LAYERS
of
PORTA NUOVA

MENTOR
prof arch. Gian Carlo Floridi

ACADEMIC YEAR
2016 - 2017

STUDENT
Silvia Moretti *834276*

Alla mia famiglia, e a te nonno, che mi hai insegnato che con una matita e un po' di colori, tutto diventa possibile.

POLITECNICO
MILANO 1863

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Notes for the reconstruction of a kindergarten in a peculiar area of Milan

Thru the nature - why
Thru the order - what
Thru design - how

A Form emerges from the structural elements inherent in the form

LOUIS I. KAHN

CONTENTS

INTRODUCTION

The design of a nursery school contemplate a deep reflection on multiple levels, from the architectural and structural one, to the educational, social and psycho-pedagogical, all aspect that participate in transforming a school into a precious and peculiar space with an important position in both the urban and social tissue of a city.
A school is a real space in a defined location in the city, but it is also a metaphorical space, formed by a series of special and social relations that together contribute to the education of the children. It is the place of excellence in which an educational pact is established and different people (for age, interests, capacities, etc.) can interact in order to create an exchange of knowledge, and form a sense of community.
The school building, therefore, becomes a point of interest in the urban tissue, representing not only the place of didactic learning, but also and most importantly a social collector, meeting point and reference of those who live and pass by the area in which it located.
For this reason it is fundamental, when designing a school, to create a dialogue between the school and the city, a spatial and functional connection that results from the interaction between urban morphology, architectural typology, and functional needs given by the city block.
After all, the character of the individual, in the first years, forms not only through the cultural knowledge learned at school, but is strongly influenced by those "accidental encounters" that happen in the urban public spaces and in the areas where community life is spent. The city offers education, all that is located around the school teaches as much as what is located inside of it.
The limit between school and city, and its typological and architectural treatment, becomes a fundamental element for the rightful design of a space that is not only an educational place; a pace which does not end in itself, but regenerates the urban space around and becomes a center of exchange and social encounters.
IN the urban tissue of a city there are spaces with a precise connotation, located right next to multifunctional places, which use destination is able to answer to the needs of the moment, changing with the changes of the community.
In the same way, the internal spaces of a kindergarten should be able to satisfy criteria of flexibility and improvisation, while maintaining a clear functional structure.
The result will be the creation of multifunctional spaces for the discovery and the interaction, in adjacency to more private areas for didactic activities. The buildings have to be designed for discovery and 360° learning experiences, with the awareness that the real users are the kids, not the adults, and the spaces should be fit for the growth and development of the children.

MILAN

1
THE EDGE OF THE CITY

Analyzing the city of Milan and its urban development, it's easy to recognize how the city grew in concentric circles and ray arteries crossing from the city center towards the more suburban areas. This type of urban planning originates from the development of the city's defensive walls that have characterized Milan since the early Roman era.
The first defense system was built starting in 49 b.C. ca, under the rule of Ottaviano Augusto and was expanded during the West Roman Empire in the III Century, under the Emperor Massimiano.
Initially the city was enclosed between the modern Piazza della Scala and Piazza Cairoli on the North side, and Piazza Missori e Largo Carrobbio on the South border, so to include the Imperial Palace, the Foro, the theater and the area on which is now located the Duomo Cathedral.
The first extension of the defensive walls was made during the Imperial Era in order to enclose once again the growing city and the new public buildings of the Circus and of the Terme Erculee. Of these ancient walls, nowadays we only have few remains, such as those of the Porta Romana in Piazza Missori.

Although not many archeological remains of the medieval walls built starting from the XII century are still present, we can indirectly trace their location as their external moat gave rise to the "Cerchia dei Navigli". The navigli are a system of urban canals that were navigable until the beginning of the 1900s and used to be one of the most distinctive features of the Milanese urban planning.

Lastly, the Spanish walls represented the most external defense line. Their extent covered what nowadays is the "Circonvallazione dei Bastioni." These walls were built in the XVI century and served as a defense line for the city until the second half of the 1700s after which they were transformed, firstly by Pallavicini and subsequently by Piermarini, into elevated panoramic walks from which you could gaze on the city skyline and on the northern Alps in the distance. The walls were demolished in the second half of the 1800s and the last remaining part was torn down after First World War.

1.1 _ Milan's view, detail, 1854, G. Elena, Collezione Bertarelli, Castello Sforzesco, Milano

1.2 _ Milan's Plan, 1572, Collezione Bertarelli (P.V. m. 3-44), Castello Sforzesco, Milano

1.3 _ Milan's Plan, 1814, Localization of the Public Buildings and the Navigli System

Between the 1500s and 1800s the city of Milan grew quite unevenly within and outside of the Cerchia dei Bastioni. Upon the Union of Italy in 1861, Milan could be easily divided in 3 distinct areas. The first a densely built historical central core enclosed by the Cerchia dei Navigli. The second, a mixture of natural areas intermixed with urban settlements along the principal arteries of the city. The original Spanish walls, converted in elevated walk paths, acting as duty gates for the city delimited this second area. The Corpi Santi, the agricultural settlements and the farmsteads surrounding Milan outside the walls constituted the third area.

These three different areas of Milan coexisted on the territory, but were poorly connected. The main junctions were the ones in proximity of the Duty Doors, and of the entrance points of the water of the Navigli system, which allowed the transportation of goods and people from the most peripheral areas to the center of the city.
One of the most important entrances to the "internal" city of Milan was that of Porta Nuova, which identified the northbound territorial axis of the city and was located nearby the area on which the first Central Station was built in the late 1850s. Slightly west of the Duty Door of Porta Nuova, was the entrance of the Martesana river. Its water flowed within the city of Milan forming the Navigli canal system. In correspondence of the bridge crossing the Bastioni the river entered the Conca dell'Incoronata where its waters were divided in order to control and refurbish both the Redefossi trench outside the walls and the naviglio San Marco inside. The navigable canal of S. Marco would then continue its path through via Fatebenefratelli, Via Senato, etc., following the ancient traces of the mediaeval walls, until its arrival at the Darsena.

By the late 1800s, the territory inside of the Spanish walls was saturated. The city needed new connections and had to expand outside of the obsolete defensive system. Within this context of metropolitan development, in 1884 Cesare Beruto proposed the first urban regulatory plan for Milan.

Beruto identified three key aspects on which he developed the urban expansion plan in order to fulfill the necessities of both the public administration and of the general population.

First of all he understood the requirement of implementing a proper communication scheme connecting the inner city within the walls with the outer settlements so to create a single urban system.
Following from the first point, he considered vital to supply the city with a proper expansion plan that could withstand the expected industrial development and population growth.

Lastly, he thought necessary to also better plan the existing urban system of the inner city so to organize the occurring transformations and to ease novel architectural interventions.

The first action undertaken to fulfill these points was the extension of streets across the walls to guarantee better continuity along the expanded city and the demolition of the Bastioni, which started immediately in 1885.

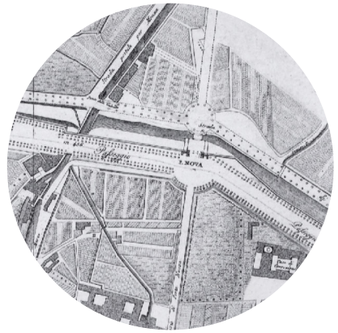
"At this moment there are fourteen direct communications between the internal and external (city); with the project we will increase them four-fold. Because of the frequent crossing of the connection system across the Bastioni it renders their demolishment necessary at the Circonvallazione. It might be sorrow to lose such beautiful sights. It is though common agreement that they go losing their attractiveness, being tightly oppressed and dominated by newer buildings. It is true that they constitute a real obstruction within the city and are a hurdle for its expansion."

Cesare Beruto, Progetto del Piano Regolatore della Città di Milano, relazione all'Onorevole Giunta Municipale (31 dicembre 1884)

This intervention allowed to connect the inner city with the external settlements, enabled proper fluidity in the urban plan and confirmed the city's expansion in concentric bands, typical of a radial-based architecture. The demolition of the walls strengthened the development of the area between Porta Nuova and the naviglio della Martesana as its location is strategically placed in-between the inner city street connections and the developing outer city.

Within Beruto's plan there were also indications for the Navigli system. With time, the canals had switched from a great resource to a burdensome problem. Navigation across their waters was scarce, many of the banks and bridges were badly kept and dangerous and during certain times of the year water collections could be upright unhealthy for the population.

Although such considerations were made, little was done during the XIX century and the first signs of true transformation came only at the beginning of the 1900s. The navigli canals were covered and connecting roads built over them, many of which constitute the principle routes for traffic in modern Milan connecting the historical city center with the sub-urban areas (such as Via Melchiorre Gioia that runs above the buried underground Naviglio della Martesana).



1.4 _ Milan's Plan, 1814; the Bastioni between Porta Nuova and the Naviglio Martesana

1.5 _ Detail of the Hydrographic Plan, 1884

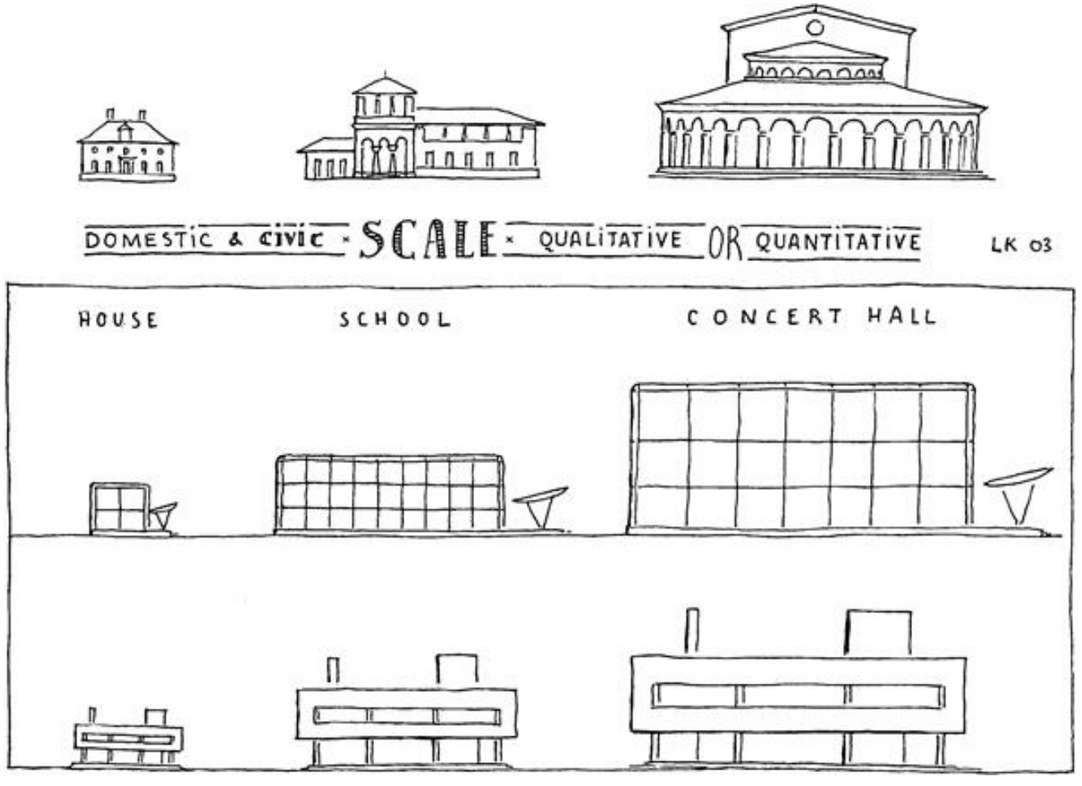
Nowadays, the Circonvallazione of the Spanish walls, which represented the outer limit of Milan in the 1800s, can still be considered a sort of limit within the city. It defines the boundary of the inner historical urban tissue, but it also represents a connection between the established city and the novel transformations occurring just outside its border. This is especially clear in the case of the Porta Nuova and Garibaldi Station area, where the city has been completely reorganized through the construction of a new high-density business and residential quarter. In this area the historic layers left by the regulatory plans are still recognizable in the urban tissue, particularly for what regards the traces of the water system and of the Spanish walls, elements that have to be carefully considered when proposing new architectural interventions.

1.6 _ Porta Nuova, 1850, Collezione Bertarelli (Albo D, tav.5), Castello Sforzesco, Milano

1.7 _ Demolition of the Bastioni di Porta Nuova, unknown data, Archivio Fotografico Castello Sforzesco (FM C 234), Milano

1.8 _ Via Melchiorre Gioia and the covering of the Naviglio Martesana, 1960-61, Milano

SCHOOL TYPOLOGIES



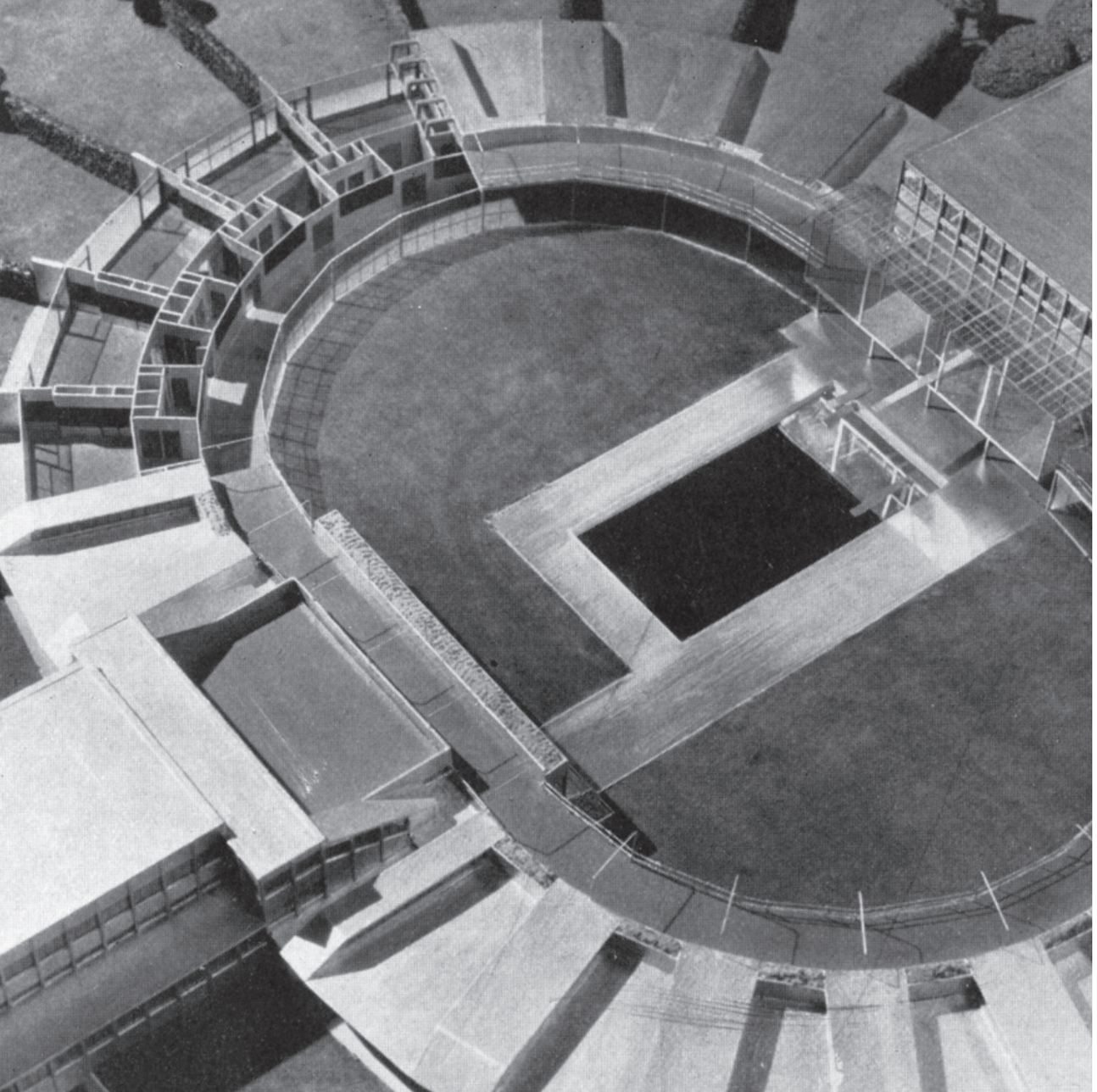
Leon Krier illustrated in three satirical vignettes the well-perceived evolution of the scholastic model: from the strict and oppressive system of the 1800s, reflection of the introverted and detached court system promoting an unfriendly and discipline-driven education of children, towards more modern views of schools composed like a city, a union of different components coming together as blocks of a city allowing scholars to actively explore them driven by their own curiosity.

Architectural planning of schools has thus evolved greatly and represents an active field of experimentation for modern European architecture.
The researches were aimed to the creation of a new typological model, driven not by the mere use of modern styles, but by the needs of the new pedagogical systems and of the peculiar areas in which the new scholastic buildings had to be located.
Starting from the 1800s buildings were designed to reflect the changes occurring within society. Healthier and more mode lifestyles meant leaving behind traditional architectural models in favor of progressive designs. This change, especially in Italy, was not completely fulfilled within the school construction field because of the limited propensity for progressive models within the local administrations.

Indeed in the Italian landscape, projects and constructions of new schools were merely marginal events. In 1947 Ernesto Roges commented on what he defined as the Italian architectural analfabetism. He remarked how in Italy schools were inadequate and how this could be a reflection on the limited budget the parliament reserved for public education. For him, schools do not just constitute the space within which teaching occurs, but they are at the heart of our society. Their content reflects their shape and the two are linked by a cycle in which one strengthens the other and so on. «Nice schools are thus good schools».

In the postwar period public spending suffered great cuts leading school construction to drift away from architectural investigation and move towards a cold and uniformed business. Construction occurred by prefabricated block-like structures, which stripped schools of their pedagogic potential and concealed them within their surroundings.

Many economists defined the XXI century as the "century of knowledge" because knowledge and its sharing are the driving forces of Europe's development. We are producing great knowledge that must not be stored but brought in the open and shared. This key aspect must be kept in mind also when planning space distribution, buildings and cities themselves. We need to focus on exchange and sharing also at the urban level. We must invest in schools and integrate them within our urban structure as they are pivotal for knowledge spreading and sharing.
To achieve such aims we require an authentic revolution of our society's values and change our investment policies so to prioritize funding of education. New teaching methods require a more complex spatial organization of school buildings and must be flexible for future evolution. The architecture of schools must be elevated once more to be itself a source of teaching and a pedagogic instrument.



2
THE MODERNIST THEORIES

The new schools developed within the Modern Movement expressed their desire to leave behind the eclectic shapes and structures typical of traditional scholastic buildings. The architects preferred to experiment and absorb the new pedagogical theories of the modern didactic systems (such as Pestalozzi in Switzerland, Petersen, Ostreich and Steiner in Germany, Montessori in Italy, Morris in the United Kingdom, Dewey and Dalton in the U.S.A., Makarenko in the Soviet Union, etc…) and looked at architectural designs themselves as being able to shape new social behaviors.

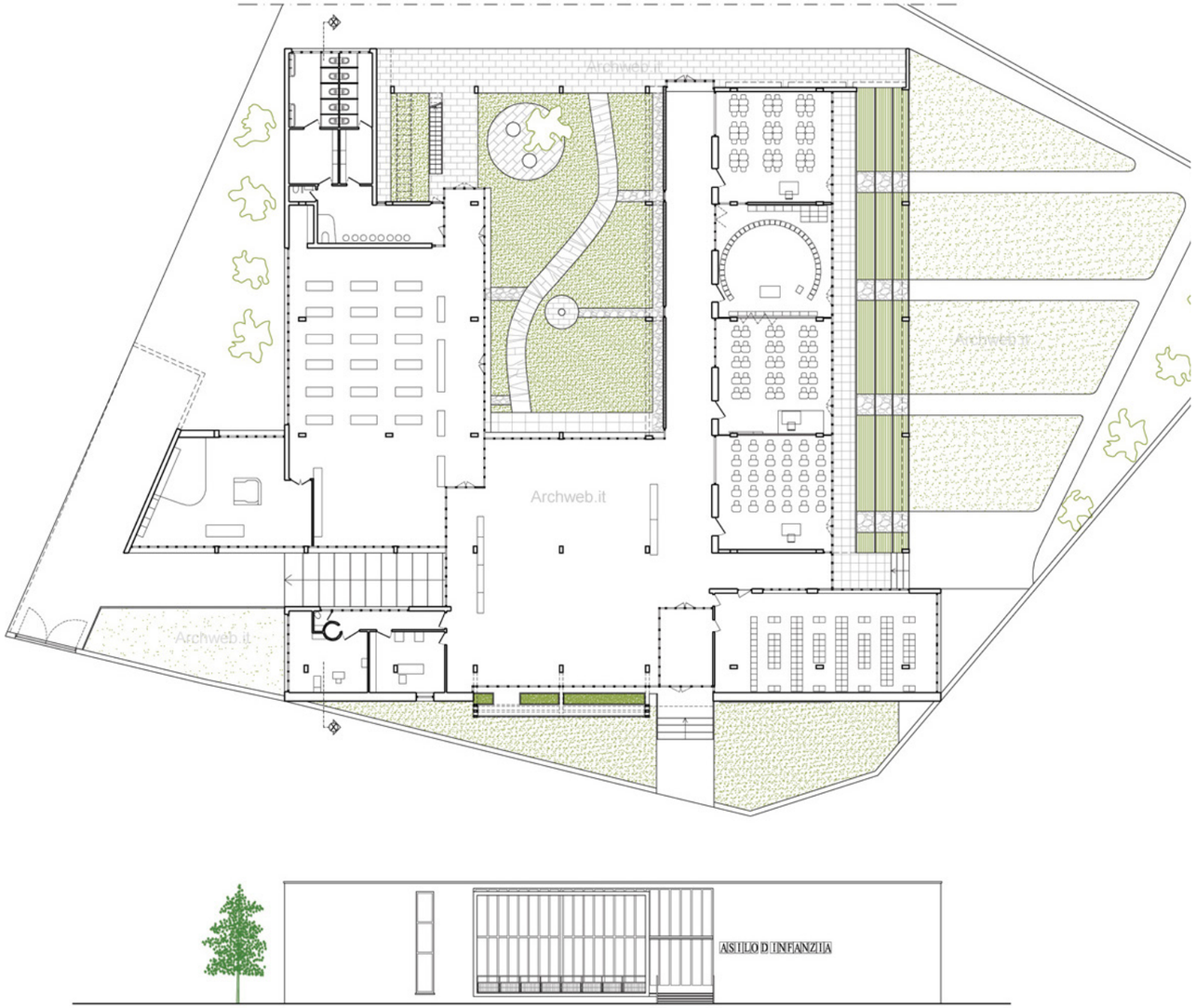
Some of the functional and innovative aspects regarding attention to hygiene and education (such as linear body structure, side corridor, double light sources within classrooms, etc…) had already been introduced by the rationalist approach of the 1800s which had to answer to the increasing mass education brought by the industrial revolution. These aspects were then taken into greater consideration and developed further during the Modern Movement.

The Modern Movement though perceived the scholastic building quite differently from the view of the1800s traditionalists. The monumental dimensions for a building to be used mainly by small children and the homologation of spaces without respect to their function, was perceived as an obstacle for the psychophysical wellbeing of students. In the same way, the formal representative character of the outside facades wouldn't be able anymore to express the modern character of the school. In the new didactic experimental systems, in fact, each child is not considered anymore as a passive being within the control of its educator but as an independent and active player who must receive attention and stimuli also from its surrounding environment so to promote an individual self-development.

During the architectural investigations on the scholastic typology in the first postwar years, the new pedagogical theories were considered to be as important for the design of the project as the quality of the building's internal functional spaces. In this way the individual, seen as a new man, free and in harmony with its mind becomes the protagonist of the design process, together with the need of creating educational spaces that could favor its development.

Active teaching methods rely

2.1 _ Ring Plan School, R. Neutra, 1923



on stimulating observation, social, and motor skills and on the physical and psychological well-being of the children. These principles were strongly related to the experimentations of modern architecture. Older buildings relied on classrooms along a central corridor, a very precise and strict scheme that reflected the rigidity of the educational system that was being embraced during the 1800s. Newer models prefer instead one-story buildings immersed within green areas, if possible, or more compact block buildings although with collective spaces, areas for special activities and open-air spaces.

Traditional schools had a long central corridor from which you could access the classrooms disposed on both sides. Modernists instead prefer the side-corridor school typology, which had been already implemented in some of the most innovative buildings of the 1800s. This newer plan allows for more articulated architectures and promotes the interaction with the external environment that can be considered as an extension of the internal space and culminates with the idea of a school in a single story building.

Also many important hygiene considerations promoted in those years favor the new single-storey school with the classroom as the key element of the spatial organization. The most favorable functional system would be the one of the division in pavilions, with the classes located in close proximity with open courtyards in order to promote natural illumination of the spaces. These ideas completely override the old concept of the long dark central corridor that hampered proper illumination of classrooms and prevented an adequate air exchange.

Such initiatives do not only result in technicalities and regulations but engage with research on space, construction, shapes of modern architecture. They drive a new way of architecture focused on a novel lifestyle that combines renovation of the city and of its social organization together with innovation in the use of space, construction and living.

Schools became pivotal for the social plan of mass education and urban development driven by industrial workers coming to the city. Plan which had multiple dimensions crossing from politics, to health issues, education and last but not least architecture.

One example of architectural experimentation within such principles is Richard Neutra's Ring Plan School, which was designed as part of a future metropolis, modeled on quick rhythms given by the social use of the city through modern transportation systems.

The school is isolated within a green space and its one-story elliptical ring plan is considered optimal to avoid excessive elongation of the building, having abandoned

2.2 _ Sant'Elia Kindergarten, G. Terragni, Como, 1937

the traditional block schools with vertical extension.
The ring is composed of twenty classrooms along the external perimeter that are connected by a glass corridor facing the internal elliptical courtyard. Each classroom has its own filter area where toilet facilities, illuminated by shed, and accessory spaces are located, and which also acts.
The skylights extend radially along the roof and contribute to illuminating the classroom itself. The wall facing the garden is made of sliding stained-glass window screens so to extend the classroom's bright space towards the natural gardens.
Neutra planned many schools in which he attempted to implement the key aspects of his Ring Plan School prototype but had to sacrifice the ring structure (such as in the La Corona Avenue School in Los Angeles, 1935) because of its limited applicability within already structured neighborhoods. This was true until 1961 when he managed to create in Lemoore a ring-like plan similar to his first prototype.

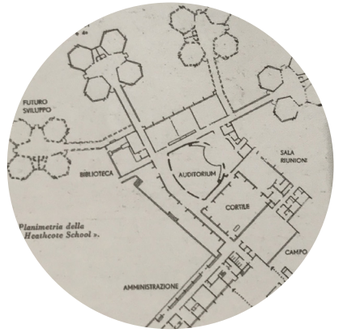
In Italy one plan symbol of the Modernist Movement within school architecture is the Sant'Elia nursery school by Giuseppe Terragni, built in Como between 1932 and 1937.
The kindergarten has an open court building structure, constituted by a double depth connection on the street front and two lateral wing that define the courtyard; the building is then located freely in the irregular parcel, taking into account the eliotermic axis. In the internal distribution the servant and served spaces are almost equivalent in extension, and the transparent surfaces are majority of the closing systems. Another interesting attribute of the building is its transformability, in fact the classic walls are substituted by transparent screens and movable ones; in this way the classrooms can be freely rearranged and opened towards the inner garden. The lightness and the aereal character five to the kindergarten a very modern character.

3
SCHOOL TYPOLOGIES AFTER THE WWII

In Europe during the second postwar the most used school typology remains the single-story plan but they are characterized by an increasing architectural liberty in the organization of single space-activity groups. The single floor allows a wide array of possible openings and promotes optimal illumination and natural cross-ventilation of the classrooms.

The concept of "functional unity" introduces in the design process a basic element made by different classes clustered around a common space. In this way, the different activities can be individually designed and then connected one another through corridors, or be left alone as unique pavilions. The pavilion system though, has the negative outcome of a bigger use of the soil and of a certain dispersion and loss of the scholastic community life.
Therefore, the next step in the typological definition, is to organize all the different functional parts of the school around a recognizable center. The entrance is not only a connection space, but becomes a multifunctional space, and gains its own architectural and didactic importance.
The functional unity is the key elements that completely separates the modern architectural models from the traditional one based on the class-corridor system, which was originally used during the 1800s, but somehow survived also in some of the Modern Movement scholastic architecture. An high flexibility, and an organic structure characterizes the new school buildings, in which there is no more fixed relation between shape and function, spaces and activities.

Experimental projects on the use of an open plan with satellite nuclei were mostly diffused in North America, where schools were built in the suburban areas, preferring the exclusive relationship with nature rather than the one with the city tissue. This is the case of the Heatcote School in Scarsdale, a suburban area near New York, that Perkins&Will designed bringing the self-sufficiency and individuality of the functional cluster to its limits.
While in the central element all the common functions are collected around a courtyard, the classes are



3.2 _ Heathcote School, Perkins & Will Studio, Scarsdale, NY, 1940

designed as individual satellites formed by four classes clustered around a common space. The strategy of the project contemplates the possibility of future expansion and addition of elements, but it can't deny the presence of the corridor as the distributive and connecting system.

In the European panorama, the nuclei system was developed in a more urban way, often following a grid that gives to the scholastic building a city effect, and also creates stronger relations and interactions with the surroundings. The corridor becomes the road, while the classes, or group of classes, represent the different buildings.

One of the most important examples of this logic is given by the Elementary Munkegard School in Gentofte, designed by Arne Jacobsen in 1949. The organizational grid of the complex is a representation of those of the North European city in which the school is located; moreover it is a perfect solution that combines the advantages of both the corridor and the pavilion building typology. Jacobsen divides the building in its functional parts, organizing them in a system made by pavilions and patios, in which the regular distribution of classes and open spaces is interrupted only by the blocks containing the extraordinary spaces (administration, teacher's lounge, etc.).

3.1 _ Munkegaard School, A. Jacobsen, Gentofte, 1949

4
ITALIAN RESEARCHES

In Italy the development of the research on the scholastic typology was slower than that of the European context, but it was greatly promoted during the fascist regime. In that period, the problem of public buildings construction was extensively discussed, especially through a rhetoric analysis based on order and functionality.
On the contrary, during the second postwar period, the budget cut on the public expenses in Italy resulted in the shift of the field of competence for the school construction industry, which stopped being an architect's problem, and became part of the city's administration bureaucracy system. As an outcome to this shift, the pedagogical potential of the didactic environment was devalued and a simple prefabricated building technique became the standard for construction of new schools. In 1947, Ernesto N, Rogers wrote an editorial article in which he denounced this situation and spoke about the necessity of an educational architecture that could solve the issues of the learning system:

« It is without doubt that a progressive pedagogy requires an adequate architecture, which means functional organisms that have to be flexible to the complex demands of an educational method that doesn't consider the alumni as an indiscriminate crowd, but wants to foster the development of each individual […]. If a sacrifice is needed, no budget voice is better justified than this one […] but it is good practice to consider that the problems of the didactic system cannot be solved without an educational architecture» (Domus – La casa dell'uomo, n. 220, giugno 1947).
In 1949, the legislations of the time, although updated were still inadequate for the existing didactic methods. This convinced the Ministry of Public Education to announce a public contest called " Scholastic buildings and open air learning". This contest had the purpose of finding new architectural models for modern schools without taking into consideration the existing regulations. The contest, given its positive results, was proposed again in 1952.
With the XII Triennale in 1960 cured by Gae Aulenti and Luigi Cacciadominioni entitled "The House and the School", the urgency of the topic acquired an international dimension. For more than a decade, in fact, the shortage of scholastic buildings

4.1 _ British Pavillion at the XII Triennale di Milano, "La casa e la scuola", 1960.

due to the growth in population, the migratory movements, and the postwar reconstruction necessities, offered a spotlight to the didactic topic in most of the European countries. Between the different proposals presented by the various participating countries, those coming from Great Britain were the most notable ones. The British commission built an example of elementary school inside the Parco Sempione by using a construction method that was widely used in England at the time. The prototype was very successful, but it also revealed that, even though Italian architecture was engaging into the use of the modern typology and materials, the creation of an authentic educational architecture was still in the distance.
Confrontation with the international experience highlighted how the use of a standardized project, method that was irresponsibly applied by the Milan Municipality in order to cope rapidly and economically to the lack of facilities, represents the denial of the most advanced pedagogical experiences, as well as the trivialization of the architectural spatial complexity and urban values.

Research on the school typology in the 60's was contemporary to the development of the Ministerial Technical Regulations for scholastic buildings that were first published by the end of the 50's, to then be provisionally reviewed and adopted in 1970, and finally made official in 1975.
These Regulations are based on principles that don't consider the school building as a stand-alone building, but underline the fact that it must have a very close relationship with the urban and social tissue of the city area in which it is located. Even though these principles were written 40 years ago, they still are very contemporary:

1. The school is an urban element. It has to rise in wide-open spaces, and become the jewel and epicenter of community life;

2. The school shall not be used solely by alumni, but for all the collective cultural manifestations. "heart" of the city block, it must be used by the adults in the afternoon and evening for their recreational activities […]. The school building shall not represent only didactic learning, but also a place where to spend leisure time;

3. A new design favorable to social interaction should substitute the organization of closed classes aligned one next to other but never really in connection. In the modern schools the "common room" becomes the most important didactical and architectural element […], each group of classes has a common area while the entire building has a bigger space that can be used by the inhabitants of the city block for conferences, concerts, meetings, etc.

Therefore, the common area is the most important element of the school as it acts as the central space of recreation. It is seen as a "square" from which all the different functional spaces unravel. Keeping in mind the analogy of the school as a city, the corridors become the roads along which all the classes overlook and follows a linear structure with a theoretically infinite development. This principle is clearly shown in the project of the High School in Via Mazzetta, in Firenze, which was one of the many responses to the creation of the Technical Regulations.

Another important principle contained in the Regulations, states that the scholastic building has to be part of an:

[…] educational continuum, inserted in a social and urban context, and not as a stand-alone entity. Therefore, the scholastic buildings have to be located in close proximity one to the other, and to other service facilities with which they can be integrated both spatially and functionally such as sport complexes, cultural and aggregation spaces, etc.

Therefore, the school becomes an element of social and urban development, which has to be inserted carefully in the city's tissue by searching for a direct connection with its neighboring context. At the same time the project must have a high flexibility, not only for what regards the functional spaces and the didactic classes, but also and most importantly for what regards the elements surrounding it. Only in this way, it will be able to accommodate different uses depending on the needs of the city and of the community.

Starting in the 1970's, a diffused but fragmentary architectural research took place based partly on the application of the Technical Regulations and partly on their overthrow. With time the theoretical bases and practical applications of the pedagogical systems changed, with a continuum of reform proposals that often were partial and inconclusive. The heated discussion on school typology that characterized the first decades of the second postwar slowly disappeared, and the problem of the architectural typological researches lost interest in the problem of scholastic buildings.

5
THE CONTEMPORARY PERIOD

With the new century, the theme of the scholastic building construction, which was forgotten in the previous decades, started to become more and more relevant in the architectural panorama. This is mostly due to a strong social change that identifies the current century as the "Knowledge" one, and that therefore has provoked a critic enquire on all the levels of the educational systems. It became evident that in order to sustain the knowledge culture, it is absolutely necessary to invest in the school system. Indeed, a country made up of educated, informed and creative people favors the creation of sustainable development.

Despite the different experimentations made, such as the one of the BSF (Building Schools for the Future) program in England, few school projects in Europe are able to detach themselves from the fascination for the trends of the earlier century. These trends idolized totemic objects and undifferentiated containers that left all the building's potential to the design of the external cover, ignoring the values of the internal space articulations, which are seen as an obstacle to free architectural design.

In this panorama, one of the fundamental principles when designing a school seems to disappear, resulting in the loss of the educational role that the building should have. Especially in the design of a scholastic building, the starting point should be the organization of the internal spaces, their function, and the relations between them and with the outside context. As Louis Khan said in his book Form and Design, «The spirit of the school is what the architect gives to the project ».

In the Italian panorama, nowadays, there are problems to cope with that are very similar to those of the second postwar – immigration, saturation of the cities, lack of adequate public service, etc. – but the responses given by the local administrations and by the architectural environment are formulated with a novel awareness. The indiscriminate use of a type-project and of standardized prefabricated solutions, quick and economic, like the ones used in Milan in the 50-60's, are not an option anymore. There is the necessity of challenging the new projects with a highly dense urban system, where elements with a high historical value coexist with others of uncertain beauty and functionality. The presence of a complex urban tissue might appear as a weakness, but it can and should be exploited as an advantage and opportunity when designing new scholastic buildings. They will be unique elements, which will be able to respond to the new educational necessities of our society while also establishing a dialogue with the historic and urban tissue of the area in which they are located.

6

THE MILANESE CASE OF THE PORTA NUOVA SCHOOL COMPLEX

When thinking of the "typical" typological character of the city of Milan, the first thing that comes to mind is the court block and building. It is a type of construction which is closed towards the city, generator of a public street space outlined by perspective sceneries made up by the fronts of the buildings; screens that hide behind them open private spaces with an higher quality than the equivalent external urban system.
In the same way, the development of the majority of the school buildings in Milan was based on the court typology, often extended to the entire city block, with the creation of All Level Institutes that include in one location all the different school levels (from kindergarten to middle school). Using this typology, the school complexes end up being "excluded" from the city system, closed up in themselves, creating a rigid functional hierarchy. Therefore the school loses its role in the urban and social tissue, and it becomes a single-function structure, opposed to those characters of flexibility and multi-functionality defined, as seen before, in the Technical Legislation.

PORTA NUOVA ELEMENTARY SCHOOL

At the beginning of the 1900s, Milan was rapidly expanding, both in territory and population. This implicated the necessity of new residential buildings, but also of new public services, especially for what regarded the school system.
In 1907, the new Elementary School of Porta Nuova was completed, following the project of Enrico Broggi, architect of the Municipality Technical Office, who also designed the Cimitero Maggiore in the late 1800's.
The school was located in a strategic position for the future development of the city: along the Circonavallazione dei Bastioni, recently demolished, in the parcel between the remains of the Porta Nuova and the hydraulic node of the Redefossi canal.

Therefore the school was built with arc foundations (see documents in Appendix), in order to let the canal flow freely in its course. The meeting point between the Martesana river, the Redefossi canal and the Naviglio S. Marco on the west side of the new

6.1 _ Localization of the area in relation to the Spanish Wall edge

scholastic building was left open, and it would be covered together with the internal water system of Milan, only in 1930.

The building presents an open court typology with a monumental character, taking up almost all the dimensions of the city block. The two different wings, which were destined to the separated male and female classrooms, were connected on the south side by an open colonnaded passage. In addition to the main school building, there is also a fourth block containing the gym, which is located on a lower height, and is accessible from the basement floor of the school.
The different heights of the gym and of the ground floor of the school is probably due to the presence of the Naviglio, and of its argins.

Around the year 1922, as testified by some pictures conserved in the Historical Photographic Archive of Milan, the elementary school was occupied and transformed into a military building. During the fascist period, it became known as the "Caserma Mussolini", but was already reorganized as a school building by the end of the 1920s.

Nowadays the public school of Porta Nuova serves the Milanese area between Garibaldi and Brera, an area undergoing numerous urban transformations, and previsioning a notable growth of the population density.

THE HYDRAULIC NODE OF THE REDEFOSSI RIVER

The Porta Nuova scholastic complex has been built right next to one of the most hydraulic nodes of Milan's water system: the node between the Naviglio della Martesana and the Redefossi canal.
As seen before, the elementary school building answered to this problem with the use of arc foundations, under which the waters of the canal could flow freely.
The hydraulic node represented the entrance point of the Martesana waters into the Navigli system of the city of Milan. Here the Naviglio S. Marco started its itinerary, from the Via S. Marco and Via Fatebenefratelli, to the Darsena, following the trace of the ancient medieval walls of the city.
With the cover-up of the internal water system of Milan, between 1929 and 1930, all the water traces from the city were eliminated, and the Gabelle Bridge, located on the west side of the Porta Nuova School, became a connection square between the new Via Melchiorre Gioia and the Bastioni di Porta Nuova main road.
In correspondence of this hydraulic node, in the 60s, a portion of the green area was closed in order to make space for the garden of the new Porta Nuova kindergarten school.

6.2 _ Porta Nuova Elementary School

6.3 _ Fascist Parade in front of the Caserma Mussolini, October 1922, Archivio Fotografico Castello Sforzesco (FM Albo 12-91), Milano

6.4 _ Fascist Parade in front of the Caserma Mussolini, October 1922, Archivio Fotografico Castello Sforzesco (FM Albo 12-92), Milano

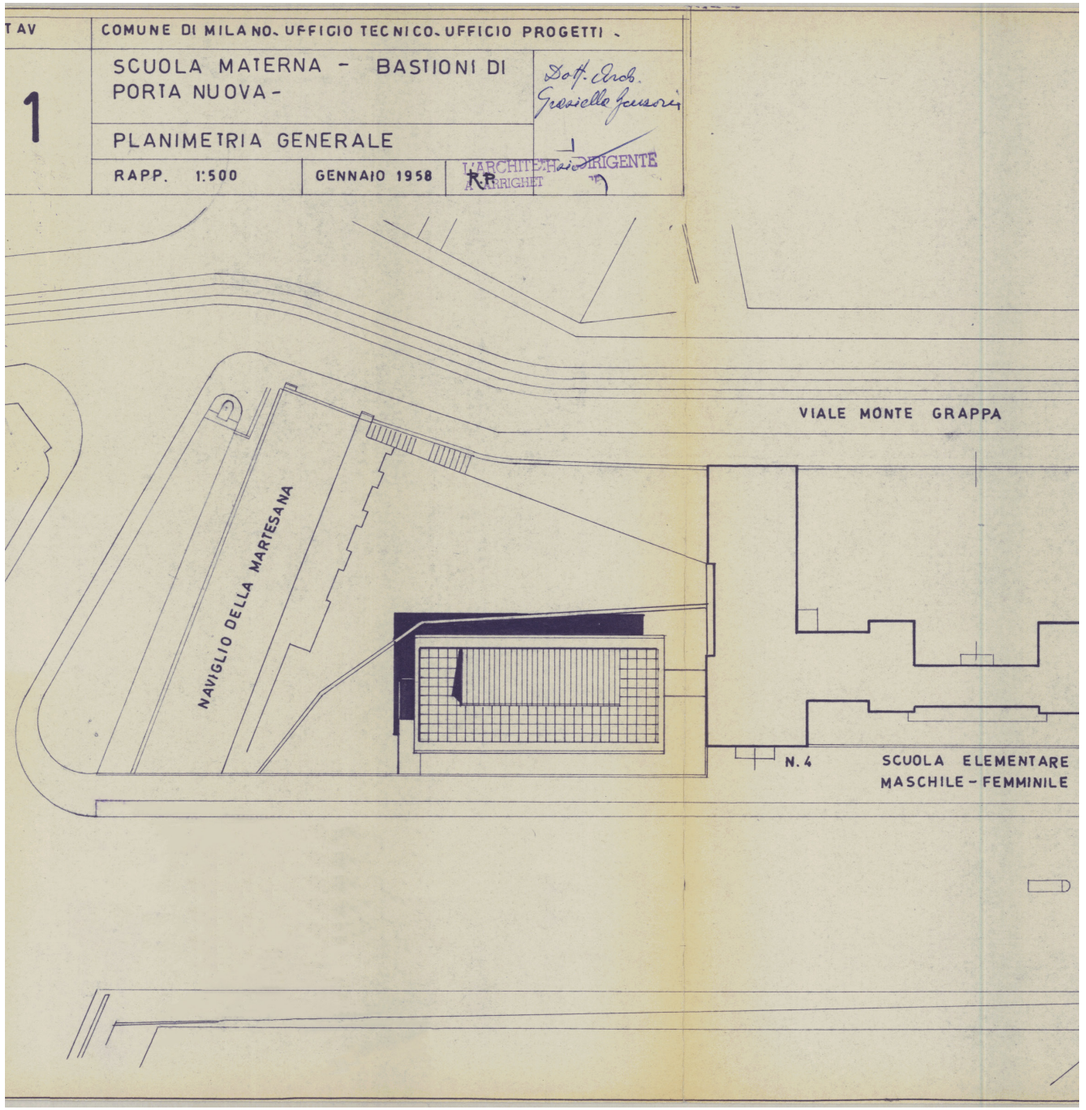
LA SCUOLA MATERNA DEL 1960

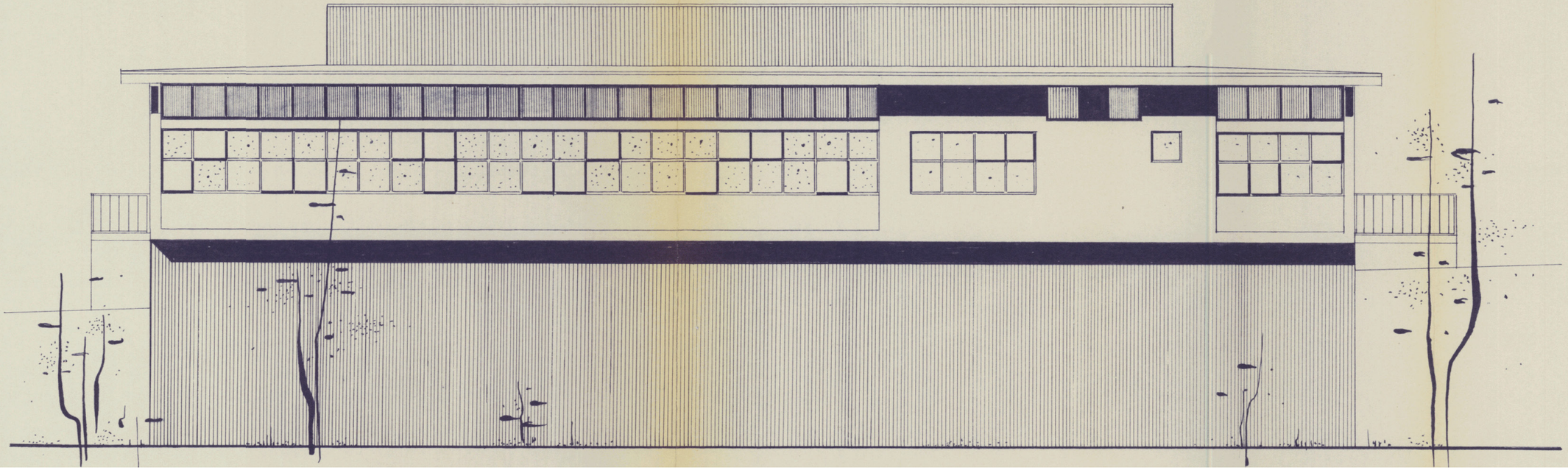
By the end of the 1950s, the complex of the Porta Nuova Elementary School was expanded with the construction of a new Kindergarten on top of the existing Gym Building. The original project, proposed by the Milanese architect A. Arrighetti, was requested by the Municipality in 1958 due to the lack of such service within that city area. The gym of the elementary school seemed to have been originally constructed keeping in consideration a future expansion, and therefore it became the podium for the realization of the new building. The entrance to the Kindergarten was originally located on the West façade, with a sloped entrance from the main road of Bastioni di Porta Nuova. An emergency staircase was locate on the opposite side. Even though the original internal disposition of the spaces was kept almost entirely, there are enormous differences between the original project and what was actually built, especially regarding the entrances, the facades, and the roof system.
A double pitched roof substituted the originally intended flat one, which also presented a pitched skylight element that could bring light into the common playroom; it was definitely a more cost-effective choice, but at the same time, it brought numerous problems of illumination for what was the main and most important area of the kindergarten.
The facades, once imagined as a single element divided by regular openings in painted wood, was built by using prefabricated elements. The facades were composed by panels in asbestos-concrete with built-in dark aluminum windows, that, once put together, create very regular and articulated fronts.
In the same way, also the main entrance to the kindergarten was revisited. Instead of having a lateral ramp that could have given access to the building also to people with disability, a staircase directly facing the main road was created; not only this resulted in the presence of a strong architectural barrier, but it also connected the kindergarten directly with one of the most congested roads of Milan.
The kindergarten was then connected with the adjacent elementary school through a secondary staircase, which also acted as a connection to the garden on the north side of the parcel, in order to have an open space play area.

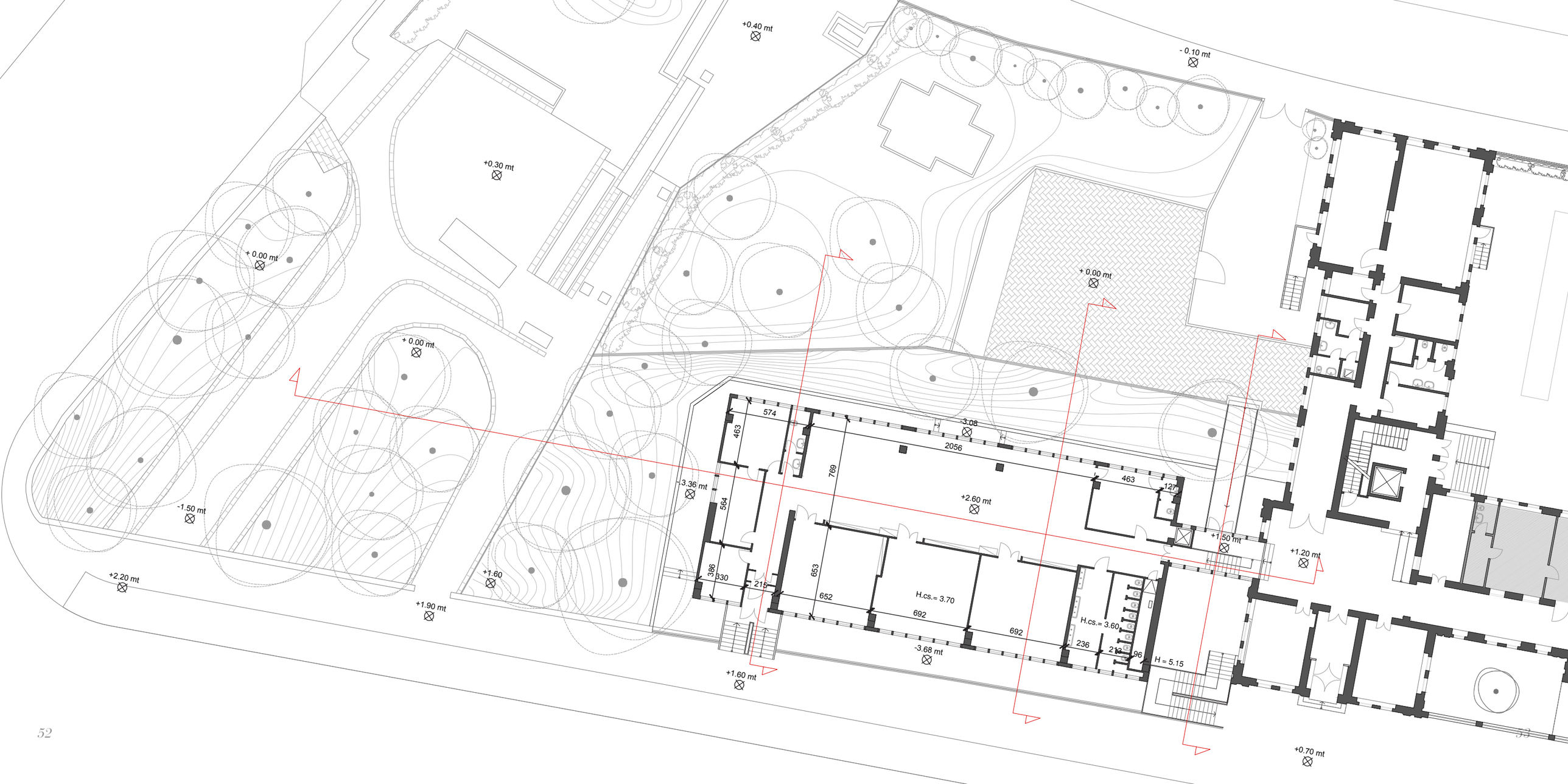
6.5 _ Cucine Economiche, Barbaglia, 1900 ca

6.6 _ Ponte delle Gabelle, pre 1930, Archivio Fotografico Castello Sforzesco, (FM VOL M 118-1-1), Milano

6.7 _ Ponte delle Gabelle, pre 1930, Archivio Fotografico Castello Sforzesco, (FM VOL M 118-1-2), Milano


TAV
1
COMUNE DI MILANO - UFFICIO TECNICO - UFFICIO PROGETTI -
SCUOLA MATERNA - BASTIONI DI PORTA NUOVA -
PLANIMETRIA GENERALE
RAPP. 1:500
GENNAIO 1958
Dott. Arch. Graziella Jusari
L'ARCHITETTO DIRIGENTE
VIALE MONTE GRAPPA
NAVIGLIO DELLA MARTESANA
N. 4
SCUOLA ELEMENTARE MASCHILE - FEMMINILE

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+0.30 mt
+ 0.00 mt
+ 0.00 mt
+ 0.00 mt
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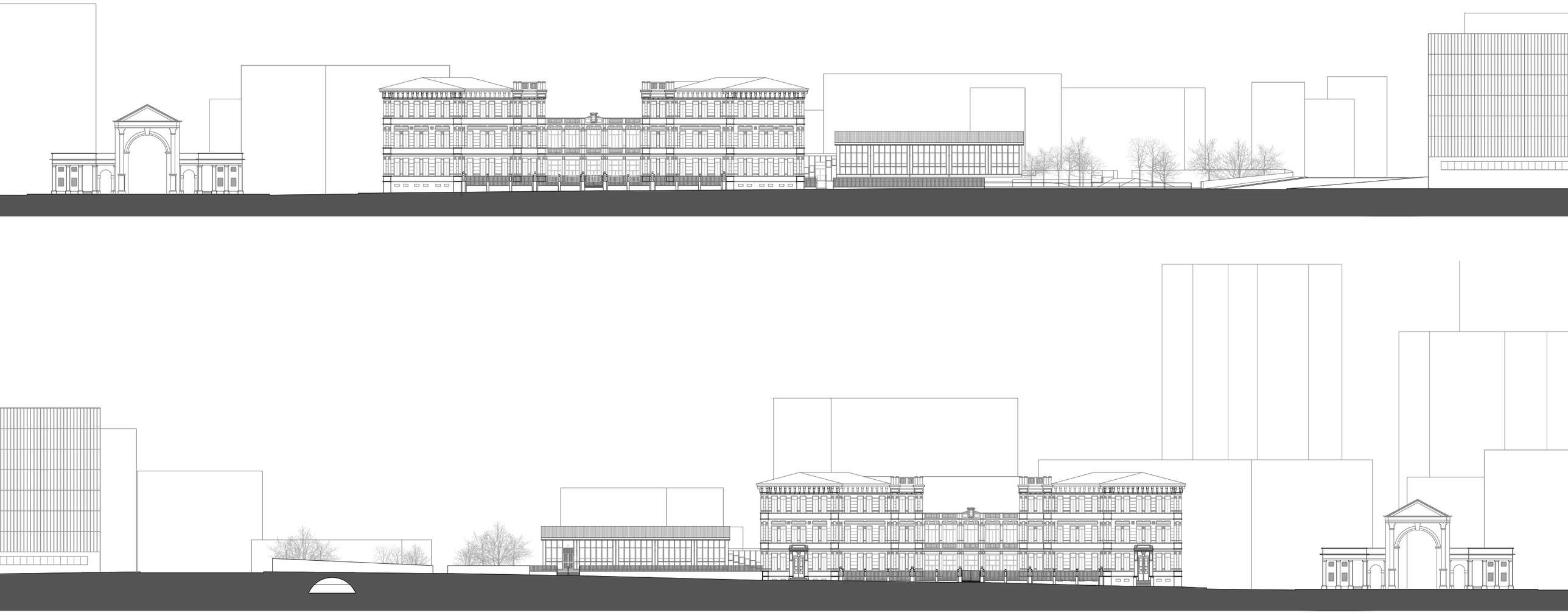
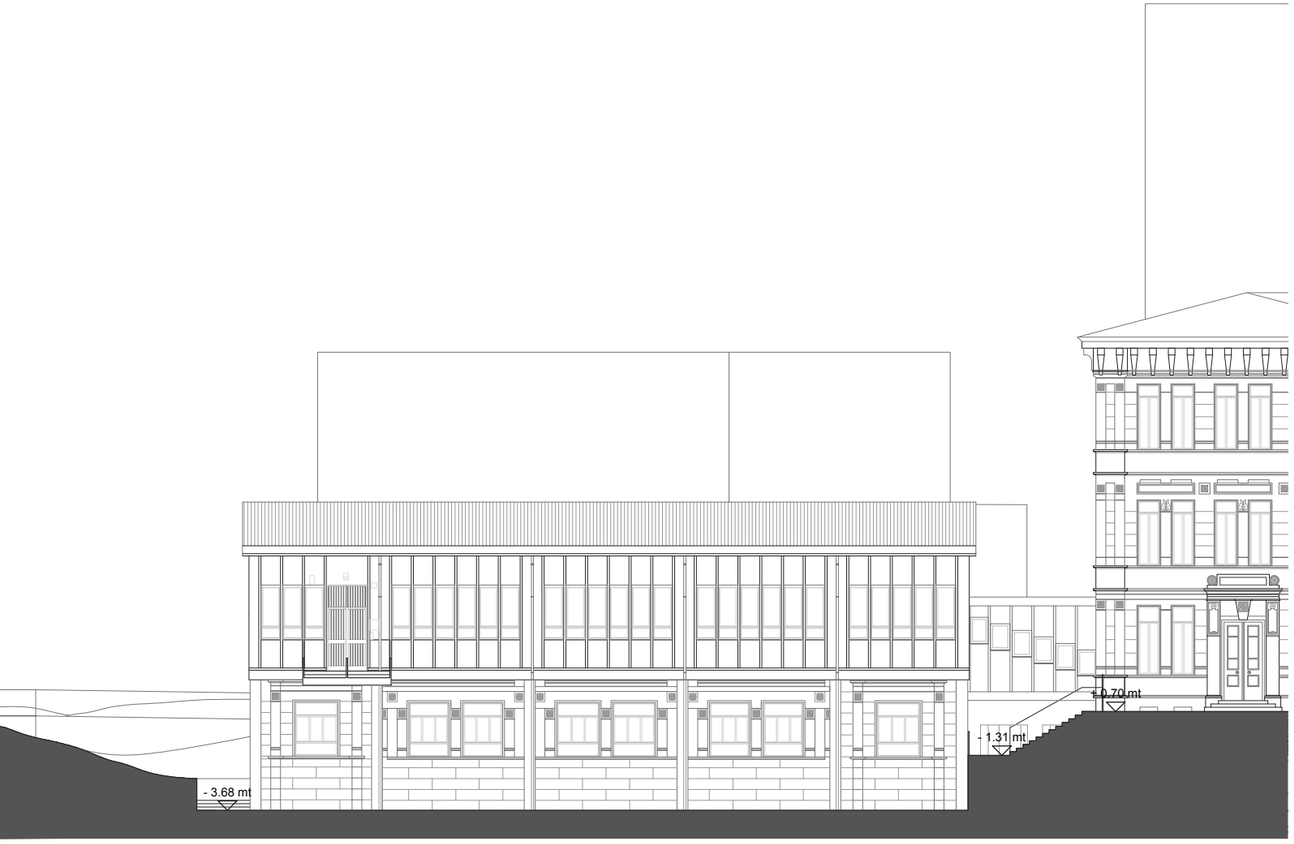
-3.36 mt
+2.20 mt
+1.90 mt
+1.60
+1.60 mt
-3.08
-3.68 mt
+2.60 mt
+1.50 mt
+1.20 mt
+0.70 mt
574
463
564
386
330
215
769
2056
463
127
653
652
692
692
H.cs.= 3.70
H.cs.= 3.60
236
96
H = 5.15



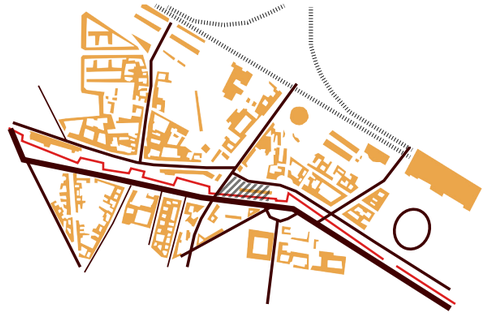

- 3.68 mt
+ 0.70 mt
- 1.31 mt


EDUCAZIONE
AUTORITARIA
OLD!
NOATIS!
16 OTTOBRE
BLOCCARE TUTTO
SCIOPERO MET

CONCEPT

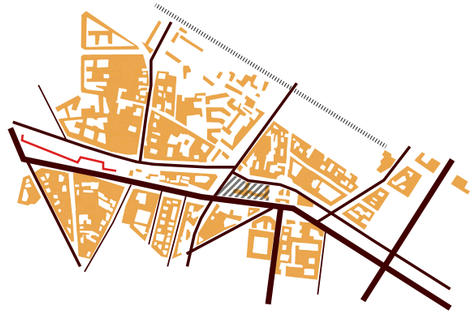
7
THE PROJECT SITE

Hystorical Densification

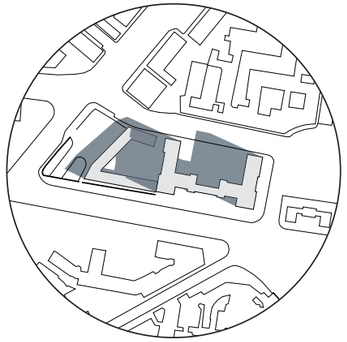


1884

1910



1956



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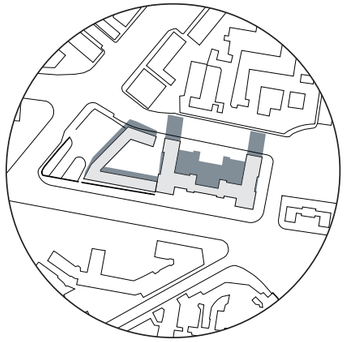

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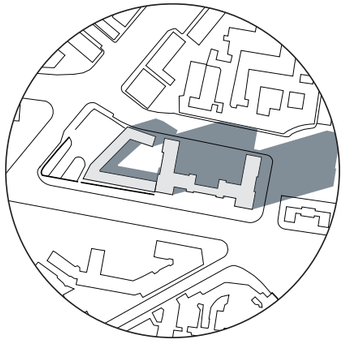

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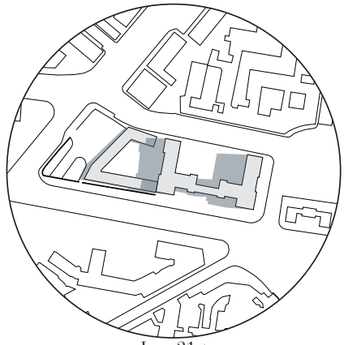

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June 21st
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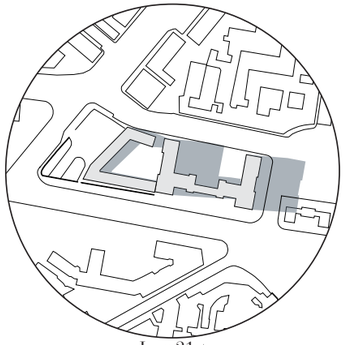

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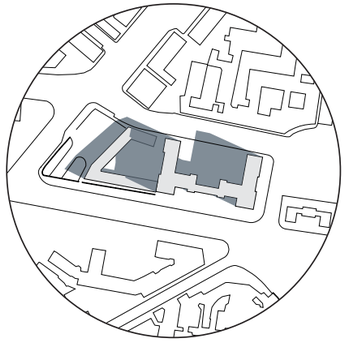

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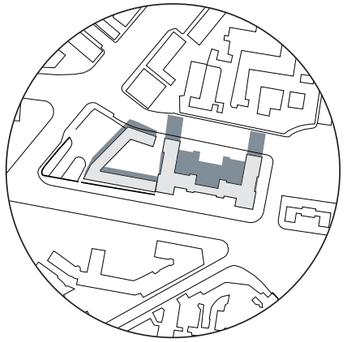

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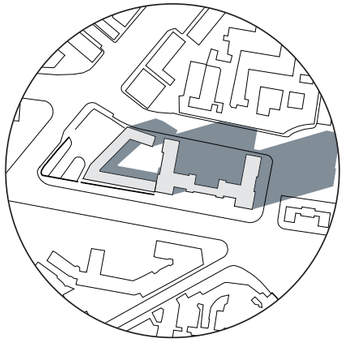

September 22nd
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December 21st
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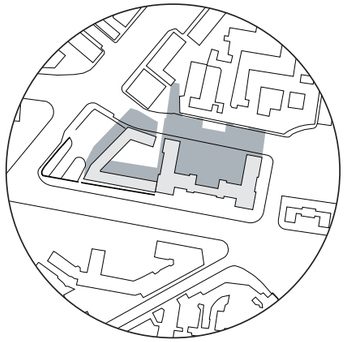
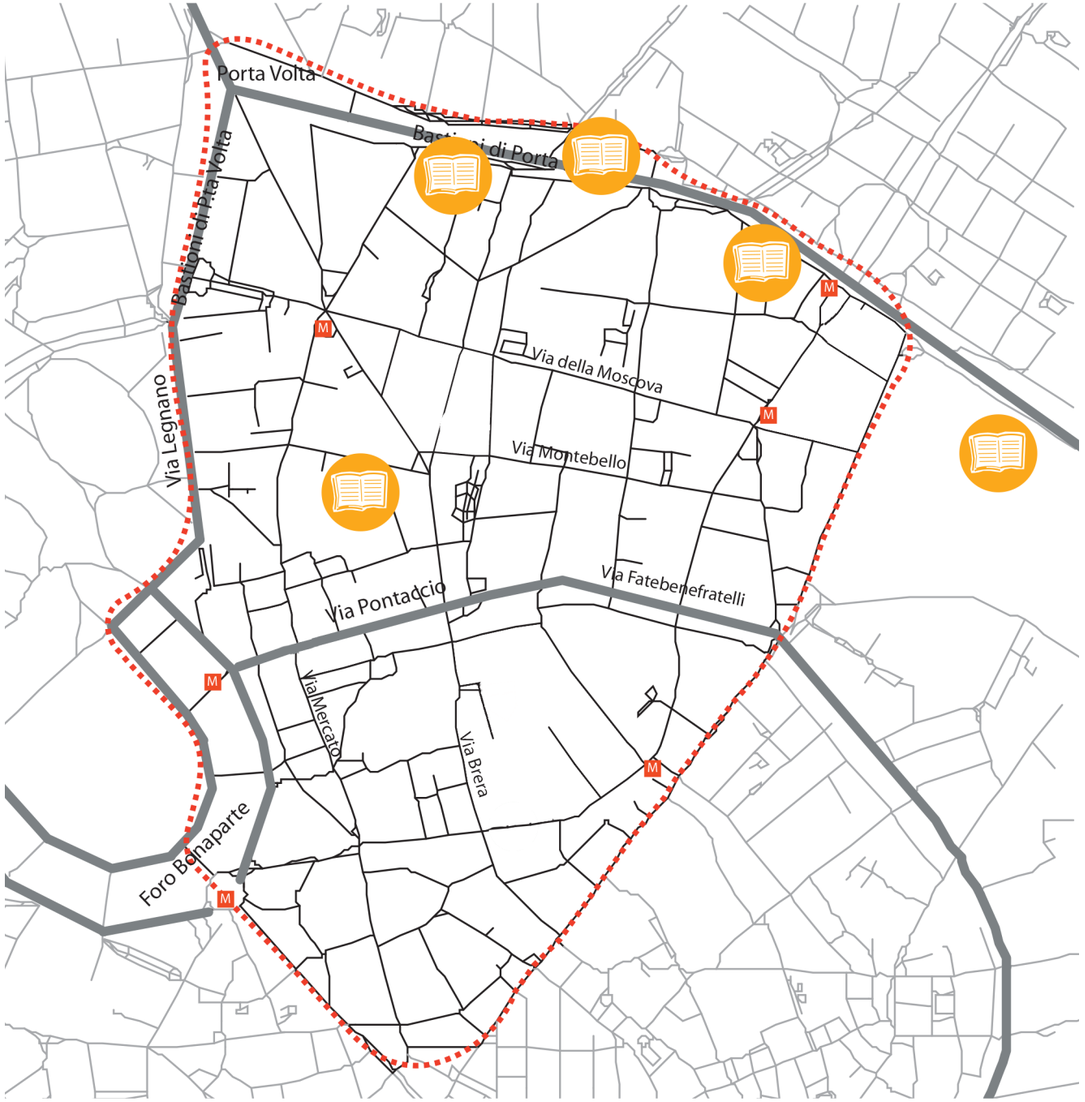


December 21st
12:30

December 21st
16:30



8
PROGRAM

In order to be able to manage correctly the city of Milan, the administration, through the 2011 Urban Regulatory Plan, divided it into 88 NIL (Nuclei of Local Identity). The NILs represent areas defined as city quarters, in which it is possible to recognize common characteristics of urban tissue. They are recognizable as systems of urban vitality: concentrations of commercial local activities, parks, aggregation areas, and services. Given their small extension area, it is possible to collect data as population, services, security, etc, in order to intervene on them and guarantee a high quality of life.
The school complex of Porta Nuova is located in NIL (Nucleo of Local Identity) 2, which includes the Brera and Moscova areas, as well as part of the Bastioni system, going from Porta Volta (where the new Feltrinelli project by Herzog and De Meuron has been recently completed) to Piazzale Principessa Clotilde, where the first Central Station, now demolished, was located.
It borders on the north side with the new business and residential complex of Garibaldi, which is rapidly growing in density. This proximity also affects our area, especially for what regards the growth of the population, and the number of minors present.
New data, collected in 2016, state that inhabitants between 0-5 years old are 992 (the 5,6% of the total population), of which 51% are of Kindergarten age. The growth estimate for the year 2034, highlights an increase of 15,2%, which translates into 75-80 additional children with respect to nowadays.
The NIL2 area has 5 kindergarten facilities, with an average of 3,5 sections each, of which only 3 are public, while the other 2 are private: Comunale Via Palermo 7/9, Comunale B.ni Porta Nuova 6, Comunale B.ni Porta Venezia, Casa dei Bambini Montessori, Ist. Suore Francescane Missionarie.
According to the existing regulations for school buildings, given by the DM/18.12.75, and regarding the number of alumni per class, as well as the minimum area necessary for the different functions, the kindergartens in the area are already almost at saturation. Therefore, taking into

8.1 _ Localization of the kindergartens in the are of NIL2

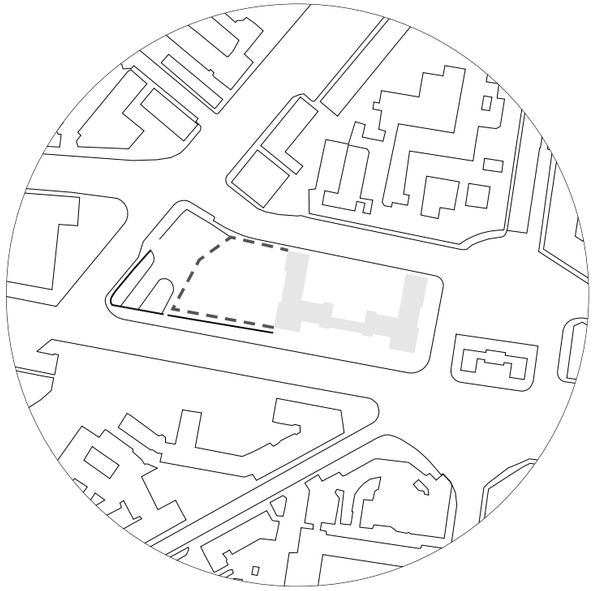
	numero Max Alunni
D.M. Edlizia Scolastica	30
D.M. antincendio, affollamento max, norme di esercizio	27 25 se 1 disabile/anticipatario

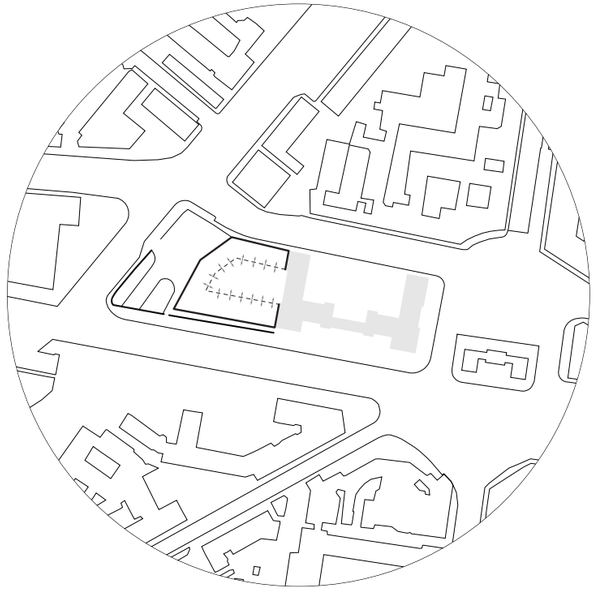
INDICI STANDARD DI SUPERFICIE (in parentesi il n. di locali relativi)				
	1 sez -30 al m2/al	***2 sez -60 al m2/al***	***3 sez -90 al m2/al***	
Attività ordinate				
attività a tavolino	1,80 (1)	1,80 (2)	1,80 (3)	
attività speciali	0,60 (2)	0,45 (3)	0,40 (4)	spazi comuni 1 per max 3 sezioni
Attività libere	1,00	0,92	0,90	
Attività pratiche				
spogliatoio	0,50 (1)	0,50 (2)	0,50 (3)	
locali lavabi e servizi igienici	0,67 (1)	0,67 (2)	0,67 (2-3)	3 servizi igienici per sezione
deposito	0,13 (1)	0,13 (1)	0,13 (1-2)	
Spazi per la mensa				
mensa	0,67 (1)	0,40 (1)	0,40 (1)	
cucina, anticucina, etc (min 30 m2)	1,00	0,50	0,35	
Assistenza				
stanza per assistente (min 15 m2)	0,50	0,25	0,17	
spogliatoio e servizi insegnante (min 6 m2)	0,20	0,10	0,07	
lavanderia (min 4 m2)	0,13	0,07	0,04	
indice superficie netta tot	8,24	7,12	6,65	
somma indici parziali	7,20	5,79	5,41	
connettivo e servizi	1,04	1,33	1,24	
connettivo e servizi/sup tot netta	13%	19%	19%	

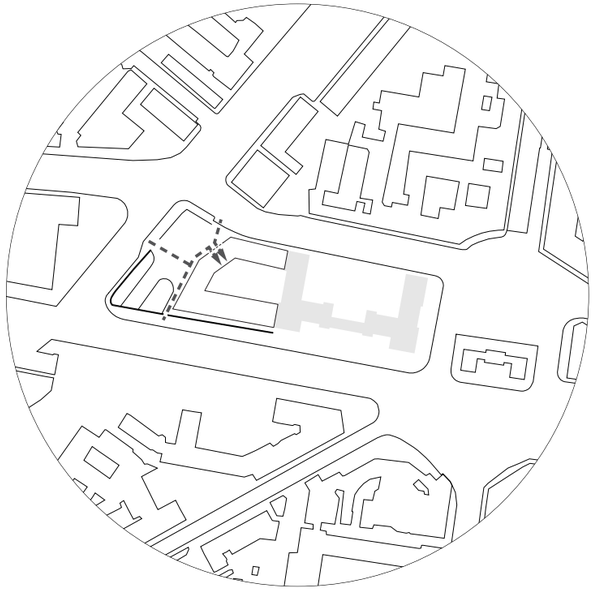
account the foreseen inhabitant's growth given by the NIL analysis, it becomes obvious that there will be a lack of infrastructure to be dealt with.
Given the high density and historical character of the city quarter, our solution is to intervene on the existing scholastic buildings, restoring, extending, or reconstructing them, depending on the current conditions of the infrastructure.

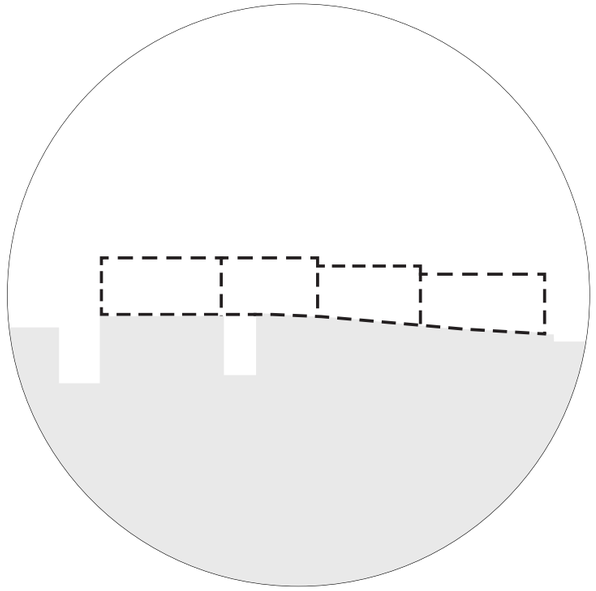
8.2 _ Summary of the regulations given by the DM/18.12.75 about kindergartens

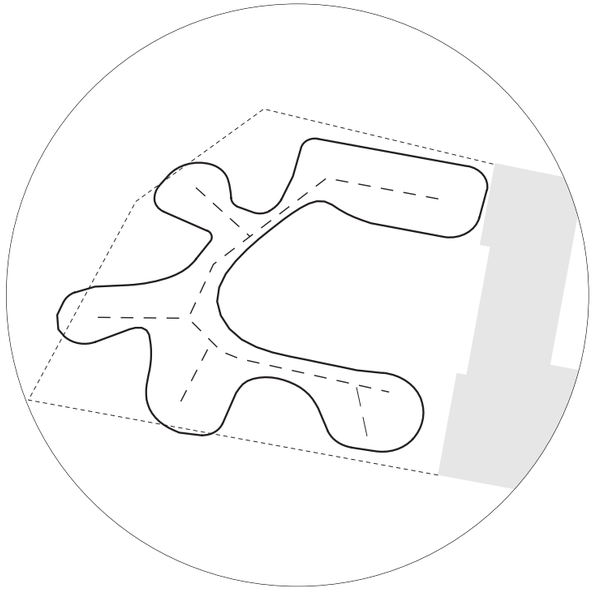
9
CONCEPTUAL DEVELOPMENT



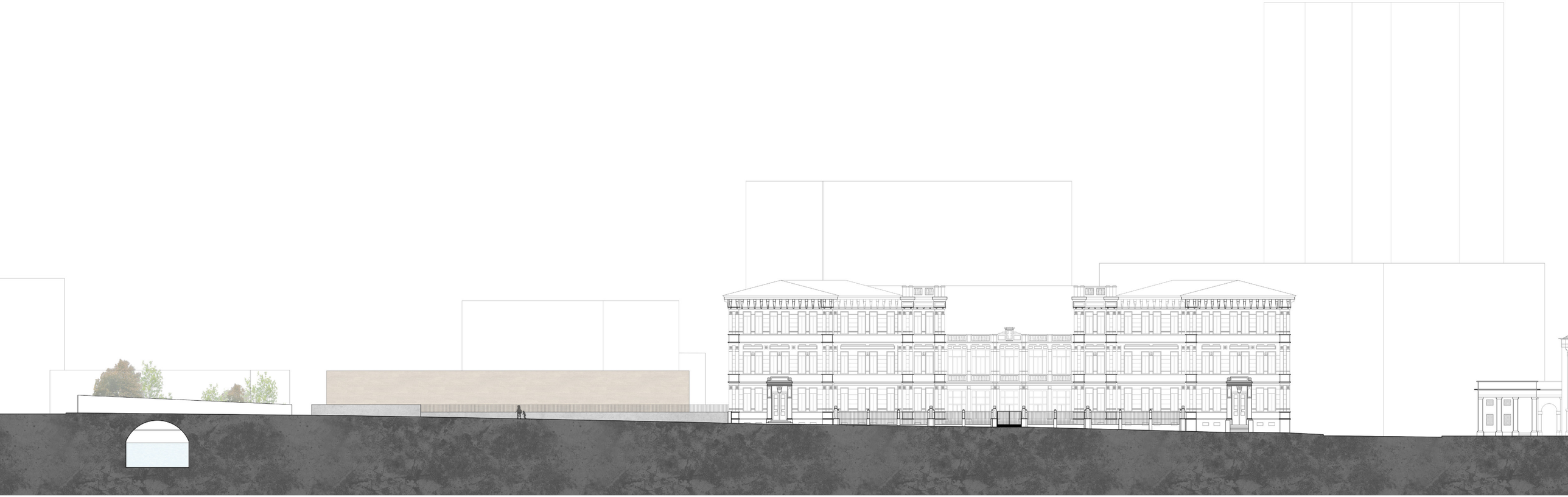


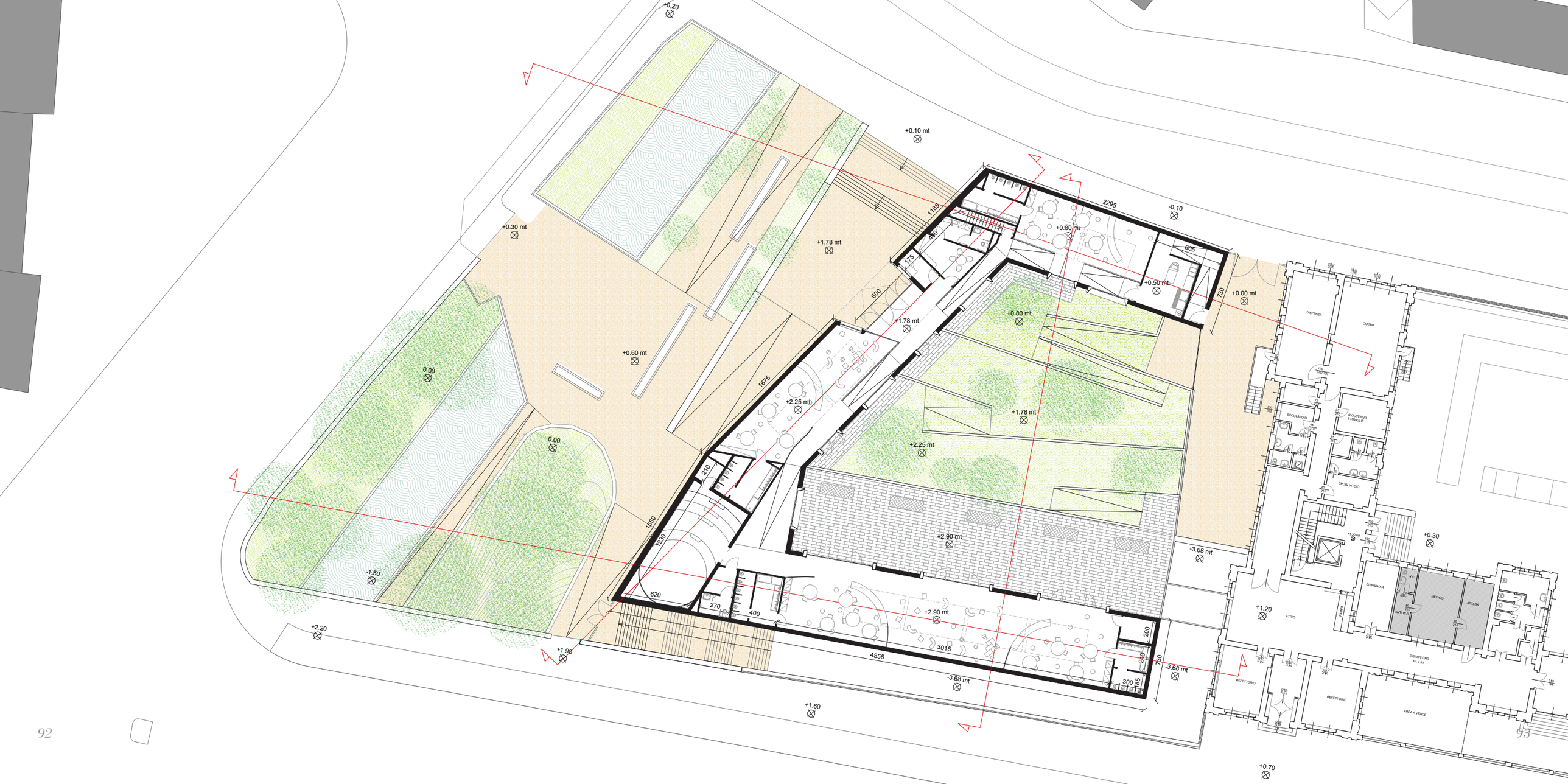






PROJECT

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+2.90 mt
+2.90 mt
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+0.50 mt
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-3.68 mt
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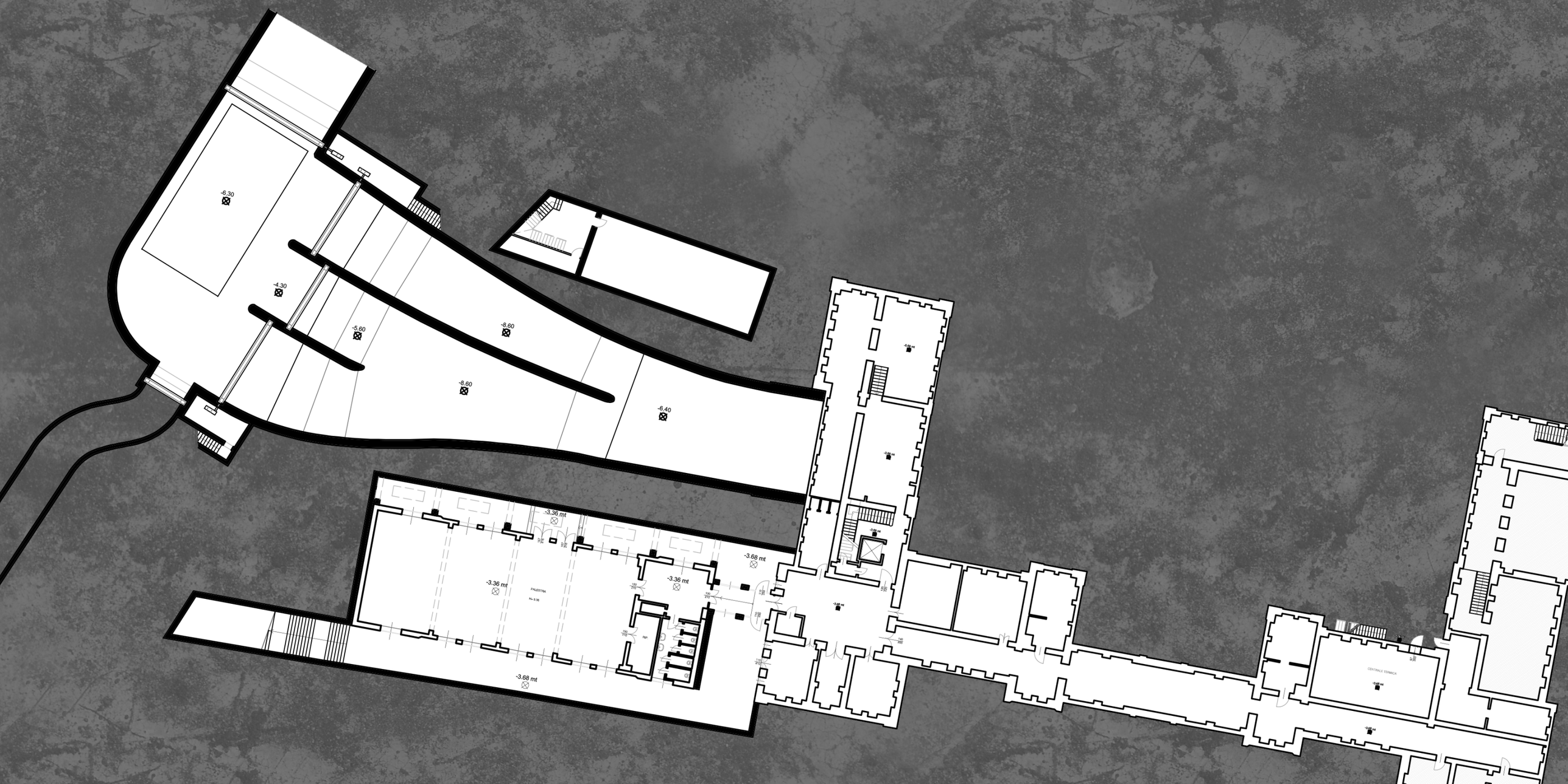
+1.20
+0.30
+2.20
+1.90
+1.60
+0.70
-1.50
2295
1185
605
730
600
175
1675
1550
210
220
620
270
400
4855
3015
200
200
300
185
DISPENSA
CUCINA
SPOGLIATOIO
INGOVERNO STOVIGLIE
SPOGLIATOIO
ATRIO
GUARDIOLA
MEDICO
ATTESA
DISIMPEGNO H. 4.60
REFETTORIO
REFETTORIO
AREA A VERDE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-5.60
-8.60
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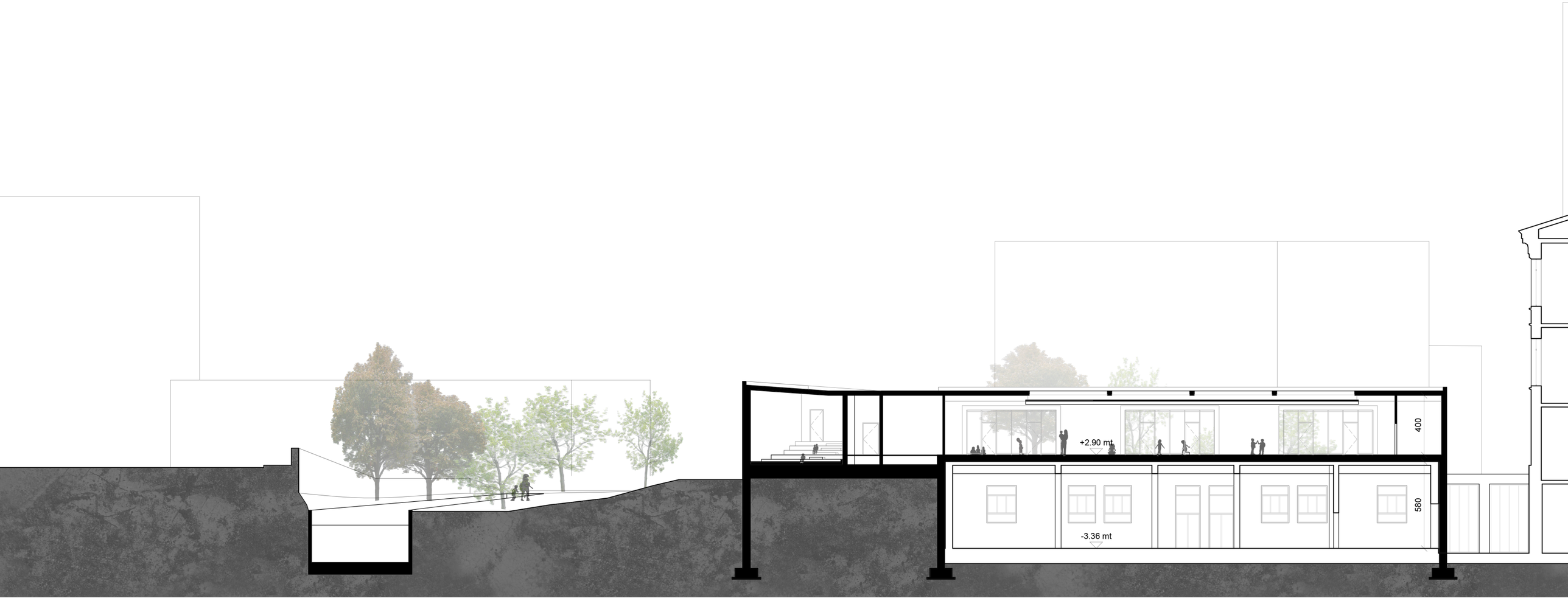
-3.36 mt
-3.36 mt
-3.36 mt
-3.68 mt
-3.68 mt
PALESTRA
CENTRALE TERMICA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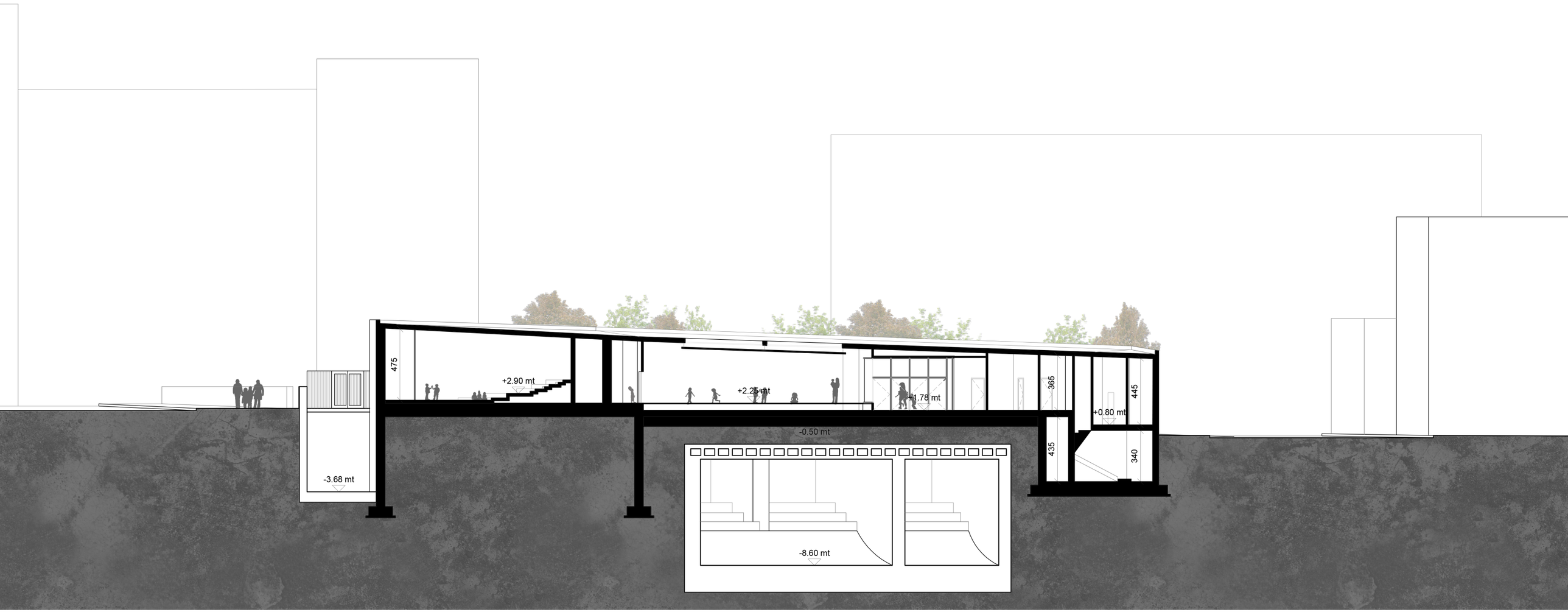
-3.36 mt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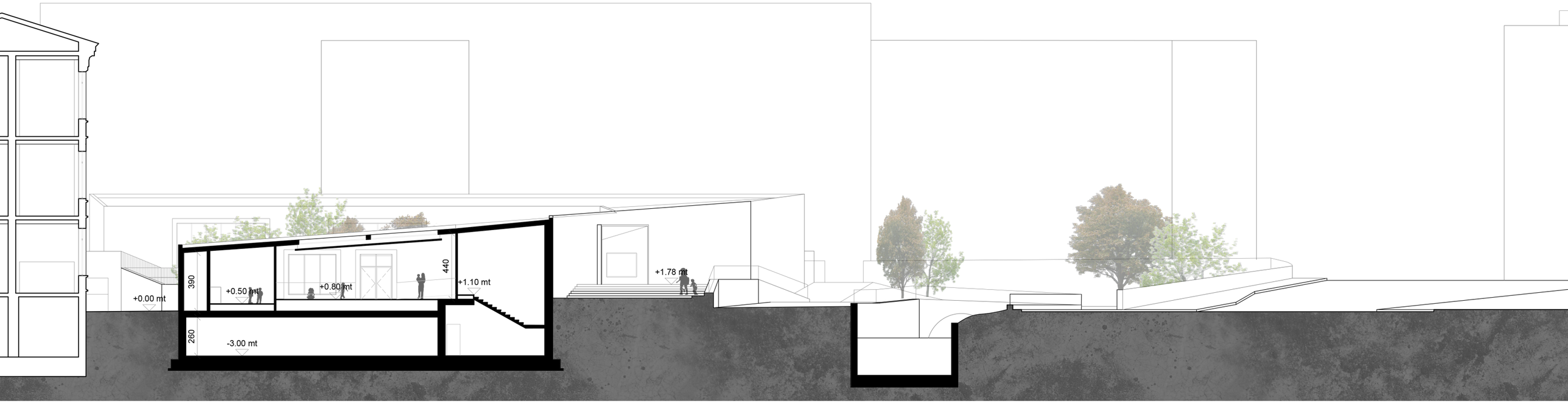
+1.78 mt
365
445
+0.80 mt
-0.50 mt
435
340
-3.68 mt
-8.60 mt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+0.50 mt
+0.80 mt
440
+1.10 mt
+1.78 mt
260
-3.00 mt


+2.90 mt
360
+2.25 mt
+1.78 mt
-0.50 mt
555
-3.36 mt
330
+0.80 mt
410
260
-3.00 mt
-7.20 mt


6
4
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A
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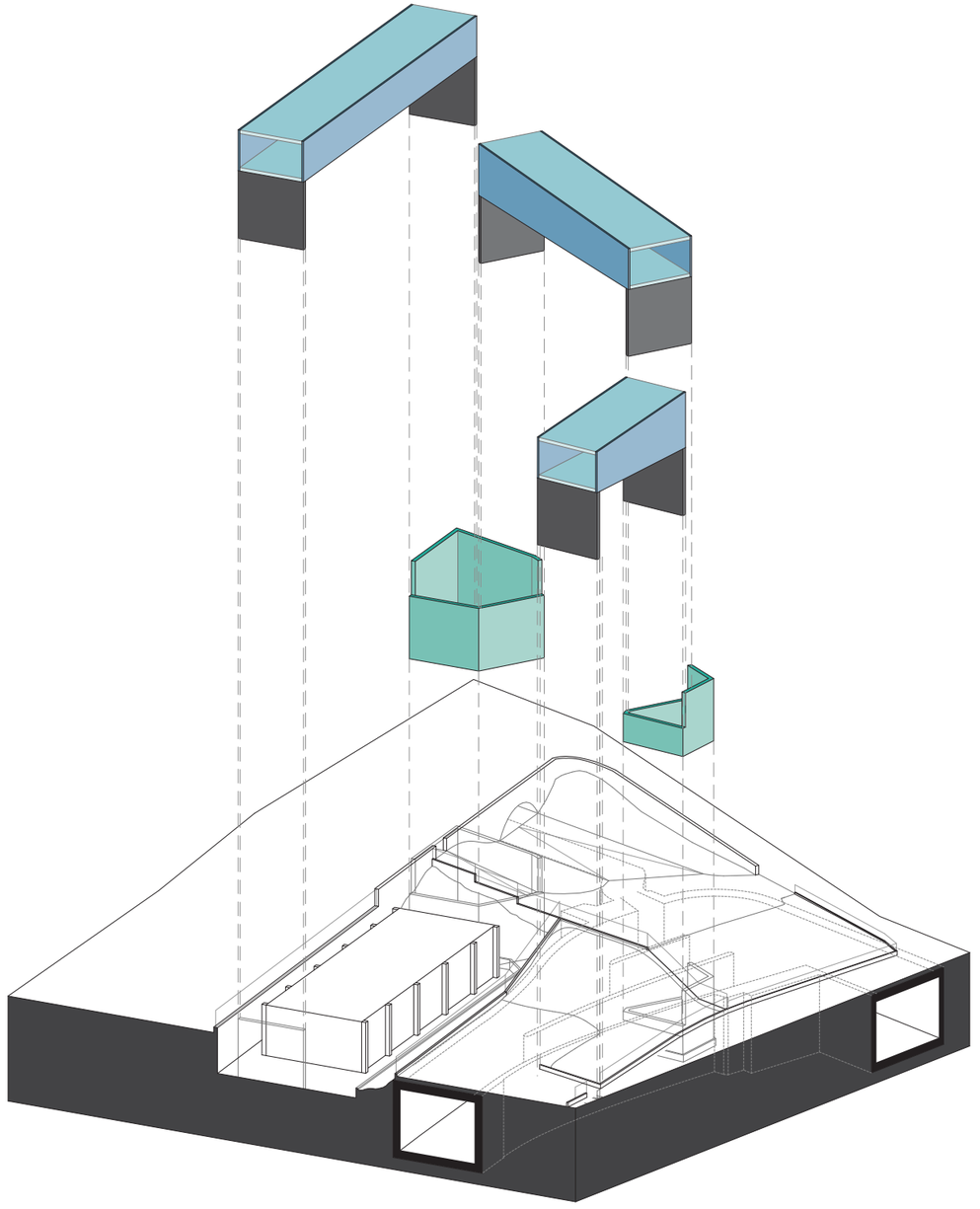
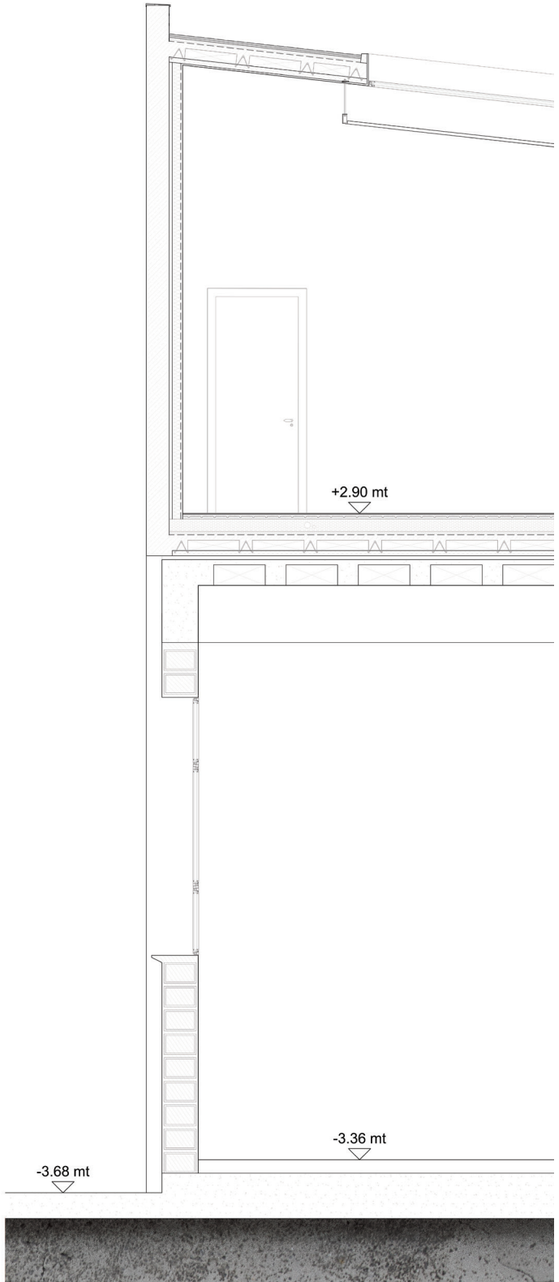
9



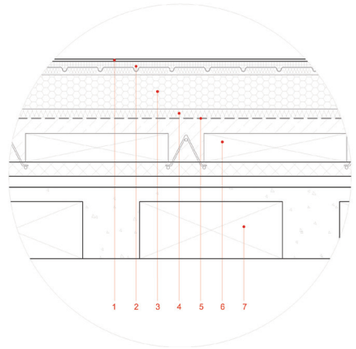


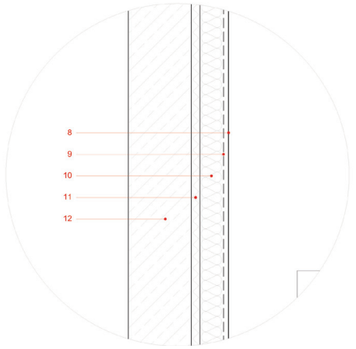
LEGEND

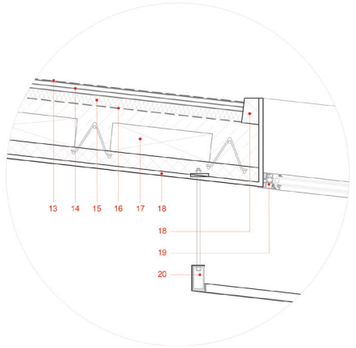
1_ Parquet Haro 3000 11 mm
2_ Radiant Heating system (25 mm) with fiber reinforced gypsum (18 mm) - Euroslim
3_ ExpandedClay for system base - Pavileca 120 mm
4_ Insulation Layer - Stifterite GT 30 mm
5_ Vapor Barrier
6_ Concrete Predalle Slab 5 + 10 + 5 cm
7_ Structural hypothesis for the existing building

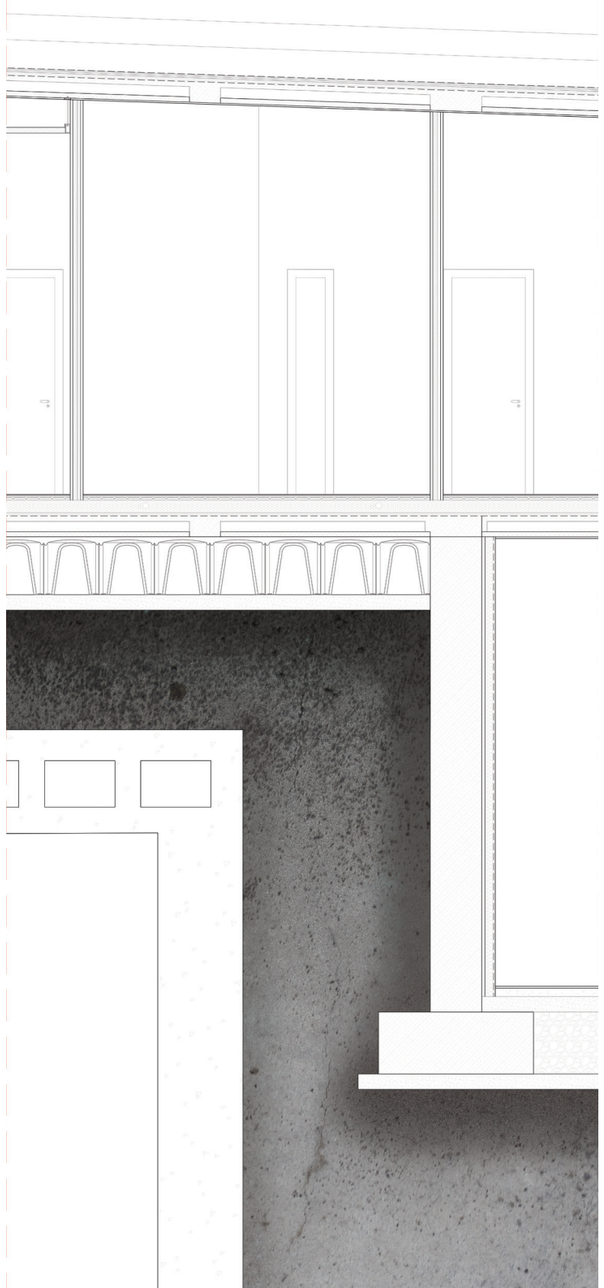
8_ Internal Plaster 15 mm
9_ Vapor Barrier
10_ Insulation Layer - Stifterite GT 80 mm
11_ Acoustic Insulation Layer 30 mm
12_ Structural Wall-Beam in reinforced concrete 22 cm

13_ Water Barrier
14_ Double Layer of Fiber Reinforced Concrete Panels 30 mm
15_ Insulation Layer - Stifterite GT 50 mm
16_ Vapour Barrier
17_ Concrete Predalle Slab 5 + 10 + 5 cm
18_ Internal Plaster
19_ Skylight Window with steel frames and double glaze
20_ False ceiling - Drywall Panels 30 mm









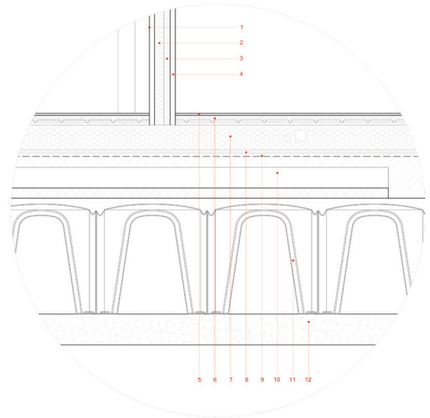
LEGEND

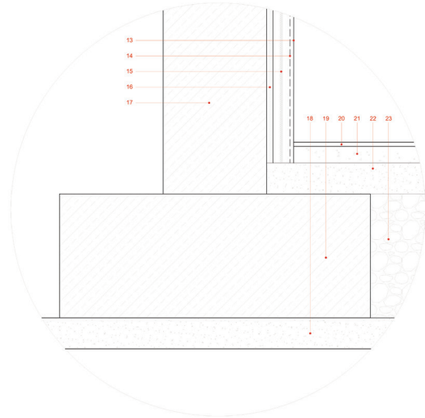
1_ Drywall panel 25 mm
2_ Insulation Layer - Stifterite GT 45 mm
3_ Acoustic Insulation Layer 30 mm
4_ Drywall panel 25 mm

5_ Parquet Haro 3000 11 mm
6_ Radiant Heating system (25 mm) with fiber reinforced gypsum (18 mm) - Euroslim
7_ ExpandedClay for system base - Pavileca 120 mm
8_ Insulation Layer - Stifterite GT 30 mm
9_ Vapor Barrier
10_ Concrete Predalle Slab 5 + 10 + 5 cm
11_ Ventilated crawl space with Igloo System 560 mm
12_ Lightened concrete foundation screed 150 mm

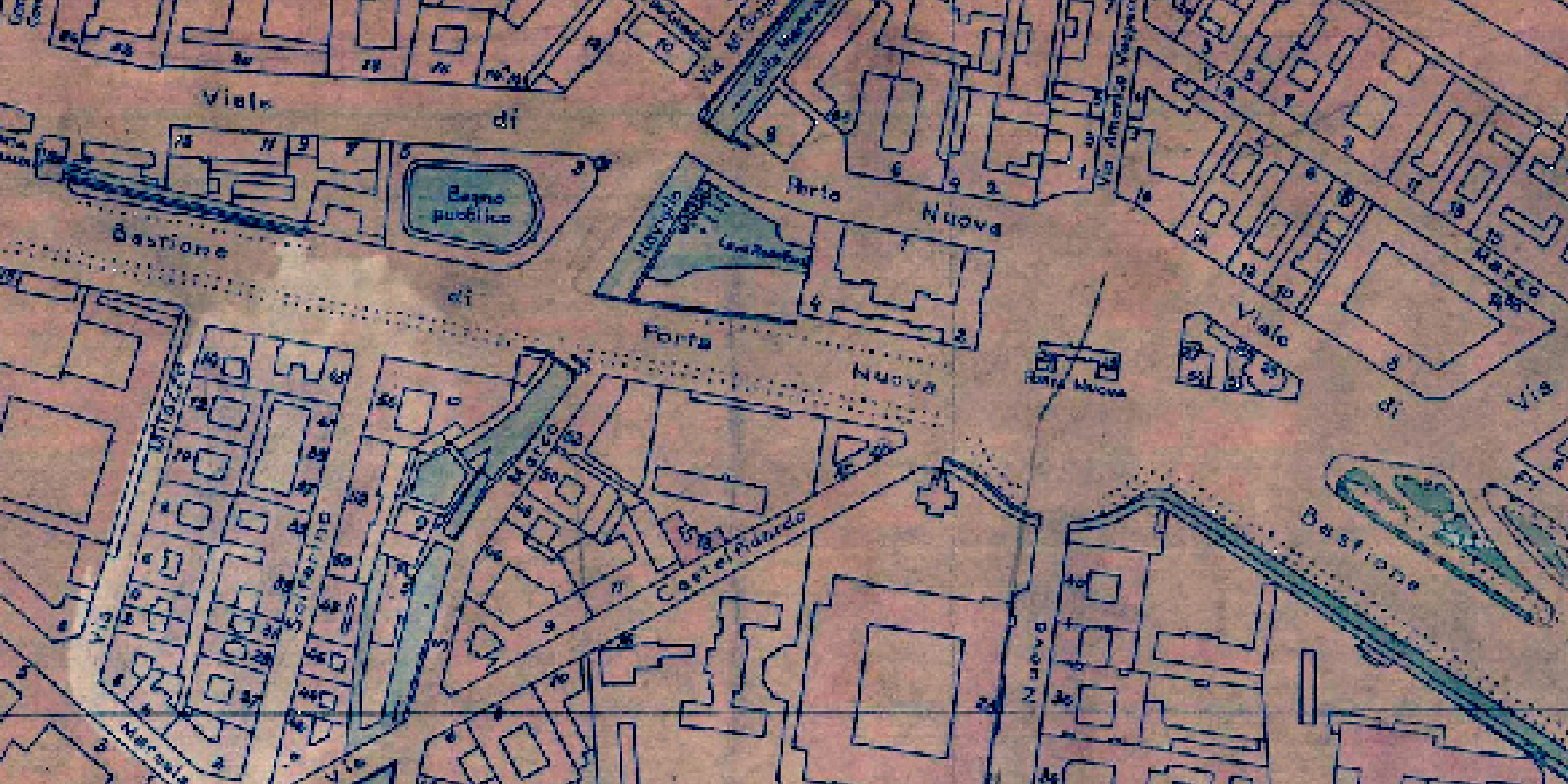
13_ Internal plaster
14_ Vapour Barrier
15_ Insulation Layer - Stifterite GT 80 mm
16_ Acoustic Insulation Layer 30 mm
17_ Concrete Underground structural wall 50 cm

18_ Lightened concrete foundation screed 150 mm
19_ Structural foundation plynth in reinforced concrete
20_ Concrete floor finishing 20 mm
21_ Lightened screed for floor base 80 mm
22_ Concrete screed for systems 150 mm
23_ Crawl space 600 mm





APPENDIX



Viale
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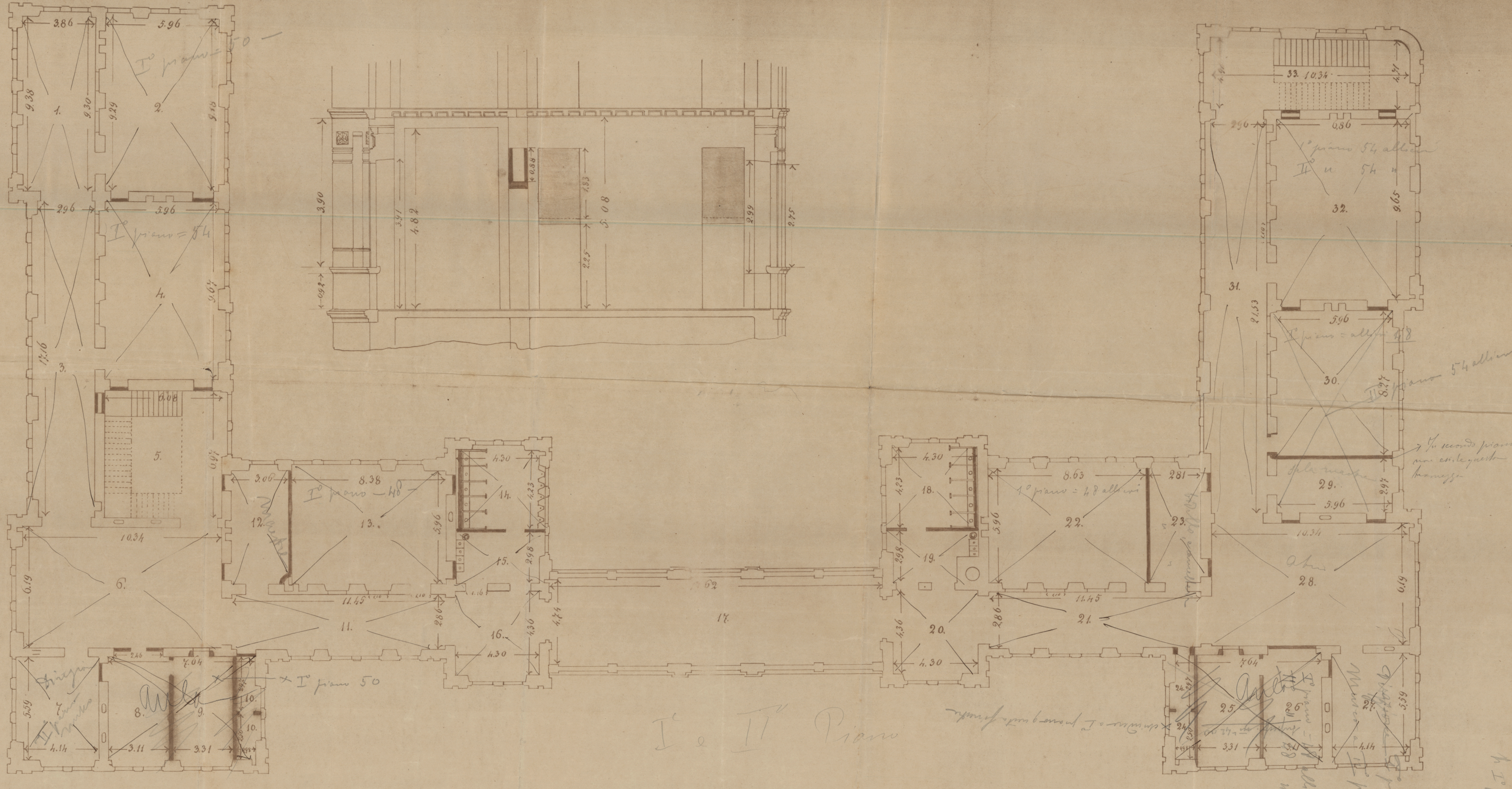
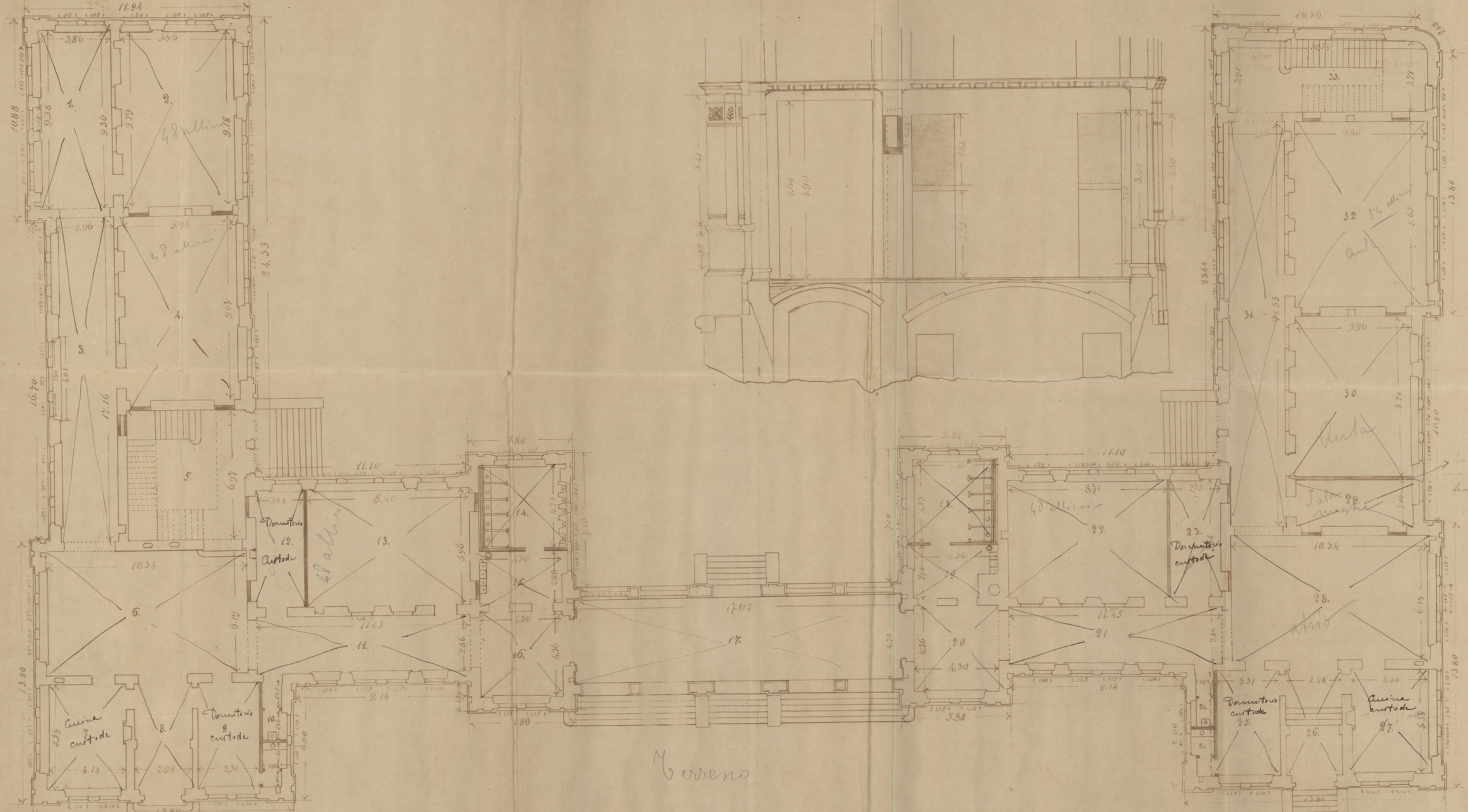

I° e II° Piano
I° piano = 50
I° piano = 54
I° piano = 48
1° piano = 48 allievi
I° piano 50
1° piano 54 allievi
II° " 54 "
II° piano 54 allievi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Aula
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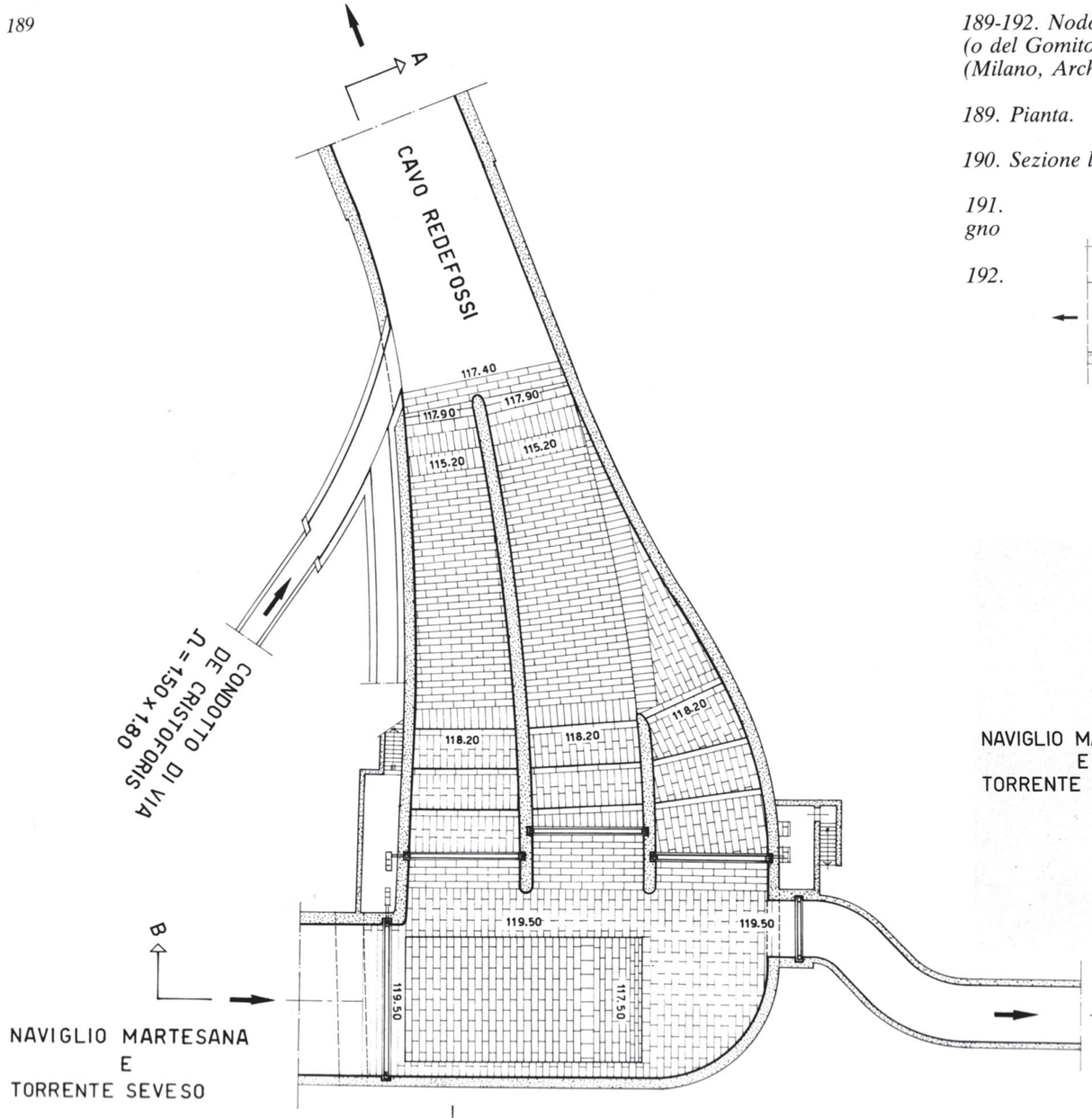
Salon
Atrio



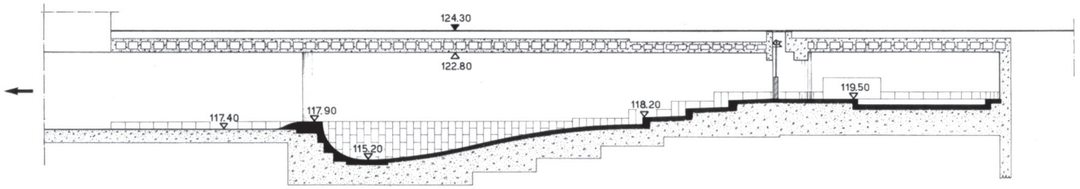
189-192. Nodo
(o del Gomito,
(Milano, Arch

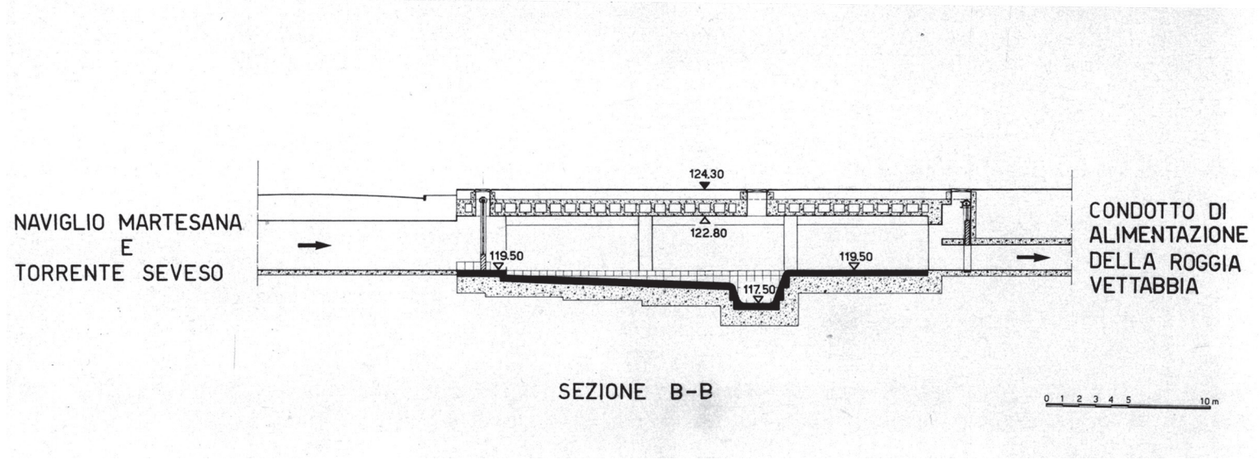
189. Pianta.

190. Sezione li

191.
gno

192.





MINISTERO DEI LAVORI PUBBLICI
UFFICIO DEL GENIO CIVILE DI MILANO
VISTO, con riferimento alla nota
data
numero
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INGEGNERE
(Giovanni Giu
PROVVEDITORATO REGIONALE OO. PP.
per la Lombardia
MILANO
N.
COMITATO TECNICO AMMINISTRATIVO

3

SCUOLA MATERNA

PORTA NUOVA

FIANCHI

RAPP. 1:100 | FEBBRAIO 1958

L'ARCHITETTO DIRIGENTE

A. ARRIGHETTI

Dott. arch. Graziella Zennoni

MINISTERO DEI LAVORI PUBBLICI

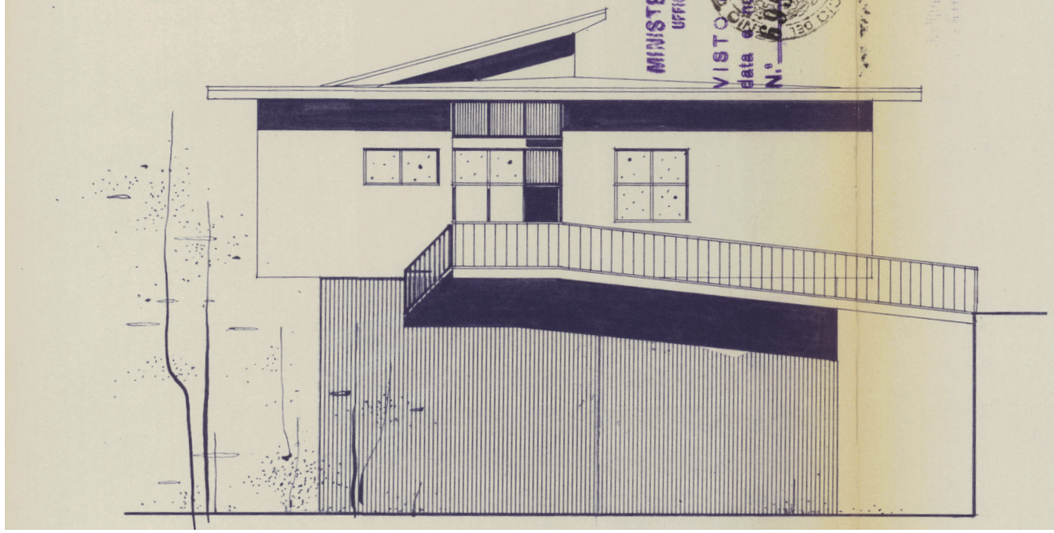
UFFICIO DEL GENIO CIVILE DI MILANO

VISTO con riferimento alla nota pari data e numero

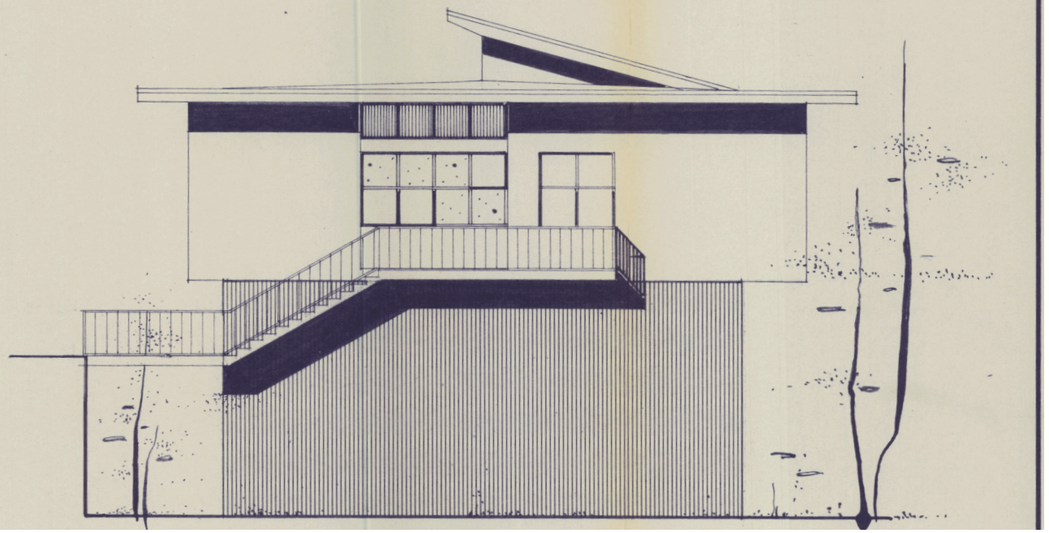
N.

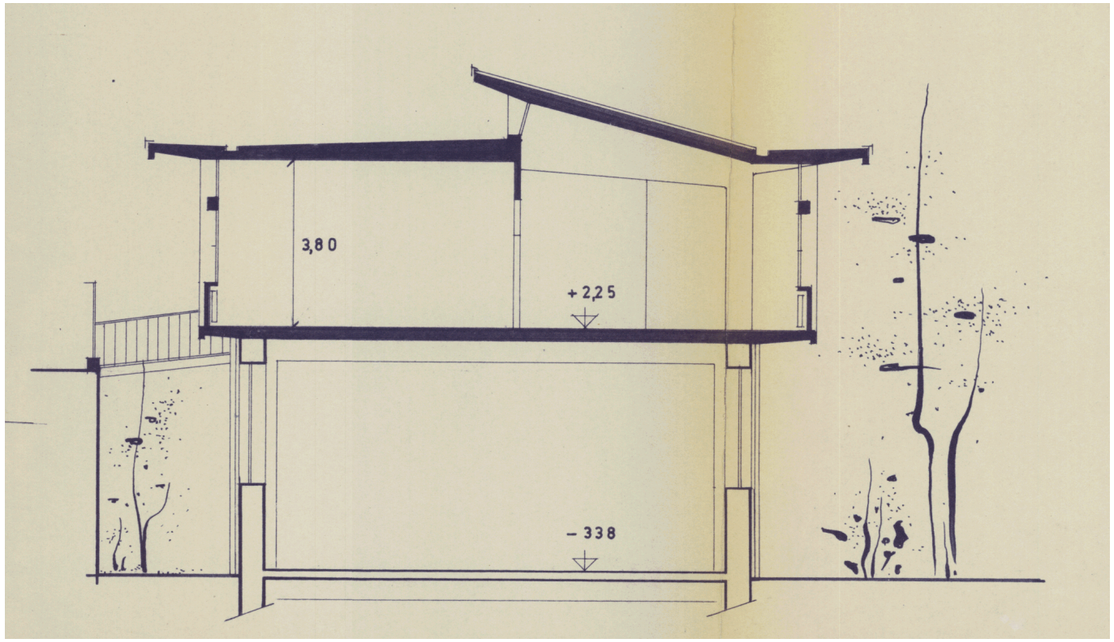
L'INGEGNERE CAPO

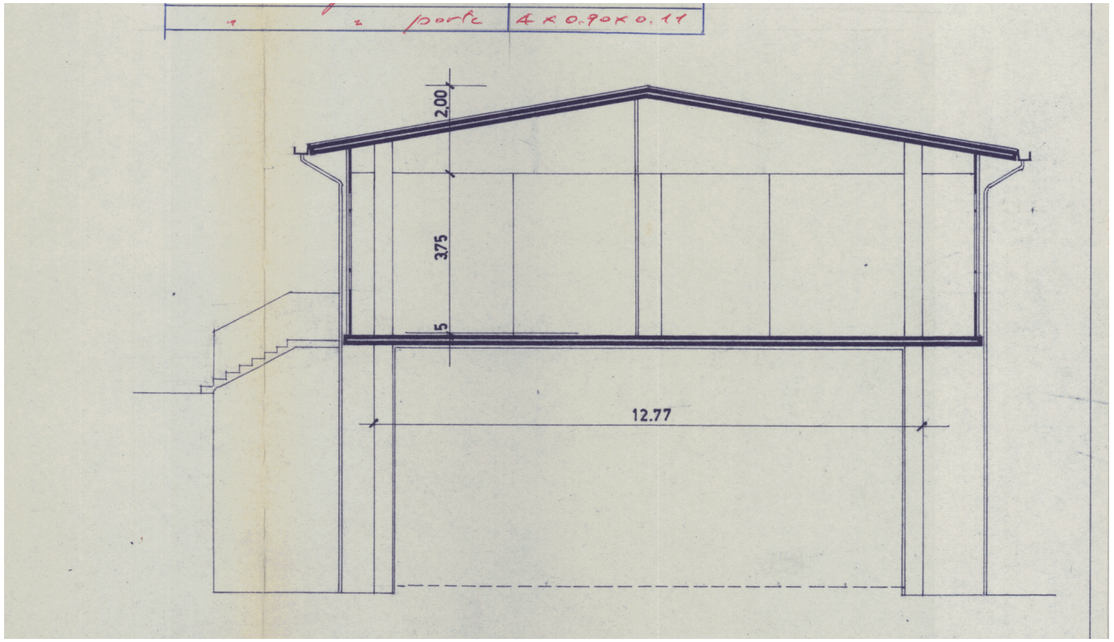
(Giovanni Alunita)



PARTE ESISTENTE




3,80
+2,25
-3,38


portic
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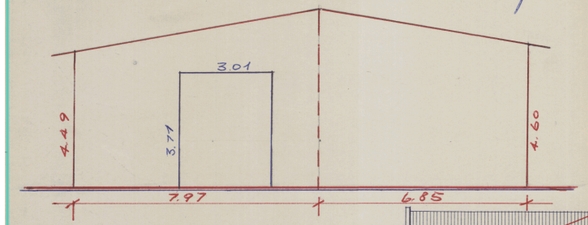
TAV.	COMUNE DI MILANO - UFFICIO TECNICO - UFFICIO PROGETTI	
23	SCUOLA MATERNA PORTA NUOVA INTONACI ESTERNI PROSPETTI	
MQ. 0,30	RAPP. 1:100	NOVEMBRE 1959

Zilli

FRONTESPIZIO VERSO MARTESANA



ART. 709 = Assistenza muraria per l'esecuzione di stucco lucido

Art. 156ª Lastre di cemento amianto per soffittature e rivestimenti: dimensioni 1,20 x 1,20 x 0,006

Facc. V/o Bastioni: lastre sopra serramenti: n. 26 x 2; pannelli pieni n. 4 x 3 x 2

Facc. V/o Martesana: lastre sopra serramenti: n. 28 x 2; pannelli pieni: n. 4 x 3 x 2

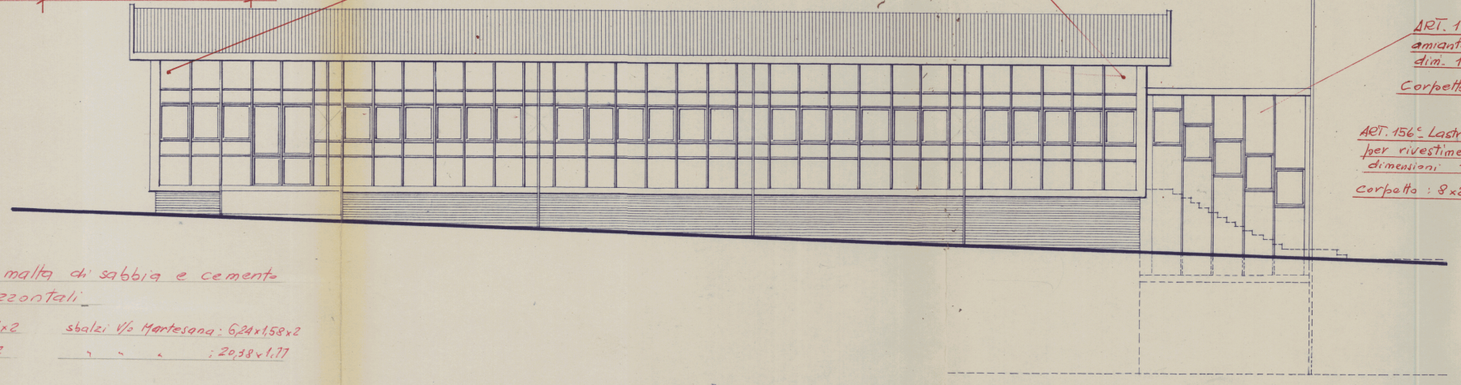
Frontespizio V/o Martesana: lastre sopra serramenti: n. 3 x 2

ART. 156ª Lastre di cem. amianto per rivestimenti: dim. 1,20 x 1,20 x 0,006

Corpetto: 2 x 2 x 2

ART. 156ª Lastre di cem. amianto per rivestimenti: dimensioni 1,20 x 2,53 x 0,006

Corpetto: 8 x 2



ART. 561 Strollatura con malta di sabbia e cemento su pareti orizzontali

sbalzi V/o Bastioni: 6,24 x 0,87 x 2

" " " : 20,38 x 1,32

sbalzi V/o Martesana: 6,24 x 1,58 x 2

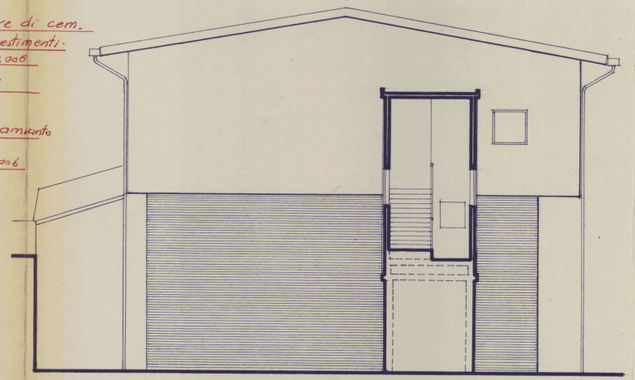
" " " : 20,38 x 1,77

FACCIATA VERSO BASTIONI

~~PROSPETTO VERSO STRADA~~

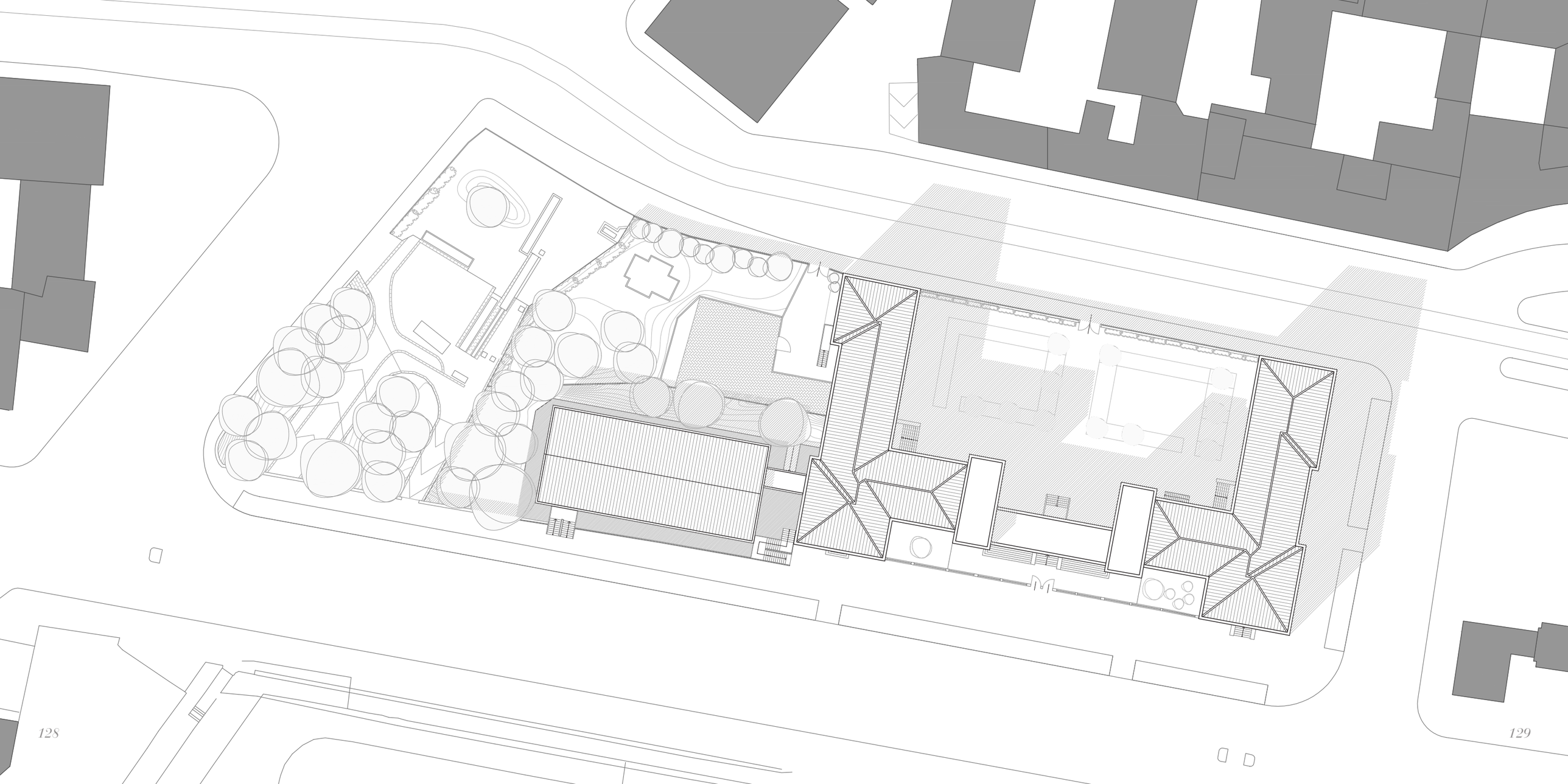
ART. 576 = Intonaco completo a civile su pareti

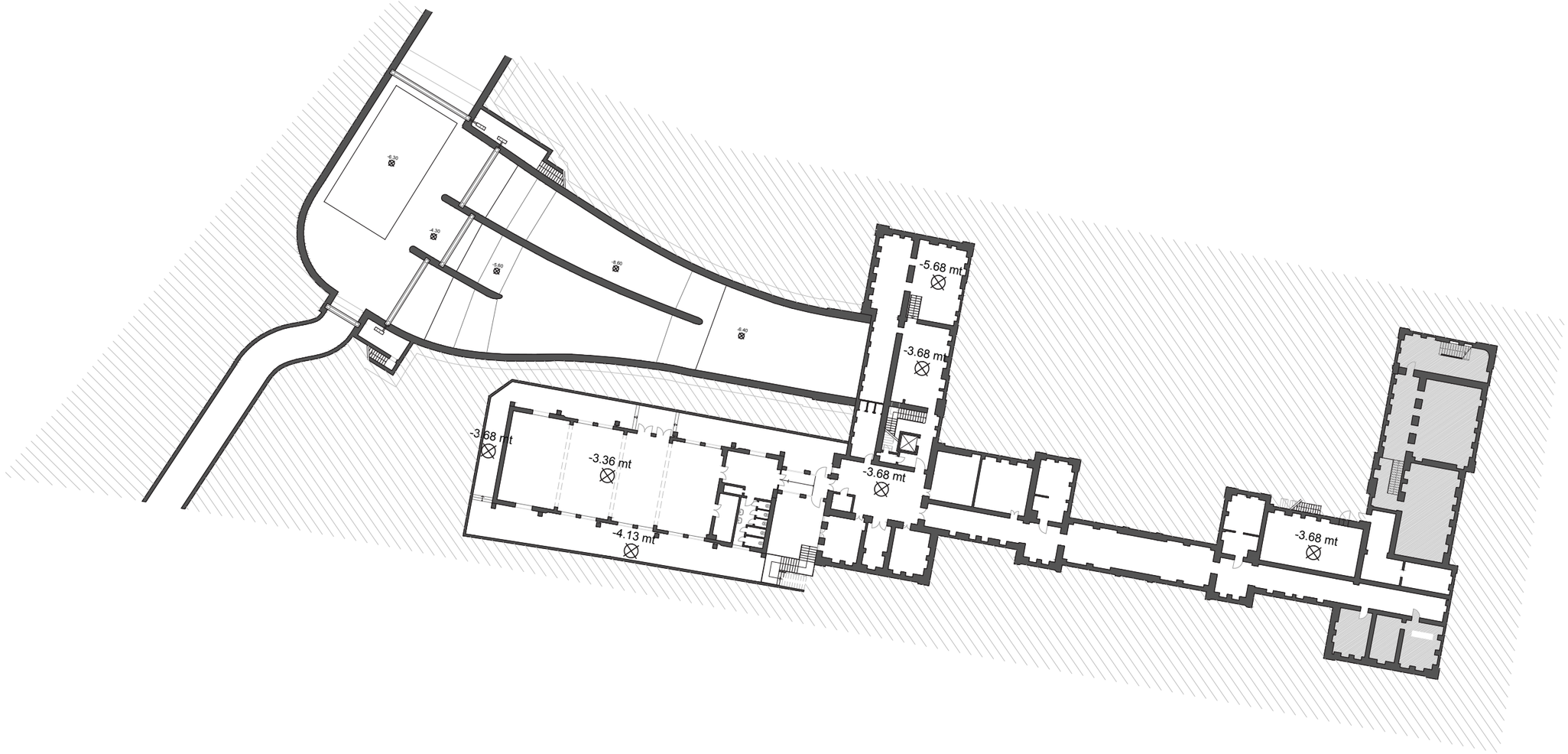
Facciata	Misure	Facciata	Mi
Frontespizio V/o Martesana	1/2 (5.81 + 4.60) x 6.85	Facciata V/o Bastioni	
" " "	1/2 (5.81 + 4.49) x 7.97	parapetti	0.96
Rientramento	(0.32 + 0.20 + 1.27 + 0.20 + 0.32) x 0.45	fronte Pc	(25.95+
Parapetti	0.96 x 1.06 x 3	spalle Ricorsi	4.60 x
Sguinci e cielino	(3.71 x 2 + 3.01) x 0.10	sguinci	4.27 x 0
Dedurre: impennata	3.71 x 3.01	orizzontale su 16Pc	6.24 x
		" " "	20.38
		spess. travi	1/2 (0.78 x 0
		" "	1/2 (1.02 + 0

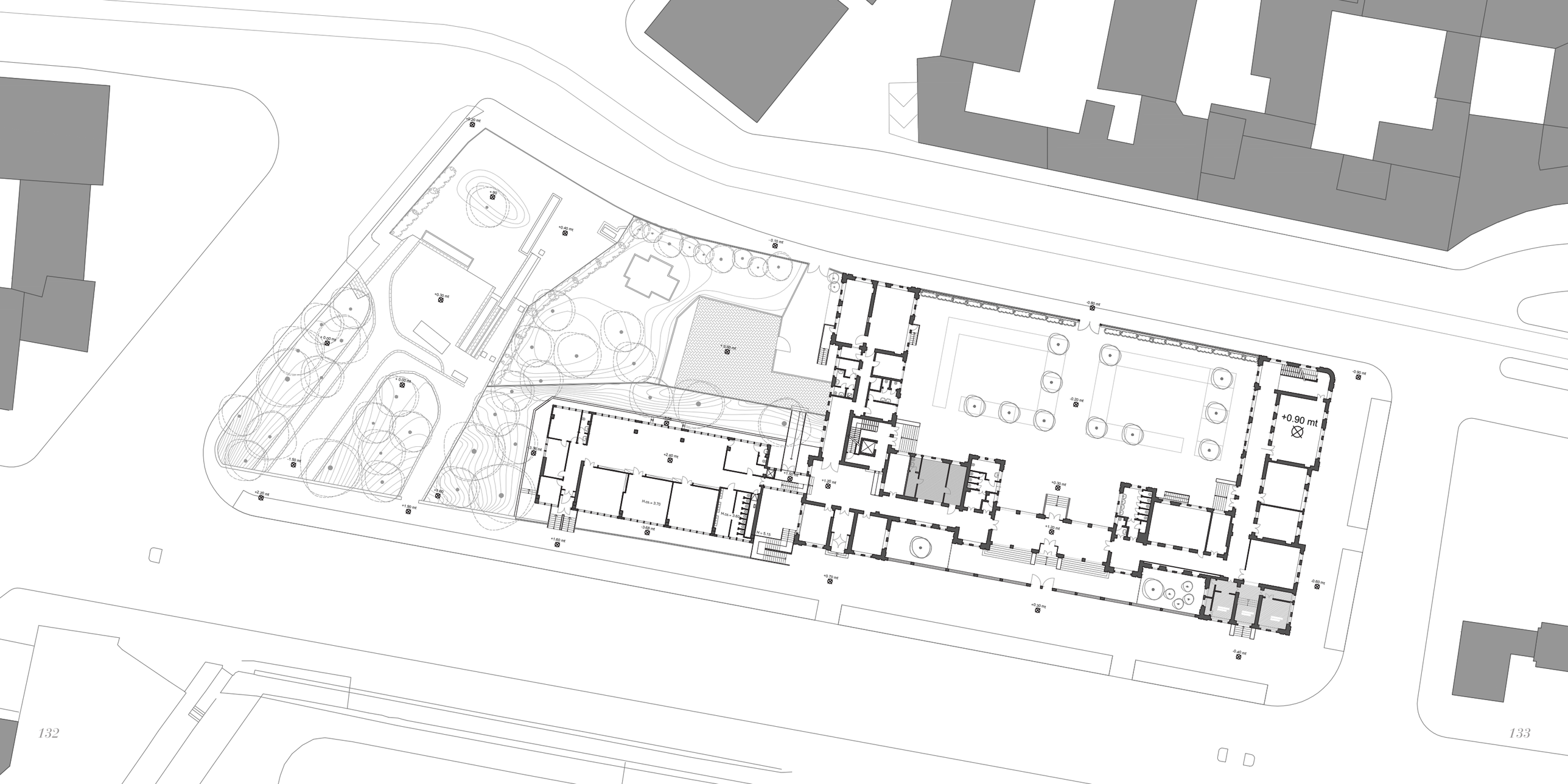


FRONTESPIZIO VERSO SCUOLA ELEMENTAR

~~FIANCO VERSO LA SCUOLA~~




-5.68 mt
-3.68 mt
-3.68 mt
-3.36 mt
-4.13 mt
-3.68 mt
-3.68 mt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H.cs.= 3.70
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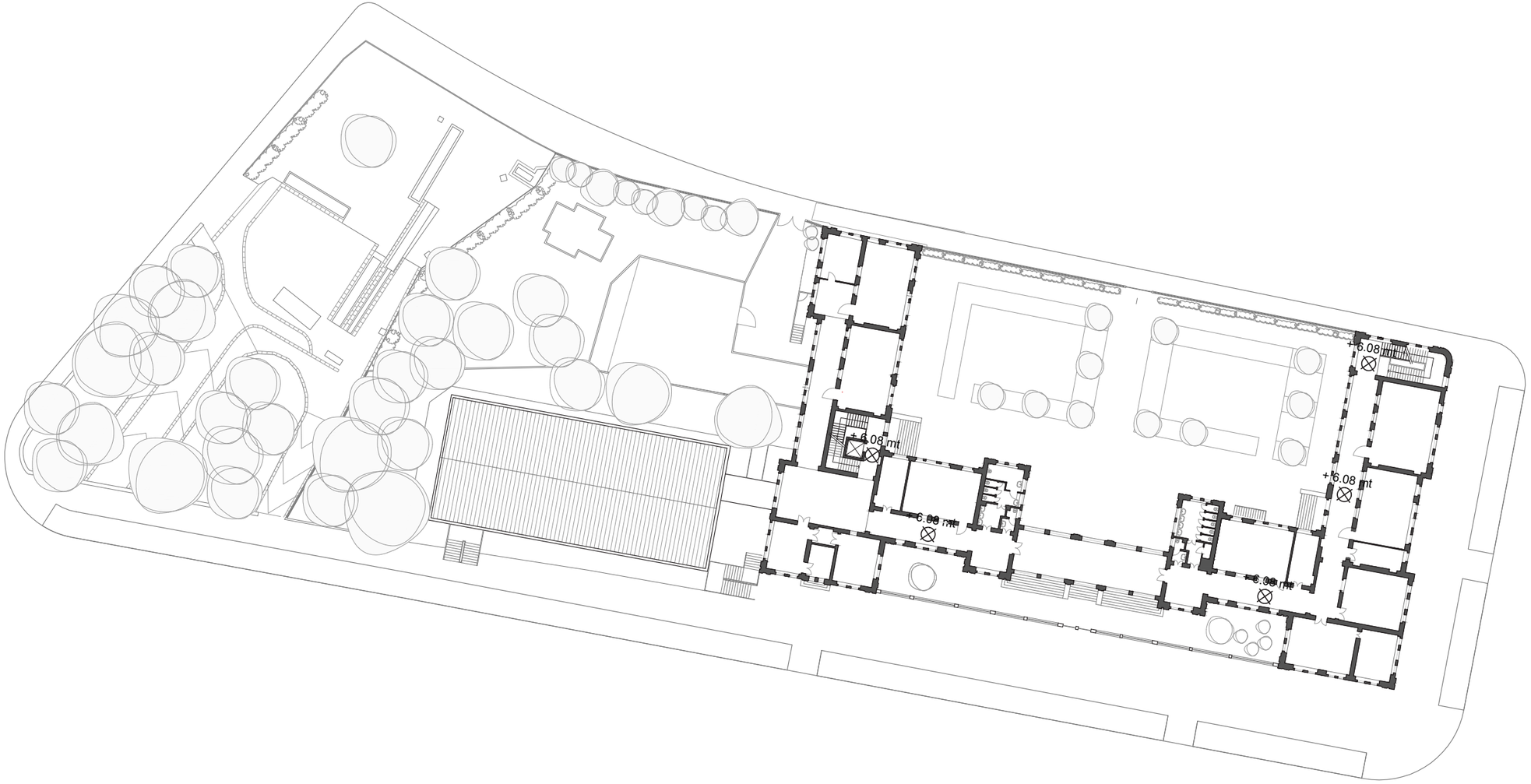
+6.08 mt
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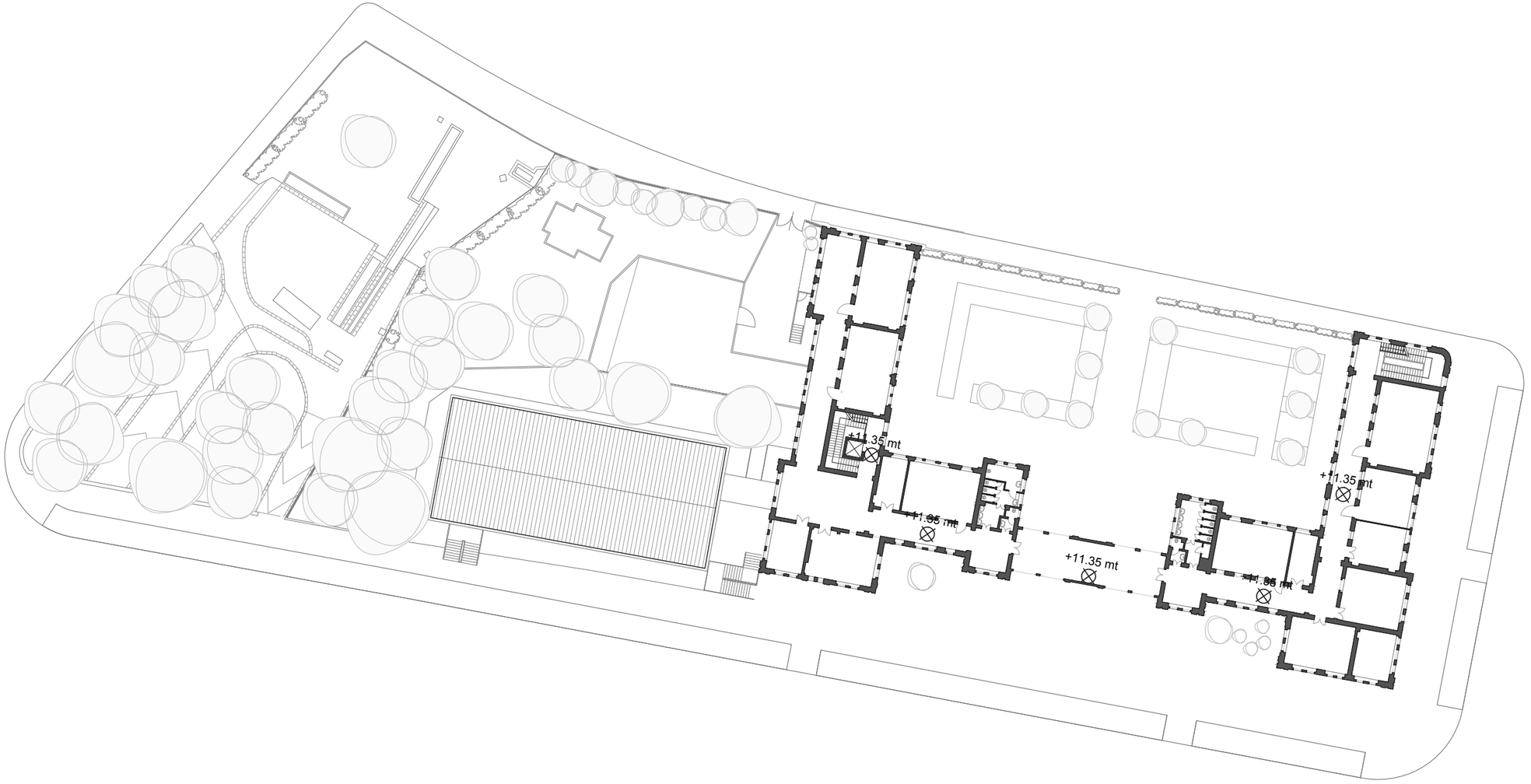
+11.35 mt
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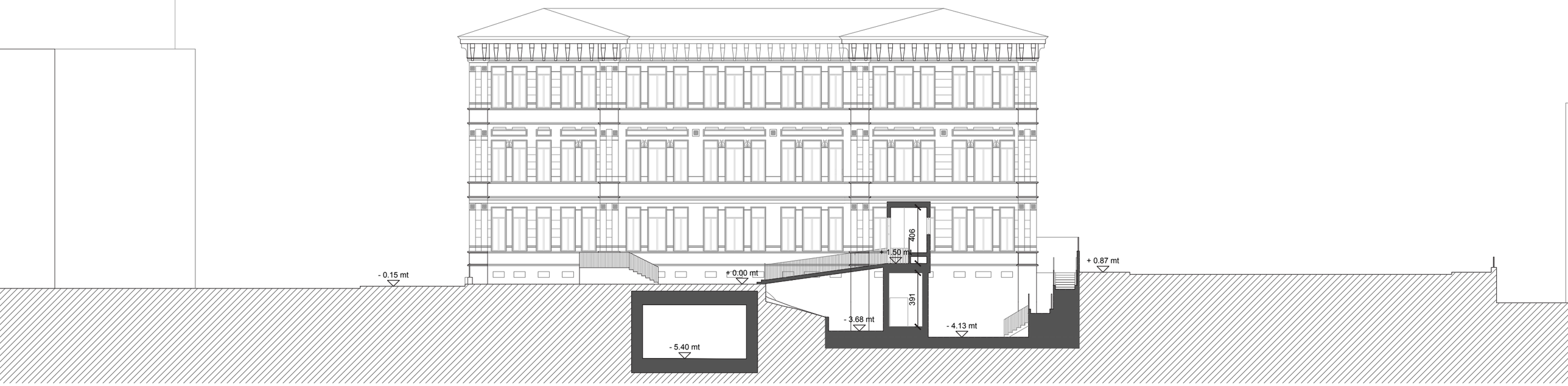
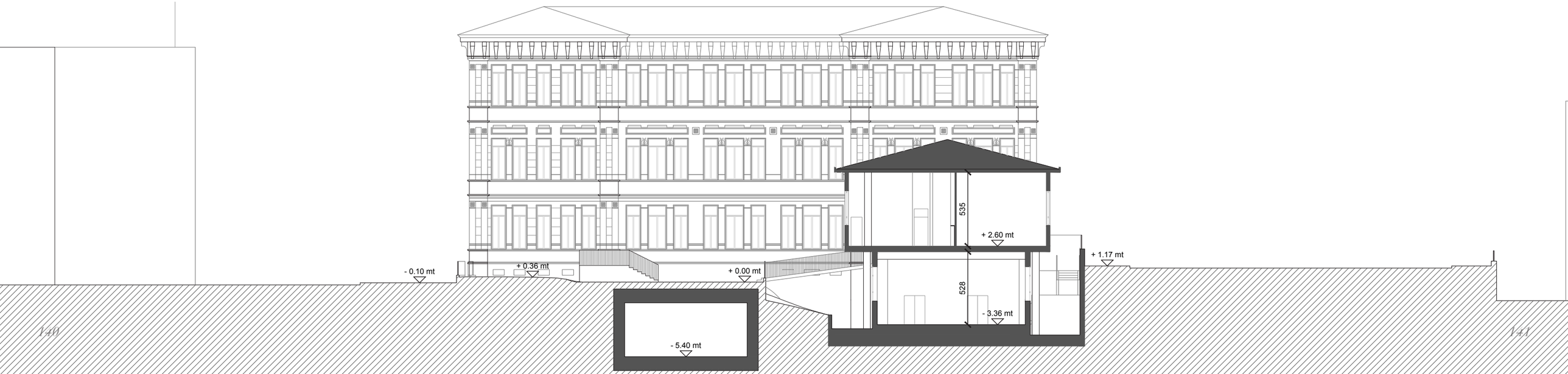
+11.35 mt


-3.36 mt
+ 0.30 mt
+ 1.60 mt


+ 0.10 mt
+ 0.43 mt
+ 1.65 mt
- 3.68 mt


406
+ 1.50 mt
+ 0.00 mt
- 0.15 mt
+ 0.87 mt
391
- 3.68 mt
- 4.13 mt
- 5.40 mt


535
+ 2.60 mt
+ 1.17 mt
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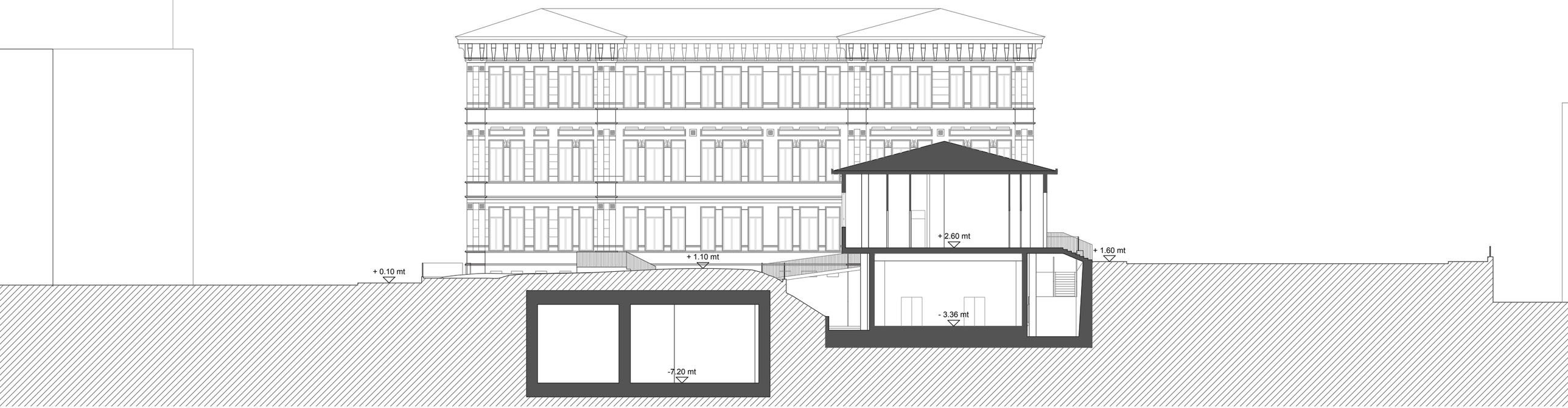
+ 0.36 mt
+ 0.00 mt
528
- 3.36 mt
- 5.40 mt


+ 0.10 mt
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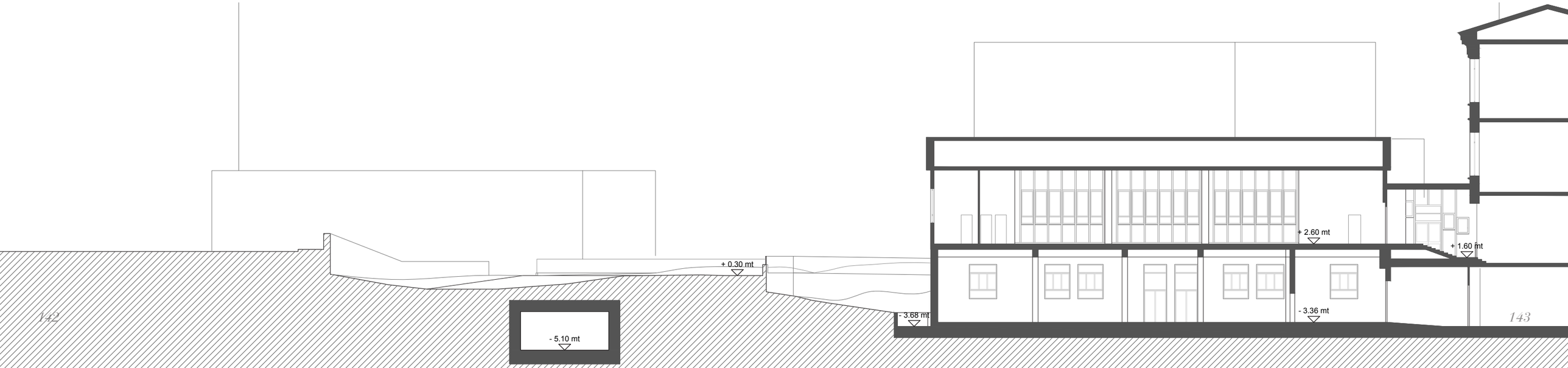
+ 1.60 mt
- 3.36 mt
-7.20 mt


+ 0.30 mt
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+ 2.60 mt
+ 1.60 mt
- 3.68 mt
- 3.36 mt

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_ https://archiviofotografico.milanocastello.it/

_ https://www.youtube.com/watch?v=TshsO06EeoA

_ https://www.youtube.com/watch?v=Y_tJMDsmirs

ACKNOWLEDGMENTS

E’ arrivata la fine di questo lungo percorso e, sebbene più che un traguardo sia un inizio, è giusto ringraziare chi mi è stato vicino in questa avventura.

Prima di tutto ringrazio il Professor Floridi per avermi aiutato nella stesura di questo mio progetto.

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A Edo, spesso siamo come cane e gatto, ma in fondo ti voglio un bene dell’anima, e non potrei mai fare a meno del mio fratellino ,della nostra complicità e dei nostri momenti di tenerezze.

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Alla Fra, perché so che nel momento del bisogno posso sempre venire a suonare alla tua porta.
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E infine, un grazie va a tutti coloro che ho incontrato nella mia vita, insegnanti, amici e conoscenti, e che nel bene o nel male mi hanno spinta a diventare la persona che sono oggi; a chi ha creduto in me, e forse ancor di più a chi cercava di tenermi a terra, grazie.

Silvia