EXPLANATORY NOTE

by 2FI4UA

TABLE OF CONTENTS

Visualisation, birds-eye view

1 ARCHITECTURAL IDEA

1.1 Concept

Our concept for the school of the future in Ukraine is like a city in miniature. It consists of learning clusters and a series of active lobby spaces between them. By forming appropriately sized clusters, the spaces and functions are arranged into smaller, easily comprehensible parts for the users. The lobbies create internal connections and serve as meeting and study spaces.

Clusters of this concept can be grouped flexibly on different sites, forming either more dense or more sparse urban structures. The size and number of clusters and the number of floors can vary flexibly.

The architecture of the concept is human-scaled, warm, inviting, and open, reflecting the democratic values of Ukraine.

The construction concept is mainly a modular steel cell structure system. It is prefabricated, precise in measurement, quick to build, and adaptable. This results in a sustainable, robust structure that ensures healthy indoor air quality and good soundproofing.

The facade materials can be adapted to the environment and chosen based on materials available in the area. Different clusters can use various materials or colours to aid in orientation. The shapes of the roofs can be chosen to suit the surrounding environment. Facade openings can be adjusted according to the function and spatial distribution.

This construction concept allows for buildings with adaptable interior spaces, easily expanded or even relocated if necessary. The concept produces all the necessary architectural elements to arrange a multitude of functions on different sites.

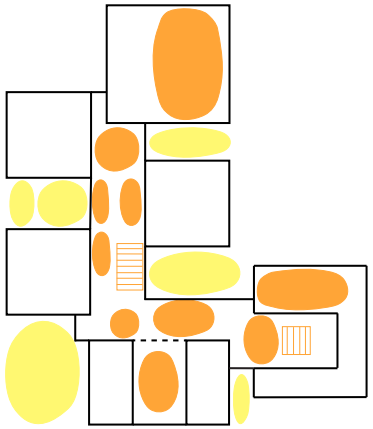


Diagram 1. Clusters and spaces in-between

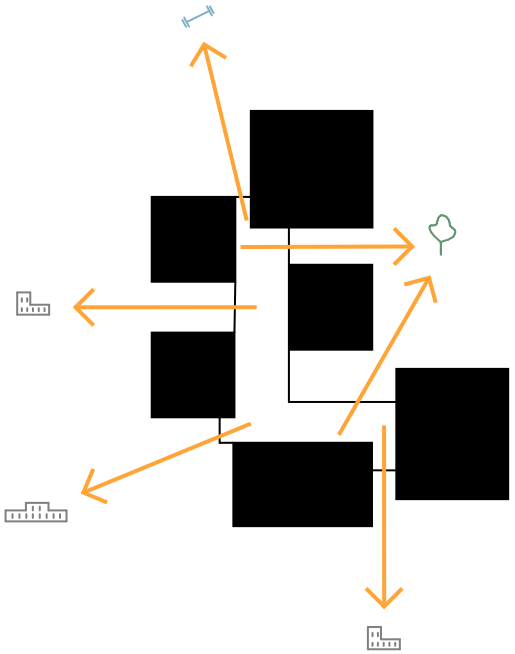


Diagram 2. Views from the lobby spaces

1.2 Cityscape and architecture

The new school stands out in the urban landscape as a central public building. An active and inviting public space is created in front of the main entrance. The architecture communicates that the education of children and the work of teachers are highly valued. The spaces are humane, growing in scale along with the age and size of the children and allowing them to progressively take over the school.

The diverse functions of the school building are visible both from the outside and within the building from one space to another. These outward-facing functions are an important part of the urban image and support the building's communal role.

1.3 Work with the local community

It is essential to co-design the school with the local community and future users (teachers, staff, and pupils). The concept of dividing a school building into clusters enables the creation of multiple schemes without reinventing the program and spaces every time. Clusters and modules can work as building blocks during the future user workshops.

1.4 Site adaptations

Clusters can be grouped and even reused in multiple configurations on various sites by tailoring the connecting lobby spaces without compromising the inherent functionality of the building. Dense urban sites can require tightly wrapped atrium-shaped formations and additional floors, while in sparse contexts the building can spread out in an elongated or loose arrangement. The roofing of the clusters can be modelled to suit the local vernacular architecture or to create a unique skyline.

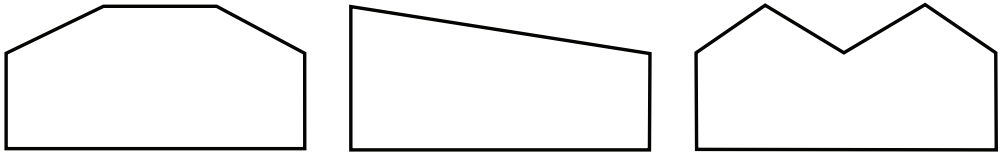


Diagram 3. Silhouettes variety

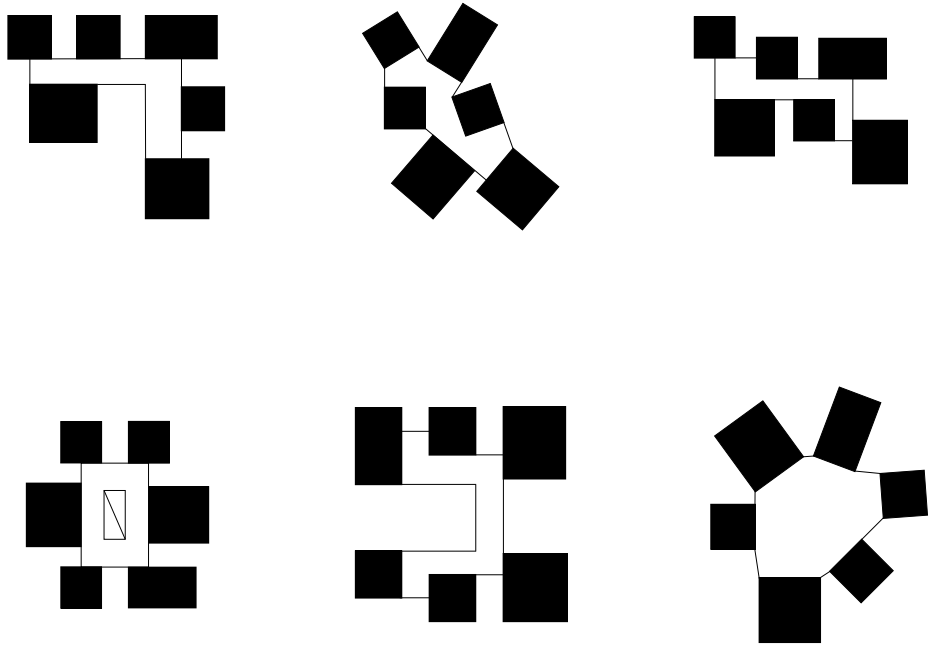
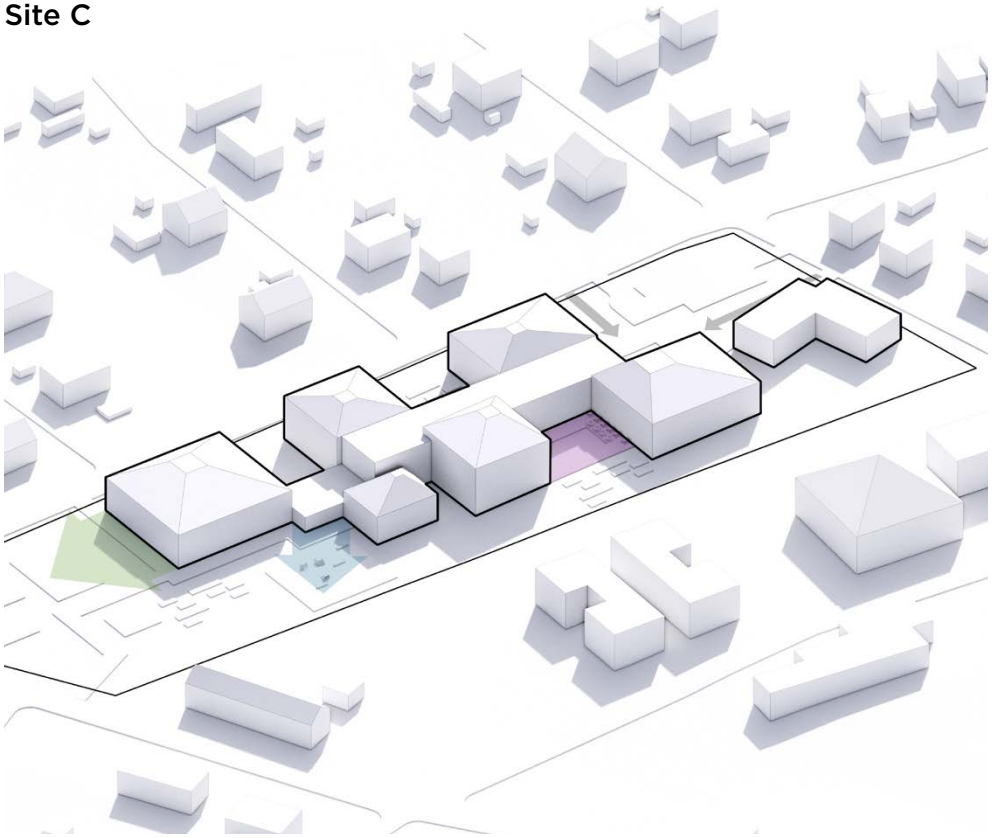


Diagram 4. Plans variety

Site B

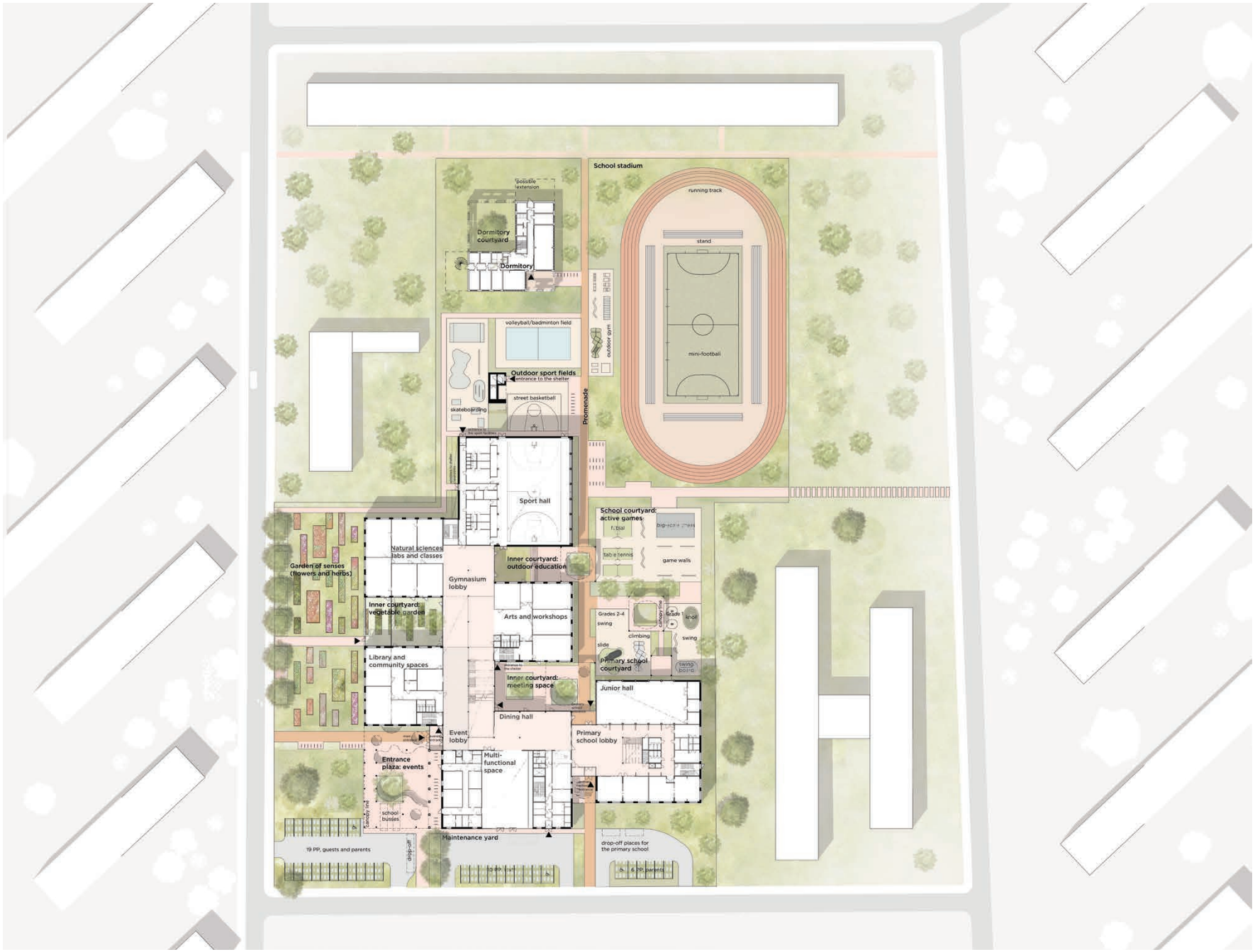
Site plan for hypothetical situation B 1:2000

Site C



Site plan for hypothetical situation C 1:2000

Site A



Site plan for hypothetical situation A 1:1500

Visualisation, view towards the main entrance

1.5 Facade solutions

The concept of the school's facades is to create a clear, legible structure by emphasising the horizontal stripes that separate each floor. The expressive effect is a more elongated and horizontal architecture. Visually, the surfaces between the horizontal stripes seem to recede into the background.

The arrangement of windows between the main horizontal stripes establishes a certain rhythm. The panels form a ventilated facade system between the windows with a uniform height and several standardised widths, which makes them a versatile decorative element for adapting facades to different local contexts. The horizontal stripes, in turn, ensure recognition of the school regardless of context.

The determined articulation of the facade into horizontal stripes and window zones makes the composing of facades of various materials and colours universal, inexpensive and easy to maintain.

Adaptation and individual integration into different environments is through panels made of various recycled materials between the windows. The choice of material and visual effect is informed by the level of urbanisation around the site. In a dense urban environment, prefabricated fibre cement panels or composite panels are recommended. In a less densely populated space (e.g. in villages and urban-type settlements) panels can be made of recycled wood. Other locally sourced materials can also be used, e.g. clay, bricks, metal sheets or ceramic tiling.

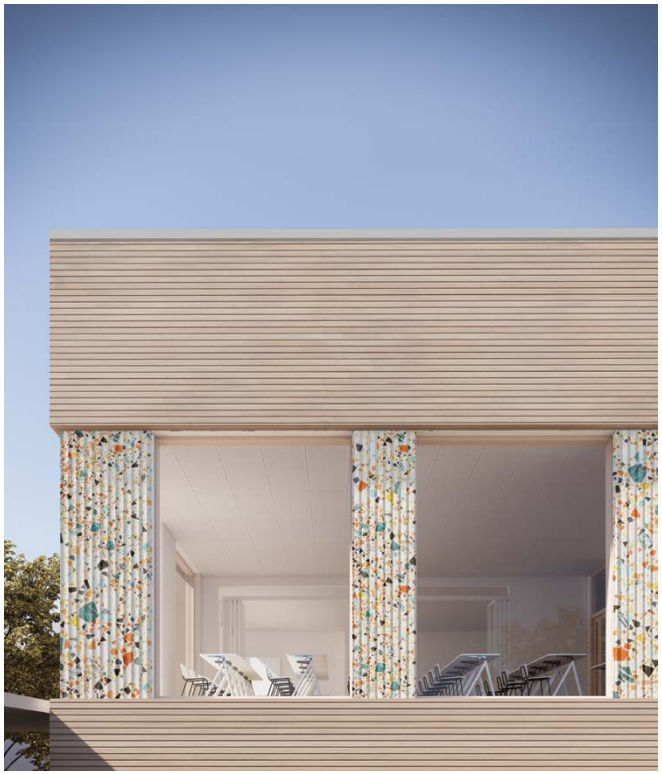
Construction rubble, such as concrete, glass and bricks, can be sorted into reusable building components (e.g. intact bricks for masonry) and material for recycling (e.g. filler for production of standardised fibre cement or composite panels). These new production methods create a smooth transition from the reconstruction era to sustainability in future construction.

The use of rubble from the war instils a memory into the walls of a building. In time, these buildings can stand as testimony to the courage and resilience of the Ukrainian people.

Building facade from the primary school entrance 1:750

Building facade from the main school entrance 1:750

Alternative building facade fragment 1:
recycled wood and plaster



Alternative building facade fragment 2:
wood panels and composite panels from recycled materials

Alternative building facade fragment 3:
plaster and metal shingle panels from recycled metal

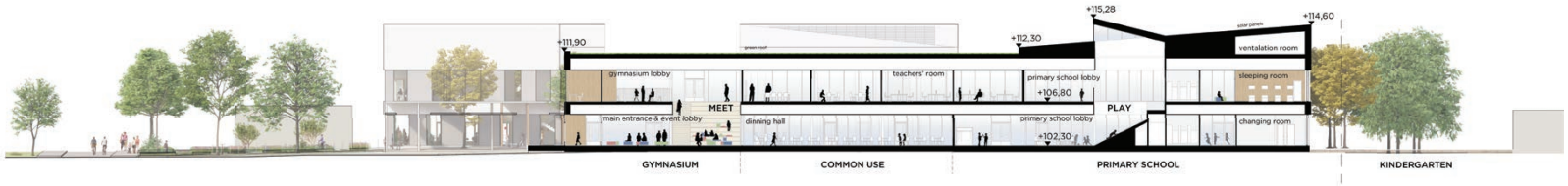
2 FUNCTIONAL SOLUTIONS

2.1 Main functions

The functions of the school building are structured into clear clusters, while a series of lobby spaces connect the main functions. Functional clusters allow easy orientation within the building and determine the public and semi-public spaces of the school. The public lobby spaces offer views out into the urban space, helping to visualise movement in the building and connect the users of the building to its surroundings. The spaces within the clusters are organised into easy-to-monitor entities.

The primary school is an easily distinguishable part of the building, which can also operate on its own. It has its own entrance and junior sports hall. Classrooms are oriented towards a peaceful outdoor area, while the junior sport hall is directly connected to the schoolyard. Depending on the site, the primary school can be detached or the orientation changed.

The primary school is connected to the rest of the school via a group of spaces comprising the kitchen and dining space, which open up to the multi-purpose hall on the ground floor, and healthcare and administrative offices on the first floor. The central, interactive location of this cluster has many benefits: the ground floor connection strengthens the unity of the building, while the first floor connection promotes social control and professional ties. It allows both pupil flow separation and a good connection to the shared functions. Placing teachers' rooms side-by-side promotes collaboration between teachers of different grades.



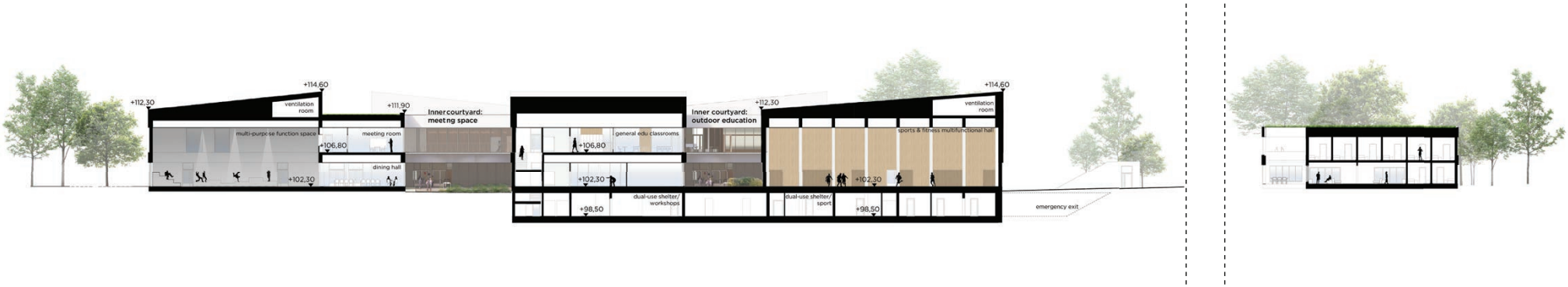
School building section A-A 1:750

The lobby space is divided into a series of functional informal spaces that support the main functions. The three main lobby spaces are called “Play”, “Meet” and “Discover”. The “Play” lobby is the core of the primary school, where pupils can have active breaks in a more relaxed environment. It connects the primary school entrance, classrooms, junior sport hall and dining hall.

The “Meet” lobby by the main entrance unites the most communal spaces of the school: the dining hall, multipurpose space, library and community spaces. The major element of the lobby is the auditorium stairs, where one can read a book, have a snack or give an informal presentation. It is both a daily meeting place and event hosting space. In case of a big school celebration, the lobby, dining hall and multi-purpose space can be opened to create a bigger space to fit everyone: pupils, teachers and parents.

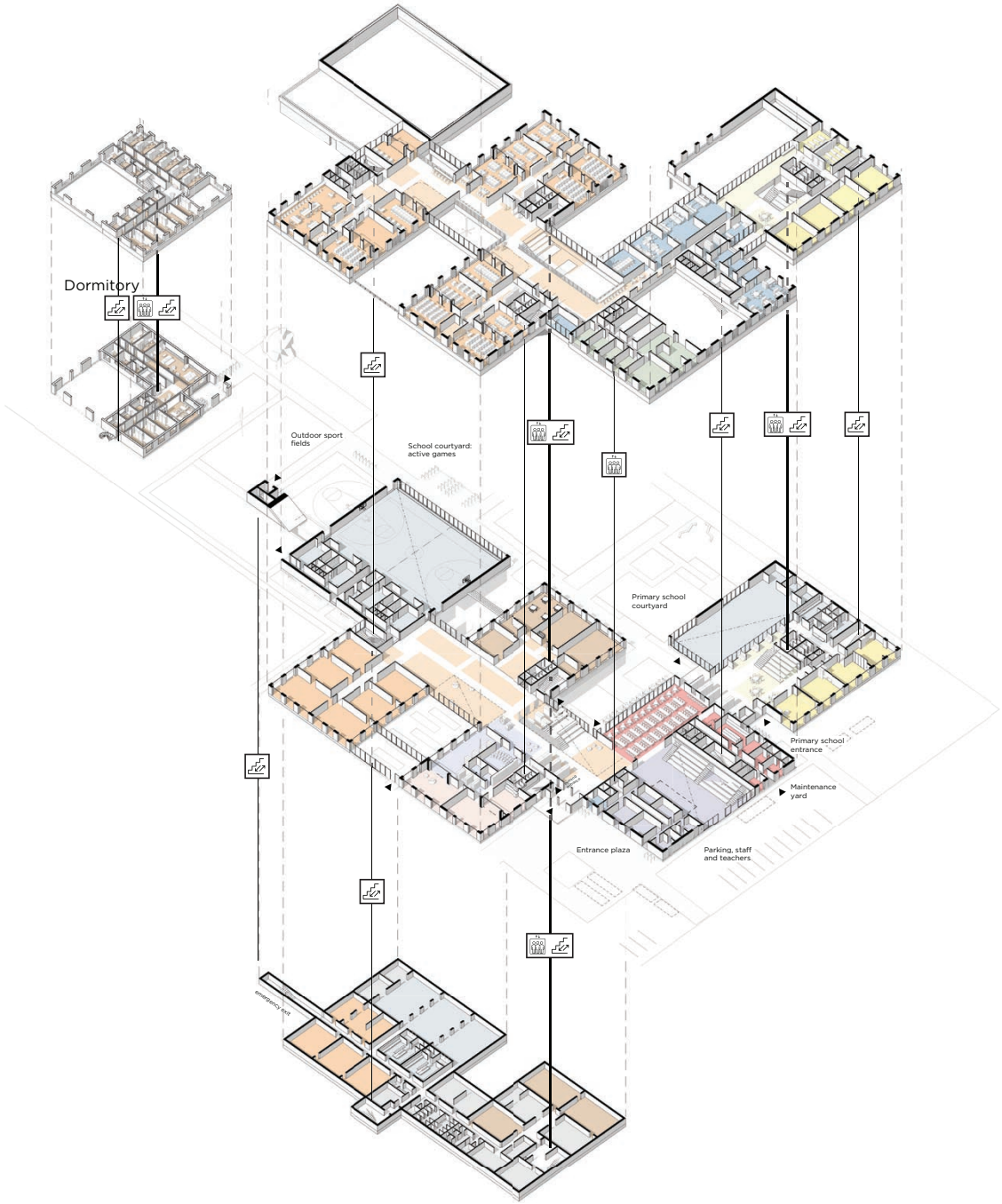
The “Discover” lobby works as a creative project space and extension to the learning environment of the natural science classes and workshops. The double-height lobby can serve as a space for science club extracurricular activities or the art exhibitions of students and residents. The lower spaces of the lobby create places for recesses between classes, but also can be an informal extension of the classes. It can be enhanced for this purpose with acoustic furniture, curtains, or sliding glass partitions.

The entire building including the dual use-shelter and the courtyard areas is designed to be inclusive and accessible for all users. The spaces and entrances are dimensioned for wheelchair use, and extra vertical connections and accessible restrooms serve people with disabilities. Entrances are fluently connected to the outdoors by sloping the terrain. Future stages of the design can take into account users with sight and hearing disabilities with contrasting colouring schemes, tactile surfaces, hearing devices etc.



School and dormitory buildings section A-B 1:750

Visualisation, interior view from the main entrance, MEET lobby

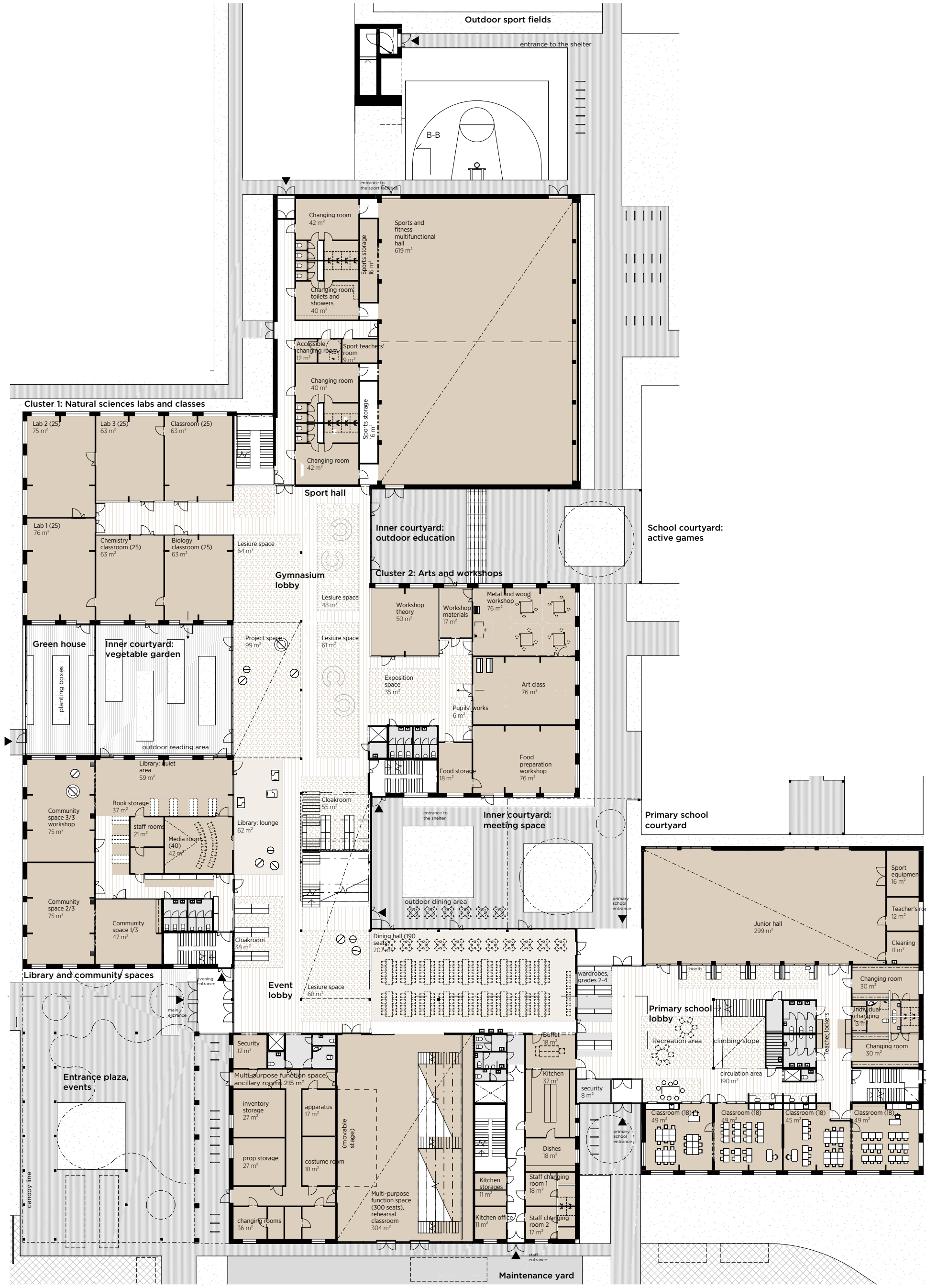


First Floor
- Common-use: Healthcare
- Common-use: offices and staff
- Gymnasium: lobby
- Gymnasium: teaching spaces
- Primary education: grade 1
- Primary education: grades 2-4
- Primary education: recreation spaces

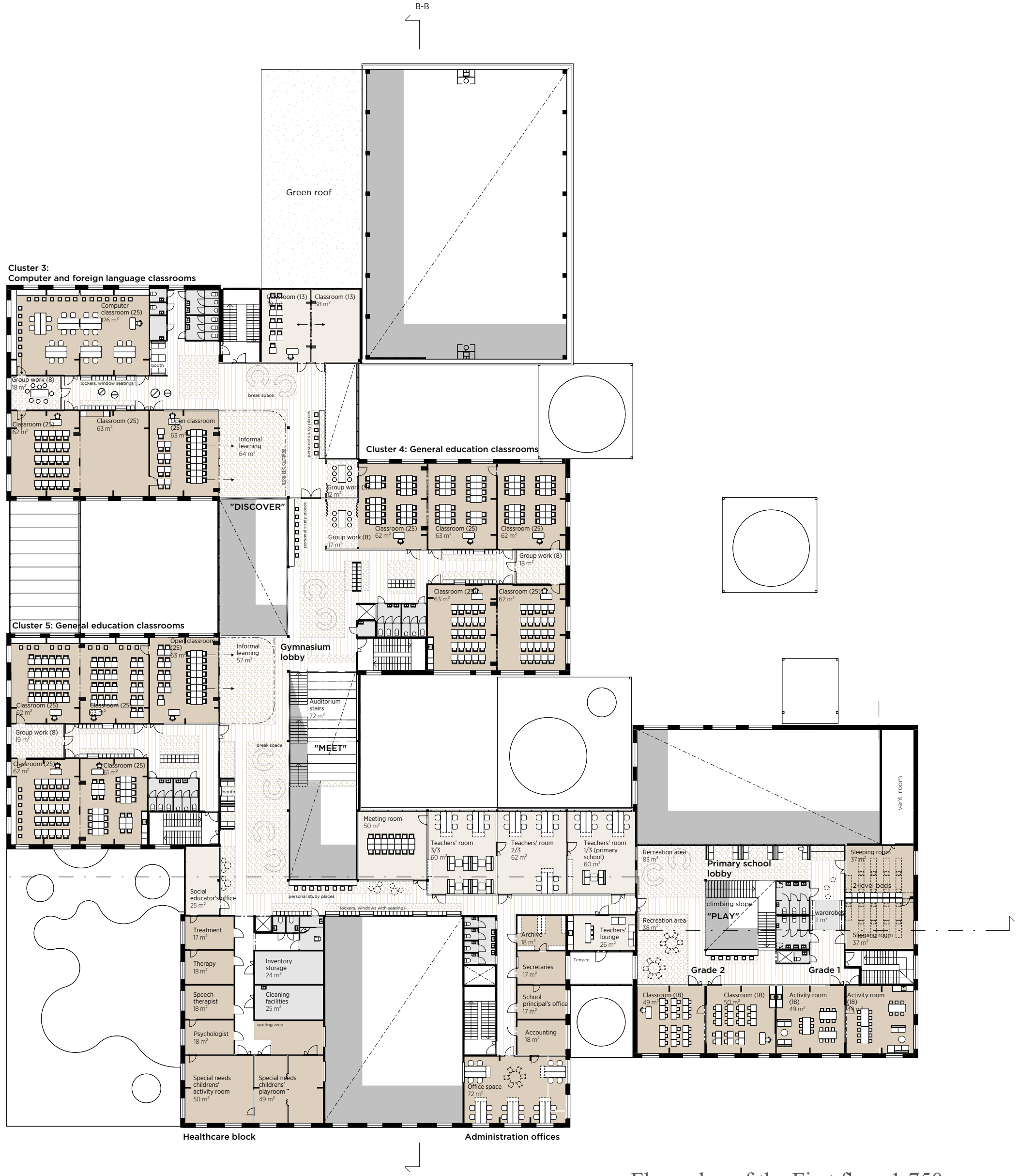
Ground Floor
- Common-use: Catering
- Common-use: community spaces
- Common-use: library
- Common-use: multi-purpose space
- Common-use: offices and staff
- Common-use: sport
- Gymnasium: arts and workshops
- Gymnasium: lobby
- Gymnasium: teaching spaces
- Primary education: grades 2-4
- Primary education: recreation spaces

(Semi-)basement, dual-use shelter
- Dual-use shelter: ancillary, sanitary and technical spaces
- Dual-use shelter: arts and workshops
- Dual-use shelter: special classrooms
- Dual-use shelter: sports

Axonometric view of the Dormitory and School buildings



Floor plan of the Ground floor 1:750



Floor plan of the First floor 1:750

2.2 Teaching spaces

The cluster organisation of classrooms allows daily flexibility and open layout within, while separating classrooms from the lobby in order to avoid unnecessary distraction. Classrooms can be easily separated, or joined to form bigger spaces with space dividing solutions such as folding doors, acoustic curtains etc.

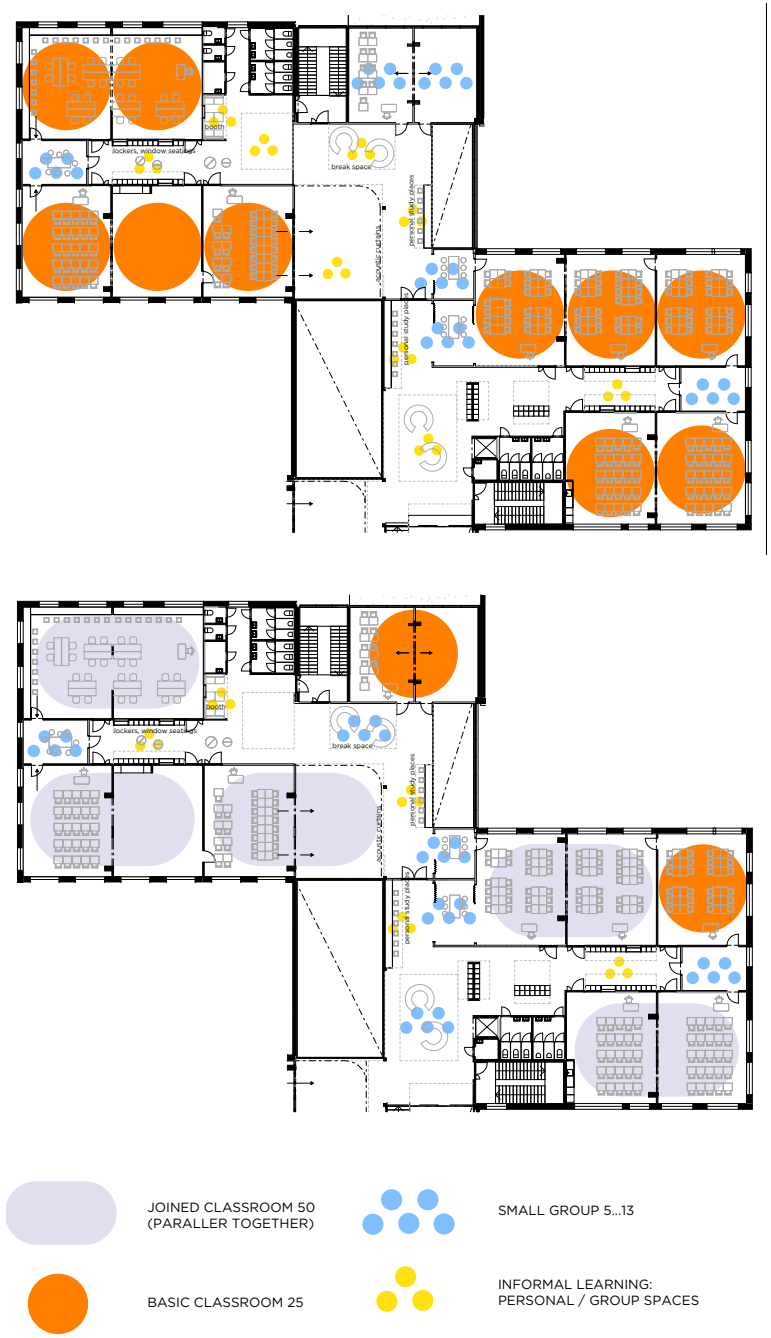
Modern teaching and learning benefits from informal learning spaces that are separate from the main classrooms. Small group spaces, booths, individual work areas and areas for classroom extension are created between recreation areas of the lobby and classrooms, answering to the different needs of the changing curriculum. The variety of the learning environment also promotes the inclusivity of the school, as some pupils need quiet space and extra attention, while others can feel freedom of expression in a more relaxed, informal environment.

2.3 Full-day school

The layout of the school follows the principle of a full-day school while at the same time allowing controlled access to all building parts. Community oriented programs, such as the library, community spaces, the sports cluster and workshops, and the natural science labs are concentrated on the ground floor. The functions of the evening use are strongly visible in the urban space and attract participation in community activities.

Groups of spaces dedicated for evening use can be used simultaneously or separately, as access can be organised through the main entrance or directly into the spaces through their own entrances, without having to keep the entire building open.

Community spaces are seen as a public function of the building, and must be tailored for the needs of the specific community. For that reason we suggest allocating it close to the main entrance and library. Community spaces can work as an independent entity or be open towards the library, creating synergy. In this way spaces can serve as group therapy rooms, a youth centre, quiet co-working spaces, or a shared «living room» depending on community needs and preferences. The connection between community spaces and outdoor areas is essential. Outdoor areas can be used among others as places for communal gardening, planting boxes or a place for community events in the warm time of the year.



Classrooms flexibility

2.4 Dual-use shelter

The on-going war in Ukraine has compelled the country to re-evaluate the significance of the shelters. Depending on the region in Ukraine, an air raid can happen several times per day and can last several hours. In the case of schools, it means that shelters should be designed to fit all the pupils and staff, and be comfortable enough for continuing class work safely without interruption.

Building shelter structures is very demanding, and the war will be over some time in the future. Alternative suitable uses for these spaces must be foreseen. In order to provide daily usage of the shelter spaces, part of the school spatial programme and extra related spaces that can sustain the basement location are suggested.

In the proposal, the dual-use shelter comprises a gym, supplementary changing rooms, Homeland defence classrooms and workshops, including a green-screen room and robotic equipment room. A gym can work as a bigger space, or be divided into three spaces to host fitness, dance or drama classes. To reinforce the daily function of the dual-use shelter, it is placed beneath the related ground floor clusters of the sport hall and art and workshops. Ample vertical connections are provided including an elevator. Homeland defence classrooms are provided with shutter windows to make them more flexible to use.

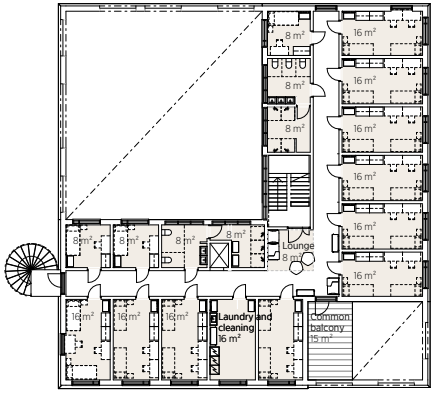
On sites with uneven terrain, the dual-use shelter should be built as a semi-basement and have more windows with shutters to allow maximum daylight during the normal periods.

Floor plan of the Semi-basement 1:750

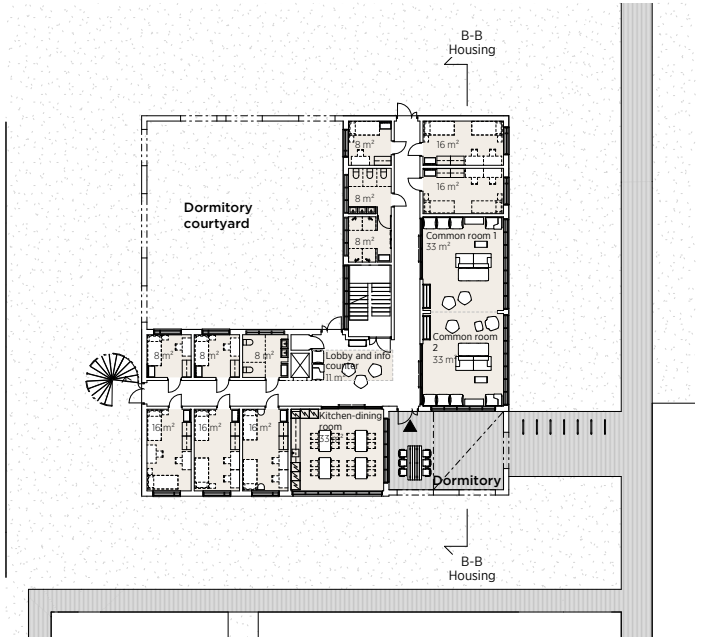
2.5 Dormitory

The dormitory is located separately from the school building in order to distinguish schoolwork from recreational time. The structure is similar to the school's, flexible and open-ended so that it can be expanded, reduced or even relocated entirely.

Although the dormitory is seen as a temporary living model for the relocated pupils and teachers, the goal is to create a safe and pleasant habitat. The common areas are mainly located on the ground floor and are connected to the dormitory's own courtyard. Even distribution of students and teachers within the dormitory helps to create a secure atmosphere.



Dormitory floor plan of the First floor 1:500



Dormitory floor plan of the Ground floor 1:500

2.6 Schoolyard

In addition to the traditional recess function, the schoolyard is a place for learning - one of the teaching spaces. The schoolyard also serves as a workspace for special education and therapy, enabling flexible booking of the interior spaces.

The schoolyard is naturally subdivided by the external volumes of the clusters. Each area of the schoolyard has its own special nature for different activities. The building shields the schoolyard against traffic, noise and pollution, and creates a microclimate while providing shelter from the elements.

The structures and details of the courtyard area, such as the surface patterns, are designed in such a way that they serve teaching situations: geometric patterns, reading lines, letters, grids, compass directions, table of elements. In addition, the three-dimensional objects within the schoolyard act as teaching equipment.

The schoolyard's vegetation is a mixture of whatever existing vegetation can be preserved, enhanced with carefully selected local natural vegetation. The local climate and seasonality are the starting point of the landscaping of the schoolyard. The solutions are sustainable, easy to maintain and favour perennials.

The winter garden also serves as an experimental and kitchen garden for students.

Schoolyard games can be played in the multi-purpose field, street basketball or racquetball courts. Basic colors, untreated wood and galvanized steel are used in the surfaces and furniture.

The maintenance, escort and user traffic and parking are separated from each other and the schoolyard for safety reasons. Physical and social accessibility of the facilities ensure that education, teaching and learning are equally accessible to everyone.

Visualisation, interior view from the Project space, DISCOVER lobby

3 STRUCTURAL SYSTEM, TECHNOLOGY, ENERGY EFFICIENCY

3.1 Structure

The structural system is based on steel cell construction that enables a structural lifespan of 100 years. The load-bearing structures contain no organic components susceptible to damage. This structure has proven reliable in providing a clean indoor climate even in harsh climates. All structural components of the building are 100% recyclable and can be made from recycled raw materials.

The built structure consists of a screw pile foundation, the prefabricated steel cell modules of the clusters, including room modules, technical ceiling modules, staircase and roof modules. The technical modules include pre-assembled ventilation and electrical conduits. Larger spaces i.e. lobbies between clusters, the multipurpose hall and sports halls are built with steel columns and steel cell slab elements.

The basic modules (3,6m x 7,2m x 3m) are optimised in size for ease of transportation and lifting on-site. The lightweight steel cell structure allows for even larger modules to be produced where oversize transportation is feasible. The building system with its modular elements and pre-installed systems allows for fast on-site assembly. Bolt-and-nut assembly of the modules makes it also possible to disassemble, transport and reuse the building in a new location. It is also possible to resize the school by attaching or detaching modules between schools to balance the changing demography of the local population.

Modules can be produced and shipped to remote sites for finishing with local materials, or prefabricated at the factory to a high degree of manufacture for speed of assembly on site. Steel cell module prefabrication can be set up in Ukraine, enabling both strategies.

Precisely dimensioned, tight fitting modules with adequate insulation ensure a tightly sealed building envelope enhancing the overall energy efficiency. Combined with energy efficient windows with solar protection, lower heating and cooling maintenance costs are achieved.

Benefits of the selected structural system:

- Cost effective
- Healthy indoor climate
- Excellent soundproofing
- High level of prefabrication
- Reliable and accurate dimensioning
- Modularity
- Lightweight construction
- Quick assembly
- Longevity
- Adaptable and resilient use of space
- Technological upgradeability
- Reusability (ease of disassembly and reassembly)
- Energy efficiency
- Ease of maintenance
- 100% recyclable raw materials

Foundations

Screw pile foundation with primary steel beams is used as the default foundation type, as it's fast and easy to assemble. Another basic option is continuous concrete footing with steel columns. A ventilated crawl-in space beneath the base floor ensures a healthy building and easy maintenance. Base floors can also be slab-on-grade.

Shelter foundations are built with continuous footing / mat foundation depending on the soil conditions of the site, combined with deep pile foundation when necessary.

Floors

The base floor structure consists of load bearing steel cell slabs, as separate floor elements (lobbies, sports halls) or as part of modular elements.

Floor structures in modular elements consist of the structural floor of the upper module and the roof structure of the lower module. The load bearing structure is covered with insulation and water circulation-based underfloor heating conduit finished with pumped floor screed.

Load bearing walls

Load bearing walls are 100mm steel cell structure. In open modules the steel cell is replaced by a steel frame where beams and columns transfer loads vertically.

This modular element construction method naturally creates double-wall structures between spaces, resulting in excellent soundproofing between classrooms.

Non-load bearing walls

Non-load bearing or interior partitioning walls can use various available materials.

Long-span spaces

Long-span spaces have separate structures, in which the main elements are steel trusses and steel columns erected on site.

Roofs

Load bearing roof structures are in general modular steel cell structures. In long-span spaces (multipurpose and sports halls) steel trusses support the roof. Roofs of lobby spaces are flat green roof structures. Adjoining clusters can be fitted with various roof shapes i.e. flat, shed, open gable or hip-typed depending on the surroundings. Solar panels are integrated as part of the roof structure.

The shapes of the roofs can be chosen to suit the surrounding environment.

Facades

The outer walls are primarily insulated self-supporting lightweight structures. Load bearing / stiffening structures are made of 100mm steel cell structures. Facade materials can be flexibly chosen based on the project. The plinths are made of concrete.

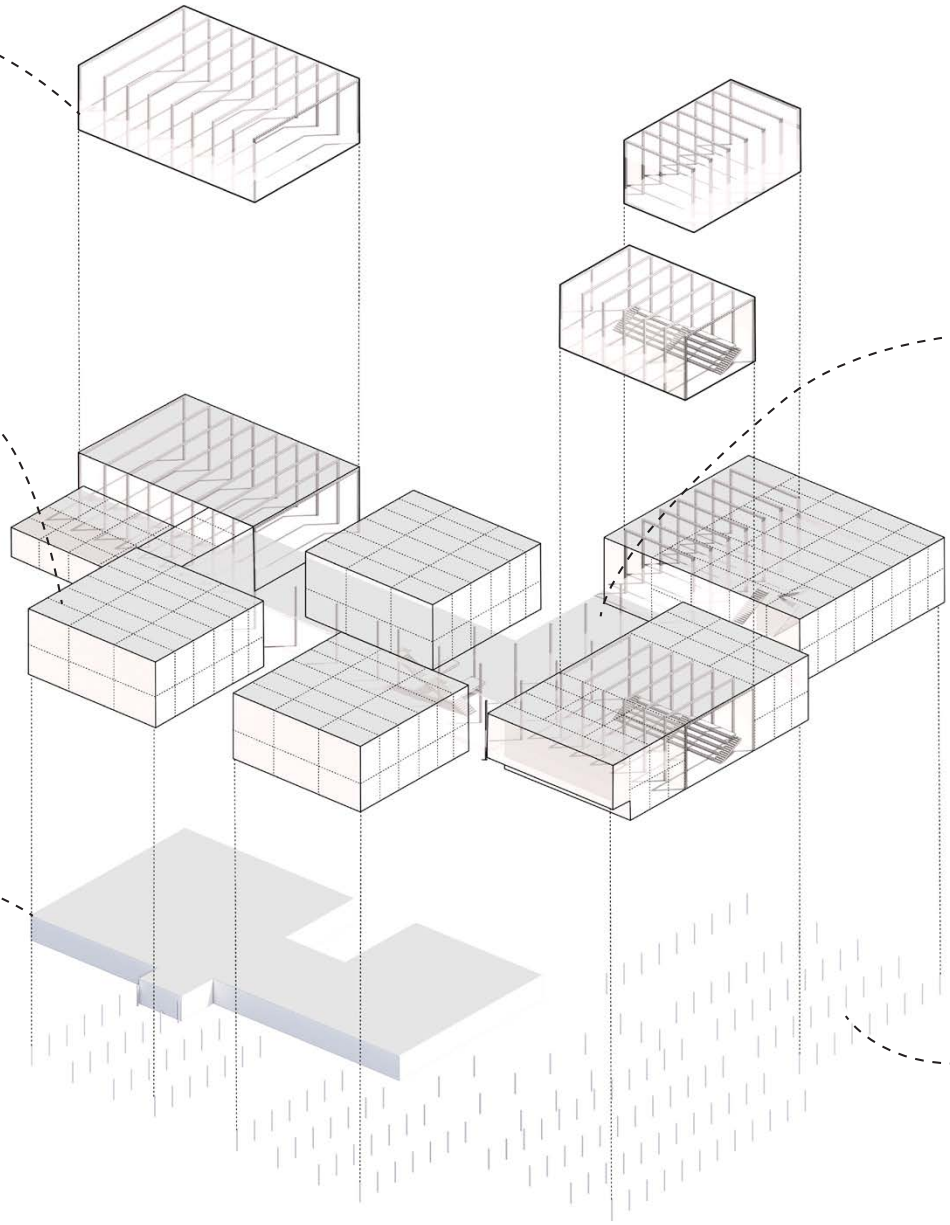
Long-span halls

Long-span halls have separate structures, in which the main elements are steel trusses and steel columns erected on site.

Pre-farbricated modules

The structural system is based on steel cell elemnts that enable a structural lifespan of 100 years.

The modules are optimized in size for ease of transportation and lifting on-site. The building system with its modular elements and pre-installed



Structural principles diagram

Roofs

Bearing roof structures are modular steel cell structures. The shapes of the roofs can be chosen to suit the surrounding environment.

Floors

Base floor structure consists of bearing steel cell elements -as separate floor elements (lobbies, sports halls), or as part of modular element.

Upper floor structures in modular elements consist of structural floor of the upper module and the roof structure of the lower module. Bearing structure is covered with insulation and water-based underfloor heating conduit with pumfloor screed.

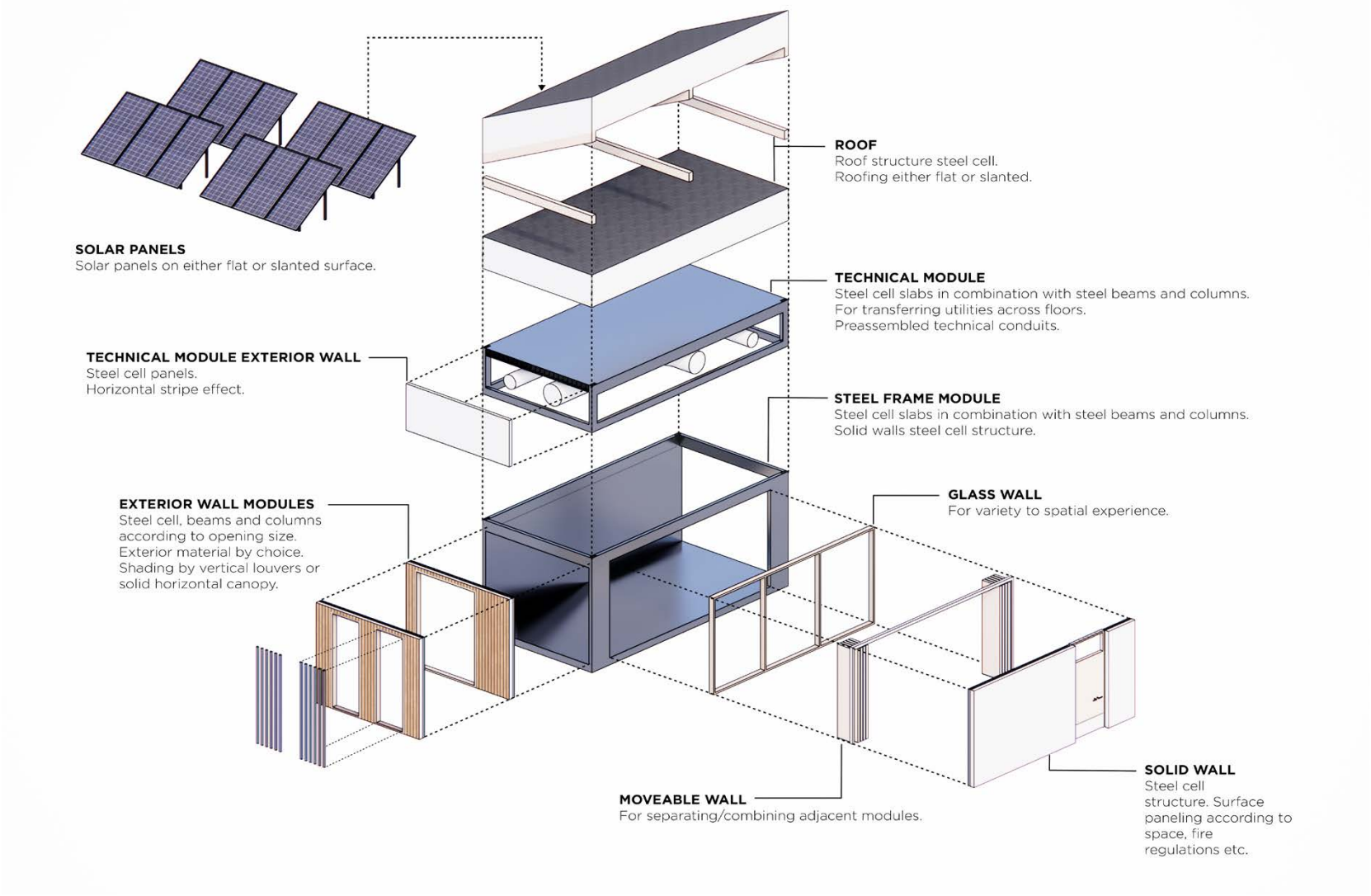
Shelter structures

Shelter foundations are built with continuous footing/ mat foundation depending on soil conditions of the site, combined with pile foundation when necessary.

Foundations and walls are built from low-carbon concrete.

Building Foundations

Screw pile foundation with main steel beams is used as default foundation type, as it’s fast and easy to assemble. Another basic option is continuous concrete footing with steel columns. Crawl-in space between foundations and base floor ensures a healthy building.



Axonometric view of a pre-fabricated module

3.2 Technical systems

The heating energy of the building is provided by a geothermal heat pump system. The geothermal conduit can also be used for cooling when necessary. Additional electrical energy is produced with an on-site solar energy system installed on the roofs of the clusters. The use of locally sourced energy reduces the building's carbon footprint. The expansive use of decentralised energy systems also adds redundancy to the local energy grid. The heating is distributed through floor conduits.

The building is equipped with energy recovery ventilation systems (ERV). Combined with the geothermal heat pump system, ERVs allow both energy efficient heating and summertime cooling. Each floor of the clusters contains its own pre-installed HVAC and electrical systems. The lobbies, sport halls and kitchen are equipped with their own separate HVAC units.

This decentralised system is cost-effective, flexible, easy to adjust, and resilient to disruptions. The technological progressiveness can be selected and upgraded according to the needs of the project. The horizontal installation space coupled with vertical shafts offer space and routes for upgrades in wiring, climate control and future technologies.

3.3 Security

Despite the apparent openness of the building concept, various underlying security measures are present. The site plan provides the schoolyard privacy from the street, while the entrances are easily monitored from both inside and outside. Clusters can be opened or closed from public use independently, and the decentralised HVAC and electrical systems are less prone to malfunction. Inside, the open plan allows for social control and multiple exits and alternative routes to dissolve threatening situations.

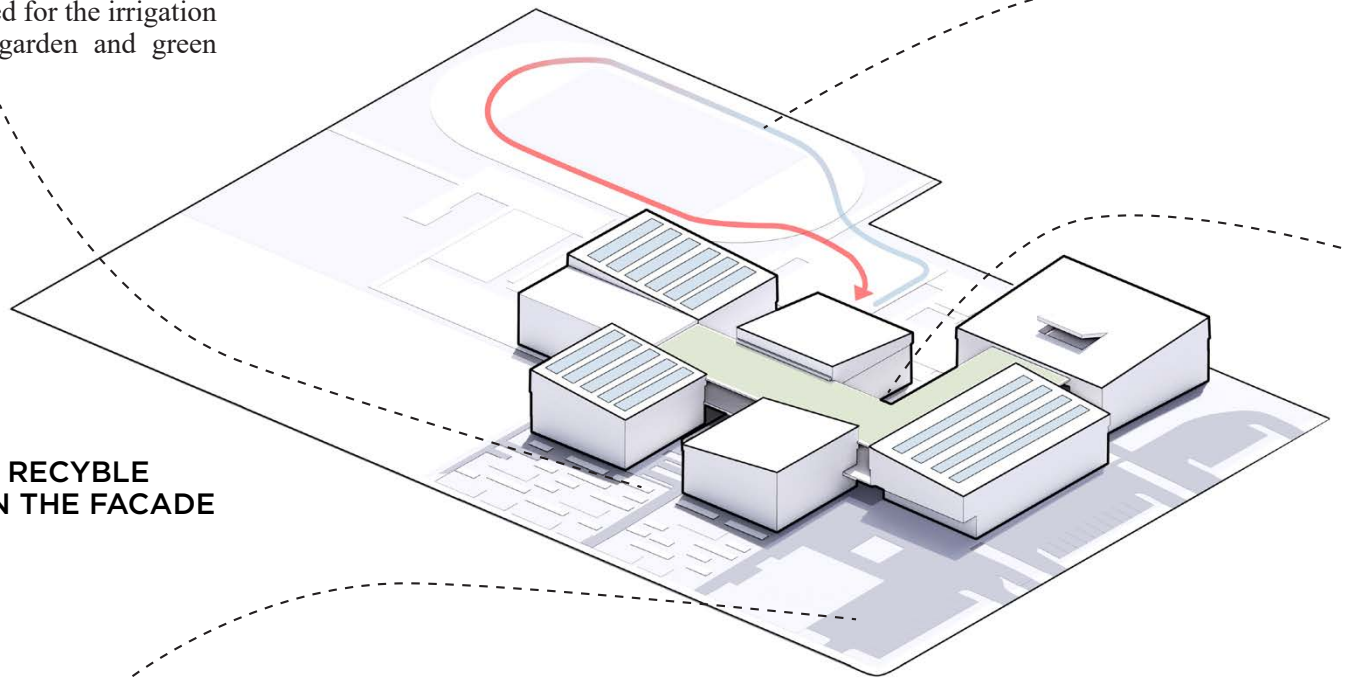
RAINWATER

is gathered and used for the irrigation of the vegetable garden and green house plants.

PANELS FROM RECYBLE MATERIALS ON THE FACADE

RECYBLE MATERIALS

in the courtyard: pavement of the pedestrian path can be done from recycled bricks, while pavement of the parking areas from recycled concrete



Energy from renewable resources:

geothermal heat, heat recovery from waste water, solar panels on the roofs

GREEN ROOFS:

cooling effect

VENTILATION:

decentralized energy recovery ventilation systems

Sustainability principles diagram

4 SUSTAINABILITY

3.1 Adaptability

The structural system of the building has been chosen for its quality, cost-efficiency, rapid construction, long-term durability, and adaptability. The steel cell structure enables a sustainable and long-lasting frame, with spans optimised according to the intended use.

The functional areas of the building are clearly defined, and the spaces within the clusters can be flexibly allocated to different age groups and teaching groups. By staggering the building mass, natural light is introduced from multiple directions, allowing for diverse interior layouts for various usages. The internal layout of each cluster can be easily modified by partitioning, combining, and rearranging spaces using lightweight wall structures, movable walls, door arrangements, or furniture.

Thanks to the structural system, it is possible to expand the building with additional floors or clusters or even relocate the entire building to a new site if necessary.

3.2 Lifecycle objectives

The proposed construction method achieves the energy class “A” for school and daycare building projects. High room ceilings and large, energy-efficient windows provide spaciousness and ample light for working and learning. The roofs can be fitted with large solar power systems if needed.

The openings in the building are designed according to each site to ensure quality indoor conditions without additional cooling. Windows facing greater heat loads from the sun are smaller in size. Heat load is also managed using solar control glazing, as well as various external screens and canopies.

3.3 Low carbon footprint and circular economy

The building’s lifespan is maximised, and maintenance needs are minimised. Structures are optimised for a low carbon footprint. Wooden materials can be used in interior walls for carbon sequestration. Steel structures are made from recycled steel where possible. Bolt-and-nut assembly of the modules make it also possible to disassemble, transfer and reuse the building in a new location. Low-carbon concrete is used in concrete parts (foundations, shelter).

Low-carbon concrete can be produced by replacing part of the cement with low-emission additives such as fly ash, blast furnace slag, limestone powder, and silica. Using these additives can reduce the carbon dioxide emissions of concrete by up to 90%.

Additionally, the use of various recycled materials (thin metal sheets, composite panels, and ceramic products) as part of the cluster facades is proposed, as well as the use of recycled bricks in lobby floors and recycled concrete rubble and bricks in schoolyard construction.

3.4 Use of construction scrap and building rubble

While the war is leaving behind much loss including building ruins i.e. construction scrap and building rubble, we should look at it as an opportunity to develop the reuse of waste material in the construction sector. Treating waste material as a resource is still not a common practice in Ukraine and Europe, regardless of environmental issues we are facing. The war has made this issue more obvious in Ukraine, therefore a change in approach is crucial. Making the reuse of building materials and components a common practice in school construction in Ukraine would lead the way into the development of a circular economy. It will also be an inspiration and example for Europe in demolishment and reconstruction practices.

Our approach is to give the new buildings a fresh, upcycled appearance. That is why rough surfaces or damaged appearances of the materials are intentionally avoided in the design. The war will remain in the collective memory of Ukraine, and this memory must be preserved in different ways. However, we see the Future school of Ukraine as a safe and optimistic environment for pupils to leave thoughts of the war behind, and concentrate on learning and growing.

The reuse of the construction scrap and building rubble has to be studied site-specifically. It is impossible to predict what material, shape and amount can be recovered from each affected area. Therefore it is very important to leave flexibility in the design. The concept of a school building as a city in miniature helps to break down the scale of the project into parts that can flexibly utilise various material supplies and sources, which not only creates a human-scale environment, but helps to differentiate and personalise each cluster with its own facades, flooring and even furniture.

As construction of the new schools doesn’t happen simultaneously or in the same place where the war has affected, it is important to establish hubs for collecting and sorting waste material. Ideally, micro-production of the building components, such as recycled composite panels, shingle facade panels etc, should take place in connection with the hubs. For effective integration and implementation, the available material rubble and building components should be analysed as a starting point of the school design.

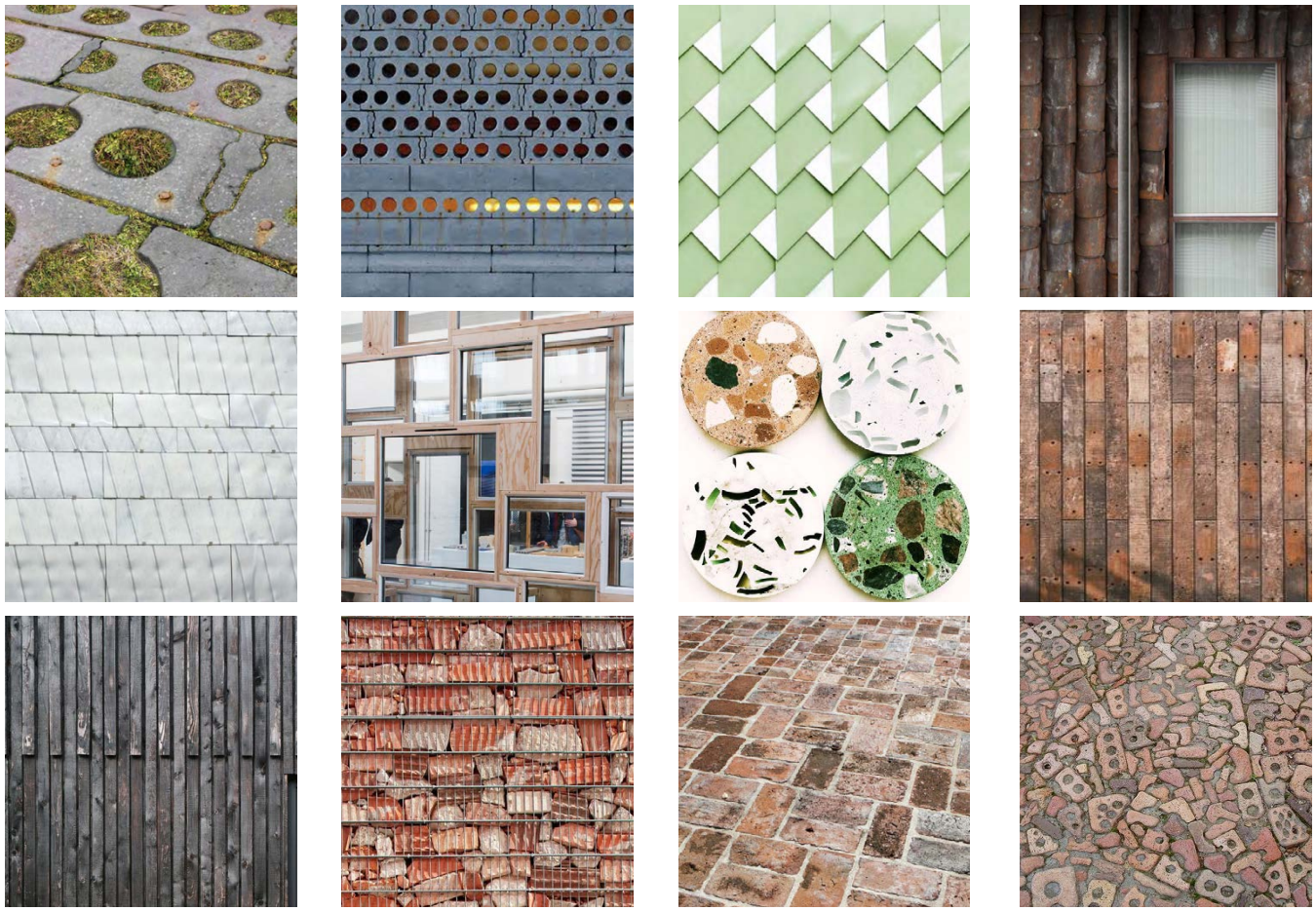
Platform for learning and creativity

Circular economy will become part of the curriculum in future education. Therefore the school building itself and micro-production places will become platforms for learning.

The reuse process can encourage the local community e.g. to design and build furniture or even works of art to inhabit the public spaces.

	CRUSHED CONCRETE/STONE DEBRIS	CONCRETE ELEMENTS/SLABS	BRICKS (WELL-PRESERVED)	BRICKS (IN BAD SHAPE)	ROOF TILES	CERAMIC TILES (CRUSHED TO SMALLER PIECES)	METAL (ROOFING, VENTI-LATION DUCTS)	WOOD (BOARDS, SHEETS, CLADDING LUMBER)	GLASS (BROKEN)	WINDOWS	PLASTIC RUBBLE
COURTYARDS STRUCTURES	PATHWAYS, DRIVEWAYS, RETAINING WALLS	OUTDOOR FURNITURE, RETAINING WALLS	PATHWAY PAVEMENT, OUTDOOR STEPS	PATHWAYS, RETAINING WALLS	SHED STRUCTURES AND CANOPIES	PATHWAY PAVEMENT	SHED STRUCTURES AND CANOPIES	SHED STRUCTURES AND CANOPIES		SHED STRUCTURES	
INDOOR WALLS, CEILINGS			NEW MASONRY			TERRAZZO-LIKE COMPOSITE PANELS, AS AGGREGATE	FALSE CEILINGS	WALL STRUCURES, FALSE CEILINGS	TERRAZZO-LIKE COMPOSITE PANELS	INDOOR WALLS AND WINDOWS	SOUND INSULATION PRODUCTS
FACADE	TERRAZZO-LIKE CONCRETE PANELS		NEW MASONARY	TERRAZZO-LIKE CONCRETE PANELS	ROOF TILE SHINGLE FACADE	TERRAZZO-LIKE COMPOSITE PANELS, AS AGGREGATE	PANEL OR SHINGLE FACADE	CLADDING	TERRAZZO-LIKE COMPOSITE PANELS	LOBBY GLASS WALLS, WINTER GARDEN STRUCTURES	TERRAZZO-LIKE COMPOSITE PANELS
LOBBY FLOOR	TERRAZZO-LIKE CLAY OR CONCRETE FLOOR		BRICK FLOORING	TERRAZZO-LIKE CLAY FLOOR		TERRAZZO-LIKE CLAY FLOOR		FLOOR BOARDS	TERRAZZO-LIKE CONCRETE FLOOR		TERRAZZO-LIKE CONCRETE FLOOR

Table of possible recycling and reuse of material waste



Reference images of material reuse

Resources from top left:
1-5: Nordic Built Component Reuse by Vandkunsten Architects (https://vandkunsten.com/en/projects/component-reuse)
6-7: Lendager Group (https://lendager.com/)
8: Roundhouse Works / Loader Monteith - Photo by Fred Howarth (https://www.reedwatts.com/roundhouse-works/)
9: An Office and Two Houses / Loader Monteith Photo by Henry Woide (https://loadermonteith.co.uk/projects/an-office-and-two-houses/)
10: Polish War Museum / Kwadrat (https://www.dezeen.com/2017/07/15/second-world-war-museum-kwadrat-architecture-cultural-gdansk-poland/#/)
11-12: Recycled brick pavement

3.5 General characteristics of the site A and of the buildings

Site (in hypothetical situation A)		
	Unit of measurements	Quantity
Site surface area	sq.m.	22,800
Site development intensity	%	50,5
Site development density	%	26
Green portion of the site	%	38
Building(s) / part of the building(s)		
Primary education		
Total floor area	sq.m.	1,268
Usable floor area	sq.m.	824
Volume of the building / part of the building	cubic metres	5,454 (gross volume)
Number of floors	pcs.	2
Height of the building / part of the building	m	9 (without cold roof structures)
Gymnasium, Lyceum, Shared education and community spaces		
Total floor area	sq.m.	8,187
Usable floor area	sq.m.	6,124
Volume of the building / part of the building	cubic metres	43,605 (gross volume)
Number of floors	pcs.	2
Height of the building / part of the building	m	9 (without cold roof structures)

Accommodations. Dormitory		
Total floor area	sq.m.	754
Usable floor area	sq.m.	486
Volume of the building / part of the building	cubic metres	2268 (gross volume)
Number of floors	pcs.	2
Height of the building / part of the building	m	6 (without cold roof structures)
Civil Protection. Dual-use shelter		
Total floor area	sq.m.	1,743
Usable floor area	sq.m.	1,130
Volume of the building / part of the building	cubic metres	6,623 (gross volume)
Number of floors	pcs.	1
Height of the building / part of the building	m	3,8
General data of the building(s) / parts of the building(s)		
Total floor area	sq.m.	**10,209 (excl. dual-use shelter)**
Usable floor area	sq.m.	**7,434** + 1,130
Dual-use area in the civil protection structure	sq.m.	845
Volume	cubic metres	57,950 (gross volume)
Number of floors	pcs.	3
Building height	m.	12,8 (incl. basement part of the shelter, without cold roof