NEW NEIGHBORHOOD FOR EDUCATIONAL WONDER

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CPVA

Agency for Restoration

[SCANDURRA]

Deerns CEAS GOLDAKOVSKYI GROUP ARCHITECTS &P

Handbook

adaptability | community | sustainability

sensitive architecture to enhance human life
designing tomorrow, elevating today.

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1 NEW TOOLBOX

An approach that breaks down complexity into more manageable components. From the spatial layout to the modular panel.

In our toolbox, we gather the tools required to construct the Neighborhood for Educational Wonder. The box features three interconnected layers: Design Principles, Design Strategy, and Design for Adaptability.

The Design Principles establish the foundational values guiding the neighborhood's development. These include adaptability, which ensures the architecture can evolve over time; courtyards, which serve as central gathering spaces that foster interaction and a sense of community; and sustainability, which prioritizes environmental responsibility through energy efficiency.

The Design Strategy provides a roadmap for implementation, outlining the design decisions while addressing logistical and practical considerations.

Finally, Design for Adaptability emphasizes the importance of tailoring the neighborhood to the specific contexts and challenges of Ukraine, a country marked by its vast and diverse geography. Being site-specific is crucial to ensure the architecture responds to local climatic conditions, cultural nuances, and community needs. This approach allows for flexibility in scaling the project and adapting its components to suit urban centers, rural settings, or regions affected by conflict, ensuring relevance and impact across varied contexts.

This toolbox is not merely a collection of concepts but a dynamic and practical guide that equips designers and stakeholders to build the educational neighborhood.

1.1
DESIGN PRINCIPLES
REBUILDING
COMMUNITIES

The design is centered on three main principles:

• Adaptability and flexibility

The principle of adaptability is addressed with a modular customizable system that allow flexibility and reconfigurability from the urban level to the detail of the product. By integrating modularity at every scale, this approach supports a responsive and resilient design paradigm. It encourages innovation and user engagement, reduces waste by extending the utility of materials and spaces, and ensures that the built environment remains relevant and functional in the face of future uncertainties.

• Courtyards and community

Designing around a public void, whether covered or uncovered, offers immense potential to create spaces that are both dynamic and engaging. This concept draws from the tradition of the hortus conclusus, or “enclosed garden,” a design archetype rooted in medieval European and Islamic architecture, where a central void serves as the heart of the spatial composition. These voids create areas of calm and contemplation, offering a respite from the surrounding environment while maintaining a vital connection to it.

• Sustainability and resilience

Generating renewable energy and implementing green roofs to mitigate heat island effects and through modularity and prefabrication reducing construction timelines in the effort to reduce carbon dioxide emissions. Together, these strategies represent a holistic effort to mitigate the impacts of climate change.

A modular customizable system that offers endless possibility for flexibility and reconfigurability.

1 THE LITTLE GARDEN OF PARADISE
UPPER RHENISH MASTER, STÄDEL, 1410-1420

To address the principle of adaptability, a modular customizable system is proposed, offering flexibility and reconfigurability. This system predominantly utilizes concrete and timber, selected for their widespread availability and quick deployment across the country.

Additionally, the implementation plan includes various options for the reuse of scraps, such as landscape infill and iconic exterior facades. Notably, finishing products are crafted from a specially formulated mixture of recovered aggregates, comprising entirely recycled minerals.
This approach aligns with a production philosophy rooted in innovation and sustainability, ensuring resource efficiency and environmental responsibility throughout the project lifecycle.
The void, serving as the heart of the proposal, embodies the essence of community within a multipurpose educational neighborhood. Functioning as the nucleus from which the entire design emanates, the courtyards serve as the most public spaces, adaptable to diverse functions and atmospheres. Whether covered or uncovered, verdant or equipped, these courtyards are envisioned as dynamic hubs of activity, evolving to suit the needs of the hosted functions.
The framework of the courtyards cascades through the connections and functions between them.
By designing around this public void, the project opens boundless possibilities for creating dynamic and engaging spaces that resonate with the vibrancy of community life.

To address sustainability, the design is conceptualized as a modular system that can be easily assembled and dismantled. Incorporating principles of design for disassembly, the prefabricated components offer customization to suit specific site conditions while significantly reducing construction timelines and minimizing CO2 emissions.
Designed as a modular system, the architecture allows for the use of the buildings depending on occupancy levels, maximizing resource efficiency and reducing waste.
Additionally, ample green spaces are integrated throughout the neighborhood, promoting biophilia and enhancing overall well-being.
The counter-walls serve a dual purpose, hosting natural insulation to optimize energy efficiency while housing the mechanical, electrical, and plumbing systems within a compact footprint. Further sustainability features include the incorporation of photovoltaic panels to generate renewable energy and the implementation of green roofs to mitigate heat island effects and promote biodiversity.

1.2
NEW ROOTS
NEB PRINCIPLES

The design is grounded in the three guiding values of the New European Bauhaus, aiming to build a beautiful and sustainable Neighborhood for Educational Wonder:

• **Beauty**

Activating spaces culturally and socially ensures that architecture enhances quality of life beyond functionality. The design prioritizes human-centered spaces, using color, materiality, and spatial flows to create an inspiring environment that stimulates learning and well-being. By connecting people, it fosters opportunities for social interaction, strengthening community ties and creating a sense of belonging. It integrates natural and built elements, ensuring that neighborhood is not just educational institutions but a place that reflect local identity and cultural expression.

• **Inclusion**

Ensuring accessibility and affordability strengthens resilience. The courtyards serve as the heart of the proposal, fostering interaction and inclusivity through interconnected spaces and flexible layouts that adapt to diverse needs. The design makes education accessible to all, with modular structures that prioritize equity, adaptability, and collective well-being. By consolidating social structures and integrating inclusive planning, the project cultivates a way of living together, where collaboration and shared values redefine public spaces.

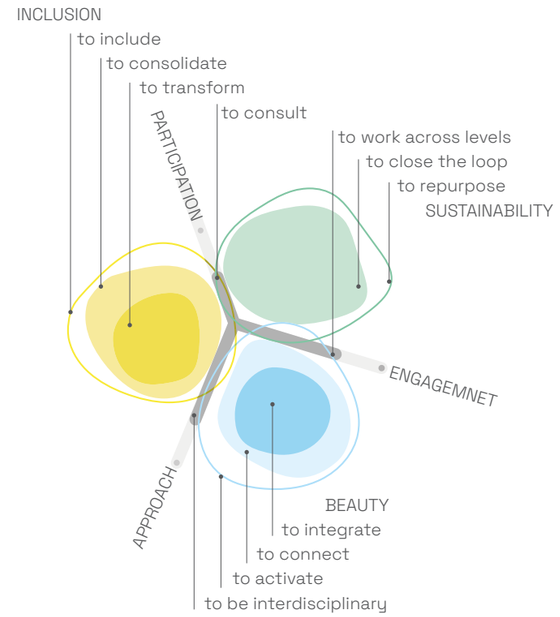
Through beauty, inclusion, and sustainability, the project seeks to cultivate a sense of belonging while fostering a collective reconnection to the nature.

• **Sustainability**

Repurposing materials and knowledge minimizes environmental impact while promoting circularity. The design integrates climate-responsive strategies, prefabrication, and renewable energy solutions to reduce its ecological footprint and ensure long-term efficiency. By incorporating green roofs, passive cooling techniques, and locally sourced materials, the project aims at creating an environmentally responsible and future-ready spaces.

NEW embraces aesthetic quality, social inclusion, and environmental responsibility, becoming a hub of learning, community engagement, and system circularity. Through beauty, inclusion, and sustainability, the project seeks to cultivate a sense of belonging while fostering a collective reconnection to the nature.

2 THE NEB COMPASS - WORKING PRINCIPLES AND VALUES



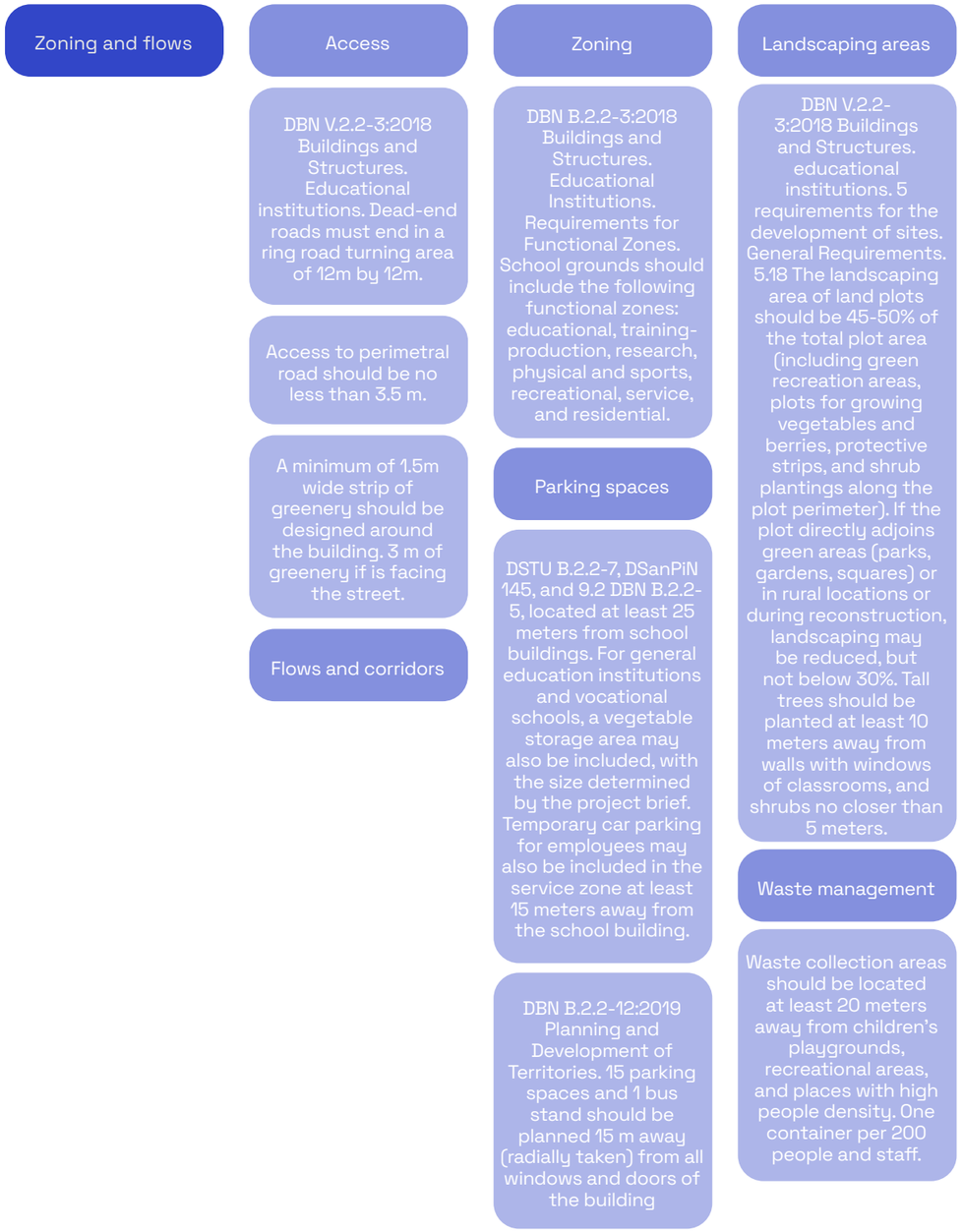
1.3
DESIGN STRATEGY
A ROADMAP TO SYSTEM IMPLEMENTATION

Here we align the project's aesthetic, functional, and environmental goals with technical execution on a strategic level. By addressing spatial planning, material selection, and systems integration, we lay the groundwork for effective implementation, drawing the direction to transform ideas into practical, sustainable, and resilient buildings.

This roadmap anticipates challenges and fosters interdisciplinary collaboration to ensure efficiency and a cohesive architectural vision.

- **Flow and zoning strategy**
- **Structural strategy**
- **Fire safety strategy**
- **Mechanical electrical and plumbing strategy**
- **Performance**

This roadmap anticipates challenges and fosters interdisciplinary collaboration to ensure efficiency and a cohesive architectural vision.



Structural strategy

Dimensions and transportability

The optimized module from the trans-portation point of view is 240cm standard width. Such kind of panel can be overlapped laying down on the truck trailers, reducing delivery amount.

Joints

Dry joints allow for easier disassembly, repair, and replacement, contributing to longevity and sustainability. Wet joints are faster to install and less reliant on highly skilled labour, reducing both project time and costs. In our case it is preferable to use wet joints.

Foundations

Considering that we are in the case of low-rise buildings, foundation beams and / or plinths will be provided. Just in case of very weak soil, a switch to raft foundations will be expected. The choice depends on the results of soil surveys.

Concrete panels

Due to prefabrication technology and mostly to components shipping matters, it's advisable to keep panels length under 16m (better 12m) for ordinary main slabs (panels without beams). Longer spans will thus need double frame arrangement: main frame with precast lowered beams and secondary with hollow core panels.
Thicknesses depend on spans: we can consider a ratio between thickness of slabs and spans of indicatively 1/25 – 1/30.

Materiality

Rubble reuse for finishings, gabion walls and landscape infills. To be evaluate other potentials also with precast supplier.

Adding floors

We can consider using spans like those employed in large, covered spaces by relying on robust beams supporting a lighter superstructure above.

Skylights and openings

Minor openings (80cm, and probably 120cm) will be directly integrated into the precast wall panels, while major ones (240cm) will be created by distancing the side panels and adding upper lintels. Similarly to vertical opening in walls, minor skylights (e.g., A x B < 100 x 100cm) can be integrated in slab hol-low core panels by means of appropri-ate holes. Linear skylights, extended to the whole slab width, will be simply created just distancing two facing panels. Other (major) ones will need a system of transfer beams surrounding the holes.

Fire safety strategy

DBN B.1.1-7:2016 Fire Safety of Construction Sites.If the courtyard contains key functional areas (e.g., classrooms, canteens, gyms) or if the internal walls of the building only face the courtyard without external access, direct access to the courtyard is mandatory.

Fire trucks with the fire team must have full perimeter access to the building.

Evacuation paths

DBN mandates convenient access for fire services. The courtyards has to have an acces for the fire trucks. It's also recommended to include windows or doors that allow quick access for firefighters.

DBN requires that all building areas have appropriate evacuation routes leading directly to open spaces. Fully enclosed courtyards must allow for safe egress through corridors or other exits that do not obstruct evacuation.

Each fire compartment does not exceed 4000 m^2. There should be no fewer than two emergency exits. The distance from a dead-end corridor to the emergency exit should be no more than 30 meters.

Distances

DBN B.2.2-12:2019 planning and devolment of the territories A road 6 m wide (double lane) or 3.5 m single lane placed 5 m from the building's wall. Fire safety vehicle need at least 8.5 m from the building's wall.

Emergency exit

Rooms allowing the presence of more than 50 people need at least 2 exit doors.

Fire compartments

Advisable to keep the building footprint at no more than 10,500 square meters. In our case, with the second degree of fire resistance and a one-story fire compartment layout, the maximum area should not exceed 6,000 square meters. For a two-story layout, it should not exceed 4,000 m^2. As a result, we will have 2-3 fire compartments.

Courtyards

Ensuring the availability of water connection points and fire hydrants near enclosed courtyards may also be necessary to meet DBN requirements.

Enclosed spaces may lead to smoke buildup, which poses an additional risk during evacuation. DBN suggests installing smoke removal systems or natural ventilation, particularly if the courtyard contains rooms that require regular access.

For buildings with a footprint of more than 10 hectares or a width of more than 100 meters, access for fire trucks must be provided from all sides. For buildings or structures with a width of 18-100 meters, access may be provided from one longitudinal side

The width (in clear span) of through driveways in buildings should be no less than 3.5 meters, and the height no less than 4.25 meters.

Mecanical, electrical and plumbing strategy

MEP layout

The fluids will mainly travel underground with a ring loop. The underground conduit system is valuable for maintaining ease of maintenance and allowing flexibility. The loop allows system resilience and redundancy for not much more investment than a business-as-usual distribution.

Technical rooms

Technical rooms modules must be thought of to be studied and repeated in different cases. There will be technical rooms on the roof with inverters for PV and AHU.

Energy centre

Heat Pumps are placed outside in a separate building.
Generator set will be under the building to provide electricity and fresh air to the dual use shelter.

Electricity

Storage battery and genset but schools will still have to have a grid connection so that they can exchange energy during the season. To be able to take energy in the winter and be able to feed energy into the grid during the summer. The generator set will be provided for emergency purposes only.

Hot and cold fluids

Heat pumps with air condensation.

Hot and cold air

air distribution ducts running in the corridors and then into the different spaces without a false ceiling

Performance

Dormitory

Fire Safety
Wall material with fire resistance rating EI 45 for internal walls between rooms and EI 60 for walls facing evacuation routes.

Thermal resistance for external walls should be R equal to or greater than 3.3 m²·K/W.

Acoustic Performance
Sound insulation between rooms should have an Rw of at least 55 dB.

Classrooms

Fire Safety
Wall material with fire resistance rating of at least EI 60 between classrooms and corridors. Exit corridors should have walls with REI 120 fire resistance standards.

Thermal resistance should be a minimum of R equal to or greater than 3.3 m²·K/W for external walls.

Sound insulation should have Rw of 50 to 55 dB to limit sound transfer between classrooms.

Offices

Fire Safety
Wall materials should have at least EI 30 rating for internal partitions and EI 45 rating for corridor-facing walls.

Thermal resistance for external walls should be a minimum of R equal to or greater than 3.0 m²·K/W.

Sound insulation for walls should have Rw 50 dB especially between meeting rooms and open office areas.

Common spaces

Fire-resistant materials with at least EI 30 rating for internal walls and EI 45 rating for walls near exit routes.

Thermal resistance should be R equal to or greater than 3.0 m²·K/W for external walls of common spaces.

Sound insulation should have Rw 50 dB to minimize noise impact.

Theater

Fire Safety
Wall materials in the theater space should have high fire resistance with at least EI 60 rating especially surrounding stage and exit routes. Audience areas should have walls with REI 150 rating separating audience areas from backstage zones.

Thermal resistance should be R equal to or greater than 3.3 m²·K/W for large volume spaces

Sound insulation for theater walls should have an Rw of 60 to 65 dB to isolate performance noise

Canteen

Fire Safety
Kitchen wall materials should be non-combustible with an EI 60 rating for walls separating cooking areas from dining areas. Storage areas should have fire separation walls with REI 90.

Thermal resistance for external walls should be R equal to or greater than 3.3 m²·K/W to maintain comfort during high usage.

Sound insulation for walls should have Rw 55 dB to reduce kitchen noise transfer.

Gyms

Fire Safety
Wall materials should have fire resistance of at least EI 45 for walls surrounding the gym especially near evacuation routes.

Thermal resistance should be R equal to or greater than 3.0 m²·K/W in gyms due to variable occupancy.

Acoustic Performance
Sound insulation for walls should provide an Rw of at least 60 dB to contain impact noise.

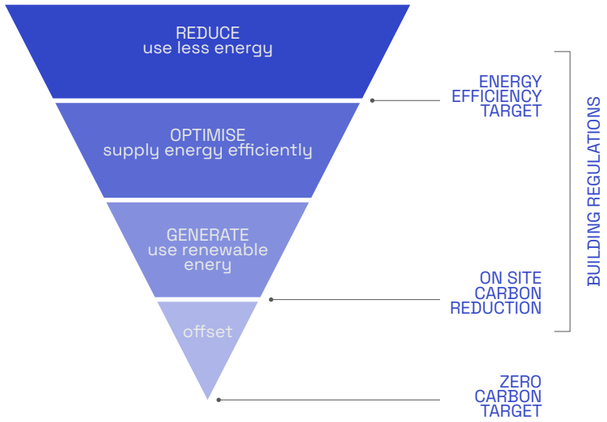
1.4
LOW CARBON DESIGN
DESIGN PHILOSOPHY AND SUSTAINABILITY STRATEGY

1.3.1 Design philosophy

The holistic approach of the proposal embraces true value of sustainability which lies at the balance of enhancing the quality of life, while also ensuring that environmental impacts are reduced, resources are effectively managed and long-term future of the project is well considered.

The proposal considers a progressive approach, underpinned by “reduce-optimize-generate” concept in which it prioritizes sustainable strategies that will greatly influence the project’s overall performance.

By implementing a progressive energy and carbon reduction approach through demand reduction, energy efficiency, monitoring and feedback (through intelligent building systems with post-occupancy evaluation), energy sharing and generation, the proposal will lead the way to establish a quality precedent for the next generation of truly sustainable Ukraine schools.



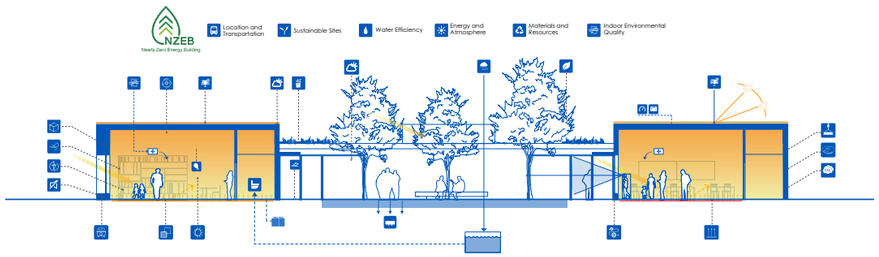
3 DESIGN APPROACH FOR REDUCING OPERATIONAL CARBON

1.3.2 Sustainability strategy

The design uses adaptive regenerative strategies that can be applied to any site or location. The project focuses on building solutions and technologies that adhere to sustainability, energy efficiency, and eco-friendliness principles, aiming for climate neutrality and low operating costs. It includes passive solar optimization, prefabrication, and rainwater harvesting to maximize energy efficiency and resource utilization while supporting the “full-day school” model. The building is designed to be sustainable from both climate and energy perspectives, integrating passive solutions and innovative technologies.

PV panels on roofs and on-site battery storage supply much of the renewable energy. Natural light sensors, heat recovery systems, rainwater management, green roofs, and outdoor spaces all help reduce energy demand and mitigate the Urban Heat Island effect while enhancing biodiversity.

The modular, circular design allows for easy disassembly and reuse, reducing waste. Construction scrap is repurposed, further minimizing waste. The building shields from noise and pollution, avoids microclimate issues, and connects with nature by preserving vegetation, enhancing the microclimate and local identity. The design ensures quality indoor and outdoor environments for students, with natural light, views of greenery, and excellent acoustic and thermal comfort for healthy learning spaces. Versatile outdoor areas support extracurricular activities, enriching the educational experience.



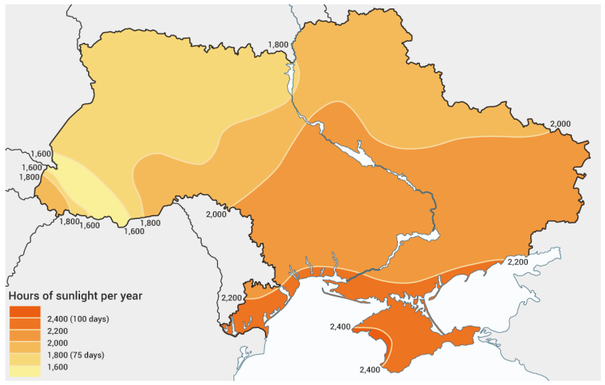
4 BIOCLIMATIC SECTION

1.5
CLIMATE RESPONSIVE DESIGN
CONSISTENTLY SITE SPECIFIC

The project is organized as a grid of modules, a large spatial device that promises infinite possibilities of interior recombination from within the certainty of its boundary.

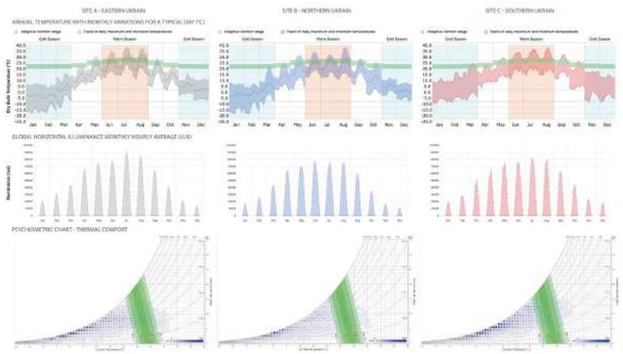
Given Ukraine's diverse climate conditions, ranging from humid continental regions with cold winters and hot summers to milder areas in the south, and its vast and varied territory, the design is envisioned to prioritize flexibility. This adaptability allows the architecture to respond effectively to local climatic variations, ensuring thermal comfort and energy efficiency across different zones.

6 VEGETATION



5 SOLAR IRRADIATION

7 CLIMATE ZONE CONSIDERED



8 CLIMATE SITE ANALYSIS

Estimating energy consumption requires typical year trends for temperature, humidity, and solar radiation instead of specific real-year data, as anomalies can lead to inaccurate estimates. To support the creation of adaptive technical designs for new schools across Ukraine, three climate files representing different locations were analyzed as requested in the initial competition brief.

Despite differences in climate at the three sites, similar trends in temperature, illuminance, and thermal comfort allow using a single climate file for analysis. The Kyiv climate file was chosen for its wide temperature range and cold winters, serving as a good reference for designing a school that can be moved across Ukraine. This approach ensures the new "full-day school building" remains energy efficient and adaptable to various locations.

1.6
MODULAR PROCESS
DESIGN AND ASSEMBLY

This modular process begins with meticulous planning to align design, manufacturing, and assembly, ensuring each decision supports the next in a cohesive whole.

Panels are fabricated in controlled environments, where standardized dimensions and embedded features such as insulation or conduits enhance performance and quality control.

Logistics play a vital role, with careful coordination of manufacturing schedules, transportation routes, and on-site storage to streamline workflows.

On-site, the panels are rapidly assembled with minimal adjustments, enabled by precise detailing in joints, finishes, and integrated systems.

Throughout the process, robust communication and data management, often facilitated by Building Information Modeling (BIM), ensure that all stakeholders are aligned.

The result is a construction method that reduces waste, accelerates timelines, and delivers buildings with exceptional durability, thermal efficiency, and aesthetic flexibility. Aenean sit amet lacus velit.

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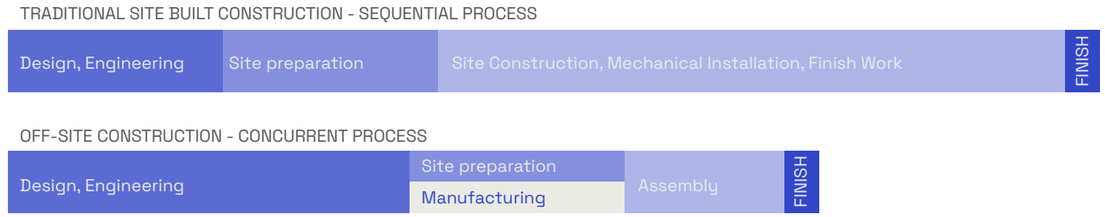
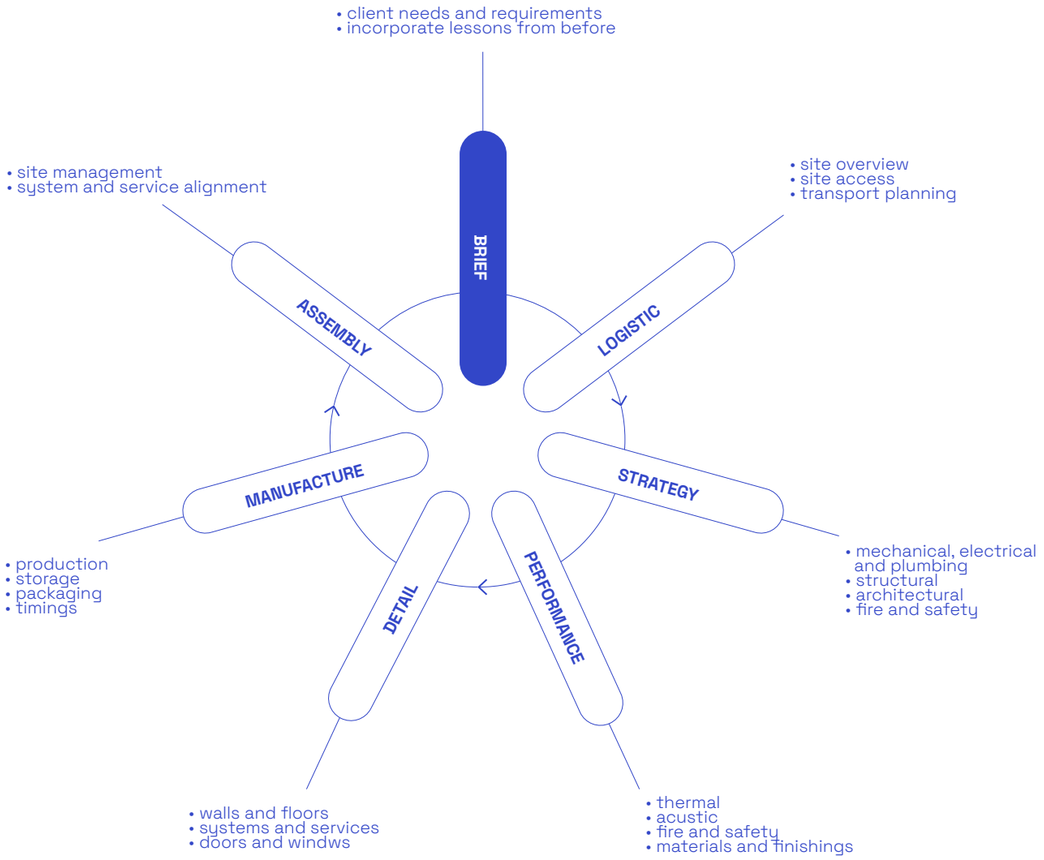


9 COMPARISON OF TRADITIONAL CONSTRUCTION AND MANUFACTURE AND ASSEMBLY

Offsite manufacturing offers two significant advantages: accelerating project delivery and enhancing quality. However, to fully leverage its potential, the design team must recognize that designing for manufacture and assembly (DfMA) differs fundamentally from traditional construction. This approach demands a distinct mindset and methodology from the outset, focusing on precision and coordination to align with manufacturing processes.

For offsite manufacturing to succeed, design information must be meticulously coordinated before production begins. Unlike traditional design and build contracts, where design intent often suffices, DfMA requires fully detailed and coordinated designs at an earlier stage. This level of detail ensures that production can proceed smoothly without delays or rework, which would otherwise disrupt the manufacturing process.



10 MODULAR DESIGN STAGES

Change control must be meticulously managed throughout the design and construction process, as design development is rarely a straightforward, linear progression. Maintaining a clear and detailed record of decision-making is essential to ensure transparency and accountability while minimizing disruptions. A well-documented decision path enables the team to trace the rationale behind changes, fostering better collaboration and reducing the likelihood of repeated mistakes.

The module dimensions must align with standard transportation regulations and logistical constraints, as oversized loads can significantly increase costs and complexity.

Transporting modules from the factory to the site is a critical factor that influences the initial and ongoing decisions in modular design. The module dimensions must align with standard transportation regulations and logistical constraints, as oversized loads can significantly increase costs and complexity. For this reason, we adopted a modular width of 240 cm, which conforms to typical transportation norms, ensuring smooth delivery while maintaining structural efficiency. This decision impacts nearly every aspect of the design process, from structural integrity and material choices to interior layouts, as modules must fit seamlessly within these transportation parameters while remaining functional and aesthetically cohesive.

We must also account for site-specific constraints that affect how the modules are positioned once delivered. One of the most significant considerations is the type of crane that will be used. Crane selection is determined by factors such as the module's weight, dimensions, and the site's accessibility. Urban sites with tight spaces may require mobile cranes or specialized lifting equipment, while more open areas might allow for larger, fixed cranes with extended reach.

While offsite completion is generally preferred for its quality control and efficiency, balancing factory and site work is essential to ensure the modules arrive intact and are installed smoothly. By addressing these factors early in the design process, projects can achieve a seamless integration of modular construction with practical site implementation.

11 MODULAR PREFABRICATED CONCRETE PANELS

1.7 WORKING IN EMERGENCIES REBUILDING COMMUNITIES

The Neighbourhood for Educational Wonder is envisioned as an adaptable platform designed to be implemented swiftly in emergencies. Its construction leverages economical and efficient methods, ensuring rapid deployment.

The flexibility of its modular composition allows it to evolve over time, accommodating changing needs and scaling as required. This adaptability ensures the neighborhood remains a resilient and sustainable solution, capable of addressing both immediate challenges of conflict zones and long-term development goals.

These spaces address immediate needs while laying the foundation for recovery and renewal, empowering communities to rebuild their lives with strength and dignity.

Community Rebuilding

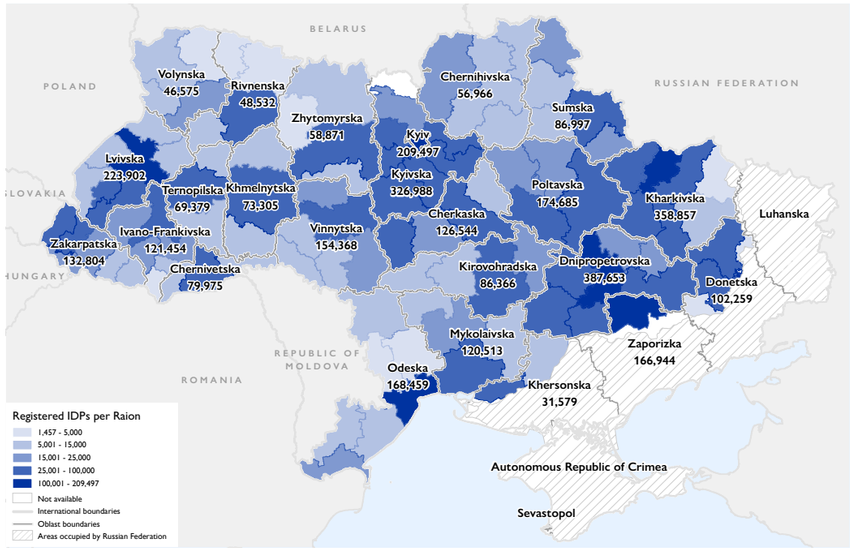
As hubs for restoring the social fabric in disrupted communities, these facilities provide essential services such as education, healthcare, and public gathering spaces, which are crucial for normalcy.

Cultural Sensitivity

Cultural sensitivity fosters trust and acceptance among community members. Engaging the community in the design process empowers individuals and ensures the architecture resonates with their needs and expectations. This approach makes the design not only functional but also symbolic, reinforcing dignity and a sense of belonging.

Psychological and Emotional Healing

The complex supports the psychological and emotional recovery of trauma-affected individuals. Dedicated areas for counseling, play, and creative activities provide critical outlets for expression and healing.



12 REGISTERED IDP PRESENCE AS OF 29 FEBRUARY 2024, BY RAION

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NEW TOOLKIT

The toolkit is a set of elements that combined originates the neighborhood for educational wonder.

Inside the box we have a comprehensive set of tools to guide the implementation process. After the recognition of the advantages and challenges of modular construction and emergency contexts, the design focuses on three critical aspects: interior architecture, structural systems, and integrated building systems. These elements are key to achieving the required performance standards.

The design principles are systematically applied to create spaces characterized by specific qualities and dimensions, with each space further enhanced by functional devices that guarantee practicality and usability. These spaces are meticulously catalogued into an organized index, providing a clear reference.

By combining the entries from the catalogue, functional units can be created, each tailored with its unique structural and HVAC characteristics, forming cohesive and adaptable solutions for diverse needs.

2.1 STRUCTURAL INTEGRITY DESIGN FOR FLEXIBILITY

To create a system that supports adaptability, the first essential step is to categorize spaces based on their appearance and function, organizing them into clear and purposeful categories.

This categorization allows designers to address the diverse needs of each type of space with precision and flexibility. Spaces are typically grouped by their intended use—such as living, working, gathering, or transitional zones—and by their aesthetic qualities, which may range from open and minimal to richly detailed and enclosed. Each category is then defined by a set of attributes, including dimensions, insulation requirements, material selections, and incorporated devices or furnishings.

For example, a workspace may require modular dimensions to accommodate changes in occupancy, sound-insulating materials to ensure focus, and ergonomic furniture to support productivity. In contrast, a communal space may prioritize larger, open dimensions, durable materials to handle heavy use, and flexible furniture arrangements to encourage interaction. These attributes work together to activate the space, making it functional and responsive to its users' needs.

Key benefits of this industrial off-site production system include high-quality control, faster construction timelines (up to 50% time reduction), seismic resistance, cost savings, and flexibility for future expansions or disassembly.

Structures of all the buildings are conceived as totally prefabricated (except for the shelter), composed by a set of precast walls and slabs.
The followed procedure is named "off-site production / construction", or "Design for manufacturing and assembly", with the aim to minimize the on-site works to those strictly required and maximizing those in factories.
Ready-made components or blocks are transported to the site just for installation processes.

This option has been selected for the following reasons:

- Well-fitting and easily adaptable to the architectural and functional layouts.
- High flexibility of the structural general arrangement and expandability by simply adding, in the future, some similar elements and/or modules.
- Possibility to dismantle or better disassembly the structural elements with few operations, ensuring that the building can be recycled as efficiently as possible at the end of its lifespan.
- High Quality of the resulting system, since all the components are produced in factories (with maximum level of quality control, by means of a quality plan from manufacturing until installation) and simply assembled on field.
- Reduction of logistics cost, less risk of on-site accidents, save resources (and use of local ones), reduction of on-site waste production.
- High seismic resistance due to continuous walls (in both transverse directions) and rigid nodes (more than 0.3 ag/g of PGA is reachable).
- Greater spans allowed without intermediate supports, up to 12m and even more.
- High speed in installation, if compared with standard (ordinary) technologies (i.e. cast in situ reinforced concrete). In high rise buildings the standard rate of construction is one floor per week. The reduction of time in the erection of structures is about 50%.
- Reduction of unexpected events on field, since all the process is managed under a digital BIM approach end methodology (deep detailing in advance and strong multidisciplinary coordination); therefore, guaranteeing fixed construction costs.

- Easy installation (with wide diffuse and standard cranes), high durability, integrated thermal insulation, and predispositions for mechanical and electrical services.

- Technology and materials available in Ukraine, where precast elements factories are located and operative.

The main structural building elements are described as follows:

- Outer and (some) load bearing inner walls are made by “multi-layer” reinforced concrete panels, placed side by side to create continuous walls. The internal layer is made of a heavy strength reinforced concrete; the external outer layer is in glass fiber-reinforced concrete (GRC) which is a strong, flexible, durable, and rather light material; between these two support an insulation layer with appropriate thickness is installed.

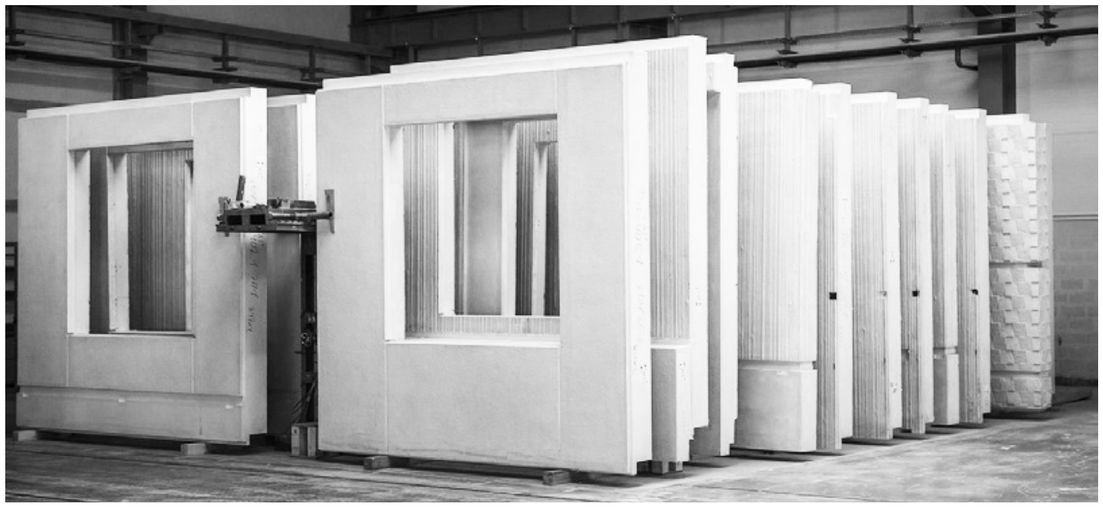
- Slabs are made of hollow core panels, completed with a cast in situ topping, and placed side by side making a continuous horizontal plane.

- Joints between walls and slabs could be “wet-type” or “dry-type”; the first ones are made with reinforcement and concrete pouring, while the second ones are made by pins, bolts, ties, and so on, without any wet material addition.

- Prefabricated stairs, prefabricated balconies, ducts, and shafts complete the precast system.

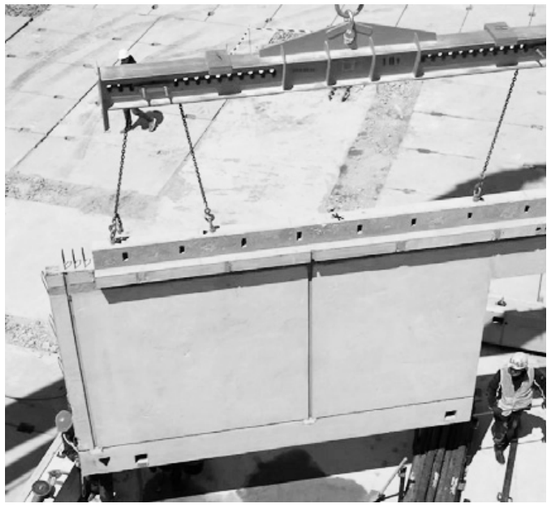
- Only foundations and shelter are built as reinforced concrete structures. The Shelter, in particular, is an underground reinforced concrete box (or shell) with very thick walls and slabs: lower slab, perimetral walls, roof (see drawings for details).

- All the precast elements (vertical walls and hollow core slabs) are usually made with channels for electricity and plumbing plants, laid directly in factory (embedded elements).



13 RC PRECAST WALLS

15 RC PRECAST HOLLOW CORE SLABS



14 RC PRECAST WALLS ASSEMBLY

2.2
INTEGRATED BUILDING SYSTEM
DESIGN FOR FLEXIBILITY

Emphasis is placed on the quality of both indoor and outdoor environments for students. The design's porosity, permeability to natural light, and views of vegetation, along with excellent indoor acoustic and thermal comfort, create healthy and effective learning environments.

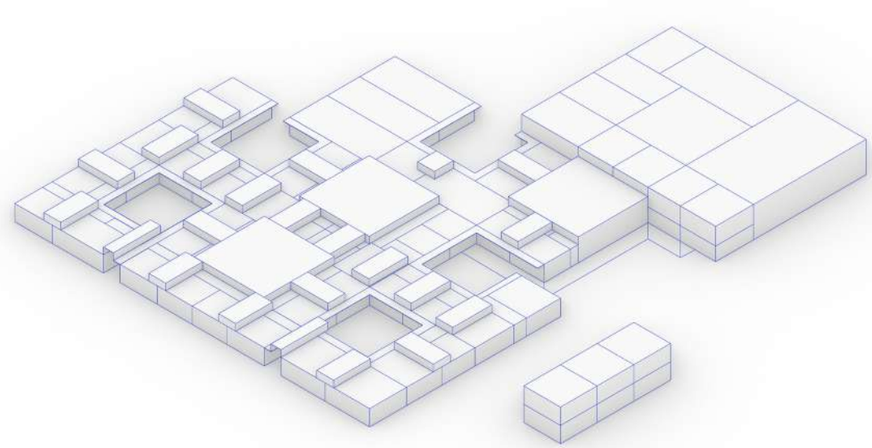
The design employs adaptive regenerative strategies that are versatile and applicable to any site within the hypothetical locations proposed in the competition brief. By prioritizing future-oriented building solutions and technologies that adhere to principles of sustainability, energy efficiency, and eco-friendliness, the project aims for climate neutrality and low operating costs. Integral to the design are passive solar optimization, prefabrication, and rainwater harvesting, which maximize energy efficiency and resource utilization while supporting the shift to a "full-day school" model.

The design's porosity, permeability to natural light, and views of vegetation, along with excellent indoor acoustic and thermal comfort, create healthy and effective learning environments.

Designed to be sustainable from both climate and energy perspectives, the building integrates passive solutions and innovative technologies. A significant portion of renewable energy is provided by PV panels on the roofs, supplemented by on-site energy storage with batteries. Natural light sensors and heat recovery systems, along with rainwater management and the creation of green roofs and outdoor areas, contribute to reducing the building's energy demand and mitigating the Urban Heat Island effect (UHI) while promoting biodiversity.

In terms of plant services, the principles of modularity and prefabrication are realized through the "Assembly", in which various elements are integrated to form functional units with unique electrical and mechanical characteristics.

Additionally, the design shields inner spaces from street noise and pollution, avoids creating local microclimate issues, and promotes silent pockets connected with the surrounding natural environment.



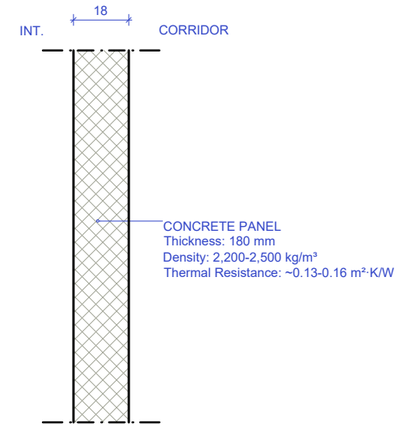
2.3 INTERNAL PRINCIPLES DESIGN FOR FLEXIBILITY

To create a system that supports adaptability, the first essential step is to categorize spaces based on their appearance and function, organizing them into clear and purposeful categories.

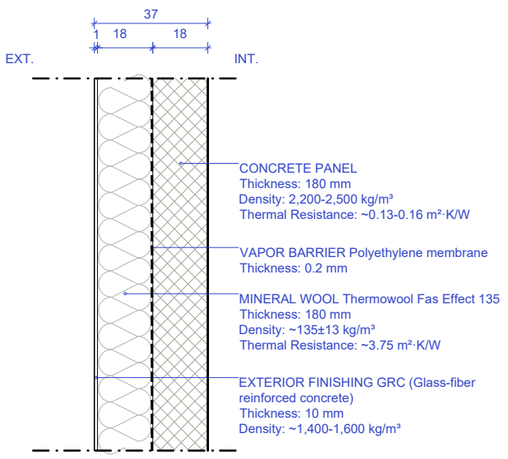
This categorization allows designers to address the diverse needs of each type of space with precision and flexibility. Spaces are typically grouped by their intended use—such as living, working, gathering, or transitional zones—and by their aesthetic qualities, which may range from open and minimal to richly detailed and enclosed. Each category is then defined by a set of attributes, including dimensions, insulation requirements, material selections, and incorporated devices or furnishings.

For example, a workspace may require modular dimensions to accommodate changes in occupancy, sound-insulating materials to ensure focus, and ergonomic furniture to support productivity. In contrast, a communal space may prioritize larger, open dimensions, durable materials to handle heavy use, and flexible furniture arrangements to encourage interaction. These attributes work together to activate the space, making it functional and responsive to its users' needs.

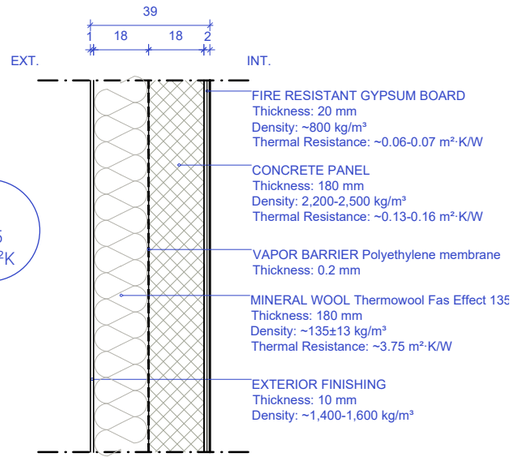
EXTERIOR WALLS:



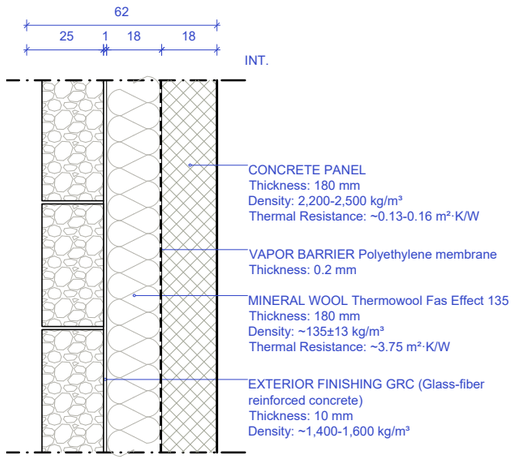
20 SHELTER WALL



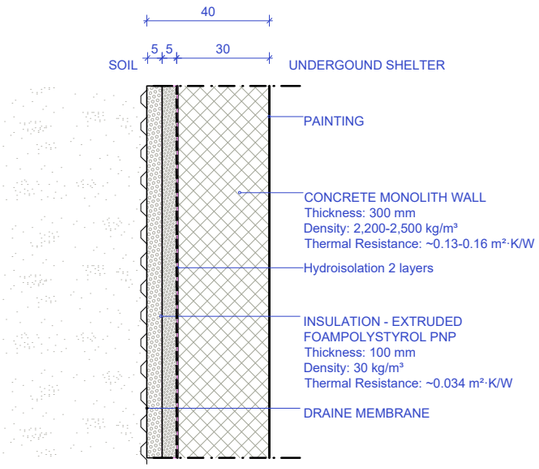
16 BASIC PREFABRICATED CONCRETE PANEL WALL



17 FIRE-RESISTANT AND ENERGY-EFFICIENT WALL

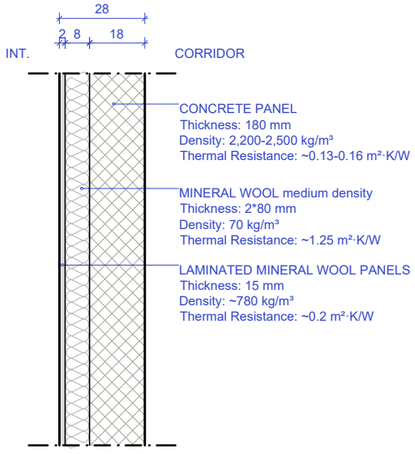


18 BASIC WALL AND GABIONS

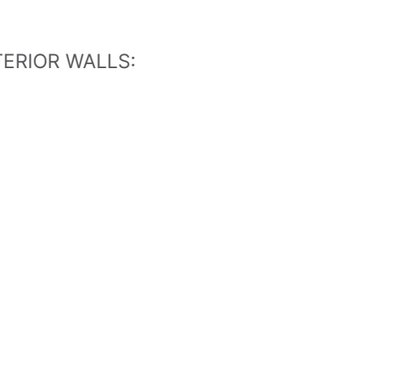


19 UNDERGOUND SHELTER

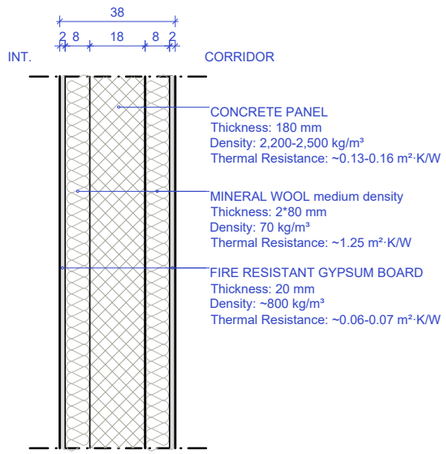
INTERIOR WALLS:



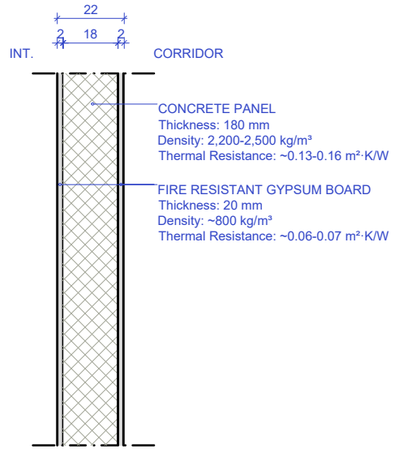
22 ONE LAYER ACOUSTIC BASIC PREFABRICATED CONCRETE PANEL WALL



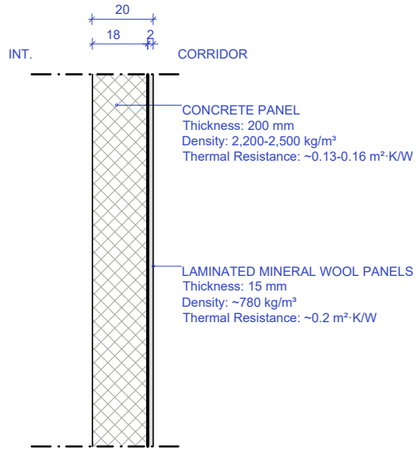
24 INTERIOR PARTITION



21 ENHANCED ACOUSTIC BASIC PREFABRICATED CONCRETE PANEL WALL

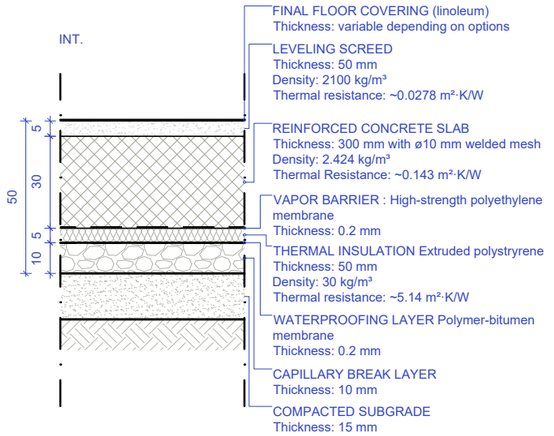


23 INTERIOR WALL

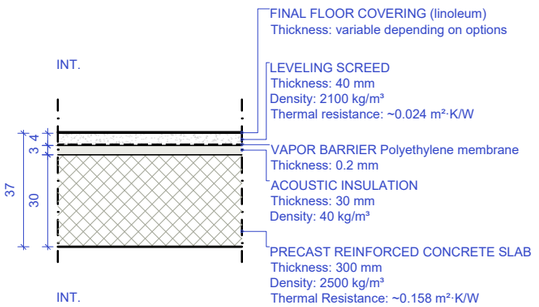


25 ENHANCED ACOUSTIC BASIC PREFABRICATED CONCRETE PANEL INTERIOR WALL

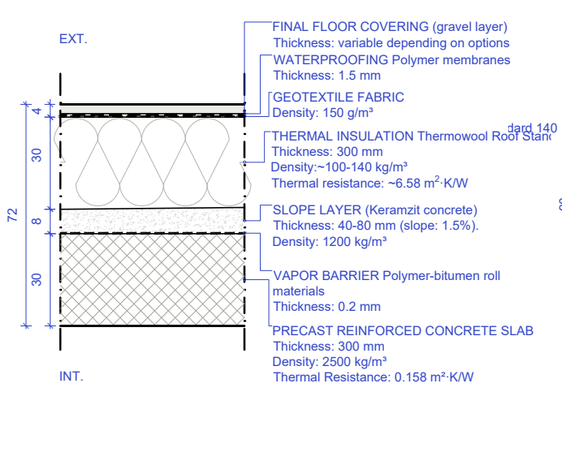
CEILINGS AND FLOORINGS:



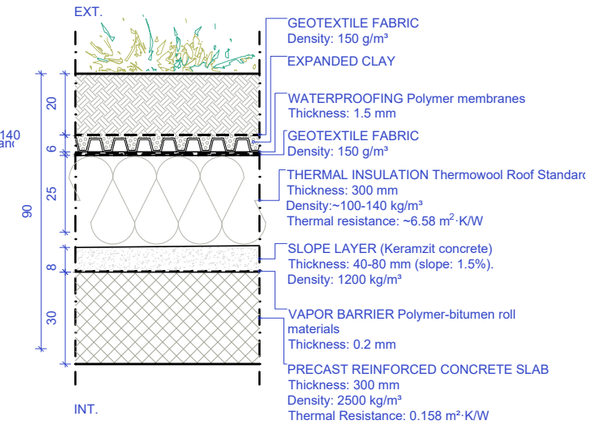
26 GROUND FLOOR SLAB



27 INTERFLOOR SLAB

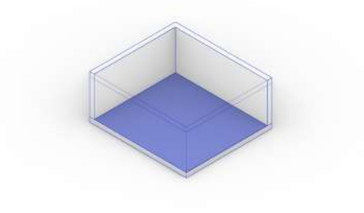


28 ROOF SLAB



29 GREEN ROOF

MATERIAL BOARD - FLOORS:



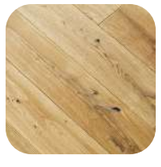
FL.01
Linoleum Type.A

FL.02
Linoleum Type.B

FL.03
Linoleum Type.C

FL.04
Tiles type.A

FL.05
Wooden floor
Type.A



FL.06
Wooden floor
Type.B

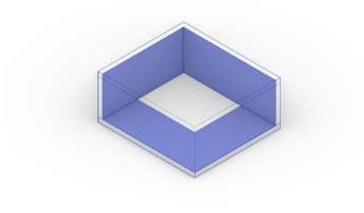
FL.07
Polished troweled
concrete

FL.08
Polished troweled
concrete outdoor

FL.09
Gravel outdoor

FL.10
Drivable
interlocking
pavers

MATERIAL BOARD - WALLS:



WA.01
Concrete panels

WA.02
Linoleum Type.B

WA.03
Fixed furniture

WA.04
Concrete panels
+ Acoustic panels
type A RAL 7005

WA.05
Concrete panels
+ Acoustic panels
type B RAL 9005

WA.06
Concrete panels
+ Linoleum Type.B

WA.07
Wall tiles type. A

WA.08
Wall tiles type.B

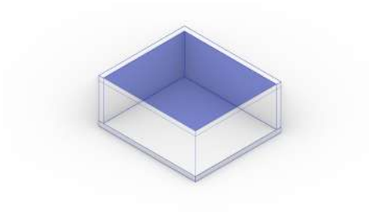
WA.09
Plaster in color A
RAL 9001

WA.10
Plaster in color B
RAL7047

WA.11
Aquapanel RAL
9001

WA.12
Texture plaster
outdoor RAL 9001

MATERIAL BOARD - CEILING:



CL.01
Polished concrete

CL.02
Baffle ceiling

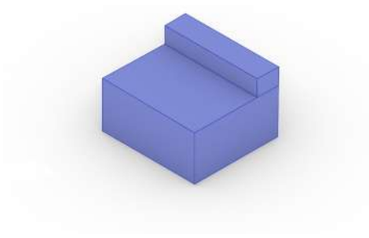
CL.03
Metal suspended ceiling RAL 9005

CL.04
Acoustic ceiling RAL 7047

CL.05
Plasterboard ceiling RAL 9001

CL.06
Aquapanel ceiling RAL 9001

MATERIAL BOARD - EXTERIOR:



EX.01
Polished troweled concrete outdoor

EX.02
Green roof

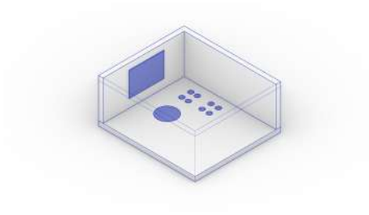
EX.03
Metal mesh type A

EX.04
Metal mesh type B

EX.05
Green metal mesh

EX.06
Texture plaster outdoor RAL 9001

MATERIAL BOARD - FURNISHING ELEMENTS:



FE.01
Curtain type.A olive green

FE.02
Curtain type.B light gray

FE.03
Curtain type.C blue depths

FE.04
Rug type.A powder blue

FE.05
Rug/ rubber mat type.B classic blue

FE.06
Furniture type.A lemon yellow

FE.07
Furniture type.B sand

FE.08
Furniture type.C orange

FE.09
Furniture type.D sage green

FE.10
Wayfinding

2.4
THE CATALOGUE
AN INDEX OF SPACES

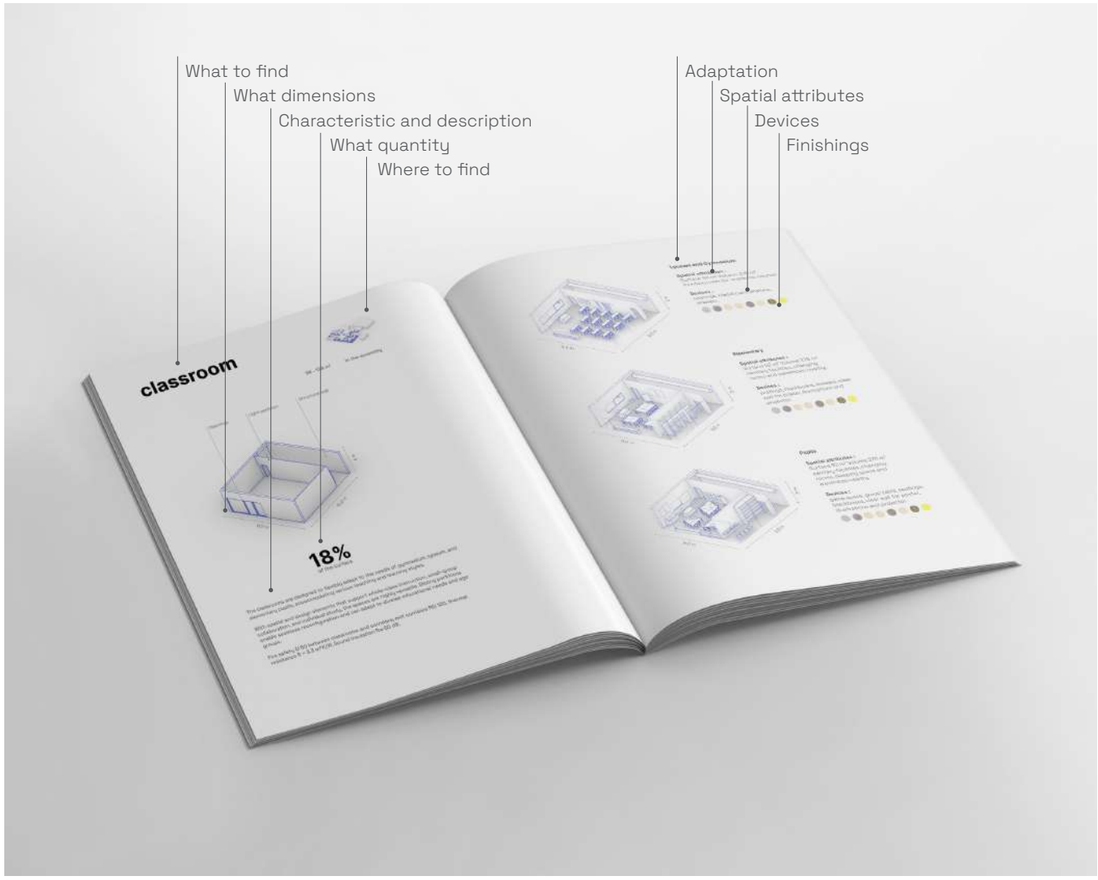
This section serves as a comprehensive catalogue, presenting an organized index of spaces that define the architectural framework. It provides a detailed exploration of the types, functions, and relationships of spaces within the project, offering a clear reference for understanding their design, purpose, and adaptability. By categorizing and detailing each space, the catalogue enables a cohesive and modular approach to design, ensuring that every element is both functional and flexible.

Each space is described not only by its dimensions and primary function but also by its adaptability to various needs and contexts. The modularity ensures the design remains relevant and responsive to evolving educational and community requirements.

The index also highlights spatial attributes and devices and how these elements contribute to the overall user experience. The spatial attributes are lighting, acoustics, and materiality. The decvices are furniture and flexible infrastructures.

This index of spaces is not static; it is a living document that evolves with the project's needs. By treating it as a reference tool, designers, stakeholders, and users can better understand how each space contributes to the whole, ensuring that the architecture remains flexible, functional, and deeply aligned with its intended purpose.

The index also highlights spatial attributes and devices and how these elements contribute to the overall user experience.

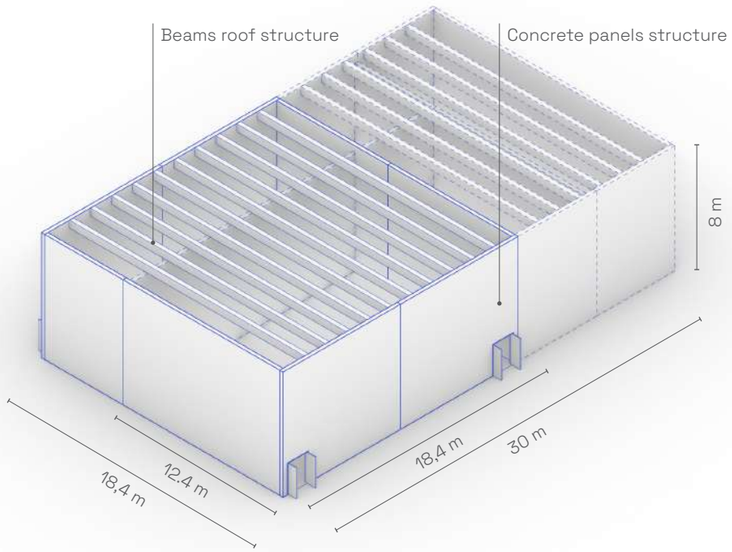


30 HOW TO READ THE CATALOGUE

NEW INDEX OF SPACES

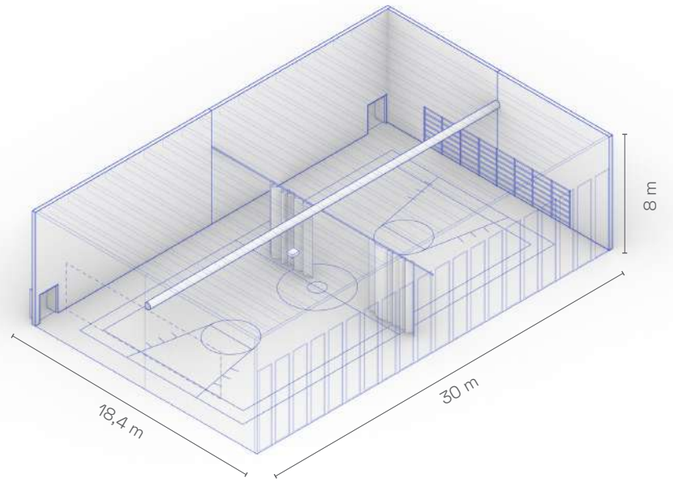
big box

300-550 m² In the assembly



10%
of the surface

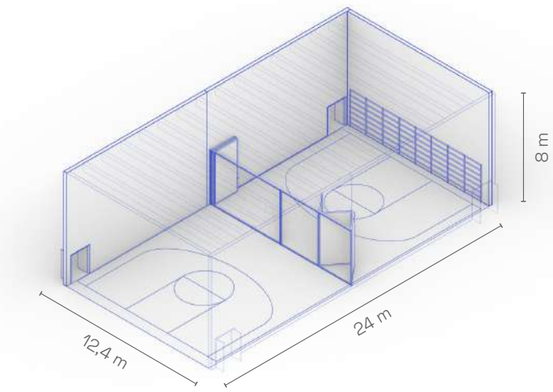
The largest volumes within the Neighborhood for Educational Wonder are the big-box spaces, including the theater and the two gym halls. These areas are designed to accommodate highly active and dynamic activities, serving as the focal points for communal engagement and interaction. Their expansive layouts allow for a high degree of flexibility, enabling them to host a wide range of functions and configurations. From large gatherings, performances, and sports events to workshops and exhibitions, these spaces are equipped to adapt seamlessly to varying needs. The generous scale and open design also make it possible to incorporate diverse furniture arrangements, equipment, and devices, enhancing their utility and versatility.



Sport Hall 30×18 m

Spatial attributes :
Surface 552 m² Volume 4416 m³
75 pupils dividable space.
Fire safety EI 60 stage and exit routes, audience areas EI 45.
Thermal resistance R= 3 m²·K/W.
Sound insulation Rw=60 dB

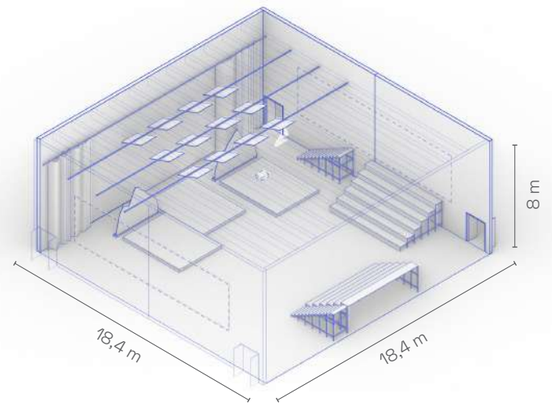
Devices :
spectator seating (up to 100 seats)
portable amphitheatres, spatial separations (nets, curtains)
designated access to allow the use of the space for community activities.



Sport Hall 24×12 m

Spatial attributes :
Surface 298 m² Volume 2380 m³
50 pupils dividable space.
Fire safety EI 60 stage and exit routes, audience areas EI 45.
Thermal resistance R= 3 m²·K/W.
Sound insulation Rw=60 dB

Devices :
spectator seating (up to 100 seats)
portable amphitheatres, spatial separations (nets, curtains)
designated access to allow the use of the space for community activities.



Theatre Hall

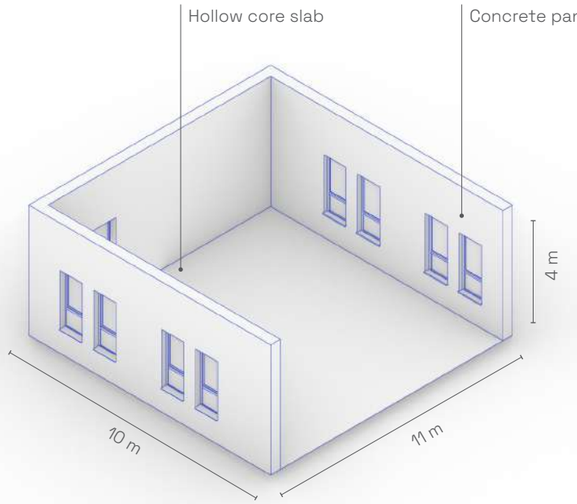
Spatial attributes :
Surface 338 m² Volume 2708 m³
300 seats amphitheatre-style meeting space with stage, 0,6 m² per seat. Fire safety EI 60 stage and exit routes, audience areas REI 150.
Thermal resistance R= 3.3 m²·K/W.
Sound insulation Rw=60/65 dB

Devices :
portable stage and amphitheatre, easily storable chairs, curtains, ultimedia video and sound system (projector, screen, sound equipment, control consoles) and stage lighting equipment.

accomodation

110 m²

In the assembly

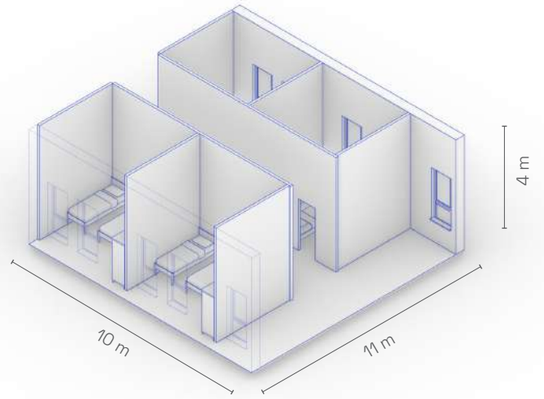


6%
of the surface

The accomodations comprises double rooms for pupils and single rooms for teachers, each to offer restful and productive spaces tailored to individual needs. Modularity for both rooms and windows, enabling seamless expansion to meet future needs.

Shared amenities include inviting lounge areas for social interaction a kitchenette with dining spaces, a dedicated workstation for on-duty staff to ensure safety and support, and toilets.

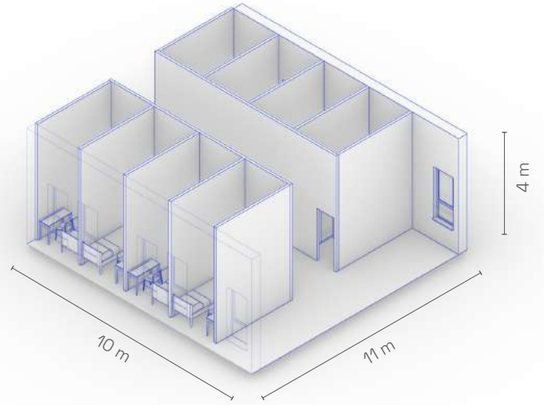
Fire safety EI 45. Thermal resistance R= 3.3 m²·K/W. Sound insulation Rw=55 dB



Double rooms

Spatial attributes :
Surface 110 m² Volume 330 m³
a set of architectural solutions that would make it easy to increase the number of seats as necessary by extending part of the building. Dorm room 8 m² per occupant. 3 Double room every single rooms.

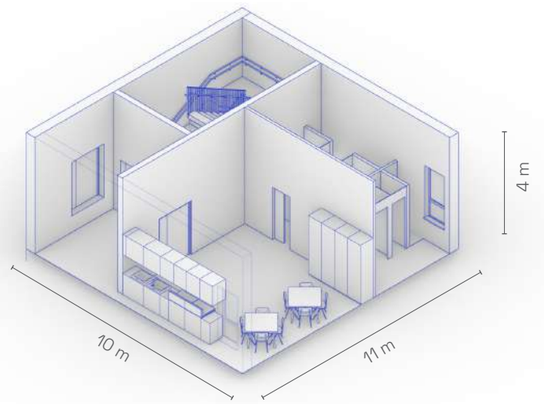
Devices :
the functional, ergonomic and aesthetic design of the facilities must allow pupils and teachers to have adequate rest or to engage in learning or work activities.



Single rooms

Spatial attributes :
Surface 110 m² Volume 330 m³
a set of architectural solutions that would make it easy to increase the number of seats as necessary by extending part of the building. Dorm room 8 m² per occupant. 1 Single room every 3 double rooms.

Devices :
the functional, ergonomic and aesthetic design of the facilities must allow pupils and teachers to have adequate rest or to engage in learning or work activities.



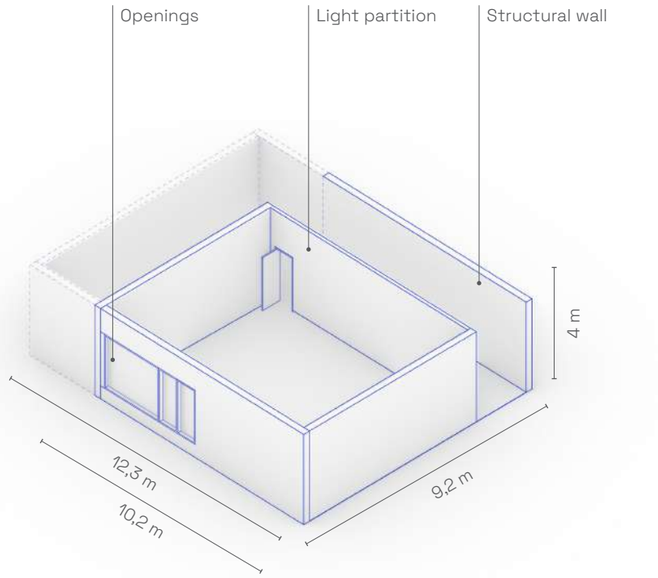
Common and facilities rooms

Spatial attributes :
Surface 110 m² Volume 330 m³

Devices :
common lounge facilities, a kitchenette with dining areas, a vertical distribution service, storage and support facilities, and toilets.

office

94 - 113 m² In the assembly

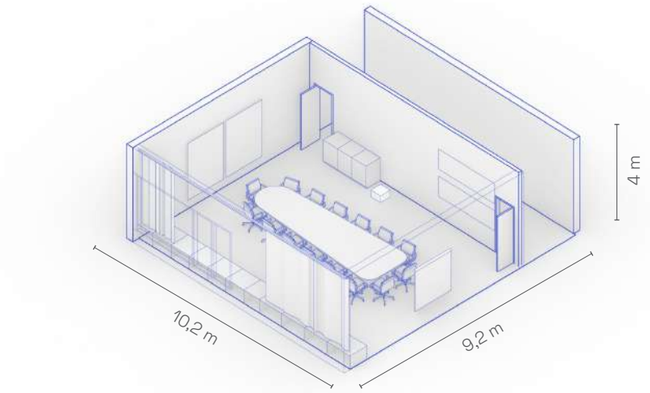


5%
of the surface

The office spaces are designed to support the administrative and operational needs of the complex, including offices for key personnel such as the school master, deputies, and clerical staff, as well as an archive for document storage.

A meeting room facilitates planning and collaboration, while utility rooms, including a workshop, and storage for furniture and inventory, ensure efficient day-to-day operations. These spaces are both functional and well-equipped, fostering organization and effective management.

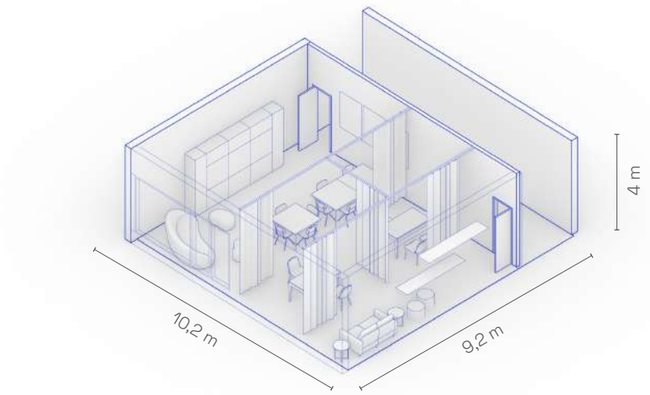
Fire safety EI 30. Thermal resistance R= 3 m²·K/W. Sound insulation Rw=50 dB



Meeting Spaces

Spatial attributes :
Surface 94 m² Volume 376 m³
meeting room for academic council.

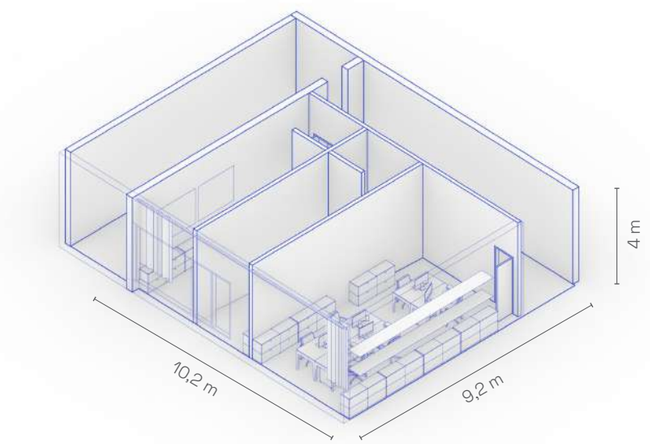
Devices :
seatings, boards, shelves, drawers.



Teachers' working premises

Spatial attributes :
Surface 94 m² Volume 376 m³
informal working.

Devices :
focus pod, coffee machine, informal seatings, boards, furniture for informal meetings and interviews.



Offices

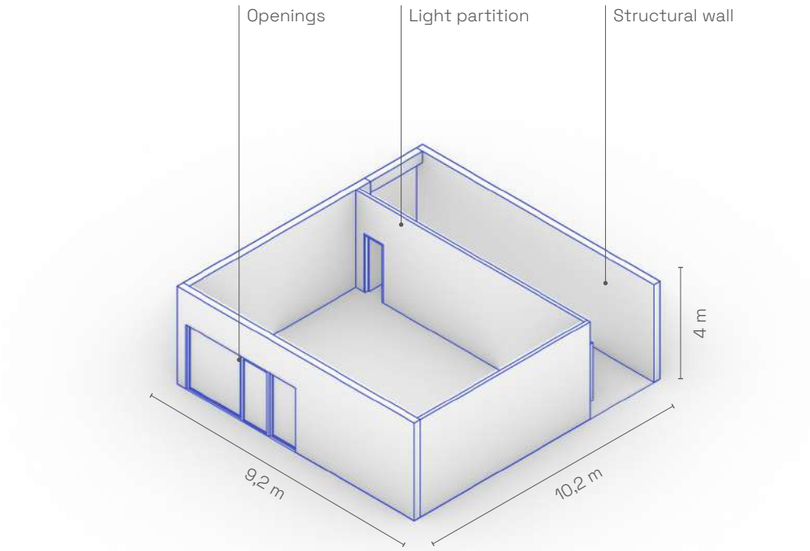
Spatial attributes :
Surface 113 m² Volume 452 m³
formal working.

Devices :
shelves, desks, working stations, drawers, office appliances.

classroom

94 - 138 m²

In the assembly

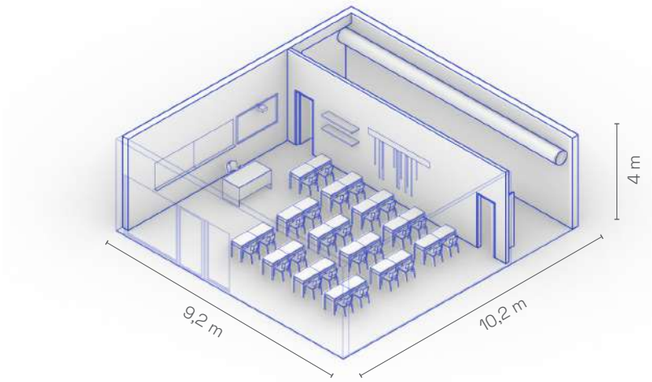


18%
of the surface

The classrooms are designed to flexibly adapt to the needs of gymnasium, lyceum, and elementary pupils, accommodating various teaching and learning styles.

With spatial and design elements that support whole-class instruction, small-group collaboration, and individual study, the spaces are highly versatile. Sliding partitions enable seamless reconfiguration and can adapt to diverse educational needs and age groups.

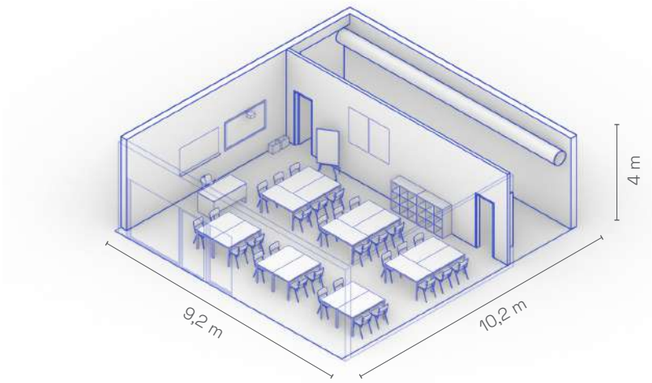
Fire safety EI 60 between classrooms and corridors; exit corridors REI 120, thermal resistance R = 3.3 m²·K/W, Sound insulation Rw 50 dB.



Lyceum and Gymnasium

Spatial attributes :
Surface 94 m² Volume 375 m³
learning classroom and wardrobes nearby.

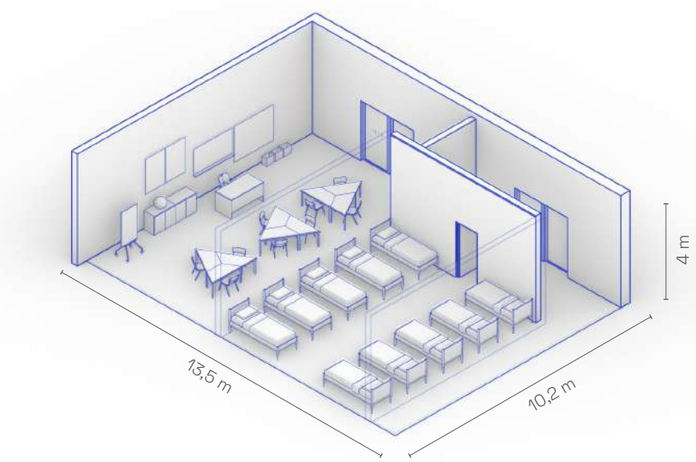
Devices :
seatings, blackboard, shelves, drawers.



Elementary

Spatial attributes :
Surface 94 m² Volume 370 m³
learning room, receration room and wardrobes nearby.

Devices :
seatings, blackboard, drawers, clear wall for poster, illustrations and projector.



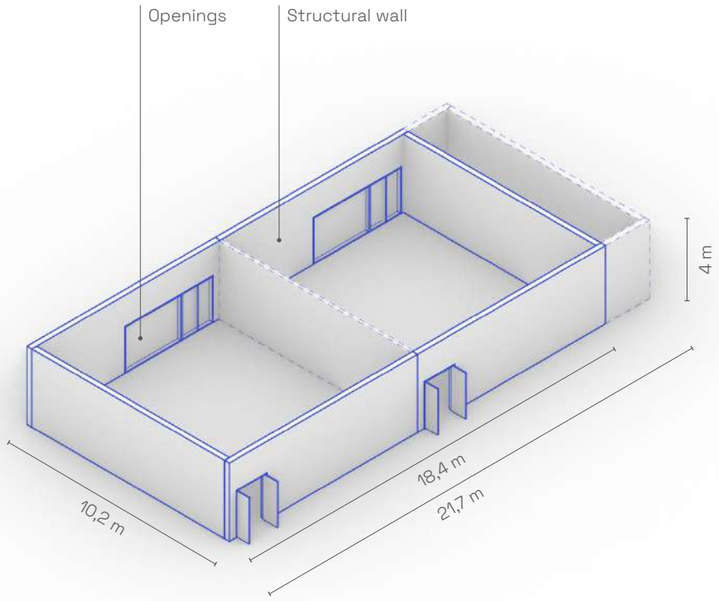
Pupils

Spatial attributes :
Surface 138 m² Volume 550 m³
learning and game rooms, sleeping space and wardrobes nearby.

Devices :
game space, group table, seatings, blackboard, clear wall for poster, illustrations and projector.

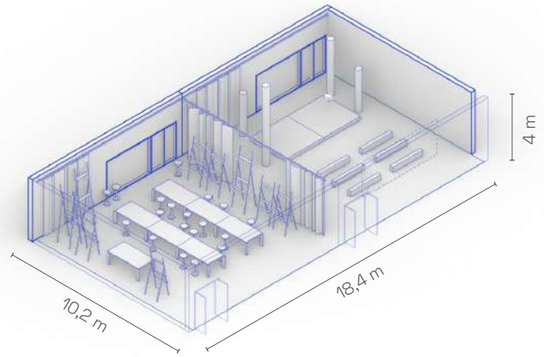
laboratory

188 - 220 m² In the assembly



5%
of the surface

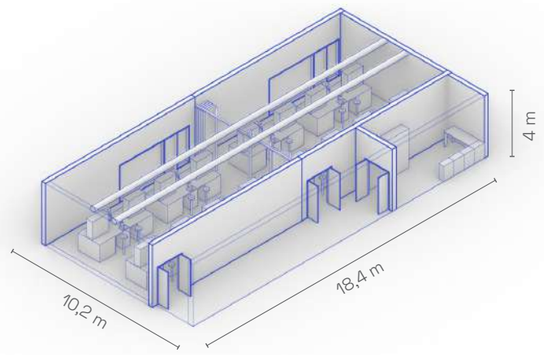
The design allow for separated blocks for specialized humanistic, scientific or workshops activities. These spaces are accessible independently from the main school building, enabling their convenient use for extracurricular programs and community engagement.



Humanistic Lab

Spatial attributes :
Surface 188 m² Volume 752 m³
natural light, interconnected

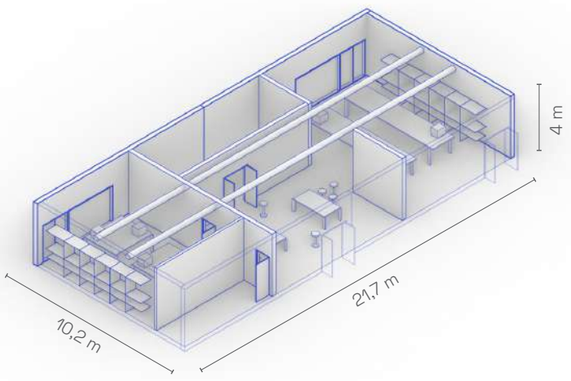
Devices :
movable stage, working tables, courtains, projector for multimedia activities



Scientific Lab

Spatial attributes :
Surface 188 m² Volume 752 m³
Science laboratories, physics, chemistry, biology, interconnected with preparation room.

Devices :
working tables, extractor fan, scientific equipment, projector for multimedia activities



Workshop Lab

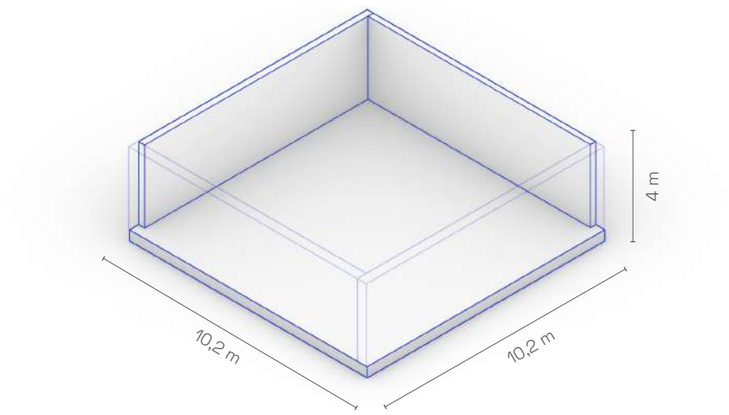
Spatial attributes :
Surface 220 m² Volume 880 m³
Training workshop for pupils 4-9 with equipped wall

Devices :
Equipped wall, working tables.

transitional space

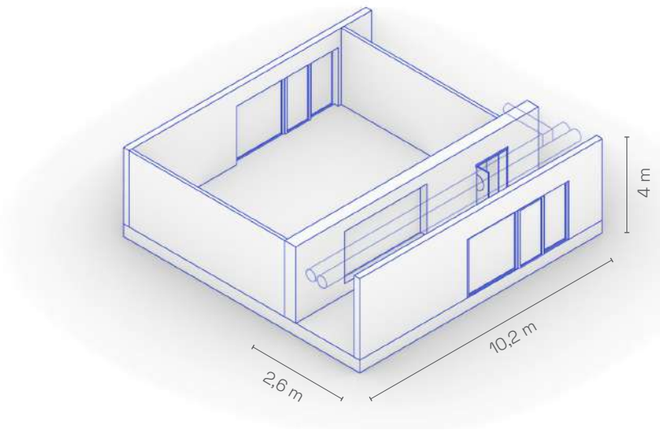
104 m²

In the assembly



14%
of the surface

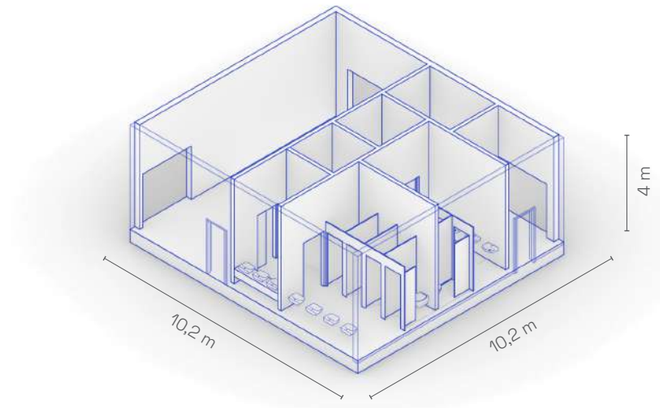
Transitional spaces are multifunctional areas that bridge different environments or purposes, serving as connectors and flexible platforms for various activities. These spaces are designed to integrate educational functions with broader community needs, creating a seamless and cohesive system.



Corridor

Spatial attributes :
Widht 260 cm
(some part with furnished wall of 50 cm)
multifunctional spaces to consolidate the contemporary educational functions into a coherent community system.

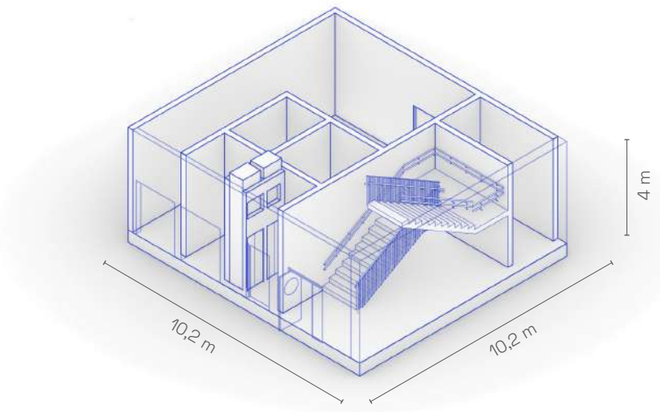
Devices :
seatings, shelves, lockers



Sanitary facilities

Spatial attributes :
Surface 104 m² Volume 416 m³
serving when necessary as storage and technical room

Devices :
toilette facilities



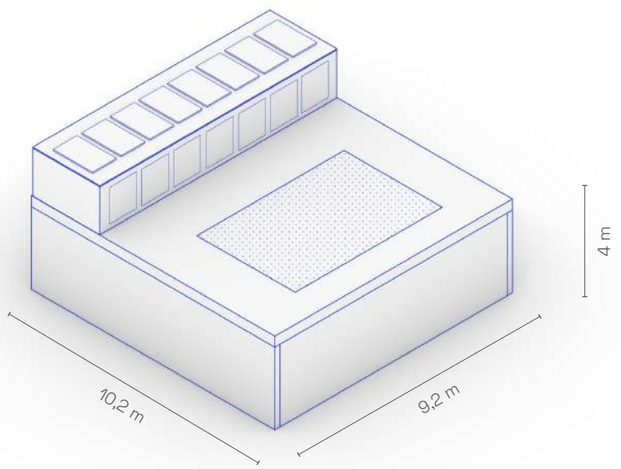
Vertical distribution

Spatial attributes :
Surface 104 m² Volume 416 m³
serving when necessary as storage and technical room, stairs

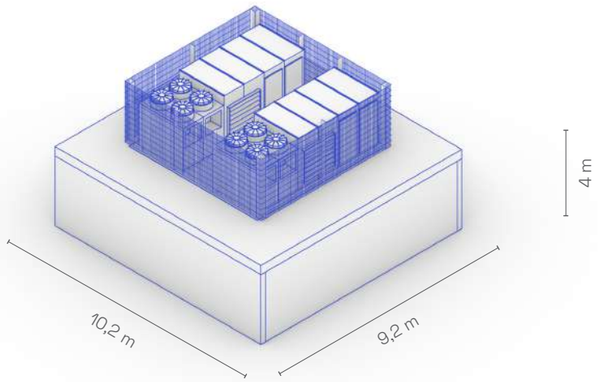
Devices :
elevators

techincal box

In the assembly

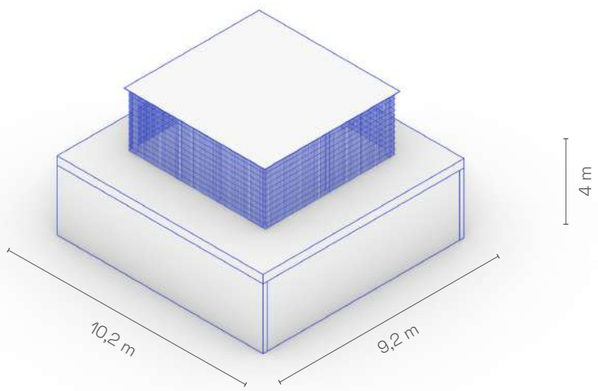


Technical boxes, positioned atop roofs support the internal operations of buildings. These structures house essential systems for energy production, lighting supply, and other technical functions, enabling seamless functionality within the space above and below.



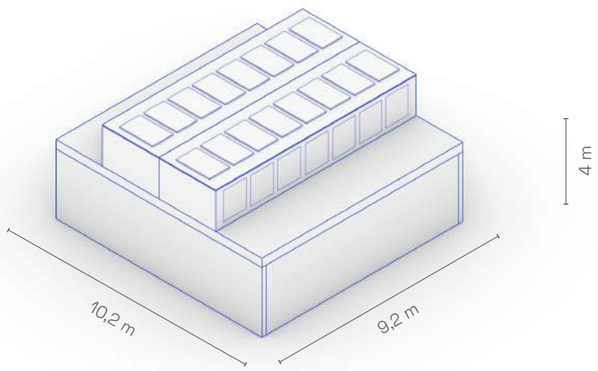
Tech spaces

Spatial attributes :
Surface 64 m² Volume 160 m³
mesh including the technical ATU



Tech storage

Spatial attributes :
Surface 64 m² Volume 160 m³
serving when necessary as storage and technical room



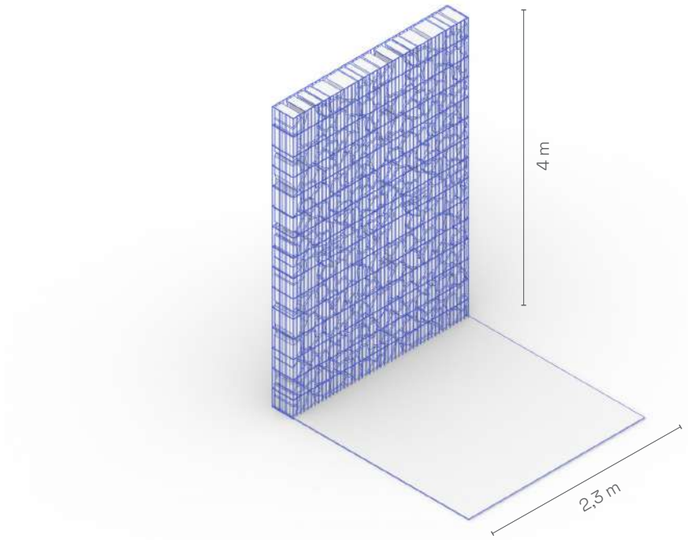
Skylights and PV surface

Spatial attributes :
Surface 23 m² Volume 35 m³
serving as skylight for classrooms

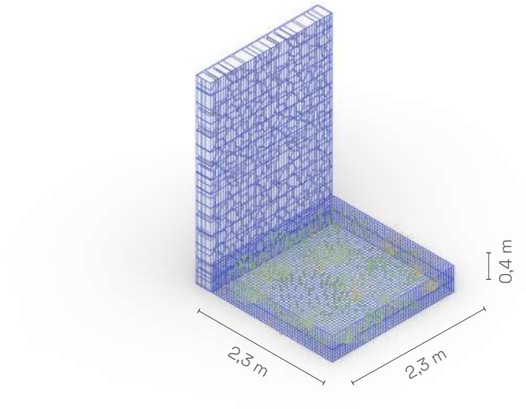
Devices :
PV panels

boundary

In the assembly



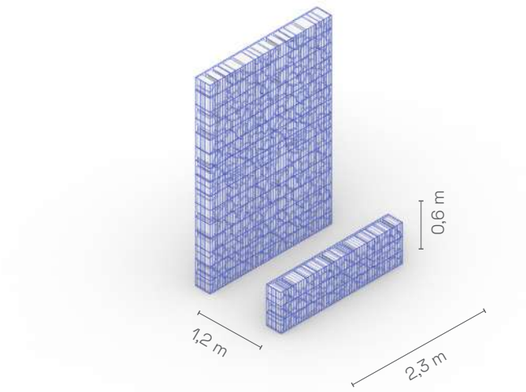
To prevent close contact between the surrounding environment and the walls of the school, various barrier elements can be employed. Options include gabion walls, which offer durability and a natural aesthetic, mesh fences for visibility and security, and greenery, which adds a soft, eco-friendly layer while enhancing the overall ambiance.



Green mesh

Applications :
street fronts,
serving as a natural filter between the street and the wall

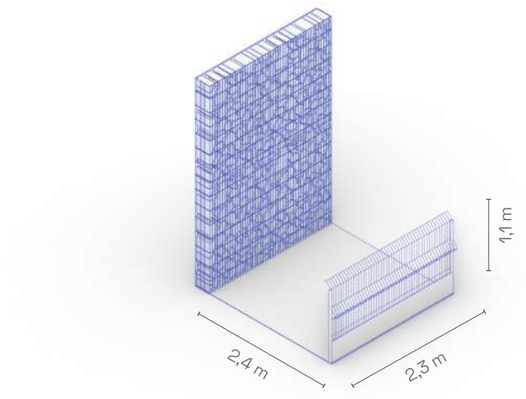
Devices :
support climbing plants, seating



Gabions

Applications :
street fronts,
serving as a natural filter between the street and the wall

Devices :
barrier, seating



Vertical mesh

Applications :
street fronts, rooftop

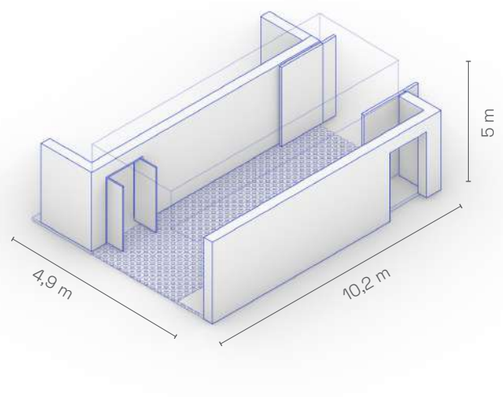
Devices :

barrier

courtyard pocket

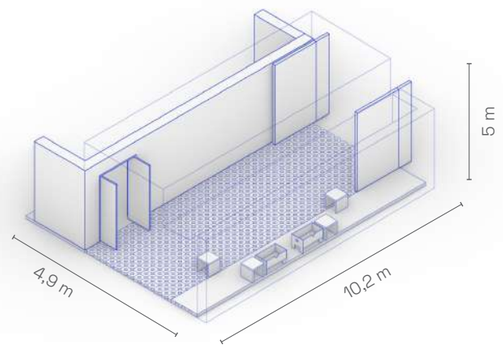
50 m²

In the assembly



1%
of the surface

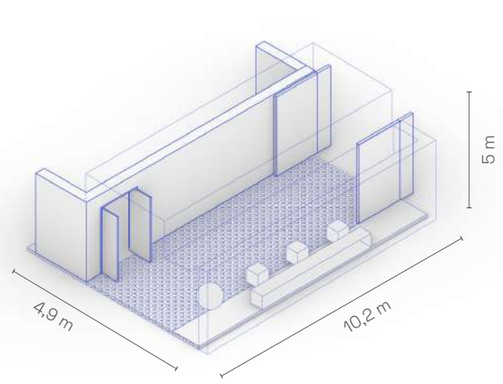
Courtyard pockets are designed to open the courtyards to the outside while maintaining the enclosed atmosphere of the central space. These pockets are equipped with furniture to facilitate small social gatherings and outdoor lessons, creating versatile and inviting areas for interaction and learning.



Elementary

Spatial attributes :
Surface 50 m² Volume 250 m³ clearly visible, self-development and communication points

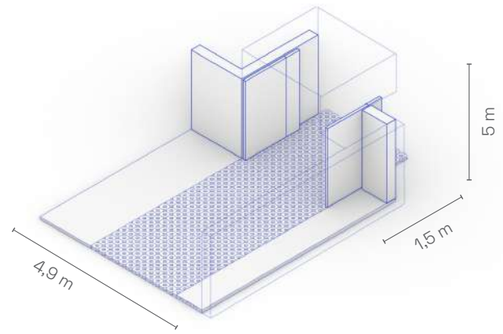
Devices :
seatings, toy storage cart, wayfinding



Gymnasium and Lyceum

Spatial attributes :
Surface 50 m² Volume 250 m³ clearly visible, self-development and communication points

Devices :
benches, sidetables, digital-totem, wayfinding, digital screen



Small pocket

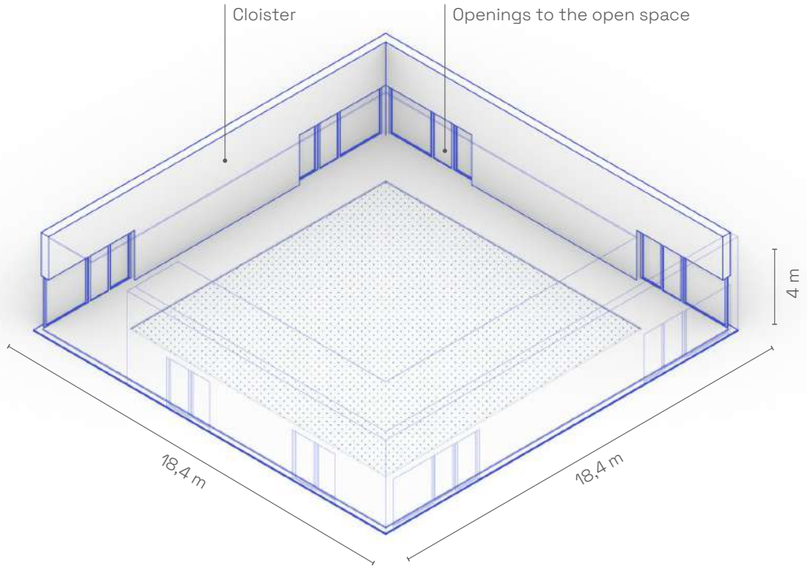
Spatial attributes :
Surface 7 m² Volume 35 m³ clearly visible, self-development and communication points

Devices :
benches, sidetables, wayfinding, digital screen

courtyard

338 m²

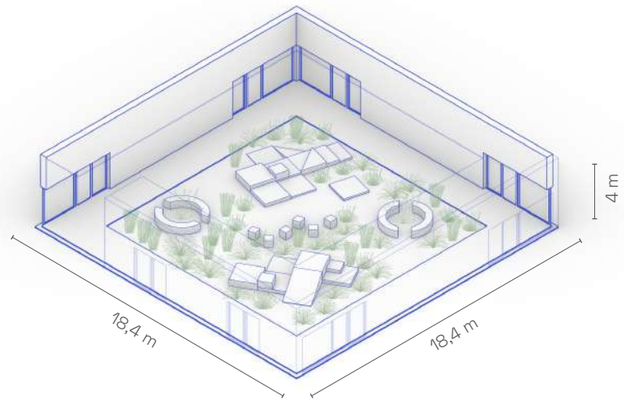
In the assembly



15%
of the surface

The square courtyards, each enclosed by a cloister and infused with greenery, forming intimate hortus conclusus spaces that serve as secret gardens and communal meeting points. These courtyards provide tranquil, enclosed environments that foster reflection, interaction, and connection with nature.

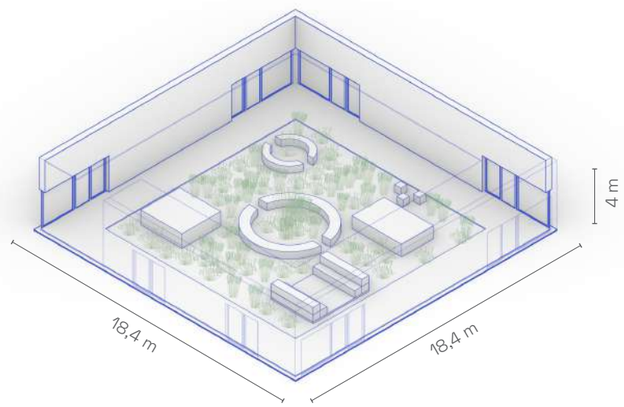
The surrounding cloisters offer shaded walkways and transitional spaces, blending the indoor and outdoor realms. These courtyards offer a shared sanctuary within the larger architectural matrix.



Pupils and Elementary

Spatial attributes :
Surface 338 m²
Elementary pupils and elementary courtyard.

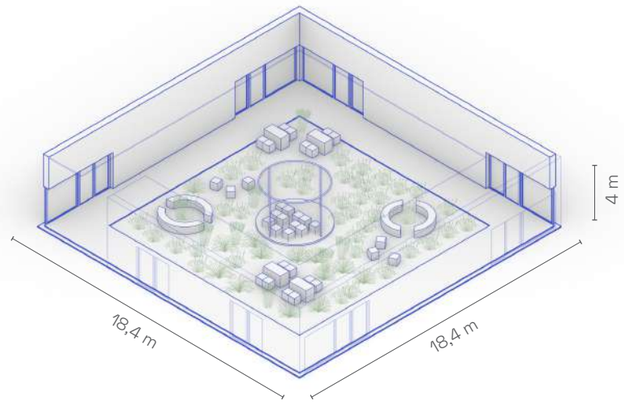
Devices :
seatings, greenery, learning ground, reading corner, sun, rain and snow covering shed.



Orchard

Spatial attributes :
Surface 338 m²

Devices :
seatings, greenery, educational and research area, meteorology and geography learning, sun, rain and snow covering shed, flower and ornamental nursery, vegetable garden.



Gymnasium/Lyceum

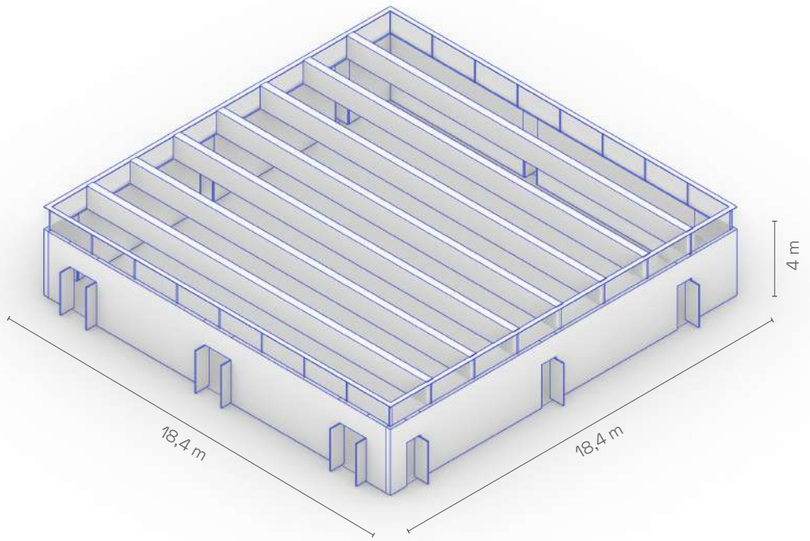
Spatial attributes :
Surface 338 m²
Gymnasium and Lyceum courtyard.

Devices :
active game, focus pod, tables, seatings, greenery, research area, sun, rain and snow covering shed.

leisure

338 m²

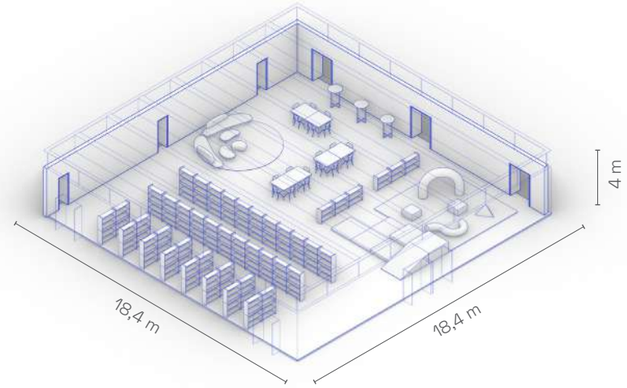
In the assembly



9%
of the surface

The leisure spaces are expansive, sky light-filled areas designed to support modern education and meaningful activities.

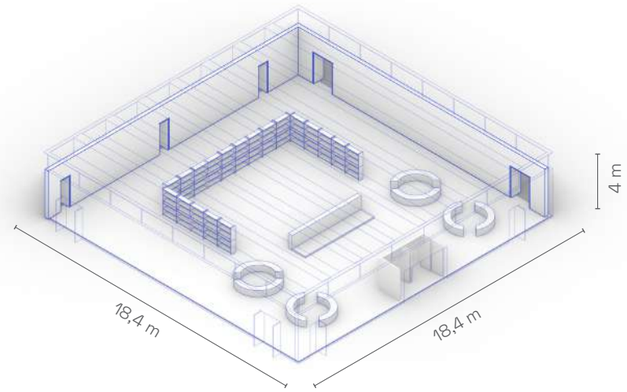
They include zones for interactive play, such as climbing walls and digital installations, as well as creative play areas. They also include the canteen area for the scholastic meal consumption and the lobby with the entry check and storage space for the school. For quieter moments, soft corners with cushions and rugs offer relaxation, while reading corners provide books and comics with cozy seating.



Leisure

Spatial attributes :
Surface 338 m² Volume 1352 m³
Space for game time and for the personal learning.

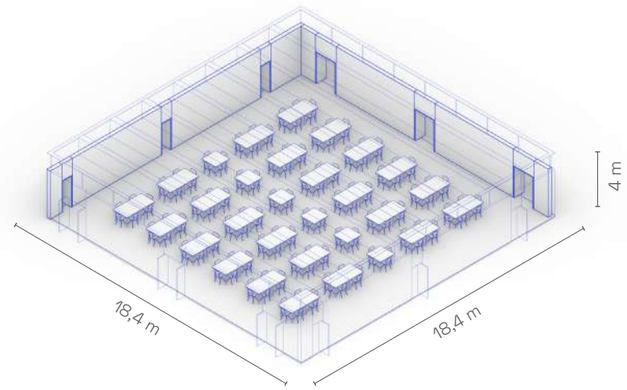
Devices :
creative play, interactive digital wall, climbing zone, sensorial play zone,



Lobby

Spatial attributes :
Surface 338 m² Volume 1352 m³

Devices :
lobby desk, maker space, social lounge, loackers, armchairs and cushions, round tables



Canteen

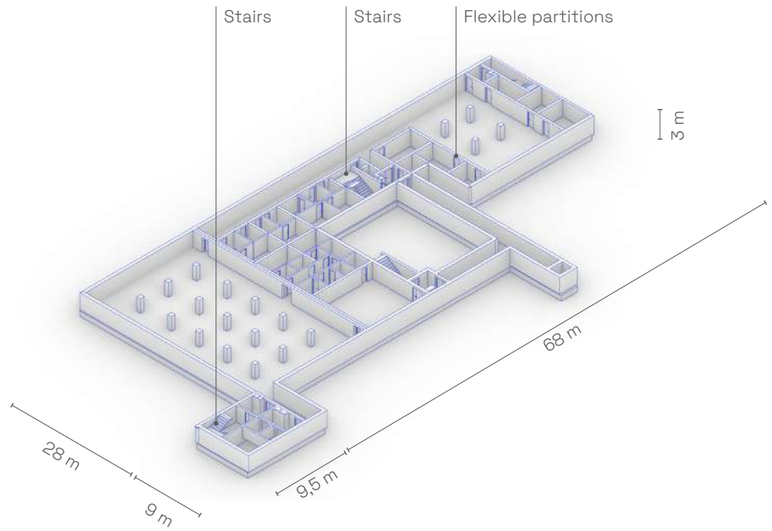
Spatial attributes :
Surface 338 m² Volume 1352 m³
Space for eating school meals.

Devices :
different types of seating, communal tables, dining tables of different heights,

dual-use shelter

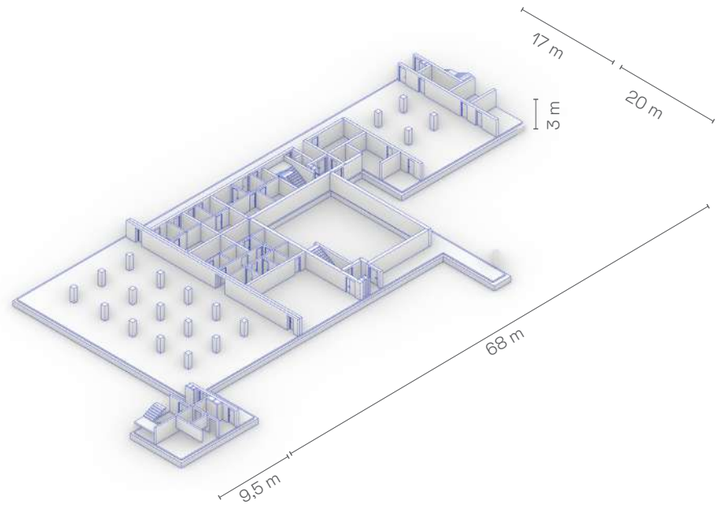
1.800 m²

In the assembly



16%
of the surface

An underground bunker constructed from reinforced concrete, prioritizing maximum safety and resilience in emergencies. This approach integrates ergonomic and aesthetic considerations to ensure the shelter remains both functional and comfortable, with the potential for dual-use capabilities. An emergency exit shaft is located outside the building's potential collapse zone.



Dual-use shelter

Spatial attributes :
Surface 1800 m² Volume 5400 m³
underground reinforced concrete
structure of protection level P-4
capacity up to 650 people

Devices :
seatings, greenery, grow lights

31 PURPOSE-BUILT SUBTERRANEAN SCHOOL, KHARKIV

Images include variations noted in the chapter Innovation roadmap items

2.5
THE FINISHINGS
SPACES AND MATERIALS

SPACE	FINISHING			
BIG BOX	**FLOOR**	**WALL**	**CEILING**	**FURNISHING ELEMENTS**
A. Gym 30x18 m	FL.01 wooden floor type A	WA.09 plaster in color A	CL.02 baffle ceiling	FE.03 curtain type C
B. Gym 24x12 m	FL.01 wooden floor type A	WA.09 plaster in color A	CL.02 baffle ceiling	FE.03 curtain type C
C. Theater	FL.05 wooden floor type A	WA.05 concrete panels + acoustic panels type B	CL.03 acoustic panels ceiling	FE.03 curtain type C

ACCOMODATION	FLOOR	WALL	CEILING	FURNISHING ELEMENTS
A. Double rooms	FL.06 wooden floor type B	WA.09 plaster in color A	CL.05 plasterboard ceiling	FE.01/ 06 curtain type A/ furniture type A
B. Single rooms	FL.06 wooden floor type B	WA.09 plaster in color A	CL.05 plasterboard ceiling	FE.01/ 06 curtain type A/ furniture type A
C. Common and recreation rooms	FL.02 linoleum type B	WA.04 concrete panels + acoustic panels type A	CL.01/ 02 polished concrete/ baffle ceiling	FE.01/ 07 curtain type A/ furniture type B

SPACE	FINISHING			
OFFICE	**FLOOR**	**WALL**	**CEILING**	**FURNISHING ELEMENTS**
A. Meeting spaces	FL.03 linoleum type C	WA.10 plaster in color B	CL.02 baffle ceiling	FE.01/ 07 curtain type A/ furniture type B
B. Teachers working premises	FL.03 linoleum type C	WA.10 plaster in color B	CL.02 baffle ceiling	FE.01/ 07 curtain type A/ furniture type B
C. Offices	FL.03 linoleum type C	WA.10 plaster in color B	CL.02 baffle ceiling	FE.01/ 07 curtain type A/ furniture type B

CLASSROOM	FLOOR	WALL	CEILING	FURNISHING ELEMENTS
A. Gymnasyum and Lyceum	FL.03 linoleum type C	WA.01/03 concrete panels ... fixed furniture	CL.01/ 02 polished concrete/ baffle ceiling	FE.01/ 06 curtain type A/ furniture type A
B. Elementary	FL.03 linoleum type C	WA.01/03 concrete panels ... fixed furniture	CL.01/ 02 polished concrete/ baffle ceiling	FE.01/ 06 curtain type A/ furniture type A
C. Pupils	FL.03 linoleum type C	WA.01/03 concrete panels ... fixed furniture	CL.01/ 02 polished concrete/ baffle ceiling	FE.01/ 06 curtain type A/ furniture type A

SPACE	FINISHING			
LABORATORY	**FLOOR**	**WALL**	**CEILING**	**FURNISHING ELEMENTS**
A. Art & Dance Lab	FL.02 linoleum type B	WA.01/02/03 concrete panels linoleum panels fixed furniture	CL.01/ 02 polished concrete/ baffle ceiling	FE.02/08/09 curtain type B/ furniture type C/ D
B. Scientific Lab	FL.02 linoleum type B	WA.01/02/03 concrete panels linoleum panels fixed furniture	CL.01/ 02 polished concrete/ baffle ceiling	FE.02/08/09 curtain type B/ furniture type C/ D
C. Workshop Lab	FL.02 linoleum type B	WA.01/02/03 concrete panels linoleum panels fixed furniture	CL.01/ 02 polished concrete/ baffle ceiling	FE.02/08/09 curtain type B/ furniture type C/ D

TRANSITIONAL SPACES	FLOOR	WALL	CEILING	FURNISHING ELEMENTS
A. Corridor	FL.07 polished concrete	WA.01/ 03 concrete panels/ fixed furniture	CL.01/ 02 polished concrete/ baffle ceiling	FE.10 wayfinding
B. Sanitary facilities	FL.04 floor tiles type A	WA.08/ 11 wall tiles type B aquapanel	CL.06 plasterboard ceiling	FE.10 wayfinding
C. Vertical distribution	FL.07 polished concrete	WA.01 concrete panels	CL.01 polished concrete	FE.10 wayfinding

SPACE	FINISHING	
TECHNICAL BOX	**FLOOR**	**WALL**
A. Tech spaces	EX.01 polished concrete outdoor	EX.03 metal mesh type.A
B. Tech storage	EX.01/EX.02 polished concrete Green roofoutdoor	EX.03 metal mesh type.A
C. Skylights and PV surface	EX.01 polished concrete outdoor	EX.06 texture plaster outdoor

BOUNDARY	A. GREEN MESH	B. GABIONS	C.VERTICAL MESH
	EX.05 Green metal mesh	EX.03 metal mesh type.A	EX.04 metal mesh type.B

SPACE	FINISHING			
COURTYARD POCKET	FLOOR	WALL	CEILING	FURNISHING ELEMENTS
A. Elementary and pupils	FL.08/ 10 polished concrete drivable interlocking	WA.12 texture plaster outdoor	CL.01 polished concrete	FE.10 wayfinding
B. Gymnasyum and Lyceum	FL.08/ 10 polished concrete drivable interlocking	WA.12 texture plaster outdoor	CL.01 polished concrete	FE.10 wayfinding
C. Gymnasyum and Lyceum	FL.08/ 10 polished concrete drivable interlocking	WA.12 texture plaster outdoor	CL.01 polished concrete	FE.10 wayfinding

COURTYARD	FLOOR	WALL	CEILING	FURNISHING ELEMENTS
A. Pupils and Elementary	FL.08/09 polished concrete gravel	WA.12 texture plaster outdoor	CL.01 polished concrete	FE.10 wayfinding
B. Orchard	FL.08/09 polished concrete gravel	WA.12 texture plaster outdoor	CL.01 polished concrete	FE.10 wayfinding
C. Gymnasyum and Lyceum	FL.08/09 polished concrete gravel	WA.12 texture plaster outdoor	CL.01 polished concrete	FE.10 wayfinding

SPACE	FINISHING			
LEISURE	FLOOR	WALL	CEILING	FURNISHING ELEMENTS
A. Lobby	FL.06 wooden floor type B	WA.04 concrete panels + acoustic panels type A	CL.01/ 02 polished concrete/ baffle ceiling	FE.02/05/ 08/09/10 curtain type B/ Rug/ rubber mat type B furniture type C/ D wayfinding
B. Leisure	FL.06 wooden floor type B	WA.04 concrete panels + acoustic panels type A	CL.01/ 02 polished concrete/ baffle ceiling	FE.02/05/ 08/09/10 curtain type B/ Rug/ rubber mat type B furniture type C/ D wayfinding
C. Canteen	FL.02 linoleum type B	WA.01/ 07 concrete panels/ wall tiles type A	CL.03 acoustic panels ceiling	FE.03 curtain type C/ furniture type D wayfinding

DUAL-USE SHELTER	FLOOR	WALL	CEILING	FURNISHING ELEMENTS
A. Dual-use shelter	FL.02 linoleum type B	WA.04 concrete panels + acoustic panels type A	CL.04 acoustic ceiling-gypsum	

2.6
THE ASSEMBLY
MATCHING THE CATALOGUE

This paragraph emphasizes how the various elements of the catalogoue can be integrated to form distinct functional units, each with unique structural and HVAC requirements.

The assembly carefully considers the interplay between the various spaces detailed in the catalogue, prioritizing their relationships to enhance both functionality and flow throughout the design. By strategically positioning and connecting spaces, the assembly ensures a seamless integration of activities, fostering efficiency and cohesion.

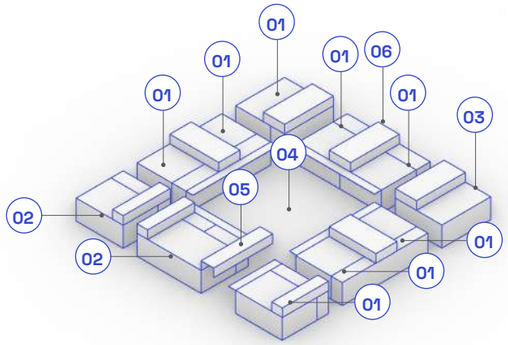
For instance, communal areas such as courtyards or dining halls are intentionally located to act as central nodes, linking private and public spaces while encouraging interaction and engagement.

At the same time, specialized zones like classrooms or offices are thoughtfully arranged to maintain focus and privacy without feeling isolated. This layout creates a dynamic environment where each area supports and complements the others.

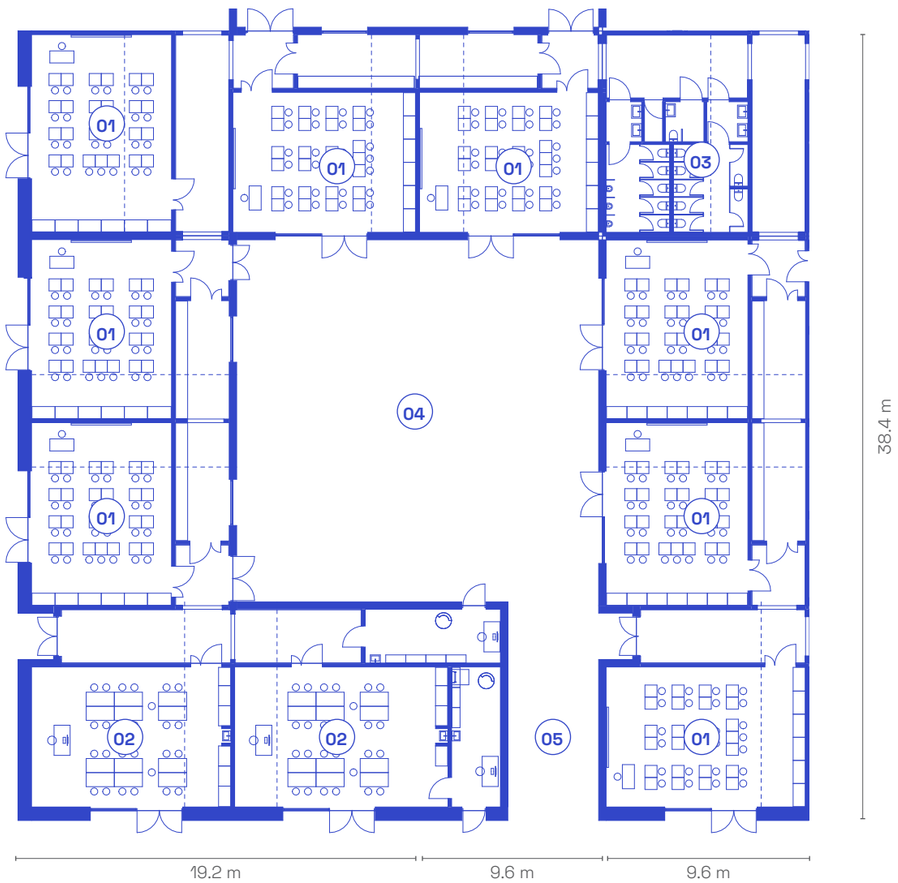
The assembly addresses the interplay between the different spaces of the catalogue, emphasizing how their relationships enhance functionality and flows.

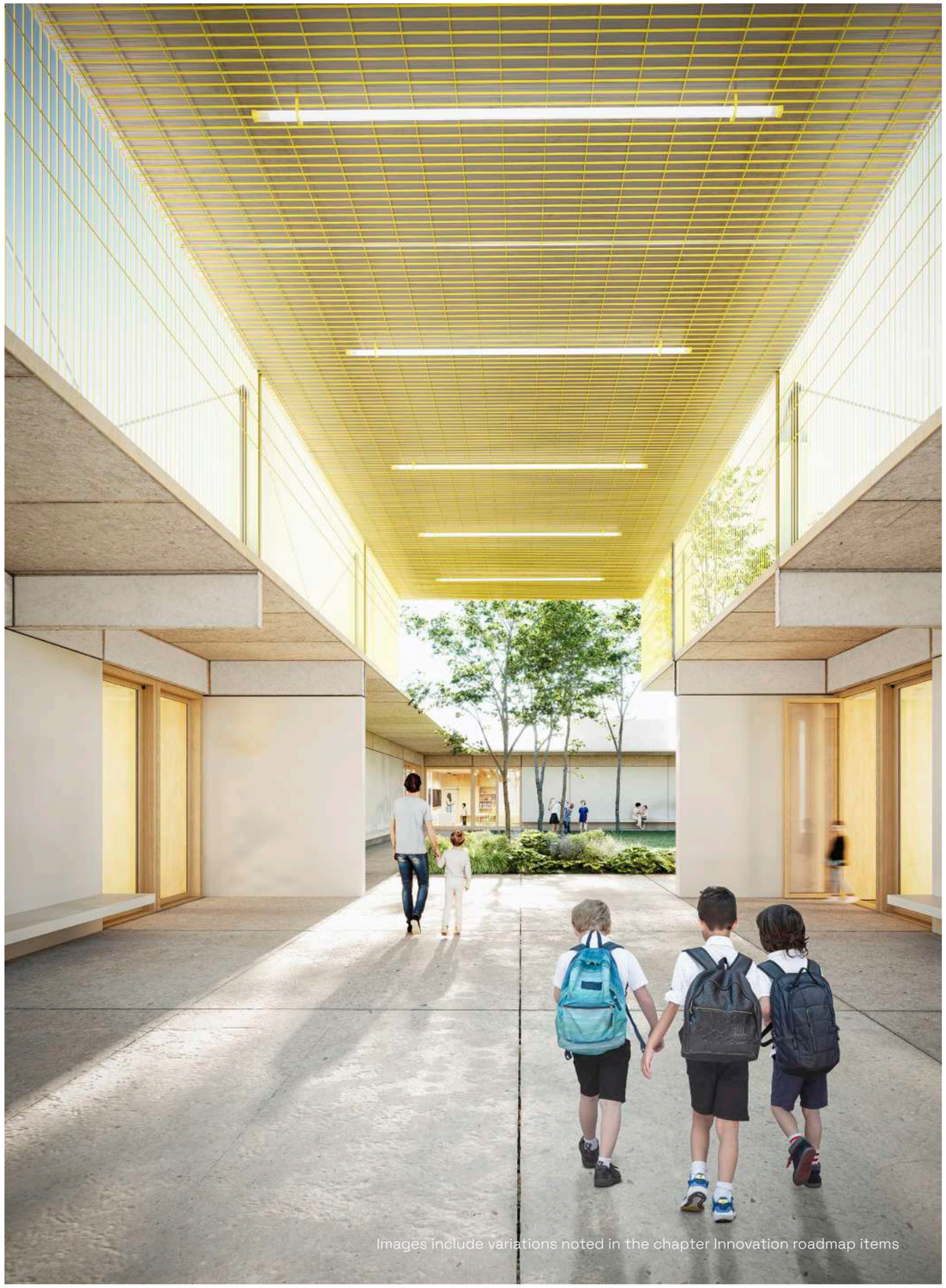
Images include variations noted in the chapter Innovation roadmap items

#1 Classrooms

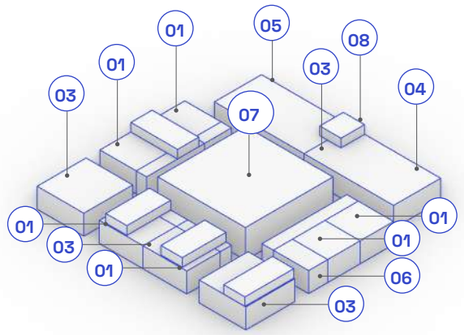


01. classroom
02. laboratory
03. sanitary facilities
04. courtyard
05. entrance pocket
06. technical room

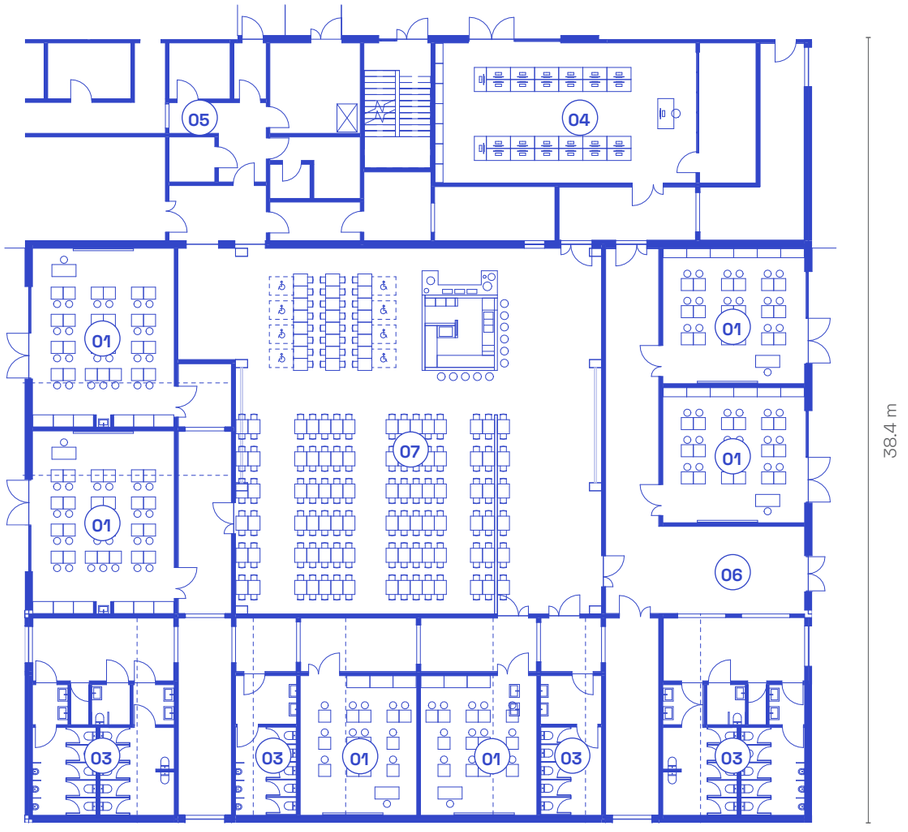




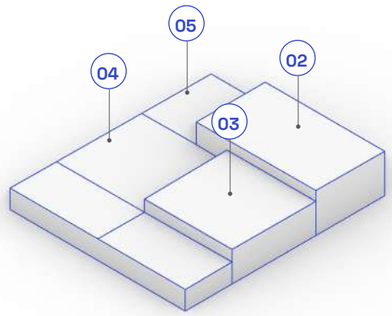
#2 Laboratories



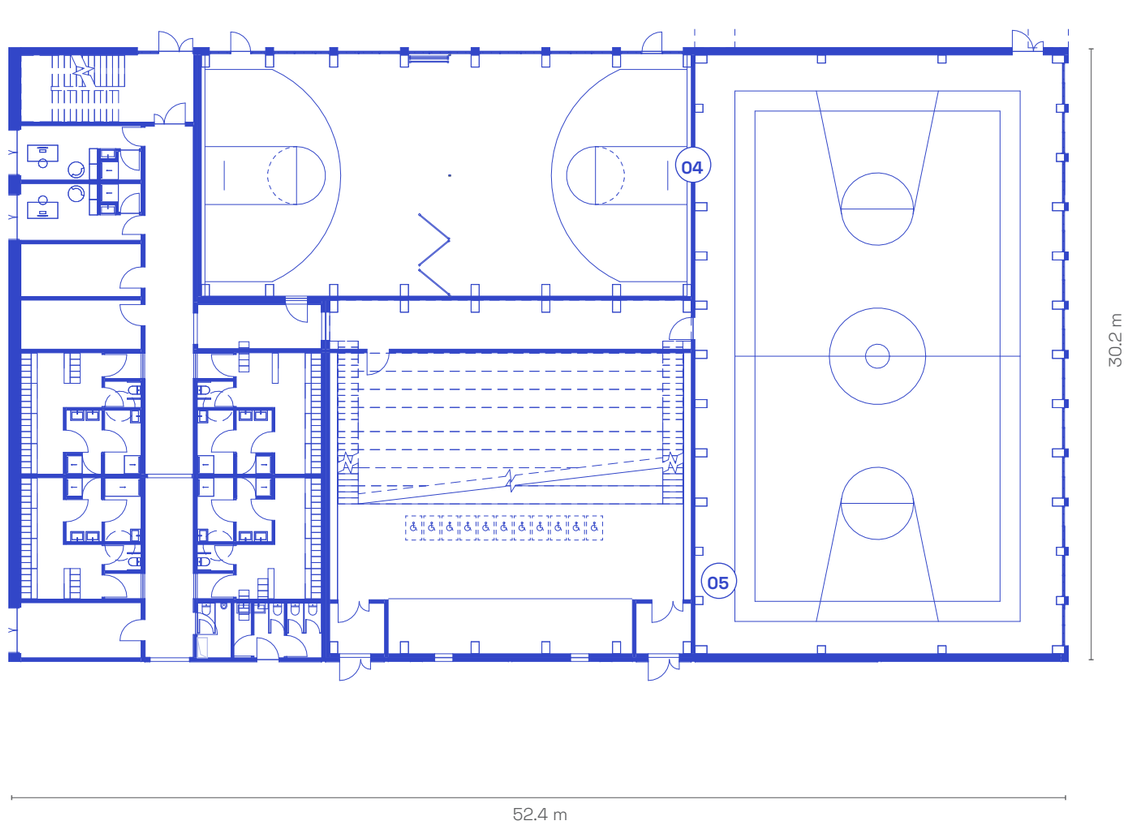
01. classroom
02. shelter access
03. sanitary facilities
04. laboratories
05. kitchen
06. recreation
07. canteen
08. technical room



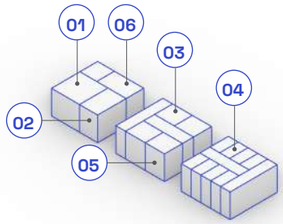
#3 Gym and Theatre Hall



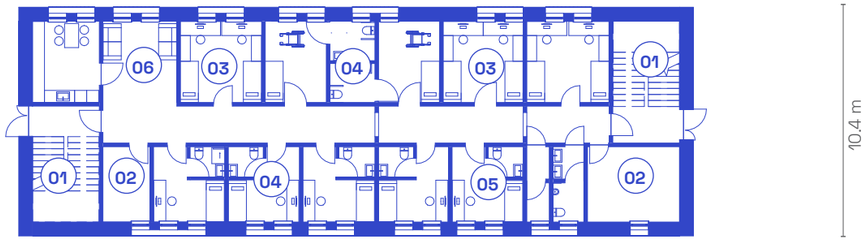
01. sport hall 30x20
02. sport hall 24x12
03. theatre hall
04. changing room
05. office



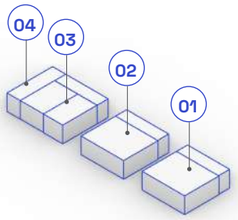
#4 Accomodations



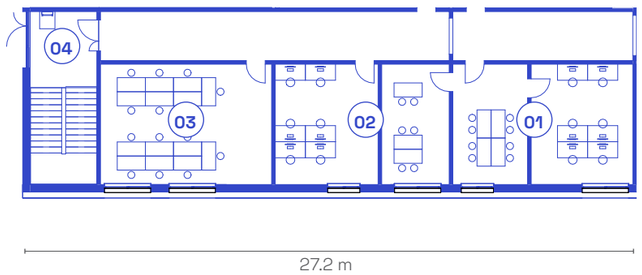
01. vertical distribution
02. kitchen
03. double room
04. single room
05. caretaker's room
06. sanitary facilities



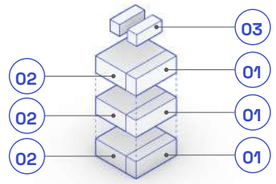
#5 Offices



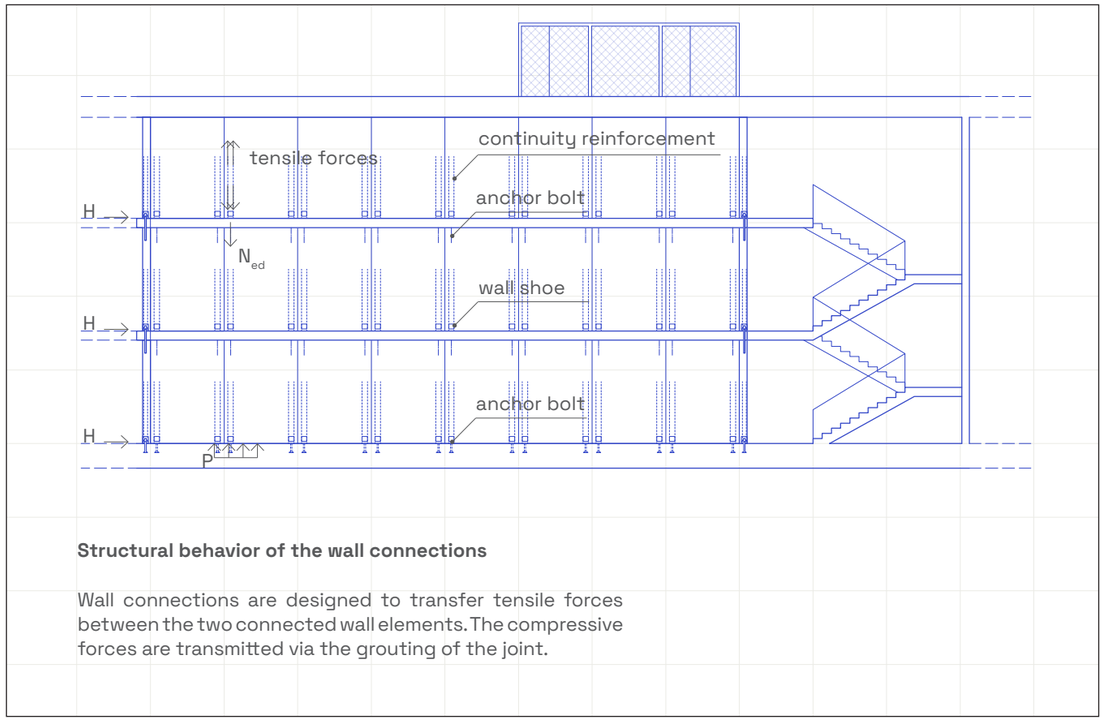
01. meeting room
02. office
03. teacher's working premises
04. vertical distribution



#6 Floor Above



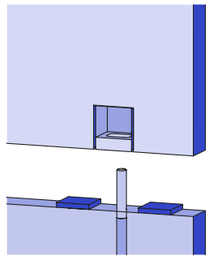
01. transitional space
02. classroom
03. AHU



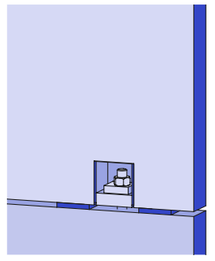
Structural behavior of the wall connections

Wall connections are designed to transfer tensile forces between the two connected wall elements. The compressive forces are transmitted via the grouting of the joint.

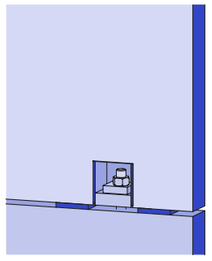
The wall is installed on preleveled shim plates



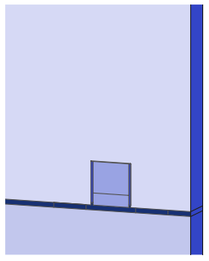
The nuts and washers are screwed on and tightened.



The connection is ready for grouting



The finalized connection after the grouting has hardened



Photovoltaic Skylight Configuration Analysis

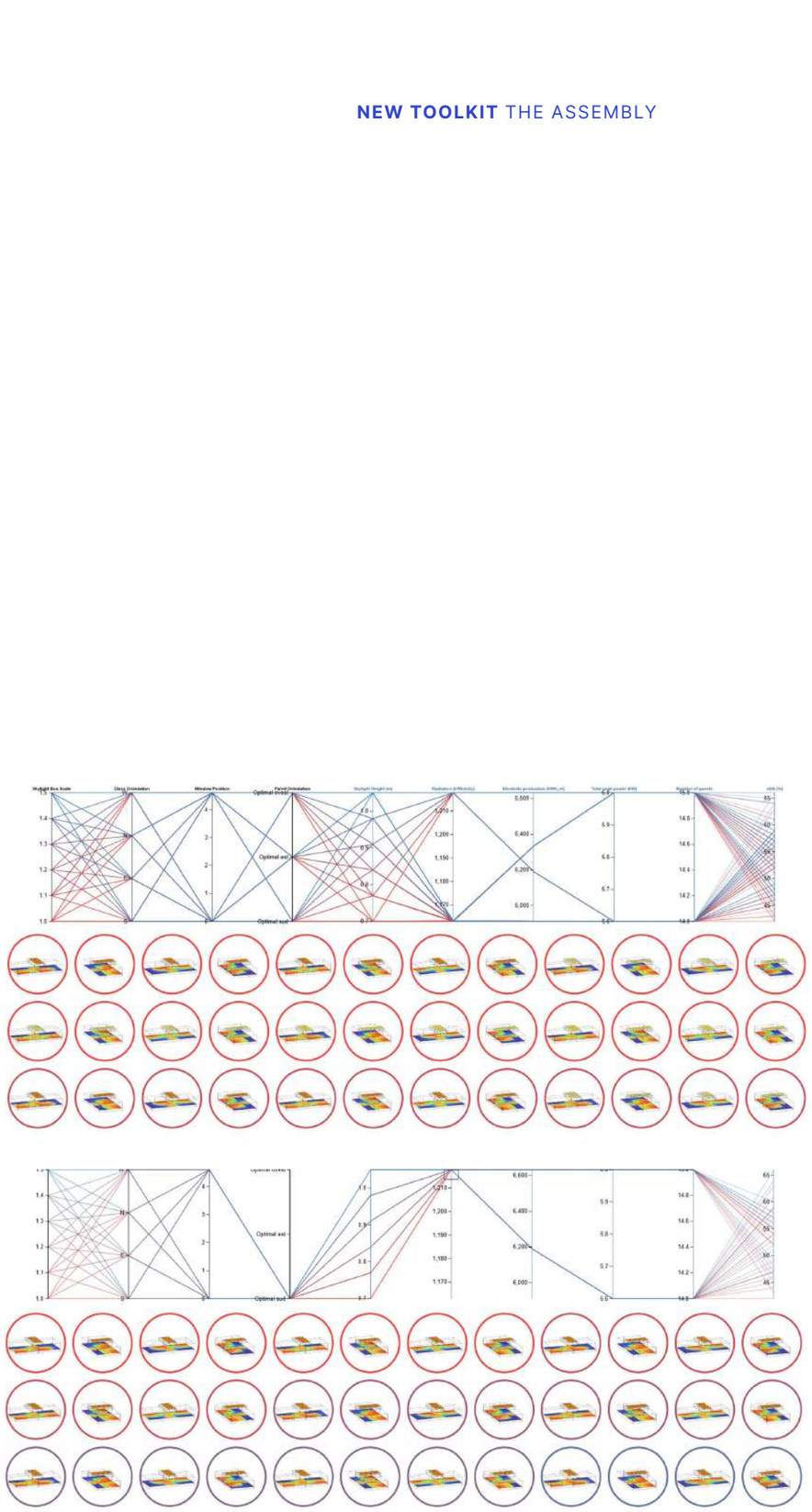
A parametric-iterative approach was used to identify areas with the highest exposure to solar radiation and to determine optimal configurations for photovoltaic panel placement on the classroom module.

The analysis aimed to optimize renewable energy production using parametric scripts, which tested various panel orientations and calculated the maximum number of panels, total system power, and estimated energy output for the site. The analysis can also evaluate photovoltaics potential, compare alternatives, and identify solutions that maximize energy production while minimizing costs.

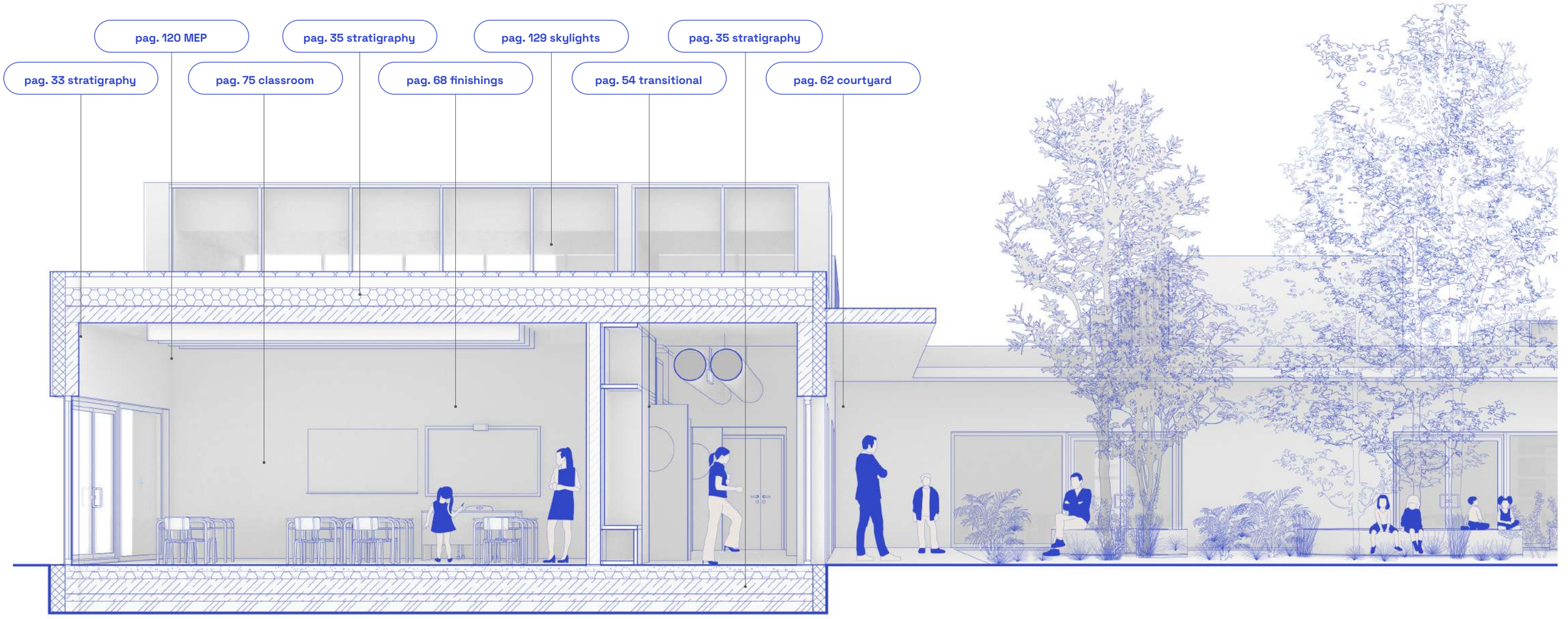
Optimizing glazing surfaces and skylight configurations in classrooms is crucial for balancing energy efficiency, daylight performance, and photovoltaic (PV) production. Strategic adjustments, such as increasing skylight height and repositioning lateral windows, can significantly enhance the distribution of natural light, especially in classrooms facing North or West.

By optimizing the skylight configurations, it was possible to significantly increase photovoltaic production, with the highest potential in east and west-facing classrooms. The final configuration enables each classroom module to achieve a power output of 3.44 kW, with renewable energy production ranging from 3070 kWh to 3268 kWh, depending on orientation.

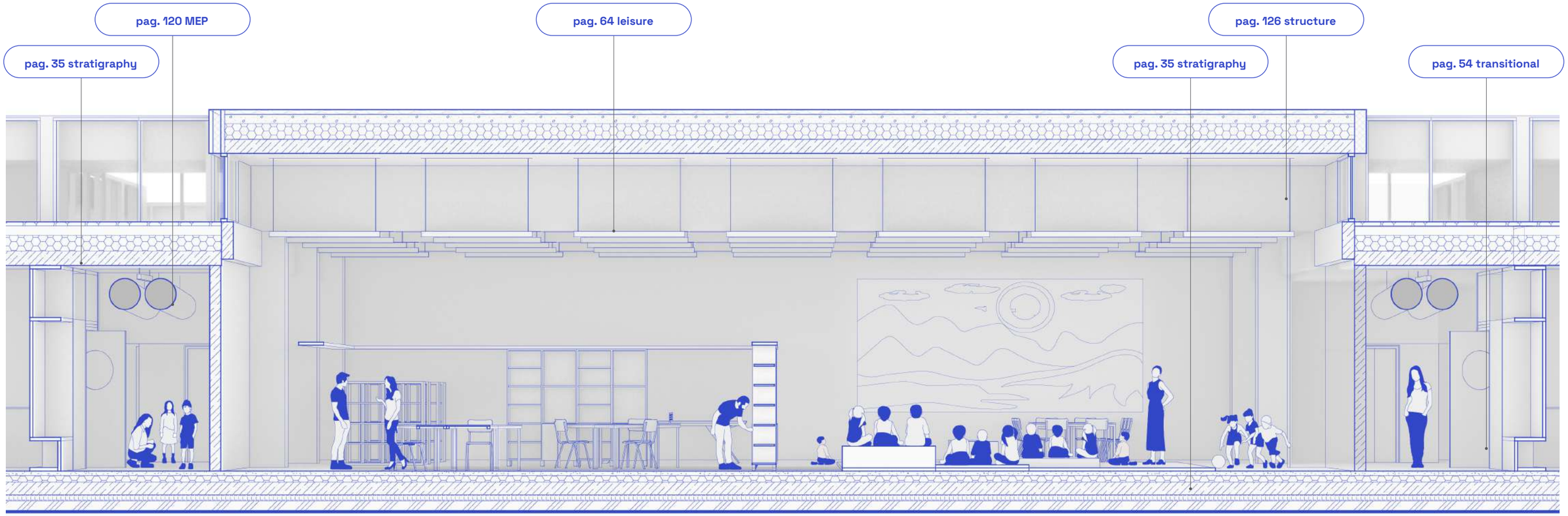
The next phases should investigate the required distance between glass and PV panels according to Ukrainian regulations, as this may impact daylight performance and PV energy production.



#1 Classrooms assembly



#2 Leisure assembly



Images include variations noted in the chapter Innovation roadmap items

2.7
GUIDLINES FOR ADAPTATION
IMPLEMENTING

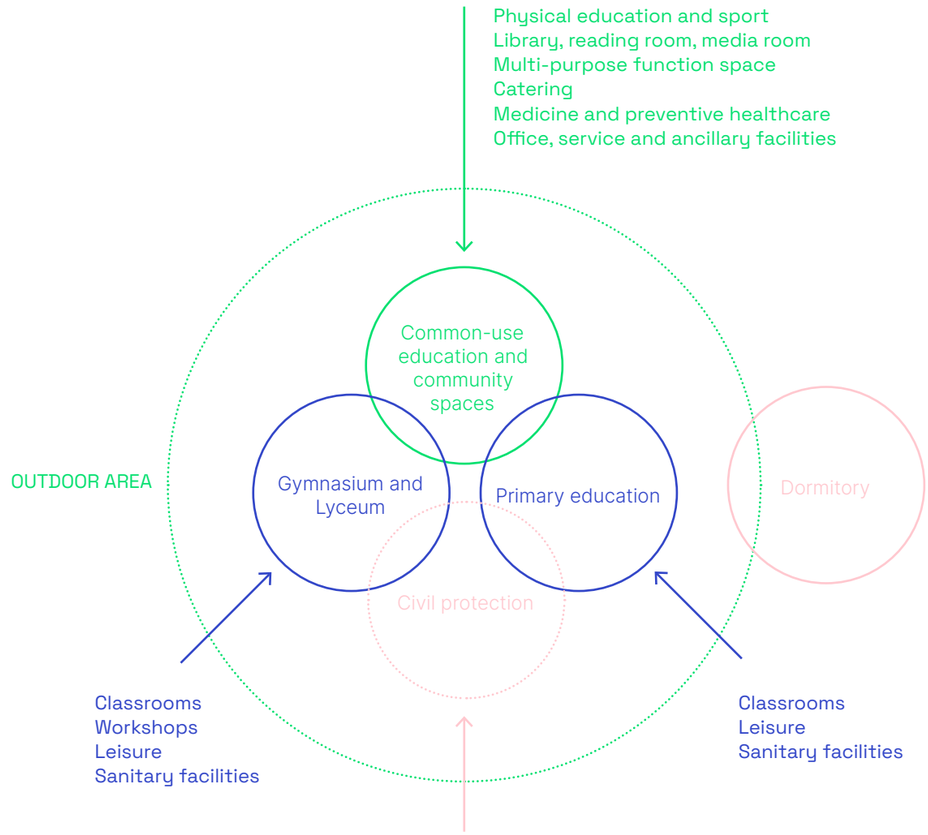
The design guidelines are intended to be applied across different contexts, adapting to specific needs and requirements, building density, terrain morphology, and buildable space.

Presented here is a strategic approach for addressing the various contexts and situations that may arise when evaluating a new site.

The radial distribution of functions, organized in clusters, allows the Neighborhood for Educational Wonder to easily connect with surrounding attractions. A cycling loop encircles the entire campus, and bicycle parking racks are conveniently located near every main entrance.

In line with DBN V.2.2-40:2018 standards, the project ensures always universal accessibility and inclusiveness for all people. It features barrier-free entrances, wide corridors, threshold-free evacuation routes, and accessible doorways. Tactile and visual indicators, contrasting signage, and tactile tiles aid orientation, while two 1000 kg elevators enable vertical mobility. Outdoor paths include ramps and minimal curb heights for wheelchair access. The design also supports inclusive education and provides clear navigation and evacuation systems, ensuring safety, comfort, and equal access for all without reducing operational efficiency.

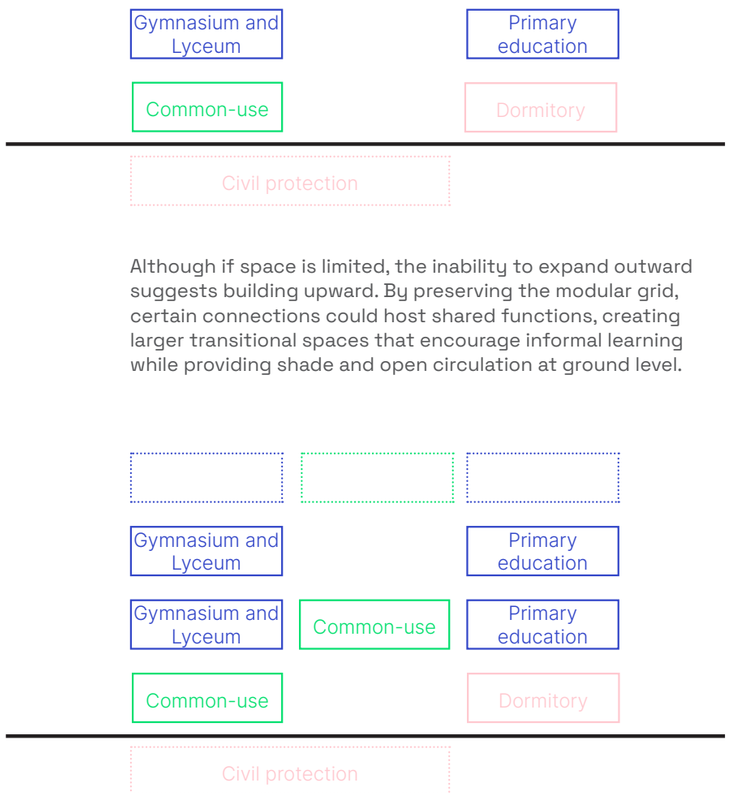
> A strategic approach for addressing the various contexts and situations that may arise when evaluating a new site.



33 DIAGRAMATIC REPRESENTATION OF CLUSTER OF FUNCTIONS DISPOSITION, FLOWS AND ACCESSIBILITY

The concept is to create an open, community-oriented ground level, with more private spaces located on the upper floors. Common-use functions should remain freely accessible to the public, fostering community engagement.

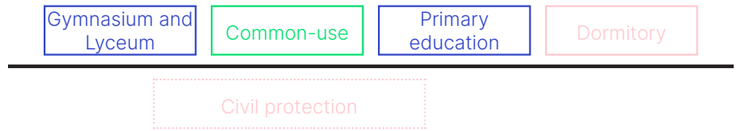
Dormitory and civil protection facilities would also have direct access from the surroundings, ensuring they operate independently without disrupting the school's internal circulation.



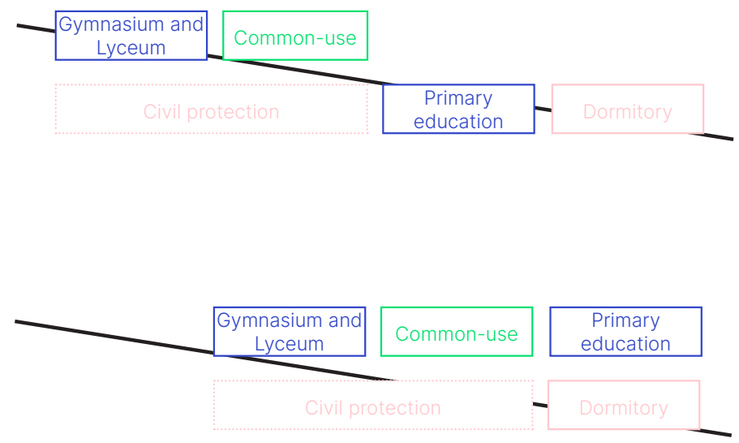
Although if space is limited, the inability to expand outward suggests building upward. By preserving the modular grid, certain connections could host shared functions, creating larger transitional spaces that encourage informal learning while providing shade and open circulation at ground level.

34 DIAGRAMATIC REPRESENTATION OF DENSITY AND POSSIBLE FUNCTIONAL CLUSTER SOLUTIONS

A flat, expansive site would support the seamless extension of the system, maintaining its continuity and pattern. Placing common-use functions at the core, with the schools arranged as satellites around them, reflects the approach demonstrated in the analyzed case study.



A sloped site would require a more careful approach, using different levels to create opportunities for terraces and balconies. The building could become part of the landscape, merging seamlessly with it. Modularity is encouraged in both stepped configurations and multi-story solutions.



35 DIAGRAMATIC REPRESENTATION OF SLOPE AND POSSIBLE FUNCTIONAL CLUSTER SOLUTIONS

3 NEW AND BEYOND

Here are the upgrades previously explained, now applied to the case study that was submitted during the competition phase.

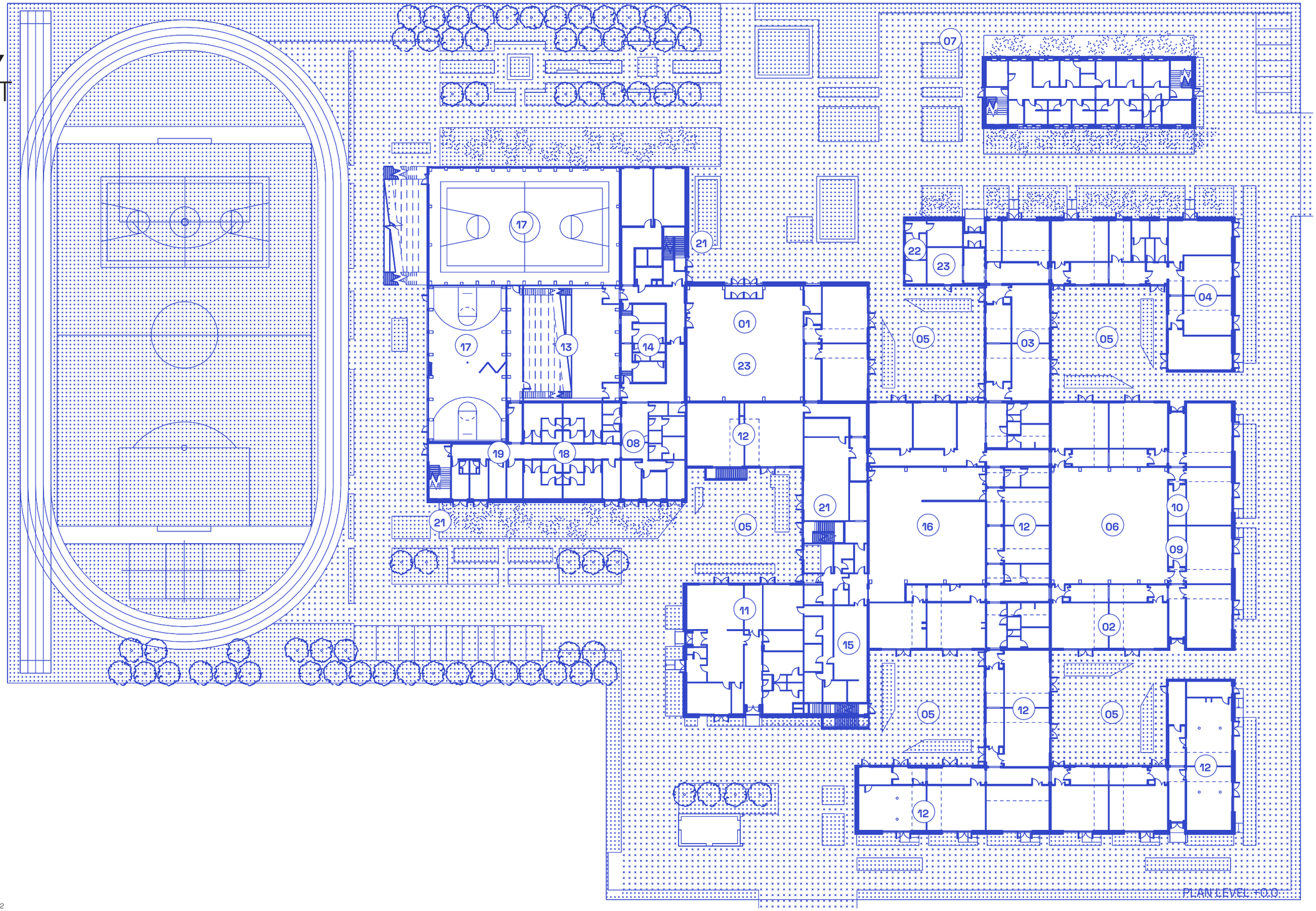
In the case study, we are showcasing the application of the principles outlined in the handbook.

Compared to the previous concept design, the courtyards have been redesigned to enhance maintenance and accessibility, offering a more open and functional layout. Additional details have been incorporated into various functions, improving both functionality and flow. The attention to detail has made these areas more practical and coherent with the brief.

Following the drawings and the cost estimation, we include an analysis of a possible school day at the Neighborhood for Educational Wonder, highlighting how the spaces facilitate learning and community interaction throughout the day.

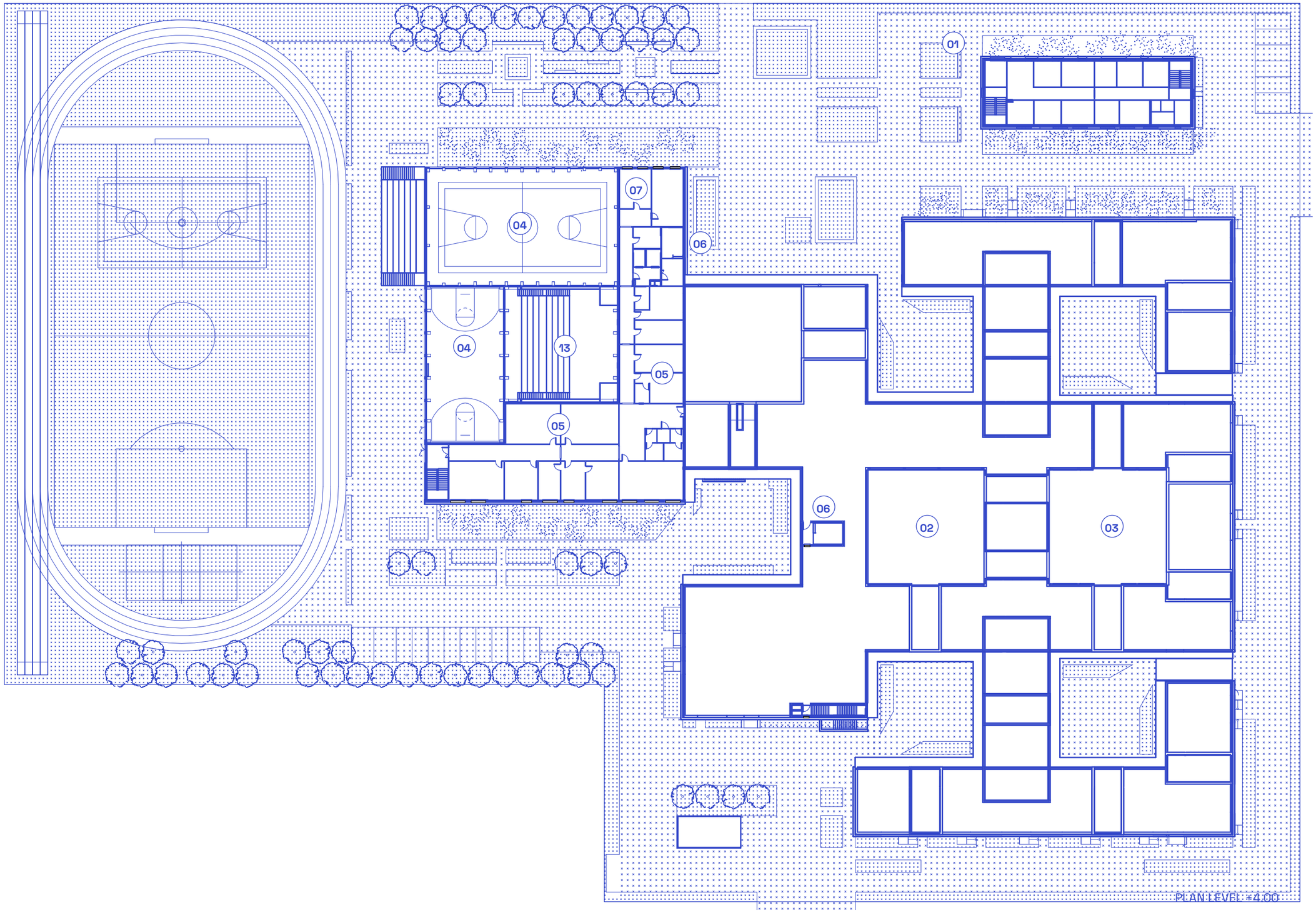
3.1
A CASE STUDY
TOOLS TO TEST

01. lobby
02. highschool
03. primary school
04. pupils
05. courtyard
06. leisure
07. dormitory
08. medicine
09. book storage
10. museum repository
11. workshop
12. laboratories
13. amphitheatre-style space
14. custom room
15. kitchen
16. dining hall
17. sports and fitness multifunctional hall
18. changing room
19. offices + teachers' working premises
20. utility room
21. shelter access
22. technical area
23. cloack room



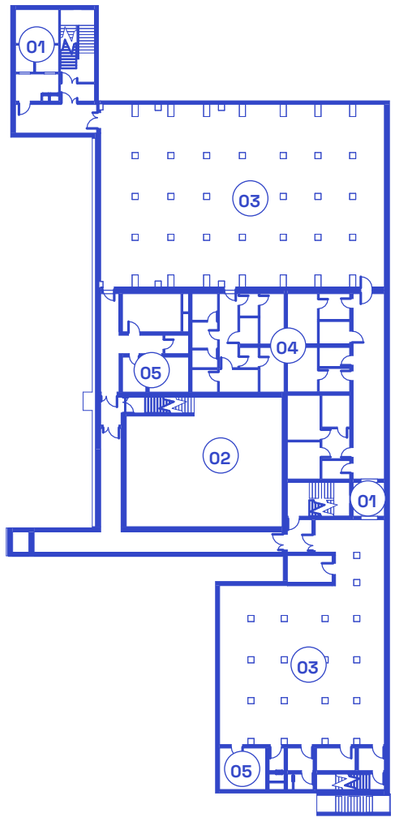
Total usable area: 8 886,18 m²
Total gross area: 10498,65 m²

01. dormitory
02. dining hall
03. leisure
04 sports and fitness multifunctional hall
05. offices + teachers' working premises
06. shelter access
07. technical area



The roof design includes a heating system that facilitates snow melting and prevents ice formation along critical drainage paths.

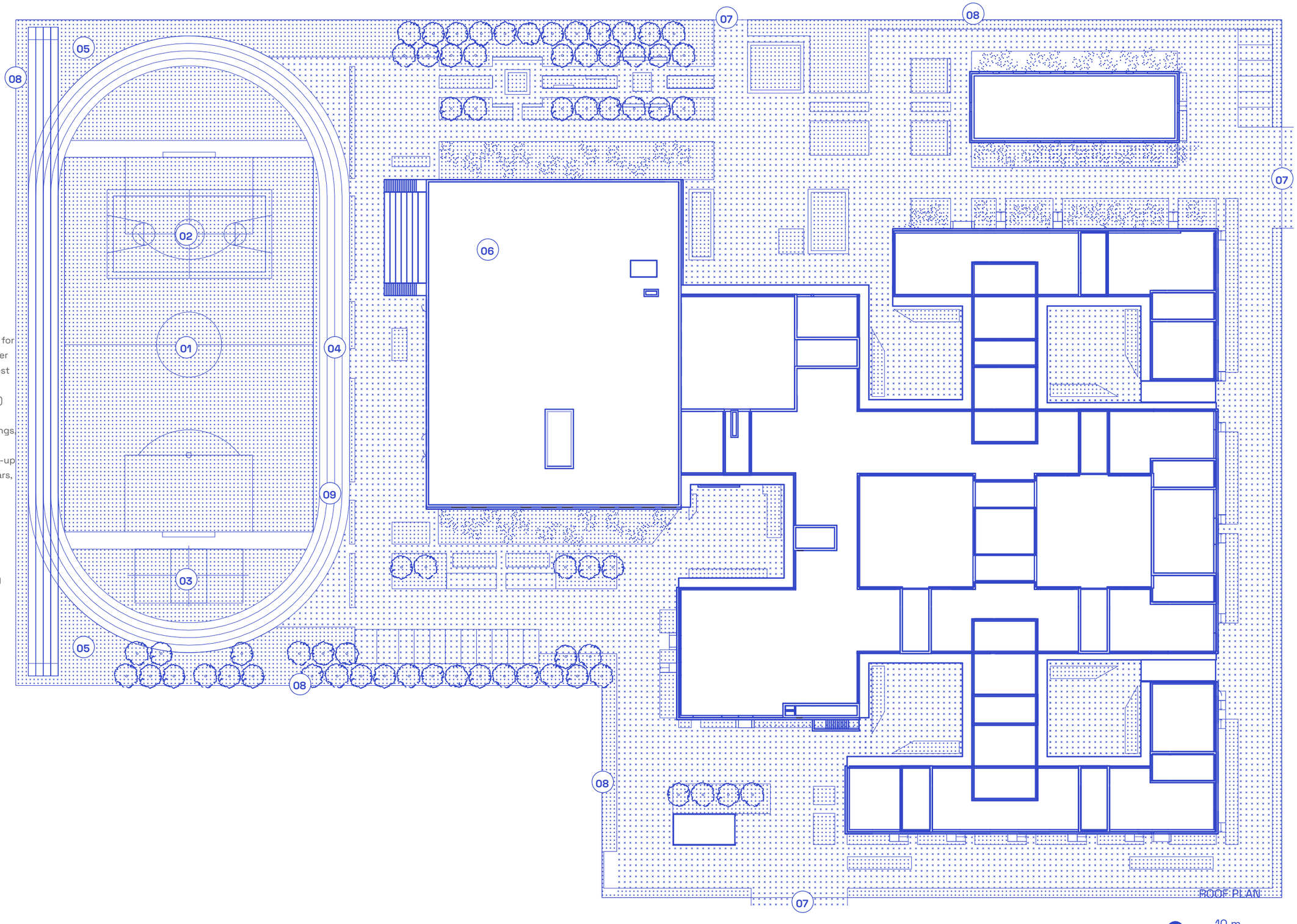
01. shelter access
02. ancillary facilities
03. refuge area
04. toilet
05. electrical technical area



PLAN LEVEL -4.10

N 10 m

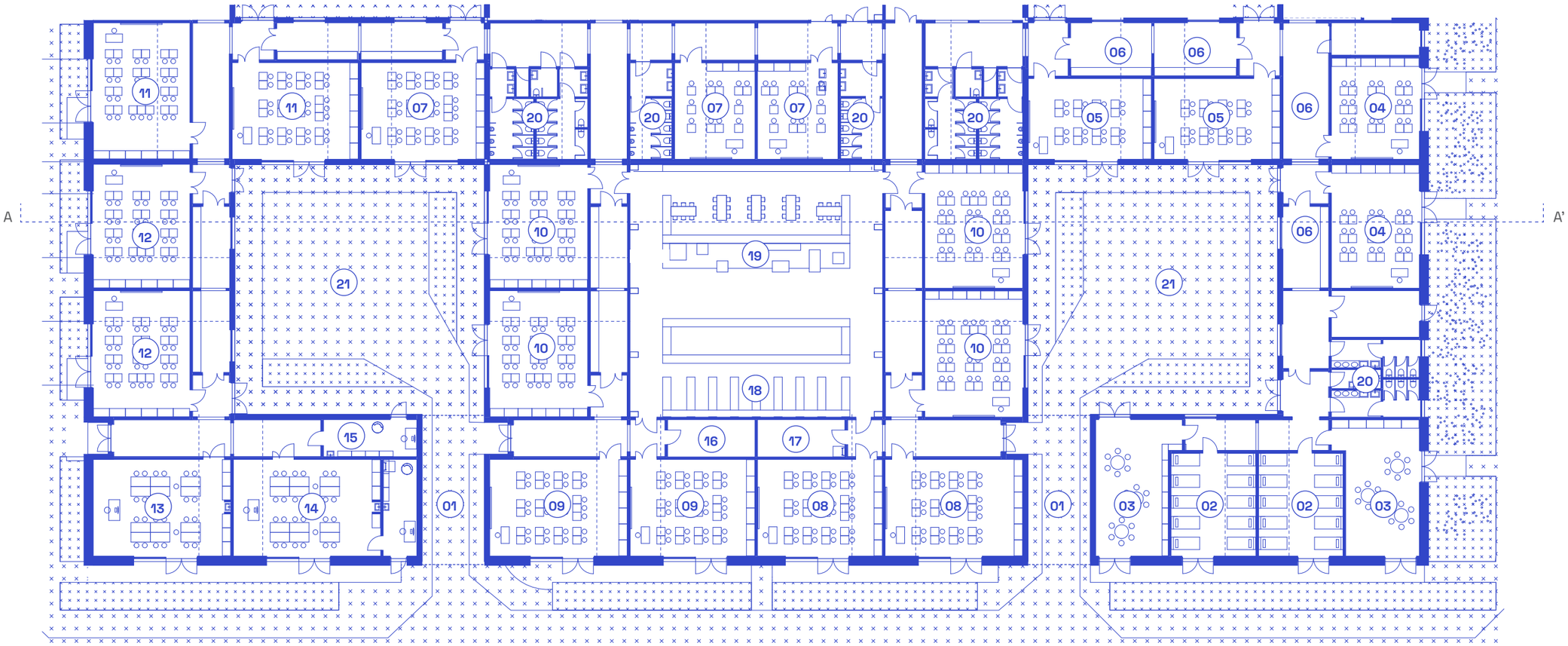
01. football pitch
(football goals)
02. basketball court
(basketball backboard with hoop)
03, volleyball court
(volleyball net)
04. running track
(distances 400-100-60 m)
05. fitness equipment
(trainer for legs and glutes, trainer for the press and arms, treadmill, trainer “Krok-Rasklad”, Butterfly-style chest press, Trainer “Orbitrek”, Cycling trainer, Trainer “Upper / Lower Pull”)
06. gym equipment
(gymnastic easel, bridge, bench, rings. low balance beam, rope, pole for gymnastics, horizontal ladder, p ull-up bar (various grips/sizes), parallel bars, swedish ladder, hand walk bars, labyrinth)
07. gates
08. fence
(3m height)
09. wheel sports
(rollerblading, skateboarding, BMX)

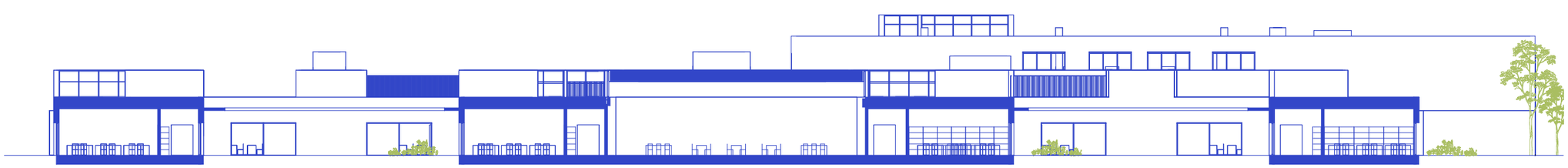


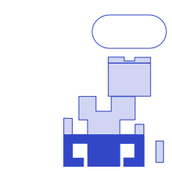
Images include variations noted in the chapter Innovation roadmap items

#AA'_Plan and section

01. pocket entrance
02. sleeping room
03. learning room
04. grade II classroom
05. grade III classroom
06. recreation space
07. foreign language (x3)
08. foreign literature (x2)
09. history class (x2)
10. math/literature class (x4)
11. civic defense class (x2)
12. geography class (x2)
13. biology class
14. biology lab
15. preparation room
16. book storage
17. museum repository
18. library space
19. leisure
20. sanitary facilities
21. courtyard

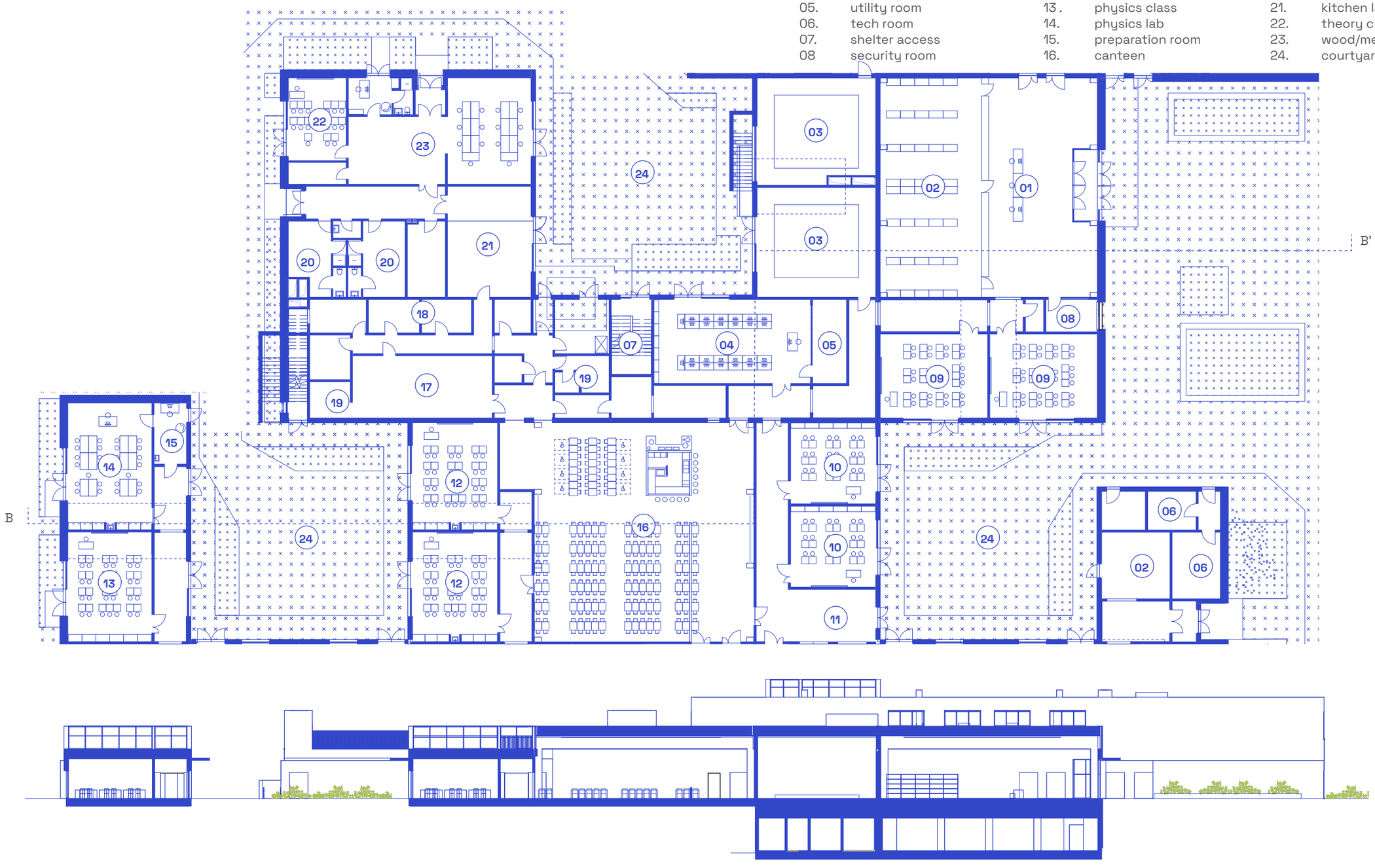






#BB'_Plan and section

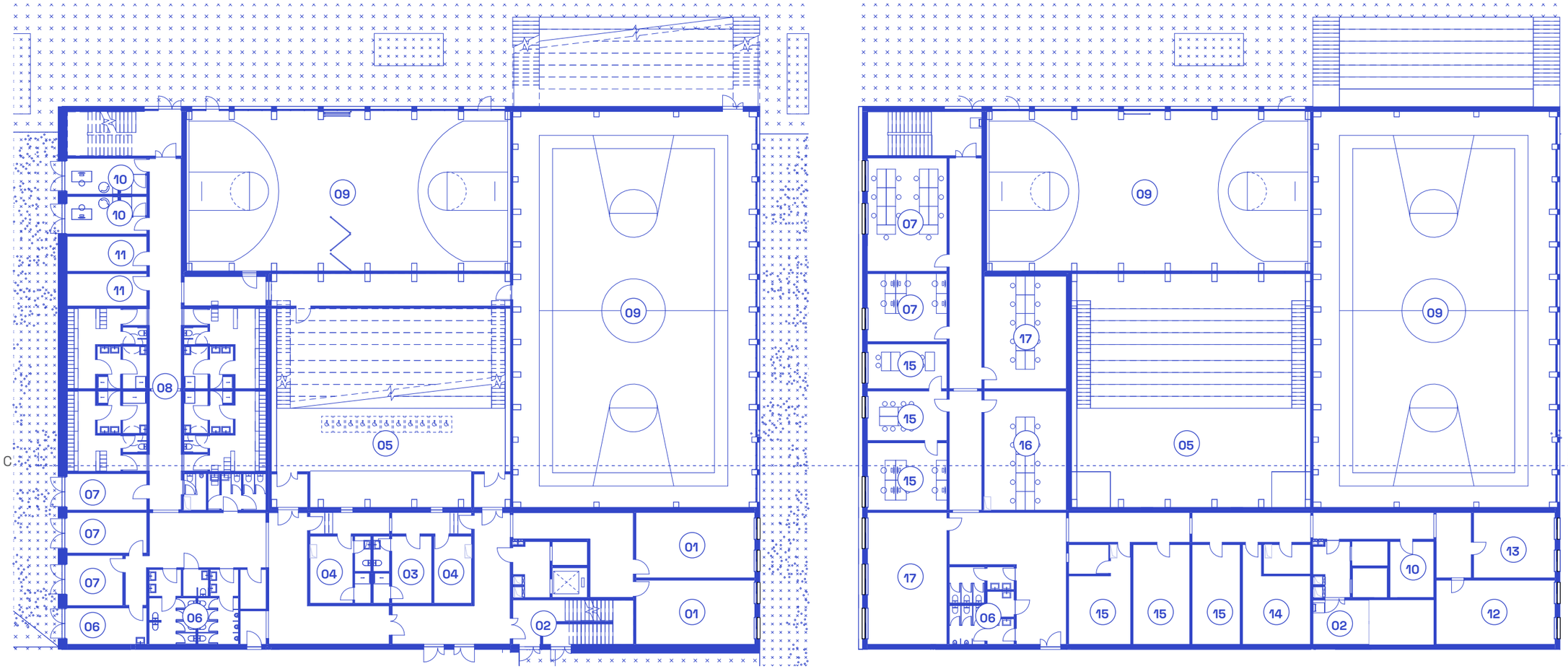
01 . lobby
02 . cloack room
03. art/dance class
04. IT class
05. utility room
06. tech room
07. shelter access
08 security room
09. foreign language (x2)
10. grade IV classroom
11. recreation
12. chemistry class (x2)
13 . physics class
14. physics lab
15. preparation room
16. canteen
17. kitchen
18. storage
19. cleaning room
20. changin room/toilet
21. kitchen lab
22. theory class
23. wood/metal workshop
24. courtyard



Images include variations noted in the chapter Innovation roadmap items

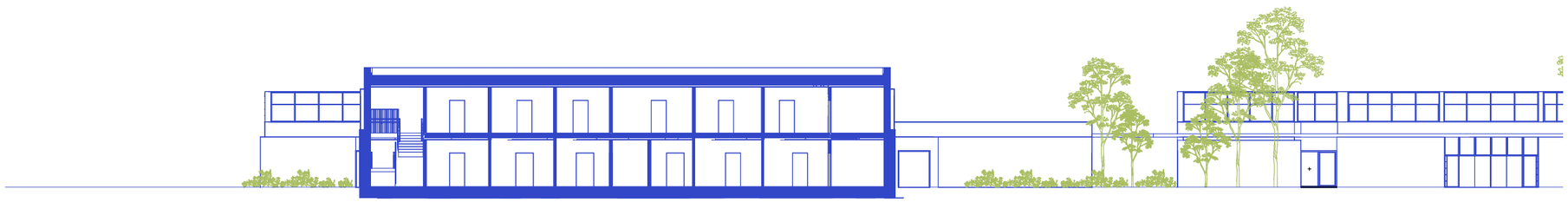
#CC'_Plan and section

01 . tech room
02 . shelter access
03. costume room
04. ancillary room
05. assembly hall
06. sanitary facilities
07. medicine room
08. changing room
09. gym hall
10. teacher room
11. storage
12. academic council
13 . community
14. archive
15. office
16. meeting room
17. teachers' working premises

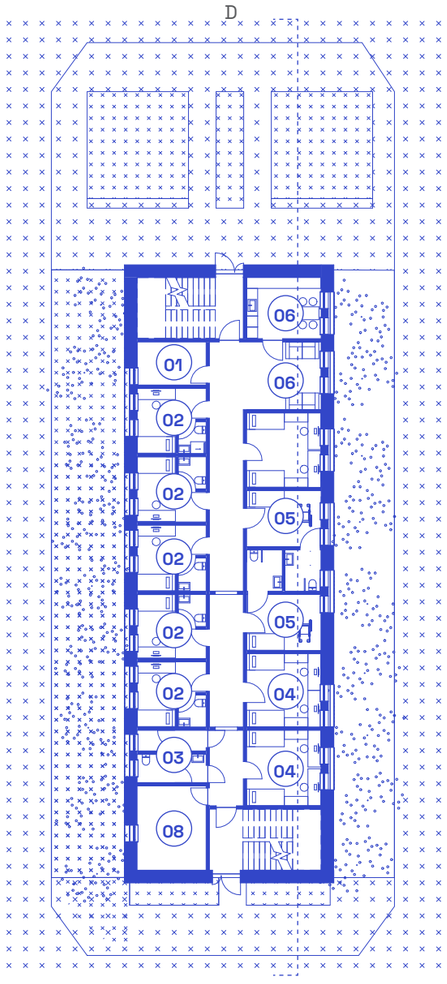


Images include variations noted in the chapter Innovation roadmap items

#DD'_Plan and section

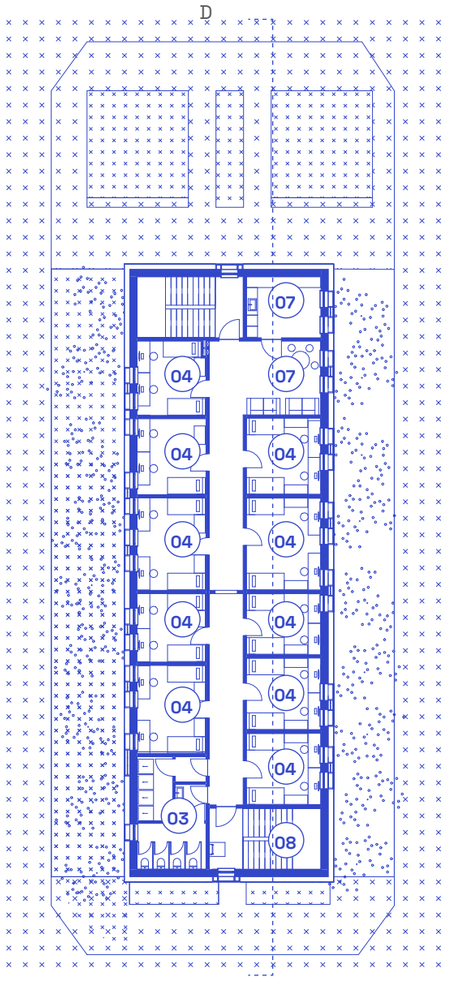


D



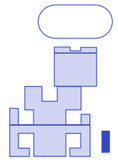
D'

D



D'

01. caretaker room
02. teacher room
03. sanitary facilities
04. double room
05. people with disability single room
06. kitchen
07. common space
08. technical room



N

5 m

3.2
ENERGY STRATEGY
TOOLS TO TEST

The planned energy strategy is oriented towards the concept of “NZEB (nearly Zero Energy Building)”, aiming to make this project as independent as possible from the local electricity grid. The goal is to minimize the use of on-site fossil fuels by electrifying all systems such as heat pumps, with the intention of minimizing carbon emissions and local air pollution.

The systems are designed to be highly efficient, utilizing air-to-water heat pumps as the primary heat source and employing modern, low-temperature distribution networks. This design is a key engineering factor enabling the outstanding energy efficiency class “A”. The systems are designed for comfort, individual room control, and reliability.

3.2.1 School Building Energy Characteristics

Total annual energy consumption: 791.3+63.9 MWh
Specific energy consumption (heating + cooling): 38.9+7 kWh/m³
Primary energy consumption: 1978.4 + 159.8 MWh
Annual greenhouse gas emissions: 332.4 + 26.9 t

The entire project achieves an Energy Efficiency Class “A”, with the school using 86% less energy for heating/cooling than the legal limit.

3.2.2 Heat Source & Central Plant

Primary Heat Source: Air-to-Water Heat Pumps. This is a highly efficient, modern solution that extracts ambient heat from the outside air, leading to significant energy savings compared to traditional gas or electric boilers.

System Separation: Separate heat pump systems are provided for the main school building and the dormitory.

Distribution: Heating is distributed from Individual Thermal Points (ITPs) located within each building.

Temperature Regime: The systems are designed for a low-temperature regime (65°C flow / 45°C return), which is optimal for the efficiency of heat pumps and modern radiators.

3.2.2 System Design & Piping

System Type: Two-pipe, horizontal dead-end system with floor-by-floor distribution (horizontal branching).

Piping Materials: Main Pipelines & Risers: Steel pipes (water and gas pipes per DSTU 8936:2019, electric-welded pipes for diameters >50mm per DSTU 8943:2019). All are thermally insulated. In-Floor Horizontal Branches: PEX-a cross-linked polyethylene pipes with anti-diffusion oxygen barrier. These are laid insulated within the floor screed, providing an invisible and efficient distribution system.

Compensation: Thermal expansion is handled through natural self-compensation in the piping layout.

Draining & Venting: Drain valves are installed at low points; automatic air vents are installed at high points for system bleeding.

3.2.3 Heating Devices & Controls

Heating Devices: stamped steel panel radiators.

Control & Efficiency: All radiators in occupied rooms (offices, classrooms, dorm rooms) are equipped with thermostatic radiator valves (TRVs) for individual temperature control and energy savings.

Balancing and regulating valves ensuring proper hydraulic balance and system efficiency.

3.2.4 Special Systems & Safety

Stairwell Heating: Designed as a vertical two-pipe system. Radiators are placed at a height of 2.2m to comply with fire safety codes (DBN V.1.1-7:2016) and are not equipped with thermostatic valves to ensure constant heating in these circulation areas.

Shelter Heating: A separate heating branch is designed for the civil defense shelter to maintain a standby temperature of +10°C when not in use.

Gymnasium: Radiators are installed in wall niches and covered with protective grilles for safety.

3.2.5 Thermal Loads

School Building: 285.0 kW

Dormitory Building: 48.5 kW

Total Thermal Load: 333.5 kW

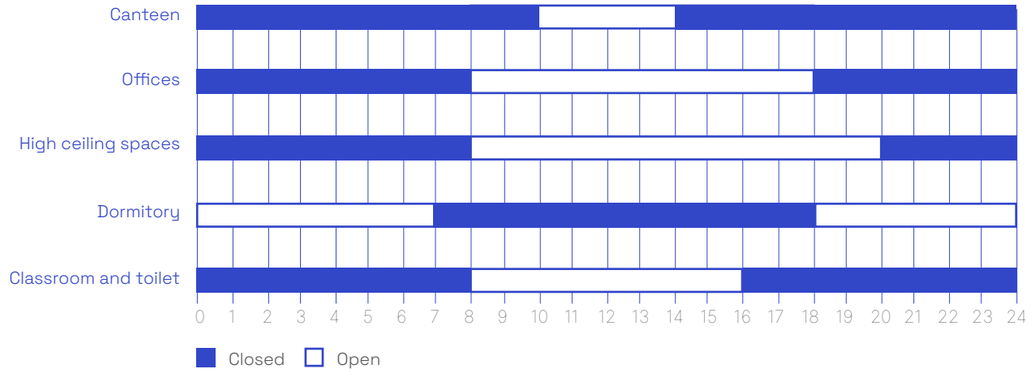
3.2.6 Protection & Compliance Measures

Thermal Insulation: All main pipelines and risers are insulated according to Appendix B of DBN V.2.5-67:2013 to minimize heat loss.

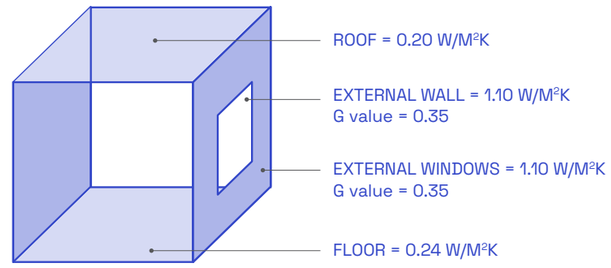
Anti-Corrosion Protection: All metal pipes are painted with anti-corrosion primers and paints before installation and insulation.

Noise & Vibration: Measures include using elastic seals for pipe penetrations, vibration-isolating pads under equipment, and adhering to regulated coolant flow velocities to prevent noise.

Materials: All used materials have necessary compliance certificates and hygienic conclusions.



36 OPERATING TIME CHART

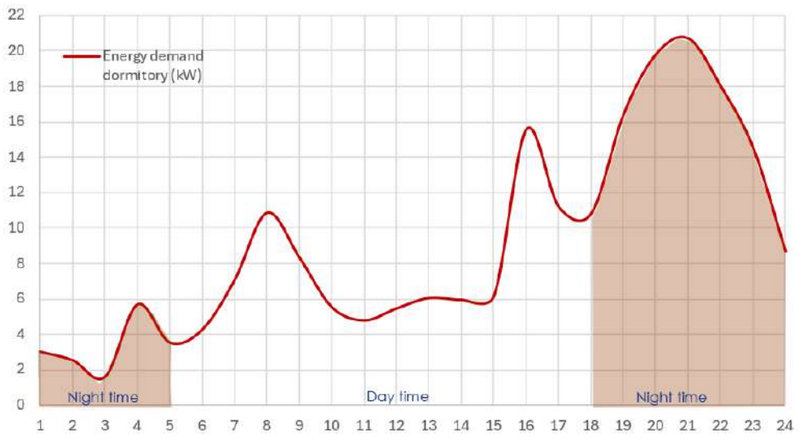


37 STRATIGRAPHIES PERFORMANCES

3.2.7 Battery energy analysis

Energy storage batteries will also be provided to reduce peak loads and extend the dormitory's energy autonomy by shifting excess energy production to periods of higher demand. This approach ensures that the dormitory can maintain consistent energy availability, even during times of low solar production.

To ensure that the dormitory meets minimum livability standards for at least one full day, it is projected that a battery with a capacity of no less than 105 kWh will be required. This capacity can be achieved through the use of modular batteries.



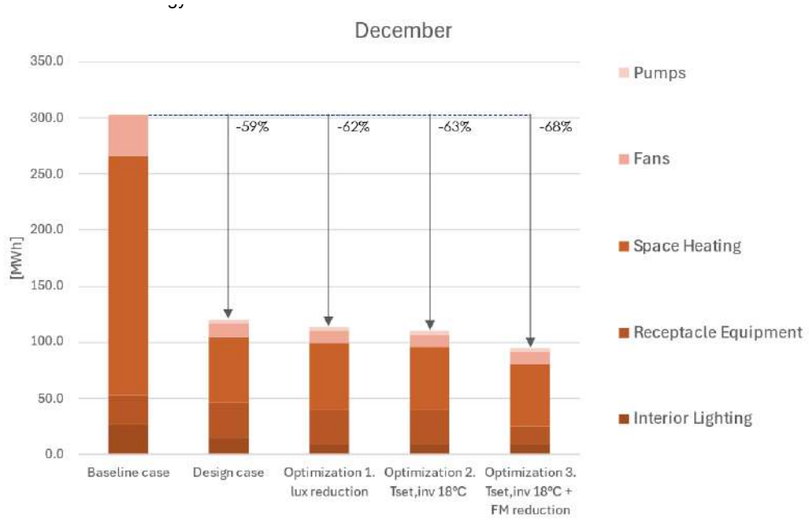
38 ENERGY TO BE STORED IN BATTERY

3.2.8 Transition mode analysis

To guarantee the continuity of the "full-day school building" even in the event of a lack of connection to the electricity grid, it was decided to analyze possible energy reduction scenarios for the month of December, which is the most critical from an energy point of view, in order to simultaneously define the size of the genset.

The reduction in energy required by the "full-day school building" in December as the following parameters change is shown below:

- reduction of the guaranteed lux;
- reduction of the winter setpoint temperature from 20°C to 18°C;
- reduction of equipment energy consumption by 50%, implementing a strategy similar to "demand response" ensures that, in the event of a decrease in supplied power, only the most critical equipment devices remain connected, prioritizing essential operations while reducing overall energy demand.



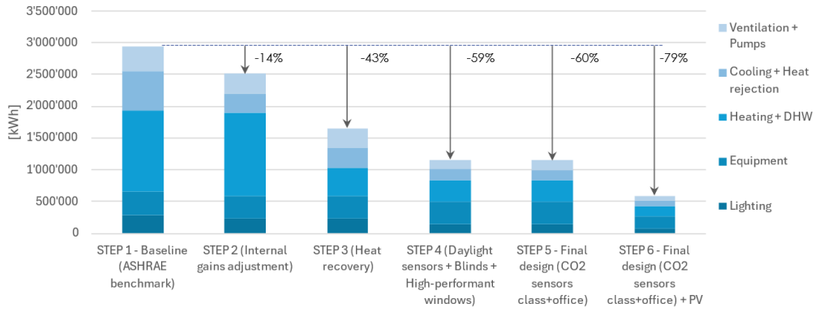
39 ENERGY TRANSITION MODE OPTIMIZATION

3.2.9 Final results from energy modelling

By studying the site's climate, using smart design strategies to reduce energy needs, and adopting the most efficient energy systems available, the building achieves outstanding energy performance while providing excellent comfort in terms of temperature and humidity. The dynamic energy simulation made it possible to assess the effectiveness of the various solutions proposed and to compare the energy consumption obtained with that of the ASHRAE baseline building, the reference for calculating scores and obtaining LEED certification.

From the model, energy saving strategies such as the use of lighting sensors and heat recovery were applied, achieving a reduction in annual energy consumption of 60% compared to the ASHRAE benchmark for this type of multifunctional building. Subsequently, implementing the contribution of the photovoltaic system resulted in a building that consumes 79% less energy than the ASHRAE benchmarks.

The results obtained from the analysis are shown below:



40 ENERGY STEP CONSUMPTION

3.3 STRUCTURAL STRATEGY TOOLS TO TEST

This section presents the structural strategy adopted for the school complex, comprising the single-story teaching block, the large-span assembly and sports halls, and the underground shelter. The scheme combines prefabricated and monolithic reinforced concrete elements to achieve strength, rigidity, and construction efficiency.

The frame system provides large clear spans and layout flexibilty, while load-bearing walls deliver an economical, thermally efficient solution for regular-span areas.

3.3.1 Single-story school building

The structural system is wall-based, consisting of prefabricated reinforced concrete panels. Structural strength and spatial rigidity are achieved through the combined action of external and internal prefabricated wall panels, staircases, landings, floor slabs, and roof slabs.
External load-bearing walls: Three-layer reinforced concrete panels comprising:
A 180 mm thick load-bearing layer of C20/25 concrete with A500C reinforcement.
180 mm of THERMOWOOL FAS EFFECT insulation (135 kg/m³).
A 10 mm outer facing layer of fiber-reinforced concrete.
Internal load-bearing walls: 180 mm thick precast reinforced concrete panels of C20/25 concrete with A500C reinforcement.
Canopies (inner courtyards): Prefabricated reinforced concrete slabs, 150 mm thick, with lengths of 1,200 mm and 1,700 mm.
Stairs: Monolithic reinforced concrete (C20/25, A500C reinforcement).
Floors and roofs: Prefabricated reinforced concrete slabs, 320 mm thick.

3.3.2 Big boxes

Assembly hall amphitheater: Monolithic reinforced concrete, class C25/30 with A500C reinforcement.
Sports hall grandstand: Load-bearing brick walls with a monolithic reinforced concrete structure of class C25/30 with A500C reinforcement.
Load-bearing columns: 600 × 400 mm cross-section, C40/50 concrete with A500C reinforcement.
Beams: Prefabricated beams, 280 × 1,600 mm (h), C40/50 concrete, variable spans.
Covering slab: Prefabricated ribbed slab, 300 mm thick.

3.3.3 Shelter

The shelter is designed as an underground reinforced concrete structure located beneath the single-story part of the school building, in accordance with DBN V.2.2-5:2023 “Buildings and Structures.”
Foundations: Monolithic reinforced concrete slabs, 450 mm thick, C25/30 W6 F200 concrete. Embedment depth: 4,975 mm. (As this project is for reuse, foundation design is not included. It is preliminarily proposed to use bored or drilled piles.)
Walls: Monolithic reinforced concrete, 300 mm (internal) and 400 mm (external) thick, C25/30 W6 F200 concrete with A500C reinforcement. A welded mesh shall be installed on the interior side of the walls.
Stairs: Monolithic reinforced concrete, C25/30 W6 F200 concrete with A500C reinforcement.
Columns: Monolithic reinforced concrete, 600 × 600 mm and 1,200 × 600 mm cross-sections, C25/30 W6 F200 concrete with A500C reinforcement.
Floors: Monolithic reinforced concrete slabs, 450 mm thick, C25/30 W6 F200 concrete with A500C reinforcement.

3.4
CLASS OF CONSEQUENCES
TOOLS TO TEST

Under Ukrainian building norms (DBN B.1.2-14:2018), all buildings and structures are assigned a class of consequences (liability) CC1, CC2, or CC3 depending on the potential severity of consequences in the event of failure, collapse, or unsafe conditions.

For this project, which involves the construction of a new general secondary education facility with 24 classrooms and a total capacity of 550 students, the building is classified as CC3, the significant class of consequences, due to the large number of permanently present occupants and associated potential risks.

3.4.1 Determination of Building Class (CC3) According to Ukrainian Norms

The facility is evaluated in accordance with the Ukrainian classification of buildings by the class of consequences (liability). The assessment by individual criteria is as follows:

Number of people temporarily or periodically present at the facility:
Corresponds to the minor class of consequences (liability) CC1.

Number of people permanently present at the facility:
As the building functions as a school with more than 400 people permanently present, it corresponds to the significant class of consequences (liability) CC3.

Possible economic losses:
Correspond to the medium class of consequences (liability) CC2.

Potential danger to the health and life of people outside the facility:
Corresponds to the minor class of consequences (liability) CC1.

Interruption of operation of linear engineering facilities, transport infrastructure, communication systems, energy and utility networks:
The object corresponds to a local-level facility with a class of consequences (liability) CC2 (medium consequences).

Based on the above evaluation and in accordance with regulatory requirements, the overall class of consequences (liability) is determined by the highest characteristic of possible consequences.
Therefore, taking into account the number of people permanently present at the facility (over 400 persons), the building is classified as belonging to the significant class of consequences (liability) CC3.

3.5
INNOVATION ROADMAP ITEMS
A GUIDE TO FUTURE IMPLEMENTATION

Several designed elements would have required deviations from standard procedures, particularly in relation to regulatory approvals and safety compliance.

These deviations necessitated additional reviews and authorizations that were not feasible within the given timeframe. Furthermore, constraints involving multiple stakeholders, along with tight project schedules, created significant challenges in coordinating and implementing these elements at this stage.

As a result, certain proposed features could not be realized despite their strong potential to enhance the overall design. These elements could, however, form part of an innovation roadmap moving forward.

> Certain proposed features, despite their strong potential to enhance the overall design, could not be realized because they required deviations from standard procedures.

COURTYARD'S TREES

In the courtyards, the presence of deciduous trees would enhance the overall space providing shade during summer, allowing light in during winter, and creating a greener environment that enriches school life for children. Incorporating biophilic design as part of future development would further improve the livability of these spaces.
However, due to fire safety regulations, vehicle access would require a deviation from standard procedures. Constraints related to stakeholders and project timelines prevented implementation at this stage.

COPRENSHIVE PRESENCE OF FORNITURE IN THE CORRIDORS

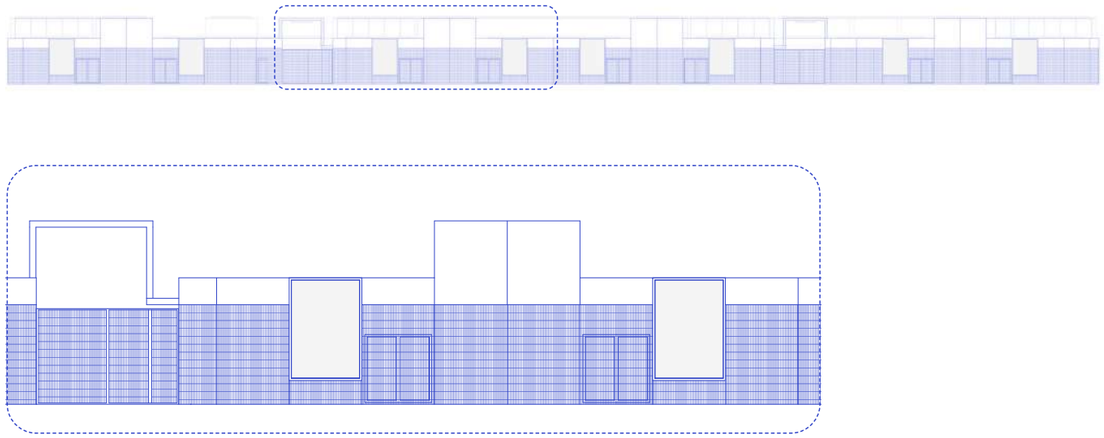
The corridors were designed as spaces for informal learning, providing opportunities for interaction and play in transitional areas. However, due to fire safety regulations, the presence of furniture that encourages engagement with the space was greatly reduced.

FLEXIBLE WALLS IN THE CLASSROOMS

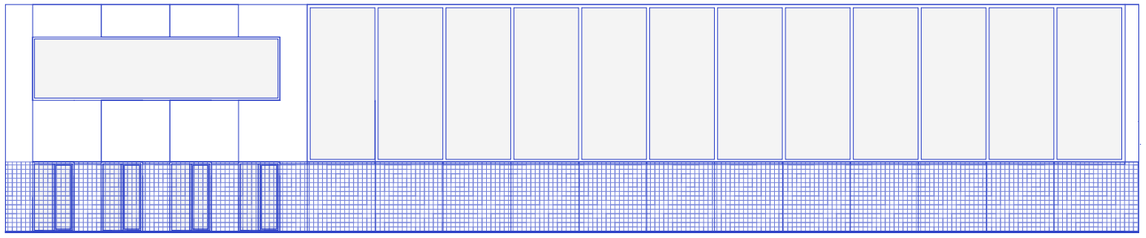
The classrooms featured flexible, foldable partitions to create larger spaces, allowing the area to be used in different configurations. However, due to current regulations, this product cannot be used in an educational environment.

SKYLIGHT TO ADD BENEFICIAL CALCULATION IN CLASSROOMS ENLIGHTMENT

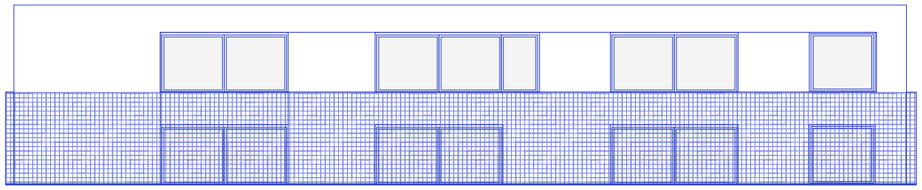
The skylights were included in the calculations to ensure the space received the minimum required natural light. However, deviations from standards and project timelines prevented their implementation at this stage. These elements can be further developed to increase their sunlight contribution.



41 CLASSROOMS ELEVATION AND HORIZONTALITY



42 GYM ELEVATION AND HORIZONTALITY

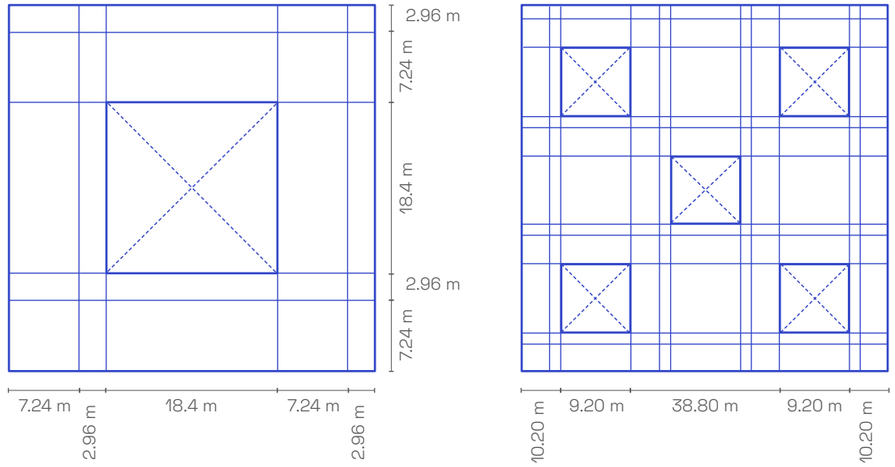


43 ACCOMODATION ELEVATION AND HORIZONTALITY

HORIZONTALITY The NEW school is a large, horizontally oriented, mostly flat structure where spaces are organized on a continuous grid, creating a flexible and interconnected layout. (41, 42, 43)

CIRCULARITY During the implementation phase, a proper analysis of the fruitful collaboration with startups and emerging realities that are pushing the boundaries of innovation and ecology becomes essential, particularly since the reuse of waste materials in construction stands as a pillar of the circular economy, reducing waste, lowering environmental impact, and promoting a culture of resource efficiency.

GABIONS INFILL Gabions cover the perimeter wall of the system, infilled with scraps and rocks found on site to create a sustainable and context-responsive envelope that provides both durability and a distinctive architectural character. To enhance greenery, a layer of non-woven fabric is placed inside the gabions together with soil, supporting the growth of ivy and other vegetation and integrating the structure into the surrounding landscape.

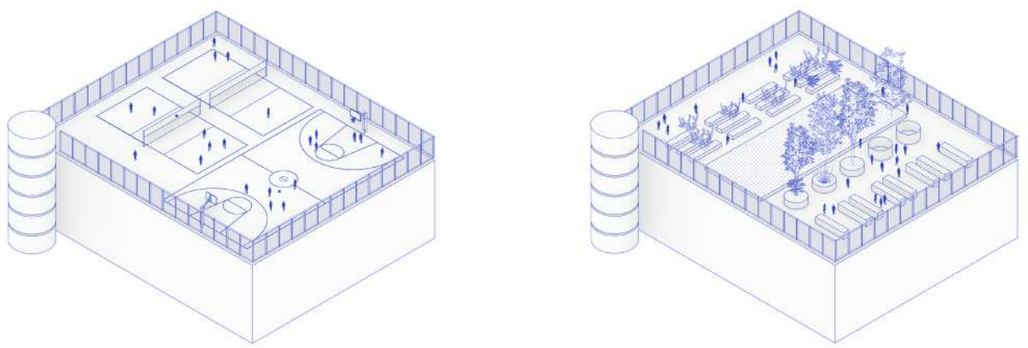


44 GRID SYSTEM, MODULARITY, FURNITURE

BIOPHILIC DESIGN To enhance students' connection with nature and promote well-being, classrooms should be positioned to overlook green, secluded outdoor courtyards whenever feasible.

MODULARITY NEW structure is aligned to a clear modular system, ensuring that columns, walls, and circulation paths maintain consistent distances and proportions throughout. This regularity not only allows for easy adaptation, repetition, and extension of spaces but also enhances structural prefabrication efficiency, as standardized modules can be manufactured off-site and assembled with precision. (44)

FLAT ROOFS A careful planning and design of green surfaces and activities on roofs should be carried out, taking into account access, usability, structural loads, and maintenance, ensuring that these elevated landscapes remain functional, safe, and beneficial over time. (45)



45 ROOFS AS SPACES FOR GARDENS, ACTIVITIES, AND SPORTS

Images include variations noted in the chapter Innovation roadmap items

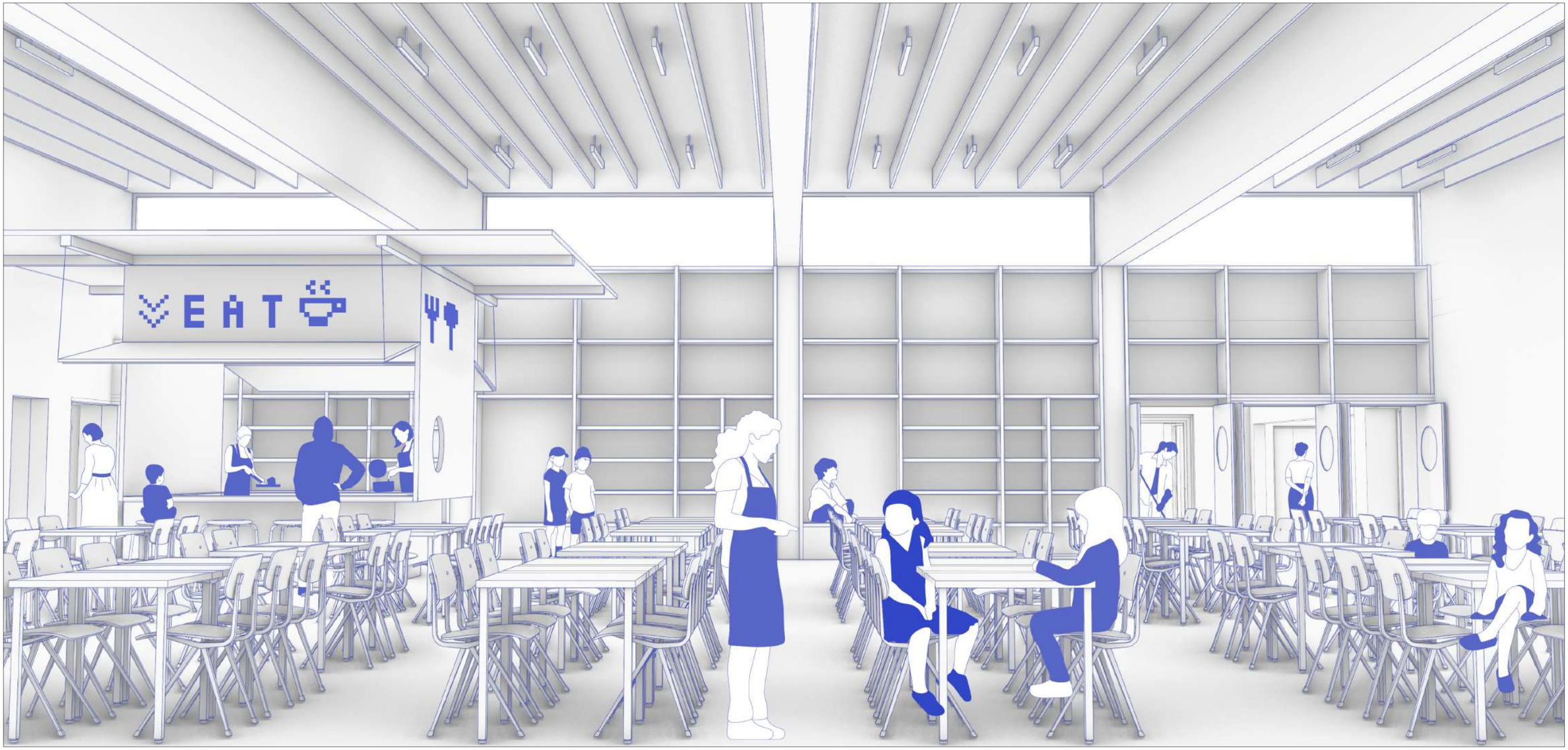
3.6
A NEW DAY
USER EXPERIENCE

Nadiya walks into the NEW school alongside her friends.

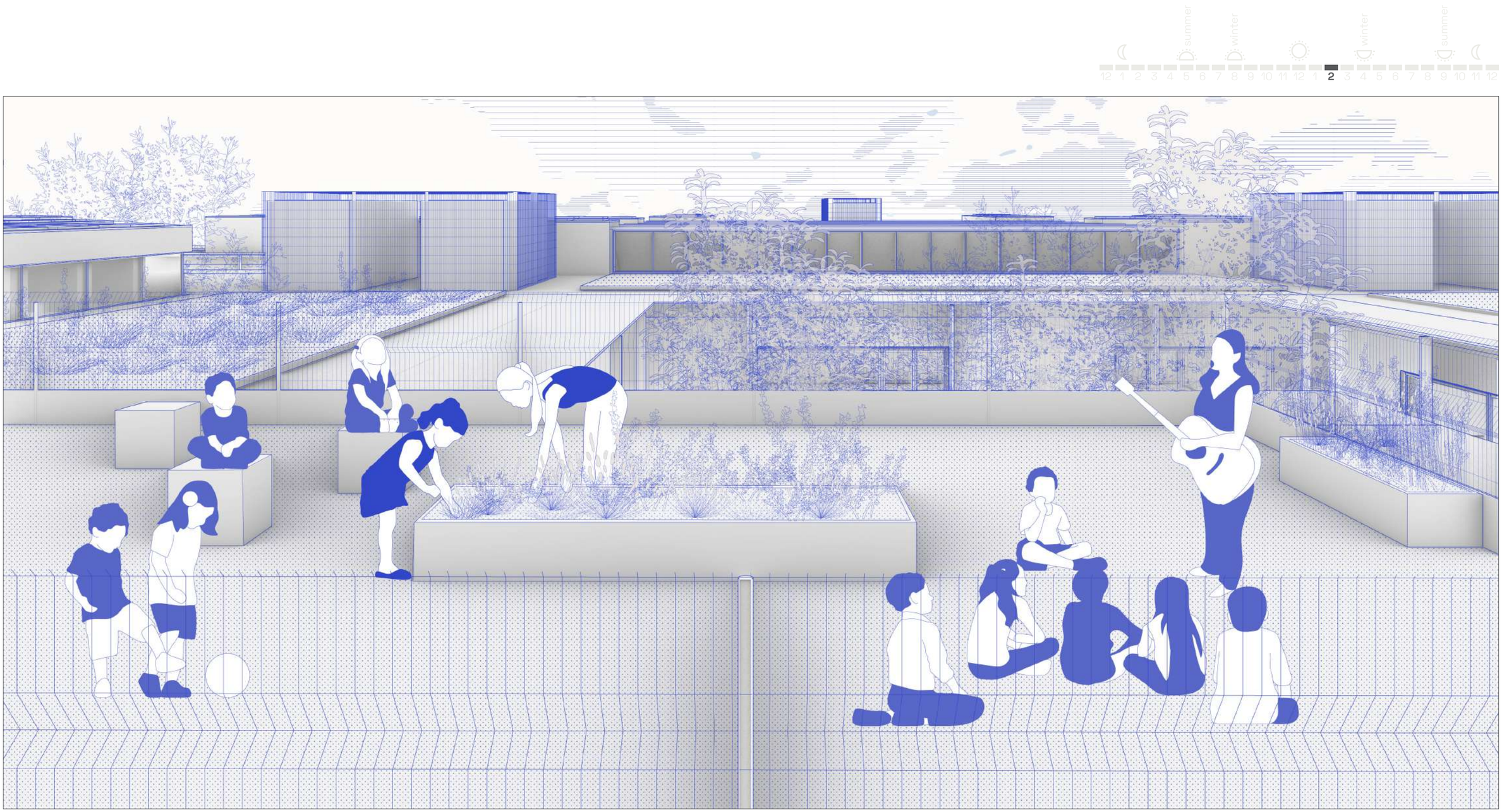
Nadiya walks through corridors that offer opportunities for informal learning and spontaneous interactions.

Nadiya listens during class as the teacher explains the lesson.

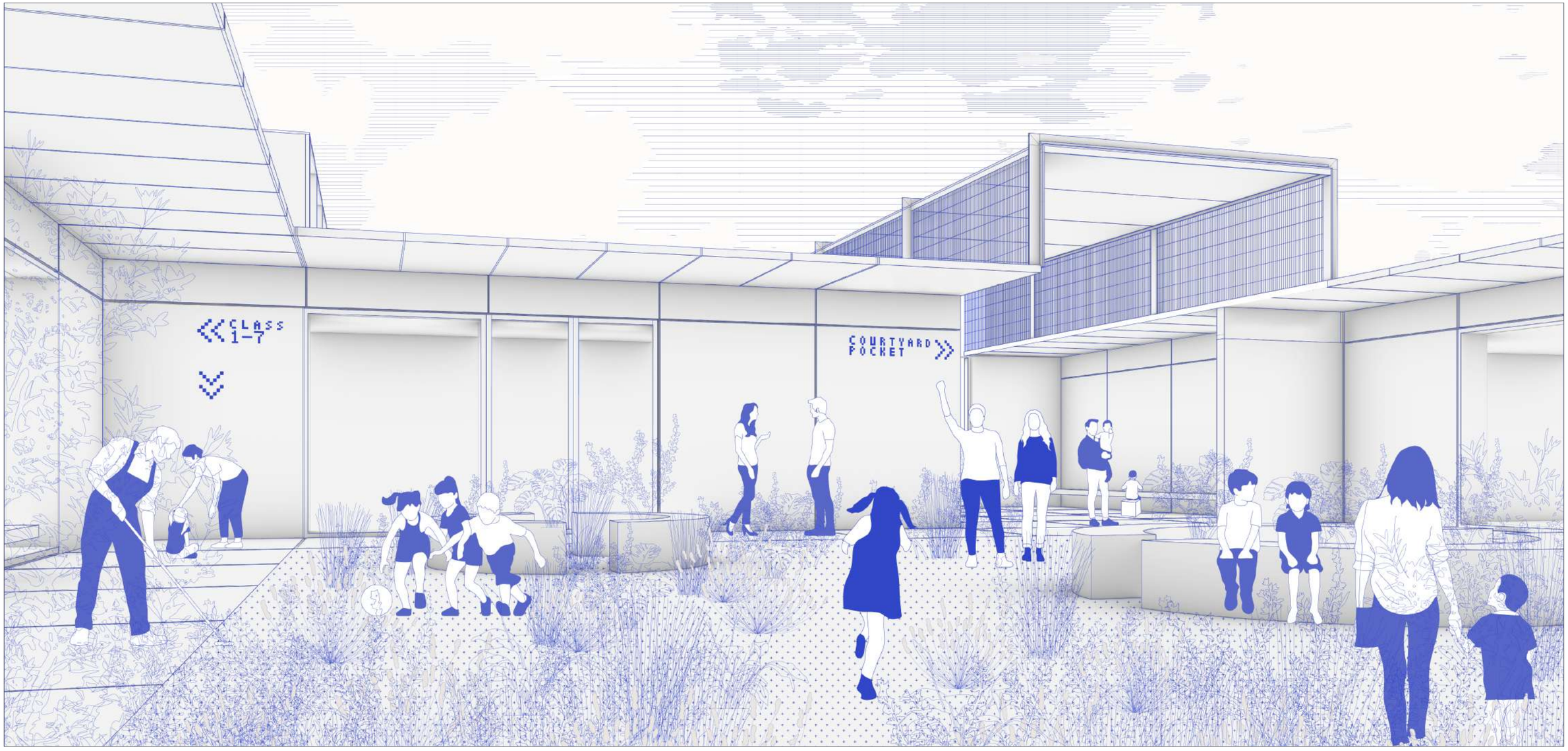
Nadiya laughs and runs around with her friends in the recreation space.



Nadiya shares a meal with her classmates and others from the school community.



Nadiya spends the afternoon tending to the rooftop garden.



Nadiya meets her parents at the school gates at the end of the day.

Nadiya returns to the neighborhood with her family alongside the entire community for an evening gathering.

3.7
GLOSSARY
TOOLS TO TEST

ACCESSIBILITY Designing environments that are usable by people with disabilities or other limitations, promoting equality in access.

ADAPTABILITY Ensuring that spaces and structures can evolve over time to meet the evolving needs and demands.

ANCILLARY Supportive spaces that facilitate the primary activities of a facility, such as storage, technical rooms, or administrative areas.

ASSEMBLY The process of connecting prefabricated modules on-site to form a complete structure.

AUTONOMY Achieving independence from external energy sources through renewable energy generation and storage.

BIOPHILIA Integrating natural elements like vegetation and daylight to enhance well-being.

BIM - Building Information Modeling - A digital tool for managing the design, coordination, and construction process.

CATALOGUE An organized index of spaces that details their types, functions, relationships, and adaptability, ensuring a flexible and functional design approach.

CARBON Addressing emissions reduction through strategies like energy-efficient design and renewable energy.

CIRCULARITY Emphasizing the reuse of materials, such as recycled aggregates for finishes and structures.

COMFORT The provision of conditions that ensure appropriate sound insulation and temperature regulation for users' well-being.

CONNECTIVITY Creating seamless transitions between spaces and functions, enhancing user experience.

COURTYARDS Central public spaces, inspired by the hortus conclusus, designed to foster community interaction and connect the built environment with nature.

DFMA -Design for Manufacturing and Assembly - A methodology focusing on efficient production and rapid assembly.

EDUCATION Using design to enhance learning experiences, integrating adaptable and collaborative spaces for modern education.

EFFICIENCY Reducing energy consumption through design elements like passive solar optimization and thermal insulation.

ENGAGEMENT Involving the local community in the design process to ensure the architecture reflects their needs.

ENVIRONMENTAL RESPONSIBILITY Strategies to reduce ecological impact, such as renewable energy and green roofs.

FLEXIBILITY Allowing spaces and systems to adjust to various uses and conditions over time.

FUNCTIONAL ELEMENTS Design components that ensure practicality and usability, tailored to specific performance standards and needs.

FULL-DAY SCHOOL MODEL A school design that extends the day to include both academic and extracurricular activities, prioritizing sustainability and energy efficiency.

HARMONY Balancing aesthetic appeal, functionality, and integration with the local context.

HVAC - Heating, Ventilation, and Air Conditioning - Systems for maintaining indoor thermal comfort and air quality.

INCLUSIVITY Designing spaces that are accessible and usable for individuals of all ages and abilities.

INFORMAL LEARNING Learning that occurs organically through unstructured interactions, experiences, or environments outside traditional classrooms.

INNOVATION Employing advanced methods and technologies such as digital tools and efficient manufacturing techniques.

INSTALLATION On-site integration of prefabricated components or systems.

LEISURE SPACES Areas designed for relaxation and enjoyment.

MANUFACTURING The off-site production of building elements under controlled conditions.

MODULARITY A customizable system designed for flexibility and reconfigurability at various scales.

OFFSITE A construction process where components are fabricated in factories and transported to the site.

ON-SITE Activities occurring at the construction location, including assembly and installation.

PARAMETRICS The use of computational tools to optimize design variables for performance, aesthetics, or sustainability.

PLACEMAKING Creating dynamic, engaging spaces that foster community interaction and identity.

PLUG AND PLAY Pre-engineered components designed for quick integration without further customization.

REBUILDING Restoring and revitalizing communities by providing essential services and spaces that promote social stability and normalcy.

RECREATIONAL Areas designated for activities that promote relaxation, play, or physical exercise.

RESOURCE EFFICIENCY Maximizing the use of materials and minimizing waste, often through prefabrication and modular processes.

RESILIENCE Designing for durability and the ability to adapt to climatic, environmental, or social challenges.

RESOURCING Leveraging local materials and skills to support sustainability and community development.

SUSTAINABILITY Strategies to generate renewable energy, implement green roofs, and reduce construction timelines and carbon emissions.

STRATEGY A roadmap for implementation, outlining the design decisions and addressing logistical, practical, and contextual considerations.

SYMBIOSIS Achieving mutual benefit between architecture, nature, and urban environments.

TOOLBOX A collection of modules - and strategies designed to support and streamline processes providing ready-to-use solutions.

3.8
BIBLIOGRAPHY
TOOLS TO TEST

- Clyde Zhengdao Li, Vivian WY. Tam, Xulu Lai, Yijun Zhou, Shan Guo. (2024). Carbon footprint accounting of prefabricated buildings: A circular economy perspective.
- Daneshgari P., Moore H. (2019). Prefabrication handbook for the construction industry.
- Dodge data analytics. (2020). Prefabrication and Modular Construction 2020.
- Durmisevic S. (2010). Transportability and adaptation through design for disassembly: The case of concrete buildings.
- Fianchini, M. (2017). Rinnovare la scuola dall'interno: scenari e strategie di miglioramento per le infrastrutture scolastiche.
- Gómez-Galán, J. (2018). Educational Architecture and Emerging Technologies: Innovative Classroom Models.
- Hasselbach R., Knaack U., Chung-Klatte S. (2018). Prefabricated systems: Principles of construction.
- Herbert G. (1984). The Dream of the Factory-Made House: Walter Gropius and Konrad Wachsmann.
- Hertzberger, H. (2008). Space and Learning.
- Hille, R. T. (2011). Modern Schools: A Century of Design for Education.
- Kim H., Lee D. (2012). Design Optimization for Modular Concrete Systems.
- Lange A. (2018). The Future of School Design.
- Lun Weisheng, Tan Tan, Xu Jinying, Wang Jing, Chen Ke, Shang Gao, Xue Fan. (2020). Design for Manufacture and Assembly (DfMA) in construction.
- Nair, P. (2014). Blueprint for Tomorrow: Redesigning Schools for Student-Centered Learning.
- National Construction Code (NCC). (2024). New prefabricated, modular and offsite construction handbook.
- National Institute of Building Sciences. (2008). Modular Construction in the 21st Century.
- Pezzetti, L. A. (2012). Architettura per la scuola: impianto, forma, idea.
- Rosana W.M. Wong, Becky P.Y. Loo. (2020). Sustainability implications of using precast concrete in construction.
- Sanchez V. K. (2014). Architectural System Structures: Integrating Design Complexity in Industrialised Construction.
- Smith R. E. (2011) Prefab Architecture: A Guide to Modular Design and Construction.
- Sanoff, H. (1994). School Design.
- Tosi, L. (2019). Fare didattica in spazi flessibili.
- Vishal G. G., Shital S. G., Shubham M. Z., Ujjwal D. N., Deelip B. K. (2024). The impact of modular construction on project delivery times.
- Wasim Salama. (2017). Design of concrete buildings for disassembly: An explorative review.
- Weyland B., & Attia S. (2015). Progettare scuole: tra pedagogia e architettura.

Images include variations noted in the chapter Innovation roadmap items

NEW

NEIGHBORHOOD FOR EDUCATIONAL WONDER

December 19, 2025

CPVA

Agency for Restoration

[SCANDURRA]

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Handbook

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