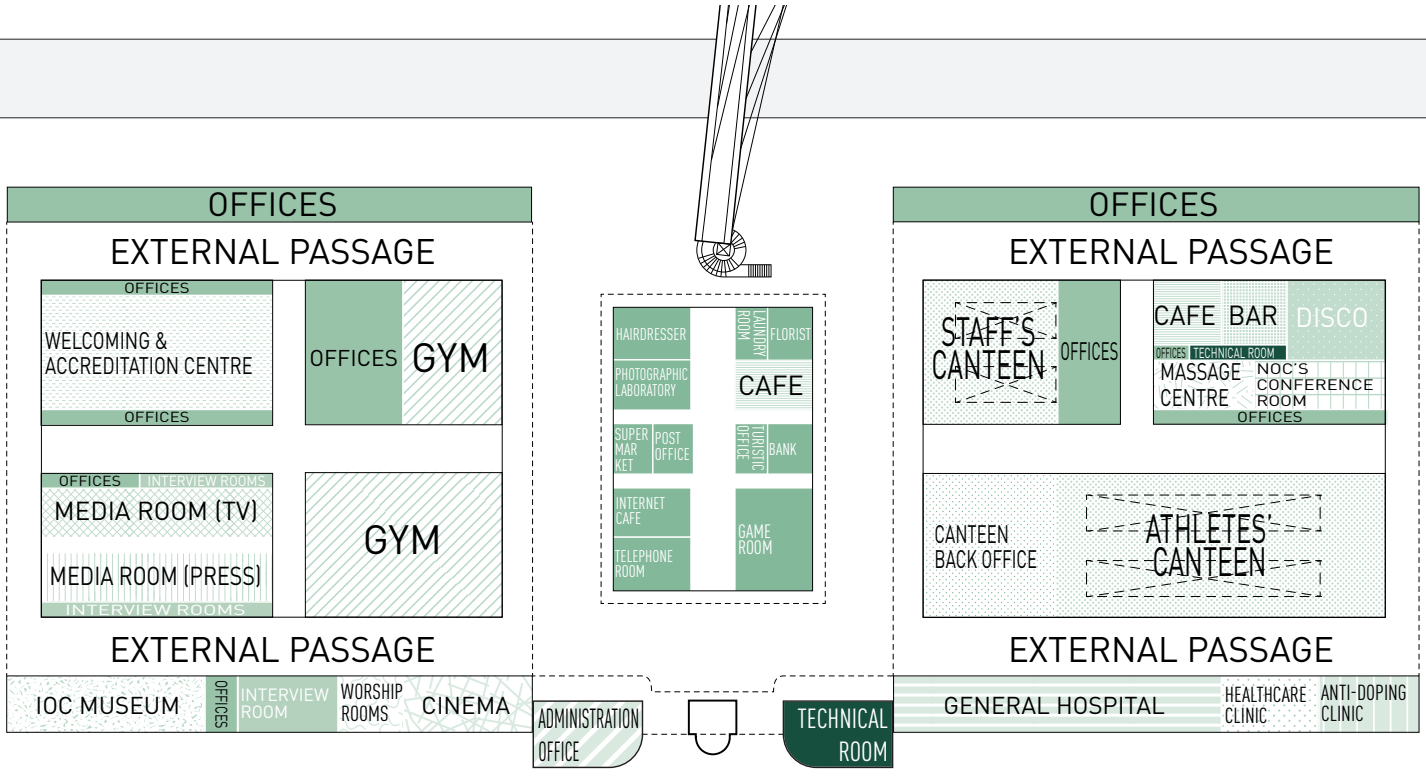
MOI - Administration Center for the Olympics: Lot 2

At the time of the Olympic project, the General Market was consisting of an entrance gate with two lateral volumes and a tower; two symmetrical wings formed by arcades and a central square occupied by a roof, referred previously to as the 'airplane'.

The left wing of the Market hosted the accreditation and protocol areas, a media center with interview rooms, a transport and logistics office, a staff check-in point, a gym, a Venue Operating Center (VOC), an IOC museum and a cinema (**Figure 27**). The central part of the construction, the 'airplane', comprised a bank, a tourist office, a post office, a supermarket, a photographic laboratory, florist shop, hairdresser, a coin-operated laundry room, leisure and entertainment facilities with cafeterias, internet connection points and an Olympic store. The main gate in front of the 'airplane' hosted the technical room, the director's office and the village's administration office. The right wing of the market covered catering services, a fitness center, an Interfaith Center, various entertainment facilities, the National Olympic Committees (NOC) offices and a medical center with anti-doping control.

All facilities were carefully designated and located in order to satisfy Olympic protocols, including health, safety and environmental protections, special regulations and national standards. The task of these newly designed spaces was to provide space for planning and managing Olympic events during the entire lifespan of the Games (TOROC 2006). The ex-Market became a symbolic Olympic place, a welcoming public space for communities of all ages, as it became the main cutural, administrative and residential hub for the 2006 Winter Games.

Figure 27 *The Olympic functions inside MOI, as specified by IOC.*



Athlete Village: Lots 3, 4, 5

The international design competition for the Olympic Village started in June 2002. The masterplan for the residential area of 52,000 sqm was designed by an international team of architects under the guide of Benedetto Camerana, and divided among different professionals to design various skins for the housing blocks.

Several strategies were selected by the leading actors of the project in order to regenerate the area. One of them is the development along Via Giordano Bruno, which is the site's interface towards the city. The strengthening of the main axis of connection by the commercial activities will help to start the rehabilitation of the area lacking public activities. Promoting the idea of sustainability, the housing units were developed in a modular way, while bringing forward the theme of living by different variations of colors and styles for the housing blocks (**Figure 30**) (Bianchetti 2005). Additionally, the housing arrangement represents the field of a chessboard (**Figure 28**) in order to provide each block with a view to the Lingotto and the hills, while excluding car circulation inside the neighborhood and promote a more sustainable, 'car-free' lifestyle.

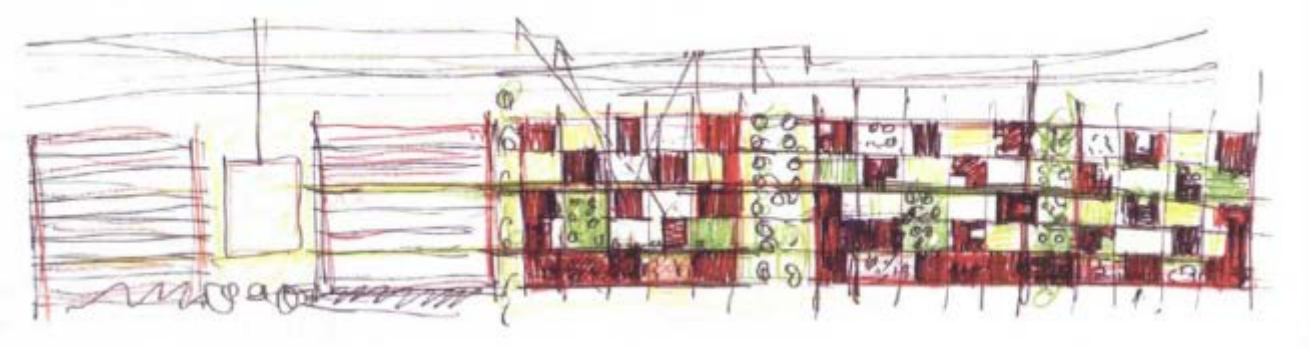
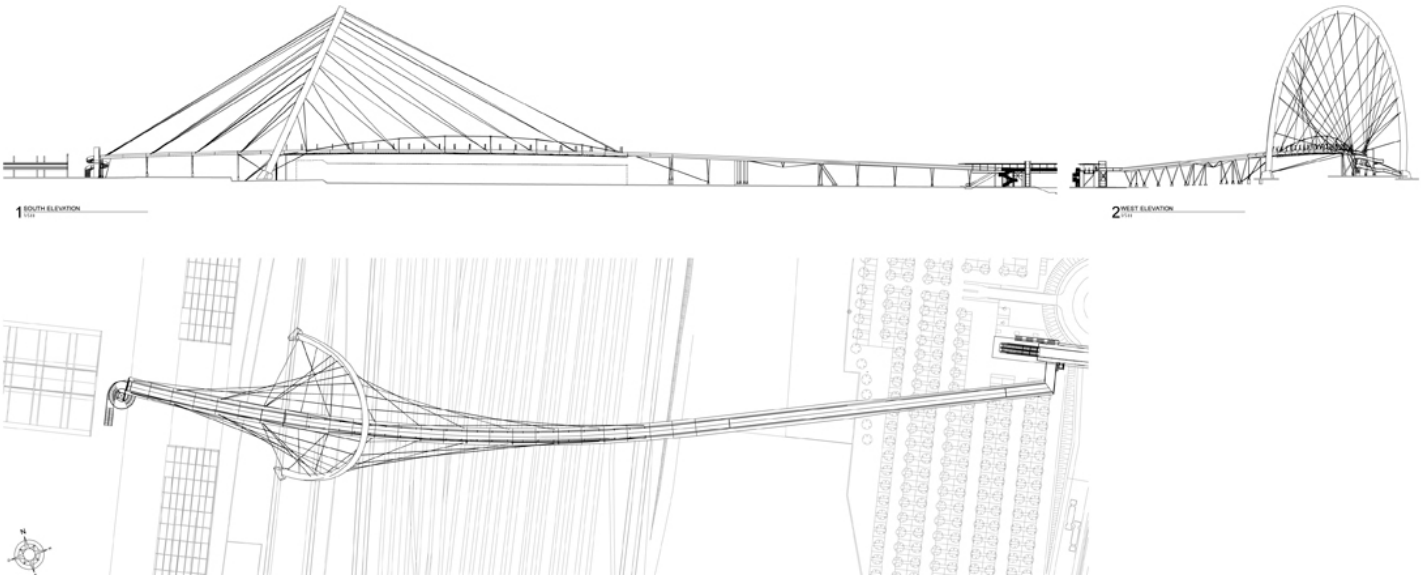


Figure 28 *A sketch representing the masterplan by Benedetto Camerana. (Bianchetti 2005)*

"When we set up the project, first of all we imagined a new suburban neighborhood with a beautiful view of the hills, ecological, polluting little, without cars, with many gardens, sustainable, varied, vital, and definitely more beautiful than gloomy urban areas without dignity of colors... It was a question of building a large piece of town" (Camerana 2005 p.2).

The works were completed in September 2005. The distributed funds for the works were approximately 145,000,000 euros, marking the Village as the highest expenditure for the entire Olympic works, sporting venues comprised (Bottero 2007).



The Olympic Footbridge: Lot 6

One of the most recognisable urban landmark, symbol of the 2006 Olympic Games is a 400-meters long footbridge with an impressive red metallic arch 69-meters high (**Figure 29**). Realized by Studio Hugh Dutton-HDA and Benedetto Camerana, the bridge is located on the lot № 6. The bridge is suspended by cables supported by an inclined and tilted arch, removing the need for halfway pillars falling in the railway area and putting them only where allowed and necessary. The construction meant to connect the existing Lingotto polyfunctional center, on the opposite side of the railway, with the Olympic Village. During the Olympics, it was heavily used by athletes and staff to reach the sporting venues and Media center from the Olympic Village. As a post-Olympic heritage, it is not only an iconic element serving as a memory for the Olympics but also a tool of unification of flows between the two parts of the city, formerly divided by the railroads. Its construction faced complex difficulties, such as the necessity to assemble the bridge on the railroad that had to be kept operative during the whole works. For this reason, the architects and engineers considered that 'to build a bridge on the railway lines is a challenge bigger than building it on a river' ('The Olympic Arch of Turin' 2007 p.1).

Figure 29 *Technical drawings of the Olympic Footbridge.*

The Olympic Arch was inserted into a greater plan for mobility for the Lingotto area. The originally planned position of the Lingotto Metro station was on the western side of the Lingotto complex, right on the pedestrian bridge landing point. Nevertheless, during its realization it was placed on the eastern side, leaving the pedestrian bridge detached from the primary connection hub. To solve this inconvenient an extension was provided as a connection with an existing footbridge from the Lingotto to its parking lot (Agenzia Torino 2006 2003a).

Figure 30 *Various views of the Athletes' Village and the Olympic Bridge.*

PART TWO: ANALYSIS

AFTER THE OLYMPICS

Positive Outcomes

As the city deindustrialized, it had to dispose of many facilities and neglect some urban areas. This caused a fragmentation in the image of a strong, unified, productive Turin into one of a city collecting unused places with empty industrial shells. The urban development of the last twenty years took advantage of this fragmentation to perform punctual interventions of development, as to resolve potential degrading situations into opportunities for the city (Bianchetti 2006).

The most representative one is the infrastructural development of the Spina Centrale, 'Central Spine', the biggest intervention in the city since the second post-war. By bringing underground the railway that crossed the city in a north-south direction, the city got new surface available along 4 zones (called Spina 1, 2...) in an already condensed context and had the opportunity to use this long axis, once separating the city in two, as a strong backbone for a new mixed-use urban setting. The huge Parco Dora, the technological Environment Park, the new Porta Susa station, the expanded Polytechnic campus and the new cultural center hosted in the Officine Grandi Riparazioni are some examples of the directions in which the city brought forward its transformation. It was carried out for longer than 15 years following precise improvement goals or "four axes of development": knowledge, formation, research and innovation. The rehabilitation of former productive areas, like ex Michelin and Vitali in Spina 3 and the ex-General Markets, is aligned with this long-term agenda of urban renovation and was made possible only with the support given by the Olympics.

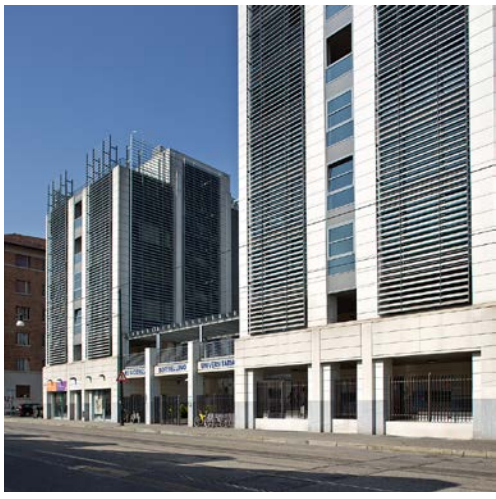


Figure 31 *Two of the Media Villages repurposed as students' residence: Spina 2 (above) and Italgas (below).*

These major urban areas of transformation brought also more activity inside the real estate market (Bottero 2007, Bianchetti 2006). The interventions in Spina 1, 2, and 3 became symbols of an urban economy that imposed itself on the market through the renovation of abandoned areas. When the Market was discontinued in 2001 and assigned for Olympic purposes, the whole area around experienced a rise in the real estate value. The houses nearby benefitted from the closing, since they were not going to be disturbed anymore by the noisy trucks working at night, from the increased mobility given by the refurbishment of Piazza Galimberti and from the new viability freed of the market activity.

Moreover, the whole Olympic project, including the Media Villages distributed all over the city, generated a huge amount of square meters around the city that was poured all at once in the building market. As these transformations affected mostly the northern part of Turin, the MOI refurbishment was a way to counterbalance this evolution in the southern part, creating a starting point for a new centrality (Bianchetti 2006).

The Media Villages mentioned before became a valuable asset for the transformation of the city. They were mostly reused for various purposes, the most relevant being, in order, housing, green spaces, commerce and hotels. Some of them were assigned to the regional university body (**Figure 31**), EDISU (Ente Regionale Per il Diritto allo Studio Universitario del Piemonte),

Figure 32 *First conceived in 1990 but never realized for lack of funds, the first Metro line was realized on the occasion of the Olympics.*

which converted them into student residences: the ones of Italgas (Residenza Universitaria Olimpia), Spina 2 (Residenza Universitaria Borsellino) and Grugliasco (Residenza Universitaria Villa Claretta). There were 1614 available beds before the Olympics, and 2839 after, or a considerable increase of 78%. Noting that an average of 15% extra-regional and foreign students are enrolled at the Polytechnic University of Turin (about 12'000 in 83'000 total students), this addition has benefitted 20% more students in need of accommodation (Bottero 2007). Despite still not completely fulfilling the great number of student demands, with this addition, Turin confirms itself as one of the major and most competitive high educational poles at the national level.

The Municipality of Turin became owner of 10% of the gross floor surface of the Olympic Village, as well as 10% of the Media Village in the ex-Michelin area in Spina 3, to use as public residential buildings (Edilizia Residenziale Pubblica, ERP). Of a total of more than 16'000 public apartments present in the city of Turin, there have been added 207 more from MOI and 400 from ex-Michelin. A modest increase of number, but that will provide a better living quality (Bottero 2007).

The contribution from the Olympics was also fundamental in strengthening services in the city, mainly in terms of network infrastructure, like the construction of Turin's first metro line (**Figure 32**), the first fully automated in Italy. But the Games were drives also for some long-awaited important services in the Piedmont region as a whole, such as the construction of aqueducts, sewage systems and water treatment plants in several mountain villages and valleys, or improvements to healthcare services and lighting system (Bottero 2007).

Figure 33 *The red pinwheels are totem-like elements that define urban identity by recalling the industrial image of the city. They were used as signs to point out Olympic places.*

At last, one of the most imposing material legacies of the 2006 Olympic Games is related to the spaces for events and the impact of the Games on tourism. Many of the venues built or refurbished during the Olympics continued their functions as home for big events, such as the Oval, PalaIsozaki and Lingotto Fiere, increasing the prestige of the city in a post-Olympic use (Sokol 2008). At a more economical level, carrying on to exploit such architectures is mandatory to cover their maintenance and operational costs throughout their following usage years (Bottero 2007). One of the most important events at the international level was the Salone Internazionale del Libro (International Book Fair) hosted until recent years inside Oval, the former speed skating rink, reaching more than 300,000 visitors each edition (Bottero 2007). This large availability of surface was a powerful resource to continue revamping Turin's image as an international city for culture, gastronomy, art and technological innovation.

For two weeks the eyes of the whole world were pointed at Turin, and surely this brought a considerable recognition of the city at a worldwide level (Imarisio 2014). During that period the city was flooded with visitors from all countries, and Turin took this occasion to show-off its history, its treasures, its cultural heritage and its strengths as a postindustrial modern city. A strong brand image was carried out in every Olympic site (**Figure 33**) and in the entire city, starting from the International Airport in Caselle, the main welcoming point for most international visitors (TOROC 2006). After the Olympic spotlights went off, the hopes were that the city would benefit from this temporary '15-minutes' of notoriety and fame to promote tourist flow as a major European city.

Negative Outcomes

Despite the Olympic experience being universally acclaimed as a resounding success for Turin and the country as a whole, the city was still not able to keep up with overly optimistic expectations. Many positive outcomes, mainly the material ones, have kept on being relevant to the urban environment and society after years, like the general improvement of transportation and urban services, given proper maintenance. The adaptive reuse of the MOI for the Olympics was conceived as a way of reviving one of many historical industrial facilities in Turin. The afterlife of this project was believed to act as a starting point for regeneration in the area, however the Olympic neighborhood appears nowadays isolated from the city and is decaying, lowering the quality of life and giving a persisting feeling of 'danger' to inhabitants and passers-by alike (Versienti 2012, Ricca 2019).

Despite good intentions, the restoration of MOI, seen as an optimistic effort for urban development, resulted in a massive waste of investment and resources since, after 13 years from its renovation, it is still unused. Sporadic, temporary events revived the arcades, like two editions of Paratissima Art Fair in 2012 and 2013, but apart from those, the Market does not bring any positive contribution to its district. On the contrary, such decaying state, coupled with the one of the Olympic Villages, worsens the living conditions and the serenity of its inhabitants (**Figure 34**) (Versienti 2012, Provost and Lai 2016).

Figure 34 *As the area was left unused for long time, it was aim of vandalism that affected both old and new structures.*

Countless are the reports from local and national newspapers issued over the years and the MOI, with its Village, quickly became synonyms of squats, criminality and a total failure of the Olympic investment, decreasing more and more the reputation of the Olympic effort and the trust in other possible Olympic experiences for the whole country (Graziani 2012a, Graziani 2012b, Graziani 2012c, Versienti 2012, Graziani 2013, Imarisio 2014, Provost and Lai 2016, Ricca 2019).

Observing this situation, it is easy to dismiss the great importance of the Olympic project in Turin's urban development in other areas that, thanks to their success, have managed in getting absorbed and assimilated by society (like EDISU student's residences or the ex-Michelin and Vitali's public housing). The General Markets and the Olympic Village in turns, are still seen as a fresh wound, despite the passing years (Ricca 2019). It's an experience that subverts the common idea that mega-events are a good

mean for rehabilitating abandoned areas, as it shows that they can generate them instead (Bianchetti 2006). What is tragic in the case MOI is that the Market was already going towards an inevitable abandonment after being closed: all the combined efforts made for these two weeks of Winter Games vanished without any meaningful trace. The General Market went on to be empty once again, as if the Games had never happened (Chiorino 2016).

Additionally, far from urban areas, there is the issue of underused sports infrastructures in Piedmont's mountain arc. Some were downsized and have been converted for tourist uses and competitive sporting activities, but right from the end of the Games there were uncertainties about the future of the two major sporting structure in the Olympic mountains, the Cesana Pariol bobsleigh track and the ski-jump trampoline in Pragelato: the expected use was to convert them into national excellences for training and competition (Bottero 2007).

Figure 35 *The bobsleight track in Cesana hosted also the disciplines of luge and skeleton, but it was scarcely used after the Games.*

The bobsleigh track in Cesana (**Figure 35**) was not even planned in the bidding candidature for the Games. It was strongly desired by CONI, despite unfavorable positions from both the IOC and TOROC, that had suggested instead to use an existing venue in La Plagne, France, very close to the border (Pagliassotti 2016). The bobsleigh track was left open for three years after the Olympics, waiting to host competitions with no avail, while requiring extreme operational costs (half a million for the three-monthly winter season, plus 800,000€ for ordinary maintenance). Defaced and severely damaged by copper thefts, it was closed in 2010 (Imarisio 2014).

The Pragelato ski jump infrastructure is another cathedral in a snow desert. As it was dedicated to a discipline unpopular with the general public and the venue fell quickly into under-use and closed permanently in 2009 (Pagliassotti 2016). A temporary structure was proposed instead but it was harshly discarded by the IOC, adverse at that time to anything not permanent (Imarisio 2014). The complex, composed of two larger trampolines used for Olympic competitions and three minor training ones, now is considered an eco-monster disfiguring Val Chisone mountains, as it was necessary to perform heavy excavations and deforestation (Imarisio 2014). Many called on this outcome, foreseeing the environmental disaster that would have resulted in pouring concrete in natural habitat (Pagliassotti 2016). A possible last resort to justify such large permanent infrastructures would have been using them as a strong point for a future Olympic application, even jointed with other Italian localities (like the most recent bidding for the 2026 Winter Games between Cortina d'Ampezzo, Milan and Turin. Eventually, Turin retired its participation, due to political pressures, and the Games were awarded to Cortina and Milan alone (Monaci 2019)), but as the venues were abandoned for such a long time, as of today they are completely unusable and need to be rebuilt.

CAUSES OF NEGATIVE OUTCOMES

Ex-MOI

Figure 36 *Just like what happened for some sports venues, also the MOI has been subject of copper theft of the new wiring applied for the Games.*

The management of the Village and other Olympic facilities was appointed to Torino Olympic Park (formerly Fondazione XX Marzo), a foundation which, according to Bottero, 'had a tough start' since its formation more than a year after the Games (Bottero 2007, p. 83). The delay caused a hard transition in the post-Olympic programs of the heritage, as it was more difficult to find medium and long term projects, sponsors and activities programs after the great excitement for the Olympic success toned down (Bottero 2007).

According to the foundation's planning, the post-Olympic conversion expected for the MOI was as headquarters of the foundation itself and CONI and as Olympic Museum (Agenzia Torino 2006 2003b). The first two were indeed realized, but they occupied only small parts of the large available surface of the building, while the Olympic Museum was never realized. As there were no other actors interested in what was left of the Market, its ownership was subdivided between the foundation and the City Municipality; the latter, in turn, split out the arcades to different private actors and banks over the years, making even more difficult an organic, coherent management and reuse of the Market as a whole (Bianchetti 2006, Imarisio 2014).

Over subsequent years, many proposals have been made to recover the ex-MOI, each of them igniting a spark of hope in the inhabitants which meanwhile were observing the Market, left to its own, suffer from lack of maintenance and vandalism.

Twenty-five possible functions were formulated in 2012 in a public call for interest issued by the Municipality, six years after the end of the Games (Graziani 2012c). All equally plausible, none good enough to actually start the recovery engine: this impasse is the final result of the initial inadequacy of the long-term planning (Bianchetti 2006) even stated in the official report: '[for the] post-Olympic Phase [...], as of today, there is still no defined program of reuse (shopping center, restaurants, offices, etc.)' (Agenzia Torino 2006 2003b, p.9). In 2014 it seemed that something was moving once again, as the city's two major academic public institutions stepped up into expressing interest for the MOI: they proposed to use the galleries as a pole for Biotechnological research (Rossi 2014, Guccione 2015), mixing the departments of the two universities to create a potential long-sought excellence in the country. Somehow this proposal seemed stronger and more convincing than the others, being able to start in unravelling problems related to ownership and permits, but it too eventually stopped without further new developments (**Figure 36, 37**). Along with managing issues, there is also the contribution made by the restoration interventions performed on the structure. The Market was restored and equipped with steel, glass and wood structures, to be clearly distinguishable from the concrete arches: the galleries were closed with glazed facades to enclose the interior space; internal subdivisions were made by adding dry-walls and removable steel mezzanines with wooden

Figure 37 *The present conditions of the renovation of the ex Market.*

flooring. All interventions were carried out ensuring complete removability, as the MOI is a protected cultural property. Nonetheless, as there was no defined post-Olympic program but only several hypotheses, the intervention didn't have any particular distributive typology and was realized in the most generic way possible, to provide a sort of 'flexibility' for future functions that would be installed within (Agenzia Torino 2006 2003b). In any case, new renovations are required, regardless of future uses, as the space right now is in a severe decaying state.

Not even the urban settings laid down the best conditions for proper integration with the city. Despite its front facing a newly refurbished Piazza Galimberti and the whole Circoscrizione 8, its back is looking at the large rail area and at Via Zino Zini, a high-speed urban carriageway that was about to be completed right before the Games. For this reason, the original buttresses for the arches on the back were replaced by the so-called 'metal boxes', opaque volumes in concrete and metal with no windows or openings, in order to isolate and protect the Market from the carriageway (Agenzia Torino 2006 2003b). Because of this, there is no permeability between the western and eastern side of the area, and whoever would cross the Market towards the railway would reach a dead-end.

Athletes' Village

The Athlete Village faced the same turbulent path. Its original purpose was to complete the large-scale empty area in the neighborhood by constructing residences as planned by the PRG, the City Regulatory Plan. These new buildings were erected with the intention to use them for tertiary, commerce, leisure activities and hospitality, but the most prevalent function would be residential. In order to promote social mixing and avoid gentrification, there were several different housing options: private ownership, subsidized lease, social and public housing, each divided in different proportions among the three lots. A fragile balance that, if not managed properly, can exacerbate already challenging social conditions and create situations of discomfort (Ingaramo, Bagnasacco, and Prizzon 2007). For the first time in Olympic history, all of Turin's Olympic works, particularly the Olympic Village, were realized following a strict strategic sustainability evaluation (the so-called VAS, Valutazione Ambientale Strategica), assessing environmental impacts at every stage of the project and setting standards for the future Games (Bottero 2007). Yet, a few months after the ending ceremony, the Olympic Village was already showing signs of distress (**Figure 38**), probably caused by poor quality works that induced

Figure 38 *The 'blue tower' became the icon of the progressive decadence of the Olympic Village, as it was the building where the first signs of architecture's degradation were the most visible.*

Figure 39 *During its illegal occupation, the Village's buildings faced some informal modifications both outside and inside.*

high maintenance costs right from the beginning (Versienti 2012).

Linked to this issue is the matter of the 'Giordano Bruno' student residence that from 2009 on was housed in some blocks of the Village. In 2016 EDISU decided not to renew the lease contract of three towers in Lot 3, which had been converted to a dorm with 190 total available beds, because of the imminent reopening of another student dormitory in the city center, that could accommodate 220 students (TorinoToday 2016). It should be mentioned the low-quality conditions that the students were experiencing in the Olympic Village compared to other residences, even the ones converted from the Media Villages: the overall cheap construction, seepage and issues with heat and water services in a building made only 10 years prior (LINK Coordinamento Universitario 2016). As the blocks were having difficult times in being acquired, also because of the dragging effects of the 2008 financial crisis (Provost and Lai 2016) and for the prices deemed too high for the area - 2'000 to 2'500€ per sqm - (Graziani 2013), the managing agencies were not eager to throw resources in preserving something that was not producing profit (Imarisio 2014). Moreover, interested stakeholders like ARPA Piemonte (the regional agency for environmental protection), had to perform considerable renovations to convert the whole Lot 4 into their headquarters (ARPA Piemonte 2007).

The situation quickly precipitated when in 2013 some empty buildings were occupied by North-African refugees seeking shelter from the 2012 civil war in Libya (**Figure 39, 41**). Initially hosted in temporary reception centers supplied all over Italy by the national "Emergency North Africa" program, they found themselves out in the streets when the program was suddenly cancelled (Provost and Lai 2016). The concurrence of a pressing social need for accommodation and a large number of available apartment blocks led to an escalation of illegal occupation from 150 to 1,200 people between 2013 and 2016 (Pampuro and Stopani 2018). Even though local volunteering associations were trying to ensure acceptable living conditions and supporting the refugees in their needs, the convenient isolation of the neighborhood from the city made possible this uncontrolled housing situation. The Olympic Village itself is designed to be a gated-like community as to enhance security over entrances, but this condition should have disappeared once the athletes are gone, to promote integration with the rest of the city. The chessboard-like disposition of the blocks, with the creation of small inner courtyards and interstitial semi-public spaces, was a thriving field for unconventional occupation of this urban piece, difficult to access from the outside. This produced a progressive but massive decrease in the appeal of the area, even pushing away investors away from carrying out simple, ordinary maintenance (Versienti 2012). This eventually led the buildings, which were already showing severe decay, to become blighted.

Sport Infrastructures

The primary cause of the abandonment of Olympics venues has to be recognised in the mechanism of supply and demand (Helbling 2015). In fact, in addressing the future use of the Olympic Mountains, we have to consider that there was, and still is today, an insufficient demand from regular users compared to the supply of ice and snow sporting venues in the whole region. Seasonal tourism is not counted, for which instead the available structures are considered way above the national average in terms of quality and tourism competitiveness (Bottero 2007).

Some Olympic disciplines are simply not practised enough: it's the case for ski jumping, bobsleigh, luge and skeleton, with only one infrastructure each in Cuneo province before the Olympic additions in Pragelato and in Cesana Pariol (Bottero 2007). Their construction as permanent structures was also motivated by an expected increase of popularity due to the Games' exposure to these sports and the implementation of promoting programmes for children and new practitioners (Pagliassotti 2016).

Figure 40 *The sky-jump trampoline during its construction, considered highly invasive.*

Even if not used by amateurs and novices, in any case they were top-notch Olympic venues thus representing a good opportunity to employ them to host national and international competitions, possibly creating and excellence pole for North-West Italy. But for the same reasons related to the delay in the creation of the Torino Olympic Park foundation, which was also managing the Olympic Mountain sports venues (Bottero 2007), these events never came to be, as their sponsoring was done too late. Another breaking point may have been political friction in pushing territorial promotion and competitiveness at the national level, as the main snowsport poles in Italy are already well consolidated in Lombardia and Alto Adige (Pagliassotti 2016).

Besides these matters, there are also environmental issues involved (**Figure 40**). The area hosting the Pragelato's trampoline in Val Chisone suffered from hot winters and lack of snow for multiple years, making the venue unusable. Moreover, security issues have arisen as it can't be used anymore since 2015 due to avalanche risks in the area (Pagliassotti 2016).

Figure 41
The signs of passage of the refugees in the Village's blocks.

PART THREE: OUR ALTERNATIVE PROPOSAL

INTRODUCTION

Lessons Learned And Our Proposal

In analysing the causes and consequences of what generated the present conditions of Turin's Olympic Village, we can see many issues pertaining to architecture and its role in shaping neighborhoods, and thus assess what would be possible improvement points. What we can learn from the sequence of events faced by Turin's Olympic Village is that design itself can affect how a large part of the city is seen and assimilated. We can observe two aspects that are linked to each other, which we choose as starting points in defining an alternative proposal for the Village: design choices, from master plan to internal distribution; and focus on in-Game and post-Olympic functions. As they are related, for example in defining the spatial divisions that will have to change after temporary Olympic activities, an optimal solution would be to implement a system that can accommodate different functions over time. This would bring benefits not only limited to the transition from Olympic programs to post-Olympics ones, but also within the natural modifications of spaces and purposes that occur when an active urban area changes needs and users (Maccreanor 2005).

This is where the circular economy concepts of life-cycles and adaptability meet urban design: a building able to sustain a physical and/or functional change is a valuable resource in urban transformations, being able to retain its architectural, social, economic and environmental value over time without having to be replaced, thus disrupting the consolidated urban tissue and require new material and economical resources (Maccreanor 2005). For this reason, we will implement the use of flexibility in an alternative project for the Turin Olympic Village, comprising both the timespans of Olympic uses and post-Olympic proposed functions, based on what we have observed and analysed so far.

The Olympic Village in Turin has a strong peculiarity that allows a confrontation of two aspects of building flexibility: one applied to new buildings and another applied to existing constructions.

For the Athlete Village, flexibility can resolve the transition between a distribution typology for many individuals, the temporary dormitory for athletes, and the apartment distribution for families and permanent households after the Games.

For the ex-General Markets, restorations performed with the intent of continuing to use a building can be already considered adaptable reuse, in the sense that the restored building itself can accommodate different functions. The adaptability, in this case, is not in the reusing action, but rather in the intrinsic architectural values of the building. The ex-General Markets, for their open layout and structural system, can serve different purposes. Moreover, since whatever addition must not damage the protected building, it has to be removable, hence it can be easily modified for other purposes.

FLEXIBILITY

Terminology: From Flexibility to Adaptability to Adaptive Reuse

In modern times, the issue of buildings changing over time started to be relevant during the XXth century, with the rising concept of 'flexibility' in the late '60s. Several investigations on flexibility in housing were brought forward by architects, especially in the Modernist era, each time reinterpreting its definition and considering different variables (Leupen et al. 2005). The lack of a well-defined concept resulted in general confusion on the subject, and in a concern that this idea wouldn't be able to deliver the expected outcomes (De Paris and Lopes 2017). Oppositions to the concept considered the risks of creating an architecture that, trying to be devoted to many purposes, would result in being falsely neutral or, for the architect, to avoid commitment in the design (Forty 2000). Therefore, before venturing into the theories behind a flexible plan, it is necessary to define and clarify all these terms that are commonly used to point out the ability to sustain change, and which are often mistaken for one another.

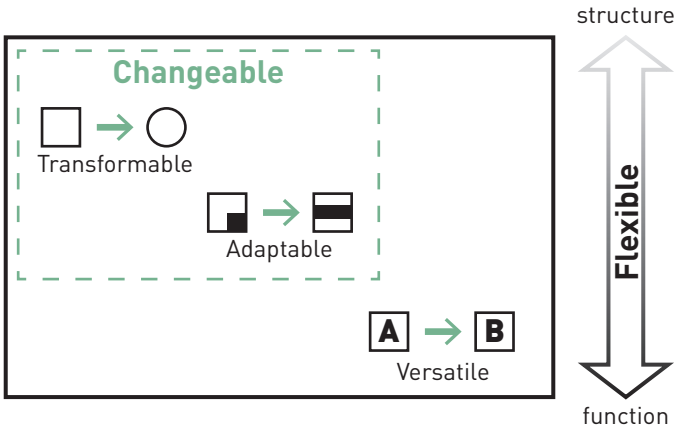


Figure 42 *The different degrees of flexibility, according to De Wolf. (De Wolf 2012)*

According to De Wolf, 'flexibility' is a general term that encompasses all the others. It refers to the ability of a building to have different physical arrangements or different social uses, and all the possible gradients within (**Figure 42**). The ability to sustain changes on the whole structure is defined as 'transformability'. When changes occur on features that don't affect the integrity of the construction, we can define the notion of 'adaptability'. Regarding function, 'versatility' is the ability to set different purposes for a building without influencing its entire architecture (De Wolf 2012). In this way, we can define the 'adaptive reuse' as any work performed to a building over and above maintenance to change its capacity, function or performance i.e. any intervention to adjust, reuse or upgrade a building to suit new conditions or requirements (Douglas 2006).

History of Housing Flexibility

Throughout human history, we can find examples of space flexibility: from nomadic tents, prefabricated houses, to temporary pavilions for exhibitions (Wadel 2009). Starting from the XXth century, flexibility emerged as one of the main topics for the mass housing construction in Western architecture. Due to major modifications of living habits and innovations in building construction of that period, architects had to find more adaptable plans to compete on the market for the ever-changing needs of inhabitants. Because of this challenging housing market situation, many studies were focused on changeable, movable partitions and variations for an internal layout (Leupen 2006).

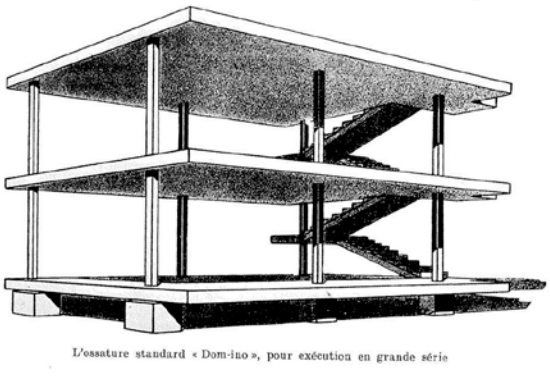

L'ossature standard « Dom-ino », pour exécution en grande série

Figure 43 *Drawing of the 'Maison Dom-Ino' module made in reinforced concrete. (Le Corbusier and Pierre Jeanneret 1964)*

One of the main research directions taken by many architects of the period was towards a minimum ergonomic living unit to maximize the efficiency of the space, leading to the development of the 'living machine' concept. The living space becomes a multifunctional field for day and night activities, satisfying the needs of its inhabitants. Flexibility and adaptability became the key elements for solving the unpredictable needs of a building during its long lifespan.

A brilliant example of residential flexibility is Le Corbusier's 'plan libre', that will later influence heavily all following architecture. One of the most representing figures of the Modernist current, Le Corbusier wanted to break old conventions (About Free Plan and Free Facade 2018). His concept refers to the innovative open floor plan, where the walls dividing interior space do not have a load-bearing function. It was first decoded in his 'Maison Dom-ino' (**Figure 43**) in 1914 as a viable solution to post-World War I reconstruction. The structural skeleton is located on the exterior, represented by load-bearing pillars supporting the floor slab. This organization gives flexibility to the interior, allowing all inside partitions to move freely without limitations. Additionally, this organization allows architects the freedom to fully design the outside facade of a building, a thing that was not possible with the load-bearing construction system dictating position and dimensions of outer elements.

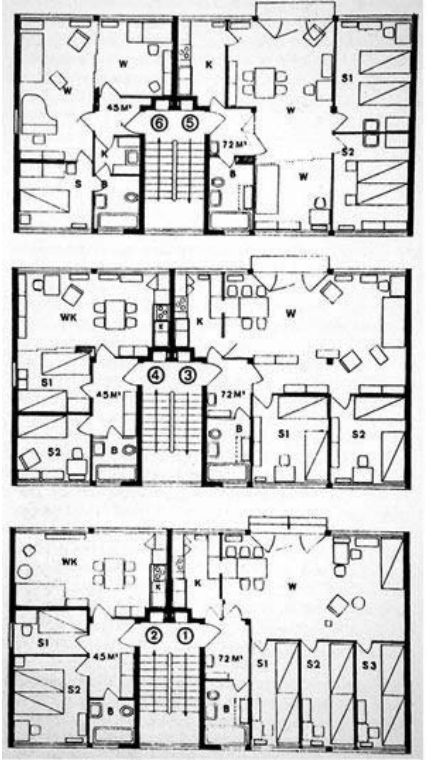


Figure 44 *Different arrangements for the apartment in Stuttgart by Mies Van Der Rohe.*

Similar in intentions is the concept for residential typologies that Ludvig Mies van der Rohe developed in his apartment block at the Weissenhofsiedlung (**Figure 44**), built in Stuttgart in 1927. The architect exploits the open plan concept by designing several possible internal layouts specifically tailored to occupant needs and the ergonomics studies pursued at that time. The living unit presents itself as a free space where only the kitchen and bathroom are fixed rooms. It can be arranged in many possible divisions thanks to the minimal obstructions of the structural columns: in fact, almost 30 architects and interior designers, the Schweizer Werkbundkollektiv, were involved in the internal arrangements (Kirsh 1987).

Office typology buildings also took part in the flexibility movement later on. One of the striking examples is the 'Open Building' concept (**Figure 45**) developed by N.J. Habraken in the '60s. His 'support' and 'infill' system immediately found a successful application in non-residential buildings (Kendall 2014). The flexibility is found at the design level of the 'infill', when clients participate in the design of the internal layout, thus empow-

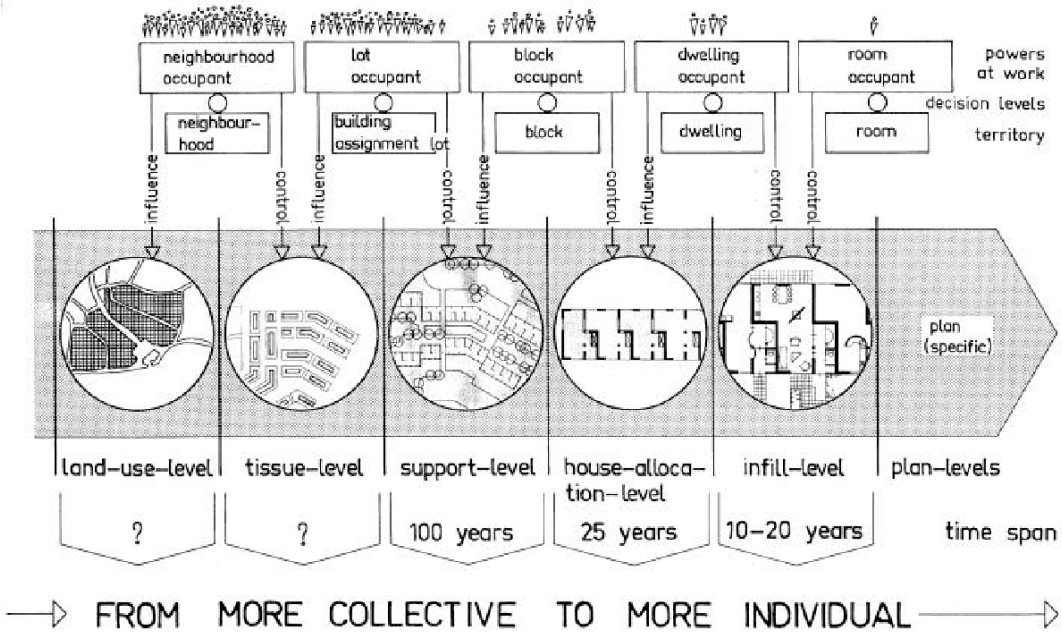


Figure 45 *The 'support and infill' concept is a part of a broader definition of time spans of different scales of the inhabited space. (Habraken 1961)*

ering them to decide how to satisfy their requirements. The independence of these two subsystems gives the building the ability to sustain changes after a subsequent renovation, a change of program or of ownership. This strategy, when applied to housing, has the potential to make the offer and the demand for dwellings' quality and features coincide. In this case, the client can design their own house based on their particular needs and budget availability (Kendall 2014). This idea brings the advantage of promoting social diversity in the same building, avoiding gentrification; while on economic terms, it doesn't let the clients find themselves having paid too much, or not enough, for their dwelling.

Flexibility Needs Rules

Figure 46 *The complex structural system of the Wohnbau Neufeldweg would allow deep modification of the building itself.*

From the works presented in the previous chapter, it is evident that the possibility for flexibility lies in the presence of something that is permanent yet still allows changes to take form. In order to open new but unforeseen possibilities for a space, the key element is to define the permanent elements that create the framework for the as yet unknown afterlife of a building. Functional freedom, which is the ability to change works according to a set of rules and fixed elements, follows a structural framework of conditions that operates in the background (Till and Wigglesworth 2002). These conditions will be called 'frame'. This may appear counterintuitive, however, experiences like the Wohnbau Neufeldweg in Graz (**Figure 46**) designed by Günther Domenig in 1988, show that extreme freedom in flexibility in every component of a building will generate high technical complexity between them. Because of that, the building has remained unchanged since construction, thus negating its quality (Schneider and Till 2005).

Different parts of the building or even space itself can act as a framework that sets the domain for changes. For example, Hertzberger states that the frame should have minimum flexibility of physical elements while having maximum flexibility of use. The space, which for him is the frame, should be polyvalent, allowing multiple uses without having to undergo any architectural or structural modifications. In this way, the building can still preserve its architectural values while also being able to modify how it is used. An example could be a layout that can change its function thanks to the room's dimensions, the relation between them and the presence of sliding doors or partitions (Hertzberger 1991). For our purpose, we will analyse the theories behind the definition of the frame as a physical element.

Bernard Cache's philosophy states that the whole architecture is indeed a frame containing the multitude of things that composes living spaces. This content is determined by the frame, but the frame is independent from the content and autonomous in its function. The permanent rules are then represented by those parts of the building that can survive multiple life cycles: such elements are the frame within which changes can occur. An example could be the frame of load-bearing columns and the content of non-load-bearing internal partitions and furniture (Leupen 2006).

Following Cache's definition, Rem Koolhaas develops his own definition in his explanation of his four-towers office building for Universal Studios in Los Angeles, built in 1996 (**Figure 47**). A building possesses an unspecified structure that will always contain the 'generic unmodified office realm'

(Koolhaas 1997). Inside, there are specific objects intrinsic to the building itself, that will accommodate defined functions, each time establishing a different relationship with the generic office space. In his building, the generic (office) space is the large floor area, while the specific objects are four towers with a specific typology, that remain fixed, permanent: they are the frame. The space between the frame is the generic space, which can have three abilities to change: alterability, if it has elements that can be changed; extendability, if it is not restrained and can expand to at least one side; polyvalence if the space can accommodate different uses thanks to its form and size. The flexibility lies in the relationship between the generic space and the frame, which each time depends on the typology that is inside the four towers (kitchen, meeting room, mixed services, etc.). Thus, the frame can be composed of different elements comprising a building. In the Universal Studio office, it is the four tower shafts that run through the whole building's height.

Figure 47 *Universal Studios Headquarters model, showing the four towers and the horizontal floors.*

To better define what the elements that can be accounted as a 'frame' are, we can look at the definition by Stewart Brand, which divides a building into categories, called 'layers' (**Figure 48, 49**): site (earthwork, non-architectural), structure (load-bearing elements), skin (protective cladding), services (plumbing, heating, etc.), scenery (internal subdivision), stuff (furniture and non-architectural elements). Eventually, another category could be added, access, which is the system of stairs, ramps, corridors, and connective surface that is typical of residential blocks (Leupen 2006). Each layer frames the one under it in a hierarchical order, and flexibility can only be reached by disconnecting (physically) one layer from its frame, making it independent from it. For instance, if the structure can bear the entire load of a building, there is no need for load-bearing walls: they are disconnected from the structure and can be displaced freely.

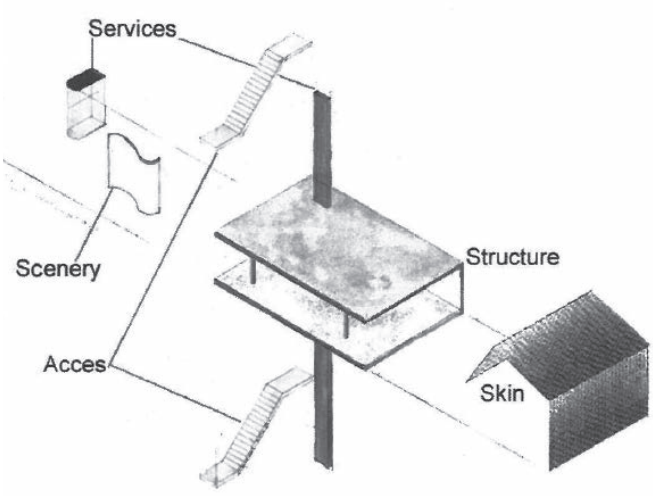


Figure 48 *The layers composing a building, as defined by Brand. (Leupen 2006 p.31)*

Five layers of architecture (Leupen 2006 p.32):

Structure	*Columns, beams, load-bearing walls, trusses and structural floors. The structure transmits the loads to the ground.*
Skin	*Cladding for facade, base and roof. The skin separates inside and outside and at the same time presents the building to the outside world.*
Scenery	*Internal cladding, internal doors and walls, finish of floors, walls and ceiling.*
Services	*Pipes and cables, appliances and special amenities. The services regulate the supply and discharge of water, energy, information and air and include the necessary appliances and the spaces primed to accept these.*
Access	*Stairs, corridors, lifts, galleries. This layer takes care of accessibility of the spaces and/or the individual homes.*

Figure 49 *The definition of the five layers of architecture, according to Brand and adjusted by Leupen.*

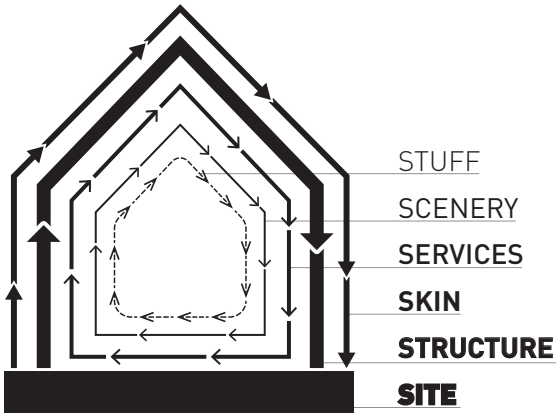


Figure 50 *Each layer has its own life-cycle's speed and autonomy from the others. (Brand 1994 p.13)*

This articulation of layers (**Figure 50**) gives a new vision for buildings: they are no more single, immutable entities with set births and deaths, but are rather an aggregation of components, each one pertaining to its layer depending on the function it responds to (i.e. windows, external doors and roof tiles are skin). Their independence extends also on their life-span: as the skin is detached from the other layers, it can be easily replaced, upgraded, or simply modified at a later time than, for example, the structure (Dhar, Houssain, and Khar 2013).

Flexibility for Existing Constructions: Adaptive Reuse

Due to their long life span, buildings may appear unalterable entities over time. In architecture, historical cases of buildings changing their shape to accommodate other functions are not rare, especially in ages when the built environment was considered a valuable resource to be exploited multiple times. Buildings that were conceived for a specific function were modified physically in order to adapt to the evolving needs of communities.

Examples are the Roman amphitheatres in Arles, France or Lucca, Italy (**Figure 51**): built for leisure purposes, they were used later on in medieval times as foundations for housing settlements around an empty oval space, resulting in a public plaza, or even complete fortified citadels. This case of reuse was extremely common throughout history: when a building responding to a purpose was not considered useful anymore in the community its precious stones and masonry were repurposed to satisfy the changing needs, by means of alteration, addition or subtraction (Leupen, Heijne, and Zwol 2005).

Figure 51 *Piazza dell'Anfiteatro in Lucca originated from the rest of the Roman structure built in II A.C.*

Adaptive reuse performed today can solve many problems of modern cities. Among them are increasing population, urban sprawl and the environmental impact of city growth (Dhar, Houssain, and Khar 2013). Moreover, as cities evolve and change, many modern buildings will at some point no longer fulfill their purpose. Present-day architects should consider the existing building stock that risks falling into obsolescence when trying to satisfy the new city's pressing needs. Giving new functions to unused buildings can become a starting point for regenerating whole districts and, eventually, whole cities (De Paris and Lopes 2017).

Cities that flourished in the past have to deal with the adaptation of their built heritage for the ever-changing needs of the present. One of the possible applications for adaptive reuse of buildings is within a city that had a strong industrial past. Countless are the examples of industrial or commercial buildings that survived time, finding themselves in new urban areas and thus acquiring new social and economic relevance (Leupen 2006). This is possible when the existing stock has a 'loose fit', (Maccreanor 2005): an over-dimensioning of spaces and volumes that allows the adaptation of several different functions.

Turin is a great example of a city with a rich industrial past and problematic post-industrial present. During the XXth century industrial revolution,

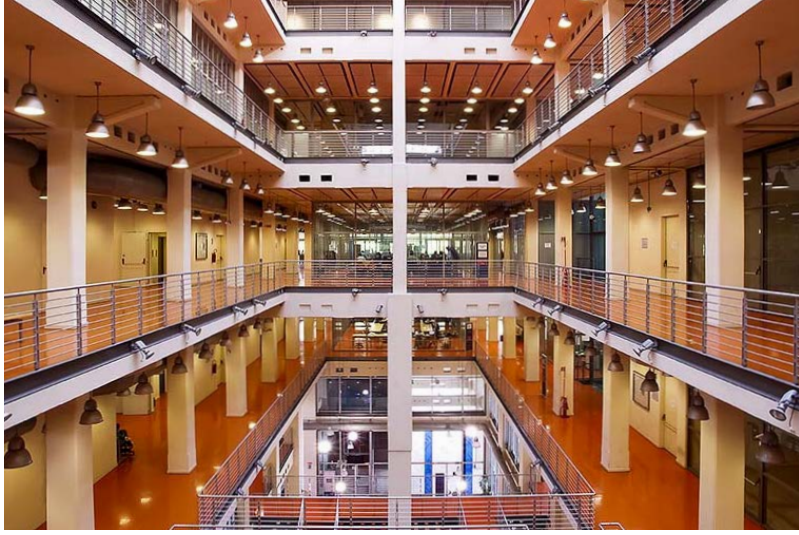


Figure 52 *Thanks to its modular structure and the presence of large voids for light, it was possible to repurpose the former FIAT factory into many different functions, like the Polytechnic campus.*

the city thrived thanks to the push of heavy industries, such as the automotive one, that played a key role in the Italian economic boom of the 1950s and 1960s. Huge immigration flows moved to Turin from all over the country, from both suburban and rural areas. This led to a massive need for accessible housing, that concentrated mostly around working areas. In the 1970s, the economic crisis hit the city, causing the relocation of people and the closure of a vast number of factories, now inglobated inside the urban fabric. A lot of brownfields were left unused, creating a derelict pattern in the city. Today, the city still has a large amount of abandoned industrial constructions, most of them left untouched since the last day of their operation. Nevertheless, some of these buildings were adapted for new users and new programs later on, as part of the post-industrial development that took place in the '90s. This fulfilled the necessity to repurpose large parts of the city while retaining the heritage and memory of its industrial past.

Lingotto

The most iconic example is the reuse of the Lingotto building, a former FIAT car factory (**Figure 53**). It was designed by Italian engineer Giacomo Matté Trucco and opened in 1923 in Via Nizza 250. The interesting feature of this five-storey building is that it has a spiral car ramp that climbs up its whole height, landing to the test car track on the rooftop. The FIAT car factory was the biggest in the world at its peak, but a little more than a decade after that, part of the production was transferred to the even bigger factory built nearby, FIAT Mirafiori. The Lingotto plant was closed in 1982, as it was outdated and in the middle of a de-industrialization period. Right after the closure, many architects gave their ideas for the reuse of such an iconic construction, Renzo Piano among them, who eventually won the competition in 1985. The long refurbishment process converted this vast building into a multifunctional part of the city, by introducing public activities like concert halls, movie theatres, a shopping mall, a private art gallery, hotels, offices, restaurants, and so on. Later on, the two academic institutions in the city transferred some faculties there (**Figure 52**): the periodontology department and a research center for orthodontics for the University of Turin, and the course for automotive engineering and Master course in architecture for the Polytechnic of Turin. The outside shell of the building has remained unchanged, but the inside was substantially amended with a new layout and partitions to meet the new requirements. This process has extended the building's life while restraining the environmental impacts of the building footprint. Additionally, its adaptive reuse helped in regenerating the urban fabric of that part of the city and reflourishing the neighborhood.

Figure 53 *The Lingotto factory was a striking modern architecture for its time. For its reinforced concrete structure and the use of functionalism in production, Le Corbusier took it as an inspiration for his studies.*

Figure 54 *The restoration of the OGR was performed by refitting the internal space with additional components and leaving the original building as it was.*

Officine Grandi Riparazioni

Another important example of XXth century Turinese industrial architecture reuse is the refurbishment of the building now called OGR (Officine Grandi Riparazioni) (**Figure 55**). The name originally was referring to the whole complex for repair and maintenance of trains and locomotives located in the central district of Crocetta in Spina 1. It was built along the railway hub connecting Turin with Genoa and Novara, along with the construction of the rail lines in 1853 and 1856 respectively (OGR Officine Grandi Riparazioni). The OGR compound was completed in 1895 between the train stations of Porta Nuova and Porta Susa, causing several inconveniences in the following urban planning, due to the fast growth of the city during the industrial era. Given the increasing need for other train services, the agency of North-Italian Railways decided to construct additional facilities, like the H-shaped building for the foundry, the furnace and locomotive assembly workshops, extending significantly the territory of the complex.

This facility, covering 19.000 sqm, was considered the biggest establishment in the city at that time (OGR Torino - La Storia 2017) and suffered severe damages caused by multiple bombing between 1942 and 1944 (OGR Officine Grandi Riparazioni). After the closing of the immense repair facility, there were several ideas of repurposing this extensive urban space without completely demolishing its buildings. In 1979 the foundry was renovated for the Railway Museum of Piedmont: it was the first try to reuse the space for other functions. Nevertheless, the whole plant fell into abandonment in 1992.

In 1995 the City Regulatory Plan gave new hopes for partial reuse of the whole complex, suggesting the Polytechnic University of Turin to increase its territory by creating a new 'urban' campus in the ex-OGR. The new project for the 'Cittadella Politecnica' by Gregotti Associati included almost total reuse of the space, integrating new welcoming academic buildings for students inside the historical industrial heritage of the site. The train warehouses were adapted for offices and lecture rooms, while the urban morphology shifted from a closed industrial system to one dedicated to the public, open functions of a university. But the university campus didn't manage to repurpose the H-shaped building, with its almost 20.000 sqm, which was intended to be demolished according to the urban development plan of Turin.

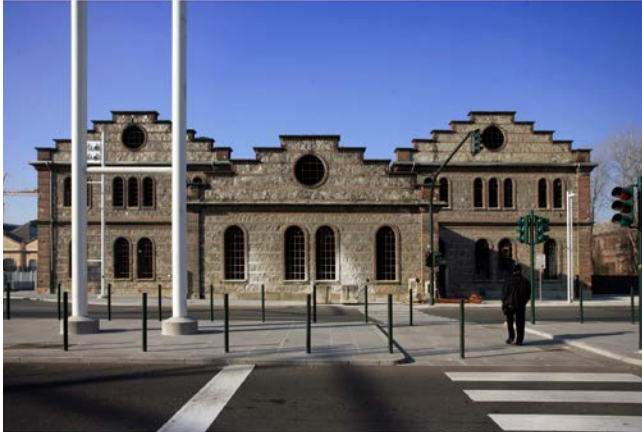


Figure 55 *The OGR is a good example of the historical architectural heritage present all around Turin.*

However, the non-profit organization of Torino 011 arranged open public visits in 2008, which helped the citizens rediscover the facility once again (Da officine dei treni a officine delle idee 2017). As a result, the building was saved for demolition and another attempt to reuse the space was staged. The workshop's halls were used for some exhibitions for the celebration of 150 years of the Unification of Italy in 2011, showing the city the spirit of this important heritage. It was the beginning of a new life for the foundry. Finally, it all led the decision to recover the space and create a new cultural gathering area for the city, and calling it with the original name of the whole complex: OGR. The restoration was carried out by the collaboration between OGR association and Fondazione CRT, and the extensive works lasted from 2013 till 2017. After the renovation, the H-shaped building acquired its new public function, hosting a multifunctional cultural center for exhibitions, concerts and performances, a start-up incubator and a restaurant with bar (**Figure 54**), while retaining its image as 'cathedral' of the industrial past of the city and showing the grandiosity of the industrial architecture of the time (Jalla 2011). The adaptation of this building was very sustainable with environmental impact reduced to a minimum (Da officine dei treni a officine delle idee 2017). The OGR made its way from a maintenance warehouse for trains to a contemporary innovation and cultural hub for all ages, creating a new attractive space for citizens and even visitors from abroad. The refurbishment project of OGR not only helped to improve the quality of the university campus nearby, but it also brought new activities to the area, making the neighbourhood more vivid and creating new communities.

Flexibility for Sustainability

Adaptability in architecture can be a support for the sustainable development of cities, including society improvement, environmental concerns and economic matters. As the population is concentrating in cities at an ever-increasing rate, and the available land in urban areas is decreasing (De Paris and Lopes 2017), the issue of buildings that can be useful for longer periods is pressing at today's city developers.

When hit by this increasing demand for housing and services, the city responds either by expansion, causing urban sprawl, or by replacing those buildings, in favourable areas, that are no longer considered useful to their purpose, thus generating waste. An adaptive approach to the existing building stock can counteract these problems, not only in cities with an industrial heritage, but also in a metropolis that suffered a crisis in the business sector and has vacant offices that can be converted to other activities, like housing. Many case studies carried out in London, Tokyo, New York and in the Netherlands in the '90s have proven this strategy to be successful (Remøy and Voordt 2014).

Flexibility is the main tool for preserving the afterlife of a building, prolonging its effective use and giving new life to a city and its neighbourhoods. However, buildings that are viable for reuse were often constructed during times where energetic efficiency sensibility was not yet established. As a result, they do not comply with present-day requirements for energetic sustainability and need to be upgraded with appropriate technologies. As

a mere economical matter, for property owners it is often more cost-efficient to demolish and build again, having also the possibility to rebuild with a better fit for future user needs (Maccreanor 2005). On the other hand, this procedure is time consuming and postpones the profit to the completion of the new building. Moreover, if the building doesn't have serious structural problems, its destruction leads to the waste of resources, that contradicts the aims of sustainability (Remøy and Voordt 2014). Even if the renovation requires higher economic investments, refurbishment rather than destruction is an effective way to diminish the environmental impact of urban transformation. Additionally, the footprint of a building can be left untouched thanks to the adaptability of new functions, thus avoiding consuming available vacant land.

Flexibility in all its forms could provide a solution to more sustainable changes in the housing typology, allowing residential buildings to be useful for a longer period. User's requirements transform over time according to personal, technological, cultural and economic changes. The most common reasons are changes in family structure - such as the addition of a new family member - or technological upgrades to increase comfort. Meeting these requests would lead the family to relocate into a more suitable dwelling or modify their house (Dhar, Hossain and Khar, 2013). From the occupant's point of view, modifying the living space requires inevitable additional investments. However, the expenses can be justified when looking at its long-term effects, which are the possibility to use the dwelling for a longer period without the need to relocate, and subsequently a better view of the living conditions and appreciation of the house. When implemented in social housing, flexibility provides a level of control for the tenants over their own living space, a quality which is usually not possible at all in such typologies (Scheider and Till 2005).

Nonetheless, the ability to delay or completely delete relocation of tenants is an impediment for the real estate market, which is based on the very scarcity of land, small living units and high demands of dwellings. Adding flexibility in a building would mean decreasing the possible maximum profit from it for a housing developer. But flexibility can also mean to give tenants exactly what they want from a house, or at least giving them the opportunity to reach it on their own. With a small additional investment from developers, the flexible living units acquire more value on the market. This counteracts high occupation fluctuations and instability and provides a solution to the problem of rapid changes in the market, with unpredictable new necessities that can be resolved with flexible housing (Scheider and Till 2005).

Finally, the adaptation of the consolidated building stock for modern needs, while keeping the load-bearing structure, outside shell, or just the general shape of existing buildings, is the tool to keep the city's history alive and relevant today. Preserving the memory of the space and recalling its flourishing past is a great way to pass knowledge to new generations (Maccreanor 2005).

OUR CONCEPT

Adaptable Village for the Olympics

Paradoxically. the most flexible and sustainable Olympics were the very first ones, where athletes would be provided accommodation in temporary bungalows or hotels (**Figure 56**). No permanent building footprint would be erected for the occasion. The hotels would return to host their usual guests, bungalows would be dismantled or reused.

Nevertheless, in earlier times there were fewer athletes participating in the Games - around 500 for the first Winter Olympics (Gold and Gold 2017), so their accommodation was less problematic than in present times, where instead there are thousands of athletes coming from all over the world, for example more than 2'500 in Turin 2006 (TOROC 2006).

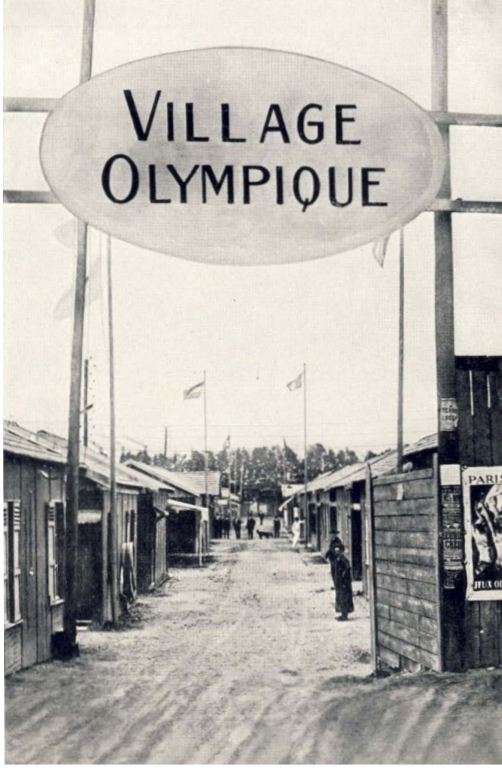


Figure 56 *For Paris 1924 Olympic Games, wooden huts were places in close proximity to the Stadium. This approach will be taken as a model in the subsequent Games, like in Amsterdam 1928, Los Angeles 1932 and Berlin 1936.*

A newly built Olympic Village will be used for this purpose only for two weeks of the supposed 100 years of the life of a building (Leupen, Heijne, and Zwol 2005). Taking this into account, it is necessary to think first about the long-term use of the building and to consider the accommodation for Olympic athletes just as a temporary change of function. The strategy involved is to construct flexible buildings that can adapt to different users in different times.

In terms of construction, this can be achieved using the 'frame', a fixed structure, and a changeable interior space, the 'scenery', the internal partition. With adaptable buildings (capable to change their internal layout for different functions) it is possible to rearrange the space division to have the best fit possible for the several uses of the building. The issue of creating a 'neutral' architecture is counteracted by the careful planning for the post-Olympic use, by analysing thoroughly what could be the demands from interested owners and assigning a 'first' function to address them. However, due to the changeable nature of the building, it is possible to assign other unpredicted functions that may arise in the future.

Anyway, this modification of internal parts has to follow specific rules. In a frame and infill solution, the infill will have to respect fixed composition rules that bound it to the frame. For example, if the infill is the dividing walls, it can be composed of ready-made components that can be arranged according to their interlocking mechanism between each other and/or between them and the bearing structure, which will be the frame. The possibilities of change will still be potentially infinite but will be determined and influenced by the rules.

For an Olympic Village, the most common post-Olympic use is dedicated to housing. Thus the building should be able to provide accommodation for both athletes and families: but they are different users with different needs. The athlete residence can be arranged with a typology of the hotel/college dormitory: single or double bedrooms with private services and common areas for communal activities. While the family housing will adopt the typology of the apartment building, with flats of various square meters and rooms. However, as already observed in the actual outcome of Turin Olympic Village, it is possible that other users will want to use the building, such as a company in search for offices. The adaptability of the building makes such change

possible, by adapting the whole floor surface for an open-space setting or separate offices, still limiting the division of space to the composition rules.

Also the sensibility towards environmental issues is increasing, especially for new buildings constructed specifically for mega-events. Since it is certain that the building will have to face modifications anyway, it is important to ensure that these changes will impact as little as possible on the available resources. As different layers of the building have different life-cycles, they need to be replaced at different times without affecting the others. So being able to upgrade the piping system without destroying the wall surface is a great advantage of using the adaptable infill system with prefabricated components, as they can be dismounted whenever a new layer needs to be changed. Following the original vocation to convert the Olympic Village into public housing, the adaptability of the building will also bring benefits. Because the apartments will be some tenants' first houses, they will be a sizeable investment that demands long term usefulness to justify the investment. But if the family needs change, they will need to move into a more comfortable house for them. With the ability to adapt and change the internal layout, it is possible to rearrange it according to their necessities, without the need to relocate.

Adaptive Reuse of MOI

The ex-MOI is a building that has served the city for more than 70 years and it had a considerable social value for its users and Turin's inhabitants. The memory of its original function may fade in with the disappearing of older citizens but the tangible memory, the building itself, will keep on standing as it was preserved as cultural heritage in 1999. For these reasons, its reuse was well acclaimed by public opinion (Bianchetti 2005), because the Markets were still a relevant structure in that urban area and the Olympic project reuse would have made possible a continuation of its history.

Moreover, its reuse fits in the city's long-term agenda of urban development through rehabilitation of dismissed industrial buildings and areas. It was a strategy well established for Turin, that pushed forward this aim for more than 15 years. The recovery of the ex-General Markets was just a matter of time in the sequence of transformations, accelerated by the Olympic project.

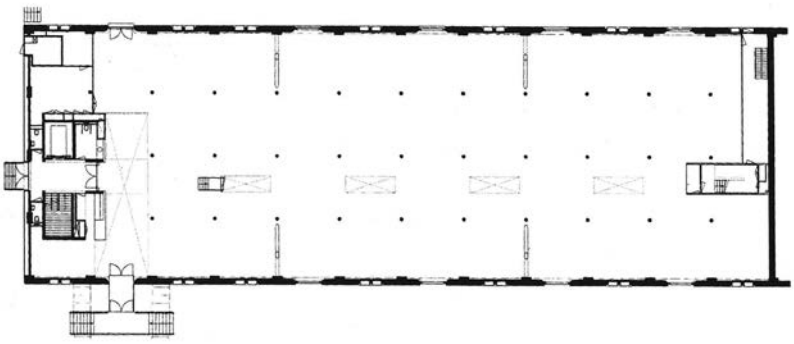


Figure 57 *The refurbishment project by Meyer & Van Schooten Architects on the Oosteiijke Handelskade warehouse, Amsterdam, 1999. (Leupen 2006 p. 20)*

The extensive brownfield directly south of it, occupied by derelict warehouses, was a missing piece on the urban pattern of considerable size. An occasion to complete the tissue with new building stock, providing housing, services and commercial surface to the district. This would have made mandatory the adaptation of the ex MOI for that area.

Its adaptable reuse can look at previous experiences of repurposed industrial buildings, like the Oostelijke Handelskade Warehouse in Amsterdam (Leupen 2006), which present the same conditions as the Turin's Markets: the

sole presence of a load-bearing structure supporting a roof (**Figure 57**). In the Amsterdam example, the warehouse was simply equipped with more architectural elements as needed, like accesses, dividing walls and services, all disconnected from the already existing structure and fully movable. The same would happen to MOI: the internal fittings won't attack the slender arcades as they will be removable.

However, the adaptive reuse of an existing structure must consider the structural health of the building and act accordingly: for this reason the reconstruction of the structural elements at the front and back of the Market has to be performed anyway, as the original technical report noted that there might be problems with the stability of the buttresses (Agenzia Torino 2006 2003b). Taking this opportunity, the intervention can be seen as a way of implementing new architectural elements for other functions, like interfacing with the dense city and the railway, with a more open and permeable relationship.

At last, the original function of the building might be taken into account as a starting point for the adaptive reuse project. The MOI was formerly a wholesale market, heavily used by inhabitants, thus a space of public interaction, conviviality and gathering. For its vocation as public space, the adaptive reuse should consider keep on guarantee public access to it, with the tailoring of specific possible functions.

PART FOUR: THE PROJECT

MASTER PLAN PRINCIPLES

A new neighbourhood

In the definition of the master plan, we focused on two key aspects for the development of this missing piece in the urban pattern of South Turin: permeability, or integration with the existing urban context and foremost, the relationship with the arcades of MOI.

The stand-alone housing blocks, arranged like chessboard pieces, were creating interesting in-between spaces blurring boundaries of private and public uses, with the aim of promoting sociability among the newly built neighborhood. However, this urban morphology doesn't originate from the context, which is instead formed by the traditional housing block. Common in the XIXth and XXth century Turin's development, reused later on in the '60s and the '70s with inner courtyards, it is defining the perimeter of city blocks.

For this reason, we adopted the same surroundings' morphology of a close perimeter and an open courtyard, but declined it in a way strictly related to the two major urban objects directly nearby: the ex MOI and the railway.

This urban area will be enclosed by a housing boundary that will open up specific access points to the public open courtyard inside. This will free up the view to the Market arcades, a significant architectural feature that we believe should be clearly visible and appreciated by passers-by and residents alike.

The Athletes' Village design

As the Olympic Village will be repurposed mainly for housing, we will adopt the multi-storey linear block. They will be arranged along the perimeter of the lot, interrupted by two types of access points for the inner urban courtyard: the ones between one building and the other, and the ones directly under the 'green staircase'. It is a connective vertical volume that, on the street level, allows to pass through the building crosswise, while vertically link the ground, the other floors and the public terrace to each other with a set of stairs immersed in a vertical greenhouse.

To ensure optimal integration within the city, we first observed the patterns and typologies of the near context, resulting in the adoption of the housing block with courtyard. We expanded it to the whole available area to create an urban courtyard acting as a linear public space.

Building height is adjusted in order for the blocks facing Via Giordano Bruno to have a clear view of the Turin Hills and the Lingotto across the railroad. Therefore, the buildings on Via Giordano Bruno will be higher than the ones on Via Zino Zini. Moreover, their storey number will decrease the closer they will get to the ex MOI, to ensure height relationship and a better view on the arches from the public terraces.

These linear housing blocks will be arranged parallel to the longitudinal axis of the area: this will direct the views to the MOI side facades, valorizing the rationalist concrete galleries. A sort of unexpected view, typical of baroque architecture, that will be revealed only when purposefully entering the urban courtyard. It is one of the factors to push public use

of this urban space and ensure permeability, along with equipped areas dedicated to sport, leisure and urban greenery. The building's boundary will act also as a closure towards the rail lines, without seeing it as a degrading object but rather as the background of the linear green park that runs in between the housing and the railroad.

The new Olympic Village is conceived with adaptability in mind: after the temporary accommodation for the athletes, it will have to respond to the needs of that particular urban area. The functions were already defined by the PRG, but once set, they can still vary in unpredictable ways. The building will be able to adapt thanks to its polyvalent floor surface, fixed piping outlets and the position of its load-bearing structure: in our study, it can accommodate public apartments, student residences and offices. The only unchangeable (to an extent) designated purpose would be the one on the ground floor, as the attachment to the ground of a residential multi-storey building can be dedicated to commercial activities, restaurants and private small offices, that do not necessitate the level of privacy of a dwelling. It will be possible to change the space subdivision thanks to the modular system of partitions and glazing, composed of movable panels with a dry installation. The self-supporting panels are attached to the ceiling and the floor, and the glazing facade panels are provided with opaque partitions to adjust the level of privacy. The service shafts are fixed and flanked by the structural columns.

The roof can be employed for public use: this 'public terrace' can be accessed through the green staircase that crosses the building vertically: an occasion to extend the public realm to unconventional heights, giving it new values. As the whole Village prohibit car use, the vertical staircases will be placed in positions that allow an extension of the urban flow (i.e. people, bikes) coming from the city. They can also serve the function of greenhouses, storing heat during winter and promote greenery in a consolidated anthropized context.

The internal courtyard will form an extensive urban plaza defined by different zones, paths and equipment. Its backdrop is the MOI facade and its galleries, which extend visually with lines on the floor that cross with contrasting slanted paths and mark patches in the ground, to fill with vegetation, urban furniture or outdoor exercise machines. The underlying theme is sport, a tangible trace of the Olympic spirit that can promote a healthier lifestyle. The equipment is accessible to multiple users, from giant chess boards to playgrounds for children. The plaza has a basketball court and an outdoor gym below ground level with stairs that double as seats, to define their spatial occupation but without enclosing them in material boundaries. A patch with 80 flagpoles will show and remember all the countries that have participated in the 2006 Winter Games, like a monument.

New functions inside MOI

The ex-General Markets will be restored with the intention to use them mainly for higher education, as the area has some academic centers that can be served by it (like Polytechnic of Turin's branch in Lingotto). One wing would be home to a research center for Biotechnology shared between the University of Turin and the Polytechnic of Turin, a project long sought by the two institutes but now in a standstill. A university hub with services for students (study rooms, a canteen etc.) will be hosted in the other galleries, increasing its quality and supply not only in the District but also in the whole city.

To counteract the perception of segregation that a university campus can generate for the population out of target, inside the 'airplane' there will be spaces dedicated to activities for the community, such as workshops, evening schools, small district library or after-school clubs. This way the Market can still be accessed by all segments of the population and not only by students and scholars, either by making use of public activities, or just by crossing the central square to reach the footbridge. The bigger, outwards galleries are left open to allow internal flows in the whole Olympic Village: they will be used for exhibitions and to engage the city with informative activities.

Public spaces and flows

As the Olympic Village was conceived to be an innovative neighborhood without car circulation, particular attention had to be given to public spaces and passages, to develop a solid system of alternative flows, mostly on foot and by bike. Because of the Market's large extension, the two external galleries will be left accessible for internal passage to improve public transit. The university's research labs and commercial activities will overlook the arcades, for visual permeability.

Pedestrian movement on a north-south axis is eased by the internal urban courtyard, the Market's public galleries and the overall narrow and long shape of the Olympic Village. But in order to promote flows also on the west-east axis, from via Giordano Bruno to the railway and the high-speed road, a natural park will be placed side by side the whole area. It will act as a buffer zone between the residential buildings and the two transportation infrastructures, while also increasing green spaces in the district and the overall livability of the neighborhood.

Another important attracting point for urban flows is the pedestrian bridge, as it will materially connect the Olympic Village with the Lingotto and the other side of Turin. The Lingotto multi-functional center can profit from the proximity of the green park and the urban courtyard, while users of the Polytechnic campus can cross the rail lines to reach study rooms and other academic services. The residents of the Village and the whole neighborhood will easily access the footbridge, as its access is now inside a controlled and safe area of the research center campus. The many shops and public activities inside the General Market and the Village will draw in all the other inhabitants in the area.

THE ATHLETES' VILLAGE ADAPTIVE RESIDENTIAL BUILDINGS

Program based on time

The program of the residential building will have to face a change after the Olympic Games are over and the Village will be given back to the city. The transition between in-Game and post-Olympic layout will be bound to stakeholder demands for specific functions that the property owners will want to fulfill. As we saw in its evolution of events, the Olympic Village towers, conceived as apartment blocks, were sometimes used as student residences or offices, requiring either entire renovations or minor changes. Taking into account this situation, the alternative project will simplify the process of modifications on the layout. After the Olympics, the floor surface will be adapted according to the appointed functions, but could always change whenever there is a new need to fulfill.

The structural scheme is formed by the repetition of a 'unit', a structural elemental entity that is composed of four reinforced concrete columns and cantilevering steel beams. The spans between the columns form a square grid of 6.00 by 6.00m, and between each square repetition there will be a 2.80 m span addition. The floor extends by 3.90m on each long side, supported by cantilevering beams, and by 1.50m on each extremity. The shortest span of 2.80m can accommodate an 'access module', composed of demountable, stand-alone metal stairs and lift shaft, by removing the flooring structure present in that space.

Student residences

The least impacting scenario is the conversion to student residences: the blocks that once housed Olympic athletes can be reused as they are for students. There would be single or double bedrooms with private services (equipped with washbasin, toilet and shower) and an external space, all completely accessible also for the disabled (as they will be used also for hosting Paralympic athletes), as well as common areas with kitchen and dining room on each floor, on each extremity the building.

Offices

For office repurposing, the entire floor surface will be emptied out and refitted at the company's request, using the stock of dismounted panels from the renovation. Since every structural column also includes the piping shafts, the services can be removed and displaced according to the office division. The kitchen and the common room can be left at the same position or modified as well.

In both office and student residence programs, the facade of the building will appear multifaceted as the glazed curtain-walls are not orthogonal to the walls but angled and recessed, to create loggias. The slanted effect is given by adding two lateral supports of 2.5 cm to the curtain wall structure, composed of panels of 60 cm width (**Figure 59**). The minimum span of the loggia will always be 90 cm, to ease the passage of a wheelchair and to use the irregular surface of the outdoor area in the most efficient way.

Housing

In the rearrangement of plans for the housing program, the floor area

will be divided according to how much square meters are bought by the owners (**Figure 58**) and, consequently, how many rooms are going to be inside. The variations could be endless, from two-room to four-room apartments, in various distributions and numbers. The internal corridors of the athlete residences will be eliminated and assimilated by the apartments, in order to maximize the available surface. In this way the apartment doors will have to be arranged around the 'access module' and, whenever they are not there, they will be added accordingly by removing the floors and inserting staircases and lifts.

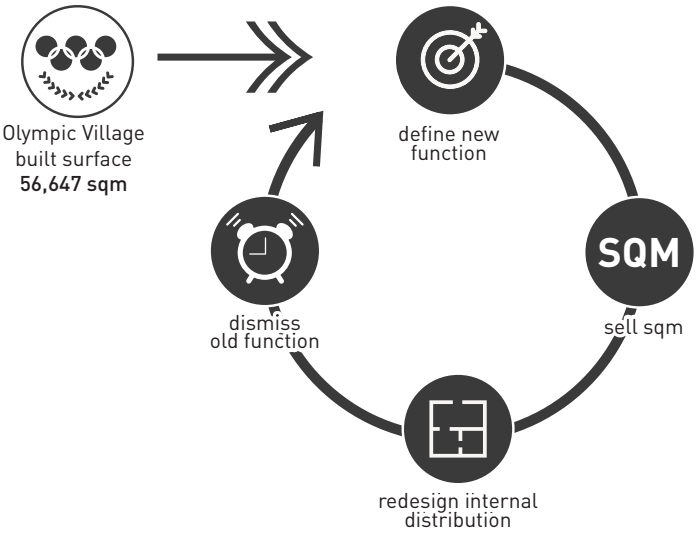


Figure 58 *The transition process between Olympic and Post-Olympic use, defining the loop of changes that the adaptive building can face.*

At minimum, the apartments will have a kitchen, a dining area, a bedroom and a bathroom. Contrary to the student housing and office typologies, theses residences will have flat glazed facades with recessed rectangular loggias, to visually differentiate the functions. They will have opaque partitions at the bottom, to ensure privacy. The minimum span of this outdoor space is 1.20m, given by two glazed panels.

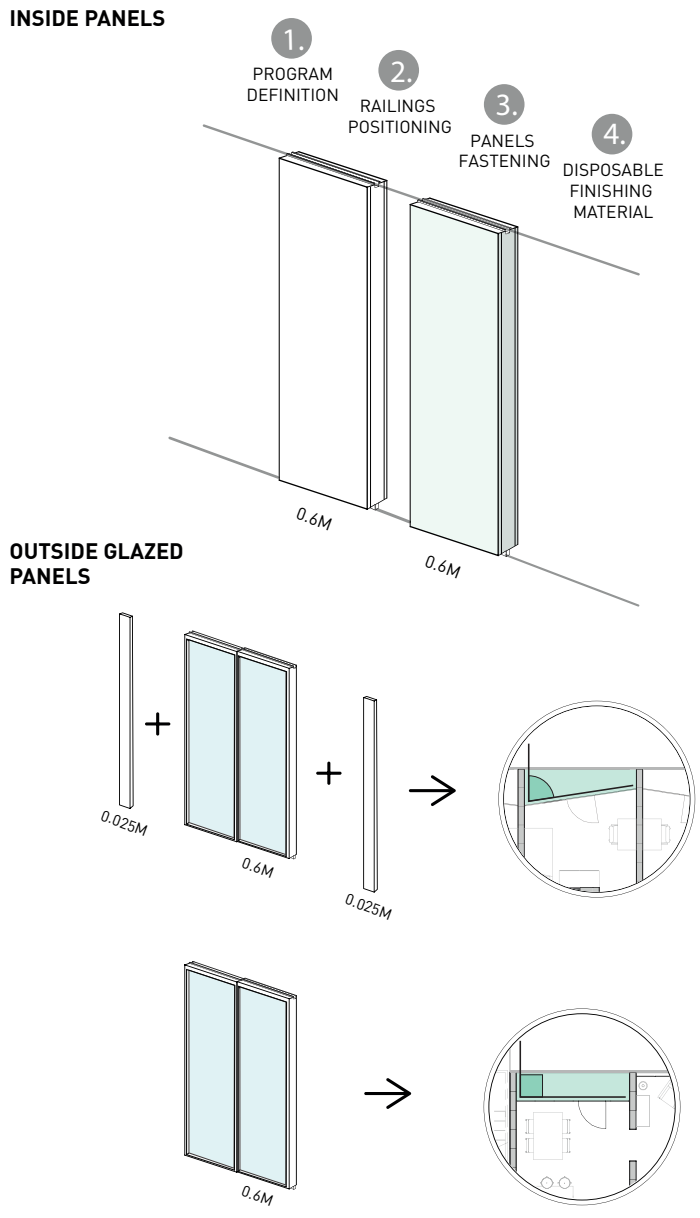


Figure 59 *Schematic assembly detail of internal panels and window panels.*

MOI
ADAPTIVE REUSE

Program: Biotechnological Research Center & Incubator, services for Education, Commercial Spaces, services for the neighborhood

The adaptive reuse of MOI will have to be executed in two subsequent time periods: the in-Game and post-Olympic ones. The main strategy is to fit the Olympic functions into an already set internal disposition of the post-Olympic program, which will be mainly a Biotechnological center and higher education services.

Because the Market will be used for the international and administrative center of the Winter Olympics, it will have to strictly follow the program subdivision established by IOC norms. Just like the project already performed in 2006, our alternative proposal will follow the same settings. The two units' arcades will be closed by a glazed facade starting from the second row of arches, to create a sort of porch. Internally, the available surface will be divided according to IOC directions by removable internal partitions, to guarantee a reversible intervention.

The post-Olympic period will reuse most of the Olympic subdivisions, services and distribution (**Figure 59**). Therefore, the Olympic canteen and kitchen will be kept entirely, but will be reduced in size, and will be available for students and researchers. The same will happen for the Olympic bar and disco, that will be merged together and repurposed as a café, accessible from the outside gallery not only to students but also for other clients coming in from the city. Another example is the gym, which will continue to be used even after the Games, as a trace of the past function that will continue its usefulness. Along with the indoor training courts,

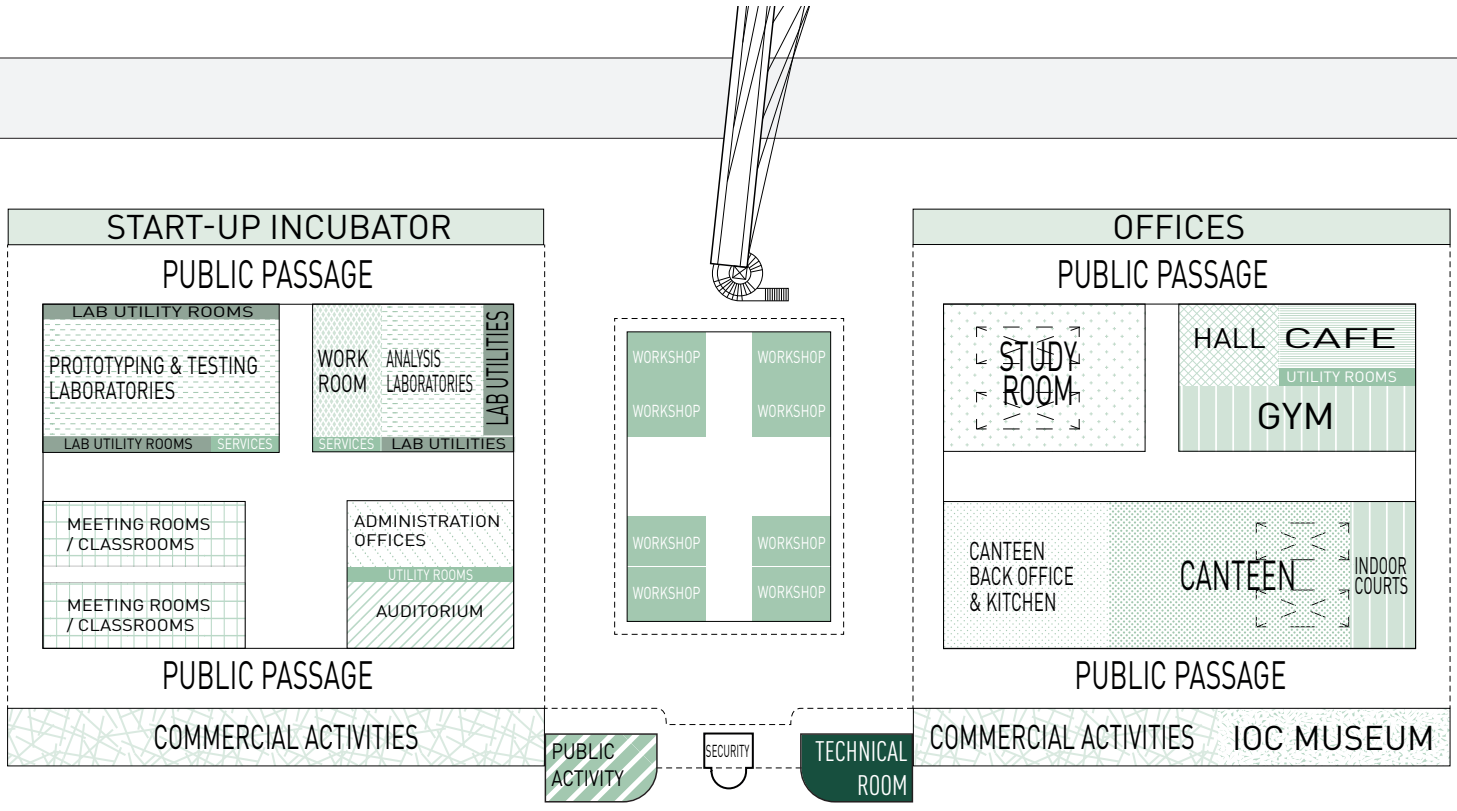


Figure 60 *Diagram of post-Olympic functions inside MOI*

inside the education services building, they will promote a healthy and mindful lifestyle in students and neighborhood residents.

The right wing will be dedicated to education services, like a silent study room with mezzanine and a large canteen for students and researchers, with its back-office and kitchen. Moreover, there will be also public activities, like a café with a hall for temporary exhibitions related to academic works, a gym and two small indoor courts for basketball and football exercises. Given the great surface of the canteen it can serve other purposes outside mealtime. Inside there will be a set of auditorium stairs with seats leading to a mezzanine with a relax area: the auditorium can be used for informal presentations and lectures, while the many tables of the canteen will be left for students to use for their needs, for example for a 'noisy' study and work area.

In the left wing there will be facilities pertaining to the biotechnological research center, like laboratories for analysis, prototyping and testing, comprising their technical rooms and services. There will be also workrooms with computer stations and classrooms for lectures and meetings, a formal auditorium and administrative offices. The laboratories and some classrooms will face the four outward public galleries, in order to promote visual permeability from outside.

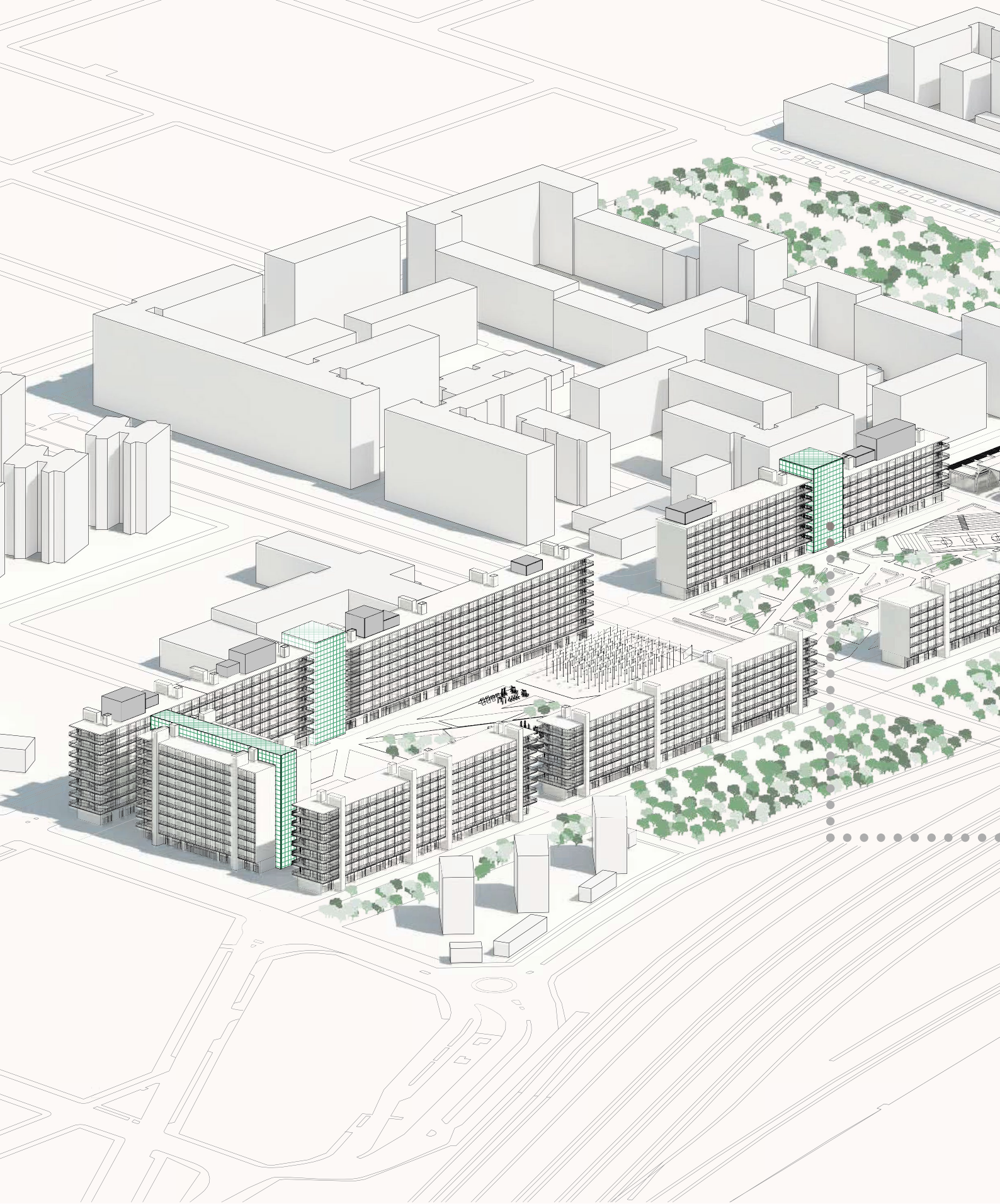
The volumes on the back of the Market that face the green park will serve as spaces for activities related to research, like a start-up incubator and offices for public-private cooperation on biotechnological inventions and to support prototyping and patenting. The blocks on the side facing via Giordano Bruno will be used for shops and for an IOC museum, collecting memories of the Olympic experience.

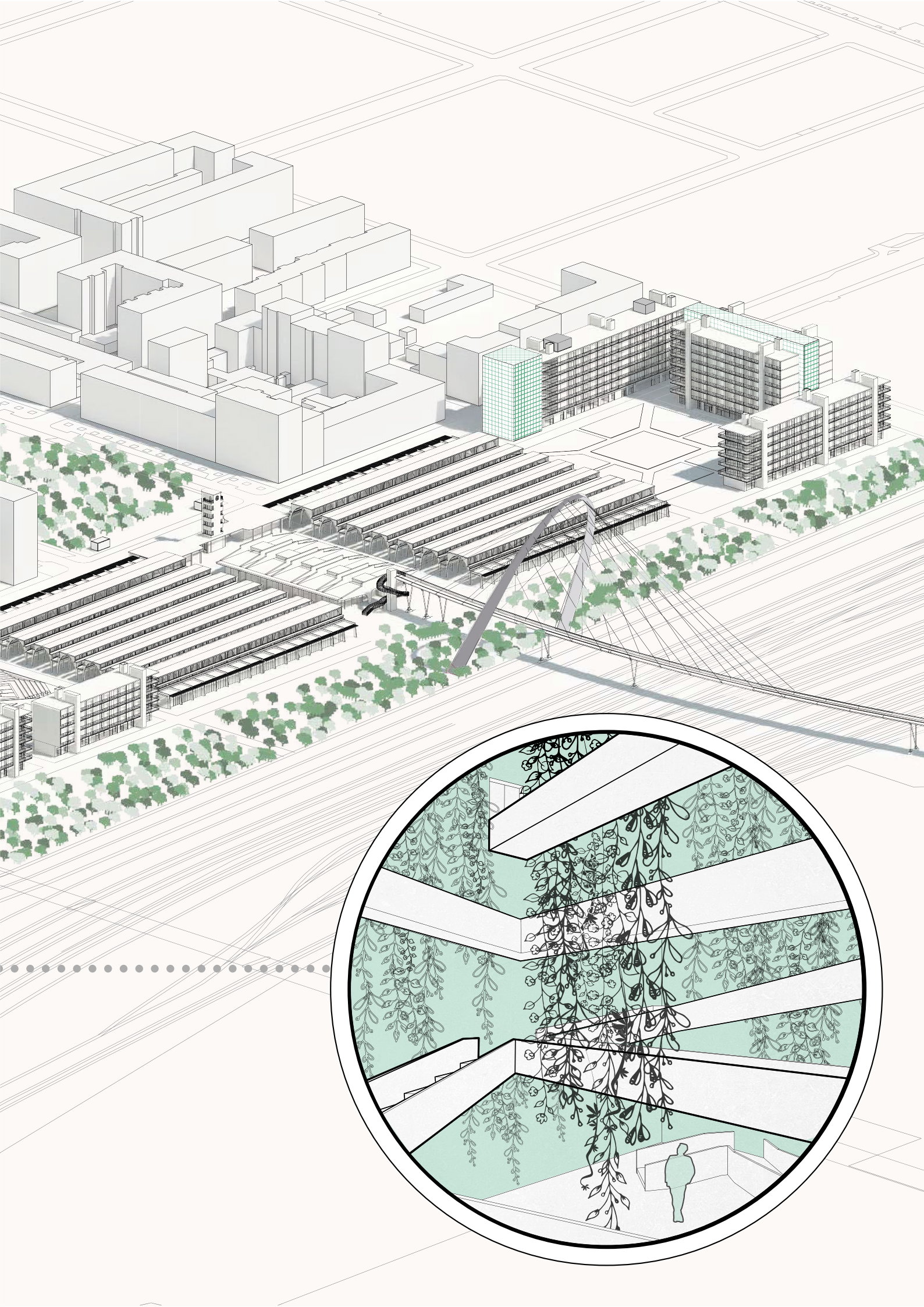
As some of the functions inside the education center will be available outside working hours and on weekdays (like the café and the gym), their access path has to be planned and placed to ensure the passage, but also to protect the research center and the education center that will be closed. Therefore, the four public galleries will be left open after university's working hours and during weekends, as well as the central part with the covered roof.

The central covered roof will have workshops for public activities in the neighborhood, but the structure itself can be crossed in both ways during opening hours to ease the passage between the two parts of the General Market.

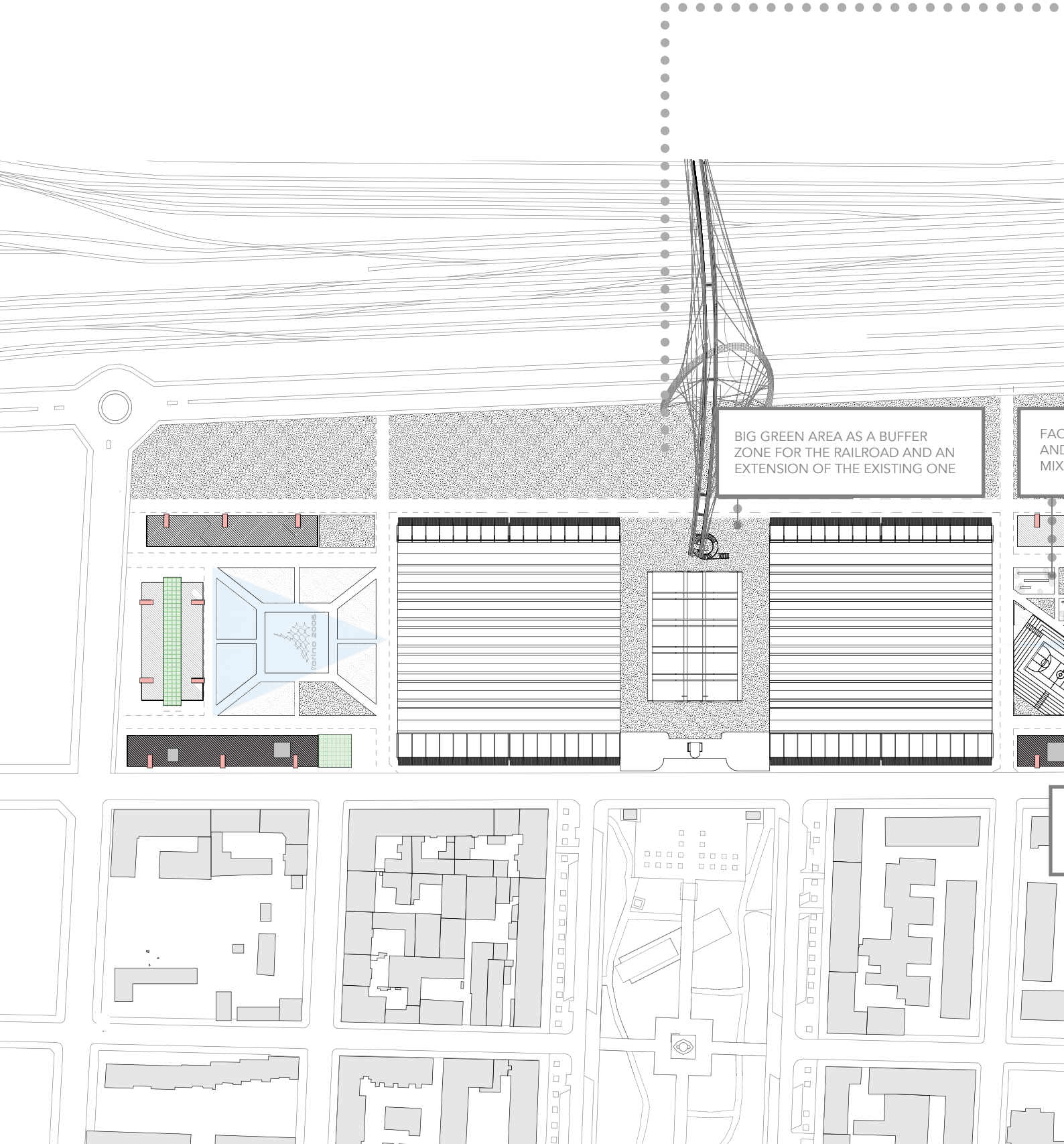
DRAWINGS AND VIEWS

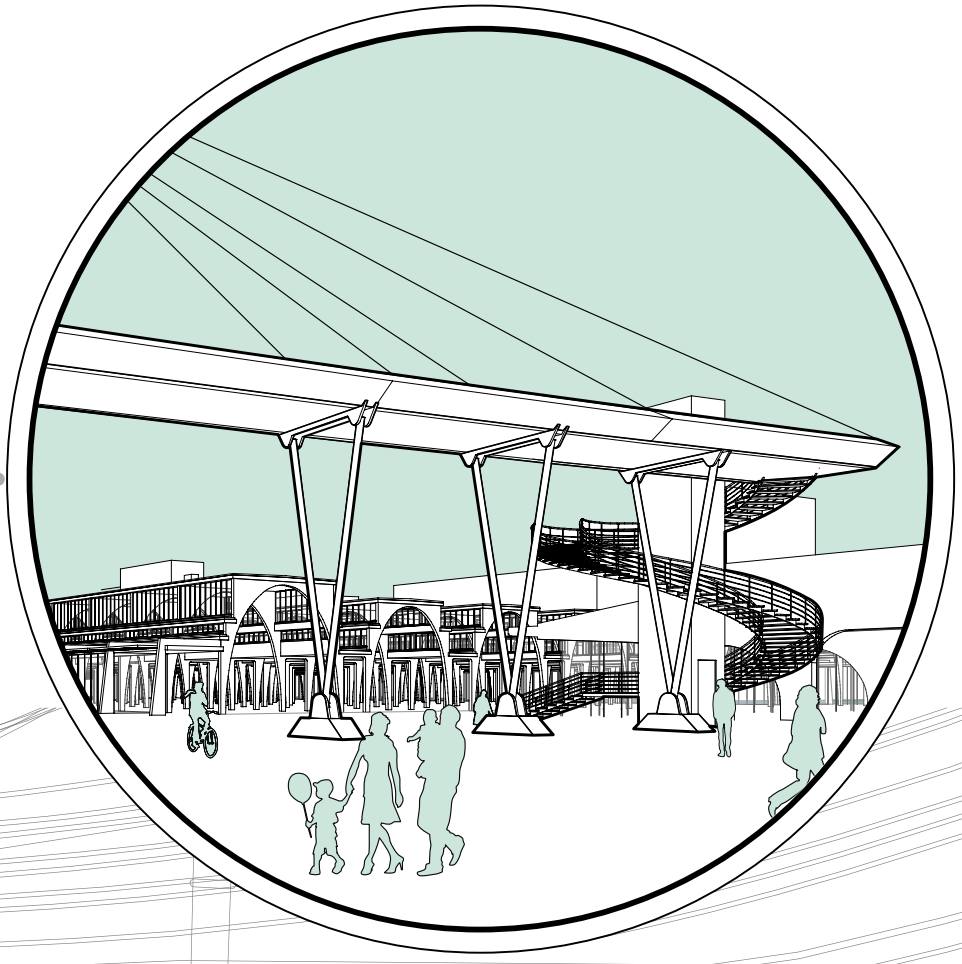
ADAPTABLE ATHLETES' VILLAGE





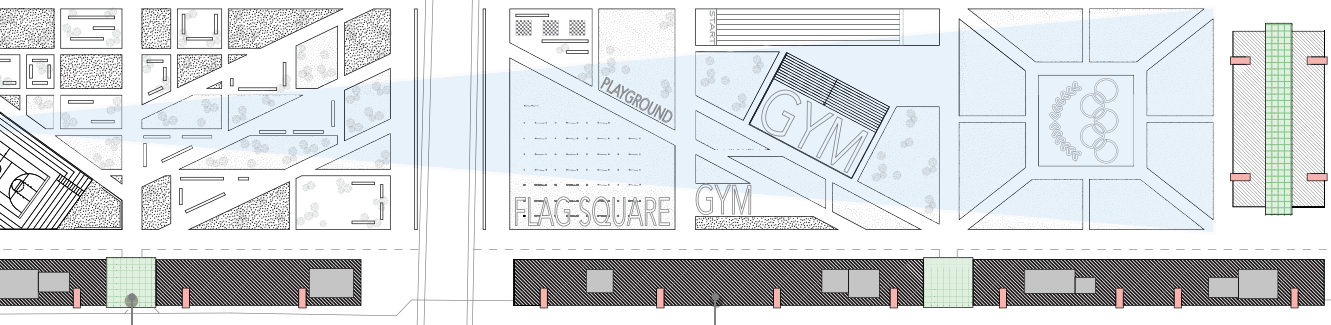
ADAPTABLE ATHLETES' VILLAGE





ILITIES FOR THE INHABITANTS
D THE NEIGHBORS: GREEN ARES
ED WITH GATHERING AREAS

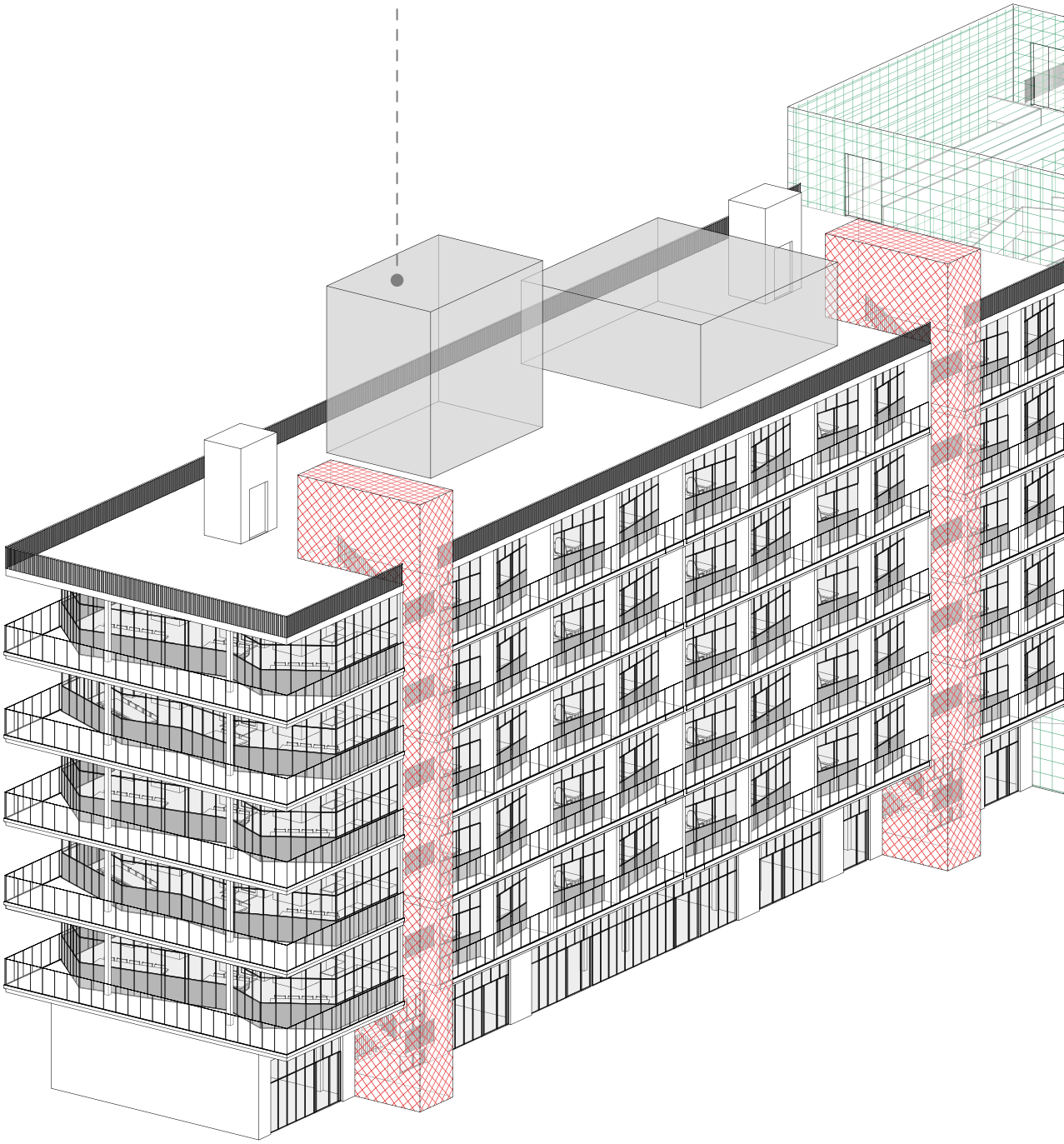
RESIDENTIAL BLOCK WITHOUT PUBLIC ACTIVITIES ON THE ROOFTOP OF THE BUILDING

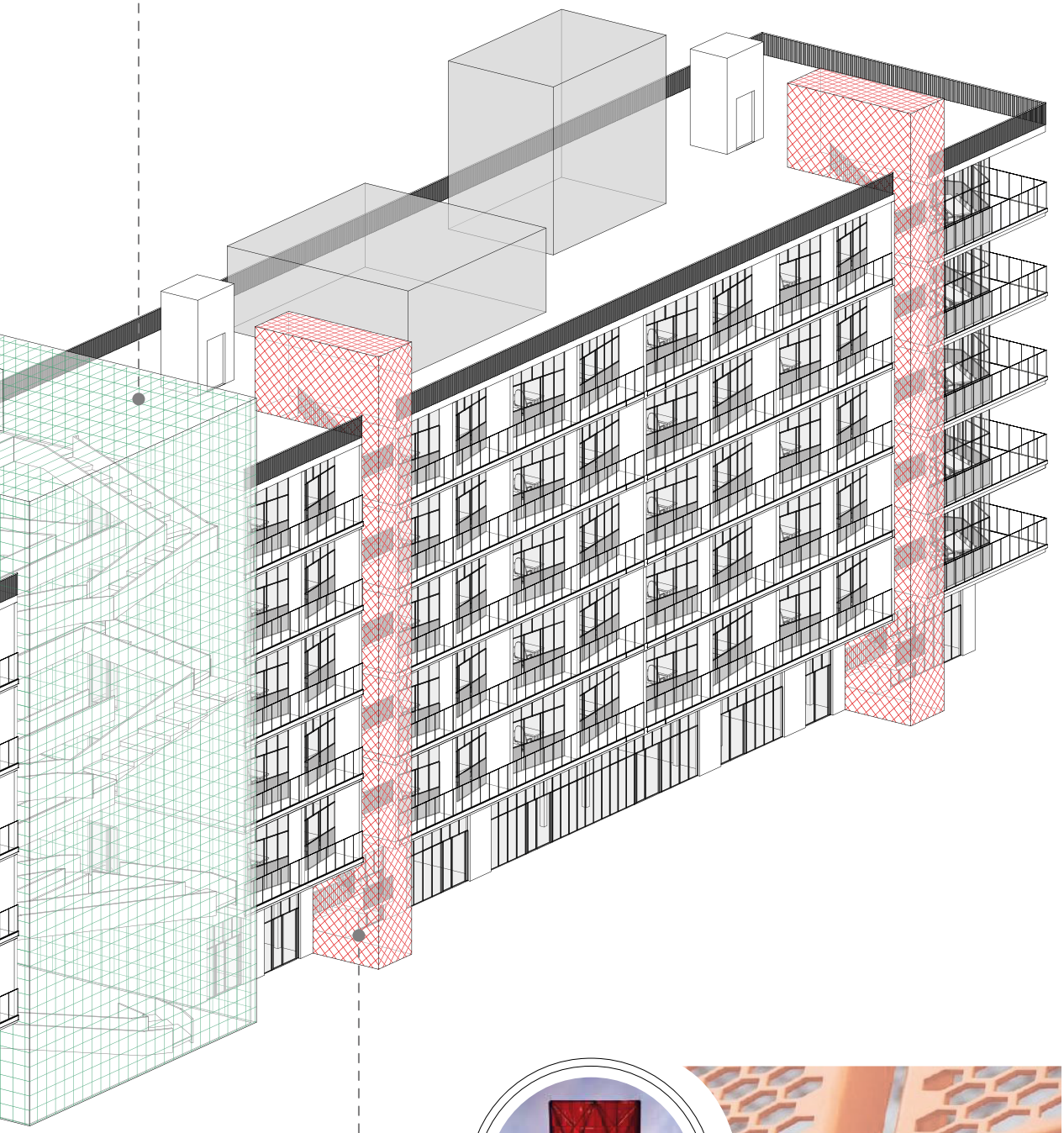


VERTICAL GARDEN, ACCESSIBLE TO THE PUBLIC WITH A PRIVATE ACCESS TO THE BUILDING

MIXED-USED BLOCK WITH PUBLIC ACTIVITIES ON THE ROOFTOP OF THE BUILDING

SPECIAL FEATURES





BUILDING PROGRAMS

OLYMPIC ATHLETES' / STUDENTS' RESIDENCE

HOUSING

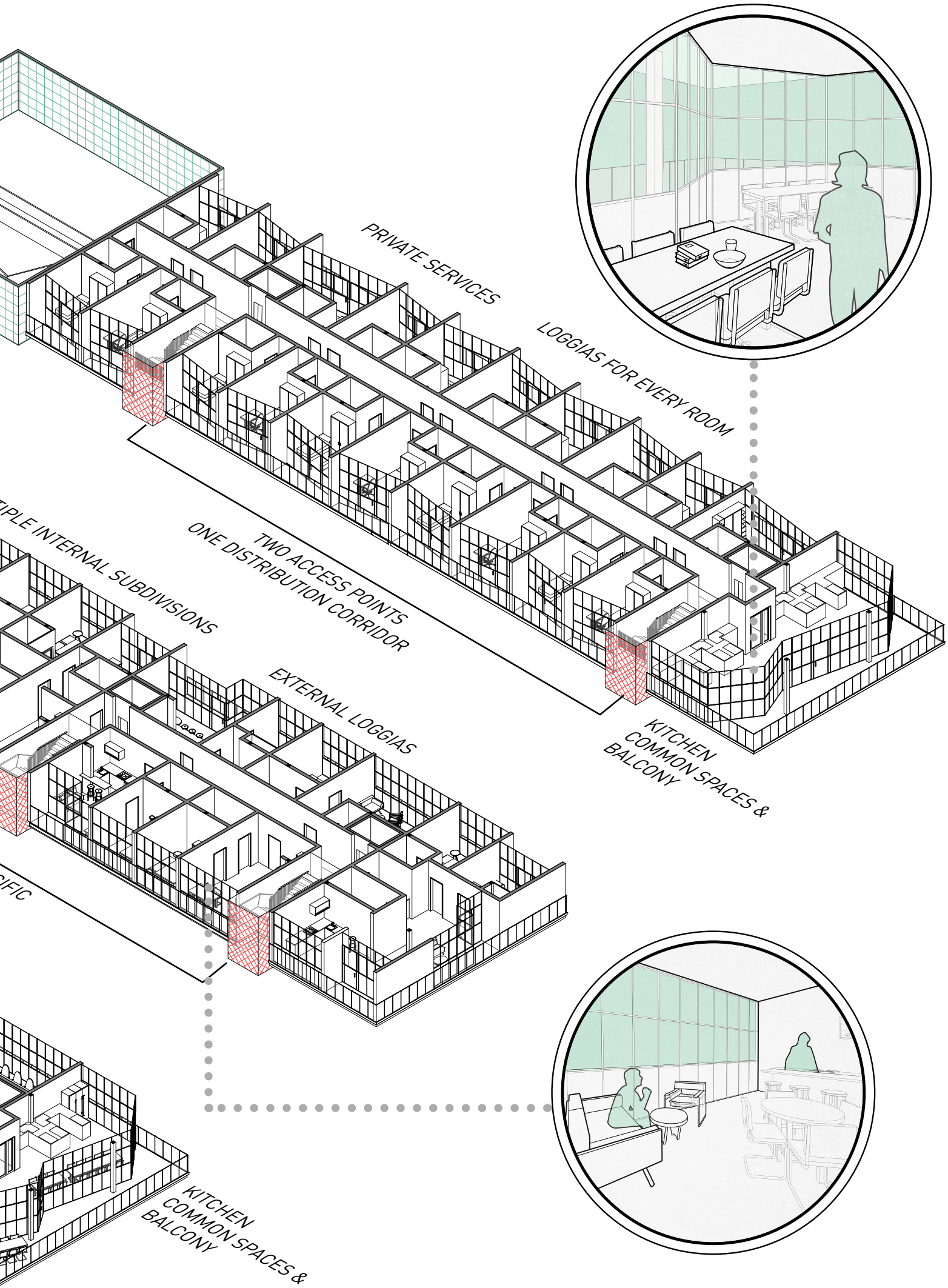
OFFICE

MULTIPLE SPEC
ACCESS POINTS

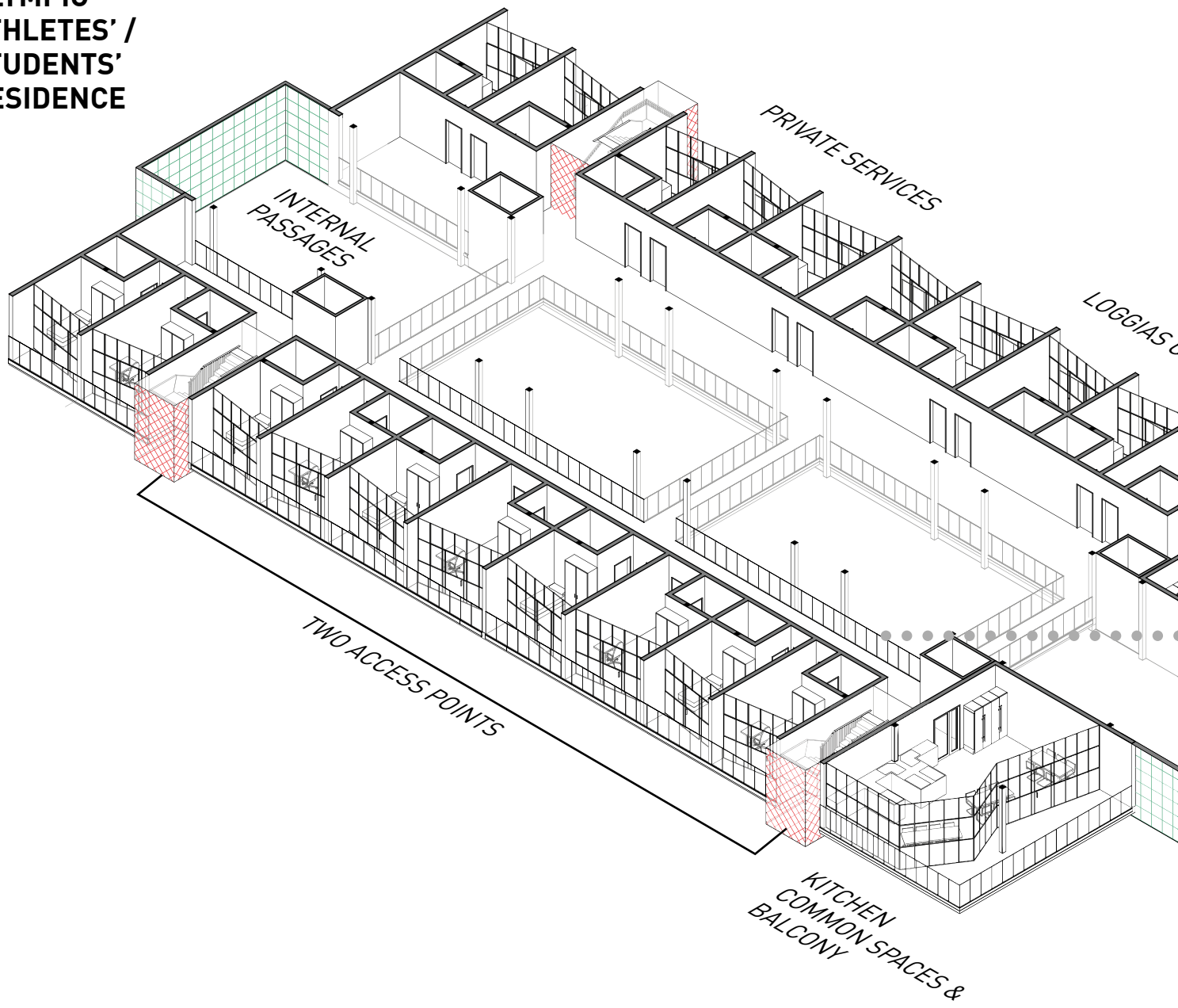
OPEN LAYOUT

MEETING ROOMS,
PRIVATE OFFICES,
SERVICES

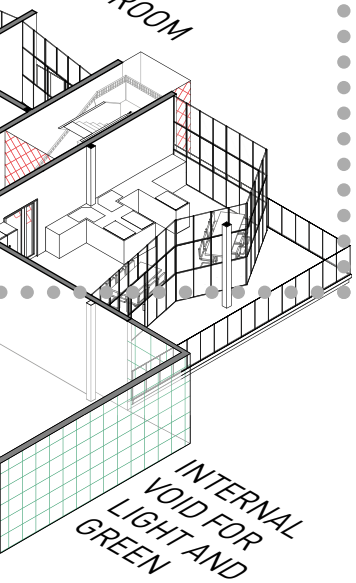
TWO ACCESS POINTS
FREE DISTRIBUTION


PRIVATE SERVICES
LOGGIAS FOR EVERY ROOM
TWO ACCESS POINTS
ONE DISTRIBUTION CORRIDOR
KITCHEN
COMMON SPACES &
BALCONY
EXTERNAL LOGGIAS
KITCHEN
COMMON SPACES &
BALCONY

OLYMPIC ATHLETES' / STUDENTS' RESIDENCE



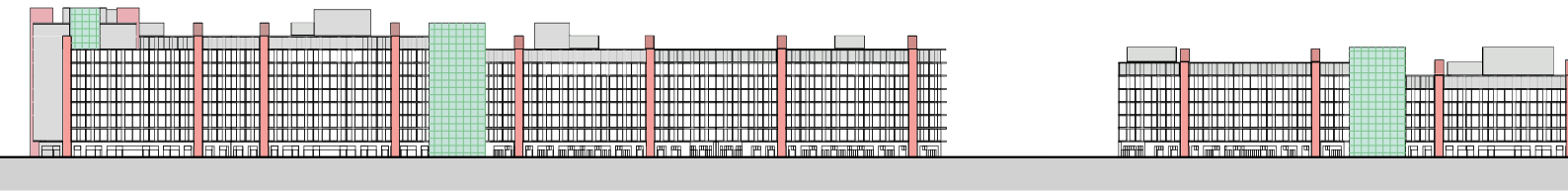
ON EVERY ROOM

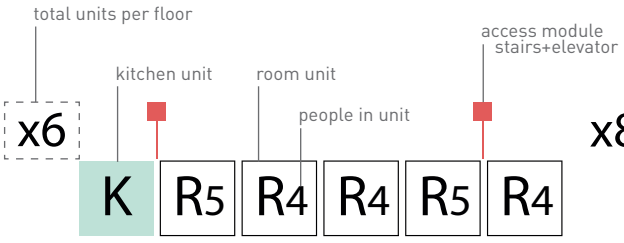


INTERNAL VOID FOR LIGHT AND GREEN

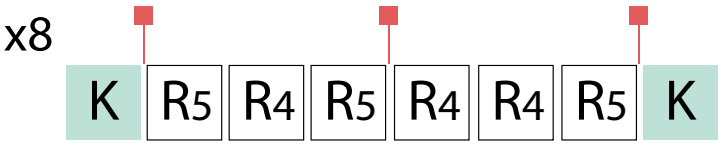
BUILDING TYPOLOGY

SCALE 1:2000

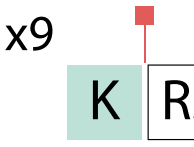


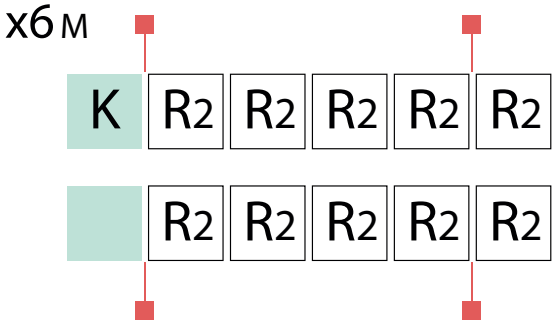


22 people/floor

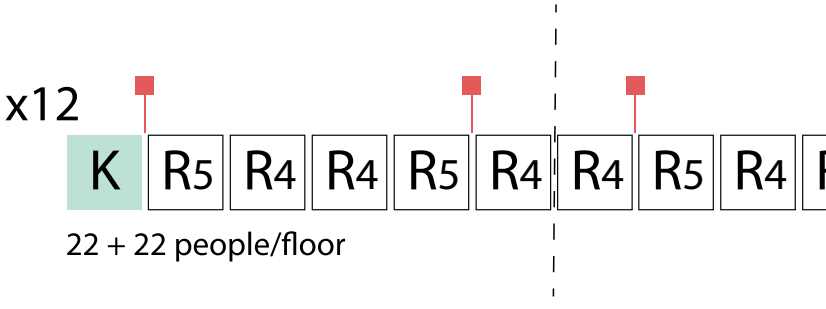


27 people/floor



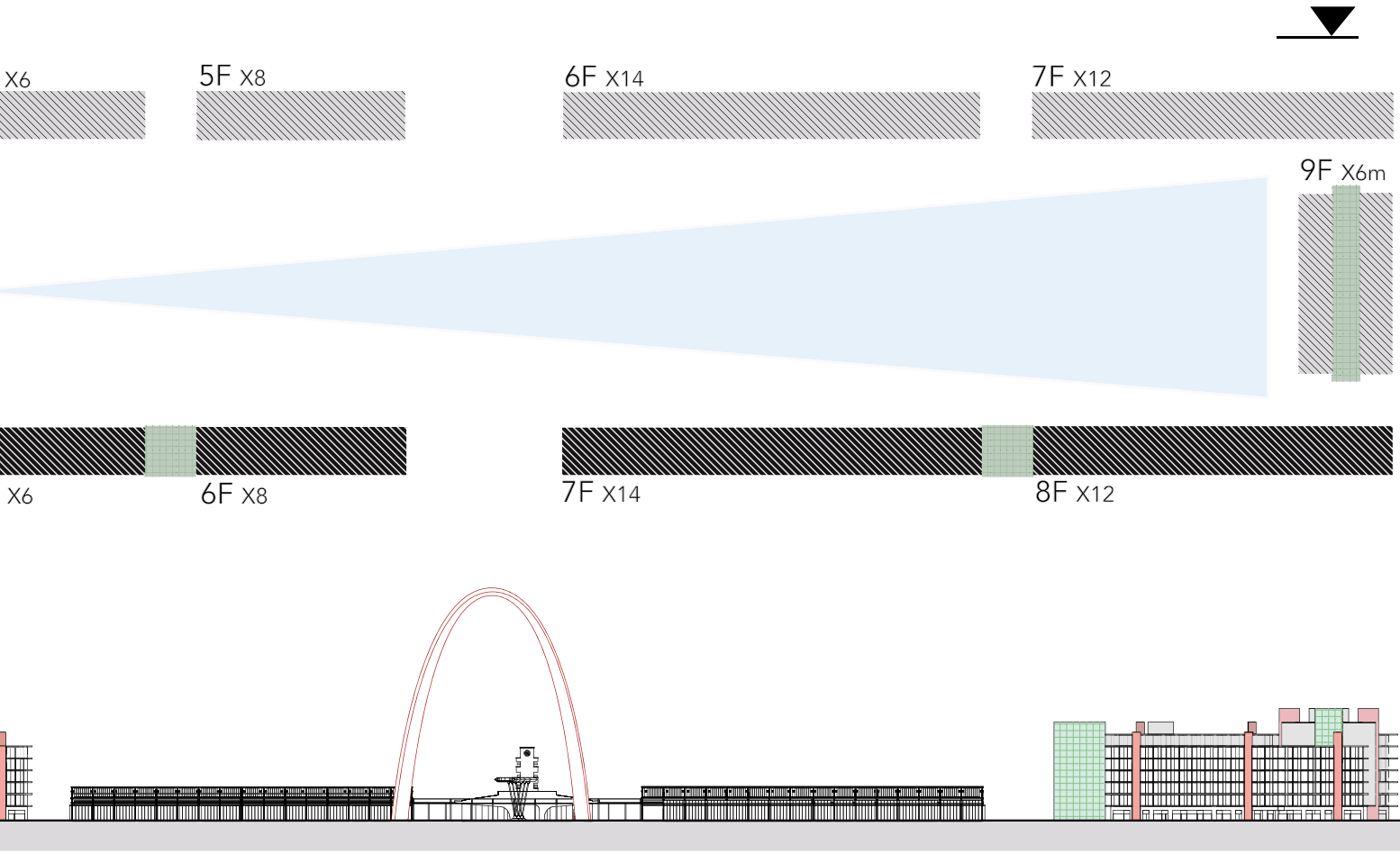


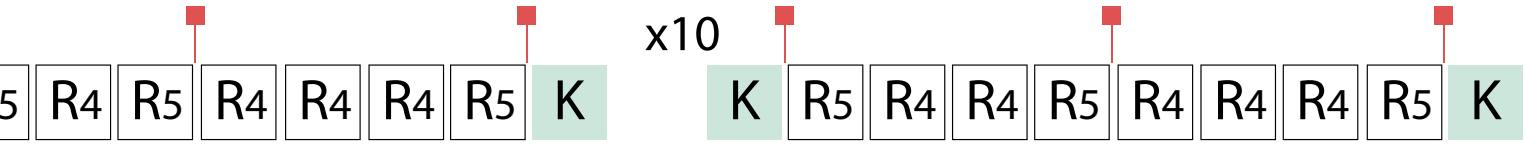
20 people/floor



22 + 22 people/floor

Total Available Bed Places (during the Olympics): **2.505**





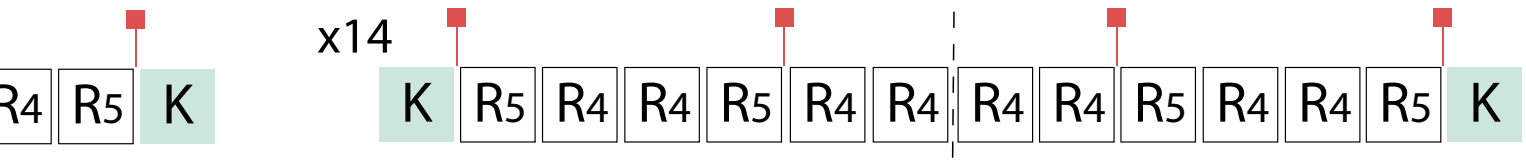
31 people/floor

x10

35 people/floor

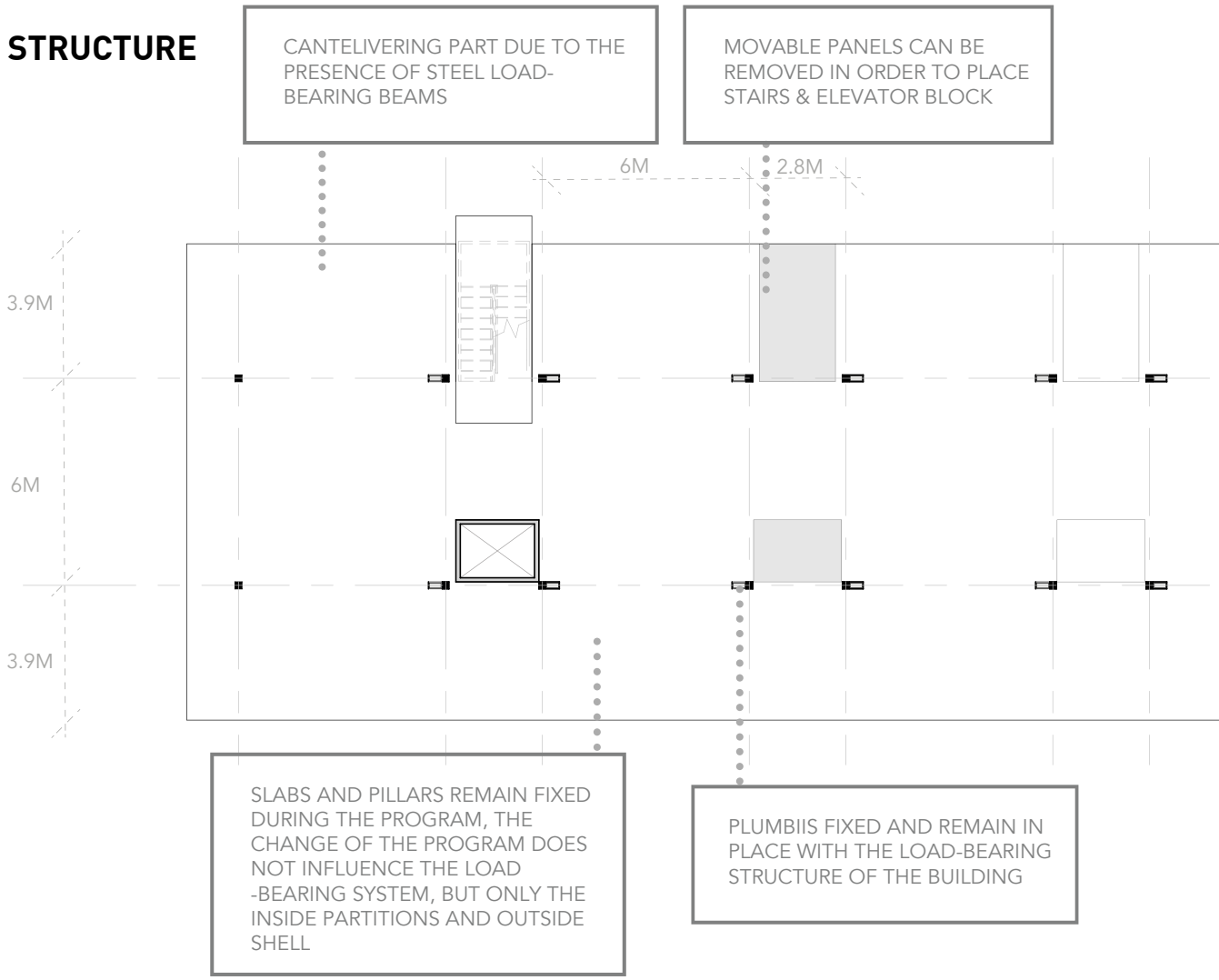
x7 + x7

x14

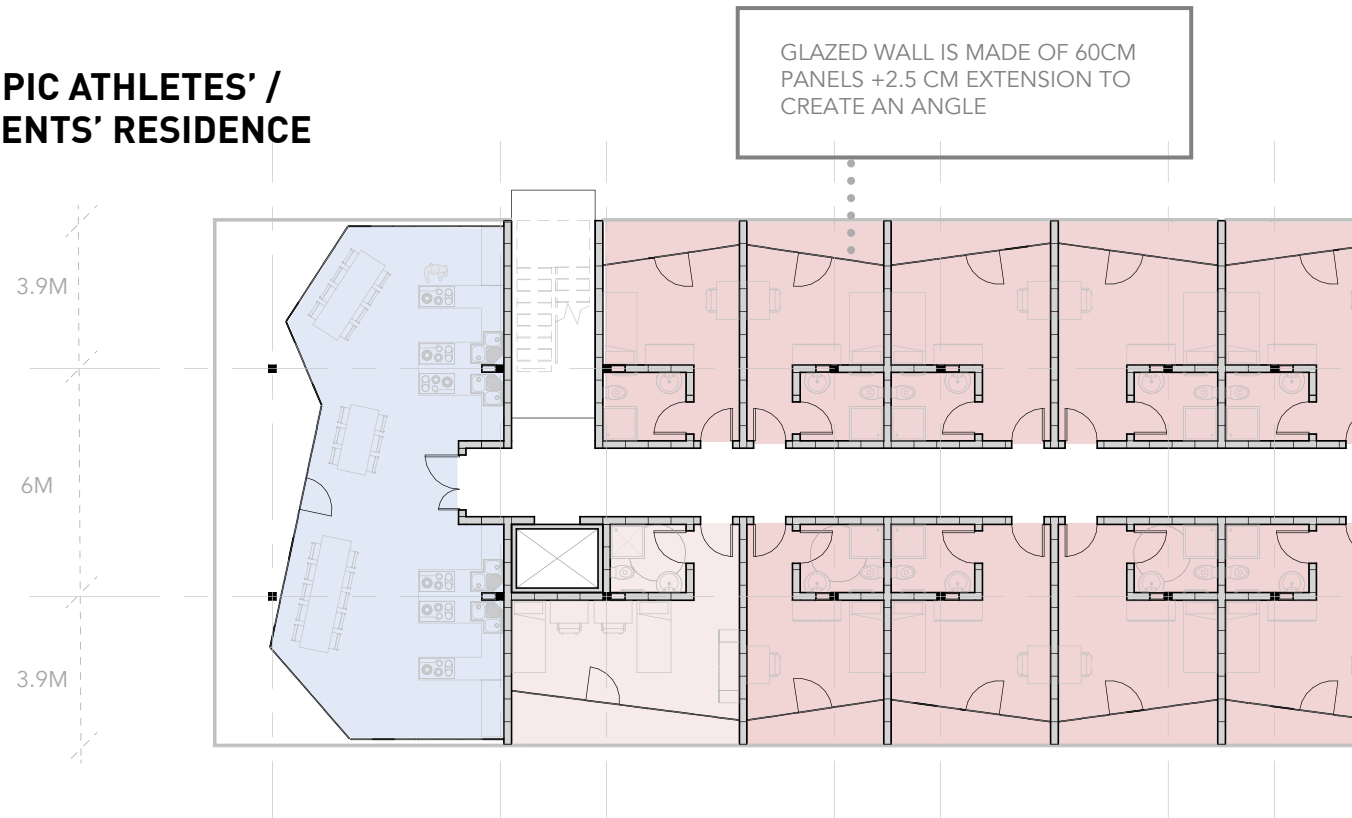


26+26 people/floor

FIXED STRUCTURE



OLYMPIC ATHLETES' / STUDENTS' RESIDENCE

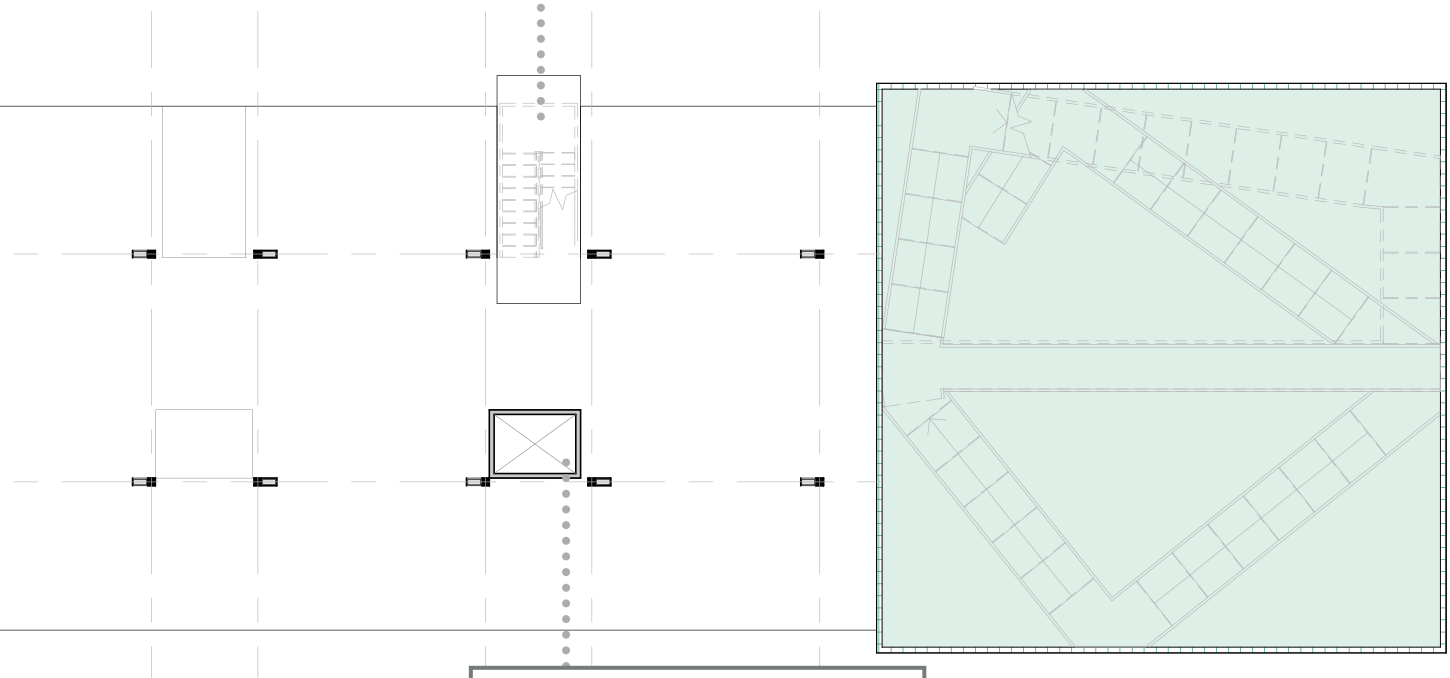


-PUBLIC SPACE -SINGLE ROOM -DOUBLE ROOM

0 10 20m

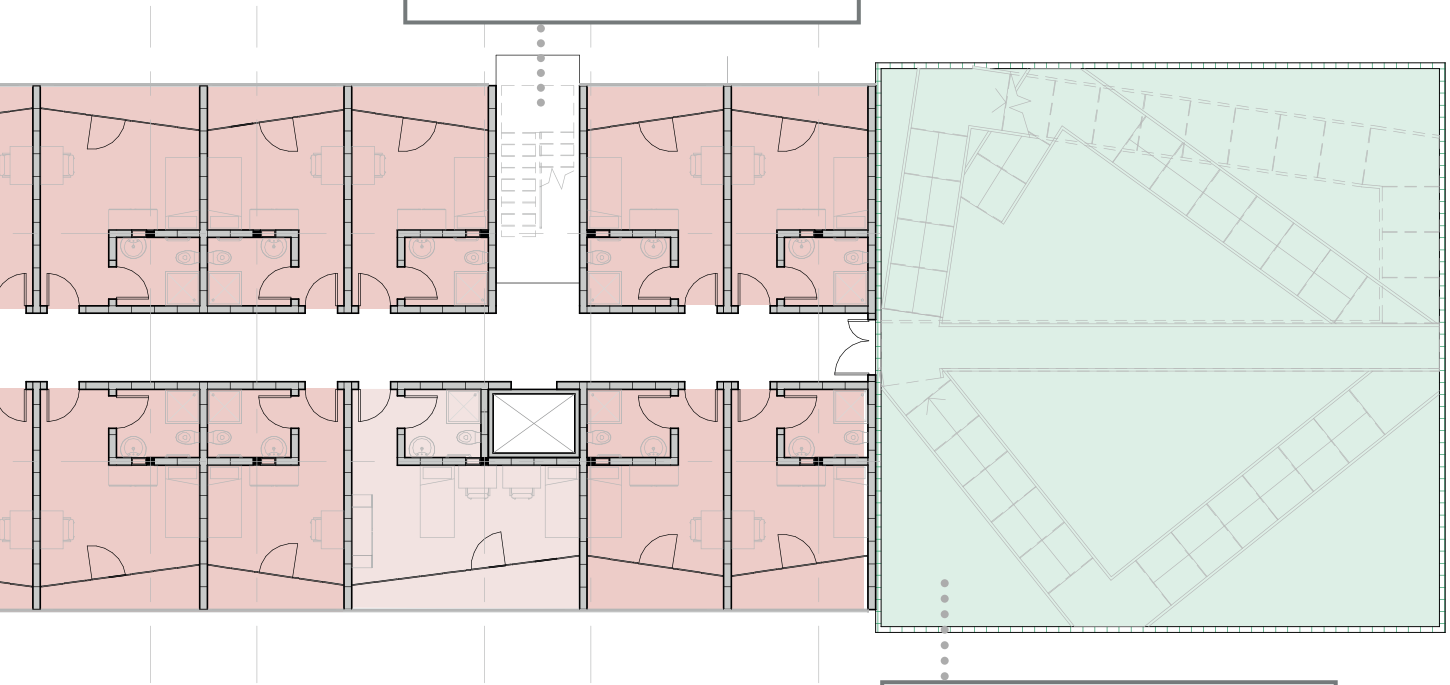
SCALE 1:200

MOVABLE STAIRS, THE POSITION CAN BE CHANGED ACCORDING TO FUTURE NEEDS



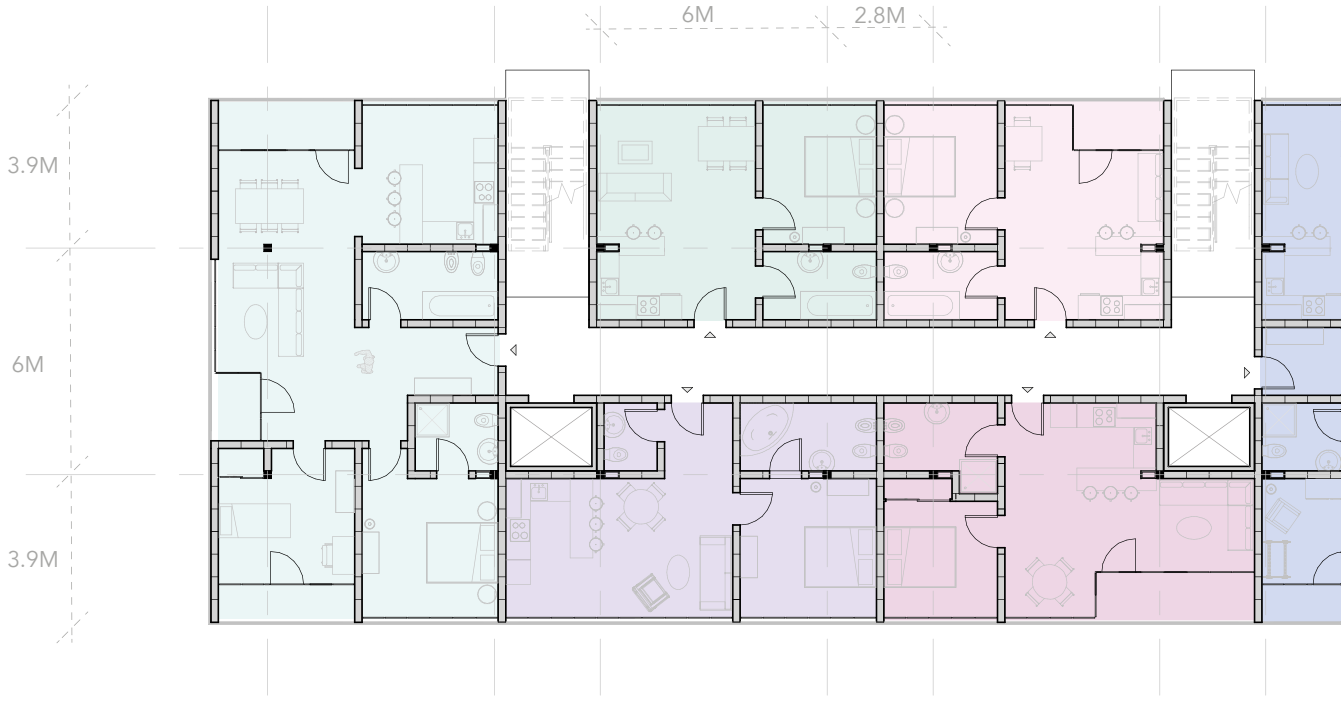
THE ELEVATOR SHAFT CAN BE MOVED AS WELL AS THE STAIRS, WHILE MOVED, THE HOLE IN THE FLOOR IS COVERED WITH REMOVABLE PANELS

MOVABLE STAIRS, THE POSITION CAN BE CHANGED ACCORDING TO FUTURE NEEDS



VERTICAL GARDEN, ACCESSIBLE TO THE PUBLIC WITH A PRIVATE ACCESS TO THE DORMS

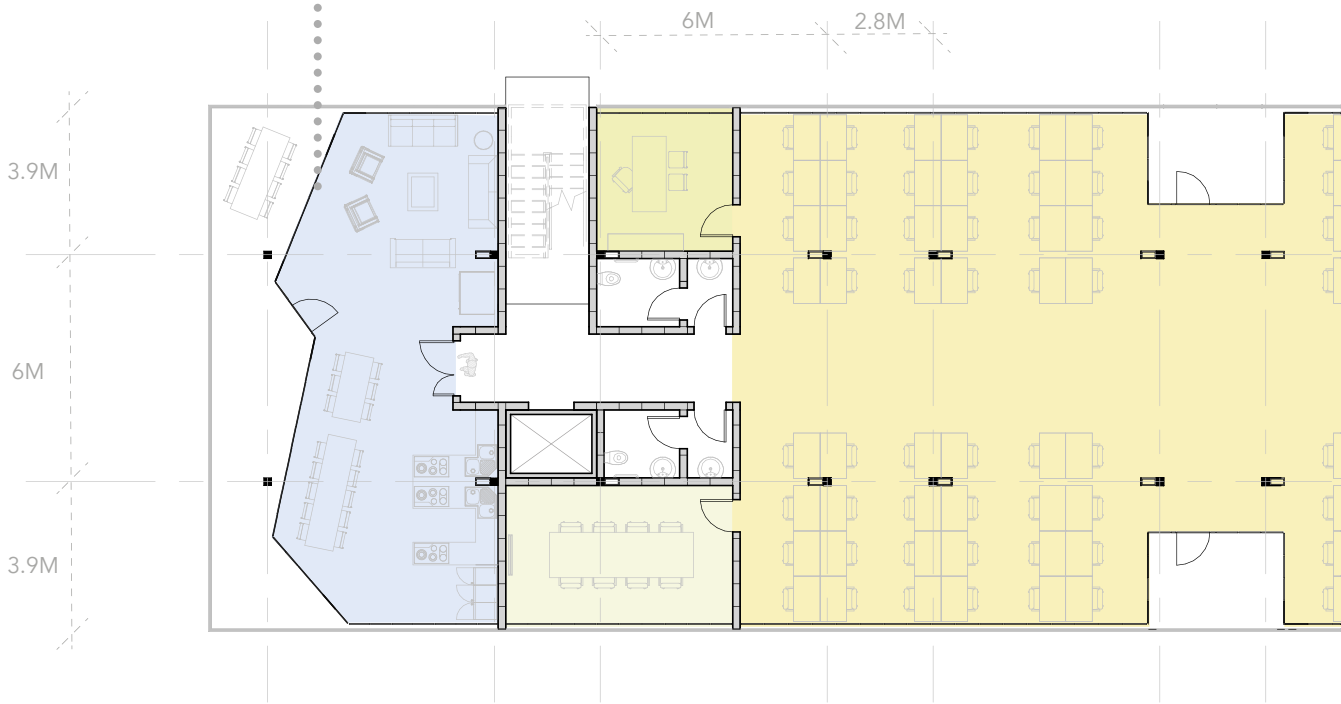
HOUSING TYPOLOGY



-APARTMENTS OF VARIOUS SQM

OFFICE TYPOLOGY

ANGLE OF GLAZED FACADE VARIES FROM FLOOR TO FLOOR IN THE COMMON AREAS



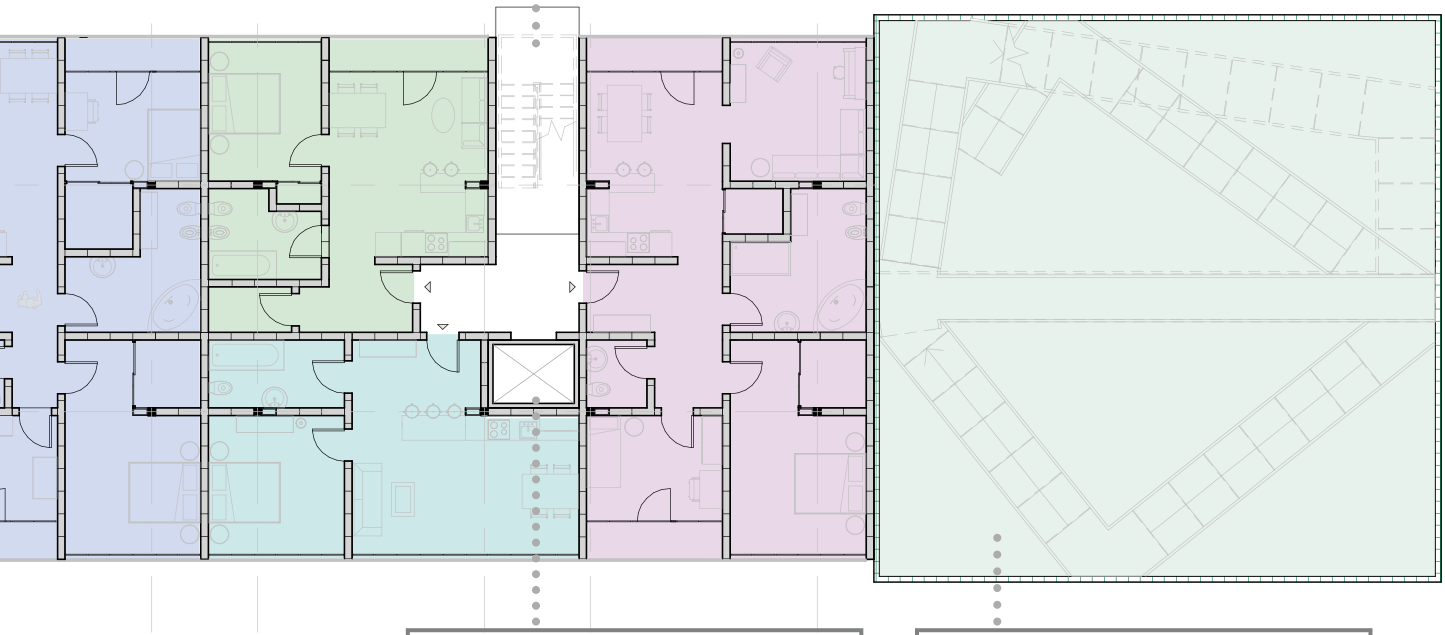
-COMMON AREA/ KITCHENETTE

-OFFICE AREA

MOVABLE STAIRS, THE POSITION CAN BE CHANGED ACCORDING TO FUTURE NEEDS

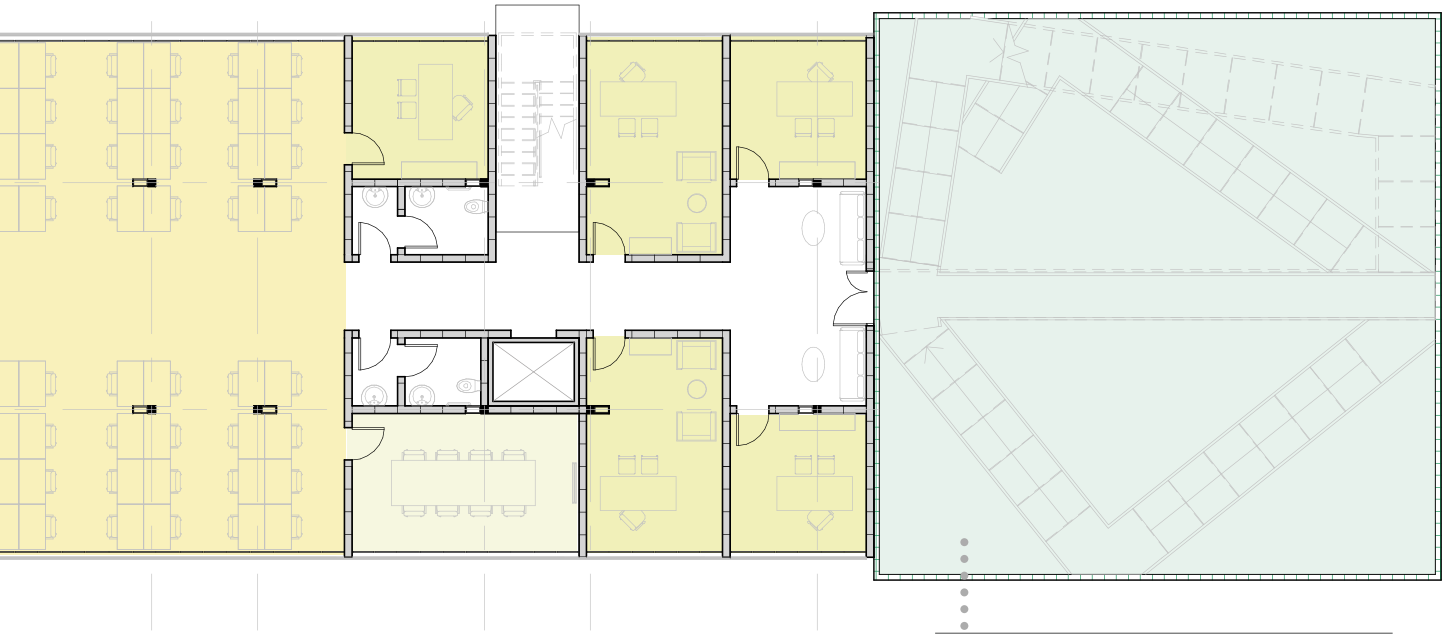
0 10 20m

SCALE 1:200



THE ELEVATOR SHAFT AND THE STAIRWELL CAN BE REMOVED. THE HOLE IN THE FLOOR WILL BE COVERED WITH REMOVABLE PREFABRICATED PANELS.

VERTICAL GARDEN, ACCESSIBLE TO THE PUBLIC



-CONFERENCE ROOM

-WORKING SPACE

VERTICAL GARDEN, ACCESSIBLE TO THE PUBLIC WITH A PRIVATE ACCESS TO THE OFFICES

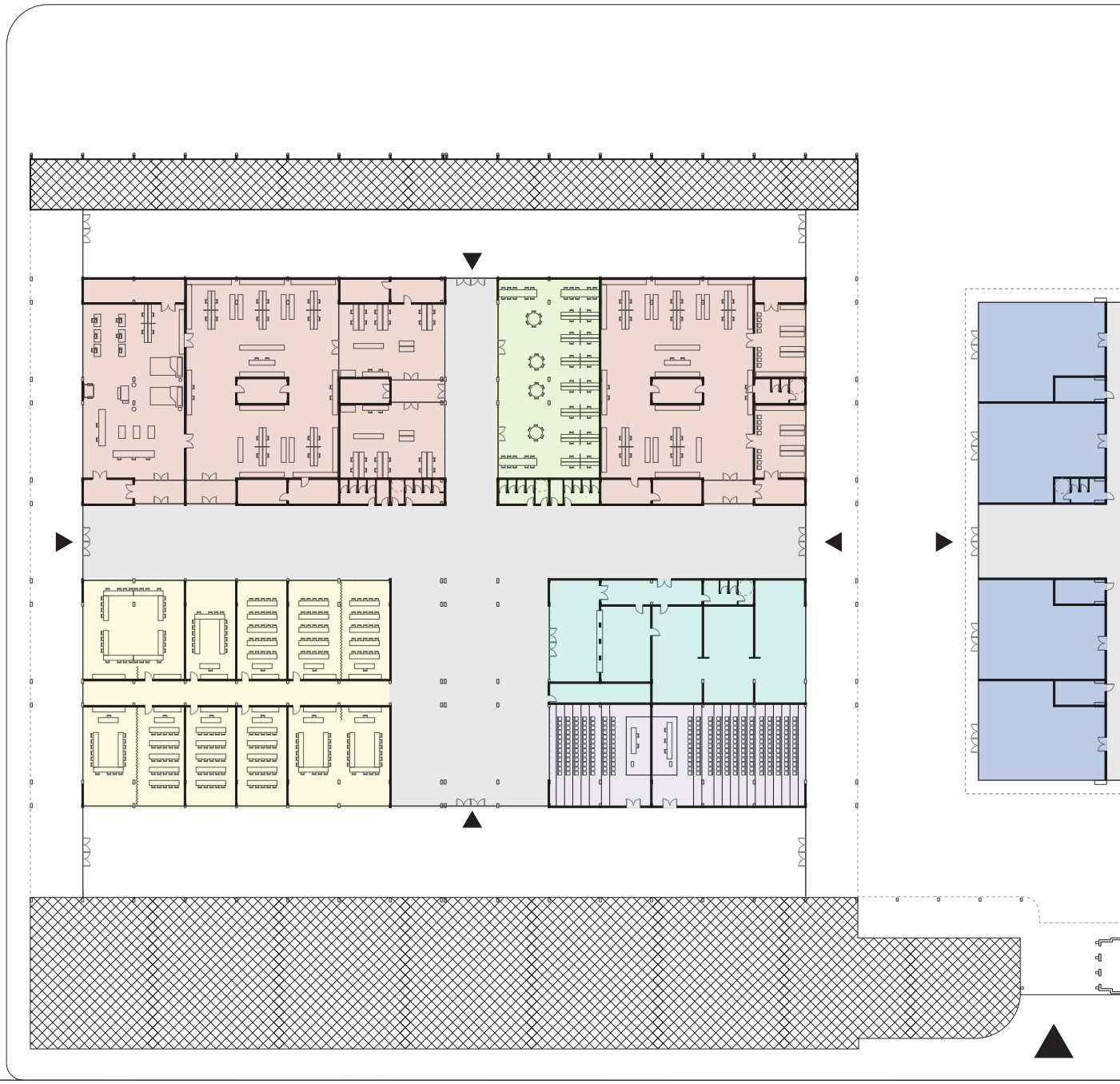
OLYMPIC ATHLETES' / STUDENTS' RESIDENCE

DOUBLE UNIT

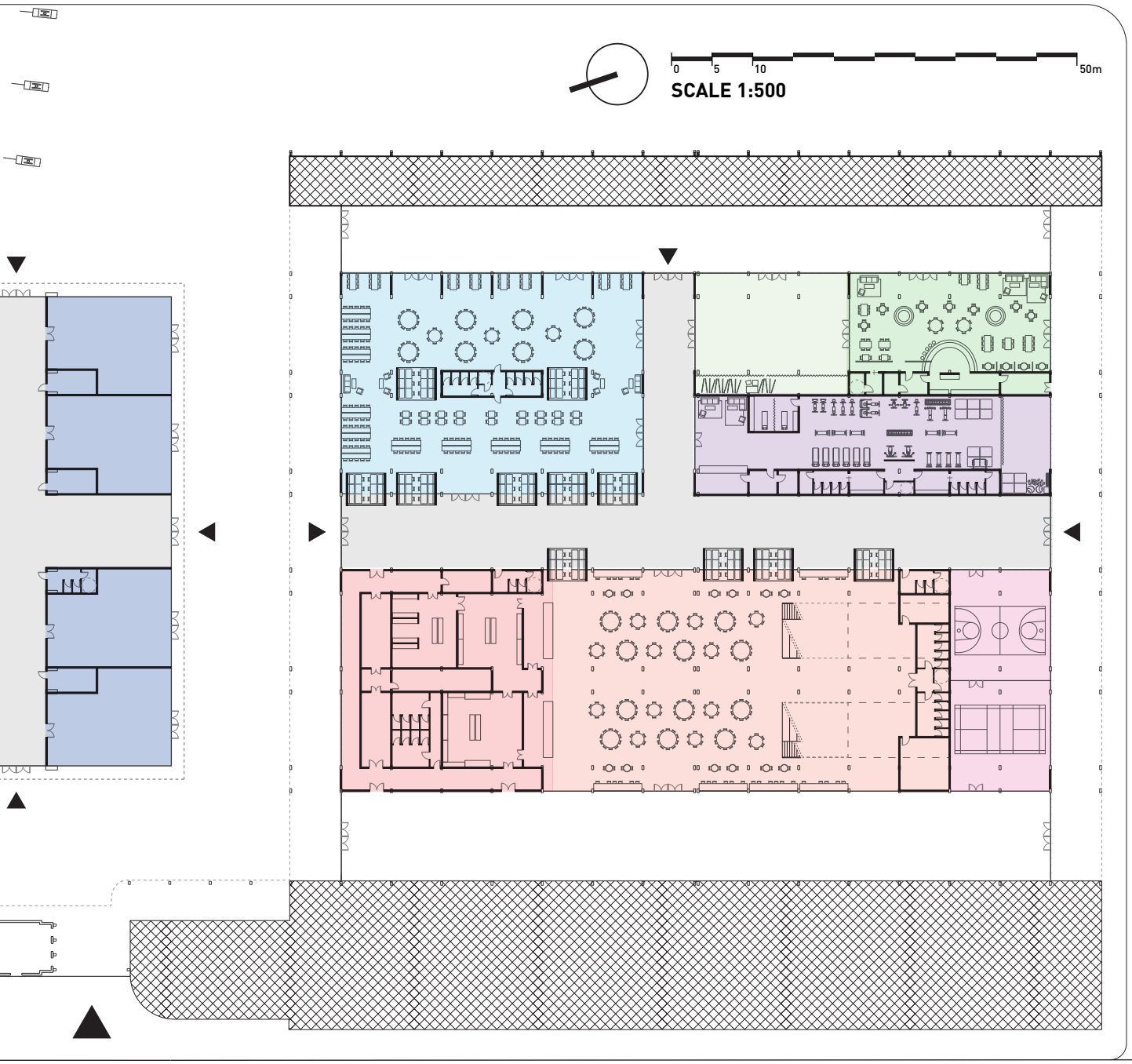
0 10 20m

SCALE 1:200

MOI PLAN - BIOTECHNOLOGICAL RESERCH CENTRE AND EDUCATIONNAL POLE



Research Laboratories
Administrative Office
Pub Wor
Research Workrooms
Auditoriums
Meeting rooms /Classrooms
Internal Passages



lic
kshops

Study Rooms

Hall

Cafe/ Restaurant

Canteen's Backoffice

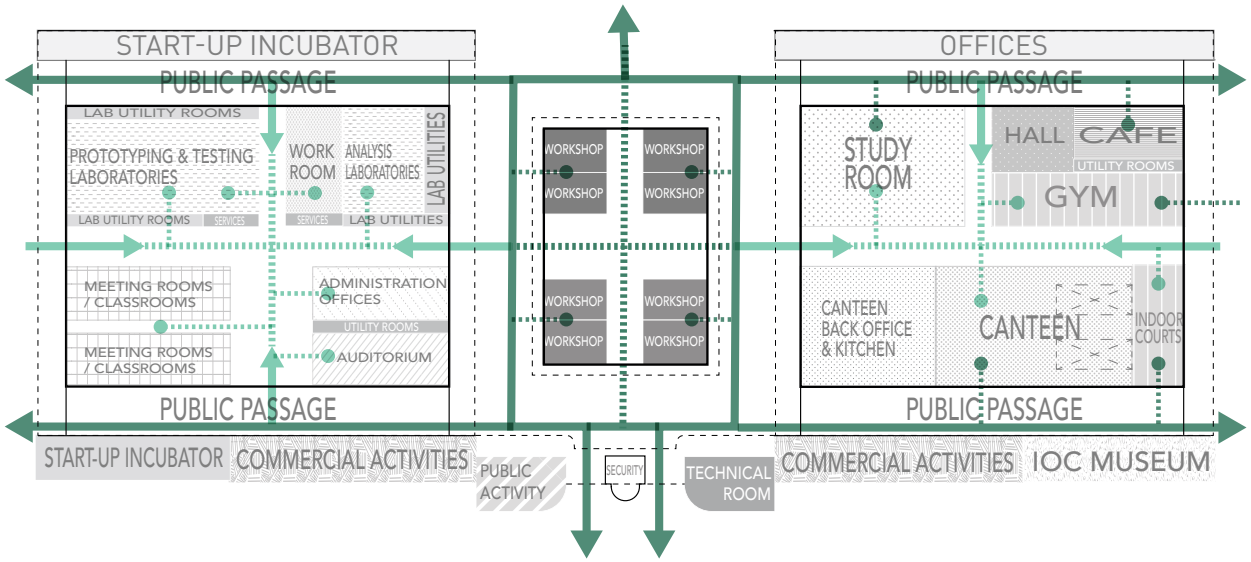
Student's Canteen

Gym

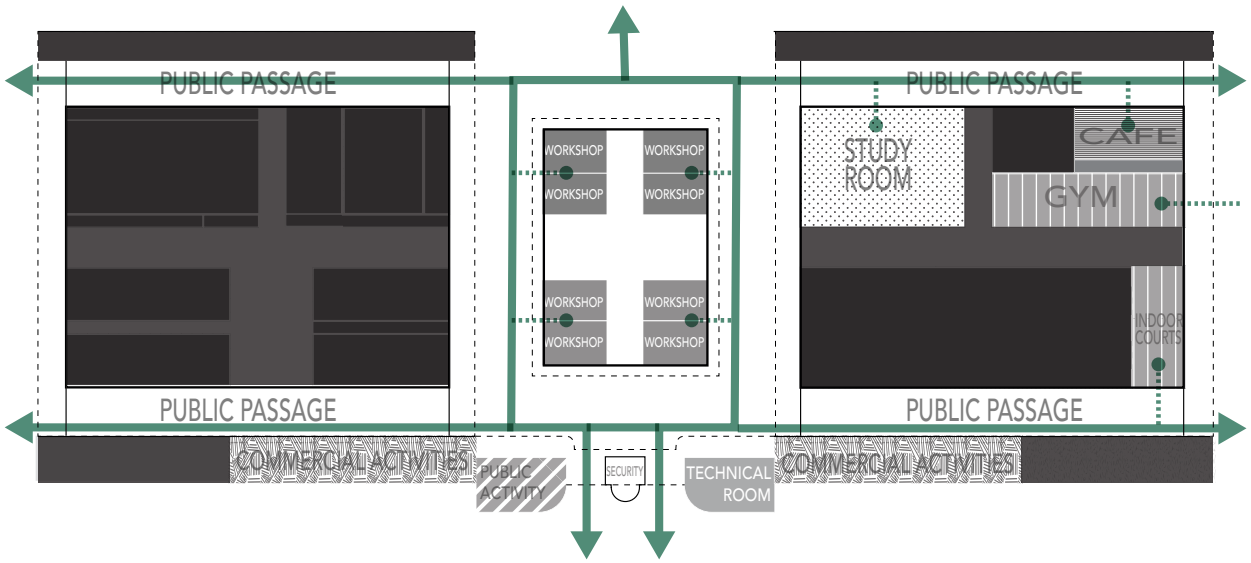
Indoor Courts

MOI - PUBLIC AND INTERNAL FLOWS

DAYTIME



FESTIVE DAYS / NIGHTIME



Public flows & access

Internal university's flows & access

M0I - BUTTRESSES STRUCTURE REPLACEMENT

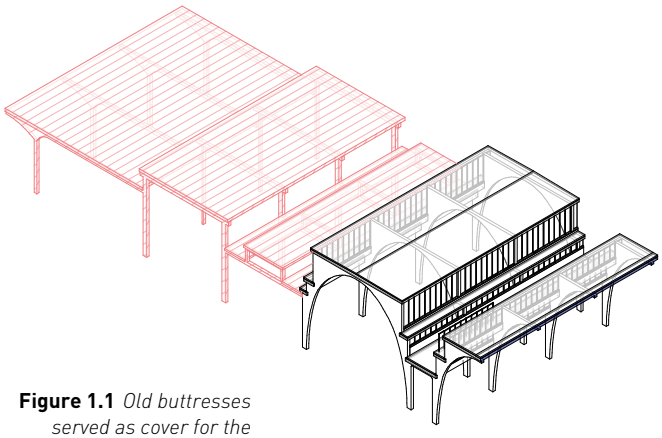


Figure 1.1 *Old buttresses served as cover for the trains' access, bringing goods to the market*

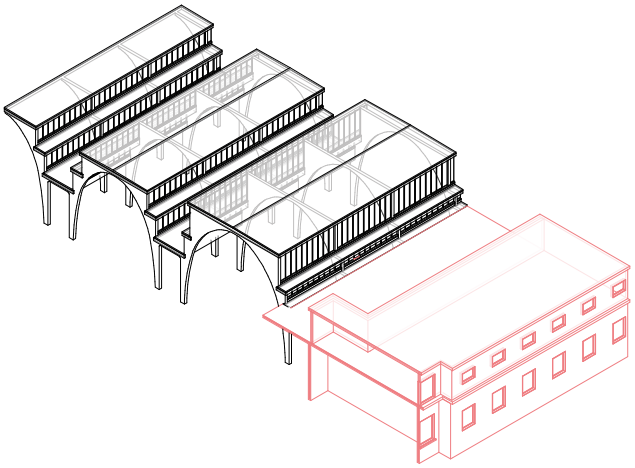


Figure 1.2 *Two-floors front construction hosted various activities for the market*

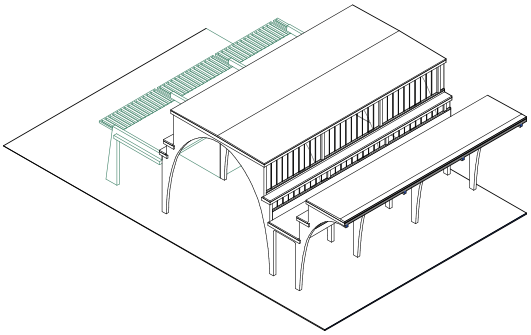


Figure 1.4 *The back part of the building follows the design of the front part*

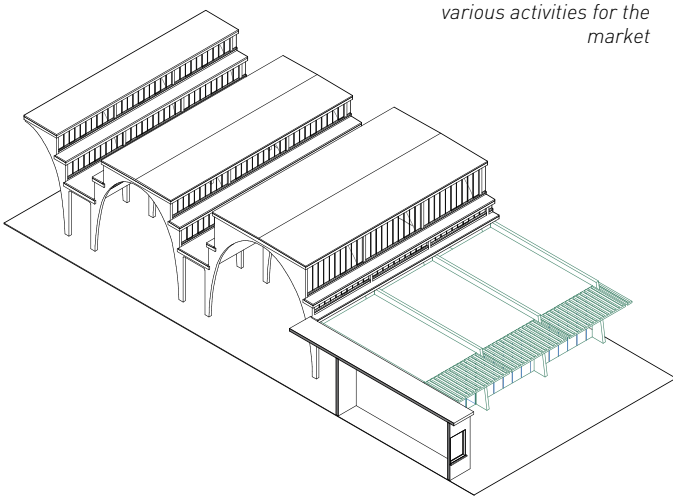


Figure 1.3 *New design opens the front part, allowing the penetration of natural light*

CONCLUSIONS

CONCLUSIONS

This thesis was initially set up as a study on the application of adaptive reuse for abandoned industrial buildings in Turin, a topic often addressed in many architecture design courses and thus well known by its students. On our first search for available structures we came up with the idea of rehabilitating the ex General Market for its historical importance, the relatively recent use for the 2006 Winter Olympic Games and its subsequent fall into a state of neglect,one that still persists today.

Dealing with the reuse of the Market would mean considering the Olympic Village adjoining it, since the area as a whole greatly suffered from the abandonment of the Market right after the Olympics. There are many social, economical and urban implications in rehabilitating such an extensive urban piece, that was built in a short time for a specific short-term event. Therefore, we decided to propose instead an alternative project for the Olympic Games, as a way to resolve problems that emerged soon after at their root cause.

In this way, we found out that the main issue, acknowledged even by the designer themselves, was the lack of a thorough post-Olympic programming in the development stage, which provoked the subsequent low effectiveness of the post-Olympic intervention.

In analysing their history, we saw that the Olympic Games became one of the strongest means of promotion for urban transformation, though it is necessary to ensure that the effort made would be long-lasting through a careful plan of what will happen after these Games.

And so, in our alternative proposal we tried to ensure a more durable Olympic Village that would continue to be useful in the longer term, by addressing three specific issues related to the ex MOI, the Olympic Village and the surrounding area.

For the ex MOI, it was mandatory to define a strong post-Olympic program right from the beginning. The Biotechnological Research center and the service center for university students were long-sought by the two Universities in Turin, and it was even considered right after the Winter Games, but never came to be.

Another matter is the adaptive reuse of the existing building stock to promote a more sustainable urban development. By designing the Athlete Village as a flexible architecture, it is possible to change its function when needed, thus maintaining its urban value without being drastically changed or replaced, saving the city considerable amounts of public funds. In theoretical terms, this is also what happened to the ex MOI: built originally as a market, it was reused after more than 70 years for the Olympic Games and will extend its life as a center of high academic formation.

At last, this large empty urban area was developed by keeping in mind the promotion of positive public social life, through the use of large public spaces and green parks, sport facilities, services for many different users and easy access for both bikes and people. Contrary to the principles applied in the original project, our proposal organized the building arrangements to improve and stimulate public interactions, social exchanges and allow more positive experiences to happen in a key urban space.

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