

SKIPPER CLEMENT SENIOR SCHOOL

A SCHOOL EXTENSION



RENE THERKELSEN, MA4-ARK12 MASTER THESIS, 2013-2014

ABSTRACT

This project concerns the design of a school extensions for the Skipper Clement School Aalborg for senior students with international and national background. It is based upon the wishes from the school board and a district plan proposal for the new building. The extension will house several functions and adhere to the current trends in school building. This includes a sustainable learning environment and sustainable performance of the building, fulfilling the BR15 and BR2020 low energy class.

TITLE PAGE

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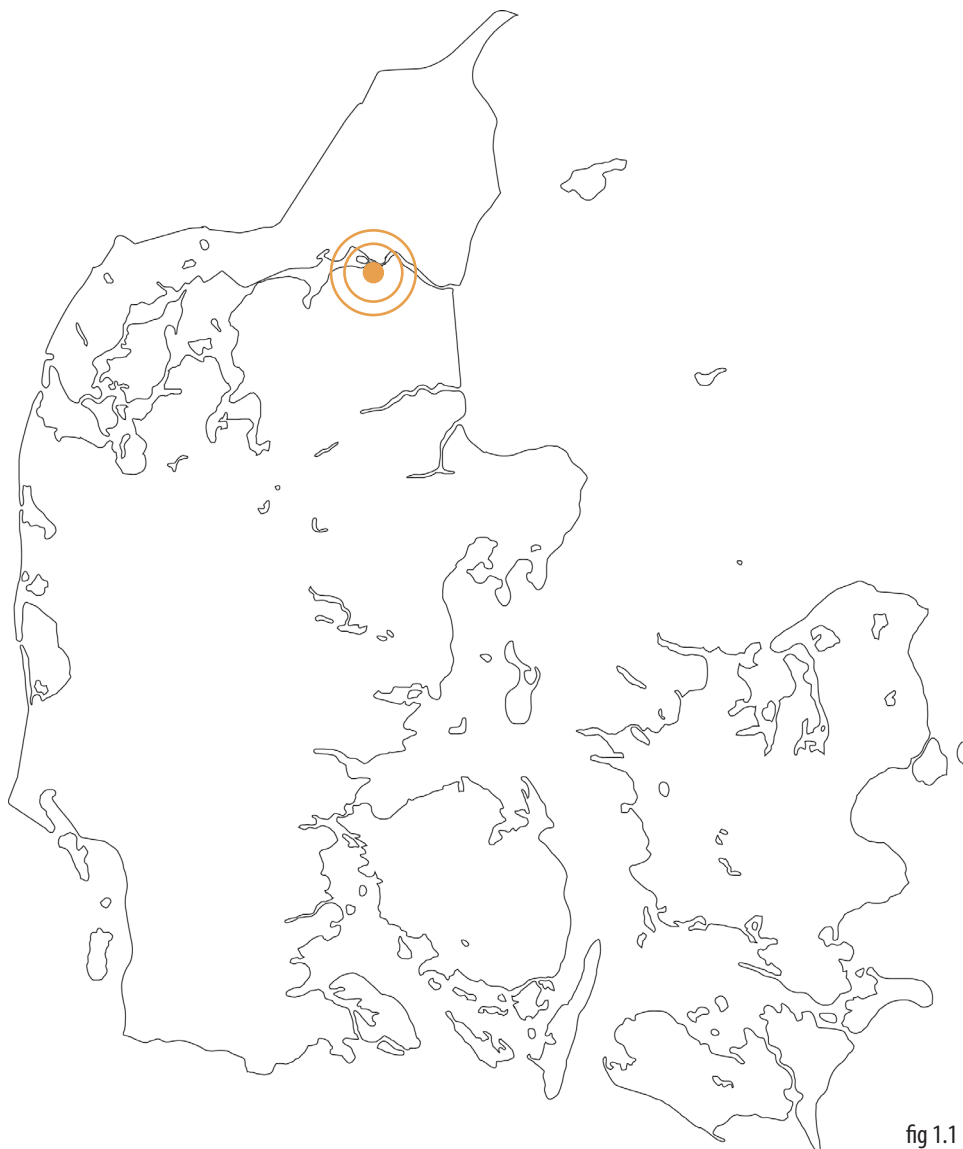


fig 1.1

INTRODUCTION

This project concerns the design of an extension to Skipper Clement School in Aalborg, Northern Jutland. Skipper Clement School is a private school in Aalborg housing both Danish and international students as it is responsible for the Aalborg International School. The two departments of the school however do not have a common school facility causing administrative and teaching problems, worsened by the limitation of available space caused by an exceeding number of international students.

The Skipper Clement School consists of 4 buildings linked together as one, though most of the school dates back from the beginning of the 20th century, making the school inadequately equipped for modern teaching situations such as project based group work. Therefore plans are currently under development for two extensions for the Skipper Clement School at Gl. Kærvej, one for the junior students and one for the seniors. This project deals with an extension for the senior students, Danish and international, including facilities that benefits the whole school. The extensions must like the old buildings, reflecting the architecture of their time, create a framework for a modern way of teaching and a social dialogue bridging between the different nationalities the school will house. This must be done while creating a coherence, uniting the school visually and functionally through its architecture.



PROVIDING THE FRAMEWORK FOR AN IDENTITY GIVING MODERN TEACHING ENVIRONMENT SUPPORTING A SOCIAL DIALOGUE BETWEEN THE USERS. THEREBY MAKING AN UNITED SCHOOL RESPECTING THE OLD AND NEW THROUGH ITS ARCHITECTURE.

METHODOLOGY

INTEGRATED DESIGN PROCESS

The integrated design process (IDP) was developed by Mary-Ann Knudstrup [Knudstrup, 2004]. It is a method used in this project to design a sustainable school through numerous design iterations evaluating aesthetic, technical and functional requirements.

The IDP consists of the following phases: Problem/idea, analysis, sketching, synthesis and presentation, between which the iterative process is circulating.

Program

The integrated design process begins with the Problem/Idea, which is the initial statement to which a solution must be found. The problem is further explored in the analysis which includes all empirical and phenomenological registrations that results in design parameters and aims that is the framework for the following sketching phase. All of this is described in the program.

Process

Based on the program the sketching phase is where the design parameters and vision is used to come up with the main concept. This happens through the use of sketches physical models, computer models and technical simulations or calculations, in order to analyze and evaluate each sketched solution aesthetically and technically. The result of the circulation through the iterations is the final concept, which is the base of the *Synthesis* phase.

The *Synthesis* is the final adjustments made to the sketched concept. It is where the design reaches its final form and all the design aims are reached.

Presentation

The final project is presented by architectural drawing, 3d visualizations, physical models, results of calculations and simulations.

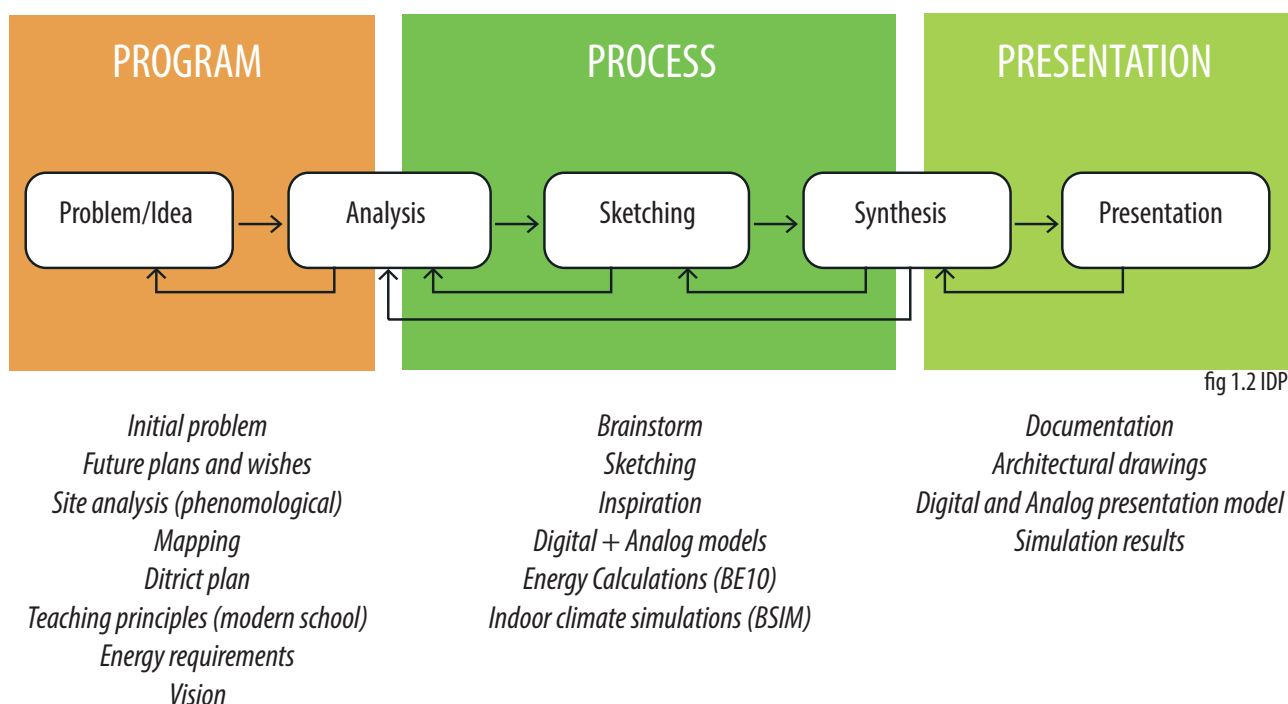
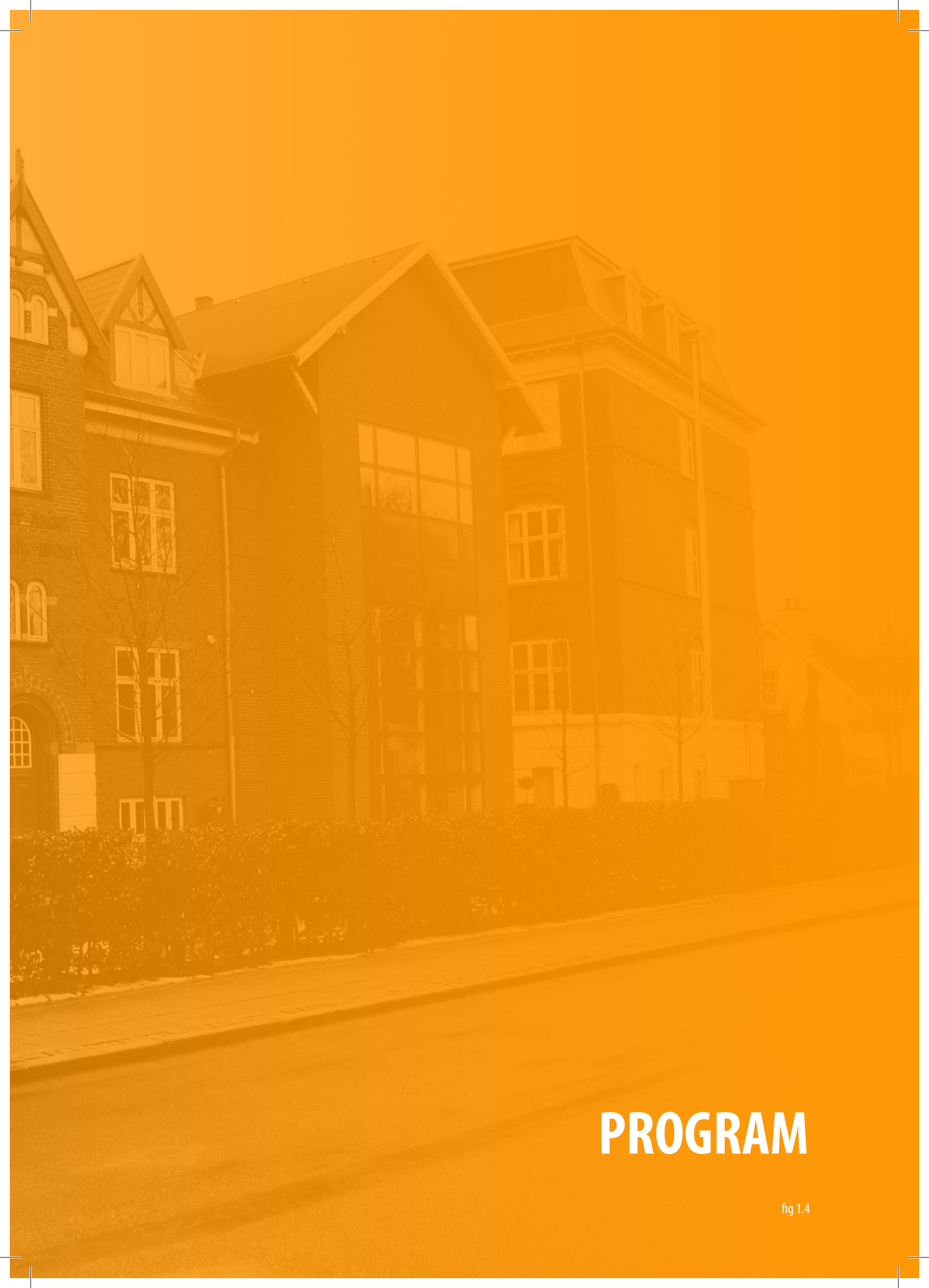




fig 1.3





PROGRAM

fig 1.4

THE PROBLEM

THE CURRENT SITUATION

The following is the problem statement upon which further analysis is based, thereby the existence of the problems nature can be pointed out and the potential for their solutions be more easily recognized.

Organization

Skipper Clement School is a private school in Aalborg. In 2005 the school took over the responsibility for Aalborg International School, providing an English based education program to the increasing number of talented foreign workers who come to Northern Jutland. The international school share administration with the Skipper Clement School however the international department resides at Vesterbro 14, while some of the minors reside at Gl. Kærvej. This results in administrative difficulties and due to the continuing growth of the international and national department, both schools has run out of available space, making the need for an extension bigger than ever. Both departments are being compromised by the situation, with facilities not optimized for modern teaching and not enough timetable space for certain activities. Therefore there is a wish to make 2 extensions to the Skipper Clement School, one for the smaller international pupils and one for the older international students coexisting in a bilingual environment with the older Danish students. This will not only future proof the Skipper Clement School but also give a sense of unity with one unified building, together with a greater relation between pupils and teachers of different backgrounds learning from each other. [JRT, 2012]

Teaching methods

The teaching at the international department differs in a lot of ways from the Danish one as most of the teaching is in English. The pupils have different backgrounds and are due to the lack of classes often being taught across year groups, making the work load on teachers for each lesson very high causing a high degree of stress related illnesses. Furthermore the school facilities are not optimal for an modern flexible teaching environment embracing all aspects of working: project related work in groups and individual, class lessons. [Ibid]

Surroundings

In its current form, there is no vacant plot for building an extension to the Skipper Clement School. As it is a difficult site with diverse surroundings it brings a lot of challenges. The site should best possible be protected from the surrounding noise and the current establishment should be respected and provided sufficient daylight. If the spatial needs of the school are going to be met, it is necessary to split the extension into two: 1 towards Stenosvej and 1 at Gl. Kærvej 24-26 demolishing two of the current villas, splitting the whole school into 3. In this project the focus will be an extension for senior pupil at the new acquired plot at Gl. Kærvej. [web 1]



fig 1.5-1.6 International School Vesterbro

FUTURE PLANS

PROPOSITION BY CUBO ARCHITECTS

This project is inspired by the current ideas for an extension to the Skipper Clement School. The idea takes it off-set in a "startrede-gørelse", which is an initial stage of the making of a district plan describing the problem, to which the school will be a solution.

As the international department is continuously growing and the need for new teaching facilities is becoming more urgent, the school wants an extension to the current school. However there is no more space to encompass it at the current school premises. Therefore in order to make a future proof solution two nearby villas Gl. Kærvej 24-26 are being bought to make room for the improvements.

The plan is thereby to make 3 schools in the school. Introductory school for the smaller pupils international and Danish will be placed towards at Stenosvej in a new building tearing down the 3 old villas unsuitable for teaching. The junior middle school will be incorporated in the current establishment that will be renovated and also contain the main administration. This project focuses on a new extension Gl. Kærvej 24-26, which will be a school for the senior pupils, international seniors and the oldest Danish pupils. The school will encompass new future proof teaching facilities such as a new multi hall gymnasium and science labs, and will in this project as a goal fulfill the BR2015 energy usage demands [Ibid]

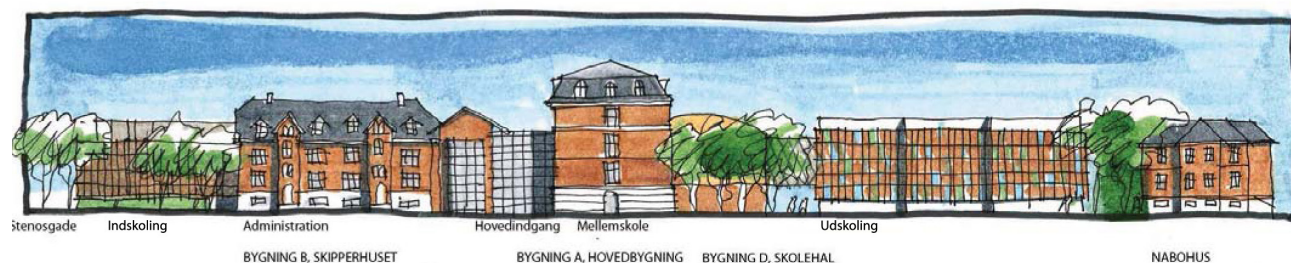


fig 1.7

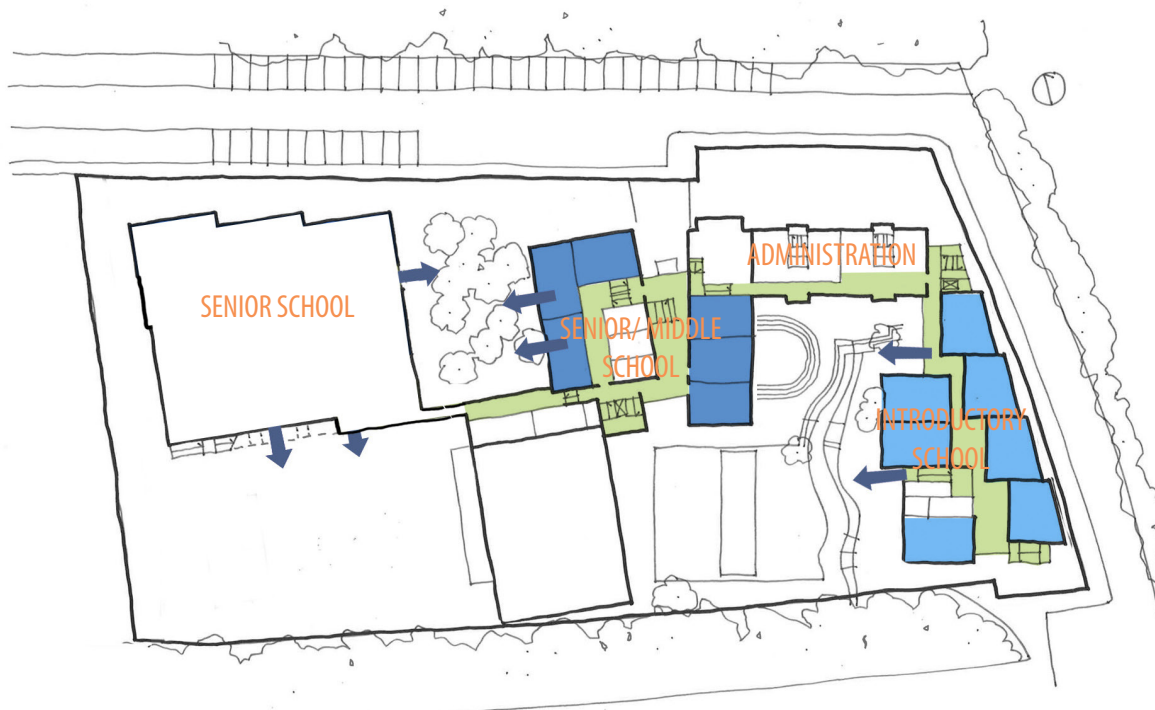


fig 1.8

CONTEXT

MAPPING

In order to gain an understanding of the current context, the surroundings of the Skipper Clement School and the school itself is analyzed. In the context the situational context will be introduced through its functions, infrastructure, microclimate and a phenomenological study of the experience of visiting it.

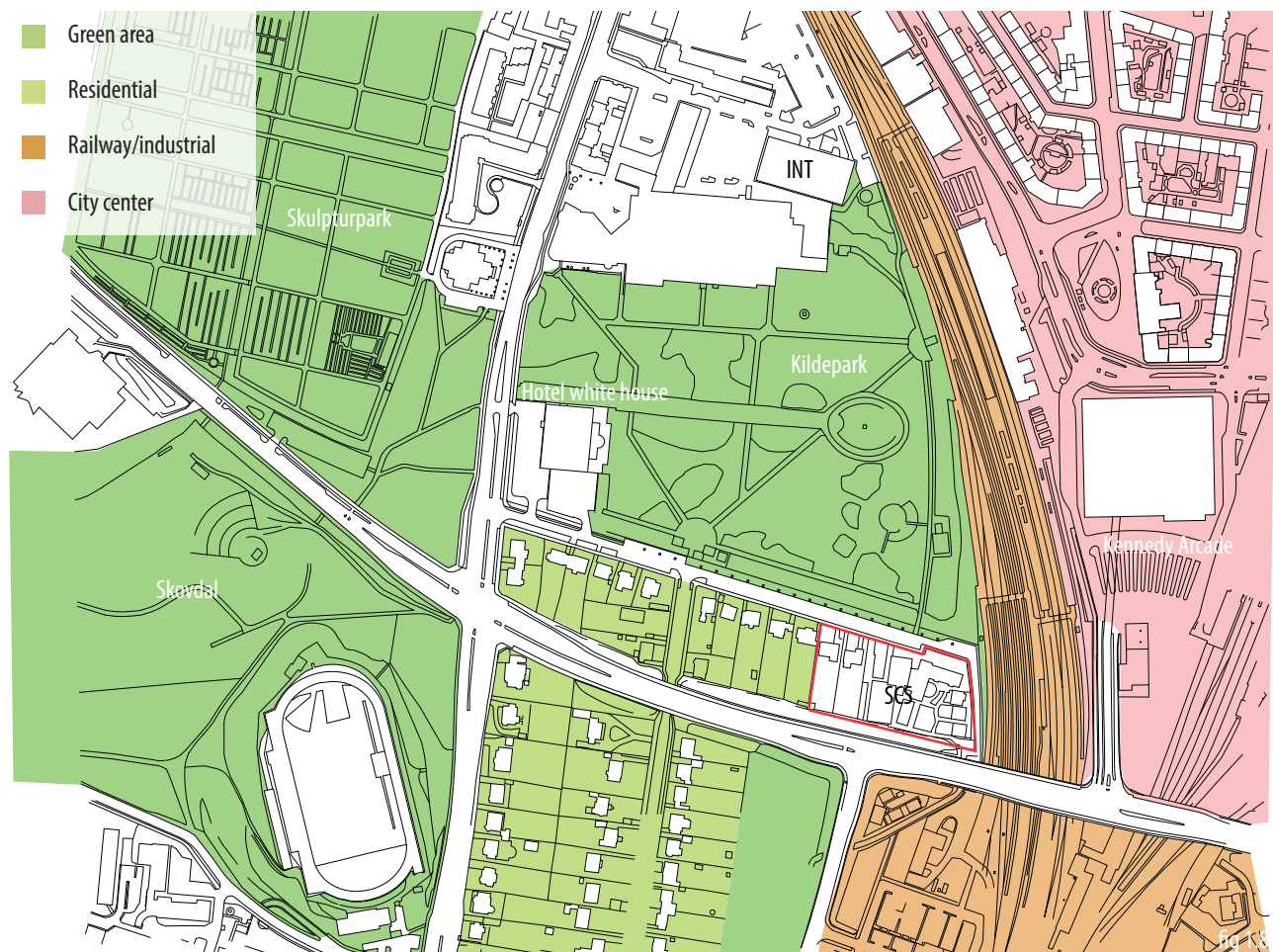
Functions

The Skipper Clement School is located in Aalborg, Northern Denmark. It consists of two departments: Danish and a International department. The international department at Vesterbro and the Skipper Clement School at Gl. Kærvej 28-30. There are several function and landmarks in close proximity to the school that gives the area its distinctive mark. Especially Kildeparken a big park is placed is placed right next to the school and often used by its smaller pupils.

Zones

The area around Skipper Clement School can be split into different zones the zone to the south and west being primarily green areas: Kildeparken, Skovdalen and Skulpturparken. The area right where the school is and straight south is a villa area. As you move more towards East the character gets more industrial with a railway making its mark before getting to the city center. The school itself lies right in the meeting between these zones.

The new school will be placed in connection with the current Skipper Clement school, making the international department an integrated part of the current school. This requires that the new building should take the existing building, the green surroundings and the villa neighbourhood into consideration.



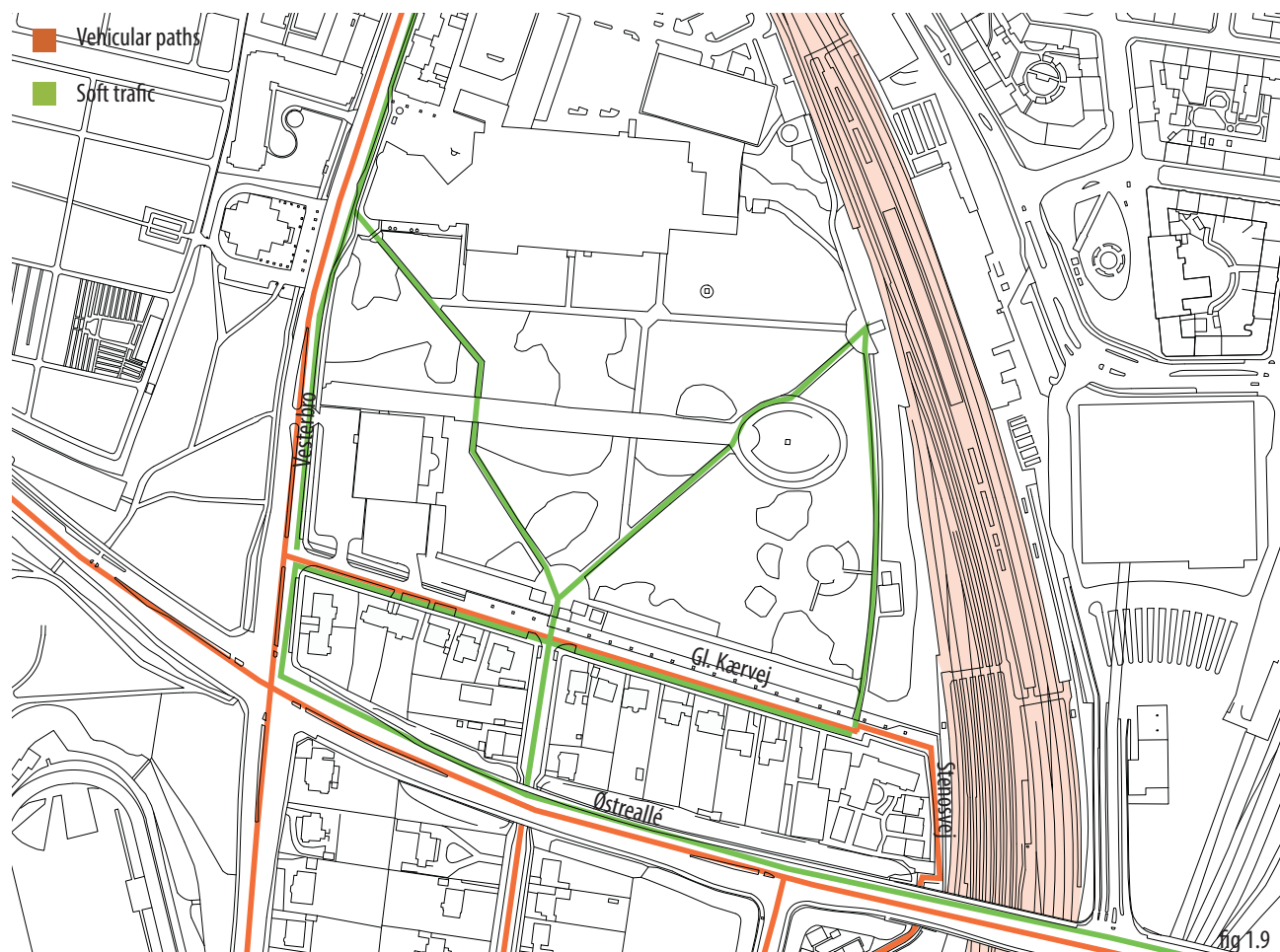
Infrastructure

Three important paths of traffic run through the area of the school. Østre Allé running along the school area, is a high speed motor traffic road. It contributes to a lot of the air pollution and noise in the area, however the road is raised approximately 8 meters above the ground level of the school giving a minor shelter from the nuisance making the area seem comparatively quiet. Further to the west Østre Allé connects with Vesterbro/Hobrovej with is a main traffic road that leads North through the Limfjords bridge and towards the high way in South Direction. Gl. Kærvej and Stenosvej is the only access to the school area using motor vehicles and are both low speed traffic roads. Towards the East the railway runs under the Østre Allé and creates a void between the school area and the Kennedy Arcade area. It does not make a lot of noise however the position of the railway is one of the main reasons that an extension to the school fulfilling all its spatial needs is impossible.

Soft traffic

Kildeparken and Gl. Kærvej are the main route for soft traffic both pedestrians and cyclists. The path system secures an easy and safe acces to the school.

The school is placed centrally in Aalborg and offer good possibilities for access. Public transportation takes place from Hobrovej to Gl. Kærvej making these together the main acces pathways, to which a new building should respond. The use of bike and walking as a transportation mean, should be encouraged by the new school by providing good parking spaces for bikes.



THE SCHOOL

ARCHITECTURE AND SPATIAL ORGANIZATION

To get more familiar with the current Skipper Clements School, to which the new school will be an extension, its architecture and spatial organization will be explored. Furthermore relevant points from the old district plan is used as an inspiration to establish a set of rules regarding the new building.

Architectural context

The facilities of Skipper Clement School on Gl. Kærvej are divided into 4 buildings. The whole complex is a mixture of architectural pieces build in different years. Thereby there is a clear distinction between each of them. However tell something about the historical development of the school.

Main building

The main building is the oldest, dating back to the beginning of the 20th century. It has a lot of the characteristics of classical historicism with its classical details, curvy profile cornices, curvy dormers and prominent mansard roof establishing it as the main building from which the rest of the school evolves in its form and scale. The building can be interpreted as 3 parts: a heavy base, a slender main body of red brick work with the lighter roof on top.

Skipperhuset

Skipperhuset from 1908 is national romanticism which can be seen from the use of old Nordic motives in the brick work and especially the vivid timber roof gable constructions painted red reminiscent of Swedish wooden houses. Like the main building it is full of architectural details on the facade, however Skipperhuset appears more colourful than the other buildings.

Extension 2001

The void between the main building and Skipperhuset is filled by a semitransparent entrance, with black mullions in a stringent pattern connecting a school extension from the same year 2001 to the main building. This extension is in brick of a different hue and follows Skipperhuset in its scale, however it seems less interesting like it is trying to mimic the old buildings.

Gym hall

The last building enclosing the play yard towards the west is the gymnasium from around 2005. It is an extension to the main building, with a partial red brick and planked wood faced facade and a barrel vaulted roof. It makes a clear boundary for the school complex, protecting the inner school yard from the surroundings. [Ibid]



Spatial organization

The fact that the school has gone through several developments at different periods has resulted in a mix of style and an equally complex spatial organization. In the current situation the oldest pupils are placed in extension from 2001, the middle pupils and the administration in Skipperhuset, the smallest pupils in the main building and the 3 old villas.

Between the buildings there is a small school yard, primarily directed towards the use of the younger pupils. Its small size makes it difficult for many pupils to use it at the same time resulting in several of the older students staying inside during the breaks. As it can be seen there is limited communal area, either it is a corridor or hallway or a classroom. The boundaries are very abrupt. Meaning that the teaching environments are similar and do not have the acquired flexibility of today's needs.

District plan

New construction cannot exceed 3 stories, this will also respect the neighbouring buildings. The main building is of high preservation value and should therefore not have changes made to the facade. Future buildings should have facades that appears fully or partially as masonry brick, wood clad or transparent glass. The area has a green character that must be preserved. The school must be accesible from Gl. Kærvej and have sufficient parking spaces 1 for each 20 pupils. [web 2]

The school have a diversity of architectural elements and each building has a charm in the sense that it has an identity while relating to the whole. The architecture have some common traits that should be used in the new building to strengthen the relation, however it should be done with a building in touch with the current architectural trend and not through mimicking the existing. The district plan for the old plot has relevant design parameters for the sketching phase, however the use of materials can be broadened. It can be concluded that the buildings needs to be connected internally with the new building. There will need to be an entrance from the main building to the senior school, which is possible through the gymnasium. It is logical that the smaller pupils will be placed at Stenosvej close to the inner school yard which have good outdoor play areas for children. Senior pupils should be placed in a new building Gl. Kærvej 24-26 where new outdoor areas for the use of older children should be established as such is currently not existing.

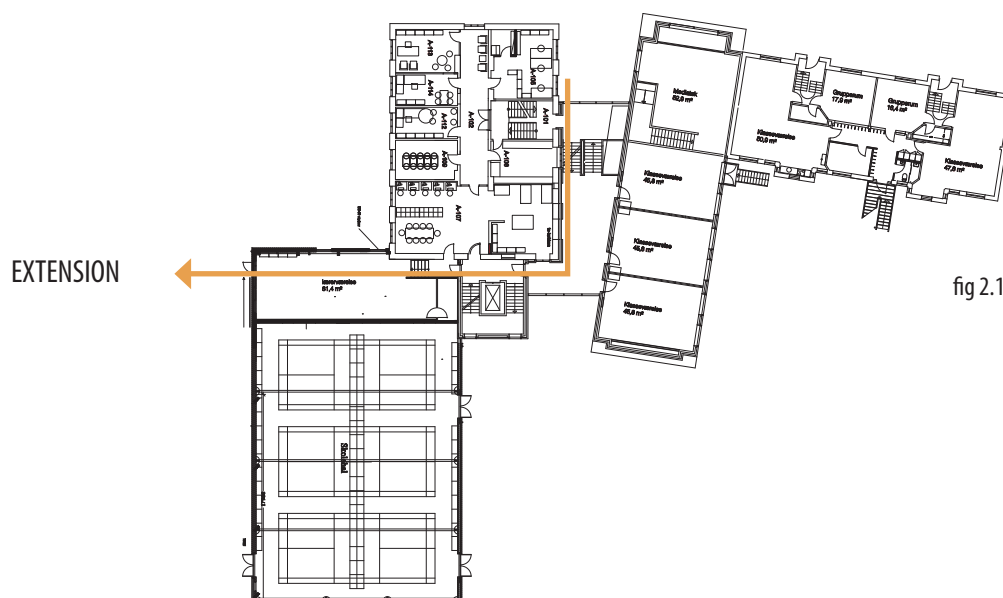


fig 2.1

VIEWS

PICTURE OF THE SCHOOL AND SORROUNDINGS



THE SCHOOL HAVE A DIVERSITY OF ARCHITECTURAL ELEMENTS AND EACH BUILDING HAS A CHARM IN THE SENSE THAT IT HAS AN IDENTITY WHILE RELATING TO THE WHOLE. THE ARCHITECTURE HAVE SOME COMMON TRAITS THAT SHOULD BE USED IN THE NEW BUILDING TO STRENGTHEN THE RELATION, HOWEVER IT SHOULD BE DONE WITH A BUILDING IN TOUCH WITH THE CURRENT ARCHITECTURAL TREND AND NOT THROUGH MIMICKING THE EXISTING.



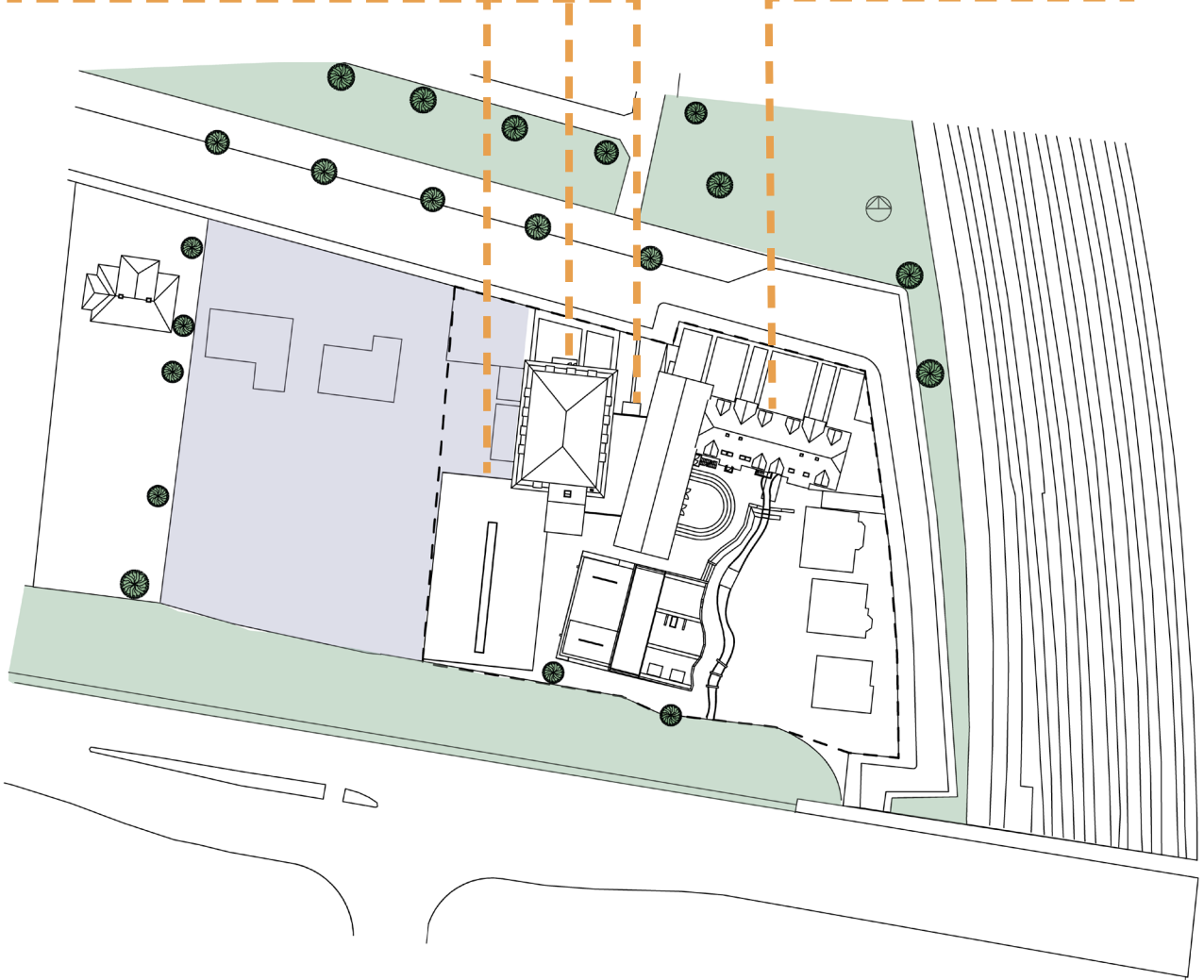


fig 2.4

MICROCLIMATE

WEATHER AND SHADING

In order to achieve a sustainable design solution that ensures sufficient daylight and a good indoor environment, it is important to analyze the microclimate. In order to create a sustainable school the design must work with the context implementing passive design solutions in the best possible way. Furthermore it is important to respect the original school and surrounding buildings, not overshadowing they need for sunlight and a good view, that all are contributors to a good learning environment.

Weather

According to data from the Danish meteorology institute the warmest months are July and August with temperatures reaching around 20 Celsius during the day. However as most of the high summer period will coincide with the summer vacation, most attention should be paid to cooling and ventilation should be right before the summer vacation e.g. June, as this is when the internal heat gain is equally high. This means the months mid April to June and from mid August to September should acquire the greatest efficiency of ventilation and solar shading. In contrast the winter months: Jan, Feb, Nov, December, are when the need for solar energy is the biggest. [web 3]

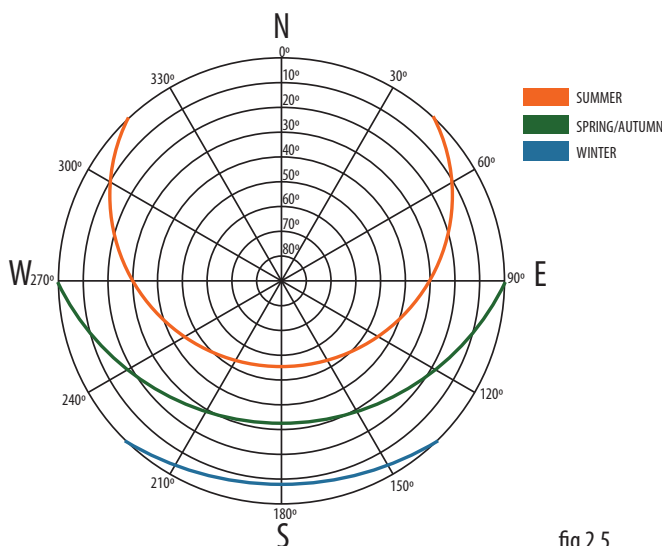


fig 2.5

Sun and shading

The sunpath diagram ill. 2.5, shows an illustrative registration of the course of the sun during a year that together with the shadow diagrams ill. 2.7 gives a good picture of the sunlight intake on the plot for the school extension. The registration shows that the sun intake is highest from South. The intake from West is higher than from East due to the existing school buildings shadowing from East. This means the more the building will be placed towards the west of the plot, the more eastern sun it will get, however it is not wished to shadow the neighboring villa. The more towards winter time the more shadowing there is from the southern Østre Allé slope due to the low sun angle. As it can be seen the sun path is much shorter in winter, the sun is not rising until 9:00 and sets around 16:00 stressing the potential of placing the building towards the north leaving space for outdoor activities at the south of the plot. [Ibid]

Wind

The wind rose displaying the wind conditions in Aalborg ill. 2.6 shows that the dominant wind direction is coming from West/Southwest. The plot is protected from some of the wind due to the slope and the neighboring villas however extra wind protection in the shape of vegetation should be considered in order to ensure outdoor spaces of high quality. [web 4]

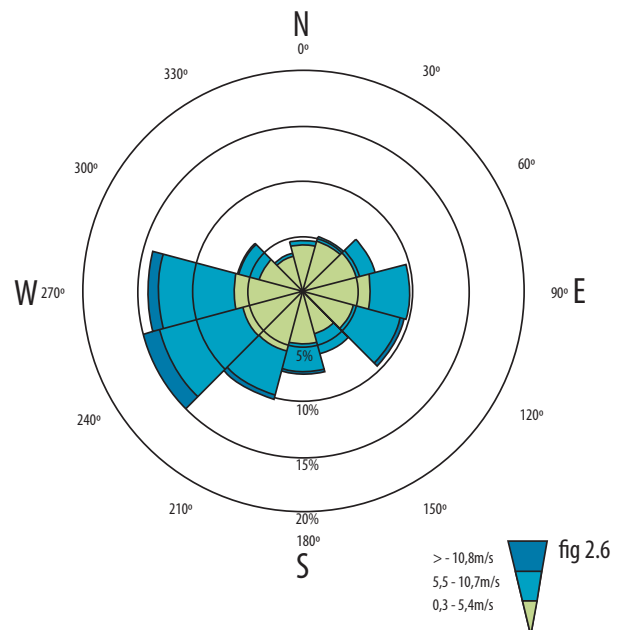
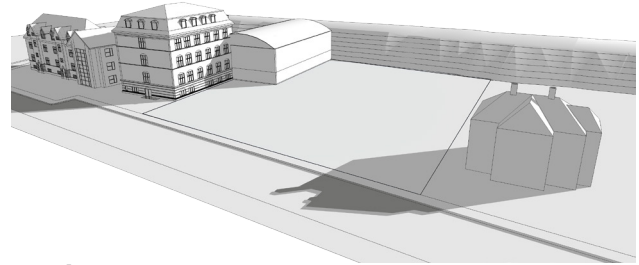
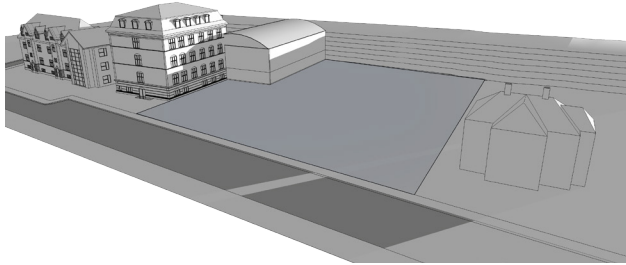
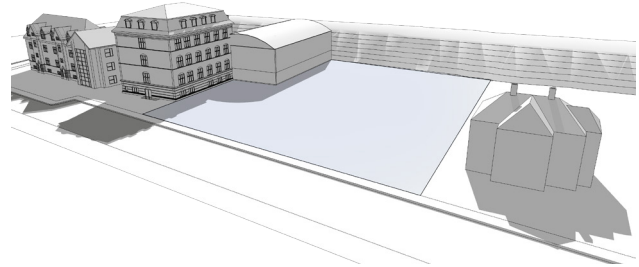
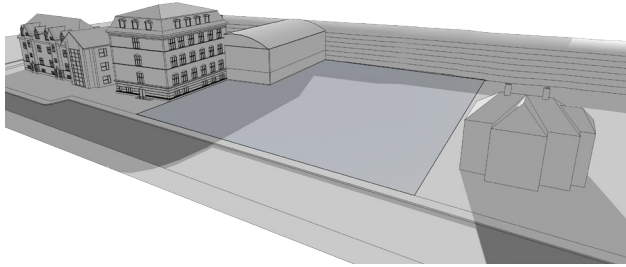
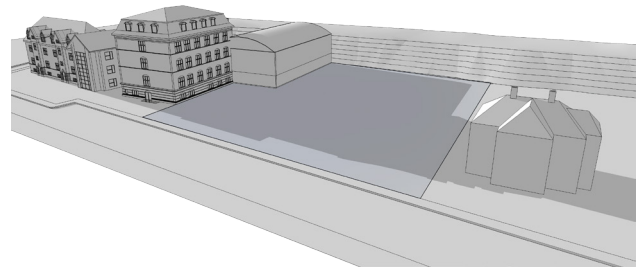
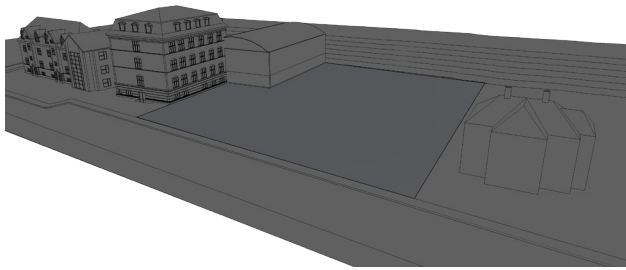
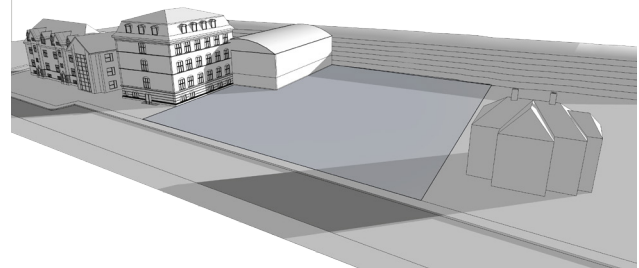
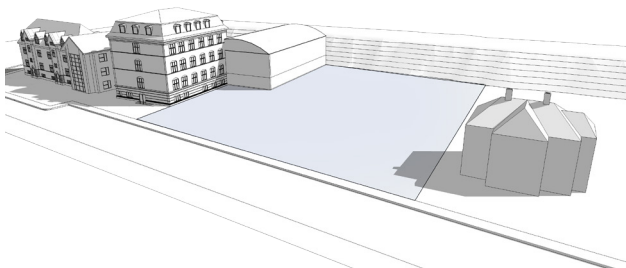
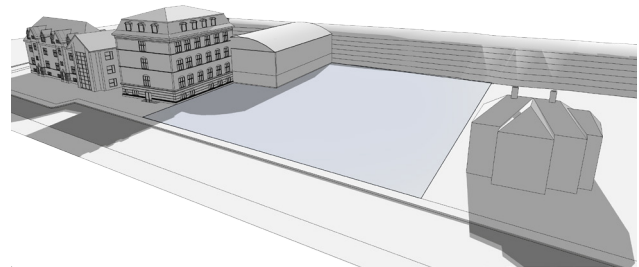
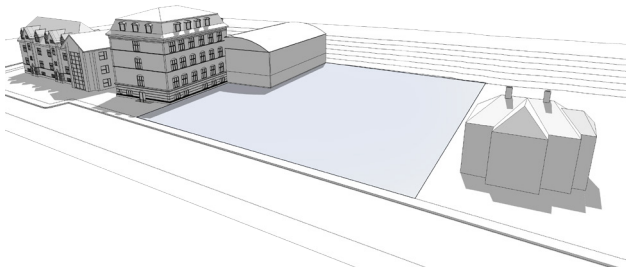
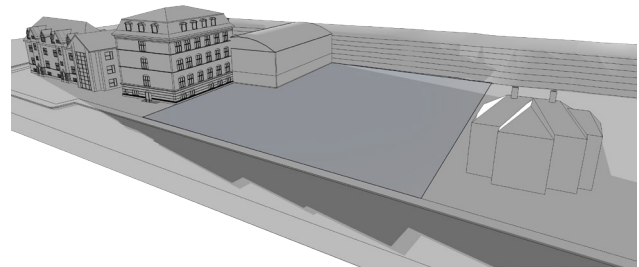
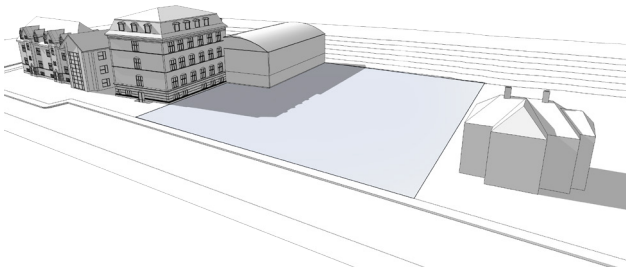


fig 2.6



January 21st

March 21st



June 21st

October 21st

fig 2.7

USER GROUP

IDENTIFYING THE USERS

In order to gain an understanding of the user group for the school extension, the current users and the trend in the schools development are analyzed.

Current situation

Skipper Clement Skolen is a private school in Aalborg that houses around 700 pupils from kindergarten to 10th grade (5-17 years old). 550 of the 700 pupils follow a Danish Education program while the rest 150 is international pupils following a recognized international Cambridge examination system. The limitation of space available has resulted in the Danish number of pupils dropping and the international line cannot grow further, therefore new extensions are needed. [one school – description and rationale, 2012]

It is the idea of an extension housing a multicultural environment, that it will stimulate and strengthen the relationship between cultures being beneficial for both the Danish community and international families considering integration into the Danish society. [Ibid]

In its current state the school has:

- 2 full Danish Lines from Kindergarten to 9th grade
- A partial Danish line of 7,8,9 graders
- An international line of 8 classes
- 3 euro classes, 10th grade
- An after school service for 5 to 11 year olds
- A service for special education needs

The primary language of the international department is English however there is also teaching in Danish, Spanish, French and Chinese etc. in order to train the pupils in their mother tongue as well. As the pupils all have different backgrounds and skills as they come to Denmark, it is necessary with individually fitted teaching. Therefore a lot of the work is project orientated for pupils of different skills to work together. However their educational program requires more individual work and exams than the national one does, meaning there is a big need to provide both kinds. Most of the Danish teaching is class room teaching however the new building should offer a variety of teaching ways to both national and international to further encourage learning and make the school suitable for the future. The majority of the international pupils are children of families that are not Danish and are staying in Northern Jutland for a limited period of time. Another part is with Danish parents but who have lived overseas for the last 5 years or more. The parents of the international students want an English quality education for their children with international examinations and a multi-cultural environment with international values. [JRT, 2012]

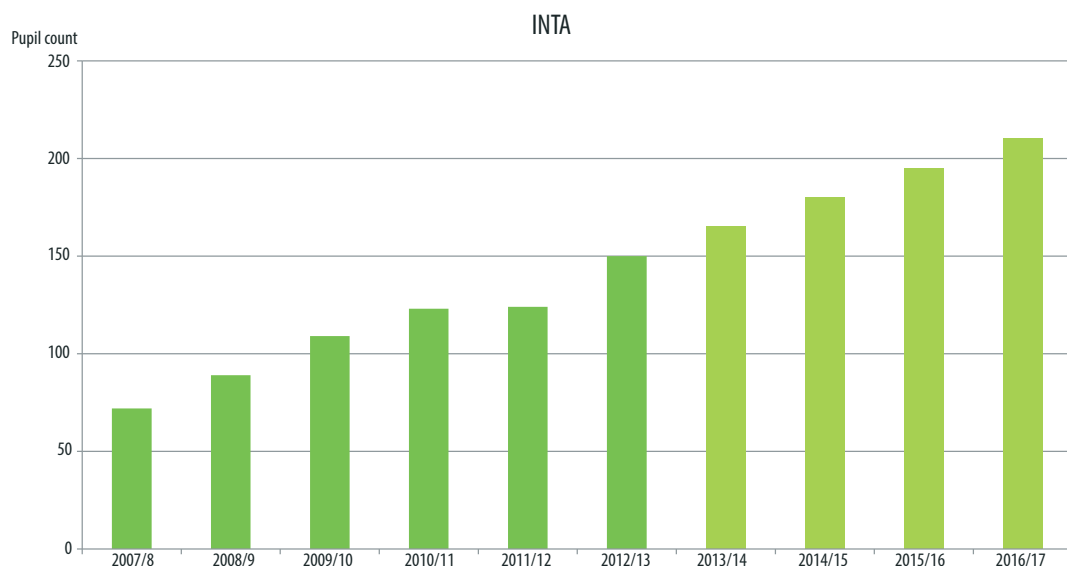


fig 2.8

The future situation

Currently the international school is divided into 8 stages, meaning some of the year groups have been combined. One of the wishes for the extensions is to make the international school a complete line of 11 year groups as the school will have over 200 pupils. This project focuses on an extension for the international classes 10-11 the former stage 9-10 and three 9th grade national classes. The international classes similar to grade 7 will be placed in the main building together with the national 7-8th grade, close to their own year groups and the new school extension [Ibid]. The extension will contain:

- Class 10 INT, 14-15 year old similar to the Danish 9th grade
- The last class 11 INT is for 15-16 year old and is similar to the first year of gymnasium/high school.
- Class 9 national for 14-16 year old Danish pupils.

A school day for these classes vary currently because of the availability of rooms, however when these are provided an average day ranges between 8:00 and 15:15 [web 5]

Besides the pupils the buildings other users will consist of teaching staff both national and international, around 10 new staff members. It is important that teachers are not isolated from the pupils, they should be part of the community and be available for communicating with the students. In this project the senior classes above will be placed together with the Danish 9th graders to create a bilingual school environment offering the best of two worlds: international education and the experience of Danish education and culture.

Designing for senior pupils

When designing spaces it is important to take into account the development of the children. In the age of 14-17 years old the young pupils discard the spaces that used to have importance for them when they were "small". Instead of staying in the class to work, much work is done in hallways, reading corners, niches and stairs. They tend to have a preference for spaces that are more free, meaning they can help shape the purposes of the spaces themselves. [Realdania,2010]

The same can be said about the teaching, as the teaching from 7th grade become increasingly more project oriented, the pupils start to define some of their own working tasks. It is a time where they develop more independence, defining their own goals and opinions and possibly the time with the last possibilities to influence their future choices. Therefore it is also important to implement rooms with a high degree of physical activity that can influence their future lifestyle. [Broekhuizen,2009]

2 class rooms with INTA class
10-11, with max 26 persons

3 Danish 9th grade classes of
26 persons



10 staff members of different
nationalities

fig 2.9

SCHOOL TYPOLOGIES

TENDENCIES AND USE OF SPACE

Based upon the modelprogram 2001, [Realdania,2010], the 3 main school typologies: the multiple floor school, the function segmented school and the spatial flexible school are analyzed. Each has its own characteristics and reflect different pedagogical approaches and learning environments.

The multiple floor school

The multiple floor school is an old typology originating from the 19th century. This typology is often located in city centers with limited area available. It typically consists of 3-4 floors with an entrance area in the ground floor and class rooms in cells with subject rooms attached. Many square meters are used on stairs and access ways and the teaching principle the old fashioned with the teacher in focus.

The function segregated school

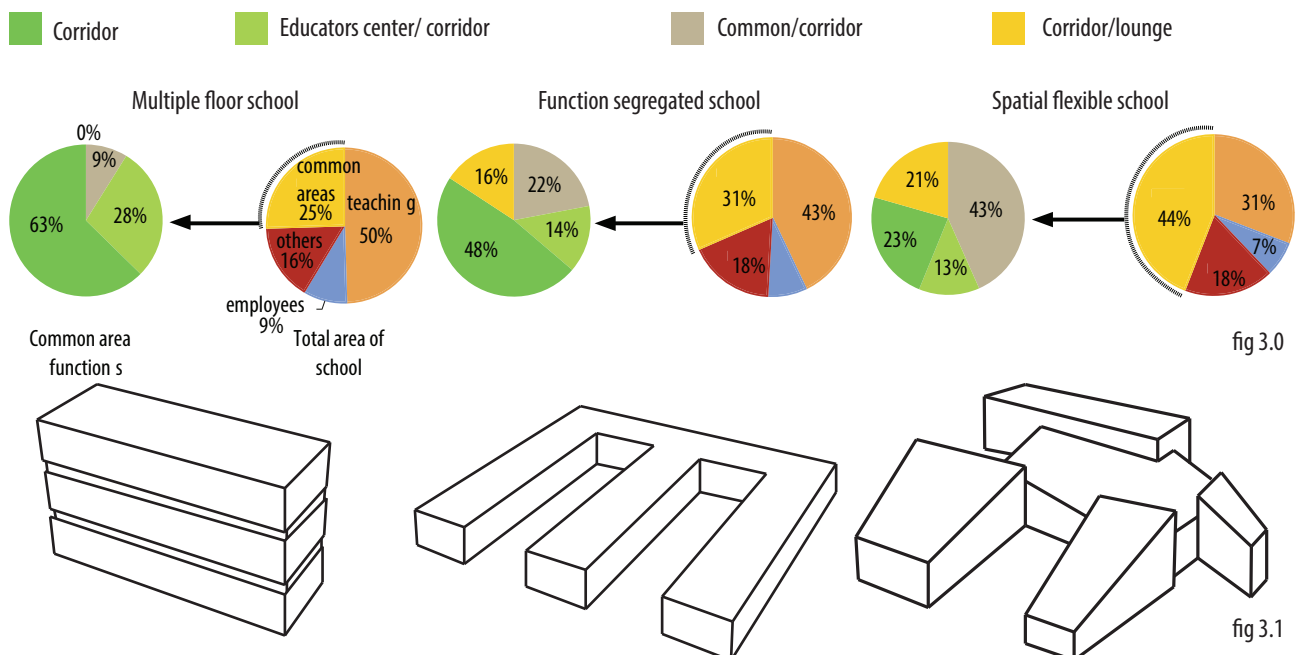
The function segregated school appeared in the 1950's. Usually located in city outskirts and consists of one floor in a comb-structure. The program is split into smaller independent parts (classrooms etc.) residing in each wing. The wings are connected by a large corridor tying everything together. This typology is spread over a big area with large common areas and area spent on corridors. It has a good relation to its surroundings and supports a learning principle where the teacher and pupils are more equal.

The spatial flexible school

The spatial flexible school appeared in the 1970's. It is an open plan school split into several "home areas", where several classes and grades reside. The teaching principle of this typology is flexible, with work alternating between class room tuition and team teaching, project related work across classes and individual work. Usually the different functions are grouped around a central element, where a sound flow binds all the elements together in order to give an relation to the whole.

The objective

In this project the school will be a mix of these typologies as the extension should not expand over an area comparable with the one from a comb structure. However the focus will be to create a spatial diversity with several communal areas enhancing the spatial experience while making the building in a more sensuous in scale and less hierarchical than the multiple floor school. The different typologies clearly display the development in the relation between area for class rooms and common areas ill. X. More attention is paid to the social aspects in the open plan flexible school and a new school should emphasize the current focus on social interaction. In this project the focus is not to create flexibility through furnishing but architectural spatial diversity with spaces accompanying diverse needs.



THE GOOD SCHOOL

PRINCIPLES OF TEACHING

Pedagogical principles

The concept of a good school has changed over time and will continue to do so in accordance with changes in society. The following is based on principles of today's good school. Today's schools play a bigger part in the life of children and young people than ever. They are more than an institution for conveying knowledge and studying, they play a vital role in socialization. Compared with the passive tuition of the past, where the pupils were tied to a table at specific hours for passively listening to a teacher, the teaching process of today is more didactic. The teaching has become more active with the students having more responsibility. It is a 2 way process where the students are encouraged to reflect upon the taught material. Equally the working methods are more free and diverse. Much of the school work are project oriented and can be part of group work, workshops. This is reflected by the schools where more open learning domains and new work places for studying, social interaction and relaxation have emerged. Equally the class room does not consist of tables in a line oriented towards the teacher's desk and a blackboard, it has to be suitable for different teaching methods theoretically and practically required by different subjects. This has also changed the role of the teachers who are becoming increasingly more like tutors in the group work besides giving lessons. [Broekhuizen,2009]

One of the major aspects of modern teaching is the recognition of the individual and his or hers learning ability. Through the various learning styles the pupils are given an opportunity to acquire new knowledge in a way they find the most suitable. In other words the teaching has become more pupils driven. As the pupil - teacher relationship has become more even the functional borders in the school has become equally more fluid and so has the character of the school itself, it is less institutional than in the postwar period and should be more like a second home for the pupils. [Ibid]

It can be concluded that flexibility is a big part of the modern school, not only in the building fabric with the architecture having flexible properties but also through the teaching. The many working methods give a differentiation making it possible to reach all the pupils. Some pupils might learn the best from being in a dialogue with others while others prefer a more calm atmosphere, similarly some pupils have problems being tied to the chair for hours while they can concentrate for longer periods sitting on a staircase reading. It shows a tendency away from the traditional auditory teaching methods and a diverse one that embraces more fields of learning, which is a goal for the new school. [Realdania,2010]



fig 3.2

FOCUS AREAS

THE 3 INGREDIENTS

Due to the increased focus on diverse teaching methods this section will focus on 3 focus areas: flexibility, well being and cooperation. The analysis of the focus areas are based upon their influence on key rooms, in this case the class room and common areas, which can help clarify which initiatives that should be put into use to achieve the wished school environment.

Flexibility

Flexibility refers to both the working methods and the spatial differentiation. Learning flexibility in working methods refers to differentiation between class based teaching, group work and individual work and teaching across classes. Learning flexibility is about spatial diversity in the environments for the teaching. The flexible school is not divided into separated function but has fluid transitions. Many schools have home bases instead of class rooms where the hallway is integrated. The library becomes open and has a central position in the building, the open domains. Flexibility is a way to future proof a building, its essence is that the spaces can be used for different activities, not at the same time but over time and it is a mean to achieve learning flexibility. [Ibid]

Wellbeing

The school plays a major part in the well being of the pupils. It is important that the school helps to establish social connections between the pupils as it can help build a motivational framework and encouraging learning, all factors linked to the wellbeing. Therefore the school must provide a variety of rooms

and activities that creates a sense of a communal feeling and positivity that the pupils will affiliate with the school. It should give the possibility to create smaller communities in the big community, so the school can be linked to a positive social establishment giving it a good profile. However it should not be forced, the pupils must have the opportunity to appreciate their individual differences while having social interaction. The sense of belonging is connected to ownership, personally or in a smaller community. A classroom can contribute to an ownership feeling and sense of belonging even something more personally as a shelf or chair. Some research suggests that physical activity benefits wellbeing and concentration, therefore the school should have the facilities to support a greater physical activity. [Ibid]

Cooperation

A goal for many schools today is to achieve a higher degree of corporation not just among pupils but also among teachers. Corporation is a big part of the modern teaching principles, where teacher plan the tuition sometimes as collaboration between subjects and classes. The common areas creates the framework for much of the cooperation, giving space for meetings work related but also for relaxation at hot spots. [Ibid]



Flexibility



Wellbeing



Cooperation

fig 3.3

SUSTAINABILITY

ENERGY USAGE REQUIREMENTS

In this project the goal is a sustainable design for a school. The focus is on minimizing the energy usage in order to bring the production of electricity and CO₂ emission down.

The energy usage can be lowered in many ways; the essence is to minimize the energy used for heating and cooling. Therefore one of the big challenges is to have a healthy balance between heating and cooling in order maintain a good indoor climate and lower the energy usage. The optimal way to minimize energy usage is by use of passive means. Passive means includes high insulation construction, low u-values for windows and doors, usage of materials with high thermal mass and minimizing thermal bridges. However the first and most important step is to optimize design according to the environment, meaning an optimization of the use of solar heating natural ventilation. Their efficiency is very dependent on orientation of the building and the placement of the windows. This requires a sound zoning in order to orient the rooms according to their demands for instance rooms with a high heating demand should be placed towards south. Another aspect is the building physique, the more compact the building is the less energy will be used for heating and also in total if the ventilation and daylight provided is sufficient. [Knudstrup, 2009]

The goal of this project is to design the school to minimum fulfill the energy requirements for low energy building 2015 (41kWh/m²+1000/area) listed in ill. 3.4. By minimum means that the capabilities of the building will be optimized further after the goal for 2015 is reached trying to achieve the goal of the 2020, meaning an energy usage of 25 kWh/m² a year for the total need of heating, ventilation, cooling, hot water and lighting for each m² heated floor area (BR10 7.2.4.2) [BR15,2013].

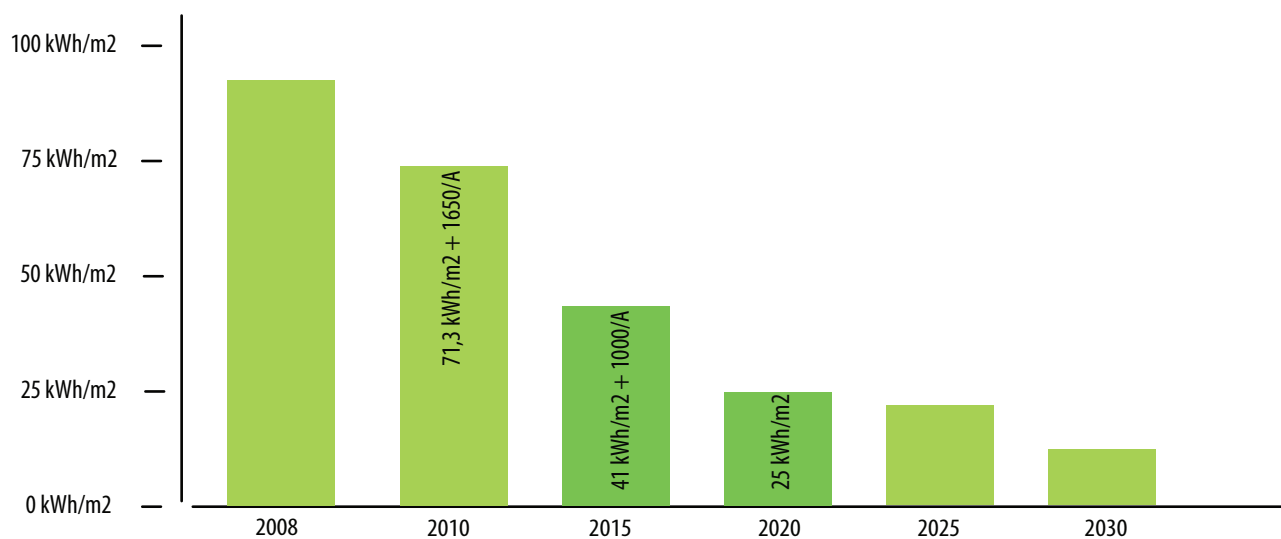


fig 3.4 Energy demands for institutions

ROOM PROGRAM

INITIAL SPATIAL OVERVIEW

This project is based on Skipper Clement School's desire to make a school extension that helps in uniting the school's 2 departments while providing new facilities to the school and create a future proofed bi-cultural learning environment. The expansion program is based upon ideas by the school itself and the findings from the analysis. [ideas for new building, 2013]

Home District

According to the Skipper Clement School, it wants to have 11 year group classes. The plan is that the extension will house the two oldest international classes 10+11 and the 3 Danish 9th grade classes. Therefore the extensions needs a total of 5 class rooms. Furthermore they express a wish for a group work area in close relation to the class room.

Subject Rooms

The school is in need of 3 science rooms with work area attached and storage. Furthermore there is a need for a music room.

Public functions

A multi purpose hall with 2 changing rooms. The multipurpose hall will be used for general assemblies, drama, music and dance but also sport. It will be possible to use the hall for physical activities in the breaks.

Preparation room

the teacher preparation rooms should be placed in a close distance to the class rooms, thereby reflecting the new relationship between teachers and students.

It is important to note, that this is constructed as an initial room program that undergo changes through the process as fitted to goal of the design.

	Area [m ²]	Pers.	Activity [Met]	Summer [C]	Winter [C]	Max CO ₂ [ppm]	Daylight F. [%]
Home district							
Class rooms, 5 rooms	60-70	24-26	1,2	24 ±1,5	22 ±1	900	2-3
Groupwork area	60-120	24	1,2	24 ±1,5	22 ±1	900	2-3
Teachers preparation	40-50	10	1,2	24 ±1,5	22 ±1	900	2-3
Toilets, 2 + handicap	20	5	1,2	24 ±1,5	22 ±1	900	2
Storage	6	1	1,2			900	-
Printer room	9	2	1,2			900	-
Subject Area							
Physics	92	26	1,2	24 ±1,5	22 ±1	900	2-3
Chemistry	92	26	1,2	24 ±1,5	22 ±1	900	2-3
Biology	92	26	1,2	24 ±1,5	22 ±1	900	2-3
Storage	16	2	1,2			900	-
Music + storage	80	26	1,2	24 ±1,5	22 ±1	900	2-3
Work area	70	40	1,2	24 ±1,5	22 ±1	900	2-3
Toilets, 2 +handicap	20	5	1,2	24 ±1,5	22 ±1	900	2
Public functions							
Multi purpose hall	400-500	100-120	2	24 ±1,5	22 ±1	900	2-3
Changing rooms, 2 B/G	35	30	1,2			900	-
Entrance area	30	10	1,2	24 ±1,5	22 ±1	900	2-3
Other							
Disponible/Lounge	60	25	1,2	24 ±1,5	22 ±1	900	-
Technical room	100	-	-	-	-	-	-

fig 3.5

VISION

The vision of this project is to design a new modern school extension to Skipper Clement School, accommodating senior international and national students in order to create one united school. Architecturally it is an unique opportunity to create a united identity for the school and its diverse users. The school will embrace its pupils offering future oriented educational facilities that will satisfy the needs of Skipper Clement School now and many years to come. The school will support the pedagogical focus on flexibility, wellbeing and cooperation, supplying the whole school with good meaningful learning environments that support the will to learn, socialize, experiment and being physical active. It is the intention to express the different uses of the school by stressing the difference in volume size, so the users will have a differentiated experience according to the activities. The school will not be a single entity but exist in coherence and help giving the pupils of the school a common experience and bridge between different cultures. Such an healthy learning environment will be expressed through the architecture and its capability of being a sustainable school.

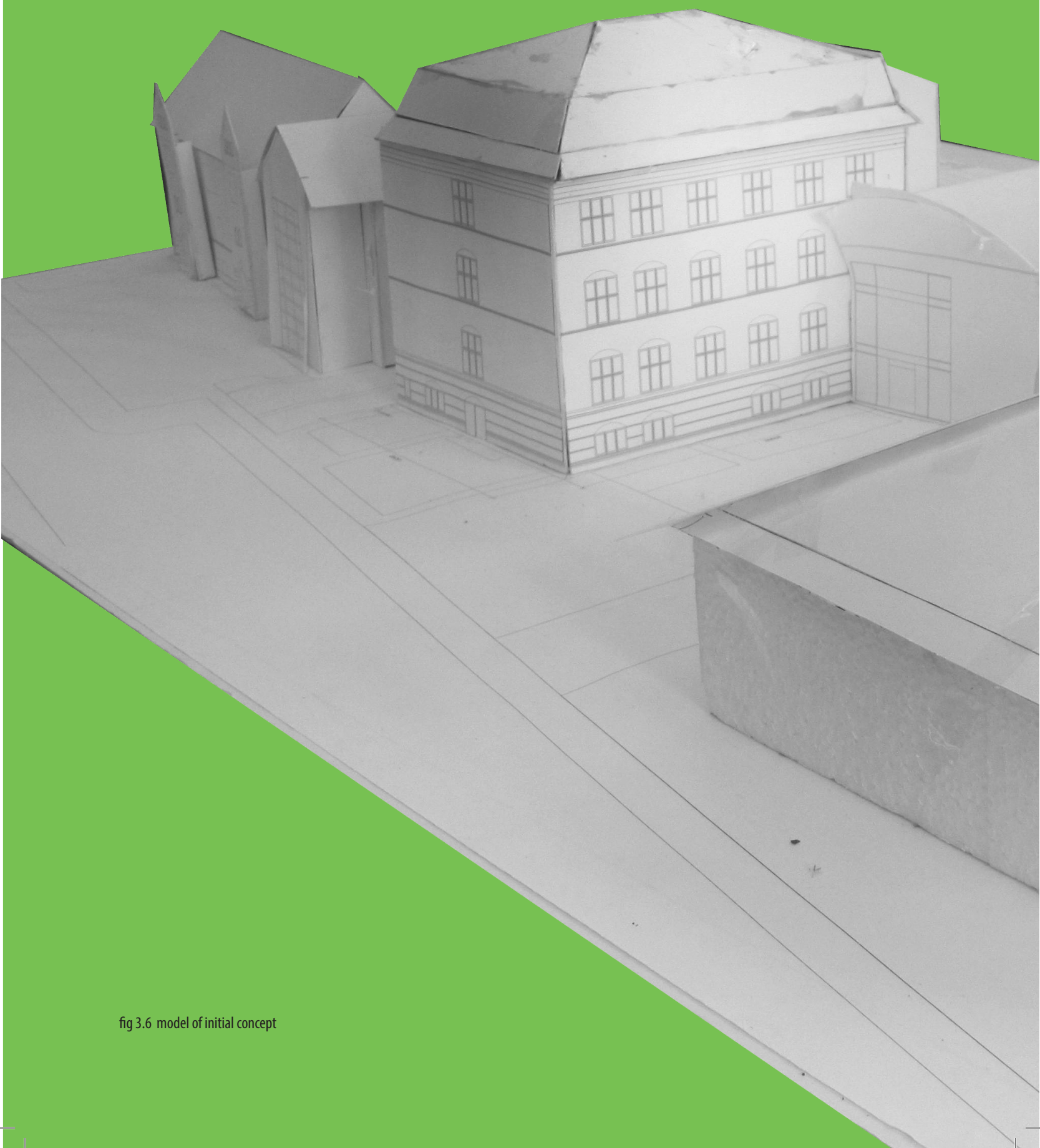


fig 3.6 model of initial concept



DESIGN PROCESS

SKETCH 1

INITIAL CONCEPT

THE DISPLACED BLOCKS

Inspired by the sketched proposal by Cubo architects, sketches were made for a concept where the different functions were placed in the northern periphery of the multi hall, integrated part of the school in close connection with all the other functions. From the beginning it was the intention to place classrooms towards North, so they could get the lovely view towards the Kildepark and the inner Aalborg, making the classroom surrounded by a green scenery but still relating to the city. Another advantage of the northern placement, would be the limitation of overheating which would be beneficial due to the high internal heat load in the class rooms.

The massive volume and big area of the multi hall made it necessary with a big basement floor if not wanted to have 3 floors, which made the building much more complex. Long corridors and several stairways between the floors making the flow of the building less intuitive and more troublesome. The size of the multi hall also closes off the whole southern facade, separating the school in two parts. A northern part with subject rooms and classrooms and the southern multihall. The functionality was also questioned, as having the hall so integrated with the rest would cause more noise. The building became to blocky and massive with no sound entrance area or path system.

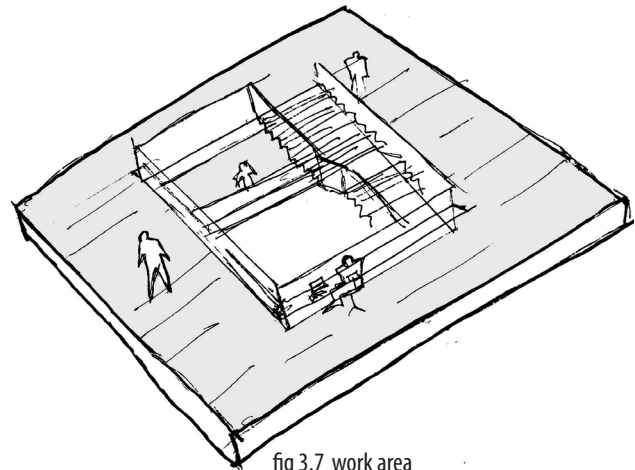
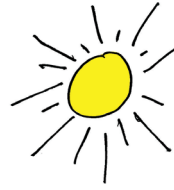


fig 3.7 work area

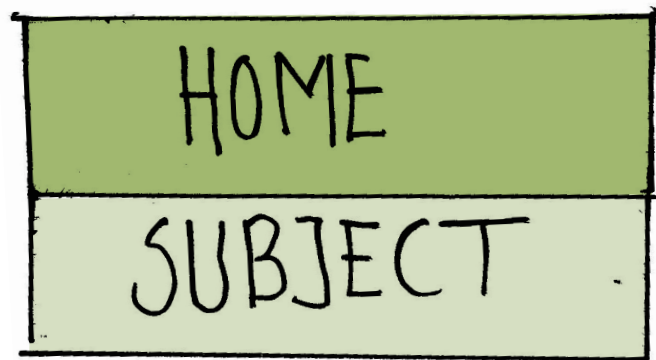
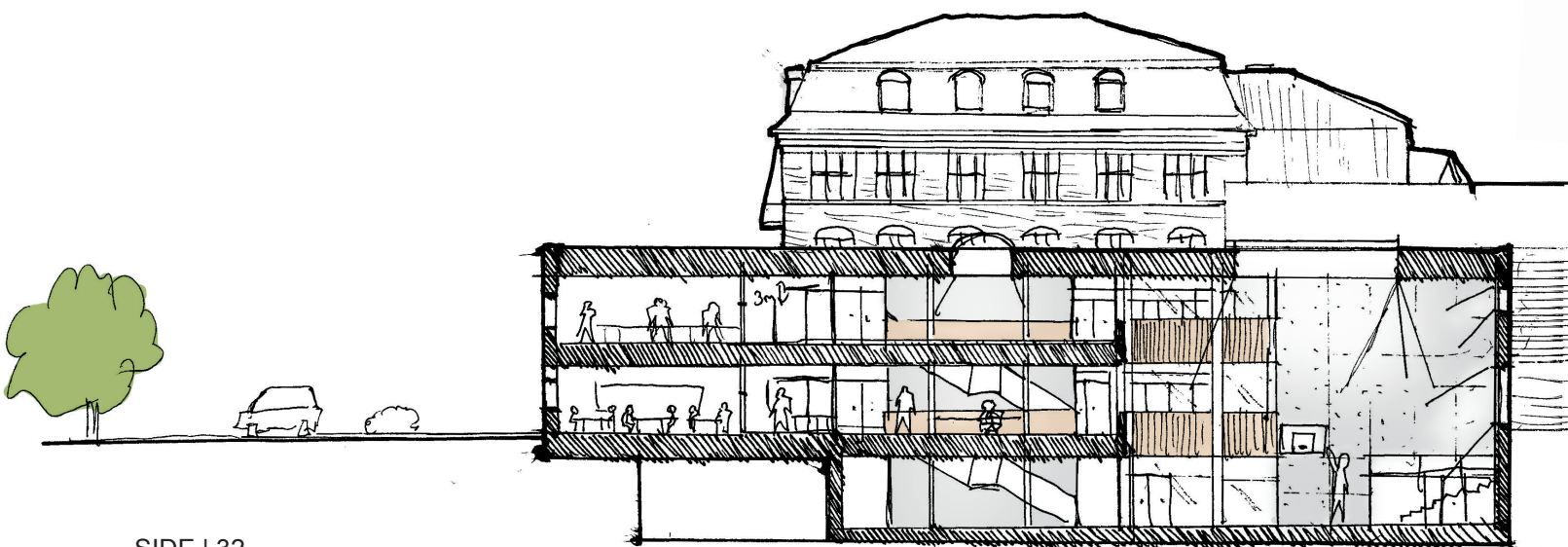


fig 3.8



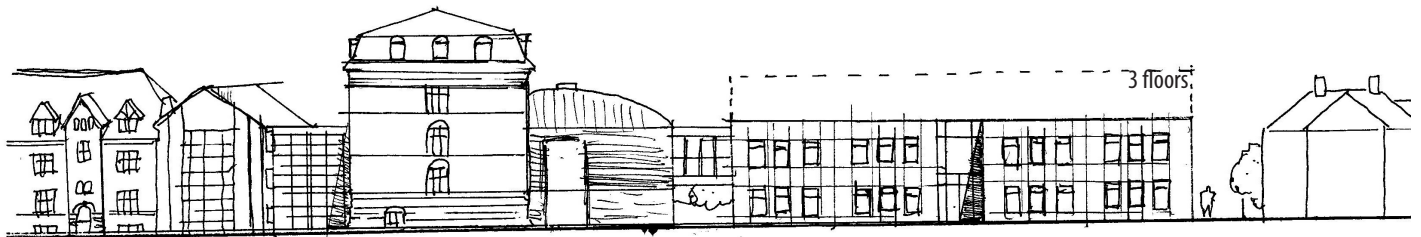


fig 3.9 North facade

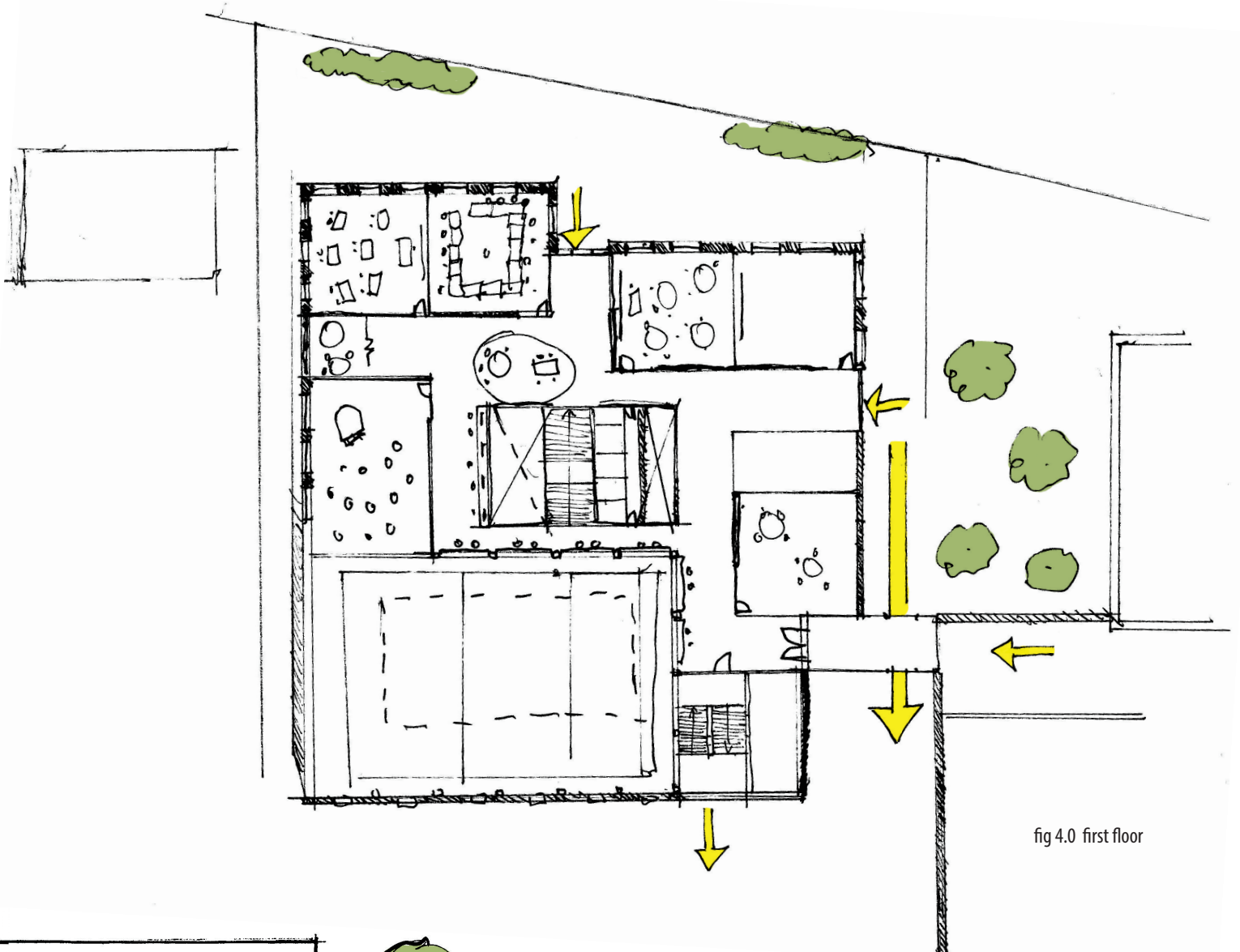


fig 4.0 first floor

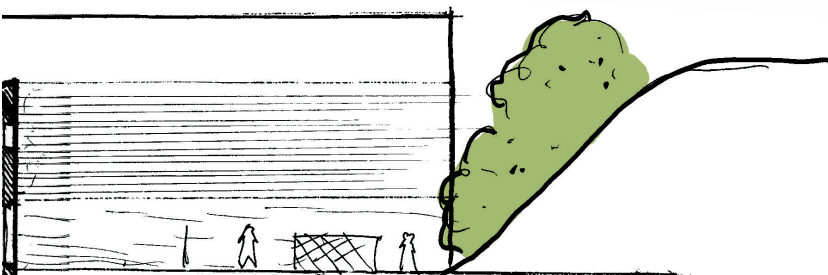


fig 4.1 section



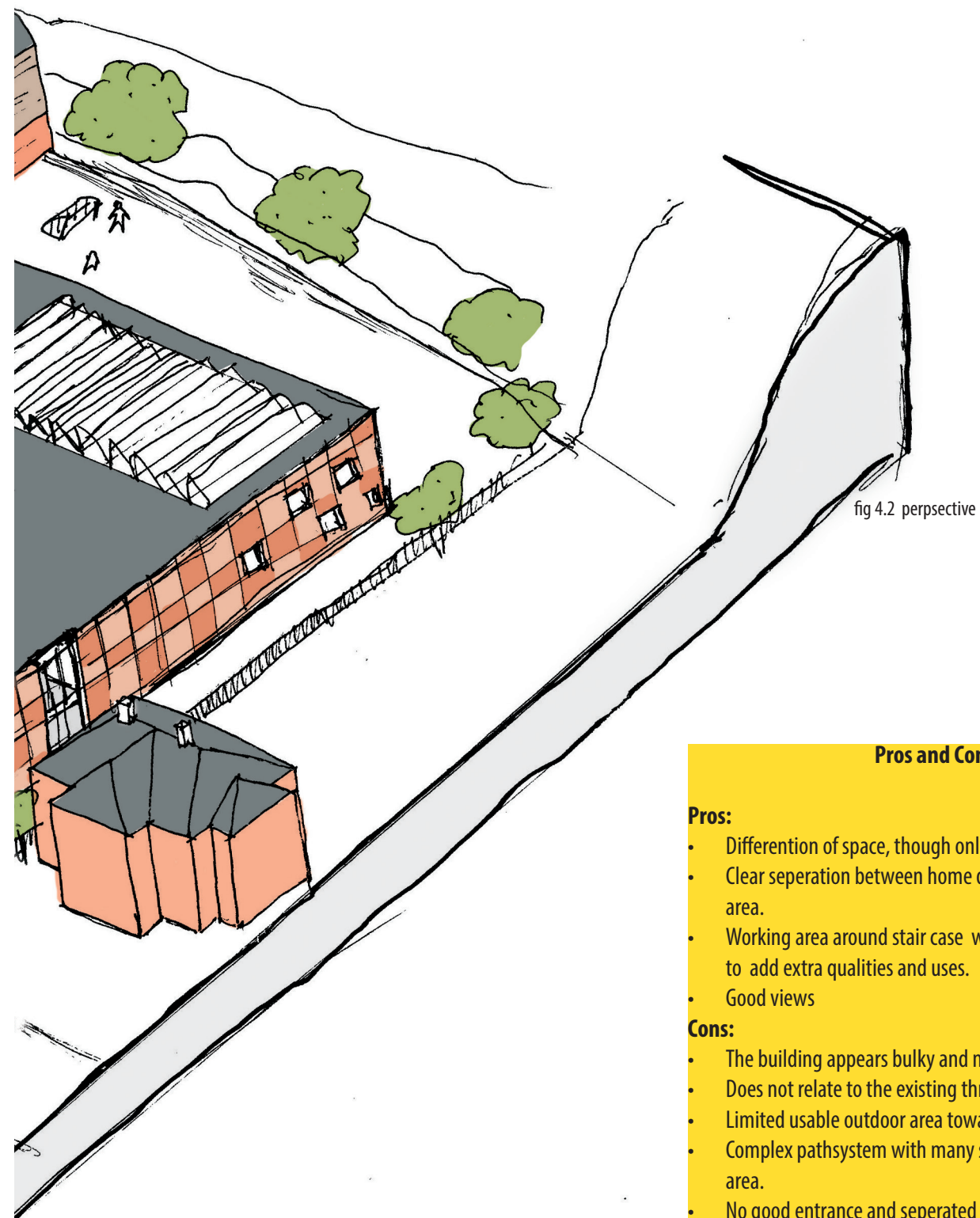


fig 4.2 perspective

Pros and Cons

Pros:

- Differentiation of space, though only outside class rooms.
- Clear separation between home district area and subject area.
- Working area around stair case with skylight is good way to add extra qualities and uses.
- Good views

Cons:

- The building appears bulky and massive.
- Does not relate to the existing through its form.
- Limited usable outdoor area towards South.
- Complex pathsystem with many stairs and limited usable area.
- No good entrance and separated entrance for multi hall
- The South is cut off by the multihall, making more problems than benefits.

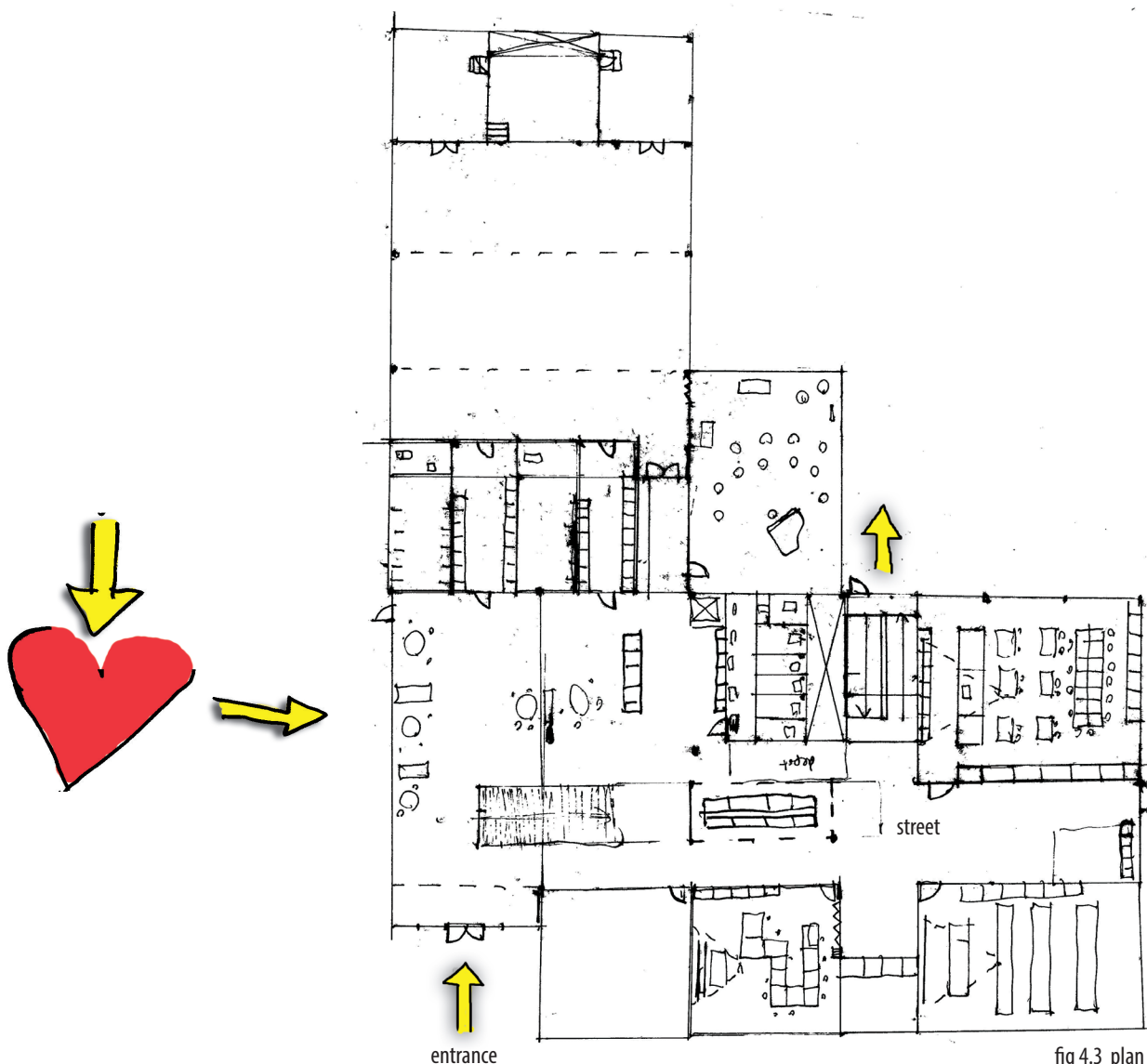
SKETCH 2

L-SHAPE AND THE STREET

The L-shape

The L-shape is based upon a more logic flow. The building is clearly defined by 2 parts: the multi hall being placed in extension with the current gym hall. A school-section, that like the former concept is separated in two parts, the home district with classrooms on 1st floor and the subject rooms at ground level. The entrance is clearly defined by a section of the building with high transparency, as a cut out of the building mass. This space is given extra attention with its scale and use and is the meeting point connecting all the functions of the building. It is a place for work, gatherings and the main transport vein. The class rooms and subject rooms are placed along a "street" with work areas with skylights above.

The multi hall is separated more from the rest of the building making it possible for the very different activities to take place without disturbing each other. The 1st floor of the multi hall is the connection to the existing school, giving the ability to grasp the school. The concept however creates a wall by having a very long northern facade. Some of the functions, such as the music room seems displaced and distorts the concept together with a confusing arrival from the existing buildings.



Pros and Cons

Pros:

- Differentiation of space: entrance, multi, "street"
- Clear distinction between space for multi hall and the rest
- The street adds a quality of place for work and interaction
- Clear entrance with a special atmosphere.

Cons:

- The building appears bulky, not relating to the existing buildings.
- The court yard between the existing and the new building is too small and dark, making the space less usable while compromising the views from the existing.
- Strange arrival from the existing.
- The South is cut off by the building, no good exit to the useable outdoor areas. Takes alot of area.
- Flexible but long "street".

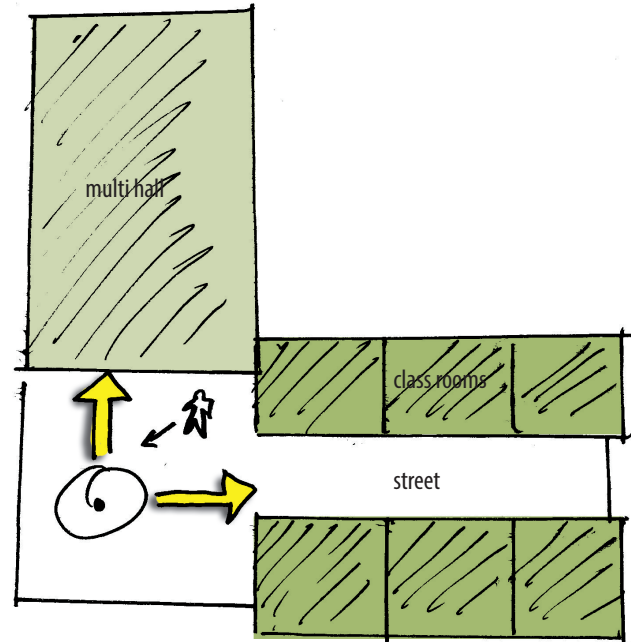


fig 4.4

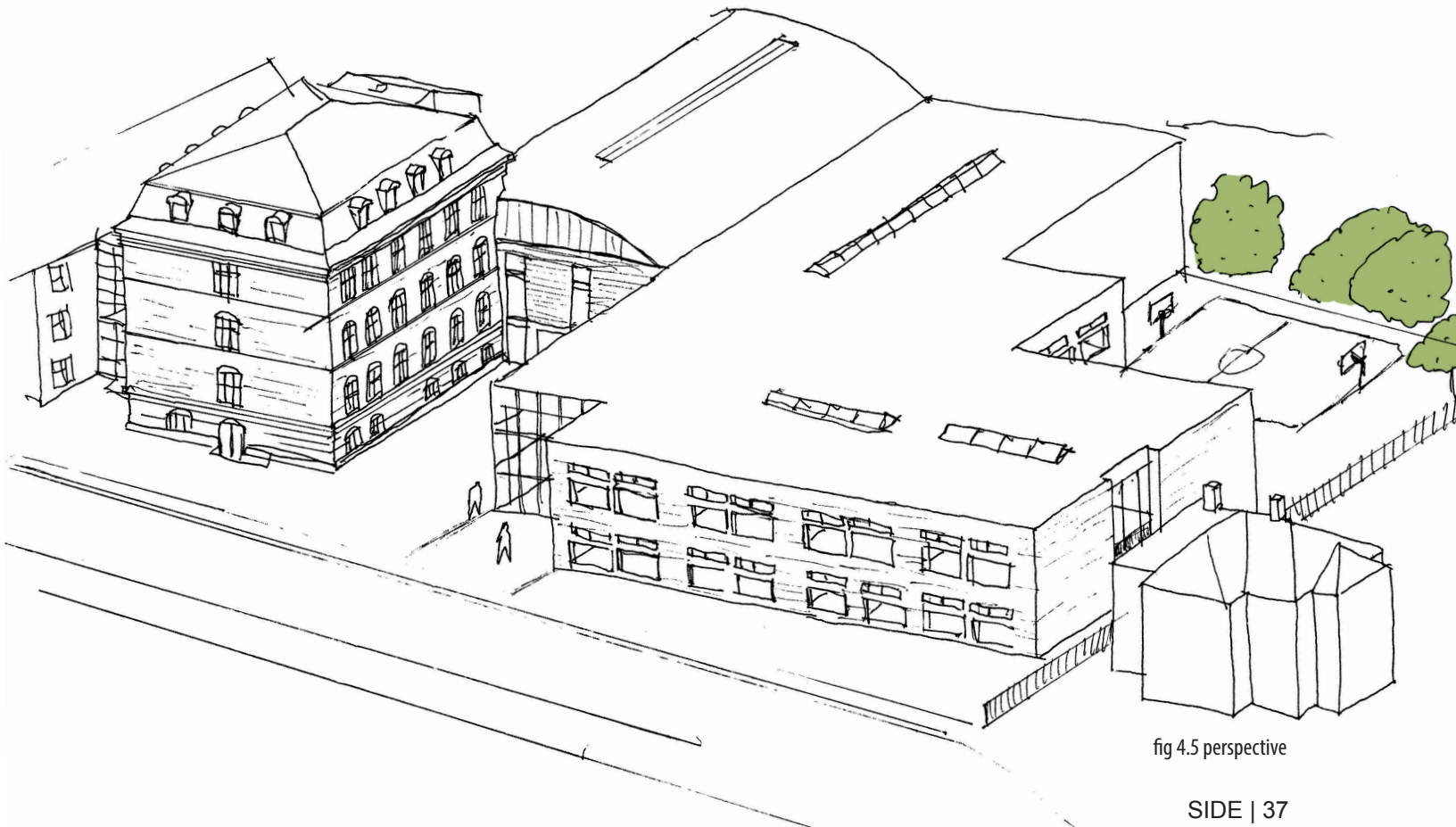


fig 4.5 perspective

RECTANGULAR PLAN

THE CONTRADICTION WITH THE CENTRAL STAIR

The “central” rectangle

Based on the ideas from the 2 previous concepts, the plan was changed to evolve around a central stair. This stair should be the heart of the building, connecting the home district with the subject room area while contributing to the social well-being of the school. It should be an integrated part of the identity of the school. It was decided that the floor for subject rooms and the floor for the home districts should be of different characters reflecting their use and degree of privacy.

This should also be expressed through the form. The building should have a base, that would be the subject room floor, that is distinctive from the 1st floor. This would also contribute in making the building relate more to the existing school, which all have a heavy base expressed through the use of materials and different usage than the upper floors.

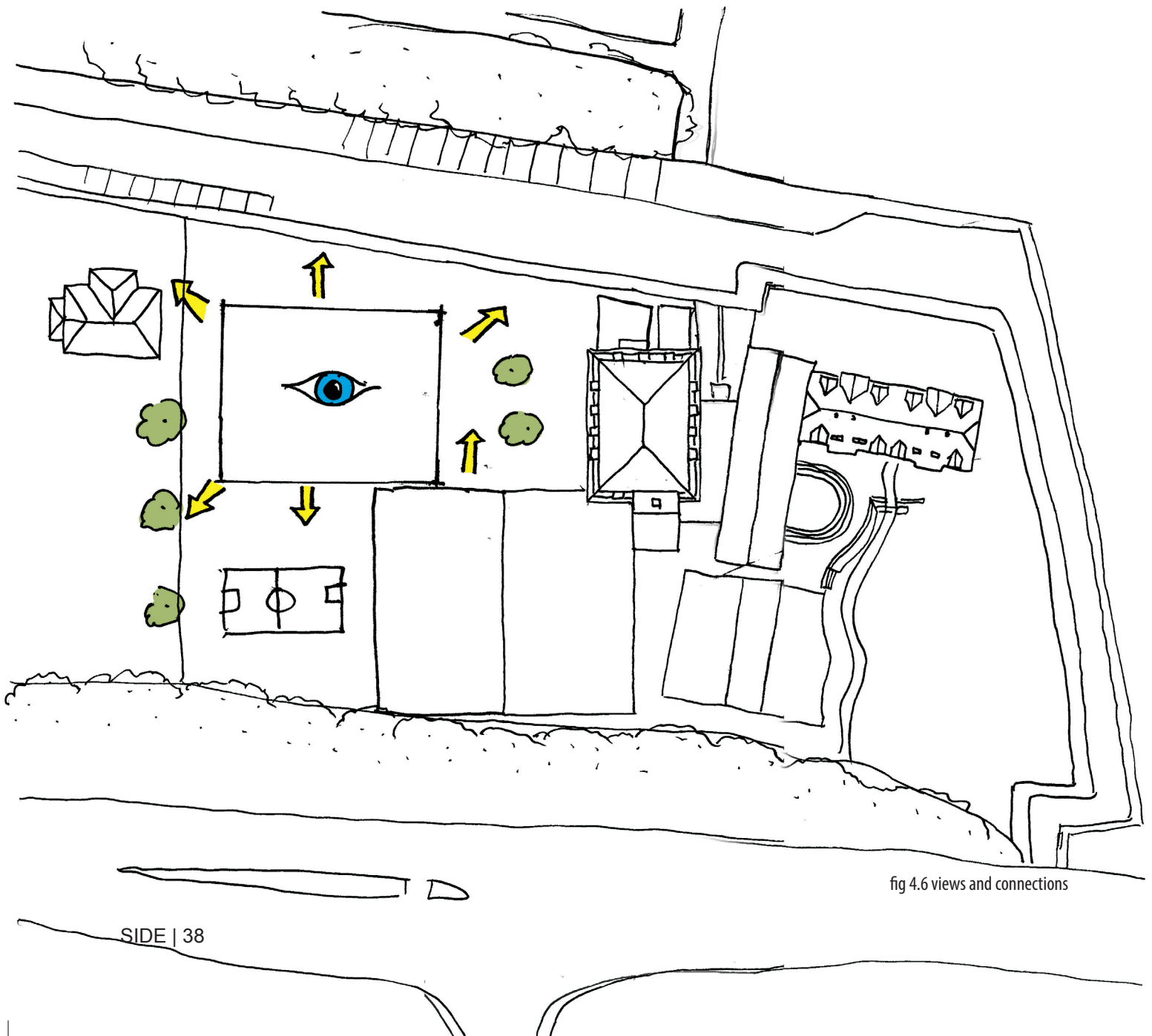


fig 4.6 views and connections

Connection to the surroundings

From the beginning views towards the natural surroundings and a good access to outdoor areas were prioritized. It was important to make an outdoor area towards South suitable for activities such as sports. similarly it was important to make a functional courtyard between the school and the existing, that makes the transition to the new building more fluent and less abrupt. The separation by the courtyard should make the qualities of both building clear and contribute with something interesting to look at. Thereby building in connection with the outdoor areas will provide the necessities for activities to take place all around the building.

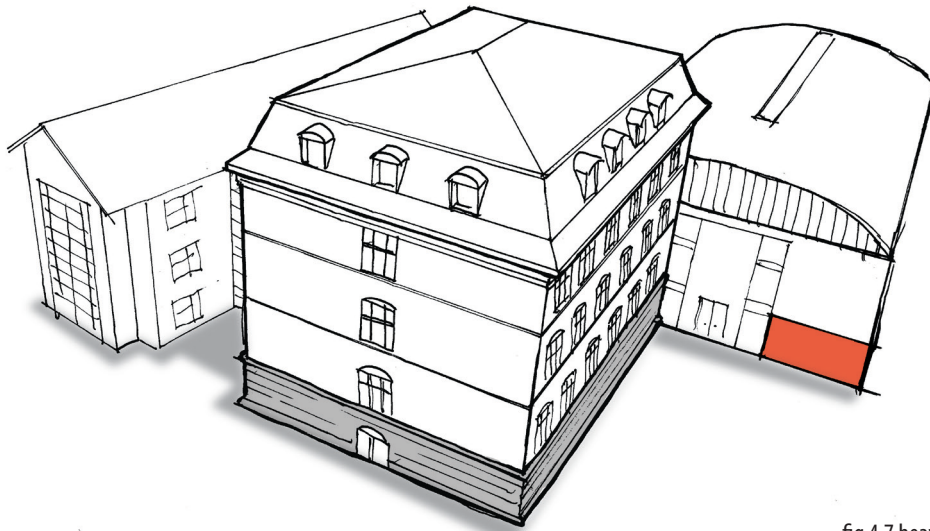


fig 4.7 heavy base

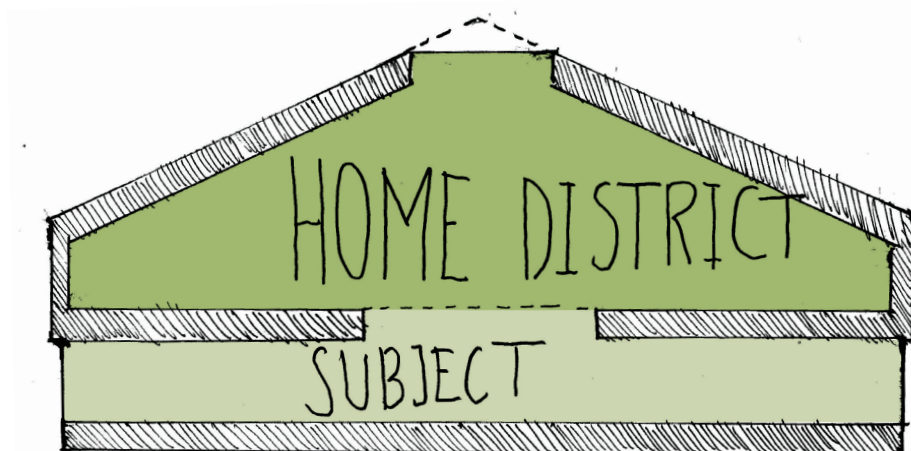


fig 4.8 two districts

Central stair

It was during this concept that the stair case, the main pathway connecting the two floors, gained its potential as the “heart” of the school, from which all the functions evolves. From the beginning it was the intention that this should be stressed by the architecture, for instance by having the area culminating in a big skylight. The ground level was thought of as a cut through the base of the building, in the shape of curtain wall in the North and Southern end connecting the green characters of both with the building. Thereby a clear entrance and exit to the southern outdoor area was established. A central entrance leads directly to the central stair, splitting the hall way into two sides, with science rooms and a clear distinction between zones. The clear cut was made possible by integrating the music room under the stair, further stressing the importance of this architectural mean to the school.

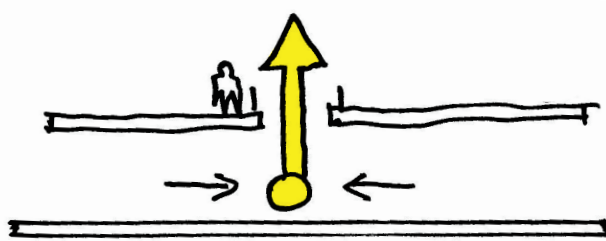


fig 4.8 connection point

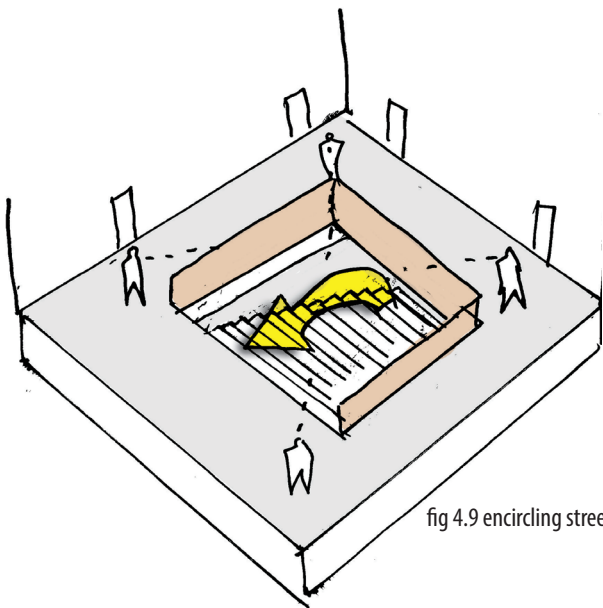


fig 4.9 encircling street

Street

On the 1st floor a street is established around the stair, with work areas and spaces for social interaction, contributing to the sense of belonging to the same community. The street boundaries should be defined by the class rooms around it like “house” facades referring to the street in a city. From the first floor it also became clear that a direct pathway to the south garden should be established, giving the students an easy access to outdoor areas in the breaks. Due to the rectangular shaped plan the street areas, or hall way areas, were too wide distorting the concept, making the central point less significant and the spaces less defined.

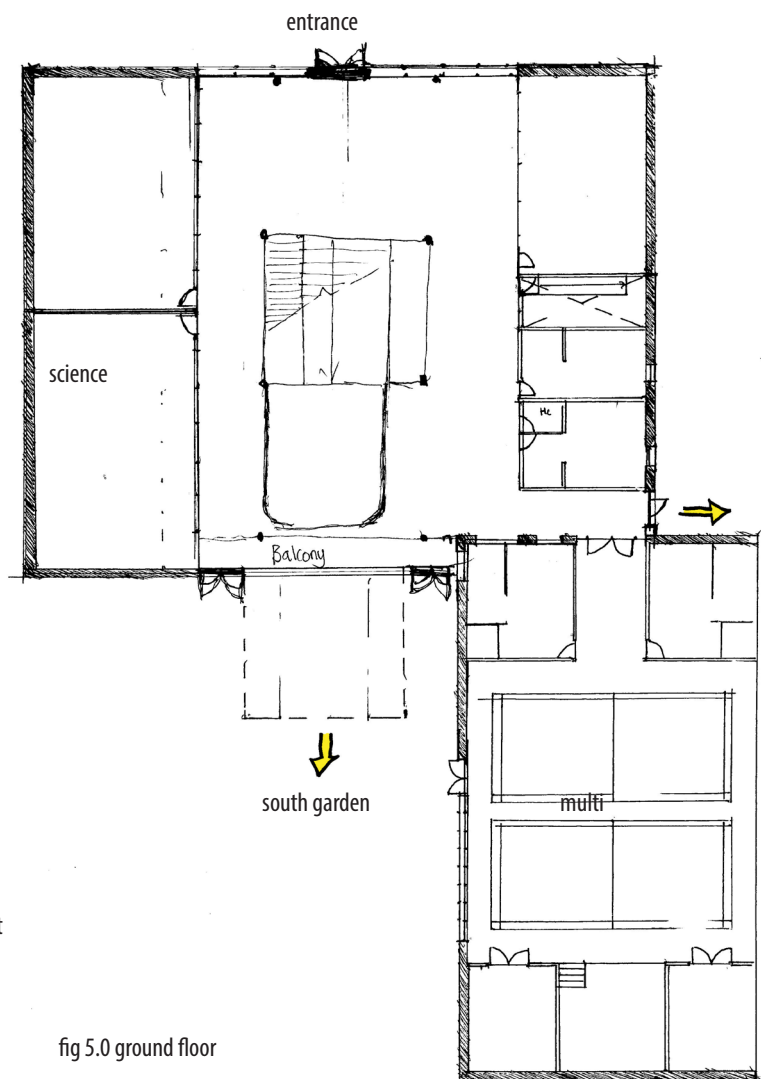


fig 5.0 ground floor

Flow

As in the former concept, the multi hall is a clear extension of the current gym hall, but there proved to be difficulties early in the process when trying to establish a sound flow from the existing school to new. It was decided that the transit should happen through the two gym halls, however due to the comparatively long building body of the rectangular school, the flow became a tortuous path system. Besides there was no separate access to the multi hall, instead being placed in the corner of the existing building, making it difficult to know of its existence as a visitor.

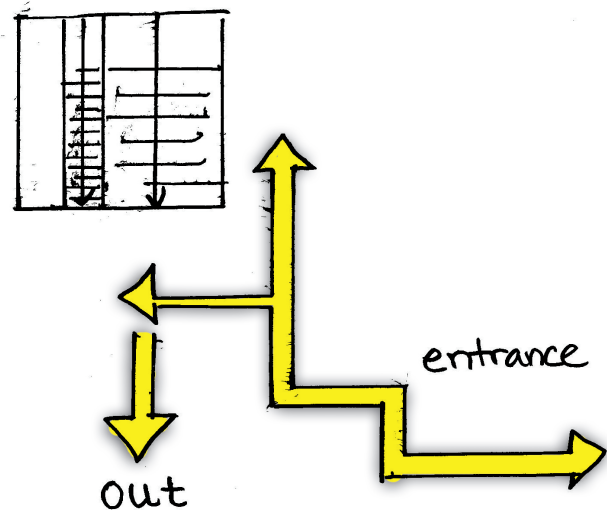


fig 5.1 path system

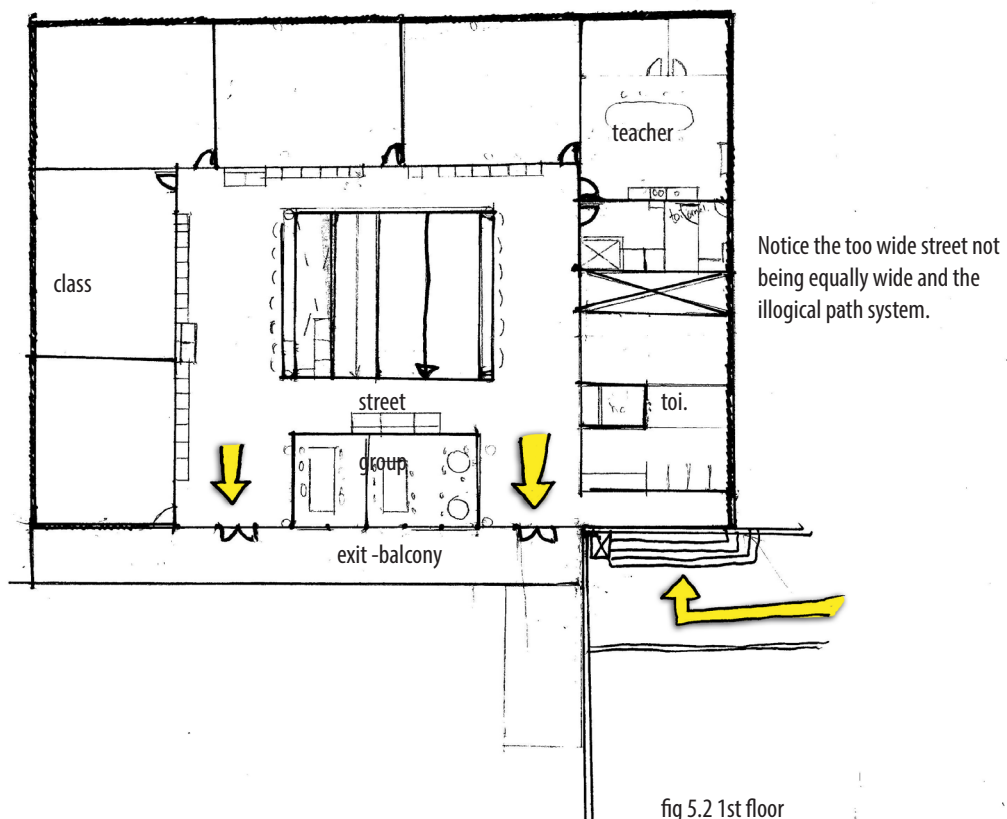


fig 5.2 1st floor

Roof shape

One of the main challenges was to make the extension relate to the existing. As mentioned the main building has a very prominent roof, therefore many different proposals were made to a roof shape that complements the existing. Another important factor was to follow the “lines” of the building. The existing school have a ordered system, it has the base distinguishing the floors in a play of contrasts and architectural details in the shape of moldings, mullions, that to some degree reflects the inside and the construction of the building. In the beginning to proposals were going through, the loop. One a very modern building with a neutral flat roof, but floor slabs creating a relation to the “lines” of the existing. The second was a building with a pyramid flat roof for the skylight, which was chosen due to its emphasize of the interior concept with the central stair and the heart of the building. However it was soon discovered that the rectangular plan, was contradictive to the concept. The construction of the pyramid roof was not possible and large spans would require a complex system of columns compromising the use of the spaces.

Facade system

Initial consideration were made regarding the use of materials based on the relation to the existing and the use of “contradictions” to enhance the appearance of the building. Regarding the composition of windows different sketches were made and compared to rhythm of the facade of the main building. From the beginning it was the goal that the windows should invite the green surroundings to make its mark on the interior, through long horizontal views. It became clear that a simple window expression was the most suitable.

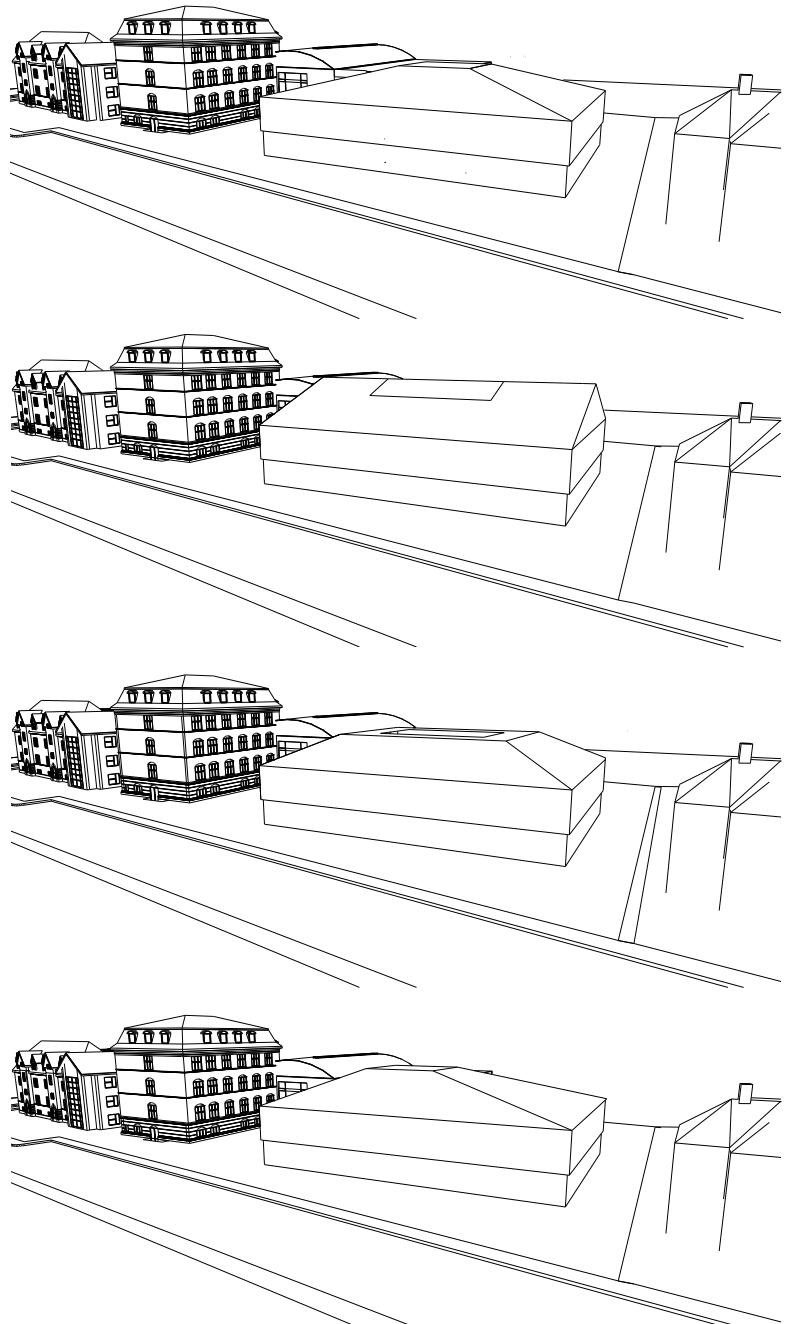


fig 5.3 roof experiments

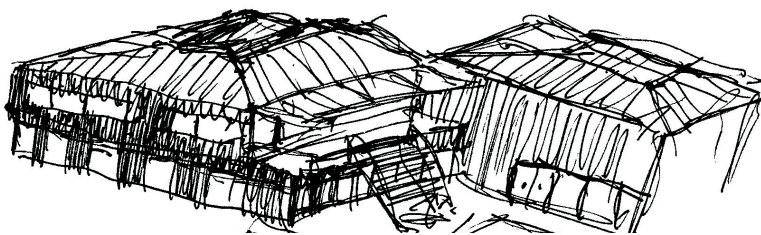


fig 5.4 flat pyramid roof

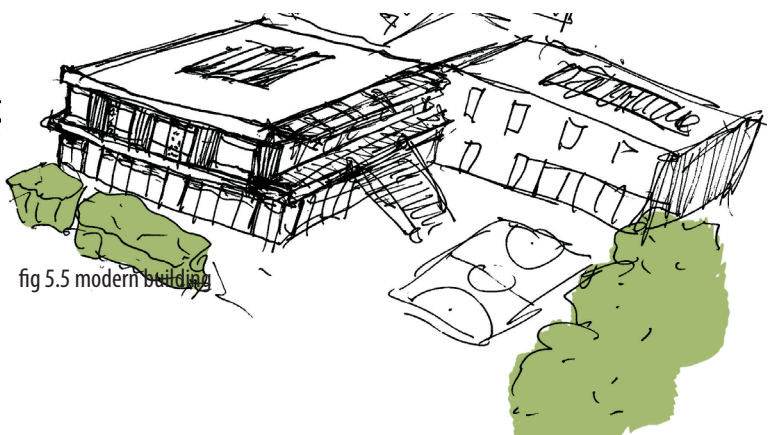


fig 5.5 modern building

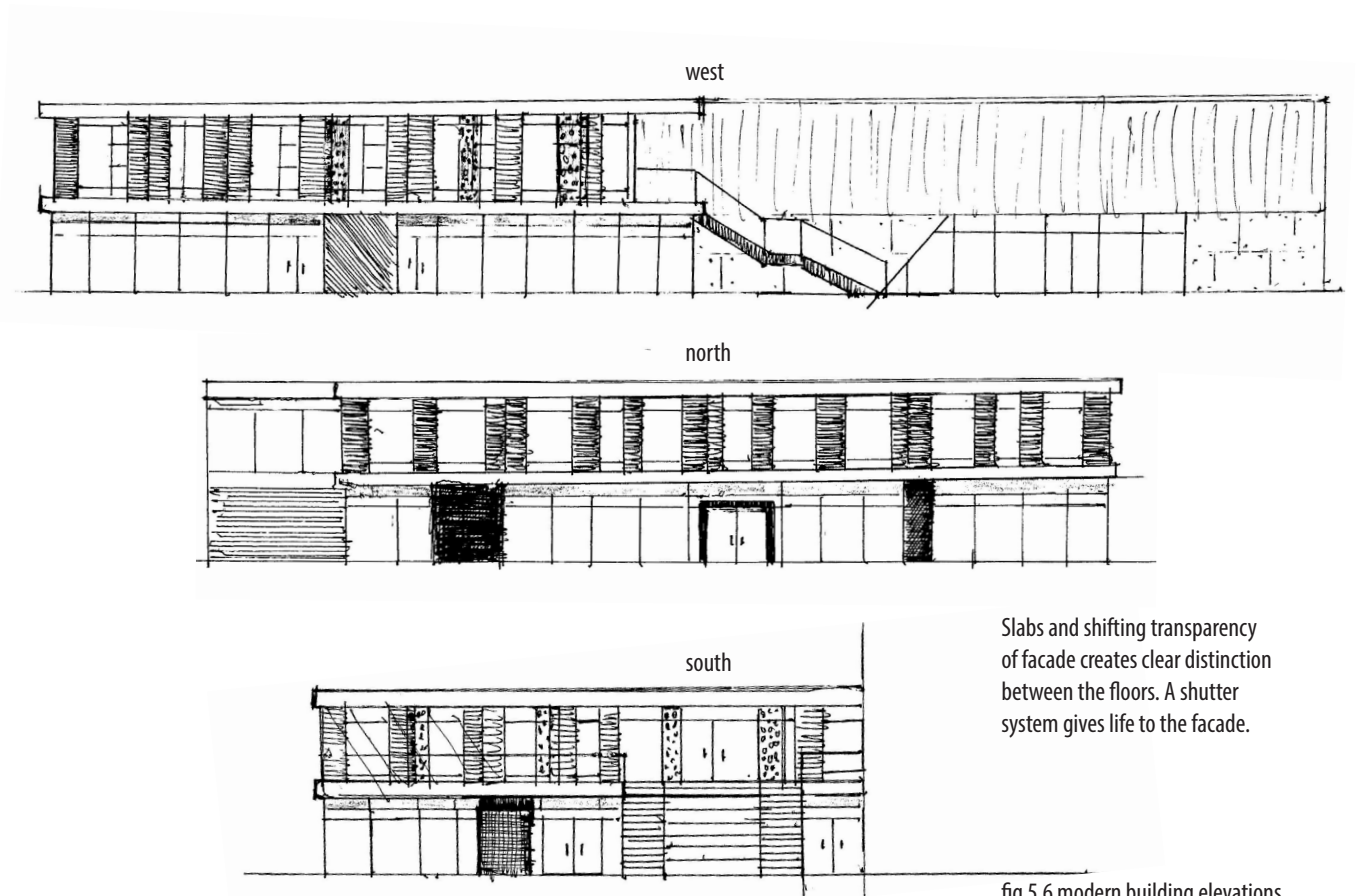


fig 5.6 modern building elevations

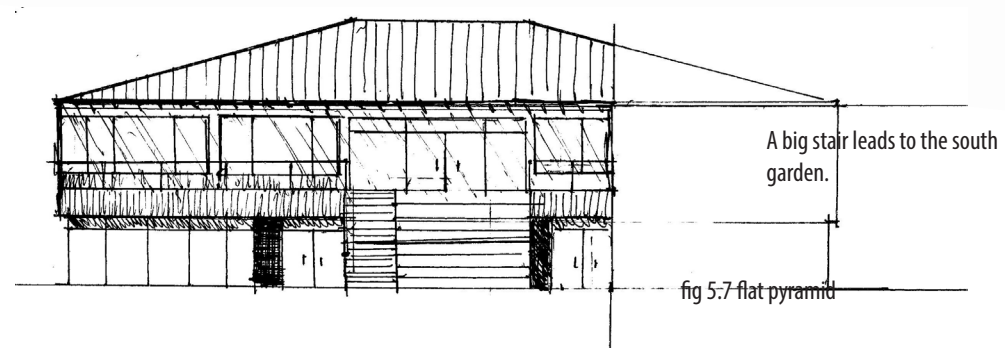
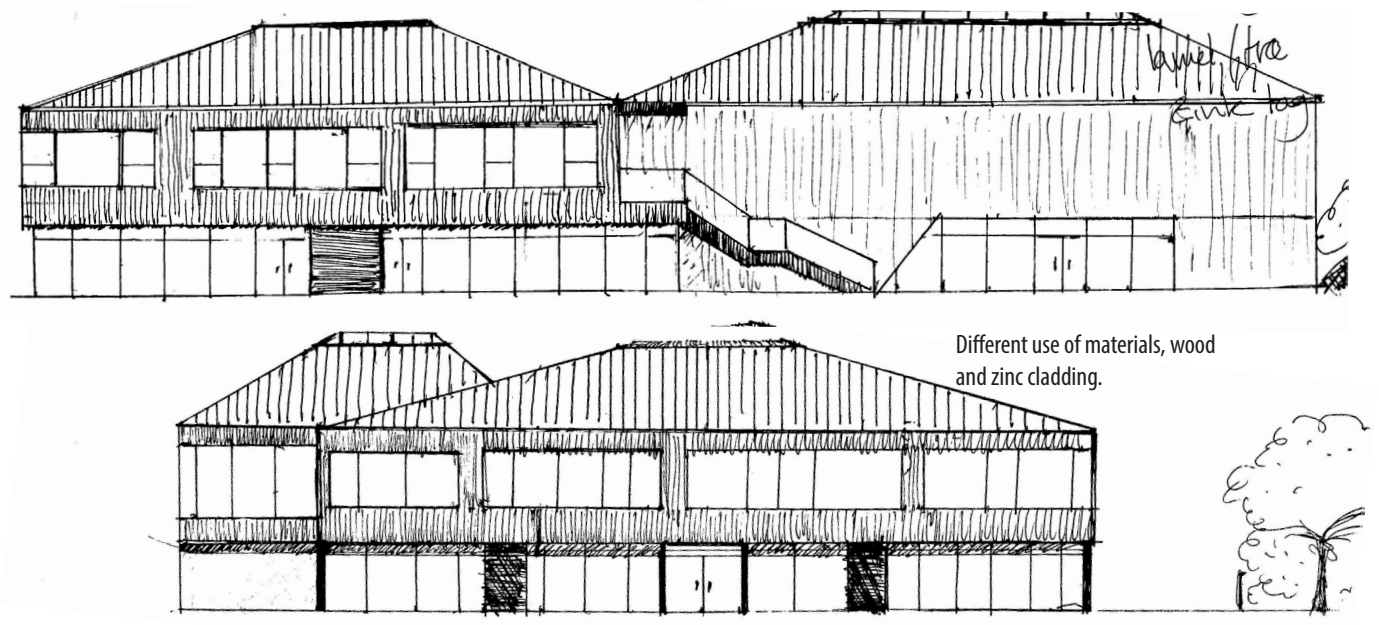
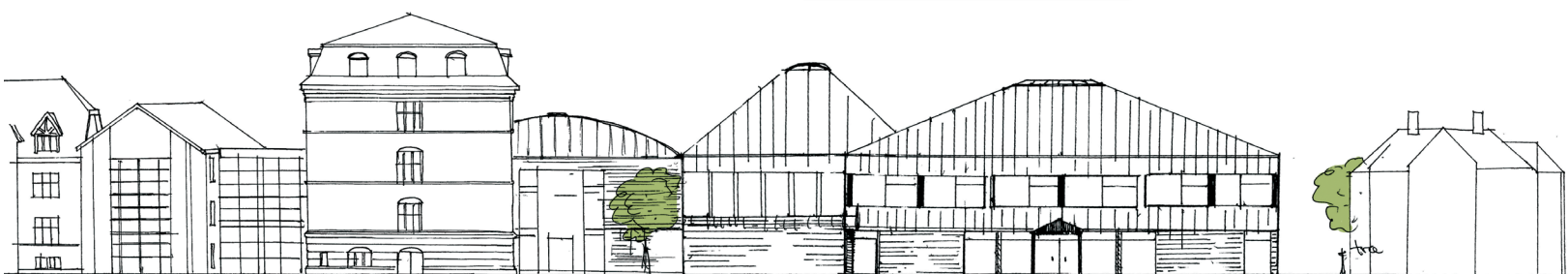


fig 5.7 flat pyramid

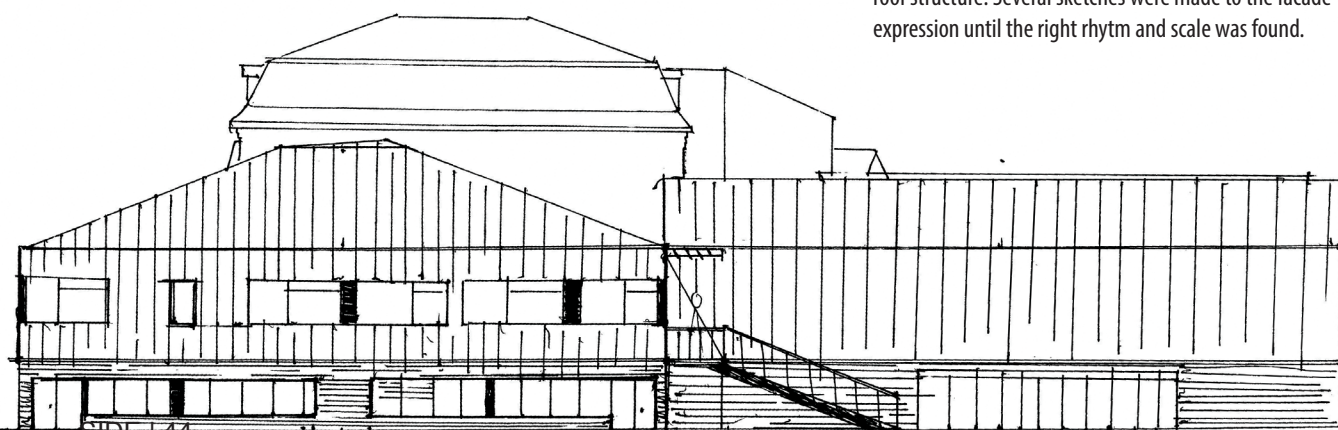


fig 5.8 facade expressions

for
fig. 5.9



Late sketch of the square building with a clear pyramid roof structure. Several sketches were made to the facade expression until the right rhythm and scale was found.



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fig 5.9 north and west elevation

Many different proposals following the scheme were made, of different scale and proportions, facade expressions, stairs, skylights, balconies. Especially the exterior expression of the building, the form, materials were evaluated through many different elevation drawings.

A critical point that also became important later during the final stage of the chosen concept, was that the roof required a certain angle in order to be visible. The first sketches were made with a roof angle of 18 degrees, making it only visible from far away. Therefore during the process of the centralized plan the roof was adjusted to an angle of 25 degrees, making the building interact more with the main building underlining the new building's importance for the whole school.

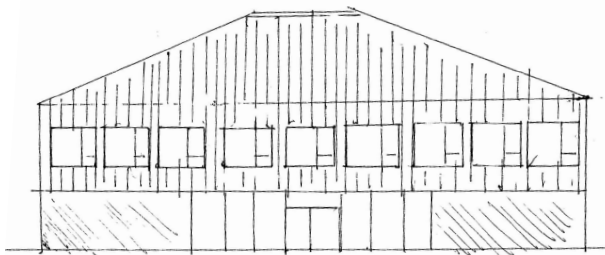
Pros:

- A good differentiation of spaces
- A clear entrance that interacts good with the heart of the building.
- Work areas and a "street" creates the basis for a good school environment
- Interacts with the existing through the use of materials.
- Creates good outdoor areas in connection with the building

Cons:

- the path way system from the existing to the new is still too tortuous, not being a straight direct connecting path.
- the rectangular building is contradictive to the concept, causing a central stair not being exactly central and the implementation of the chosen roof is not possible.
- Require complex construction system not underlining the concept but distorting it.
- The proportions of the building, made the building looks flat due to a low angle of the roof and a too long northern facade.

A 25° roof angle makes it possible to see the facade expression from a distance



A strict rhythm to the facade with horizontal windows making the border between in and out more diffuse.

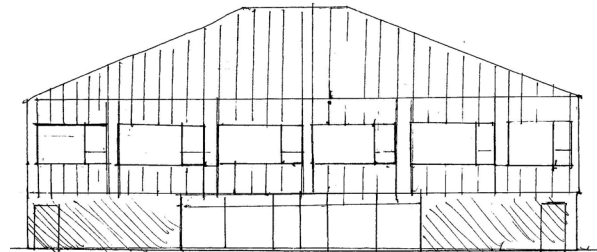


fig 6.0 late elevation sketch

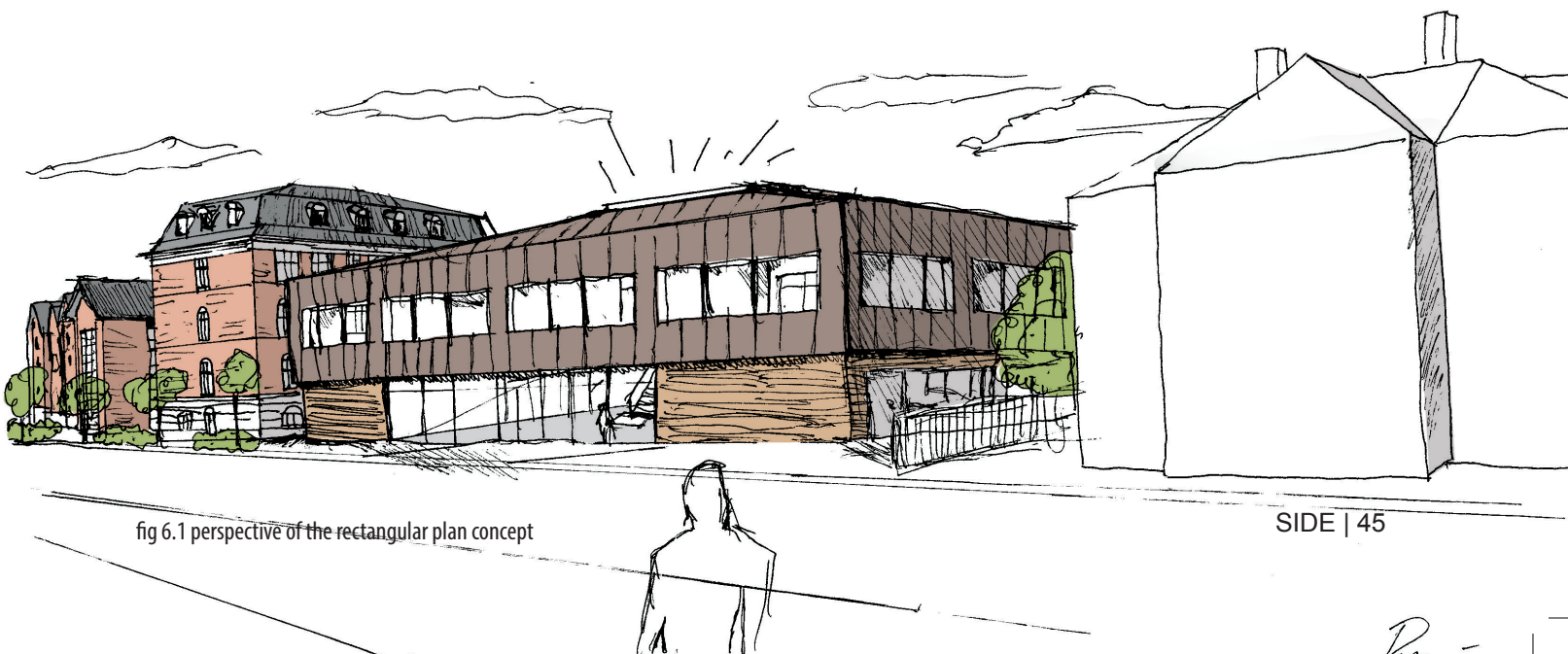


fig 6.1 perspective of the rectangular plan concept

THE FACADE

Underoverskrift lalalalalalal

1st floor

The facade of the existing classical building is characterized by their tall and slender main body of red brick work. All have an ordered rhythm to the facade, having all the tall windows placed above each other, underlining the verticality of the building. As the extension is of different proportions, not covering more than 2 floors, different measures had to be used to achieve a verticality. Especially as the ground floor should appear like tied to the ground, there was a need for a solution to make the 1st floor more vertical, so it could interact with the taller buildings a have a strong identity on its own. One of the solutions was the implementation of the flat top pyramid roof, while the other was in the choice of facade material.

Ground floor

The new building should stand out stressing its own importance while relating to existing, for that purpose it was chosen to have the 1st floor and the roof clad with zinc of a red hue in a vertical standing seam system. The rhythm of the vertical seam becomes an integrated part of the building, as a building "skin" that embraces the top of the building, meaning the home district area. This while the facade is in contrast with the more horizontally emphasized windows, that brings a more humane to the classrooms from the outside.

For the ground floor there was thought of several materials, brick, wood, glass. A combination of a oak wooden cladding and glass was the two major ones. The wood should emphasize horizontally, making the ground floor appear as the base of the building, penetrated by large glass areas in North + South. The wood is a clear reference to the wooden cladding of the existing gym hall, though here used in another coherence. The small overhang of the 1st floor, made possible by placing part of the insulation at the interior side, manifests the base as a "heavy" part of the building composition and the contradictive nature of the floors of the building.



fig 6.3 wood cladding

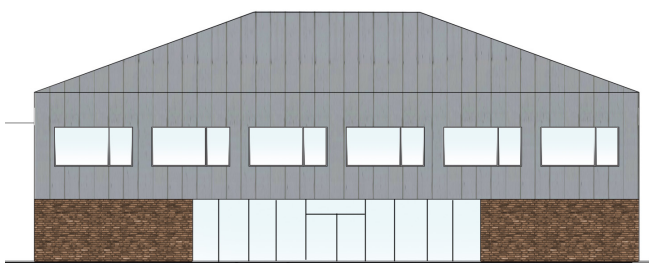


fig 6.2 material experiment: brick - zinc



fig 6.4 red brown zinc





fig 6.5 red zinc



fig 6.7 seam pattern

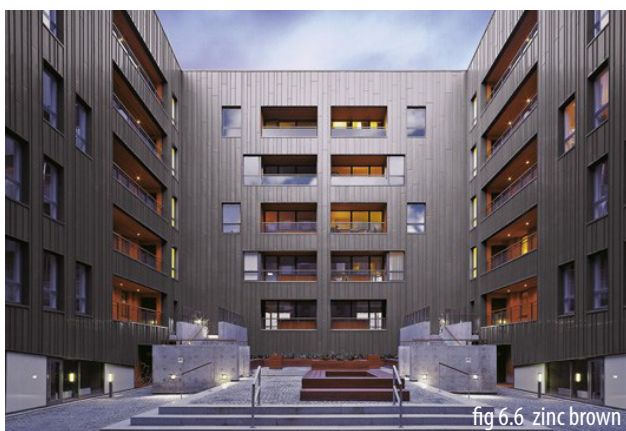


fig 6.6 zinc brown

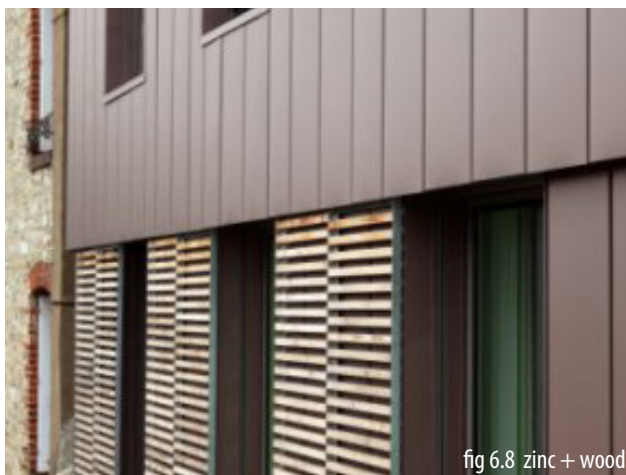


fig 6.8 zinc + wood



fig 6.9 zinc + shading

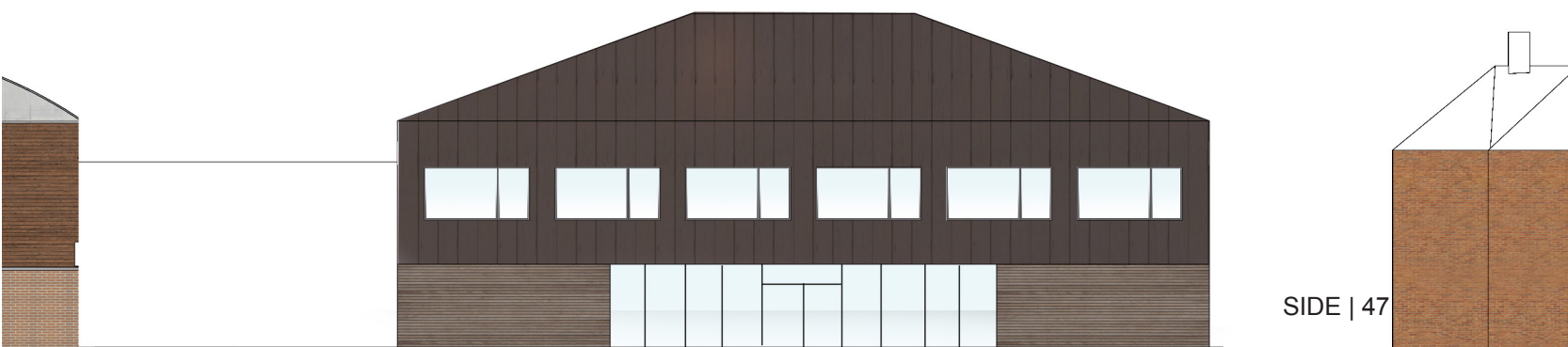


fig 7.0 material experiment

THE CENTRAL PLAN

THE CONCEPT OF THE SCHOOL

The square

The concept of the central plan is perfect for the idea of the central stair, making the whole extension form a synthesis. It is due to the essence of the square, of which it is build. The square is non-directional, relating equally to all sides and evolving from the center point, while a rectangle is directional in its character and not encouraging movement around the center but the long axis. Making the plan square also solved the constructional idea, making the fabric of the building more logic. Columns are placed around the central stair, distinguishing the circulation pathways from the center gathering space, thereby serving not merely as a structural element. However there was still a problem with the transition from the existing to the new. A separate entrance to the multi hall was made, however the only direct transition to the extension coming from the existing school, was still the pathway on the 1st floor.

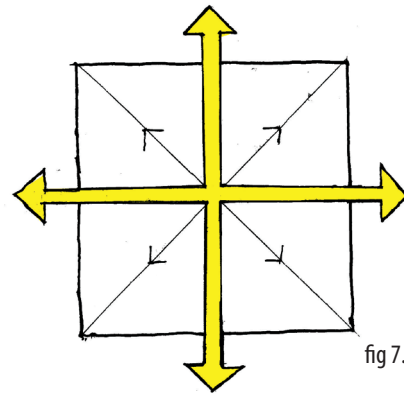
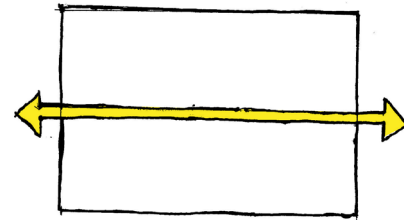


fig 7.1 the square

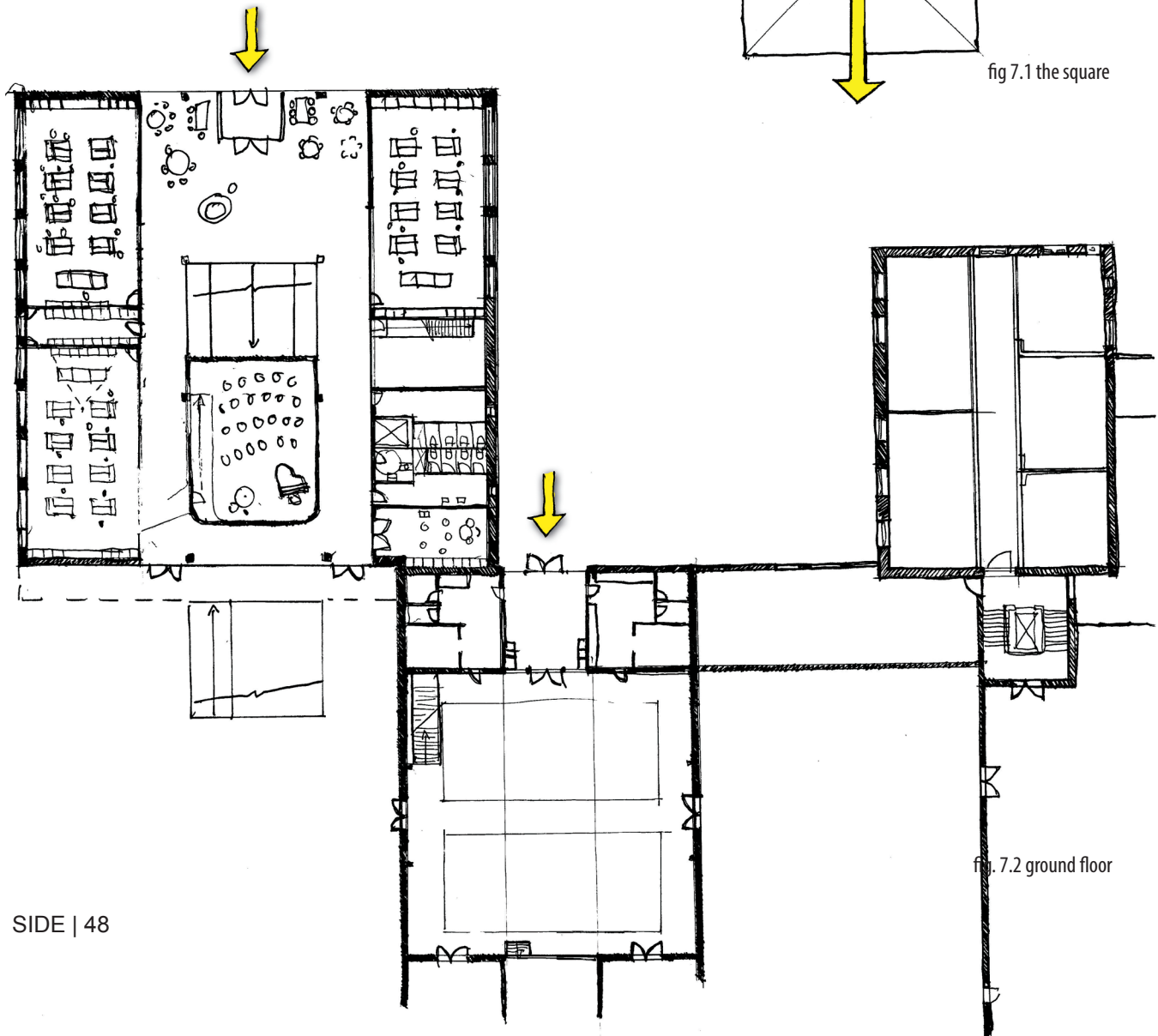
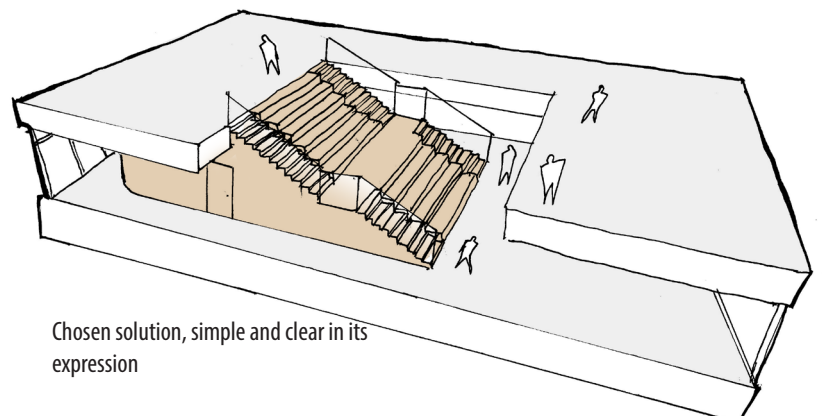
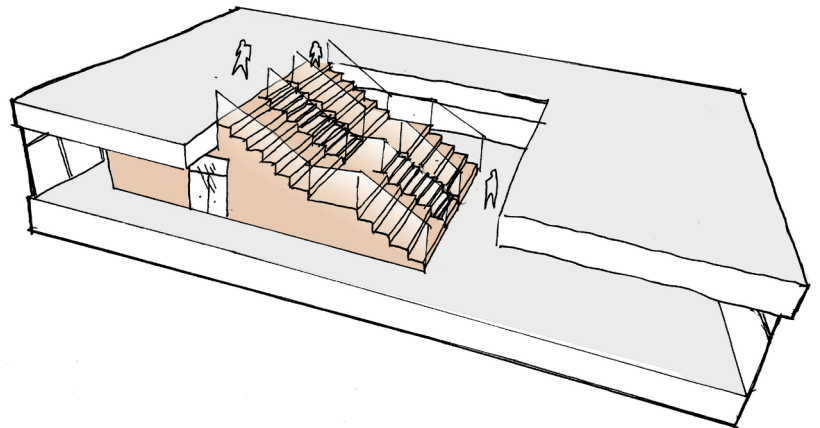
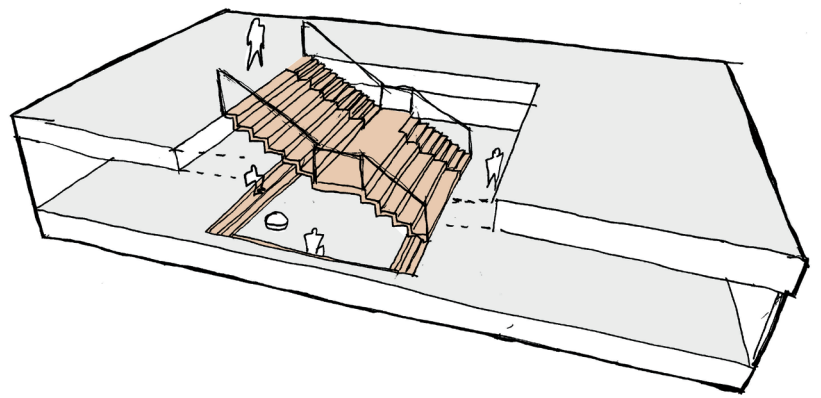
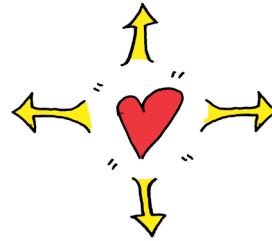


fig. 7.2 ground floor

The heart

Throughout the process, the central stair underwent several changes. It was always thought of as a gathering point of the building, this was made possible through detailing it as a furniture in the space. It was important that beside connecting the two floors it should be possible to be a place of social interaction, this meaning was made possible by double steps where the students can sit and relax or even work. This was stressed by having the stair clad in wood, making it a piece of furniture, inviting to the users. With the stair comes the music room, encompassed behind the stair. This room differs from the rest at the ground floor by its shape and material use being consistent with the stair, further telling about the way this central heart of the building ties everything together. Not only in its architecture but in the value contributes to the community.



Chosen solution, simple and clear in its expression

fig. 7.3 stair process

INTERIOR

MATERIAL USE

Equally to the clear distinction between the two floors from the use of facade material, the vision was to have a similar play of contrast in the interior, showcasing the different functionalities of the building.

Subject rooms

The ground floor should reflect the thought of the “heavy” base. This was done by having the inner wall, meaning the wall of the subject rooms turning towards the central hall, being as exposed raw concrete walls. The exposed concrete walls not only reflect their structural purpose, but also the function of the rooms. They further enhance the dramatic effect of the central stair, which warm plywood under the skylight appears softer in comparison to the hard concrete walls. Big glass parties opens up part of the science rooms, creating a visibility fostering the interest of what is taking place while giving a taste of the more bright spaces.

Home districts

Regarding the home district, more emphasize was on the use of “soft materials” wood and warm or neutral colors. The “facades”, meaning the walls of the classroom towards the center, are of plywood modular panels with (bright pine) with acoustic properties in the shape of perforations, that can be done in many ways for instance in a pattern. Panels were chosen instead of lamellas in order to not further enhance the verticality of the walls. The warm wood gives the home district a homely feeling and make the “facades” embracing the center, stand out in connection with the white plastered roof, that seems floating like a diffuse sky when met by the light from above. Inside the classrooms the colors are kept white a simple, making room for the pupils and the furniture to make its mark. The “facade” symbolism is strengthened by the appealingly

Multi hall

the multi hall builds on the same principle as the gym hall. Wooden facades and floors brings warm to the room in the same way as in the home district, while the roof is white plaster spreading the light from above. Equally here there is acoustic perforations to the interior wood work, though thought of as a different modular pattern.



fig. 7.4 acoustic perforations

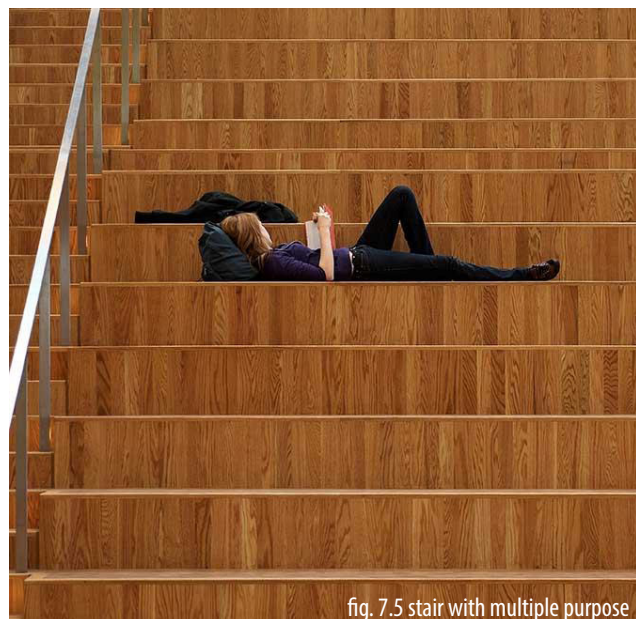


fig. 7.5 stair with multiple purpose

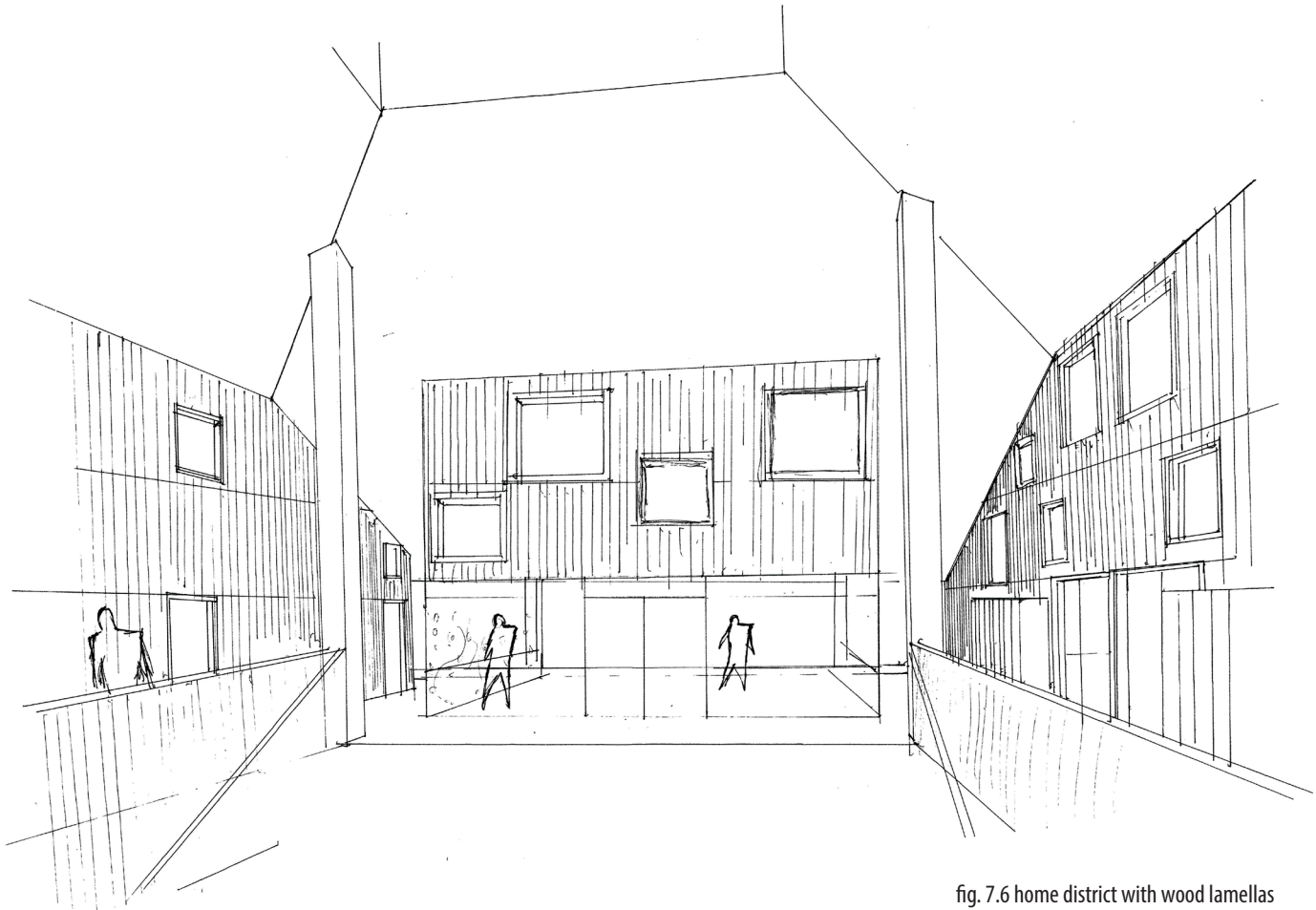


fig. 7.6 home district with wood lamellas

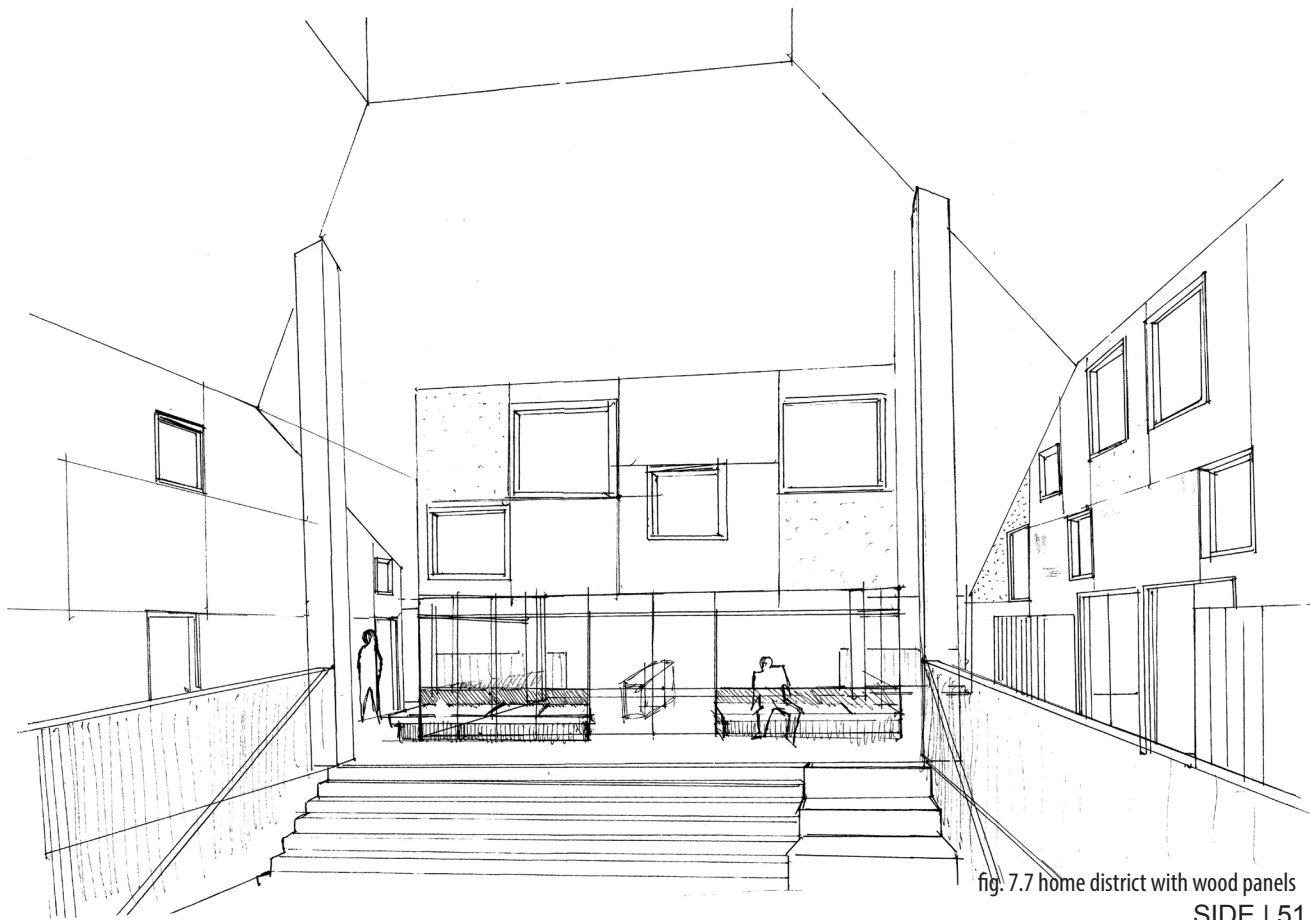


fig. 7.7 home district with wood panels



fig. 7.8 grand staircase contra concrete



fig. 7.9 Vilhelmsro school



fig. 8.0 concrete wall



fig. 8.1 Vilhelmsrø school class room



fig. 8.2 wood interior

THE CONNECTION

THE TRANSIT SPACE CONNECTING THE NEW AND OLD

Transition

Several proposals were made in order to achieve a straight and logic pathway to the existing. There was thoughts of adding a big glazed entrance area for the old gym hall and the new. However this would seem like adding another extension to the extensions with its own stair and pathways, compromising the courtyard area while causing changes to be made to the main building of the facade.

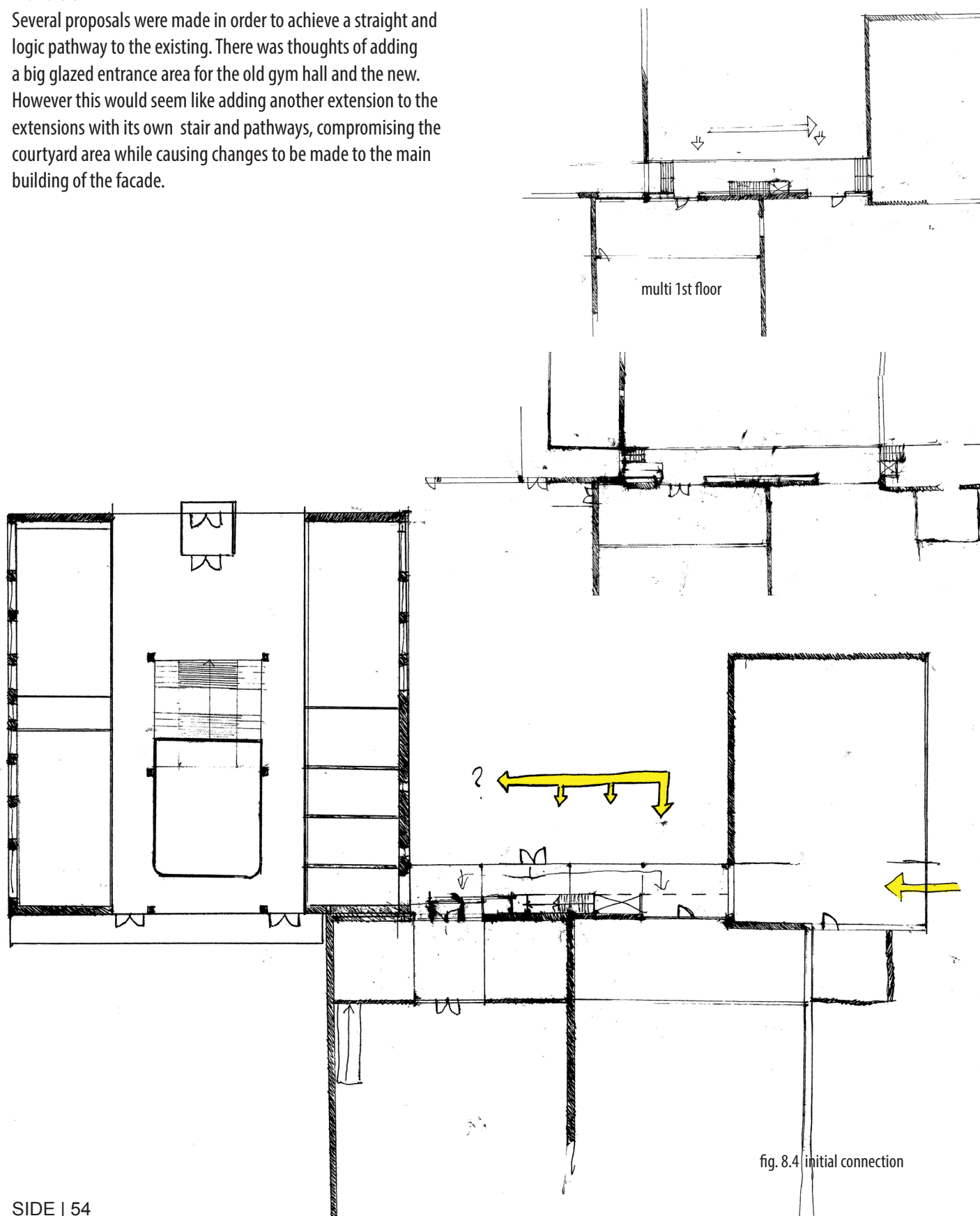


fig. 8.4 initial connection

A solution was found in scaling the multi hall, encompassing it to its actual purpose. This made way for a transit space connecting the old and new directly, while contributing to the experience of transitioning between the two buildings. It marks the transition from the old school making it visible from the outside, how the two are connected.

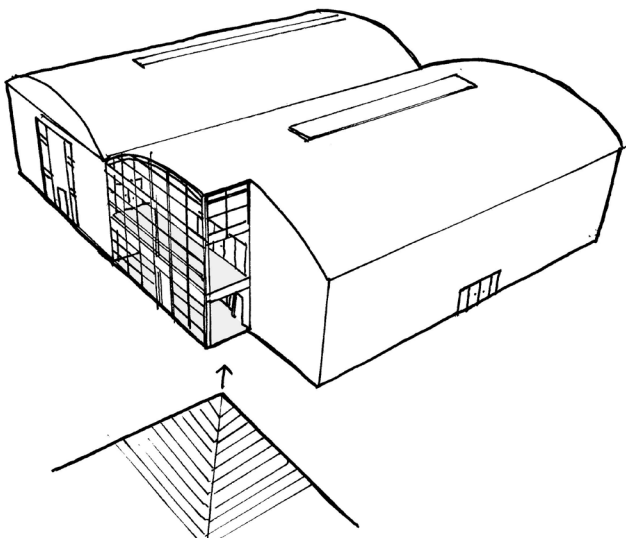
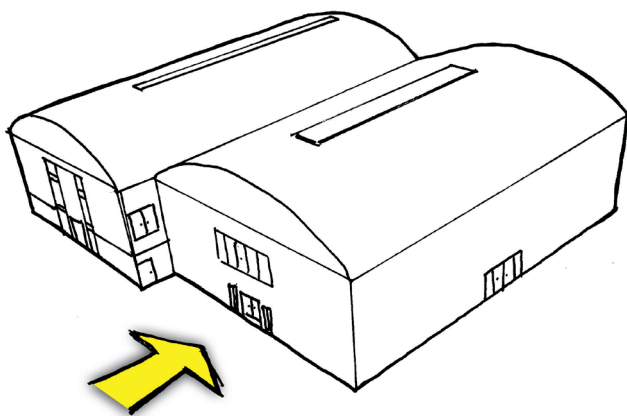
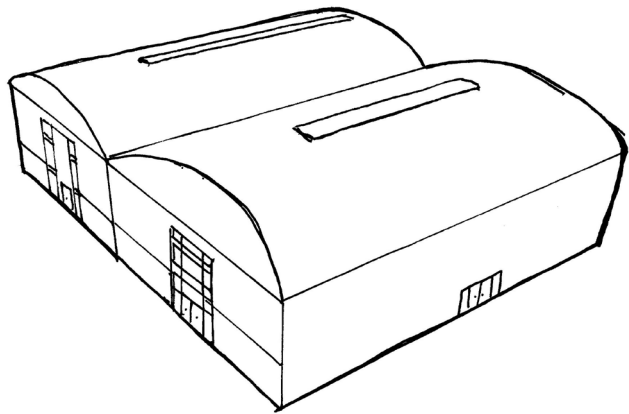


fig. 8.5 the connection

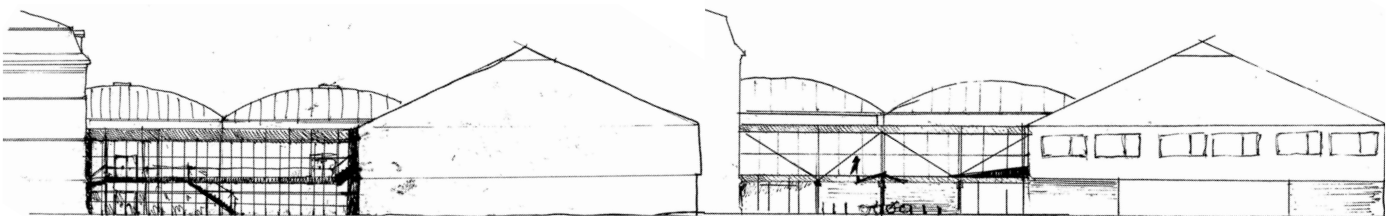


fig. 8.6 elevation of initial sketch direct connection

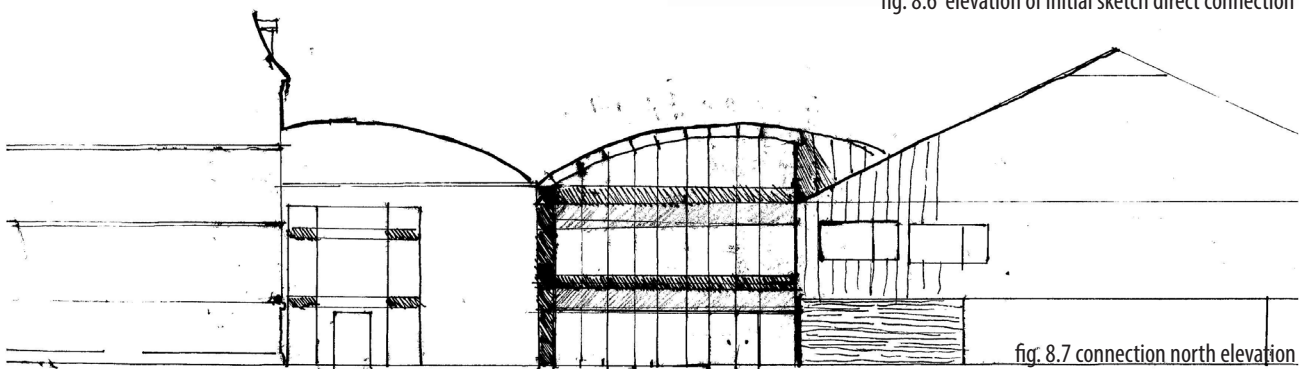


fig. 8.7 connection north elevation

CONCEPT SUMMARY

THE ESSENCE

The extension creates a strong connection with the existing school through the distinction between the two floors, the two "districts" being the subject district and the home district at the 1st floor. The ground floor is the base similarly to the existing, however in a modern version with big glazed areas creating a cut through the building integrating it with the context.

The core of the building is its use of the central stair, being the heart from which all life in the school evolves. This significance is stressed throughout the architectural vocabulary which further strengthens the relation to the existing while creating a strong identity in its own right. It establishes itself as a necessary part of the school, integrating fluidly in the path system of the existing school, making the transition between the two natural.

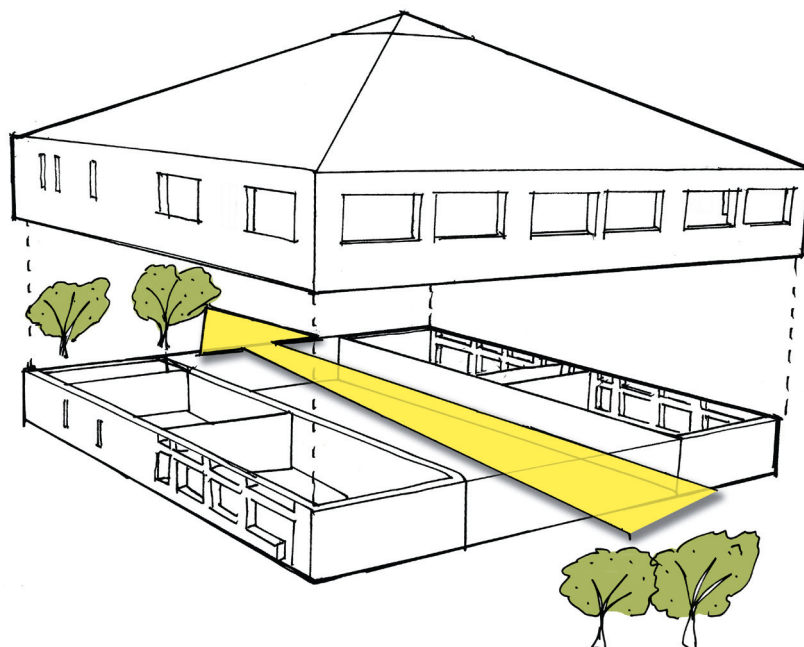
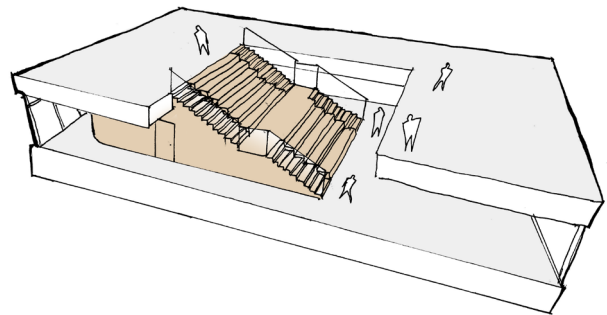
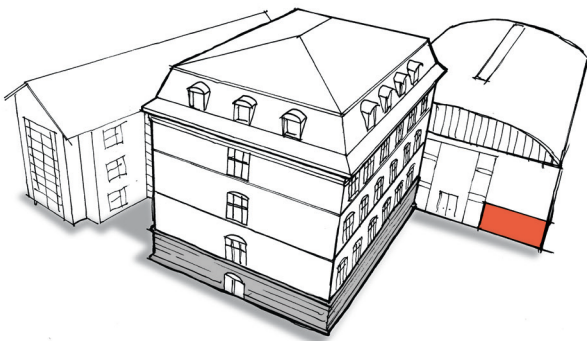
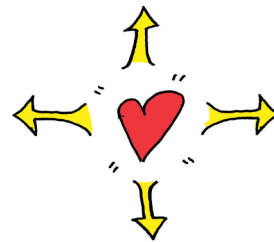


fig. 8.8 concept development

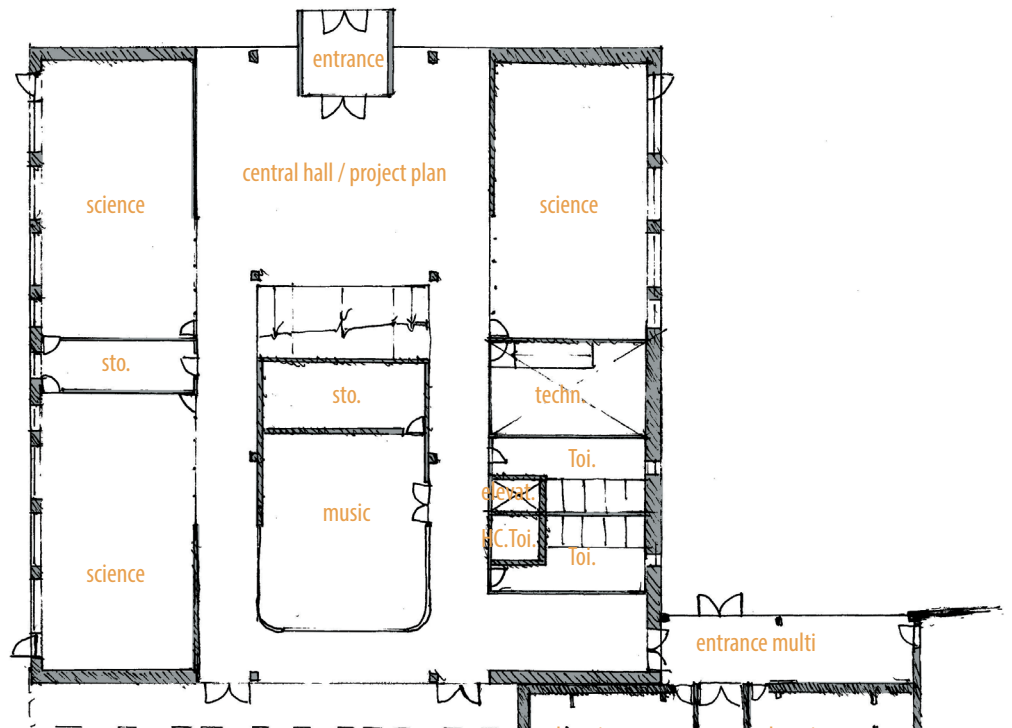


fig. 8.9 ground floor spaces

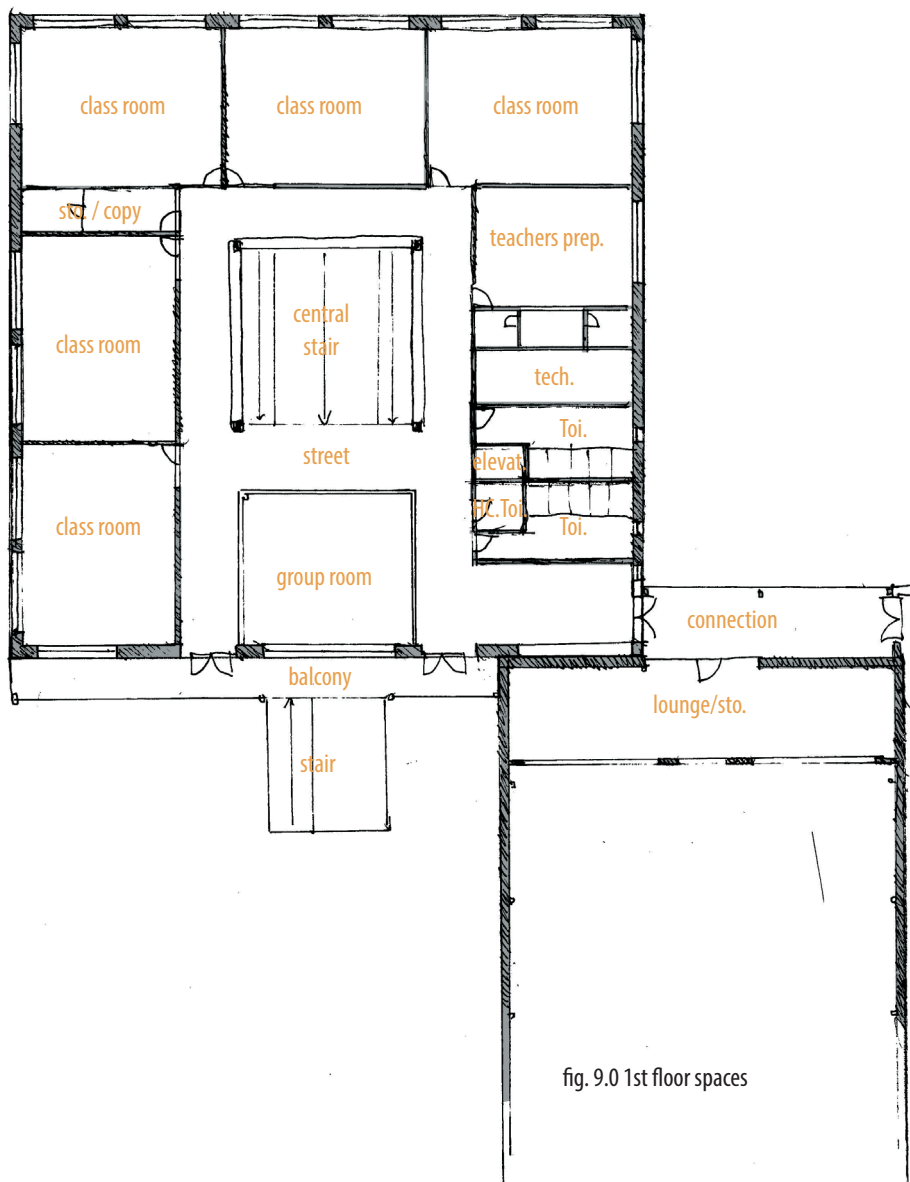


fig. 9.0 1st floor spaces

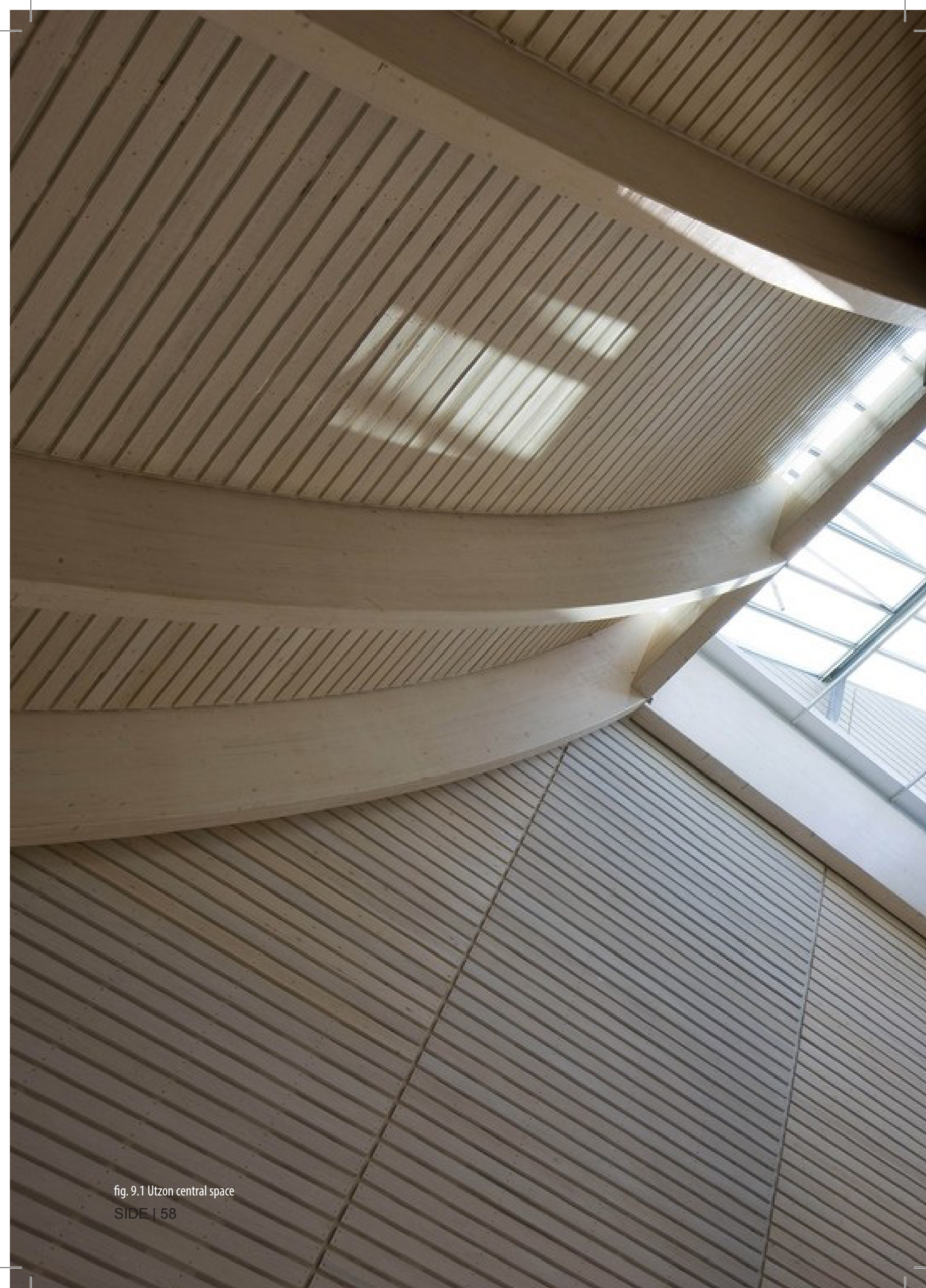


fig. 9.1 Utzon central space



TECHNICAL DETAILING

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DAYLIGHT

THE LIGHT CONDITIONS OF THE FINAL BUILDING

Preconditions

The floor area of the typical class room is 68,25m². The design of the facade varies a little, with the corner rooms having a large window area coming from 3 separate windows instead of 2. The average glazed area of a classroom with 2 windows is $12,4/68,25 = 18\%$ and for corner rooms 27%. According to BR2020 a glazing area of minimum 15% of floor area, however these numbers are for a light transmittance of 75%. In this project the 3-layer energy windows has a light transmittance of $g = 0,58$, which is assumed appropriate due to the size of the glazing area (BR20, 7.2.5.1 stk7). [Web 7]

A very high daylight factor is not equally to good visual properties, many factors play a part: views, color and the distribution of light. Also the teaching plays a part, for instance parts with less lumen intensity can be better for absorbing oneself in book, while more intensity near the windows is better for writing, and drawing. Therefore the vision was to have 2/3 of the room with a daylight factor no lower than 2. In

Classroom

One of the challenges was to get daylight into classrooms and not creating a too big contrast, which is the effect of the sloped roof. It was the vision to avoid skylights as they easily distorted the form of building, therefore it was needed to have a light intake from the exterior and interior. The inner plywood wall has a facade on its own, with windows used to lead air into the

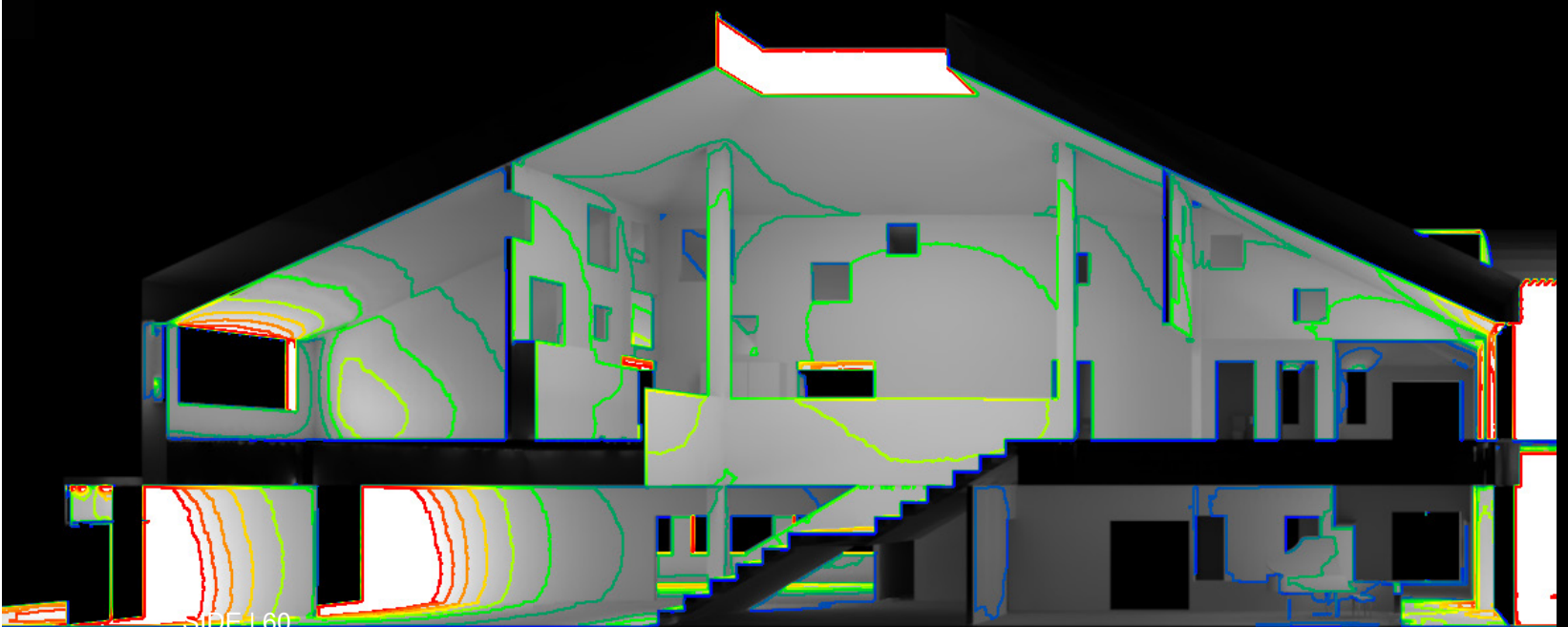
central space for stack ventilation, but they also contribute to leading a little light into the classroom limiting the dark areas caused by the roof angle. The classroom has an average daylight factor of

Central space

the central space is the most well lit space, providing the perfect light for the work areas around the central stair. The light follows the form of the roof spreading to all sides of the space and down to the base of the stair on the ground floor. The light intake from south is limited due to the sun shading but still provides sufficient light for group work areas without causing glare.

Subject rooms

The light intake in the science rooms is less than the classrooms and probably a bit less than what the Velux simulation shows, as there is not taken trees and neighboring building into consideration. As it can be seen a daylight factor of around 2 can be achieved into the middle of the room, this is satisfying as the function of these rooms in many cases will require extra lighting for safety reasons. The music room will have to be artificial lighted as sufficient light only reaches to around the piano area. Work areas towards north gives light for group work and



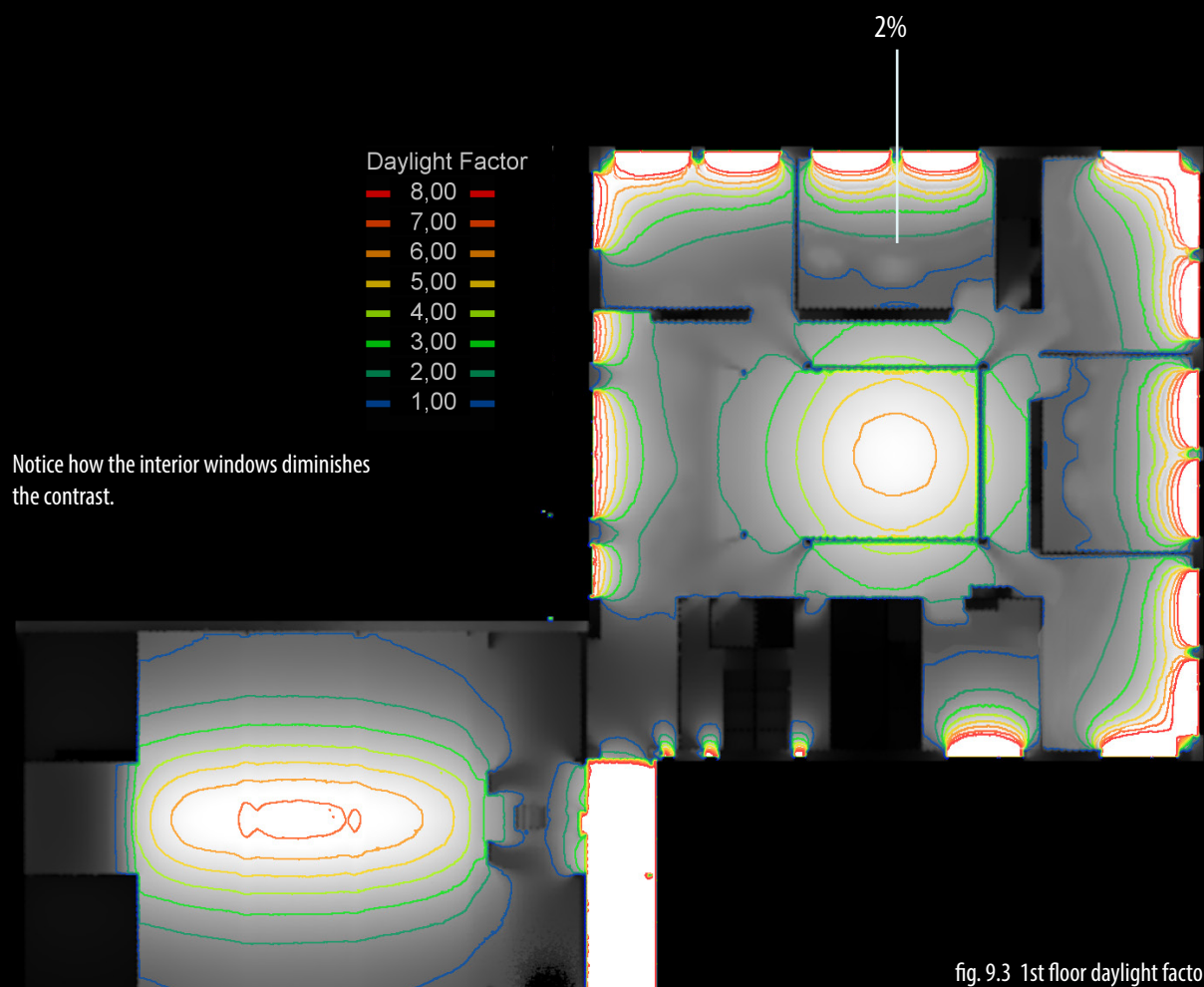


fig. 9.3 1st floor daylight factor

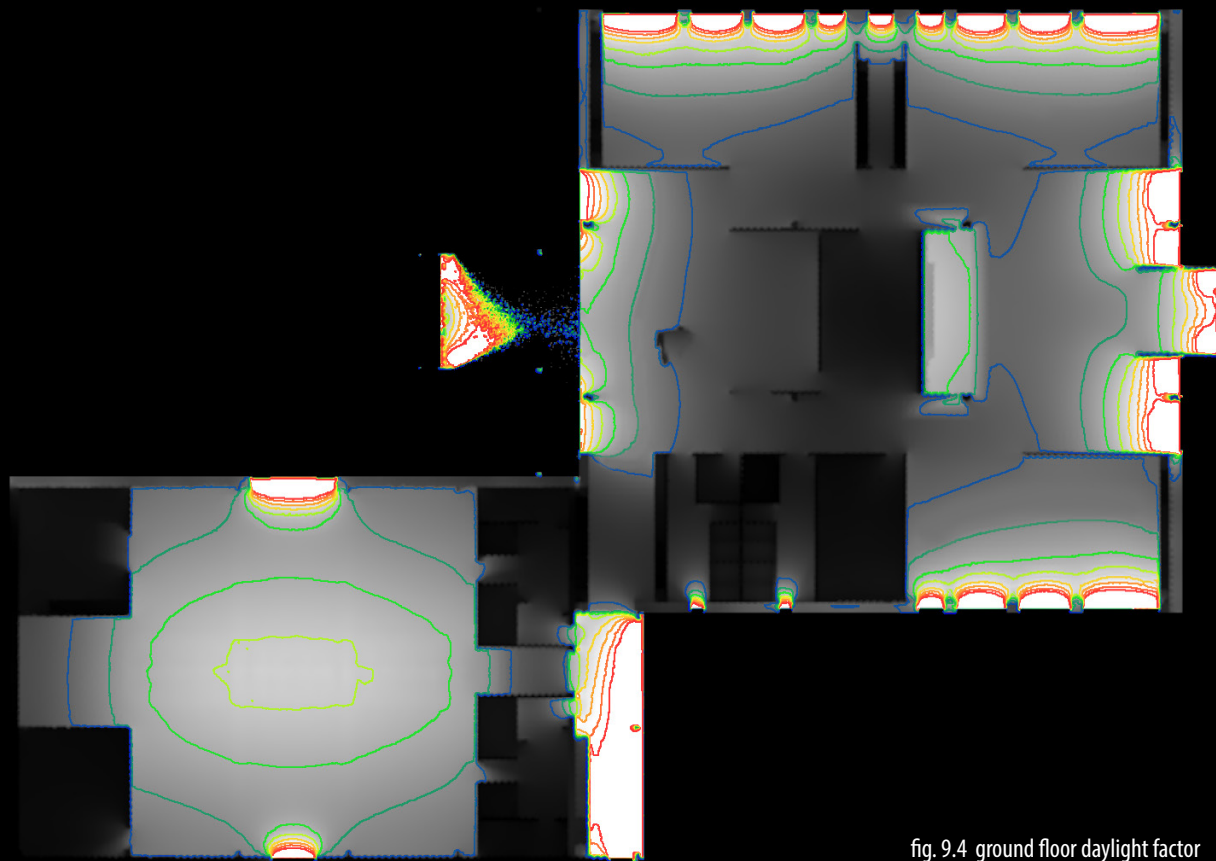


fig. 9.4 ground floor daylight factor

STRUCTURE

STRUCTURAL PRINCIPLE

School

The extension consists of 2 structural systems, a heavy and a light. The school part consists of bearing concrete outer walls and armored columns in the center which support the floors and the construction of the roof. The floor decks consists of TT-decks spanning between kb beams from the columns and the outer walls. The roof is a pyramid geometry with a flat top to allow more sunlight, without structural elements blocking. The roof was initially thought of as steel, however it should be as in the principle of using "rafters", with insulation in-between the structural bearing elements or else the roof will become much thicker as would be the case with a worm roof construction. There the current structure of the roof consists of big rafters: 550mmx380mm of wood with insulation in-between as can be seen in the construction chapter.

Multi hall

The multi hall is a light construction of steel, that follows the exact same principle of the current gym hall with steel lattice rafters and a warm roof construction. Compared to the school part, the multi hall is more transparent in the reading of the structure, making it visible from the courtyard when looking at the glazed entrance area. The school shows its main principle with the central columns and their connection with the roof, giving it a light expression.

All structural elements in both parts are considered fire-proofed by plaster or concrete as in the case of the central space columns of the school.

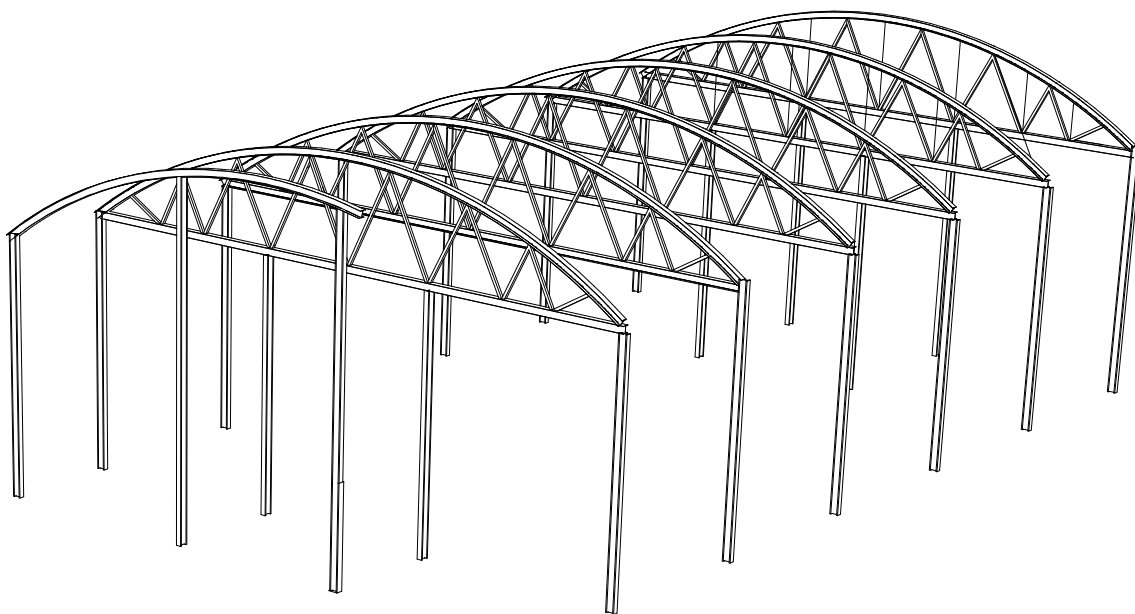


fig. 9.5 multi hall structure

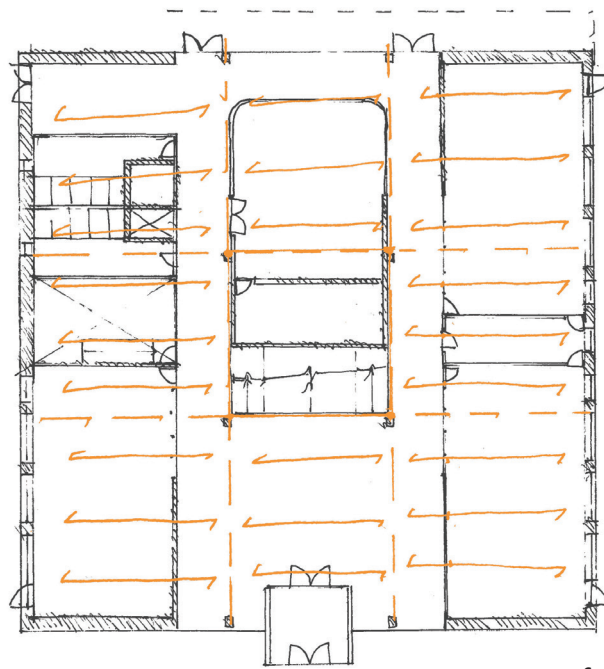
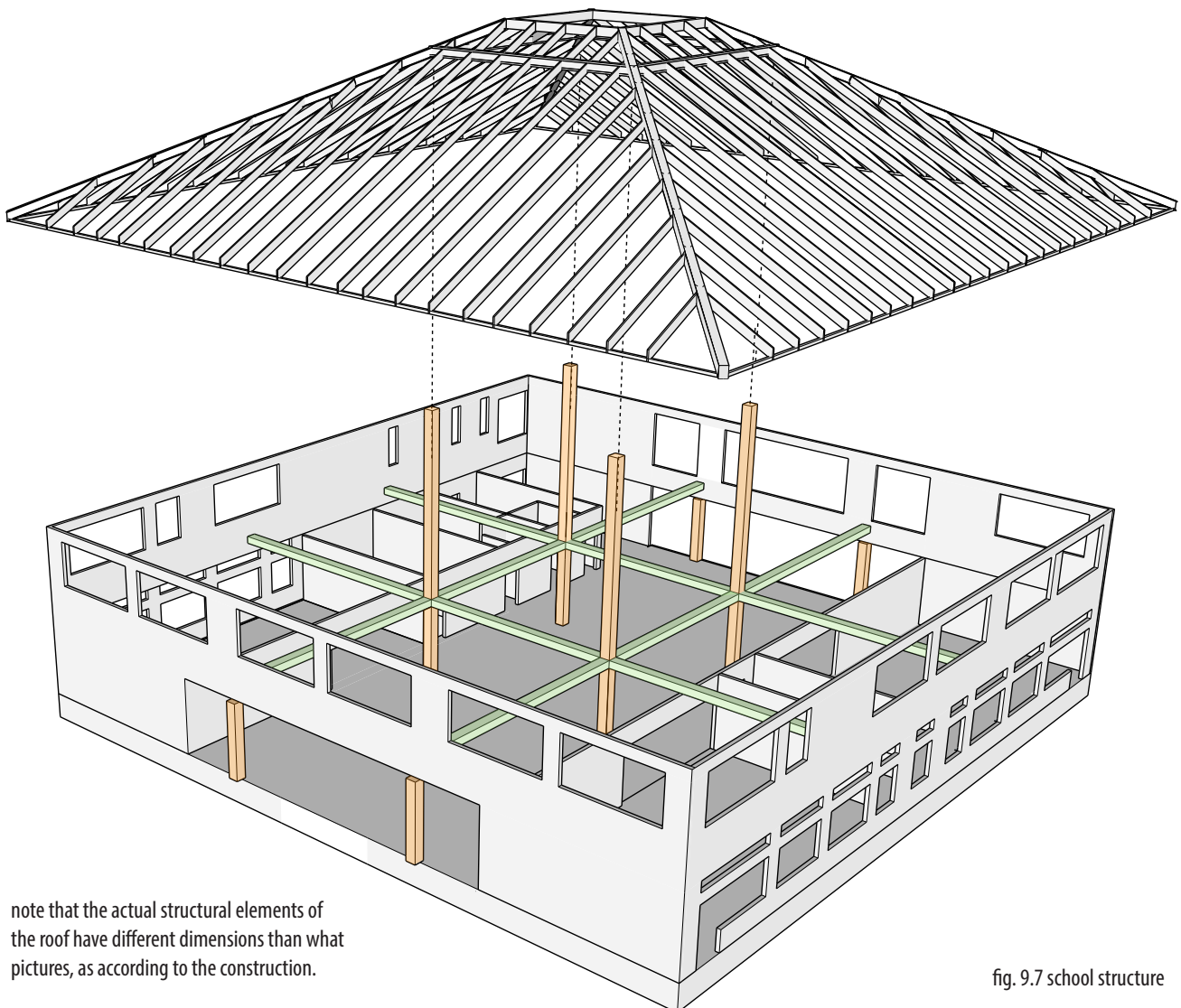


fig. 9.6 deck spanning diagram



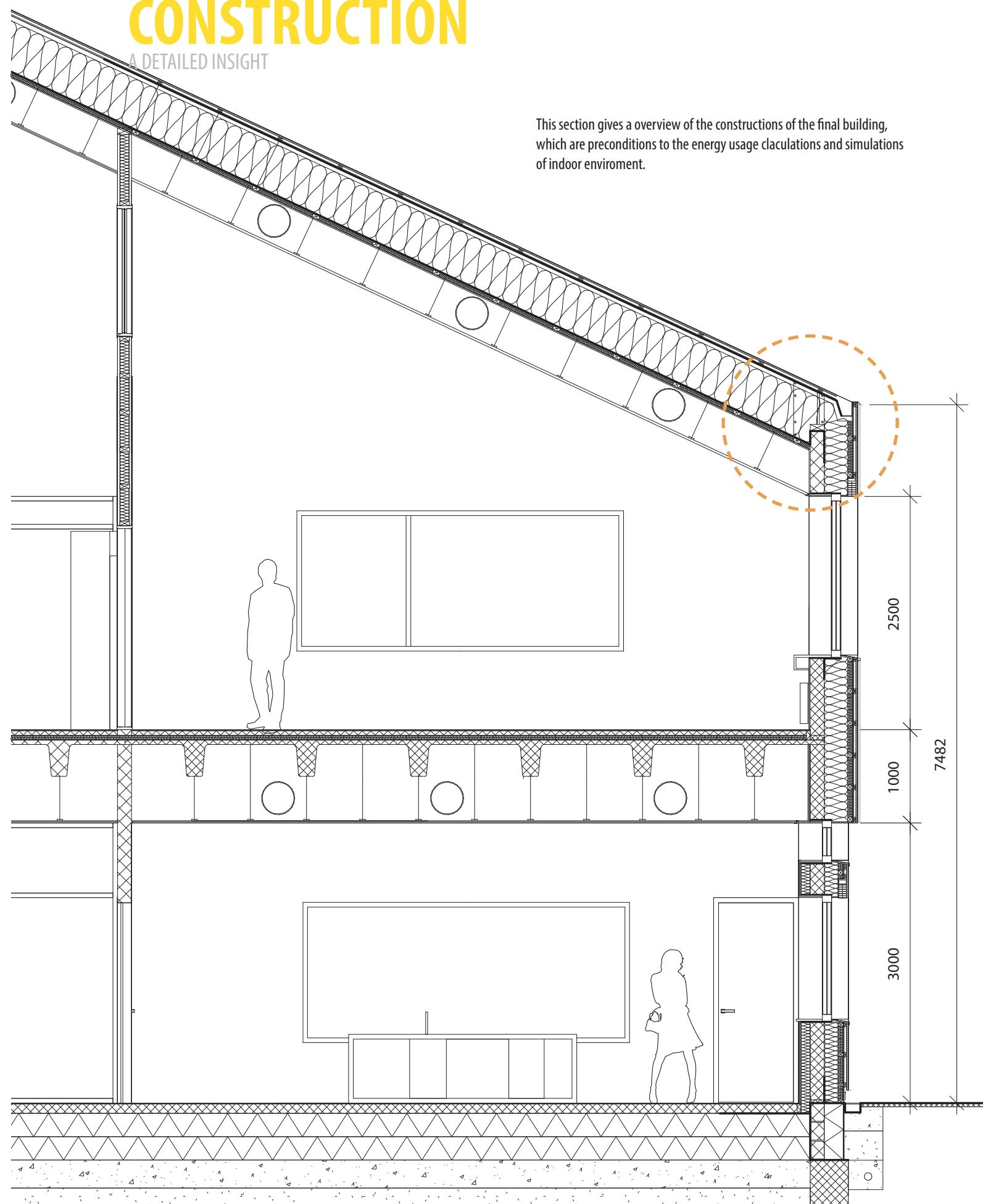
note that the actual structural elements of the roof have different dimensions than what pictures, as according to the construction.

fig. 9.7 school structure

CONSTRUCTION

A DETAILED INSIGHT

This section gives an overview of the constructions of the final building, which are preconditions to the energy usage calculations and simulations of indoor environment.



Roof (multi)

warm roof construction

Zinc 1mm

zinc membrane

Insulation plate 80+20mm

Insulation energy plate 300mm

Vapor membrane

Insulation (acoustic properties) 50mm

Steel trapez plate 220mm

671mm

U-value: 0,074W/m²K

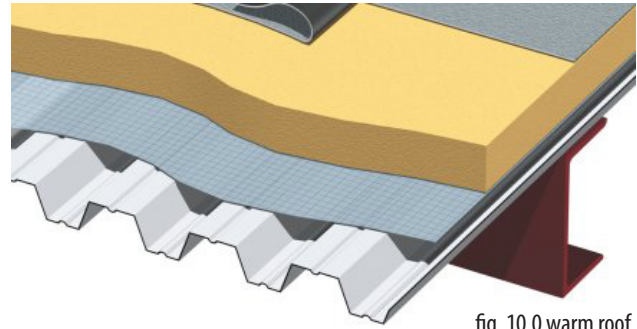


fig. 10.0 warm roof

Wall (multi)

Wood cladding 23mm

Batten 25

Laths 12

Insulation 45

Insulation 250 (insulation layers are with wood structure)

Vapor membrane

Insulation 45

Acoustic wood panel 30mm

430mm

U-value: 0,1W/m²K

Wall (school) - 1st floor

Zinc 1mm

Laths 18mm

Batten 25mm

Insulation 300mm

Vapor membrane

Concrete 150mm

Plasterboard

520mm

U-value: 0,1W/m²K

(Ground floor is same principle but wooden clad with 100mm of the insulation on the inside of the concrete, making the wall slightly thicker)

Roof (school)

Zinc 1mm

Laths 18mm (open gap timber boarding)

Batten+membrane 25mm

Laths 12mm

air gap 50mm

Rafter/insulation 500 (factor 0,9 for thermal resistance due to construction)

Batten/insulation 50

vapor control layer + plaster

Suspended ceiling 425

Acoustic roof 25mm

1105mm

U-value: 0,062W/m²K

Ground Deck

linoleum or wood floor 10-14mm

concrete 100 mm (floor heating ground floor + multi hall)

Membrane

Insulation 2x250mm polystyrene

Capillary break layer 300mm

sand 200mm

1010mm

U-value: 0,064W/m²K

Deck

Linoleum floor 10mm

Concrete 50mm

Insulation (sound) 50mm

TT-40 deck 390mm

Suspended ceiling 475mm

Plasterboards 25mm

1000mm

Basement wall

Leca therm. 390mm

Polystyrene 200mm

U-value 0,1W/m²K

Windows

3 layer energy

G-values 0,55-0,6

U-value 0,82-1W/m²K

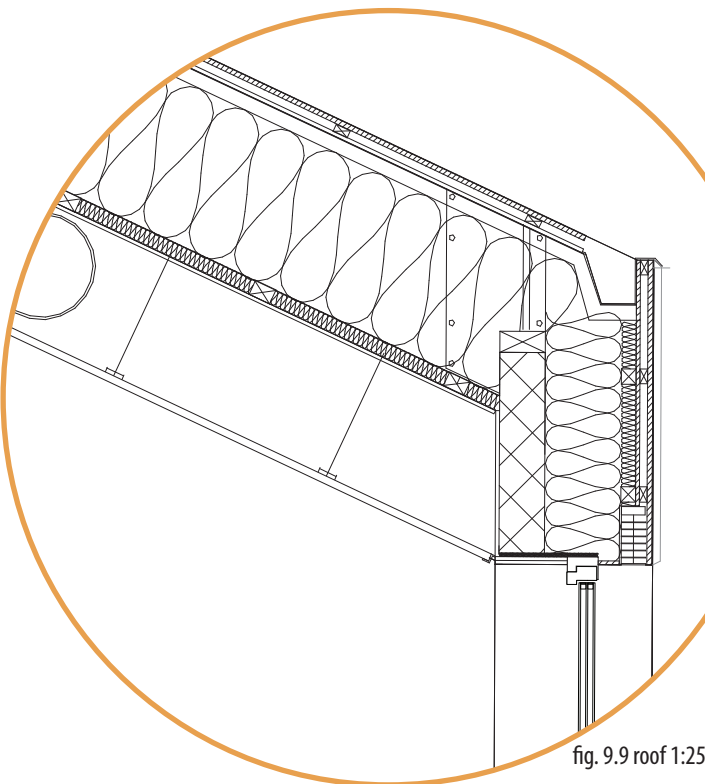


fig. 9.9 roof 1:25

The roof is like the 1st floor walls clad with zinc with 30mm seam. The gutter is integrated in the roof construction, in order not to distort the shape of the building.

Several windows have solar shading blinds integrated, that can be controlled to automatically come down when needed.

INDOOR CLIMATE

THERMAL AND ATMOSPHERIC

The internal climate plays an important part in the well-being and learning process. To ensure that the internal environment was good, BSIM simulations were made of the worst case scenario, being the classroom placed at the corner. This due to their high percentage of window and the classroom being the room with the highest internal load compared to floor area. The school extension is designed to the use of hybrid ventilation. Mechanical only in winter season and in summer season mechanical through the day and natural night cooling. The principle of the mechanical ventilation used in this project is mixed ventilation. The air is supplied by the room from the ventilation channels in the top of the room, which mixes with the polluted air, replacing the air in the room gradually while polluted air is drawn out of the room.

As mentioned in the program the goal of the indoor climate is to fulfil the BR2020 requirements regarding atmospheric comfort, meaning max of 900ppm pollution in the air. While the sensoric demands is based on CAT B demands from [CR1752], likewise the thermal demands are based on BR2020: max 100 hours above 26 and 25 above 27 and CAT B operational temperatures. The calculations can be found in attached cd together with the simulated model. [DS 474]

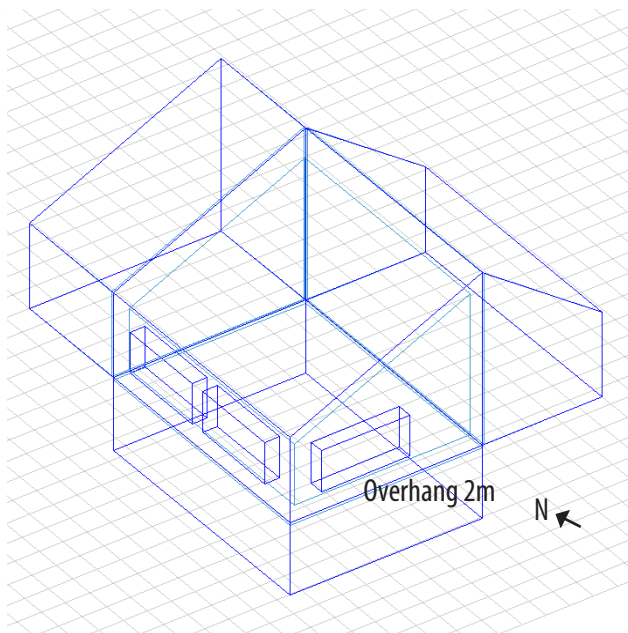


fig 10.1 bsim model

Preconditions

classroom

-68,25 m²
-282m³

Window area

-18,8m² equal to 27% of floor area.

Internal Heat load (worst case)

-26 people worst case of 72W/pers (based on Bsim -1 clo (winter clothing) equals 72 watt), Mon-Fri 8:00-16:00 (8-15 100% , 15-16 50%)

-Equipment is set as 0,9kW heat load. Value in BE10 is 6W/m² equaling 0,4kW, in this case (worst case scenario) a situation is assumed of approximately 15 modern laptops of 65W and projecting equipment. (8-15 100%, 15-16 25%)

-Lighting 300 lux lighting, task light 0,05kW, fluorescent , Gen. Lighting 5kW, fluorescent continuous, Mon-Fri 8-16

Thermal conditions

-Infiltration 0,13l/s/m² occupied time and 0,09l/s/m² unoccupied time, according to BR2020. [Exhausto,2011]

-Mechanical ventilation: 0,325 m³/s,(4,14h-1), 8-16:00 and 16-8:00 all hours. Based on calculation of pollution load according to BR2020 in other cases based on sensoric calculation load if it is higher.

-Winter inletctrl: adjusted from 22 C° -19C°

-Summerinletctrl: 24-21 C°

Based on category B [CR1752]

Heating

-40 kW max pow, 0,6 to air. Setp 22

-Heatctrl-winter: operative temperature 22+-1C°, set point temperature 22C°, Winter: January, February, March, October, November, December.

-Heatctrl-summer: operative temperatures 24+-1,5, set point is set to 23 due to the warmth accumulating in the room. Summer: May, June, July (outside usage), August, September.

Initial without shading

1024 hours above 26 C° and 530 above 27 C°, with overheating divided over: april -september.

Change of inlet

The ventilation inlet is changed in winter 21 C° and 20 C° for summer. The inlet is not changed in using time to under 3C under operative temperature range, in order to avoid draft. 795 h. above 26 C° and 380 above 27 C°

Solar shading

solar shading was activated as external blinds for when temperatures is above operative in summer months with overheating, but not in april as it was noted that the first weeks of the month was in need of heat. Reducing overheating to 355 hours above 26 C° and 105 above 27 C°, however 23 of the overheating hours was in April.

Night cooling

Natural night ventilation was activated to make stress on the room less in the beginning of the day: minimizes the overheating to 57 above 26 C° and 26 above 27 C°. However late march temperatures were still a bit too high exceeding 23,5 C°. However all the over temperatures i above 26 - 27 C° were limited to only june and august, meaning these 2 month are the ones in need of a hight ventilation rate, much higher than april and september and beginning of may.

Raising the summer ventilation rate

A higher mechanical vent of 0,4m3/s (5,1 h-1) is activated in the summer season : 44 hours above 26 C° and 21 above 27 C°. Which makes the temperatures better in march. The mechanical ventilation was set to start 1 hour earlier in june and august with a low inlet of 18 C°: 39 hours above 26 C° and 20 above 27 C°, the BR2020 demands of under 100 above 26 C° and under 25 hours above 27 C° in the most critical room. [DS 474]

To minimize the overheating of those 3-weeks, meaning last weeks of june and first in august, the mechanical ventilation is further raised to 6,38h-1: 28 hours above 26 C° and 9 above 27 C°. If the classroom is one of the 2 northern turned class rooms instead of the one towards South, the result is: 27 hours above 26 C° and only 8 above 27 C°.

Natural ventilation

The use of natural ventilation is day time was simulated first. However it was seen that due to the high airchange needed, and the shifting effect of the airchange from natural ventilation, the Co2 would raise above the permitted 900 ppm, therefore it was discarded. However this is also contributed to the calculation of it as single sided, not being nearly as effective. It is therefore assumed that in the case of the central space, natural ventilation can be used due to the thermal buoyancy.

Conclusion

It is noted that the ventilation could be set a little higher but it would not have much effect besides erasing a couple of overheating hours, that are divided over the 3 weeks. Meaning last weeks of month will have high temperatures, that could be supplemented by natural ventilation some of the day time. However it is important to note that this is the worst case scenario, taking into consideration 26 people. If the class room is used as an international one, often there be less than 26 people. It is also important to note that the effect of the natural ventilation could be higher, as it is calculated instead of stack ventilation which will be the real functioning way, through the skylight in the central space.

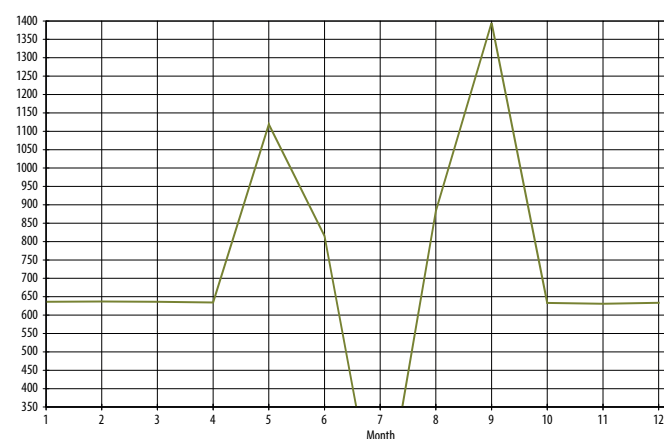
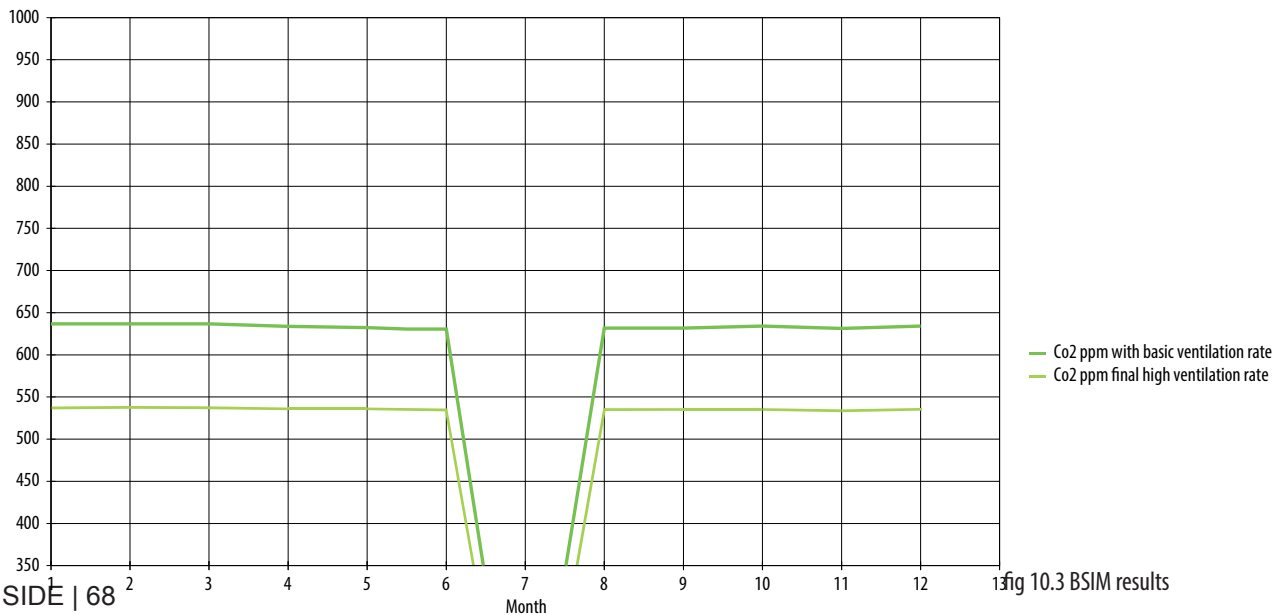
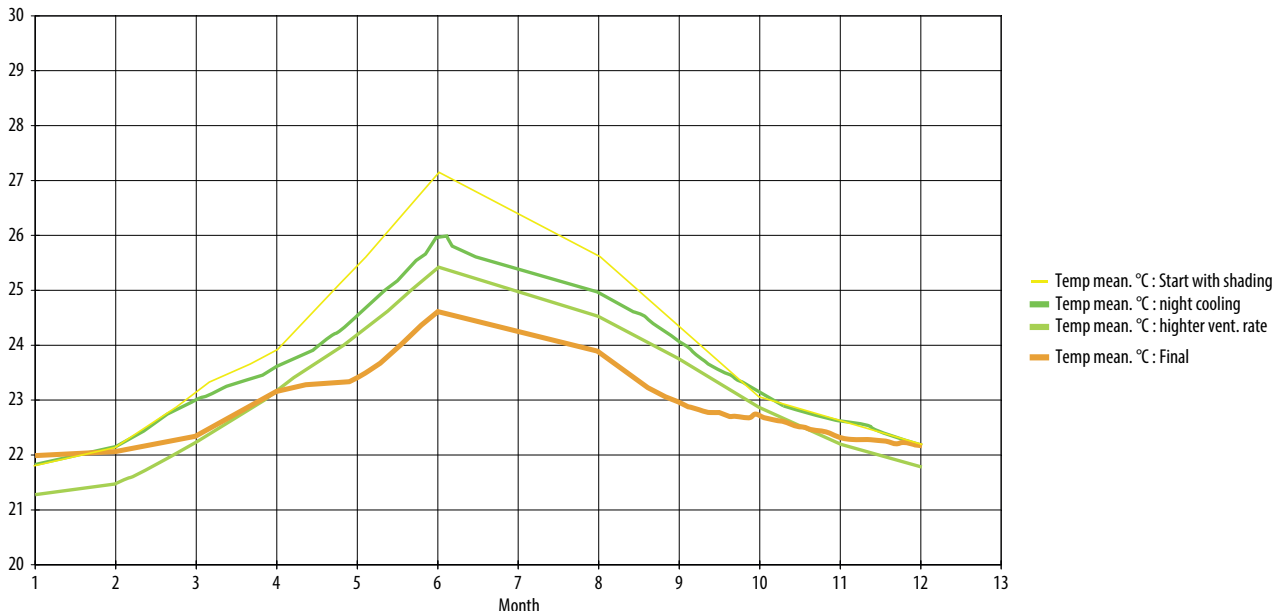
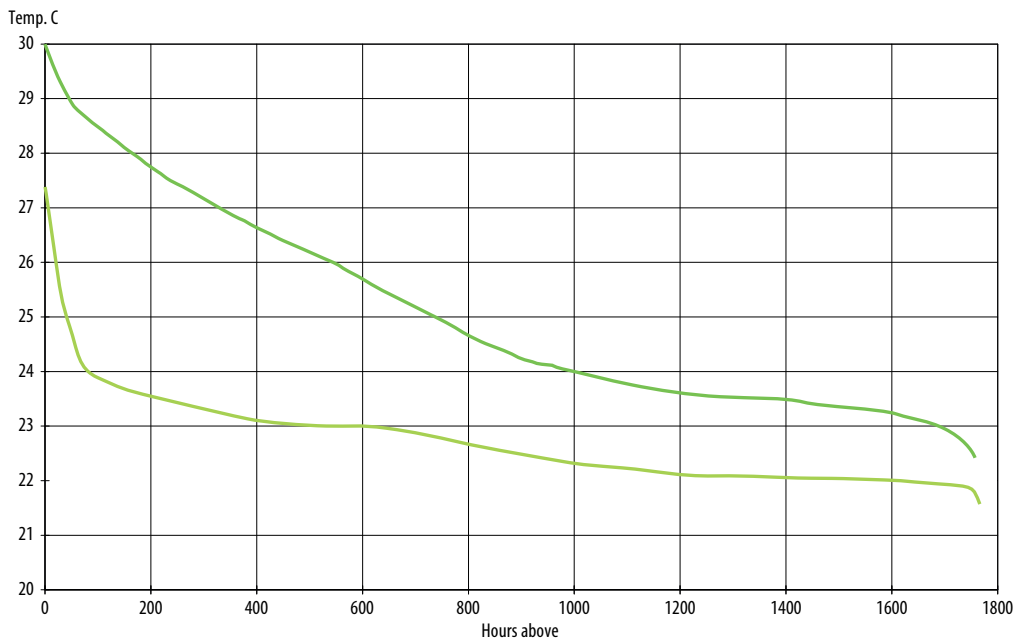


fig10.2 Co₂ natural ventilation



Classroom calculation:

The simulations are based upon average air change rates calculated in an excel sheet attached on CD. The required ventilation rate is based upon constants from CR1752 to calculate the pollution from occupants and the building and equipment. The ventilation is calculated based on category B, meaning a max 20% sensed dissatisfaction with the environment. However the atmospheric comfort is based on BR2020, which is better than cat. B. The required ventilation rate for sensoric comfort can be calculated as [CR1752] (table A.5):

$$Q_c = 10 \cdot (G_c / C_{ci} - C_{c0}) \cdot (1 / e_v)$$

Q_c [l/s m²] for comfort

G_c [Olf/m²] is the sensory pollution load

C_{ci} perceived indoor quality 1,4 dp Cat B, table [A.5 CR1752 (ibid)]

C_{c0} perceived air quality of intake 0,1 dp table A.9 [CR1752 (ibid)]

e_v effectiveness of ventilation, entirely mixed air =1.

Pollution:

26 people of 1,2 [met] activity and 1,3 olf/pers in classroom

-> 0,49 olf/m²+ new building 0,1 olf/m² ->0,59olf/m²

[A.6+A.8 CR1752]

$$Q_c = 10 [l/s] \cdot (0,59 \text{ olf/m}^2 / (1,4 - 0,1 \text{ dp})) \cdot (1/1)$$

$$= 4,57 \text{ l/s m}^2 = 1125 \text{ m}^3/\text{h} = 3,99 \text{ h}^{-1}$$

The next calculation was the required ventilation rate according to Co_2 :

$$Q_h = (G_h / (C_{hi} - C_{h0})) \cdot (1 / e_v)$$

Q_h [l/s·m²] Necessary ventilation to sustain healthy air

G_h [l/t] Co_2 load on airquality

C_{hi} [ppm] concentration for chemical inlet 900ppm

C_{h0} [ppm] outdoor concentration 350ppm of the chemical

instead of the C_{hi} value of category B 1010 ppm, the value 900 ppm is used according to the BR20 regulation of a max of 900ppm. The calculation is based upon that a student of activity lvl. 1,2 emit 19l/h Co_2 [CR1752 p. 26 A.6] The concentration of Co_2 cannot exceed 0,1% according to [BR10].

$$Q_h = (0,38 \text{ pers.} / (C_{hi} - C_{h0})) \cdot (1 / e_v)$$

$$Q_h = (0,38 \text{ pers.} / \text{m}^2 \cdot 19 \text{ l/h pers.}) / (3600 \cdot 550 \text{ ppm} \cdot 10^{-6}) \cdot (1/1) \\ = 4,74 \text{ l/s m}^2 = 4,14 \text{ h}^{-1} - \text{this were chosen for the beginning basic air change.}$$

Numbers are based on worst case scenario							
Classroom	Area m ² 68.25	Ceiling height m 2,5-5,8			Volume m ³ 282		
People load	people load pers. 26	Time Mon-Fri	Time 9-15 15-16	Schedule 100% 50%	Activity Met 1,2	Co_2 pollution l/h 19	Heat gen. W 72W pers.
Infiltration (BR2020)	airchange l/s m ² 0,13 0,09	Time Mon-Fri Mon-Sun	Time 9-16 16-9	Schedule 100% 69%	Basic Airchange l/s 8,87 6,14	Airchange m ³ /h 31,94 22,11	Airchange h ⁻¹ 0,11 0,078
Heating	Max pow. kW 400	Summer Temp. C° 23	Winter Temp. C° 22	Summer time Apr-Sep	Winter Oct-Mar	Time Mon-Fri user time	Time 8-16
Ventilation During the simulations it was noted that overheating outside June and August did not occur with night ventilation and low vent. rate during day time 0,325-0,4m ³ /s	Winter ventilation rate 0,325m ³ /s 4,14h ⁻¹ Night cooling 0-2h ⁻¹ Summer ventilation 0,5m ³ /s 6,38h ⁻¹	Heat Recovery 85%	Heat. Coil kW 100	Summer time Apr-Sep Inlet 21-20C° May-Sep	Winter Oct-Mar Inlet 22-19C°	Time Mon-Fri user time	Time 8-16 Time 17-7 Time 8-16 7-16 in June
Lighting	Light LUX 300	Task light kW 0,05	Light Energy W/m ² 10	Gen. Lighting kW 5,0	Switch Ctrl. Continous	Time Mon-Fri	Time 8-16

fig10.4 BSIM input

ENERGY USAGE

BE10 CALCULATION AND INTEGRATION OF ACTIVE MEANS

As defined in the program this project strives to fulfil the BR2015 requirements with the use of only passive means and fulfill the BR2020 demands with the use of passive means. The energy usage by the building has been documented in BE10, which is attached in a CD where all the parameters can be seen.

The values in be10 are estimated and based on calculations as the one used in the calculation of ventilation rates.

It is clear that the building has some will use a lot of energy on ventilating the spaces, when dimensioned according to the worst case scenario. An average input of the summer ventilation rate is based upon the class room scenario, meaning an average 2,5l/s m² more than in winter added to all the rooms, making use of mechanical ventilation solely during day time. It is assumed that central room and group room and the multi hall can make use of natural stack ventilation, due to their dimensions and heat load. The result is an energy usage of 42 kWh/m² year according to BR15 and 31 kWh/m² year according to BR2020. Meaning above the 41,4 demand of BR15 and 25 kWh/

m² year of BR2020. However due to the high ventilation needs in the summer season, a supplement can be granted according to BR2020 for buildings other than housing. The supplement is given if the ventilation need in summer exceeds 1,2 l/s m² and if the normal lighting level is above 200 lux, a supplement can be given that is the size of difference above the values above and the actual used values. Gym halls can only be given a supplement if area of the building envelope exceeds the floor area by a factor 3, which is not the case here. Though the multi hall have a small building envelope and a high internal heat gain from users limiting energy spent for warming. [Aggerholm, 2008]

With supplemented energy, the energy use of the building is 41,4kWh/m² according to br15 meaning an addition of 0,6kwh/m² year a difference which is just enough to fulfil the br15 demands with a building using 41,9 kWh/m² year which is demand with supplement, but 31 kWh/m² year according to BR2020, meaning that active means needs to be used to get the last 5,4 kwh/year.

Nøgletal, kWh/m ² år			
Energiramme BR 2010			
Uden tillæg	Tillæg for særlige betingelser	Samlet energiramme	
72,0	0,6	72,6	
Samlet energibehov		48,3	
Energiramme Lavenergi-byggeri 2015			
Uden tillæg	Tillæg for særlige betingelser	Samlet energiramme	
41,4	0,6	42,0	
Samlet energibehov		42,0	
Energiramme Byggeri 2020			
Uden tillæg	Tillæg for særlige betingelser	Samlet energiramme	
25,0	0,6	25,6	
Samlet energibehov		31,0	
Bidrag til energibehovet		Netto behov	
Varmerum	31,8	Rumopvarmning	26,5
El til bygningsdrift	6,6	Varmt brugsvand	5,3
Overtemp. i rum	0,0	Køling	0,0
Udvalgte elbehov		Varmetab fra installationer	
Belysning	2,1	Rumopvarmning	0,0
Opvarmning af rum	0,0	Varmt brugsvand	0,0
Opvarmning af vbv	0,0		
Varmepumpe	0,0	Ydelse fra særlige kilder	
Ventilatorer	4,5	Solvarme	0,0
Pumper	0,0	Varmepumpe	0,0
Køling	0,0	Solceller	0,0
Totalt elforbrug	17,5	Vindmøller	0,0

Nøgletal, kWh/m ² år			
Energiramme BR 2010			
Uden tillæg	Tillæg for særlige betingelser	Samlet energiramme	
72,0	0,6	72,6	
Samlet energibehov		40,5	
Energiramme Lavenergi-byggeri 2015			
Uden tillæg	Tillæg for særlige betingelser	Samlet energiramme	
41,4	0,6	42,0	
Samlet energibehov		34,2	
Energiramme Byggeri 2020			
Uden tillæg	Tillæg for særlige betingelser	Samlet energiramme	
25,0	0,6	25,6	
Samlet energibehov		25,4	
Bidrag til energibehovet		Netto behov	
Varmerum	31,8	Rumopvarmning	26,5
El til bygningsdrift	6,6	Varmt brugsvand	5,3
Overtemp. i rum	0,0	Køling	0,0
Udvalgte elbehov		Varmetab fra installationer	
Belysning	2,1	Rumopvarmning	0,0
Opvarmning af rum	0,0	Varmt brugsvand	0,0
Opvarmning af vbv	0,0		
Varmepumpe	0,0	Ydelse fra særlige kilder	
Ventilatorer	4,5	Solvarme	0,0
Pumper	0,0	Varmepumpe	0,0
Køling	0,0	Solceller	3,1
Totalt elforbrug	17,5	Vindmøller	0,0

fig 10.5 BE10 result

It was decided to integrate solar cells in the roof of the school towards south. 84m² pv-cells is integrated on the roof which brings the energy-usage of the school extension down to 25,4 fulfilling the br2020 of 25,6 kWh/m² year with supplements.

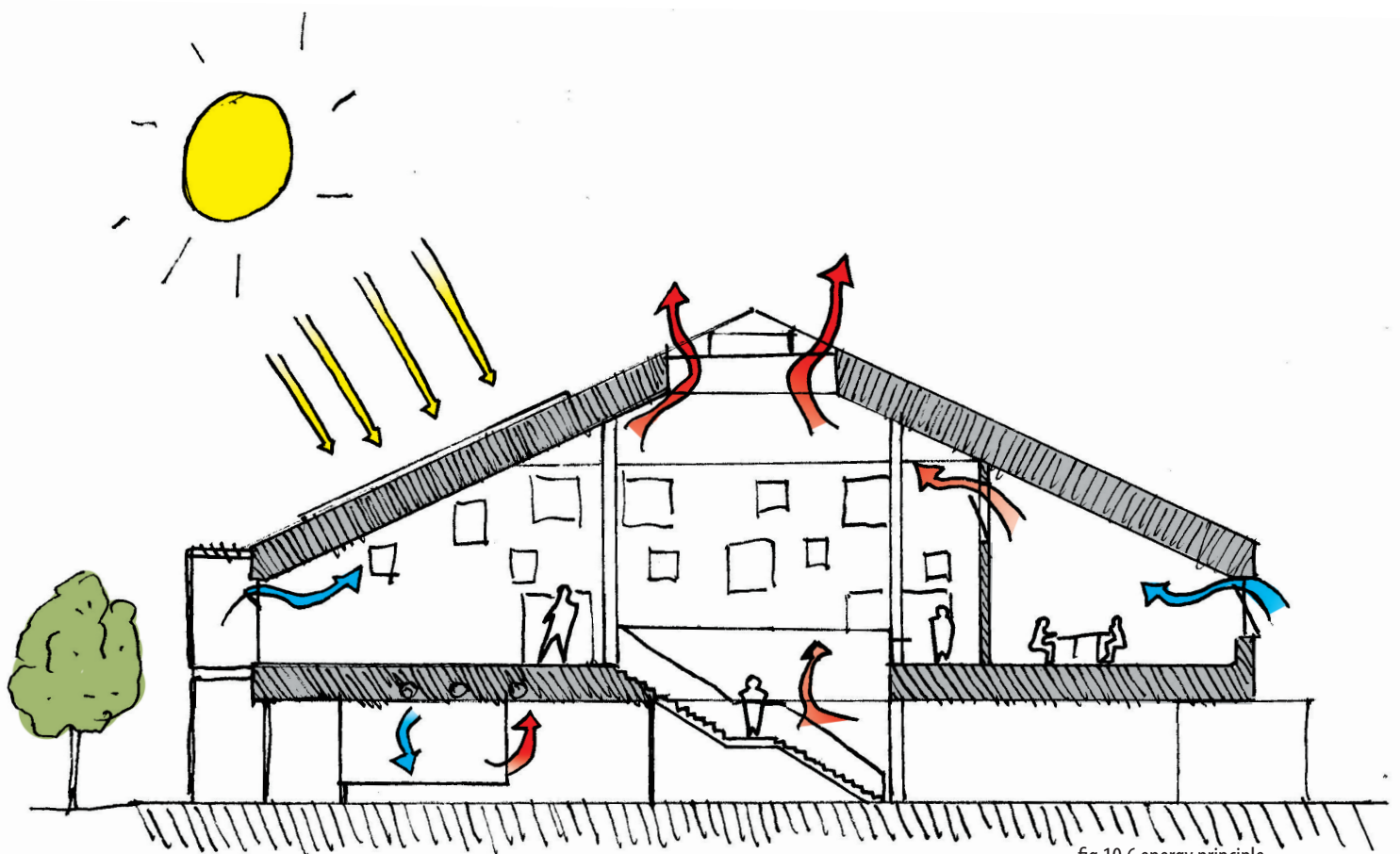


fig 10.6 energy principle

PRESENTATION

BIRD'S EYE VIEW

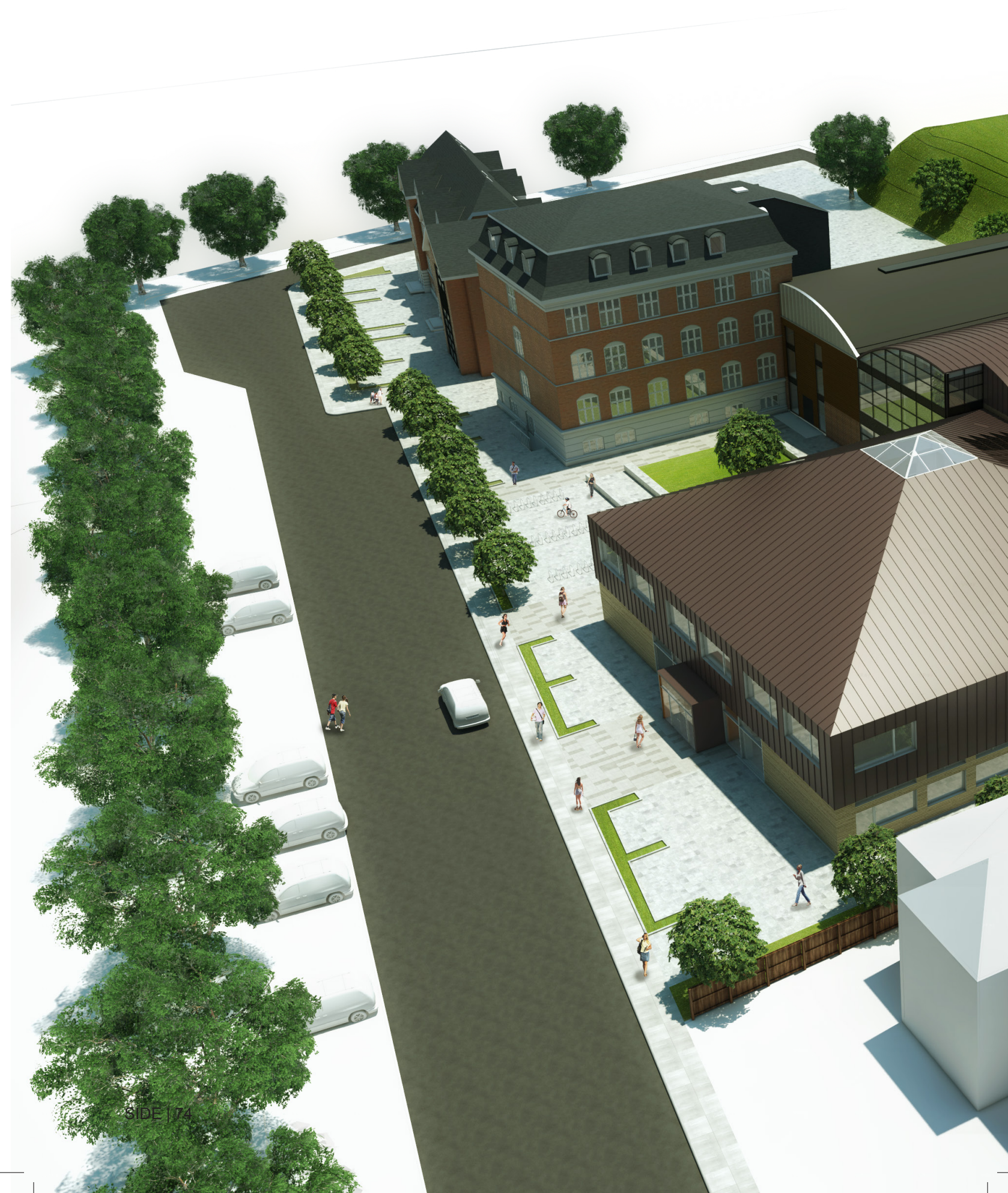




fig 10.7 Bird perspective

PRESENTATION

SITE PLAN

1:500



SIDE | 76

Situationsplan 1 : 500



Exterior Area

The Skipper Clement extension draws attention from the street and is experienced in a functional and city coherent way with the school and neighboring buildings.

North of the extension the Kildepark has a very green and recreational character connected with the road and bicycle lanes leading to the school. At the same time the school is defined by the slope along South with some greenery and trees that together with the windbreak and trees towards the West provide intimacy.

The extension inscribes itself in the scenic coherence by making a fluid transition from Kildeparken to the extension. A courtyard between the old and new school and green lines of trees leading to the south garden makes a strong relation to Kildeparken, while providing a good frame for the school. The result is a school in a joint green frame that opens up towards the main entrance Gl. Kærvej. From the street of arrival the outdoor concept follows the principle of the existing. The extension is withdrawn a bit from the street being on line with the main building of the Skipper Clement School.

From the sidewalk a green line with bushes flower beds and small trees marks the transition to the school area. Where these break up the concrete tiles of the ground cover leads the visitor to the entrances of the school and parking of bikes. The courtyard garden of the North is combined with park area for bikes placed the most towards the North, making it visible where the pupils should go with their bikes. The rest of the courtyard is seating areas and green area and an outdoor area for experiments in connection with the science room. By this the courtyard gives some glimpses of the old main building when coming to the area while not appearing as a big open yard for parking.

Equally the school opens up towards South, which is the intimate outdoor area for the students. Here there is established an outdoor area, with a sport field for multiple purposes. Seating areas and a grand stair leading to the first and its balcony provides many spaces for social interaction.

- The parking place for cars is built on the same principals as before being located along Gl. Kærvej towards the park.

ARRIVAL

ARRIVING FROM GL. KÆRVEJ





fig 10.9

COURTYARD

VIEW FROM GL. KÆRVEJ TO THE MULTI HALL

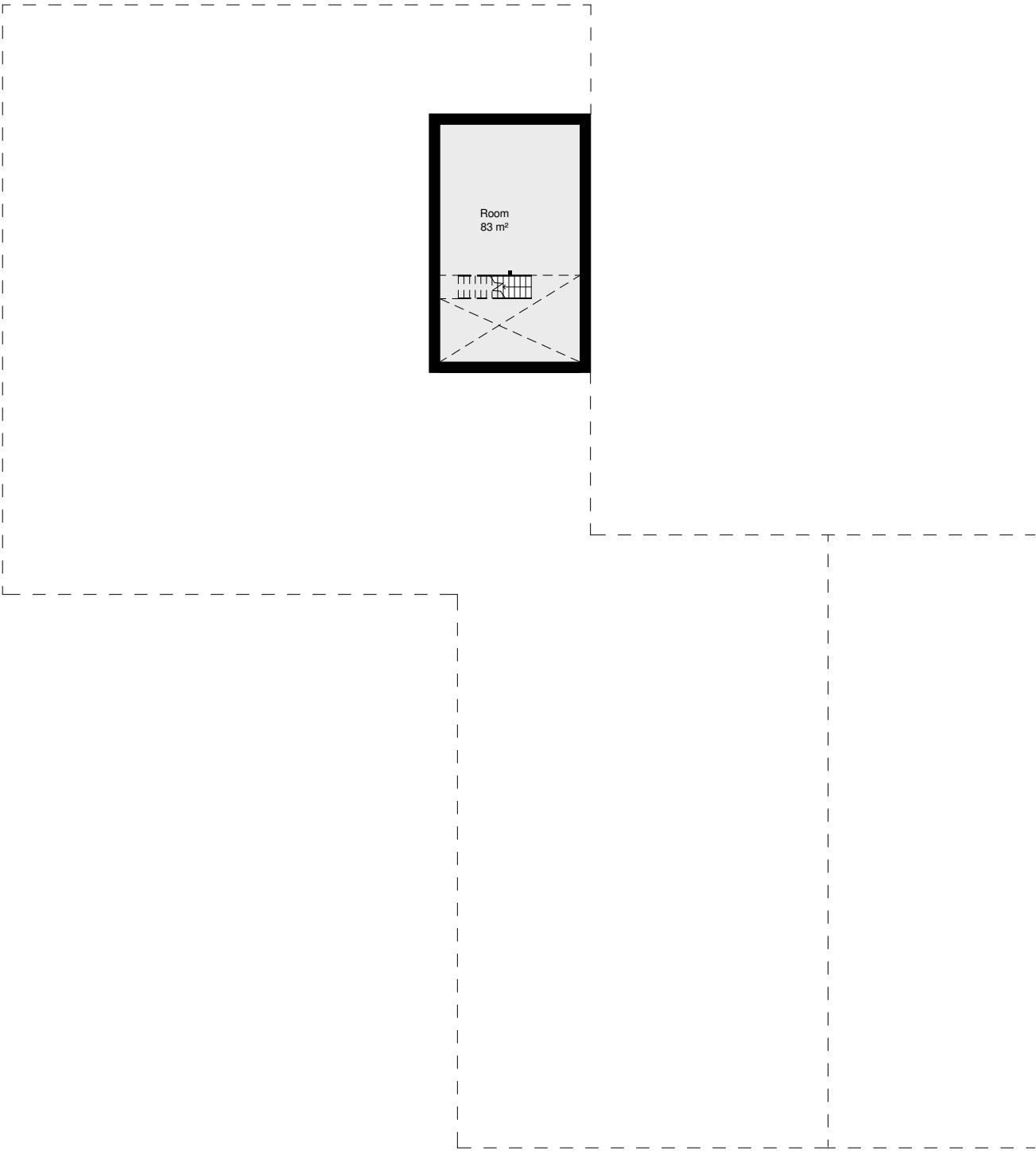




fig 11.0

BASEMENT

1:300



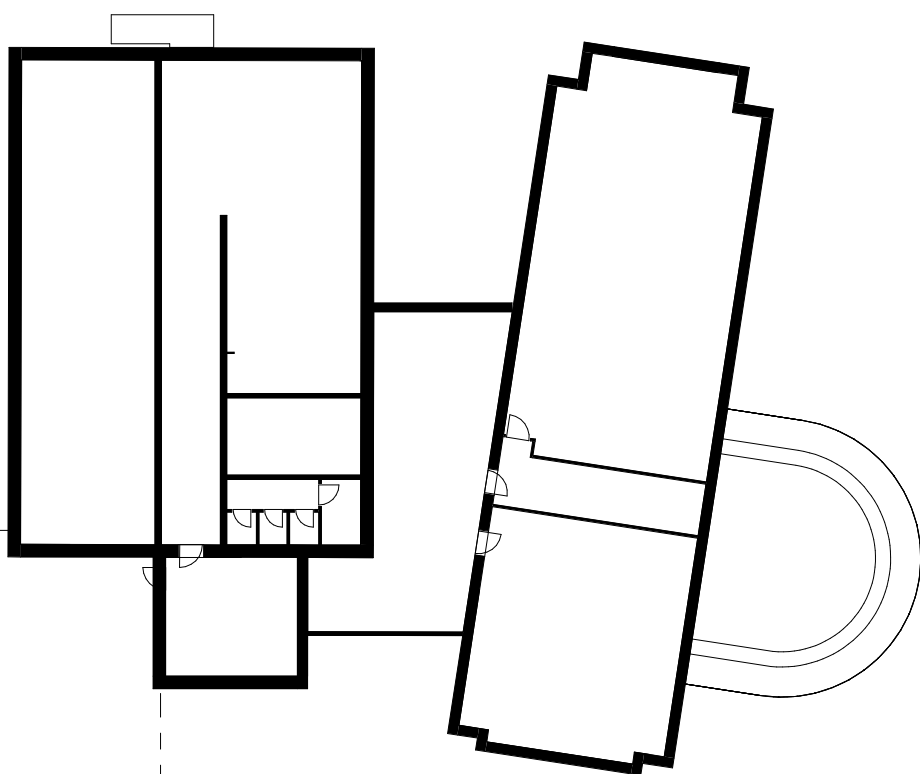
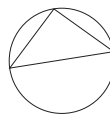
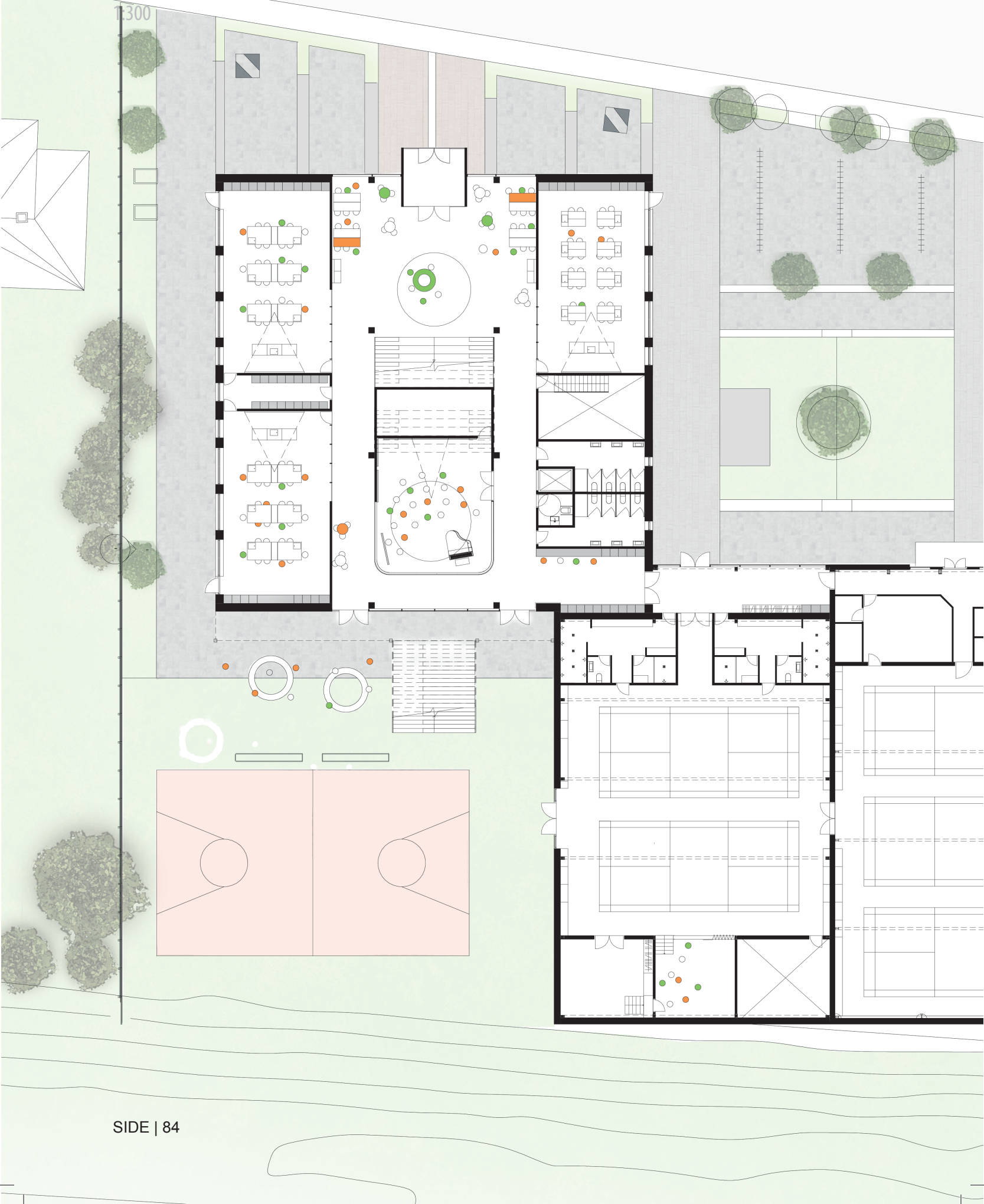


fig 11.1

GROUND FLOOR



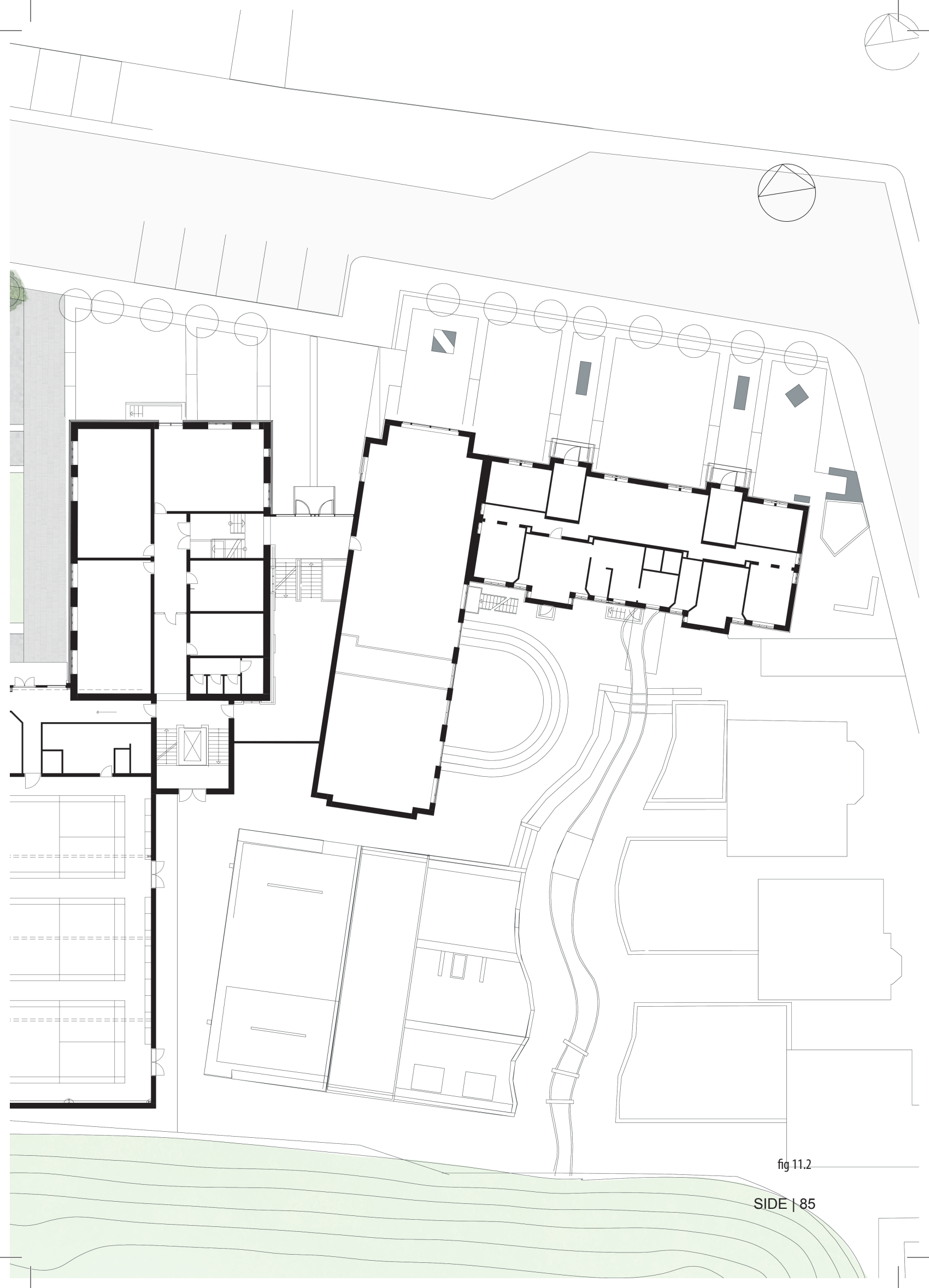


fig 11.2

FIRST FLOOR

1:300





fig 11.3

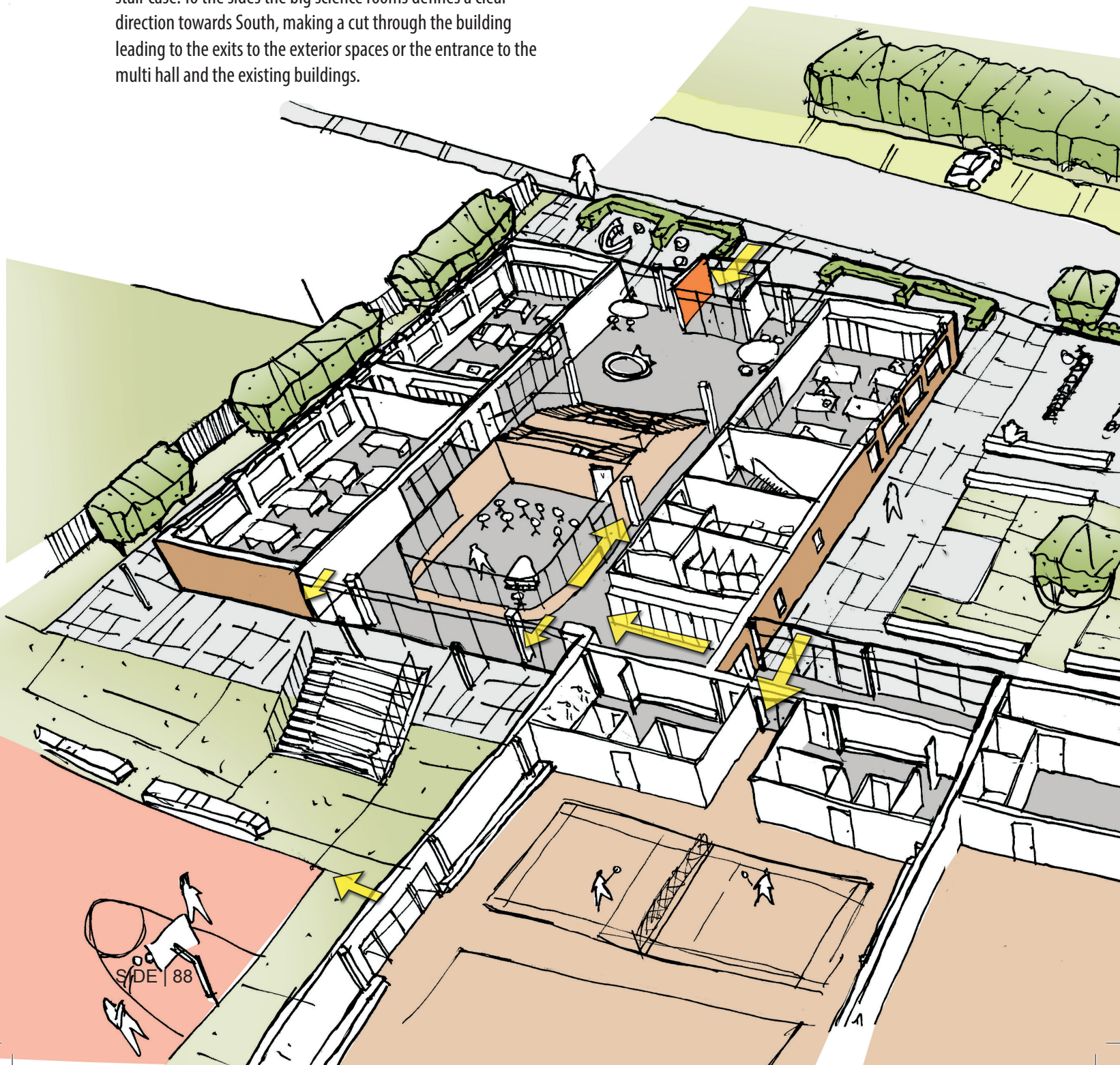
FLOW

ARRIVAL AND CONNECTION

Ground Floor

The school area is entered when coming from Gl. Kærvej. A typical beginning of the day could be arriving by parking the bike in the courtyard area placed close to the road - and from there go to the main entrance of the school. This entrance is clearly marked by the exterior design and the weather porch reaching out towards the road. From here one enters the ground floor in the center axis of the building, leading directly up to the central stair case. To the sides the big science rooms defines a clear direction towards South, making a cut through the building leading to the exits to the exterior spaces or the entrance to the multi hall and the existing buildings.

From the outside the concrete tiles also emphasizes a path leading directly to the multi hall's separate entrance. This is the connection point between the senior school and the existing school. Also here the path into the multi hall is placed on a central axis. From the multi hall there is an exit leading outside to the south garden with its multi sports field.



The pathway from the old school happens through the stairwell leading to the gym hall, having a direct path way to the multi hall and school extension.

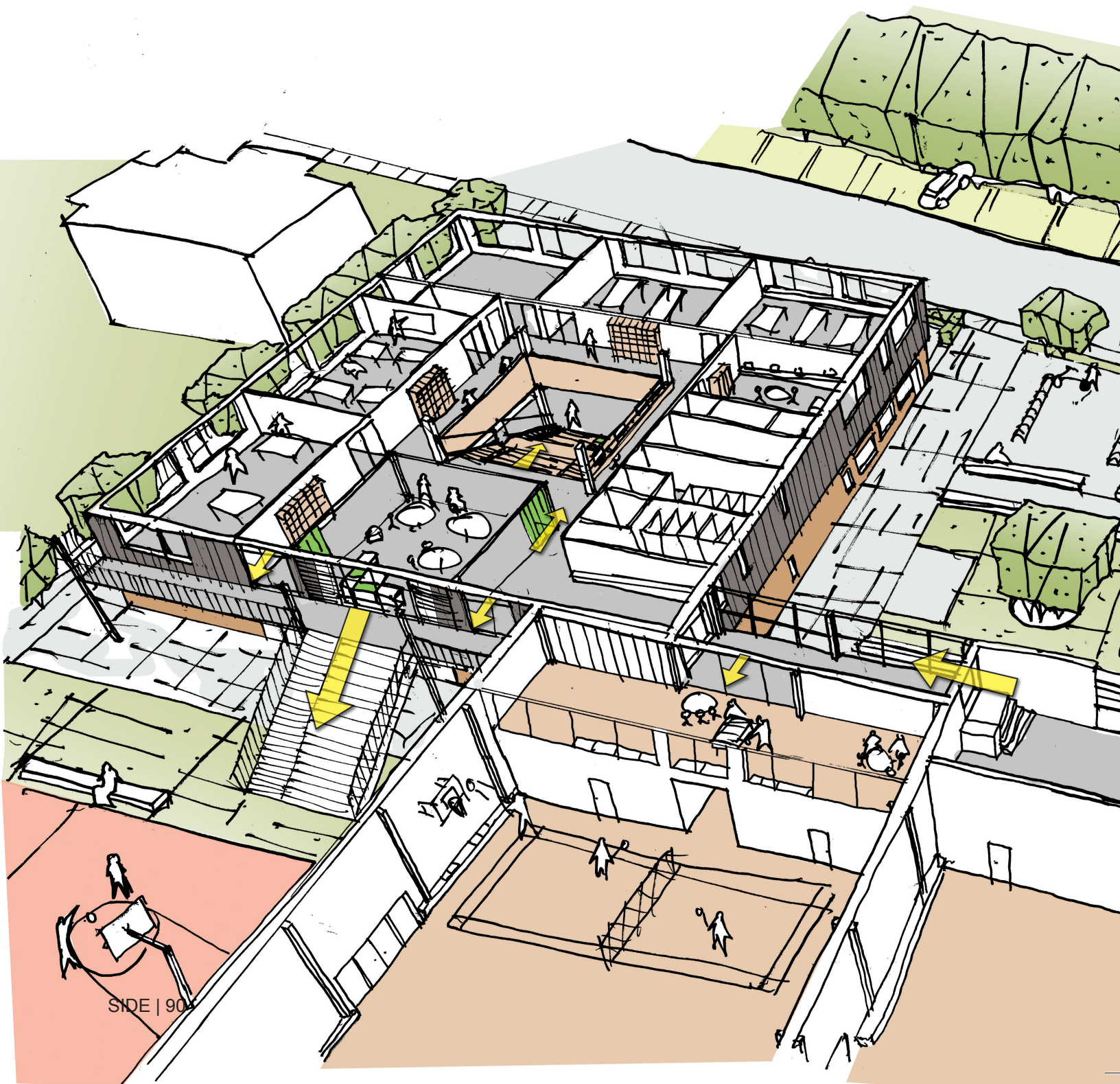


fig 11.4

First floor

From the central stair the first floor “home district” is reached. From there a “street” is leading around the central stair case with its work areas, and to the class rooms and teachers prepare room embracing the central space. Notice that as in the case of the ground floor, the toilets and technique room are placed south east, where the least daylight can be found. An elevator in the same area as the toilets directly to the path in front of the stair.

Toward the South is the group work and lounge area with an exit to the outside balcony to each side, placed in less than 25 meter from the rooms to be used as escape routes. A grand exterior stair case leads from the balcony to the South garden. Like in the previous floor, the multi hall has a direct connection spaces leading either into the movie / storage space or to the existing buildings through a group work area in the gym hall, that then again leads to the stairwell connecting the whole school.



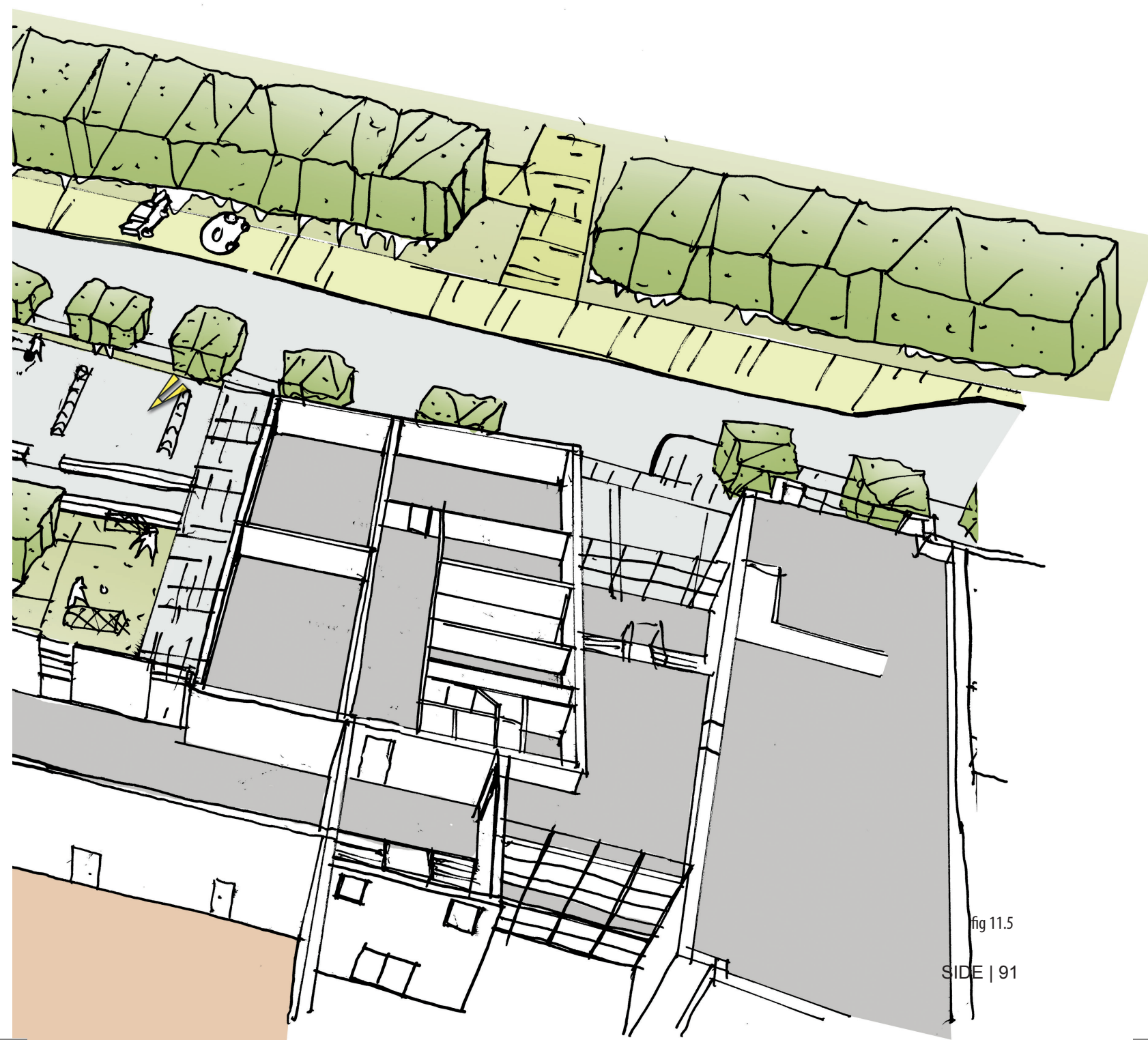


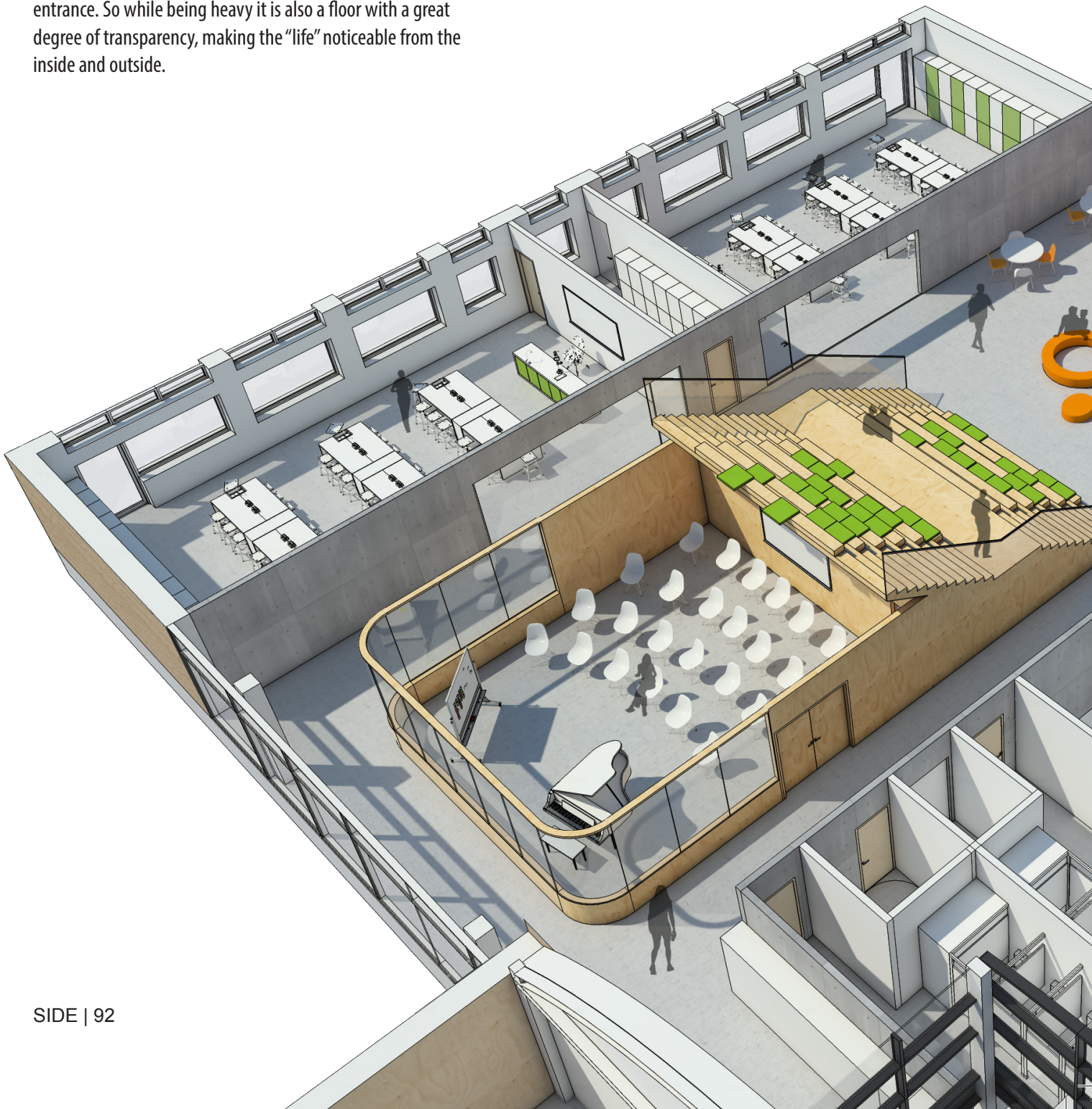
fig 11.5

SUBJECT DISTRICT

SUBJECT ROOMS AND THE CENTRAL STAIR

The ground floor is the main subject room area, with the big science rooms flanking the central stair, defining the hall way. The hall ways are wide enough for social interaction and can accommodate seating areas. This floor is thought of as the “base”, and it appears heavier. There is a great contrast in the use of materials, light and heavy, warm and cold. The entrance area is a big glazed area, making inside and outside melt together. It clearly shows where the entrance is and establishes a “project plan” - work areas located to each side to the central axis of the entrance. So while being heavy it is also a floor with a great degree of transparency, making the “life” noticeable from the inside and outside.

As the light is beginning to dim the central stair case makes a dramatic mark on the central hall. With the light from the sky-light reaching down with the central stair, enriching the warm wood texture in contrast to the concrete walls. It makes it clear that it is more than a stair, it is a central gathering point where the students can sit and work or interact socially. It can also be used for teaching situations or gatherings.



Integrated with the stair is the music room that with its round corners and use of material appears light and helps marking the path towards the multi hall.

All the science rooms are equipped with its own exit to the outside, fulfilling the requirements in the case of fire of having 2 exits, while the exit to outdoor areas can be used as a link to outdoor areas where experiments can be carried out.

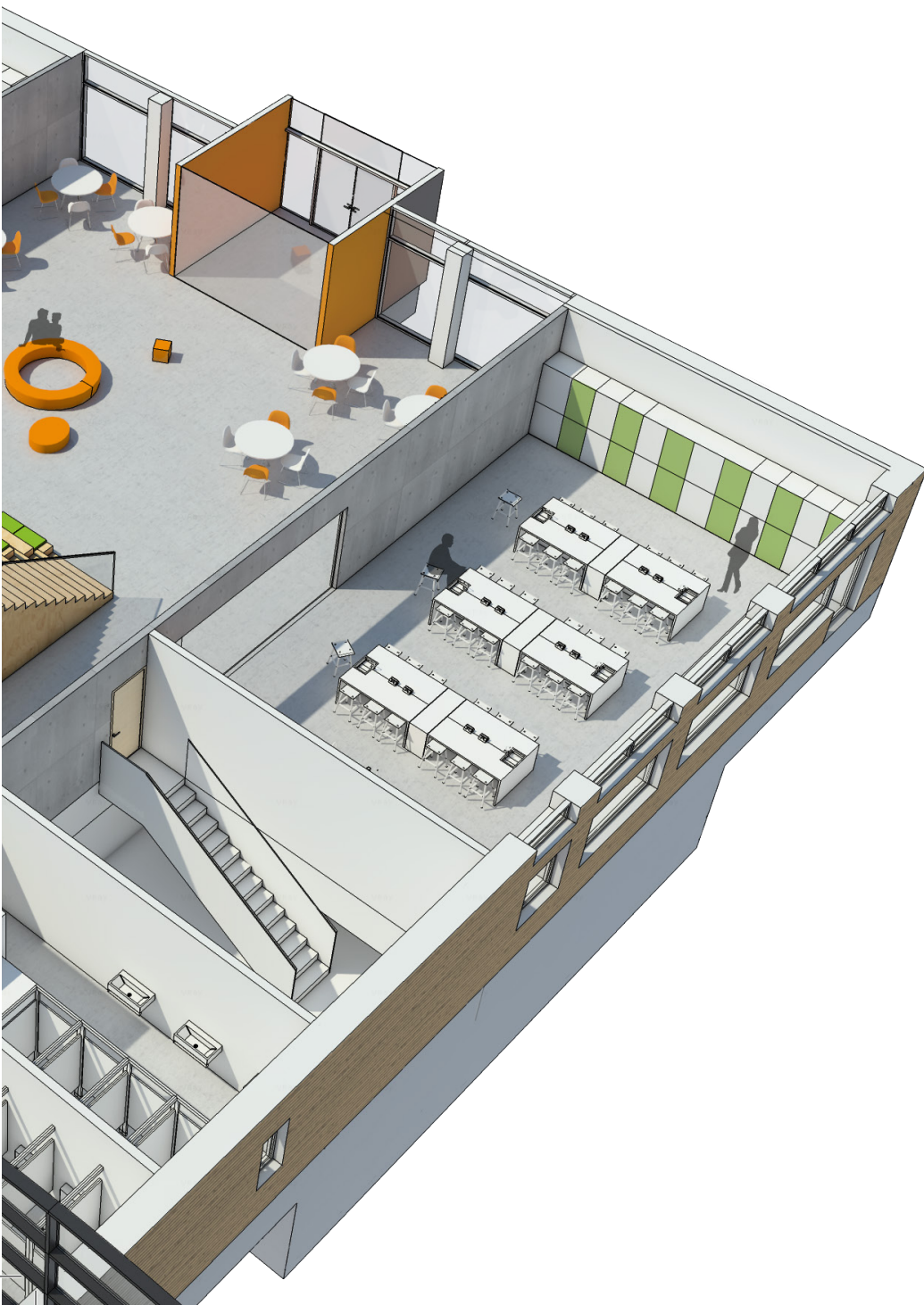


fig 11.6

CENTRAL HALL

LOOKING TOWARDS THE CENTRAL STAIR





fig 11.7

HOME DISTRICT

THE STREET AND THE CLASS ROOMS

As ascending up to the first floor the difference of the two floors becomes more apparent. The street encircles the central stair with work areas and the class rooms end walls rises up to the roof. It is like a "town square" with a "street" connecting it with the "houses" - an analogy strengthened by the expression of the class room walls, with openings in a seemingly random pattern. All the walls leading towards the central space is kept in wood with acoustic properties, that contributes with a warmth and "home" feeling.

The street is dimensioned to be suitable for the user to be able to interact while not being forced into it. Along the street lockers are placed defining smaller spaces and making the street becoming uniform.



The highest degree of transparency is towards South and the group work area. The group work area is like a isolated structure in the big, it is based upon the same principle. It can be enclosed by space dividing curtains, adding to its flexibility and ability to comply with different work situations with a different degree of privacy. It has seating areas along the glazed southern area, that also is the “escape” to the South garden through the balcony.

The balcony is a separate galvanized steel structure with wood. It is based on the same principle as the interior, with a big stair with seating areas contributing to different uses of the South garden.

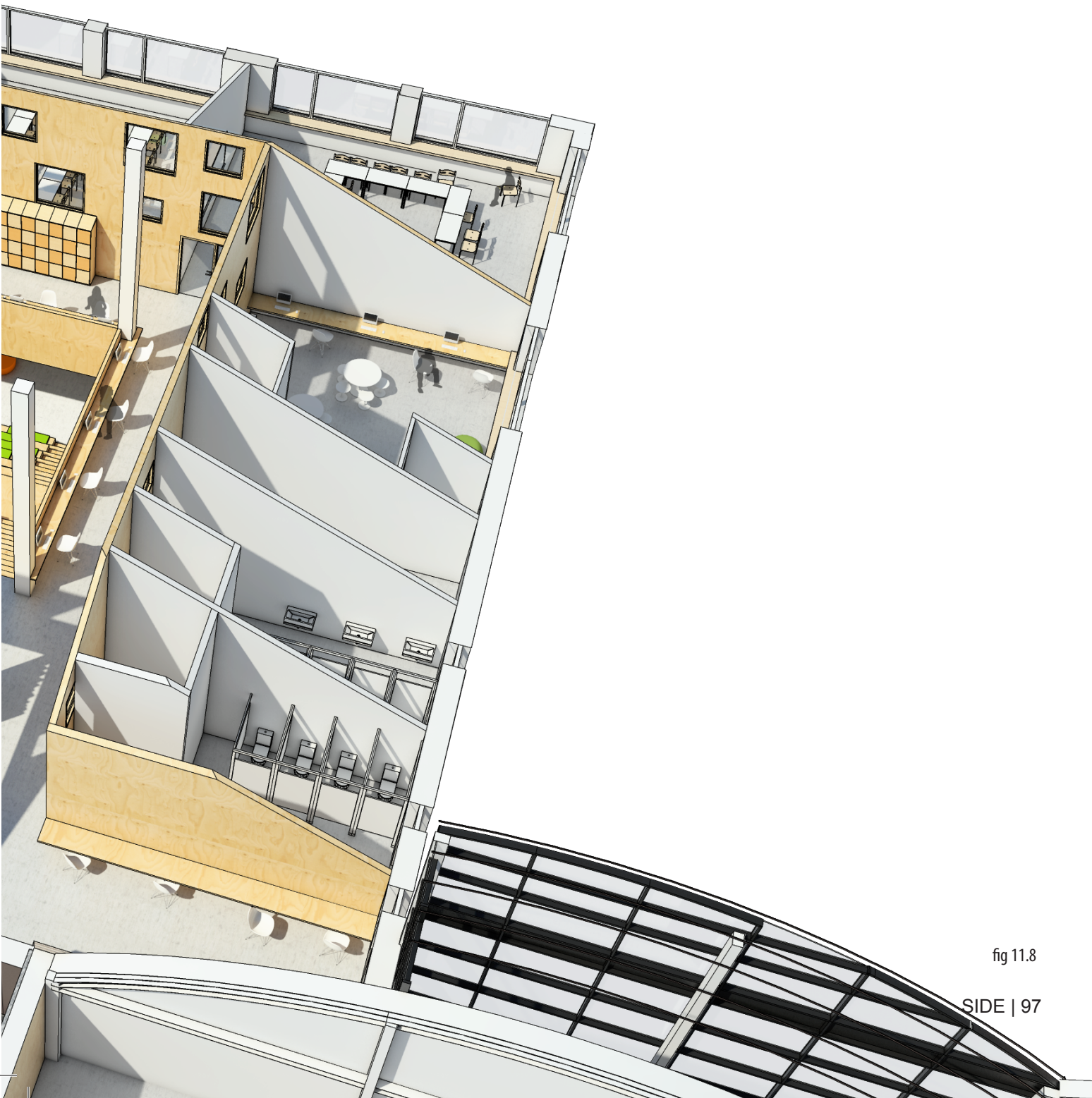


fig 11.8

THE HEART

THE HEART APPEARS



fig 11.9



fig 12.0

CLASS ROOM

THE PRIVATE SPACE

One of the most important rooms is the class room. It is the room where the students can make their mark, making it a room displaying their identity. The class rooms with a floor area of 68m² are dimensioned to allow a certain degree of flexibility, making several teaching situations possible. For instance it is possible to have more than one teacher and a big class of students, which can be useful in the case of the international classes and teaching across year groups or classes.

There are also room enough to split the room in to smaller entities, allowing for work areas with more privacy or corners that contributes to the social well being.

All the class rooms in the school have good views and the windows makes the room interact with nature. Around the windows a wooden detail allows for easy installation of laptops and similar. It also gives a window sill making it possible to sit in the window area. The wall towards the central space is clad in plywood, with openings diminishing the contrast of light, in the room that follows the shape of the roof.

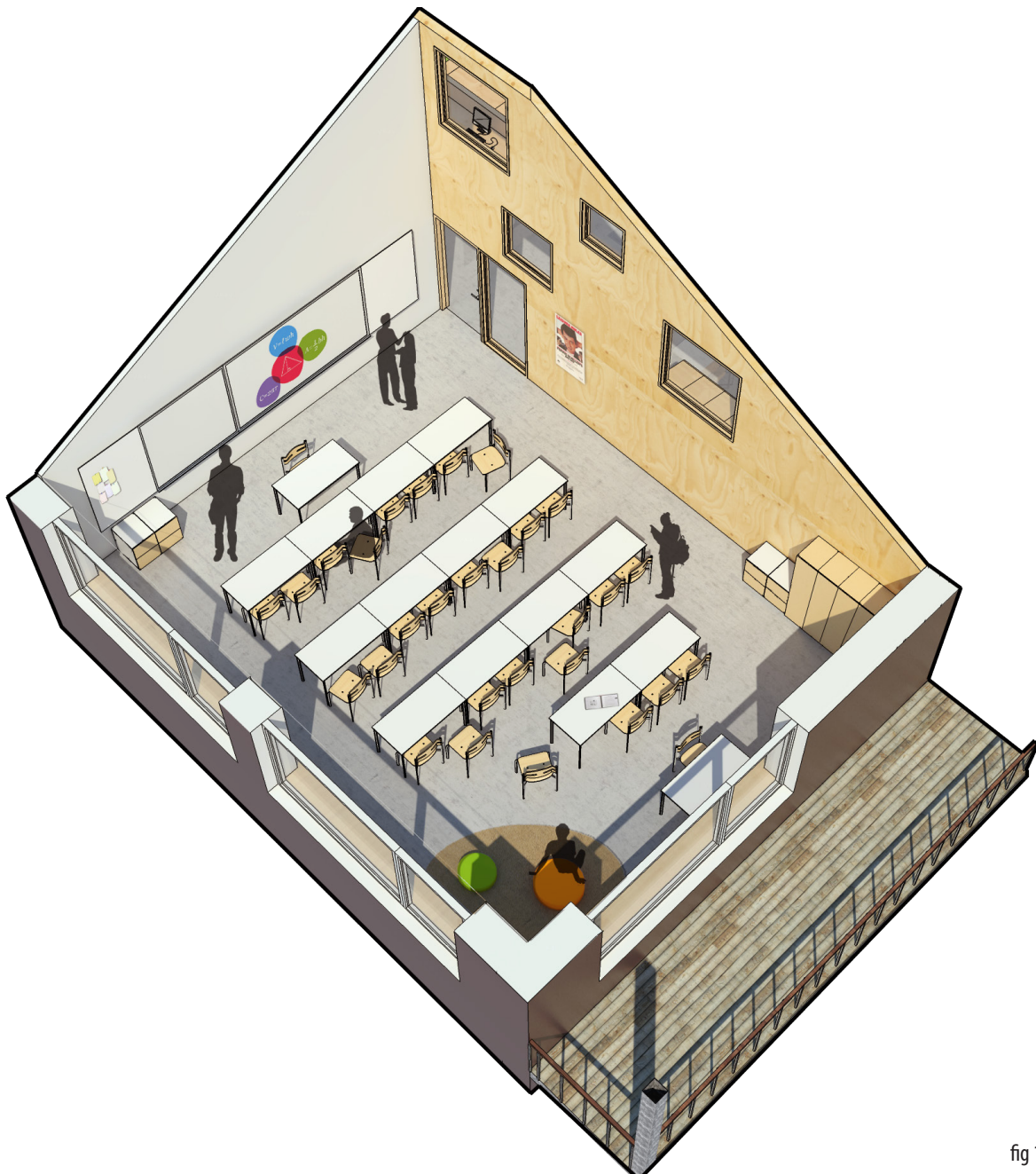


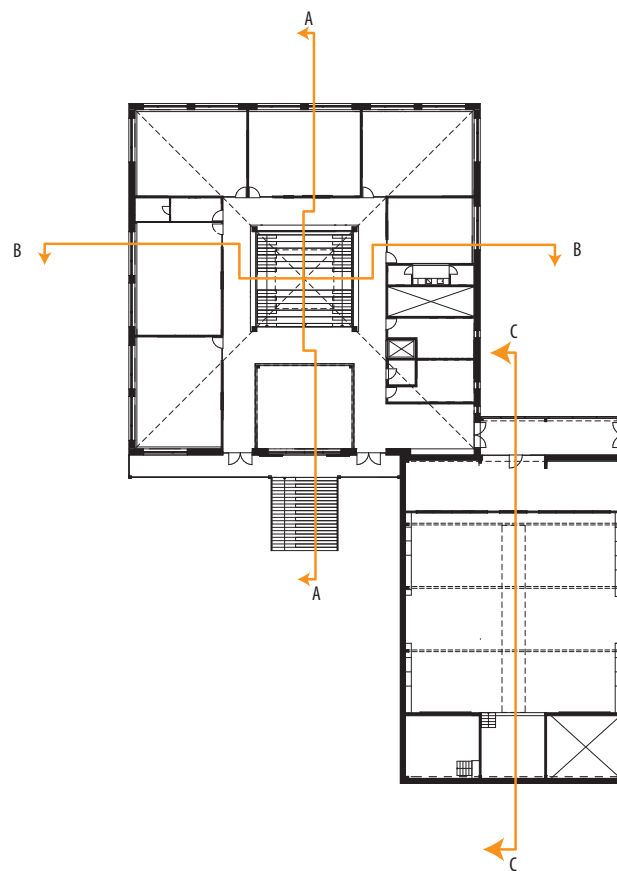
fig 12.1



fig 12.2

SECTIONS

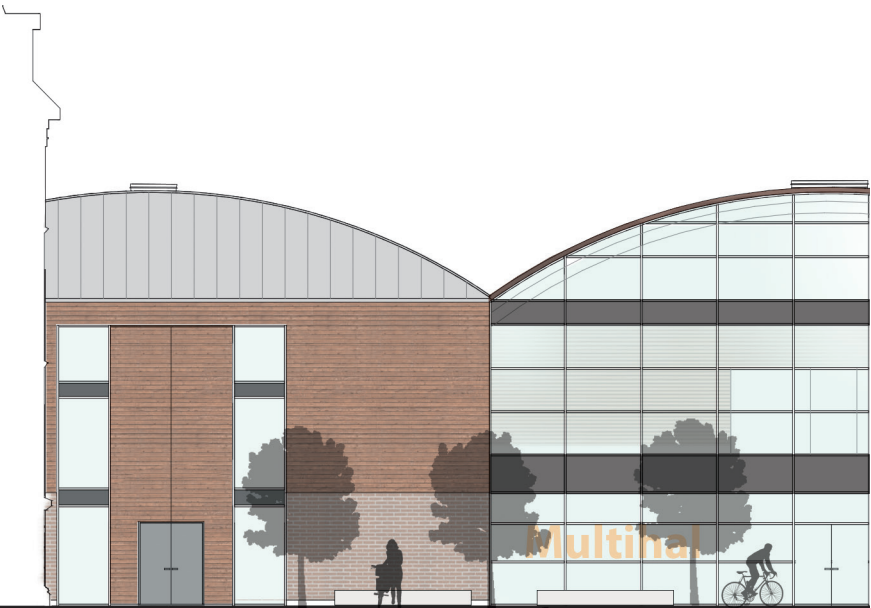
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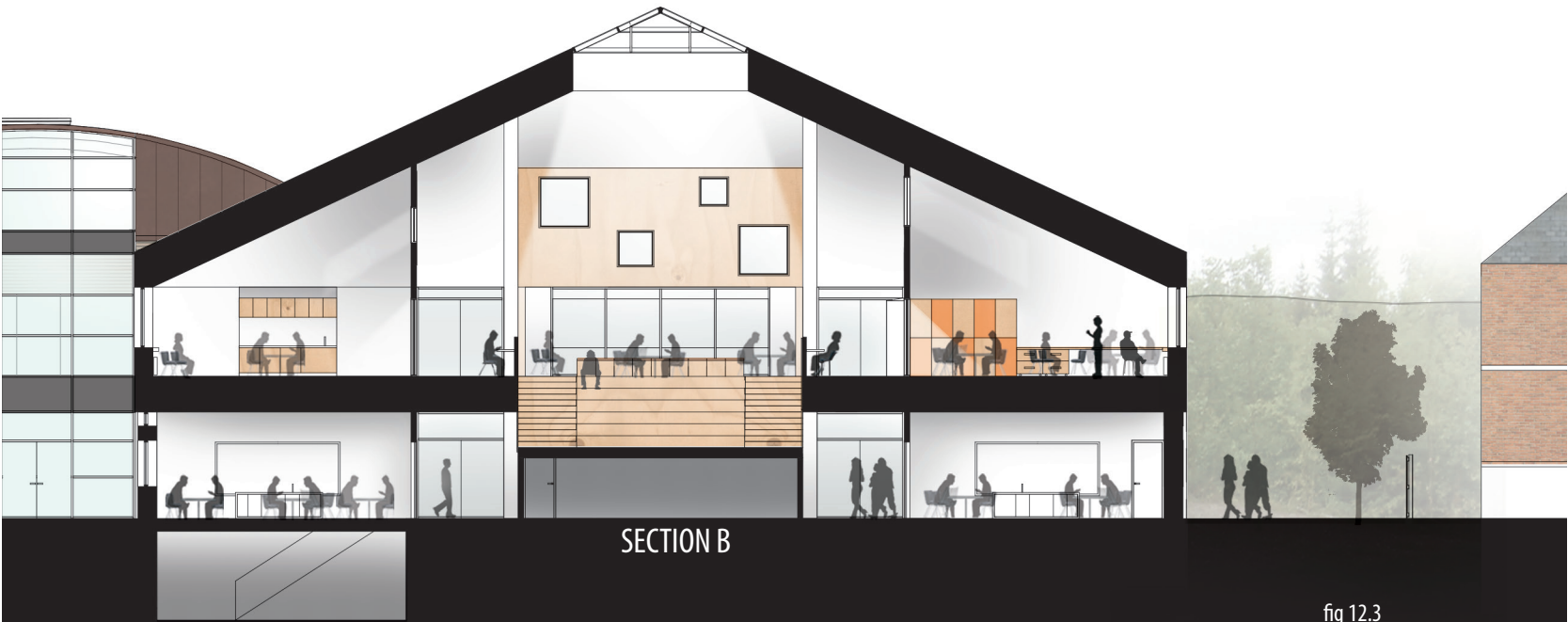




SECTION A

fig 12.2





SECTION B

fig 12.3



SECTION C

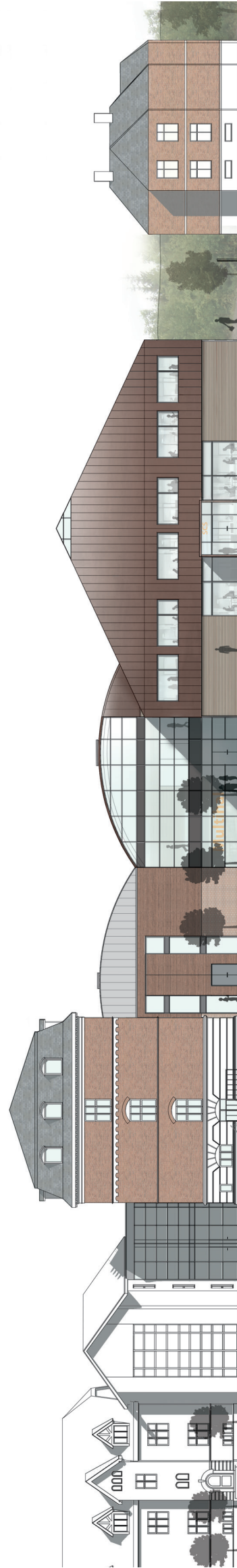


fig 12.4

ELEVATIONS

1:400

SIDE | 108



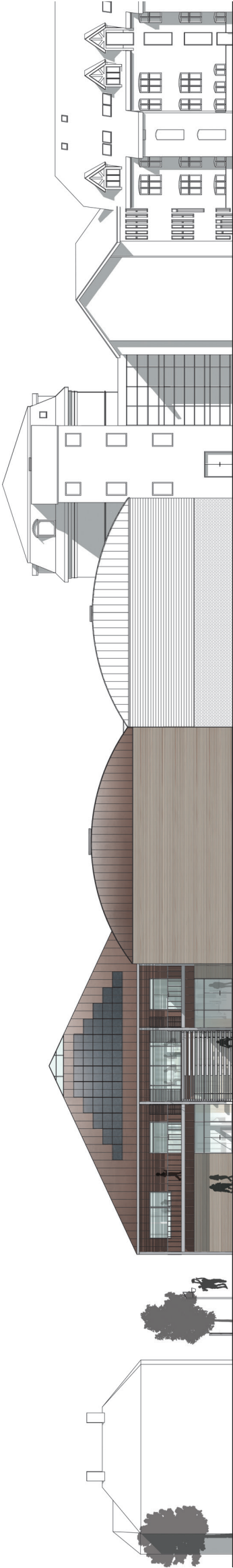
NORTH ELEVATION

fig 12.5



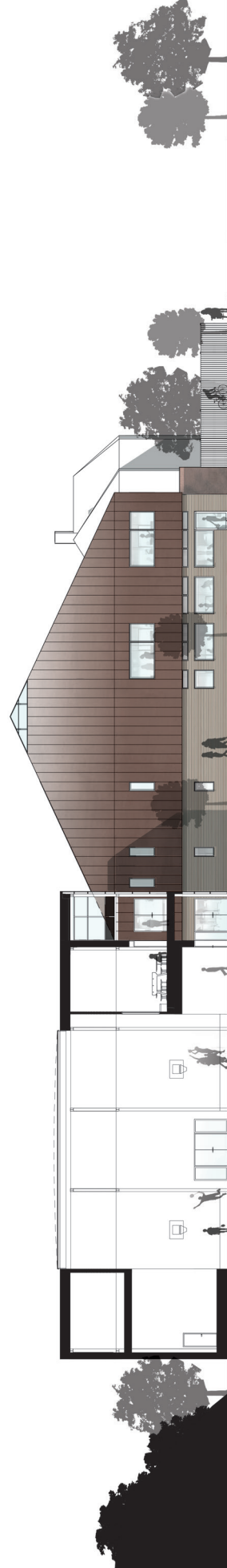
WEST ELEVATION

fig 12.6



SOUTH ELEVATION

fig 12.7



EAST ELEVATION

fig 12.8

CONCLUSION

THE END OF A JOURNEY

The vision of the project was to design an extension to the Skipper Clement School fulfilling the demands of modern teaching situations while coexisting in a symbiosis with the current school. It was important that the connection to the existing was not expressed through mimicking an old architectural style nor appearing too inferior in comparison to the main building. It should have a strong identity that expresses the qualities of the "modern" school and gives a sense of belonging to the users, which in this case is young students with different backgrounds. Meaning that an unification was not only thought of as a connection with the existing building but also socially between the users.

In order to do so the project finds inspiration in the concept of a central "heart", a space of particular importance from which the whole building evolves. A central point from which the social interaction and architectural fabric flourishes. It is expressed through the whole architectural vocabulary, the central stair, the structural columns, the skylight, the square plan - that while celebrating the heart of school also leaves a strong mark in its own right. The building relates to all sides of the context giving it a sense of "belonging", especially a strong emphasize on the connection with the green surroundings is visible through out the building. Like the old skipper clement school has a clear distinction between its use, the new school emphasizes its different functions and spatial differentiation both internally and externally contributing to the overall coherence. All done in a fluid way not compromising the flexibility of the uses. Big work areas melts together with different spatial qualities in coherence with subject rooms and class rooms. Class rooms creates smaller communities in the big community, celebrating the individual differences, which also can be seen through a differentiation of work areas embracing all ways of teaching and working. It all contributes the school framework emphasizing flexibility, well being and corporation.

The connection with the existing is stressed through a simple path system, with the new multi hall being the main link making the transition between old and new fluid. This building is a clear part of the school extension while being a bit different to emphasize its different contribution to the whole. While the school part interacts with the main building in its scale and grandeur, the multi hall has a strong coherence with gym hall, making the whole experience of the whole extension readable for the visitor.

Fitting to the modern school principles the whole extension also adheres to current and future demands of energy usage, fulfilling BR15 and BR20. The fulfillment of the BR2020 regulation is fulfilled through the use of solar cells on the southern roof, displaying the use of modern means in order to create a building sustainable not only in its use but also its performance. This is made possible through the process, factors such as glazed area has undergone several changes in coherence with the overall design scheme. The result is a building with good daylight properties and an indoor environment fulfilling the BR2020 demands of atmospheric and thermal load. The building adheres to the Cat. B of CR1752 but as it could be seen from the indoor simulation it very nearly adheres to the cat. A demands as the Co2 concentration is sufficiently low and the overheating hours is few. All of this is made possible through the implementation of several measures such as sufficient solar shading and a hybrid ventilation system with a good heat recovery.

The goal was not to optimize the building as much as possible in regard to its energy usage. This would be difficult with the current form and concept. A building fulfilling e.g. BR2020 without the use of active means would possible require a different shape with a lower volume to floor area. One big factor is the electricity used on venting the building and heating, a smaller window area in the class rooms would benefit the indoor environment while requiring lower ventilation rates thereby possibly lowering energy use, however that would require a new facade system. However the system chosen interacts well in scale with existing building while letting the surroundings make its mark on the inside, therefore it was chosen in comparison to other solutions.



fig 12.9

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All other illustrations are entirely made by me the author, René Therkelsen

