
ålesund
2011
nørvasund school/ joseph langman
ma4 spring sem. architecture & design

# nørvasund

## MA4 Spring Sem. Architecture & Design

**main theme/**
Pedagogical learning environment for students and phenomenological relation to place

**Semester/** Thesis Project
4th Semester, Architecture & Design
Department of Architecture, Design & Media Technology

**project period/**
01.02.2011 - 31.05.2011


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# school

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Aalborg University

# process/
# method

When deciding whether to approach a design for, for example, a hospital or office building, a school stands out to me as an important type of building. Allowing the current generation to provide and establish the next.

When writing the Thesis I finally understood the idea that as a final project, the ability to perform and evoke understanding and working towards a speciality area of study, for example daylighting.
However it must be also said that in the application of a primary school the vision to create an "Excellent Learning Environment" is very much like the idea of sustainable design, whereby a building is not only sustainable by the thickness of the wall and high insulation, whereby considering all aspects create a sustainable building.

This is also true when creating an "Excellent Learning Environment" in an Elementary School, whereby all aspects contribute to a more successful project. In this process the idea of prioritising aspects and aim to discover key and integral aspects of learning and also in this process identify aspects which are overall required although are less important.

This project deals with Social and Environmental aspects, as a way to evoke an Excellent Learning Environment + Student Development.

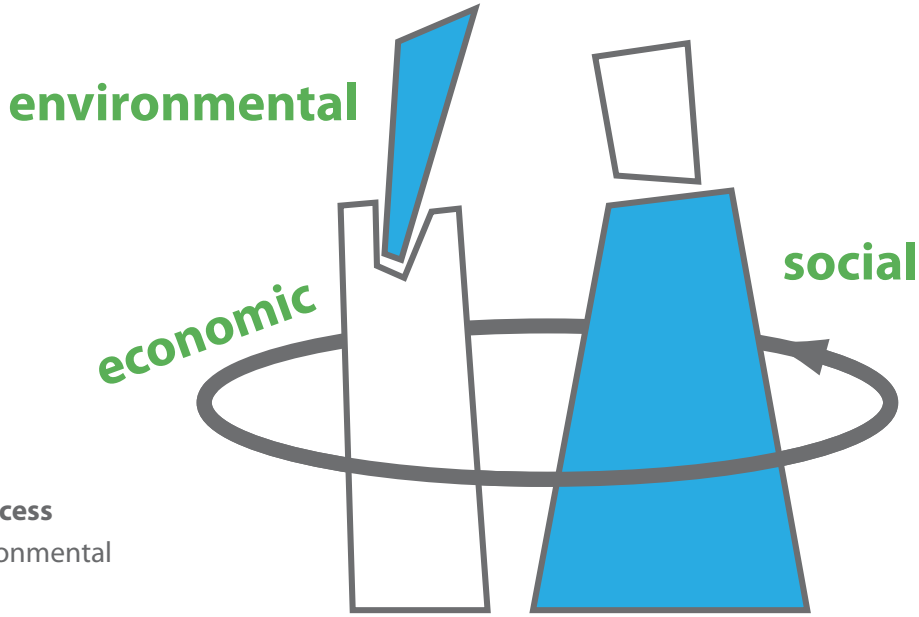
# sustainability

**“a desire for well-being must be fundamental to all architecture if we are to achieve harmony between the spaces we create and the activities to be undertaken in them.”**

jorn utzon, 1948 (prip buus, 2004, p11)

**Sustainable Approach/ Social + Environmental**

Architecture is a constant response to the ever changing needs of people. In the application of the 21st Century the priority must be seen to be sustainability. To my mind the approach for a building to be considered sustainable in terms of technical solutions is very important, however remains a single aspect of a building being able to be considered sustainable. Perhaps an equal or more important aspect of sustainability is a holistic approach, whereby the phenomenological meaning of a building for its users is also important and therefore a combination of both aspects will benefit the current agenda and provide Architecture with a sense of Identity. There is no point creating a house with a 0.11w/ $m^2k$ u-value if nobody wants to live there.




**Integrated Design Process**

Head - Technical - Environmental

Heart - Social

# synopsis/
# problem

**Situation/ Current Concerns**

Renovation of exisitng schools to meet current changes within pedagogic teaching affects Norway. Sybelle Kramer, author of educational spaces states, "1970's schools have become in need of rehabilitation." (Kramer, 2008, preface). As a new building project the Norvasund school retains the simplicity of a modern school following the idea that architecture is a constant response to the ever changing needs of people. Therefore we must repsond to current pedagogic needs.

**Nature Deficit Disorder**

Mike Weilbacher suggests that students attain a 'Nature-Deficit Disorder' (Adbusters Magazine, 2010) Pioneer Botanist Luther Burbank states "Every child should have mud pies, grasshoppers, tadpoles, frogs, mud turtles, elderberries, wild strawberries, acorns, chestnuts, trees to climb. Brooks to wade, woodchucks, bats, bees, butterflies, various animals to pet, hayfields, pinecones, rocks to roll, snakes, huckleberries and hornets. And any child who has been deprived of these has been deprived of the best part of education." (Adbusters Magazine, 2010)
"Our school system has chained kids to their desks." (Adbusters Magazine, 2010)

**Circulation**

"Corridors do not belong in schools. Those corridors that are dominated everywhere and always by rucksacks and odd bits of clothing, and by the endless pulling and shoving, badgering and carping that means they have to be made extra wide, using up a large proportion of what might otherwise be inspirational space." (Hertzberger, 2009, p17). The provision of useful space, creating different spaces capable to support learning must be supported in relation to the project. Furthermore the circulation can take advantage of a continuous flow, with no dead ends, creating open and visible spaces and thereby reducing the risk of bullying occurring..

**“corridors do not belong in schools. those corridors that are dominated everywhere and always by rucksacks and odd bits of clothing, and by the endless pulling and shoving, badgering and carping that means they have to be made extra wide, using up a large proportion of what might otherwise be inspirational space.”**

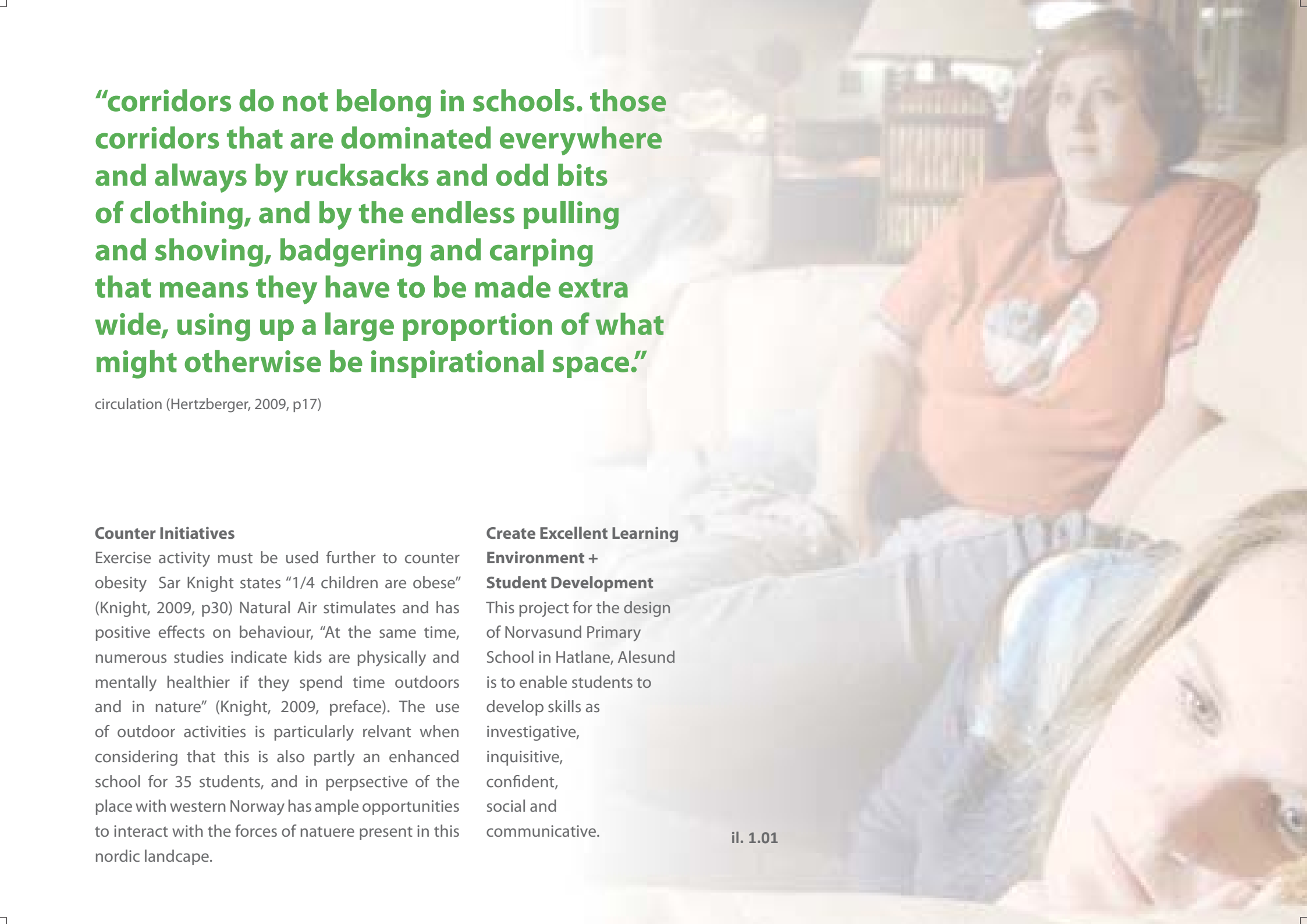
circulation (Hertzberger, 2009, p17)

**Counter Initiatives**

Exercise activity must be used further to counter obesity  Sar Knight states “1/4 children are obese” (Knight, 2009, p30) Natural Air stimulates and has positive effects on behaviour, “At the same time, numerous studies indicate kids are physically and mentally healthier if they spend time outdoors and in nature” (Knight, 2009, preface). The use of outdoor activities is particularly relvant when considering that this is also partly an enhanced school for 35 students, and in perpsective of the place with western Norway has ample opportunities to interact with the forces of natuere present in this nordic landcape.

**Create Excellent Learning Environment + Student Development**

This project for the design of Norvasund Primary School in Hatlane, Alesund is to enable students to develop skills as investigative, inquisitive, confident, social and communicative.



**il. 1.01**

# contents

# presentation/



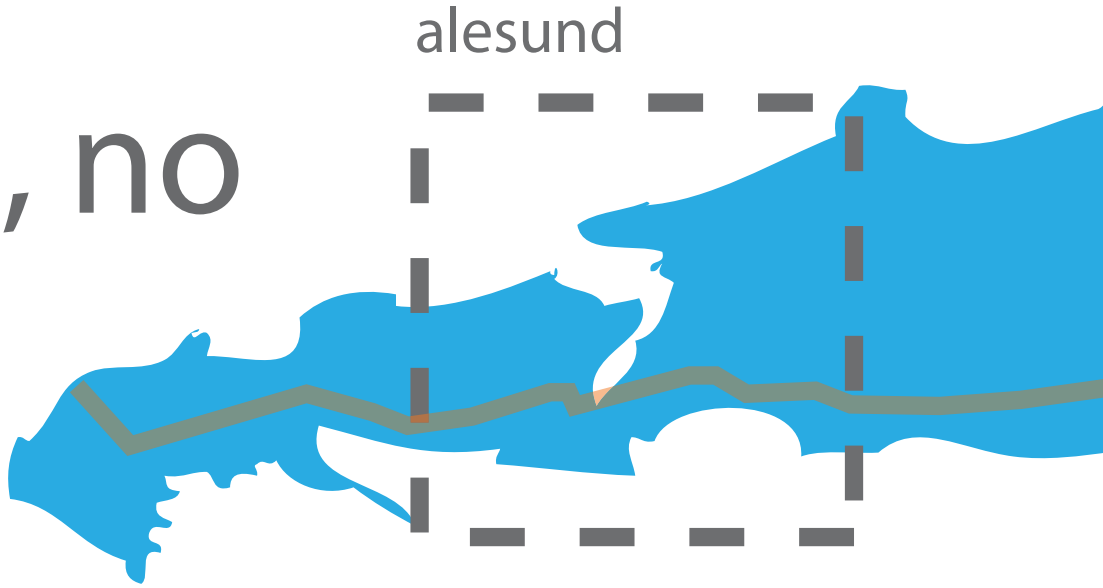
# appendix/

# site/ analy brief/

# vision/ SiS

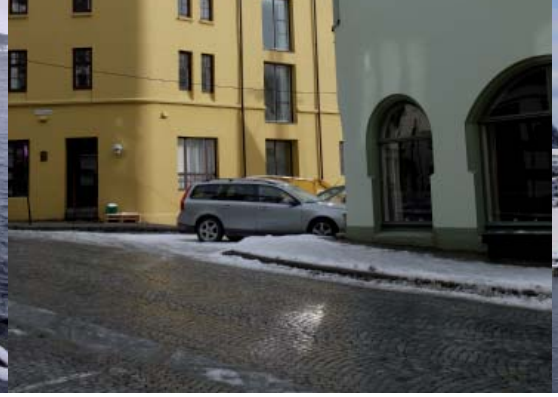
# site

## place/ ålesund, no




**Alesund as a coastal town encapsulates 5 islands and is situated amongst Norway's western region of Vestland. The town attains a population of 40,000 inhabitants** (Hurtigruen, 2011, p42). The built environment embodies the Art Noveau style, constructed from 1905 as a response to a town-wide fire in 1904 which made 10,000 inhabitants homeless. The cold climate conditions of this sub-arctic relies upon the architecture to insulate against the harsh winds and covering snow conditions for most of the year. The local industry is firmly rooted importantly now and traditionally within the fishing trade, exporting throughout Europe.

**il. 1.02**



**“vestland (west), the dramatic region of narrow fjords, where mountains meet the sea.”**

vestland, ostland, sorland, nordland (norberg-schulz, 1996, p3)




**“norway’s mountain world, finland’s wilderness in forests (and lakes) and denmark’s undulating ground.”**

environmental interplay of forces (norberg-schulz, 1996, p40)

# place/ site; hatlane

The site for the new Norvasund School is in the suburb of Hatlane, 10 minutes drive from Alesund.


il. 1.03 - site area; 1:1000

# phenomenology/
## genius loci "spirit of place"

**The natural forces of the region of Vestland in Norway are incredibly strong, whereby as a means for the Norvausnd school proposal to be firmly rooted within the areas identity, we must concentrate and understand the phenomenological imperative.** The application of Hatlane, within the place of alesund allows us to understand the qualities of the Genius Loci (Spirit of Place) in terms of; Spatial sturcture/ concrete Objects and atmosphere/ character. Refer to Appendix/ Phenomenolgy for an in depth essay of the approach to phonmenology as an architectural imperative.

The Genius Loci (Spirit of Place) that strikes is the magnificent natural beauty throughout the area. Arriving to Alesund by ferry, it is immediately captivating to see the cliffs and peaks of the mountains, rising high above civilisation. Alesund, as a fishing origin settlement on the west coast of Norway in Vestland, 61 degree latitude, compliments the natural setting beautifully.

il. 1.04

# site panorma

**Impression**

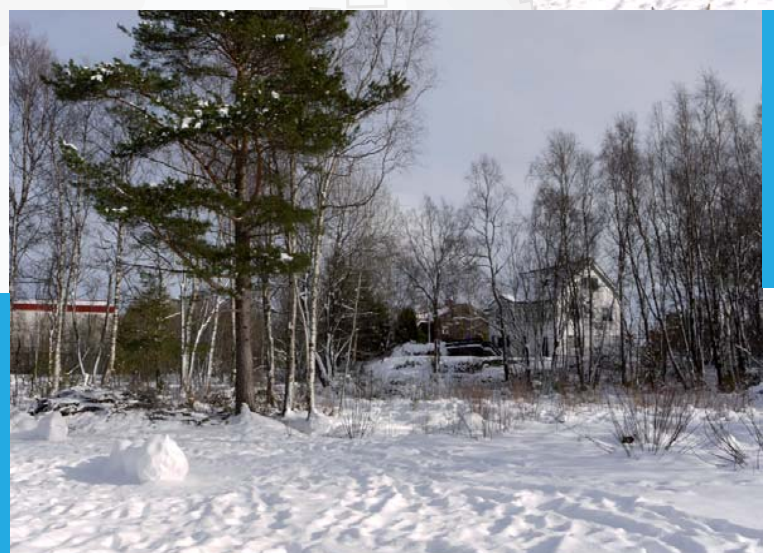
When surveying the site in relation to Hatlane, the central datum looking 360º as a way to gain perception of area. The proposed school site attains envious building conditions, whereby the topography is relatively flat, rising to the east, adjacent to the neighbouring concrete tennis hall structure. Also as greenfield land, possible issues of site contamination do not need to be considered. Moreover as a new-build project the site gains the advantage of less consideration attributed to building within existing fabric and more towards interacting with place and rich natural forces.

Assessing the site only the tennis hall and the supermarket with minimal dwellings with pitched roofs encircle the site. Dwellings are nestled upon the hillside opposite the main road.

**(reima pietila) "walked around the site, experience tactile understanding of its form"**

nordic tradition (norberg-schulz, 1996, p188)

il. 1.05



**when first surveying the suburban site, the quietness set in.... the norvasund has every opportunity with 560 students, to stimulate and awaken hatlane**

# registrations

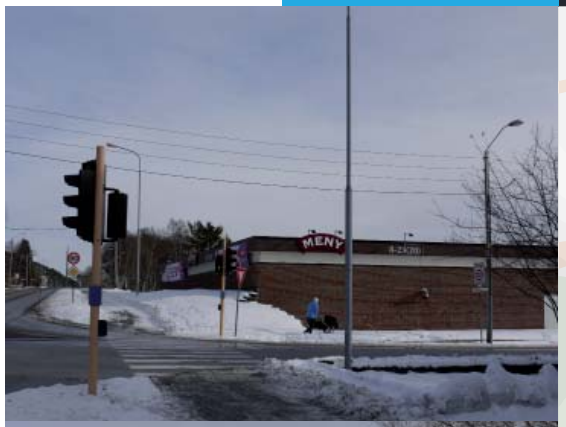
**Tactile understanding/ Sensual Experience**

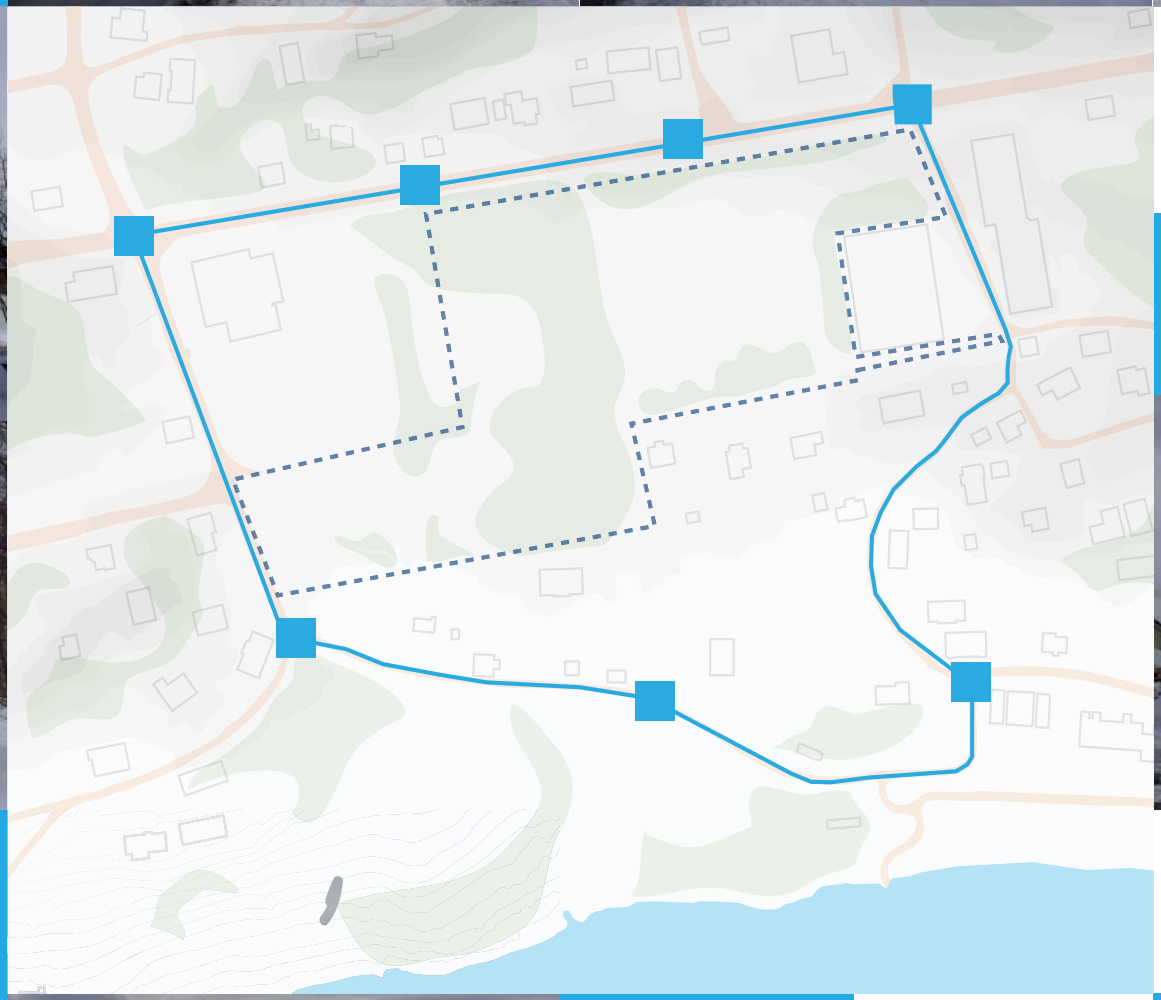
Ascend down from the road that is busy, past the supermarket 'Meny' adjacent, to the site boundary, can see a fantastic view towards the opposite side of the Sunnmore Alps, past the sea parting fjord below, surrounded by tall trees of sitka spruce and scots pine. Then walking alongside the road, acting as a main artery to Alesund, the relatively level topography of the school site, down below 3 meters, nordic dwellings surround the suburban area, scattered across the hillside above the nearby fjord. This part of the journey attains noise from constant road traffic, looking down toward the proposed greenfield site.

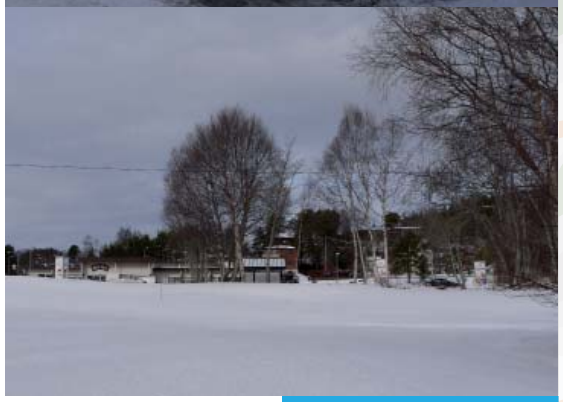
Snow has covered the area, daylight shines brightly, directly onto the site and the concrete permanence of the Tennis Hall acts as a blockade to the east of the site boundary. This building's juxtaposition inrelation to the surrounding smaller, domestically scaled dwellings confronts the landscapefunctionally, however the emptiness of the site gains no sense of identity relfected in the architecture. At the east point , the journey continues south down towards the fjord along a quiet street by comparison otf the busy road at the north of the site. The vistas gained through trees looking on to the alps across the fjord are truly beautiful.

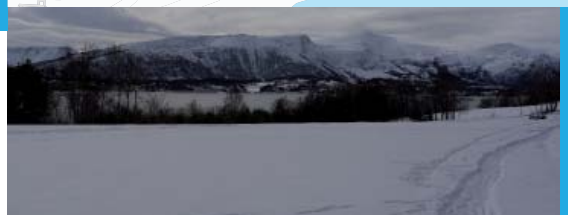
Negotiating the suburban setting adjoining the south east site boundary, the dwellings proximity play influence considerations of overlooking of the school site. At the south west of the site boundary, the experience becomes its most interesting, the clear and uninterrupted visibility and understanding of the area's beautiful alps as surroundings, encourages the idea of orientation of the school. Therefore in recognising the two most evocative forces of the site, the south-west connection with the landscape and the problem of road traffic noise affects, the first point must be utilised to its full potential gaining a powerful relationship with the school as identity.

il. 1.06







the slope of topography is particularly flat, rising towards the east

suburban dwellings scattered across the hillside, nestled amingst the fjord

# existential spirit of place

il. 1.07

**diverse flora and fauna enrich the the area**

**the sound of busy road traffic towards the north**

**“in norway, the focal building needs to be strong enough to confront the dramatic nature of the country.”**

nordic tradition (norberg-schulz, 1996, p94)

# spatial structure (concrete objects)

**Concrete Phenomena**

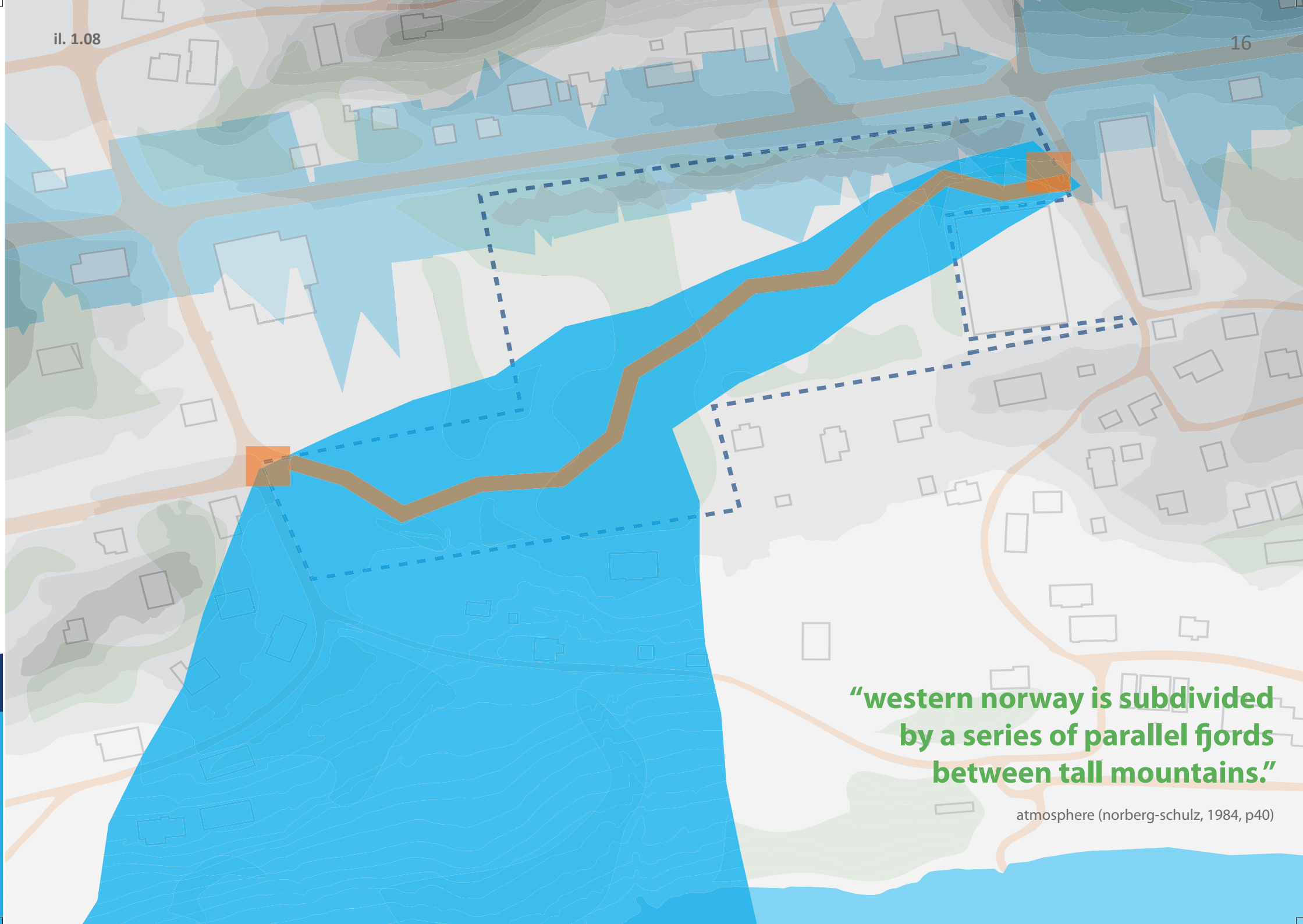
As an articulated phenomenological vocabulary, pronounced properties, such as “People, Animals, Flowers, Trees, Stone, Earth, Wood and Water, Towns, Streets and Houses, Doors, Windows and Furniture. Sun, Moon, Stars, Clouds, Night and Day and Changing Seasons.” (Norberg-Schulz, 1984, p182).

**Conclusion**

A Dialog with the south west, orienting towards the Sunnmore Alps. Attenuation of noise, orienting away from the main road and maintain a buffer, reducing the noise of traffic. The school must retain privacy of dwellings. As a suburb in Hatlane of Alesund, it is currently quiet , whereby the introduction of 560 students will stimulate and aim to awaken the area.

Therefore as a prominent building, the school can be seen to work within the Nordic Tradition, whereby focal buildings are able to confront the landscape appropriately. This will further strengthen the sense of identity and evoke the idea of a welcoming and transparent environment for users and the wider community of Alesund.

il. 1.09

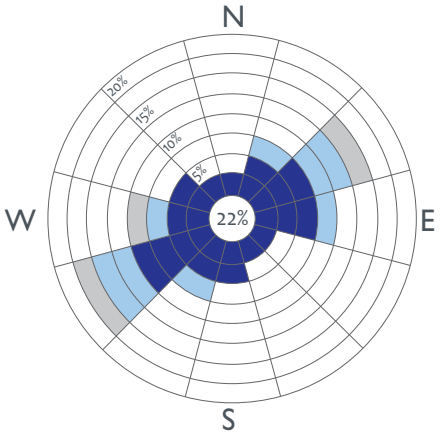


**“western norway is subdivided by a series of parallel fjords between tall mountains.”**

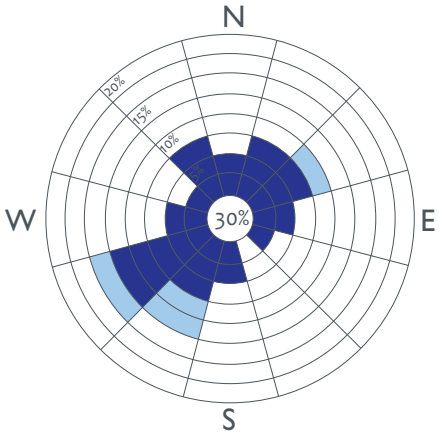
atmosphere (norberg-schulz, 1984, p40)

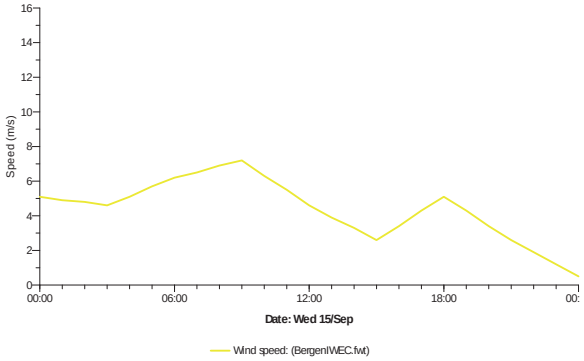
# macroclimate/
## wind

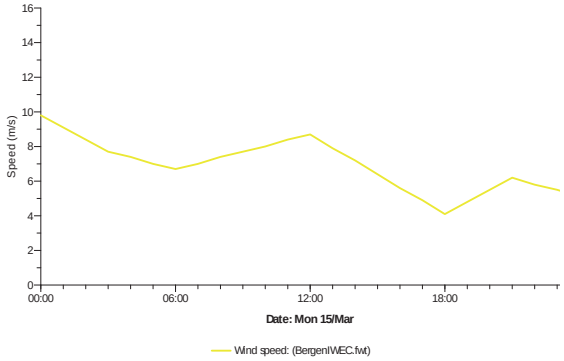
Jan–Mar



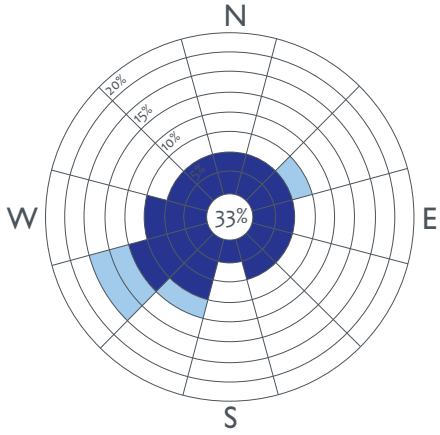

Apr-Jun



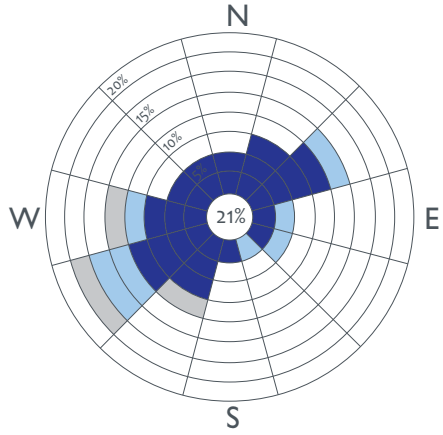



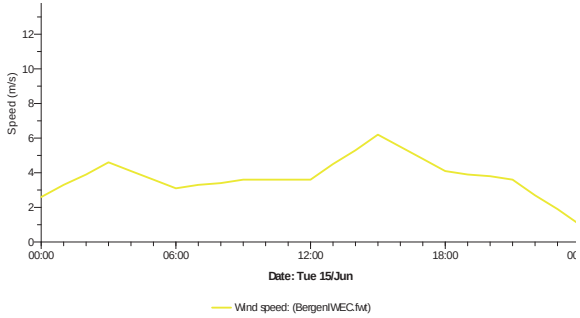



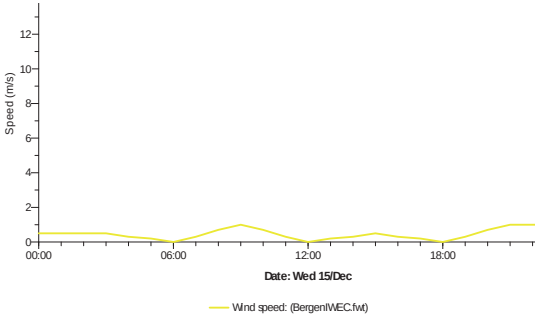

Jul-Sep




Oct-Dec

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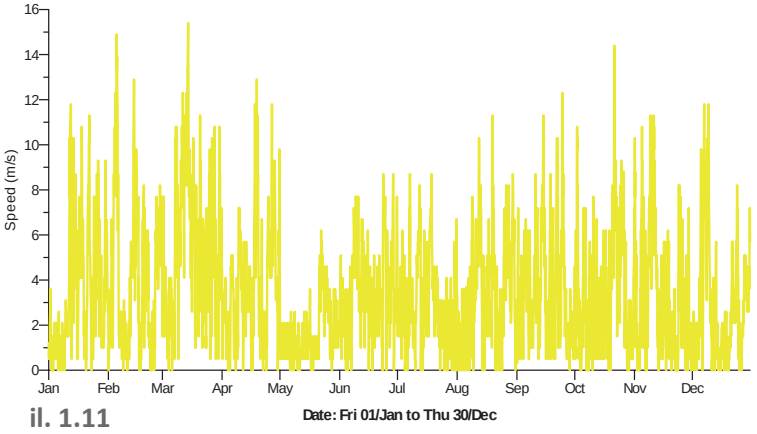
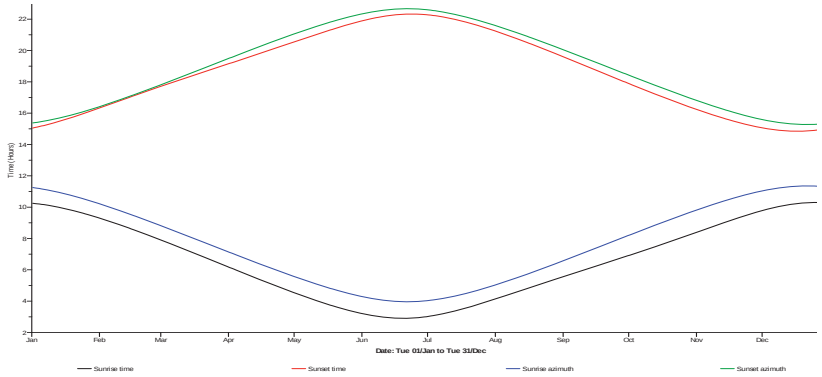
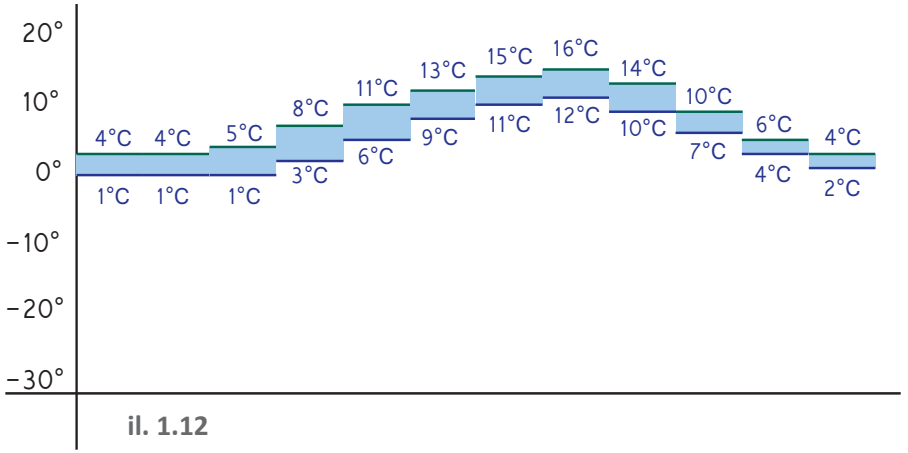



il. 1.11

# solar radiance




# temperature




il. 1.12

The climatic wind conditions for the site attains predominantly south-west wind direction with relatively low wind speeds, averaging approximately 10m/s, which is categorised as low. This influences renewable systems such as wind turbines to be ineffective, instead would aim to maintain atleast 20m/s wind speed to be suitable. This will also influence the site of the school playground and reduce wind disruption for students when outside.

# brief

## building program/ nørvasund school problem

Nørvasund school is a Primary School for Nørvasund school district that stretches from the Norvasund west, and the tunnel of Annie in the east. The school is also an enhanced school for children with complex learning disabilities for the entire municipality of Ålesund. Currently the school is divided into two departments, Gåseid and Hatlen. The two departments will be integrated into a new public school facility in Hatlen [...] The competition project includes construction of new school and outdoor area.
(Ålesund Municipality, 2010, p5)

**Educational Goals**
"Ensure the physical and psychosocial working and learning environment promotes health, wellbeing and learning. Facilitate the local community to become involved in education in a meaningful way [...] The areas must be flexible so that the forms of organization, teaching and ways of working can be easily adapted to new curricula."
(Ålesund Municipality, 2010, p17)

"Ålesund municipality's financial planning for 2010-2013 is set aside 275 million NOK for this project".
(Ålesund Municipality, 2010, p6)

**Traffic & Parking**
"The facility should have clear and safe traffic solutions for drop-off and pick up of children to school […] the facility has a need for parking 62 cars and access for snow removal with tractor (3m width)."
(Ålesund Municipality, 2010, p20)

**"Outdoors will challenge students and encourage activity."**
Landscape (Ålesund Municipality, 2010, p20)

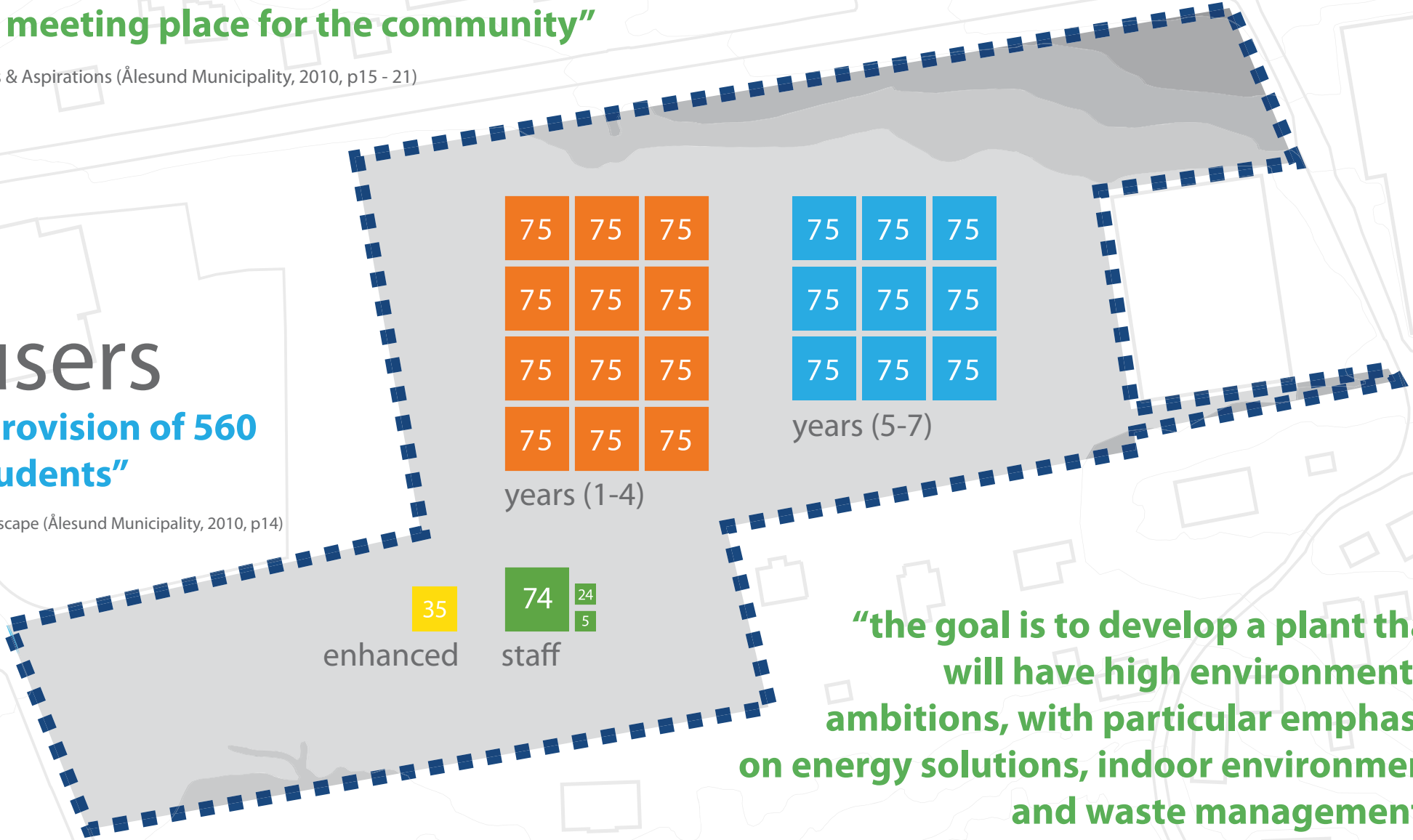
**“the school’s social mandate is to develop the whole person.”**
**“norvasund school - a community of learning”**
**“a meeting place for the community”**

Aims & Aspirations (Ålesund Municipality, 2010, p15 - 21)

# users

**“provision of 560 students”**

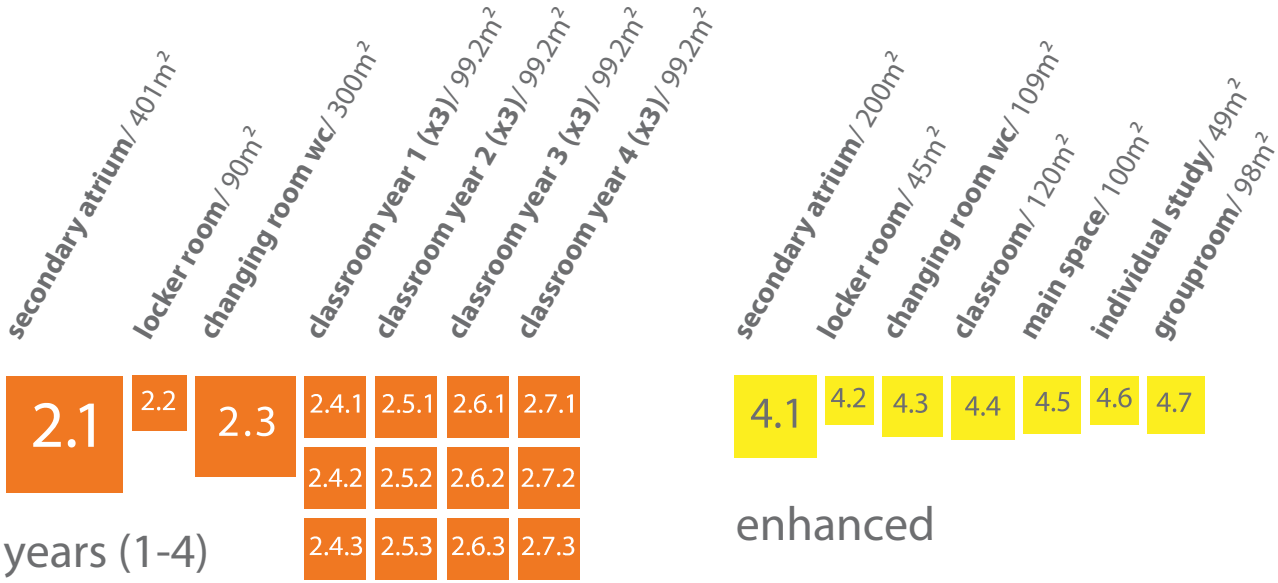
Landscape (Ålesund Municipality, 2010, p14)

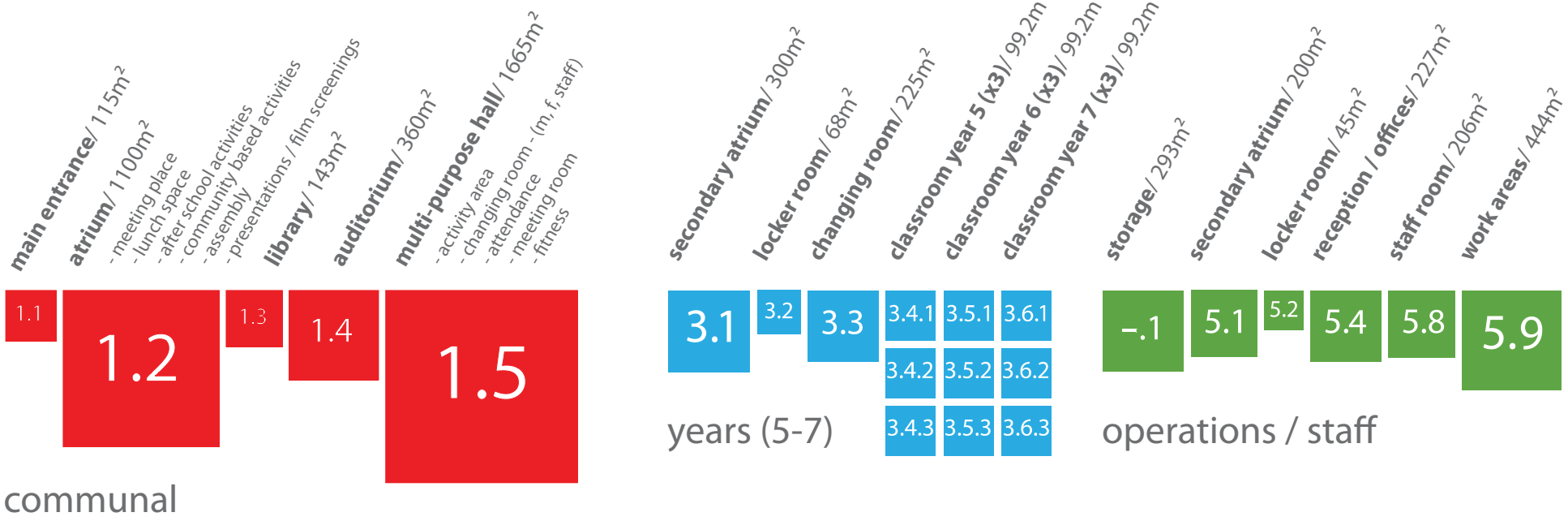



**“the goal is to develop a plant that will have high environmental ambitions, with particular emphasis on energy solutions, indoor environment and waste management.”**

Environmental Focus (Ålesund Municipality, 2010, p19)

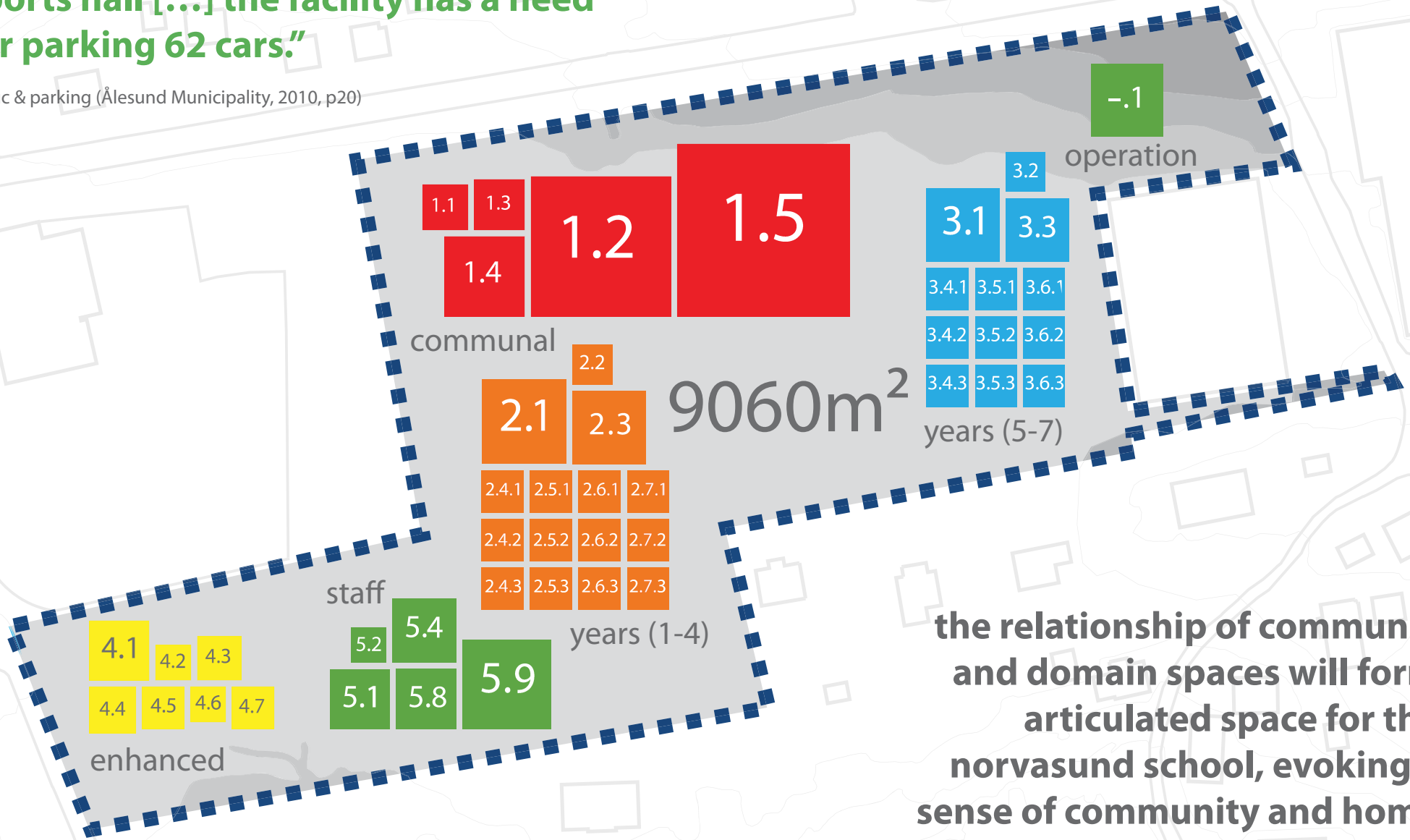
# space program



**“the facility should have clear and safe traffic solutions for drop-off and pick up of children to school and sports hall […] the facility has a need for parking 62 cars.”**

traffic & parking (Ålesund Municipality, 2010, p20)



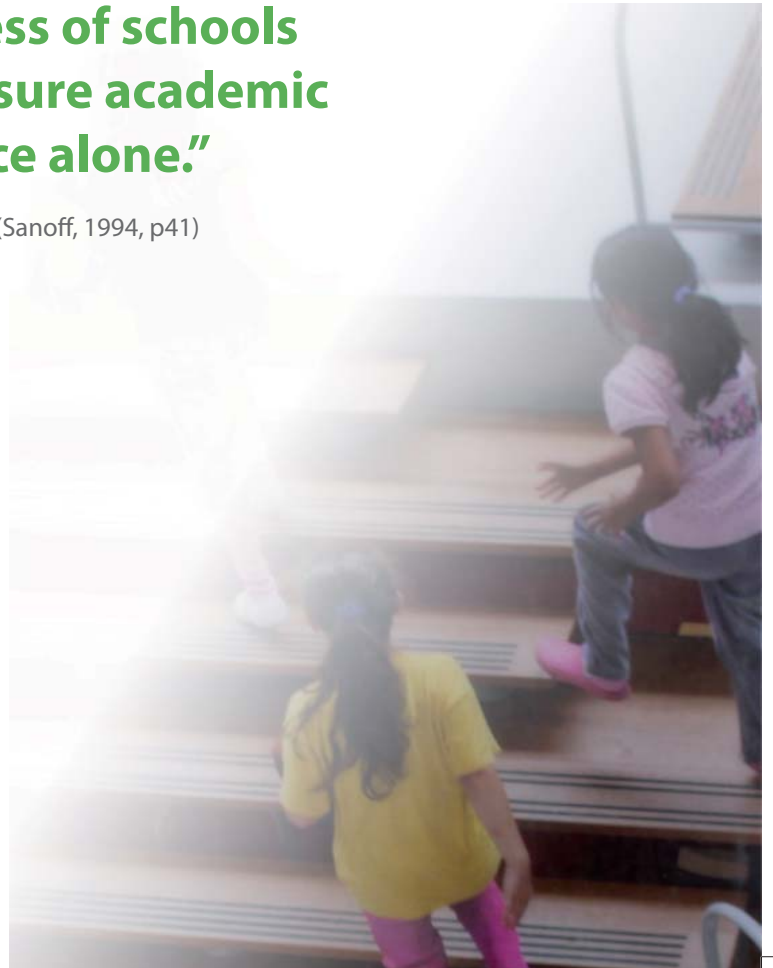

**the relationship of communal and domain spaces will form articulated space for the norvasund school, evoking a sense of community and home for users.**

# research/ pedagogy (books, articles, legislation, building study)

# users

**"the business of schools is not to ensure academic performance alone."**

children's development (Sanoff, 1994, p41)



**Students**

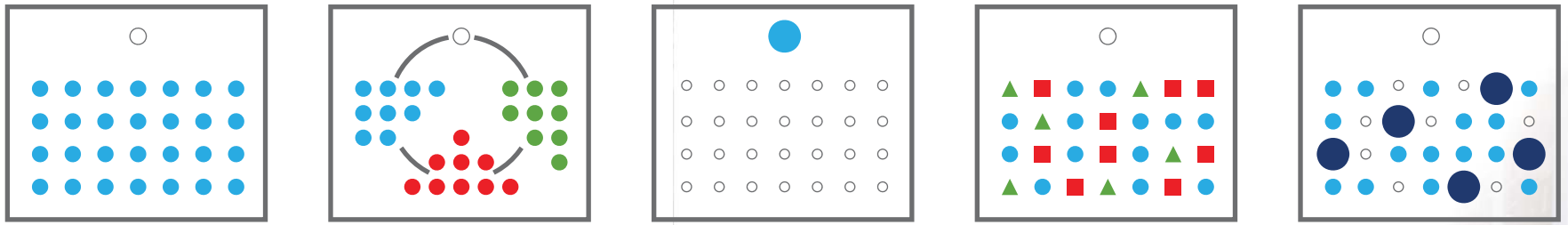
Student development is an imperative concern when approaching the Norvasund school, evoking the idea that test grades are very important, however remain a single aspect when considering the new design in Hatlane, Alesund. This is supported by Henry Sanoff, "the business of schools is not to ensure academic performance alone." children's development (Sanoff, 1994, p41) Therefore to approach a balanced sense of education for the students we must be resourceful in providing continuous opportunities for an array of movement, creativity and relaxation in every day school life.

In order to create and maintain student development we provide the following offered by Sorrell, "Agility, Flexibility, Ownership, Imagination, Invention, Social Awareness, Joy (Sorrell, 2005, p64) Furthermore we must aim to evoke a sense of students being positively encouraged, supportive by resources and enable user participation, spatial behaviour and interaction**.**

**Student development for users 1-7 stage and therefore between 6-12 years old will use the spirit of place as a point of departure, a sense of interaction as part of the nordic tradition.**

**“As an architect, it is imperative to resist being swept up by any specific view of education and to use it as a point of departure for your design. Architects should not get involved in debates about education; instead they should create spatial conditions that will benefit learning in a general sense.”**

flexible pedagogic platform (hertzberger, 2009, p9)



factory hospital log family warzone

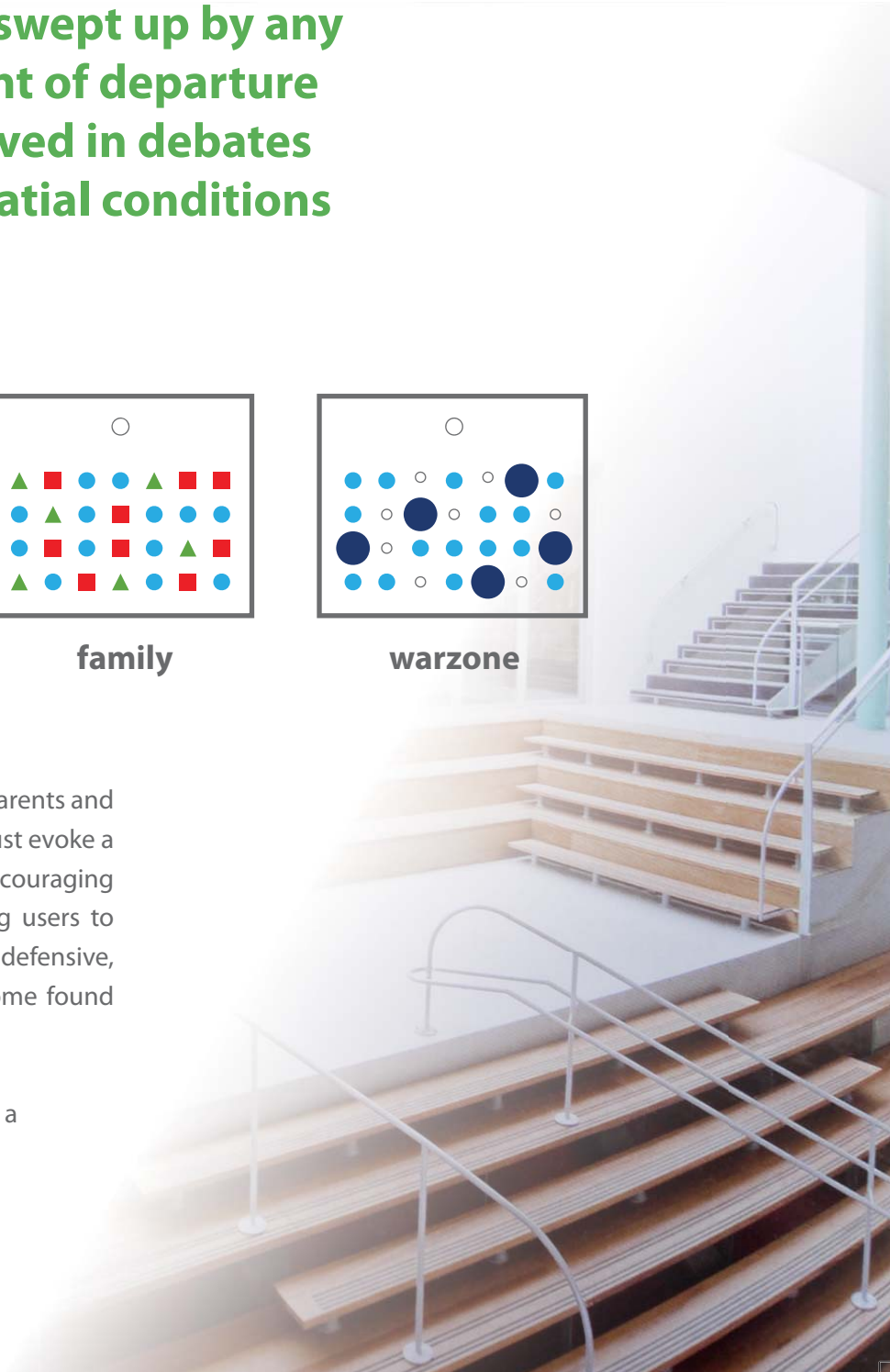
**Staff**

Staff within the Norvasund School, comprising teachers, assistants, personnel and such like are an important part of student’s education. The Pedagogic method may use the following forms; factory, hospital, log, family or warzone. Hertzberger’s view of a flexible pedagogic platform is favoured as a more able solution when responding to the ever changing needs of people. Therefore the classroom must acommodate whole class, individual, paired and group learning. However when considering the building program, the school must lean more towards the hospital and family strategy and less towards the warzone, encouraging students.

**Parents/ Wider-Community**

The role of the school in relation to parents and the wider community of Alesund, must evoke a strong sense of being welcoming. Encouraging the idea of interaction and enabling users to approach more invited and less defensive, usually attributed to fortress syndrome found in prisons.

The identity must be strong and play a vital aspect of the school’s character, using transparency and effective communal facilities to guide users.



il. 1.15 - school montage

# atmosphere

**Student Development**

Encouragement, praise, understanding, different interaction with a variety of people. Opportunity for meaningful participation in School and community, cooperation, resources, responsibility as young adolescents require diversity

**Spatial Cohesion**

Herman Hertzberger states, "The more complex a building becomes the more it tends to split into separate parts." (Hertzberger, 2009, p10) This can be seen by the use of multi-entrances, which although appropriate in some applications, have a tendency to fragment the building. Therefore to achieve a sense of communal unity withhin the Norvausnd school we must approach and evoke simplicity.

**Articulate**

Communal - School as Home

"While you want to provide the maximum in terms of rich and varied experience, it is at the same time essential to guard against alienation, to ensure that children feel at home and have the sense of security that comes from sufficient clarity as to where they belong." (Hertzberger, 2009, p17)

Domain - School as a Base

The domain should encapsulate qualities enabling concentration, quiet, individual Spaces. "It is not just buildings that need structure; people too need a structured environment, in which each person can feel at home. You need a home base to which you can always return, and from which you can venture out to explore the world." (Hertzberger, 2009, p15)

**Flexibility**

As a means to achieve a sense of permanence the ability of flexibility is critical., whereby it can be seen that the permanent building is not permanent. Instead the permanent building endures as able to integrate and respond to the ever changing needs of people. "The building should provide a general framework for education and learning, while being flexible enough to respond to changing demands and even (in a spatial sense) hold out a suggestion of pursuing avenues other than those laid down in the brief [...] schools are more susceptible to relentlessness of our demanding society than any other buildings." (Hertzberger, 2009, p9) In addition, "The design of new school buildings needs to provide facilities that can change with the times, so more flexible spaces will be needed." (CABE, 2010, p19) A less fixed and more inter-changable solution is needed..




**Stimulating**

Student and all users must be continually stimulated throughout the day. In particular daylight must be focussed upon as artificial light is significantly less effective. "The conclusion is that artificial light is significantly less healthy. Artificial light gives a uniform level and transmission of light, which, at at a rate of 750 lux, lowers people's abilities, sterilises the environment and reduces our ability to learn." Craig White (White, 2007, p55) In contrast daylight improves ability to learn. Heschong-Mahone's research concerned two groups of children, each in their classrooms for the same lengths of time - one in a classroom with natural daylight and the other, the control group in an artificially lit classroom with no daylight. The control group of children learned 20% more slowly than those with natural daylight (Heschong-Mahone, 2003).

**Identity - Visible**

Proud of school and sure of what it stands for, "When children experience a school obviously designed with their needs in mind, they notice it and demonstrate a more natural disposition towards respectful behaviour and a willingness to contribute to the classroom." (Sorrell, 2005, p68) Therefore the project must act as a statement, utilising environmentally sustainable aspects; rainwater collection, solar Panels and such like. Revealed sense of honesty, materials being natural, promoting timber as a renewable building material, produced in the forest, the environment's and society's friendliest factory. "Every use of wood instead of fossil or non-renewable materials relieves the environment and contributes to protecting the climate" (Herzog, 2004, p49)

**Welcoming**

Families and the wider community must be maintain a sense of interaction, walking to school and avoid vehicle access to the main entrance. Open spaces should be permeable and have clear transparency. "The high level of transparency in schools makes a welcoming environment to pupils and the community." (CABE, 2010, p36)

**Moreover, a focal point, by which users can orientate and relate to is required. Therefore through articulated space a landmark should arise which orientates, relates and the operate as the direct opposite of a maze.**

**”each child has 3 teachers […] Firstly the other children, secondly the teacher and finally the educational space”**

sybelle kramer (kramer, 2008, preface)

# spaces/ circulation

**Secondary Atriums**

As an alternative to the corridor, secondary atriums can be used as places to strengthen the quality of places outside of the indiviual classroom. Secondary atriums can comprise plants to positively enhance the microclimate and achieve good air quality, grow coffee, bananas, pineapples and such like. Also be a place for meeting others, added space for cramped classrooms and can allow private spaces for individual learning.

**Continuous Loop**

All circulation must be open and accessible and promote visibilty through transparency, enabling identifiable spaces. As a response to 2 aspects considered relating to the circulation of the school;

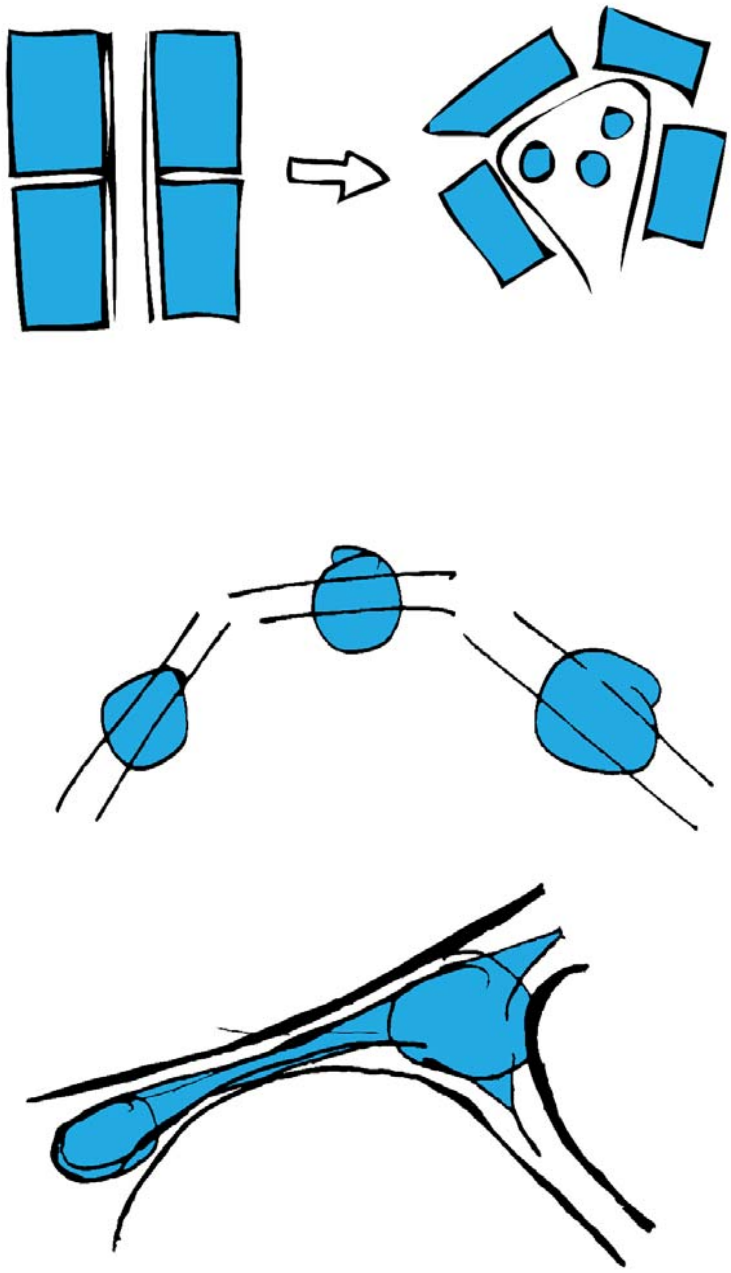
Orientation/
Users can identify and circulate effectively.
Bullying/
The ability to reduce the risk of bullying in schools must be encourages through the architecture of the school, whereby reducing pockets of single spaces, which are consoldated as a whole aims to improve visibilty and reduce separation.

**Provision for disabled users**

Access should be clear, simple in layout, with accessible circulation routes, suitable for wheelchair users; ergonomic details, such as door handles at the right height; means of escape designed to take account of people with a range of physical and cognitive disabilities

Visual contrast is highlighted by Perkins, “Materials should use colour as wayfinding” (Perkins, 2001, p24) **Therefore a sensory awareness with visual contrast and texture; avoiding glare and good-quality acoustics.**

il. 1.16



**“corridors do not belong in schools. those corridors that are dominated everywhere and always by rucksacks and odd bits of clothing, and by the endless pulling and shoving, badgering and carping that means they have to be made extra wide, using up a large proportion of what might otherwise be inspirational space.”**

herman hertzberger (hertzberger, 2009, p17)

il. 1.17

il. 1.18

# spaces/ communal

**Atrium for All/ Town Square**

The Atrium acts as a central hub for the school, boundary lines permeable and allow an exchange of knowledge. As a flexible space the atrium is ideally suited to accommodate the following different activites;

- After school
- Community based
- Space everyone can use
- Assembly
- Education/ Presentations, film screenings
- Teamwork

**Entrance**

As a first encounter with the school, the qualities of the entrance must firstly be welcoming, for all users. Therefore the entrance must be identifiable visibly and act as a focal point by which users may orientate towards throughout the school. The entrance must be permeable in accommodating the parents meeting area and reception.

**Multi-purpose Sportshall**

In relation to the building program for the Norvasund school, the provision of the multi-purpose sportshall is used by all 560 students, to exerise and interact.

# domain

**"it is not just buildings that need structure; people too need a structured environment, in which each person can feel at home. you need a home base to which you can always return, and from which you can venture out to explore the world."**

(hertzberger, 2009, p15)

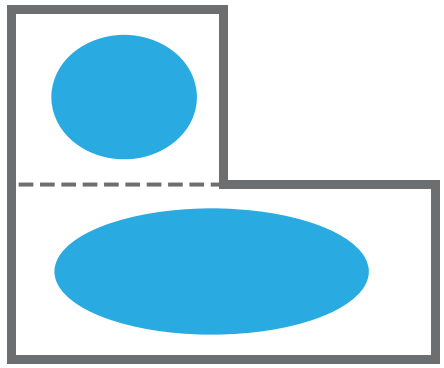
The domain for all users; students years (1-4), (5-7), enhanced students requiring special education, and the staff personnel are all unique and each of their domains should allow a sense of ownership. The domain acts as the street in relation to the communal atrium as the town square according to Herman Hertzberger.

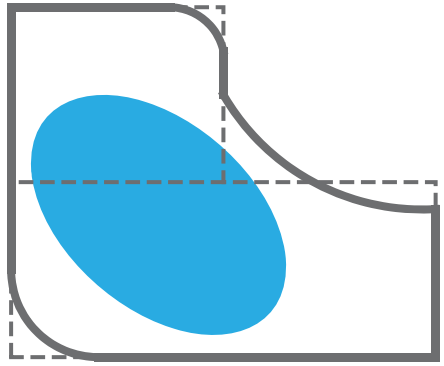
Each domain comprises spaces which directly feel a sense of ownership by those who inhabit them. However all spaces in relation to the idea of circulation should be promoted to ensure visibility and less 'pockets' of space by which are less identifiable. This will aim to be more coherent and reduce the risk of bullying within the school. This is partcularly relevant to the changing rooms/ WC, where all corners of the spcae must be seen and thereby be less intimidating.

**Students/** Years (1-7), (5-7), (Enhanced)
- Changing Rooms/ WC
- Storage - Books, stationary, equipment and coats
- Staffroom
- Circulation/ secondary atriums

**Staff Personnel/**
- Staff room
- Circulation/ secondary atriums

**spaces [...] should be promoted to ensure visibility and less 'pockets' of space by which are less identifiable**

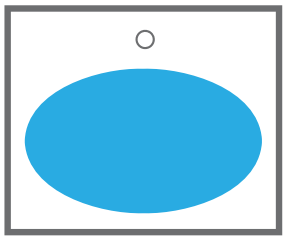




# individual

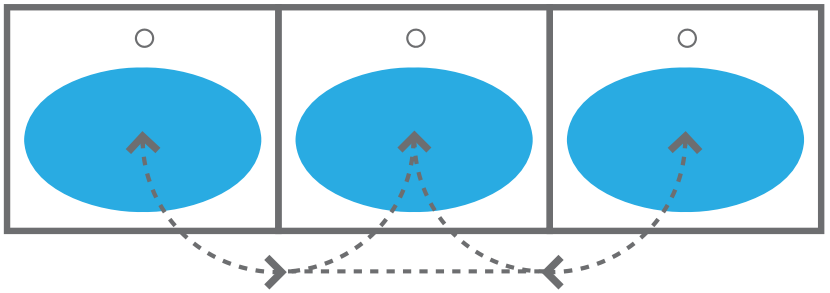
**“architects should not get involved in debates about education; instead they should create spatial conditions that will benefit learning in a general sense.”**

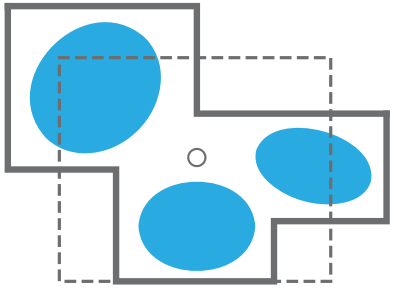
flexible pedagogic platform (hertzberger, 2009, p9)

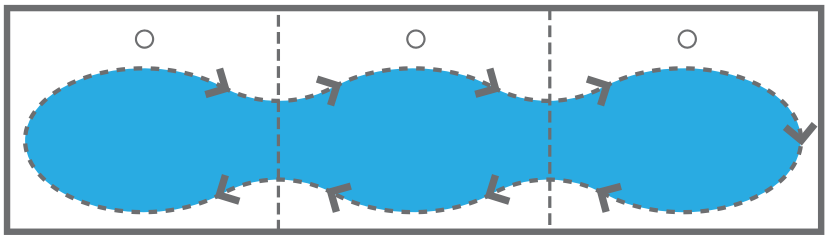


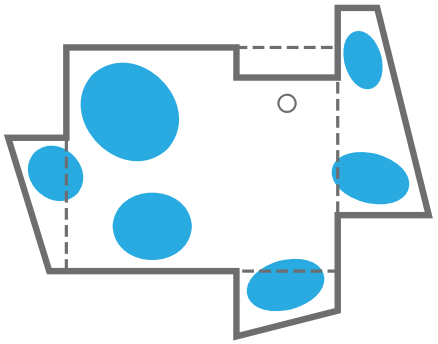
**Classroom**

The classroom within schools as an individual element, fixed between being peronal and communal is of fantastic importance, as Sorrell states, “Most of a child’s life is spent in a classroom” [Sorrell, 2005, p64) This sense of being indoor, coupled with the need for a stimulating pedagogic environment for students, proposes 2 directions that the classroom must maintain competence; Outdoor Study/ the ability to interact with natural forces and Indoor Study/ “For individual spaces, folding walls are not necessarily the most practical device to consider, and they may have shortcomings acoustically.” (CABE, 2008, p63). Therefore Open - Closed class environment allows an exchange, whereas Open pedagogy means everything has been exchanged, gaining problems of Identity, becoming confusing for users.







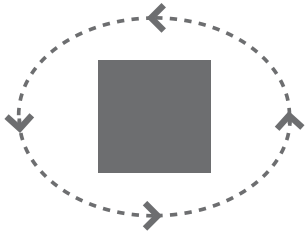


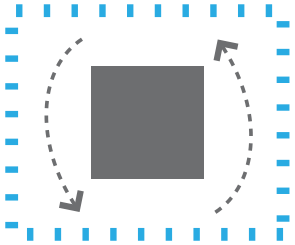
il. 1.20

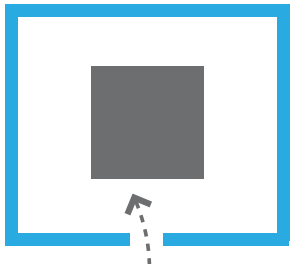
**“‘friluftshiu‘ […] there’s no such thing as bad weather…. only bad clothing”**

outdoor learning (knight, 2009, preface)

# landscape







**Outdoor learning / play**

“Investing in the design of school grounds can create stimulating and creative places, which support curriculum learning and give children rich and varied experiences that may not be available to them at home.” (CABE, 2010, p36). Sara Knight also highlights the outdoor environment, “‘Friluftshiu‘‘ […] There’s no such thing as bad weather…. Only bad clothing” (Knight, 2009, preface) Landscape spaces comprise communal uses, such as bicycle storage, grassed Area. Also the idea of the domain, catering for specific needs and users can be seen by civilisation zones, using sand and waterplay and shade areas. This will aim to provide students with resources for learning and play, utilising natural elements, which are rich and diverse; hills, valleys, trees and such like. The landscape also contributes an as initial encounter with the school for users and should be welcoming and not defensive, avoiding fortress-syndrome.

il. 1.21 montage

# environmental/
# excellent learning environment

The environmental research aims to assess best practice for indoor climate, working towards the goal to attain an excellent learning environment. Therefore we must ask, what is an excellent learning environment for the application of a primary school on the west coast of Norway?

Children's Health and Development requires a stimulating environment evoking performance and productivity. This can be organised similar to the approach of the social architectural research, whereby prioritising with key elements, concentrating on the more effective means to achieve an excellent learning environment. As an example, the quality of daylight is thought to be more prominent than other aspects of the design and must therefore capitaalise upon these articulated environmental aspects.

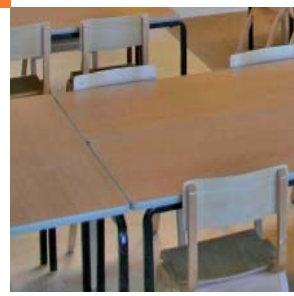
**"the lack of daylight is second only to air-conditioning as the leading cause of sbs, sick building syndrome**
**[...] symptons of sbs (sick building syndrome) are;**
**- headaches**
**- fatigue**
**- numbness and irritation of the eyes**

sbs - sick building syndrome (licht, 2006, p9)

**“Glare is a form of visual noise; noise is acoustic glare.”**

glare (licht, 2006, p17)

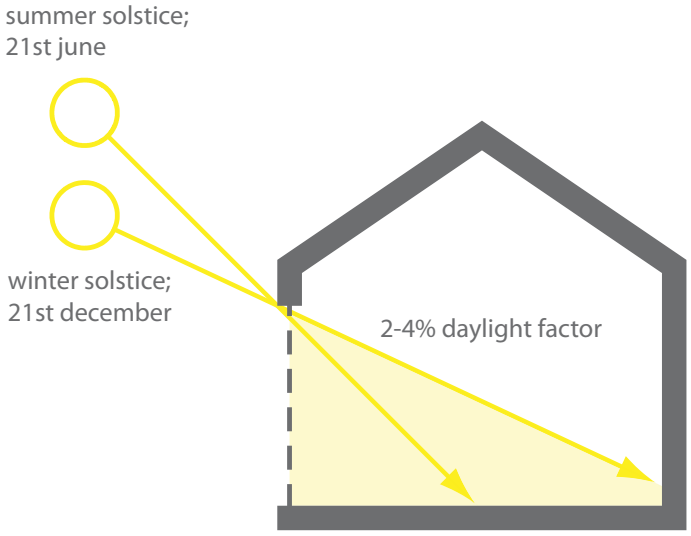
**il. 1.21 montage**



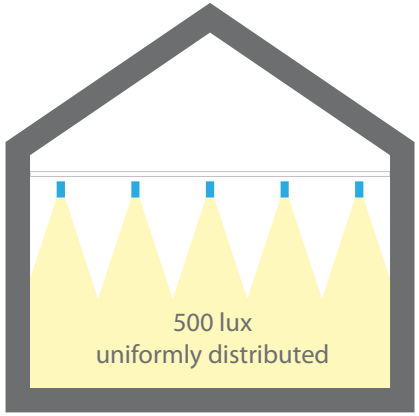
# light

The quality of light is crucial as a first priority when creating an excellent learning environment for the Norvasund school. Therefore daylight must reach a 2-4% daylight factor as a comfortable level to continually stimulate users throughout the day.

Whilst in the sub-arctic, Alesund in the nordic context is ideally suited to maximise the potential of the northern light, although various concerns attributed to pursueing a good quality of light must be addressed in the synthesis phase of the project. This includes the potential for over-heating by solar gain, and also solar glare.




**il. 1.22 daylight/**




**artificial light/**

**"the principle of encapsulating any prevailing winds and using this natural resource as a part of ventilation originated some 2,000 years ago in the middle east."**

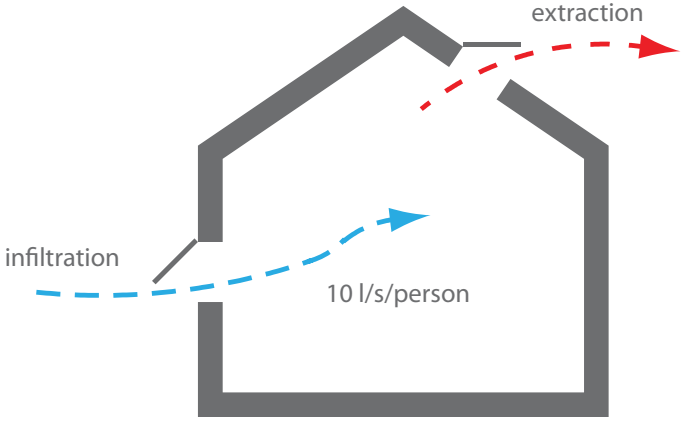
ventilation (monodraught, 2009, p3)

il. 1.23

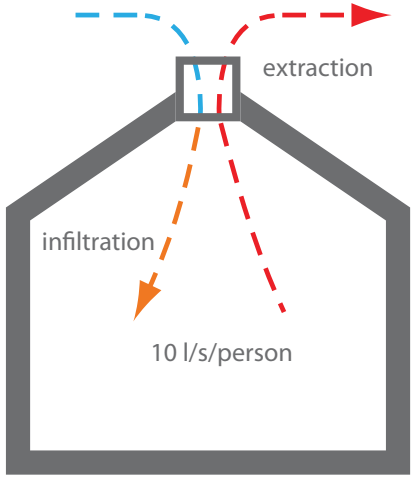
# environmental/ air quality

The air quality in the Norvasund school is almost equally as much of a priority as the provision of a good quality of daylight for users. According to best practice, the rate of 10l/s/p (litres per second per person) is set as the target for a good rate of ventilation. It is hoped to utilise as much natural air through passive ventilation as possible, ensuring good quality of air which does not exceed 1500 ppm (parts per million).

However the design must be prepared for mechanical ventilation through heat recovery as a standby system, which would be more utilised as a winter tool because of the northern hemisphere's low temperatures in Alesund.




**passive ventilation**/
cross-flow



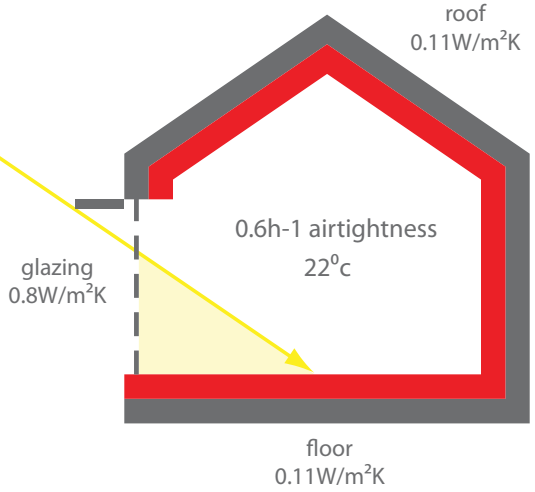

**mvhr**
(mechanical ventilation heat recovery

**“breeam state that overheating in classrooms can create problems of headaches, lethargy, irritated eyes and increased accident rates.”**

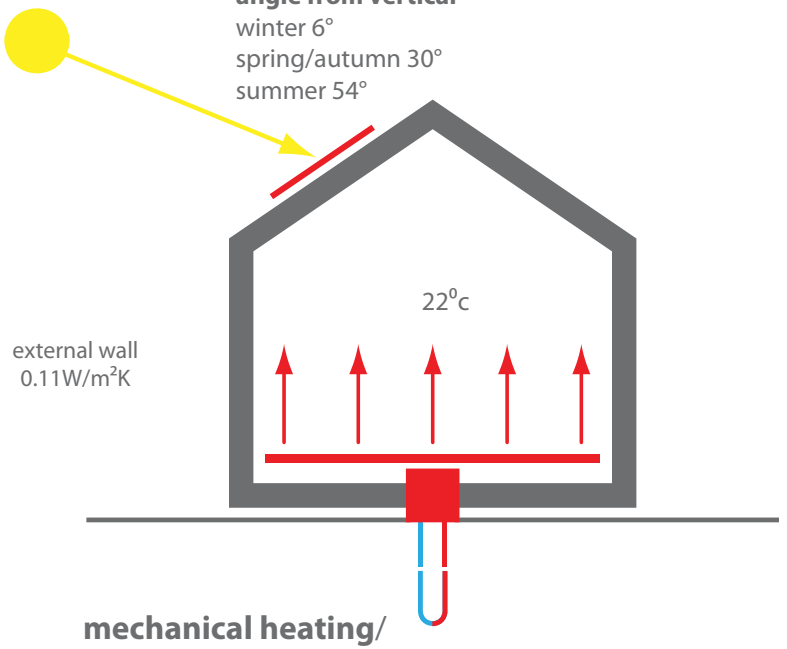
temperature (monodraught, 2009, p27)

# temperature

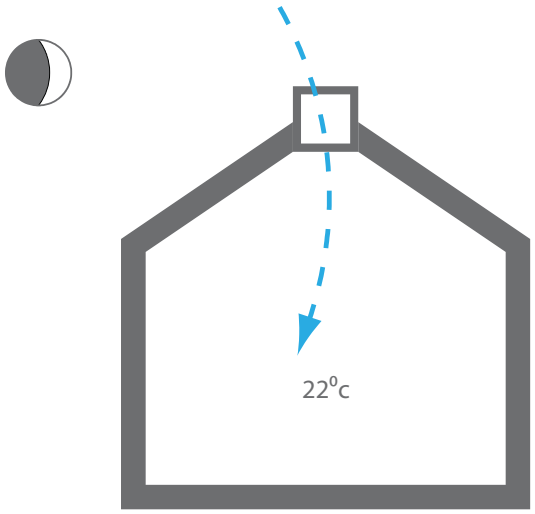
The indoor climate in terms of temperature is highlighted by the uk sustainable legislative organisation BREEAM, whereby maintaining 22ºc as a constant and avoid overheating is crucial for the comfort of users. Therefore the balance of heating and cooling is required, whereby in the nordic context the focus is more toward providing a stable heating system, as the low temperatures in the region are less likely to create overheating to such an extent and more likely attain heat loss through thermal bridges and such like. The design promotes passive solutions, whereby an airtight envelope to the German Passive House standard of 0.6h-1 is targeted, ensuring minimal heat loss and far reduced heating costs. **Night-time cooling - norway’s sub-arctic climate is suitably colder for low temperatures to passively cool the buildings.**



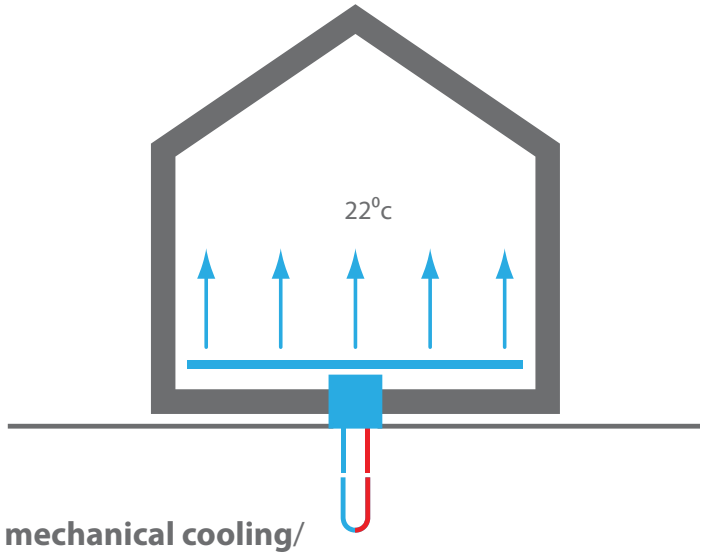

**passive heating/**
solar gain, reduction of heat loss




**mechanical heating/**
swhs (solar water heating system
geothermal heat pump




**passive cooling/**
night-time cooling

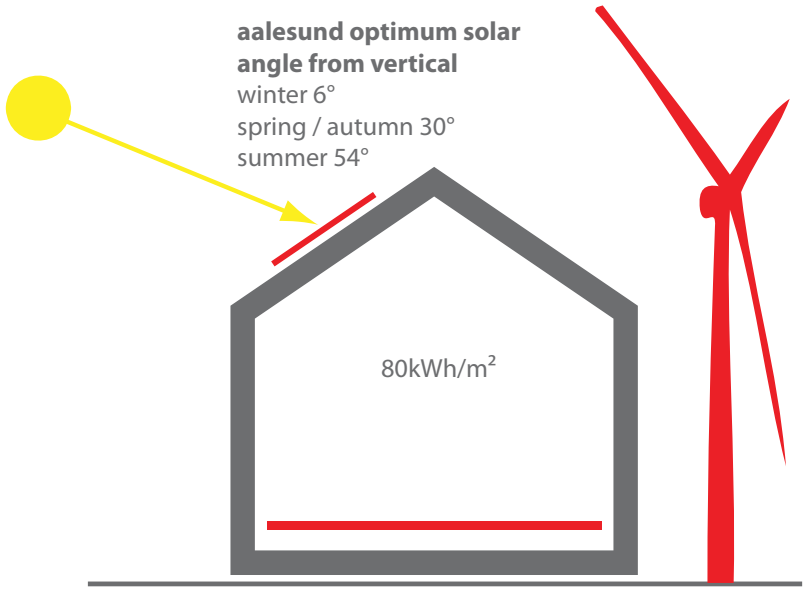



**mechanical cooling/**
geothermal heat pump

# electrical power

primary energy demand =
120kWh/$m^2$ / 2.7 = 44.4$m^2$
44.4 x 9060 = 402,662kWh/$m^2$

Solar photovoltaic panels are thought to be more effective for a renewable energy source than for example, a wind turbine. This is due to low wind speeds within this region of Vestland and indeed for most of Norway gaining less wind than surrounding countries. Also when considering the possibility of utilising close proximity oil generating 70% of Norway's gross domestic product as a local regional application. However as an environmentally responsible building the idea of retaining ideas of utilizing fossil fuels is not consistent, nor compatible with the benfits of reneable systems of for example, solar photovoltaic panels and wind turbines as a response to the need of reducing carbon dioxide emissions.

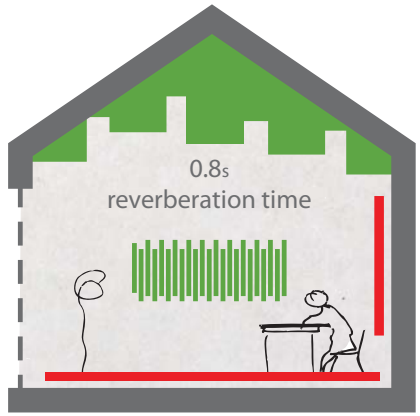



**renewable energy systems**/
solar photovoltaic panels
wind turbine

# acoustics

il. 1.24

The ability to gain good classroom acoustics and aim to allow audible sppech clearly with a reverbeation time target of 0.8 seconds, allowing students to concentrate and contribute as an asepct to be ing considered an excellent learning environment. The design aims to reduce background noise from adjacent classrooms, utilising sound insulation to dampen noise impact. Also acoustic materials can be used effectively to work towards achieving aa classroom with 0.8 seconds reverberation time, utililsing absorptive and reflective materials as a composition. Absorptive surfaces diffuse sound waves and thereby reduce the risk of echoes and such like. Reflective materials such as timber floors can be used to ensure that a good quality of audible speech, often from the school teacher may be transmitted clearly.




**classroom application/**
absorption
reflective

**crucial to stimulate users**

# environmental/ target demand

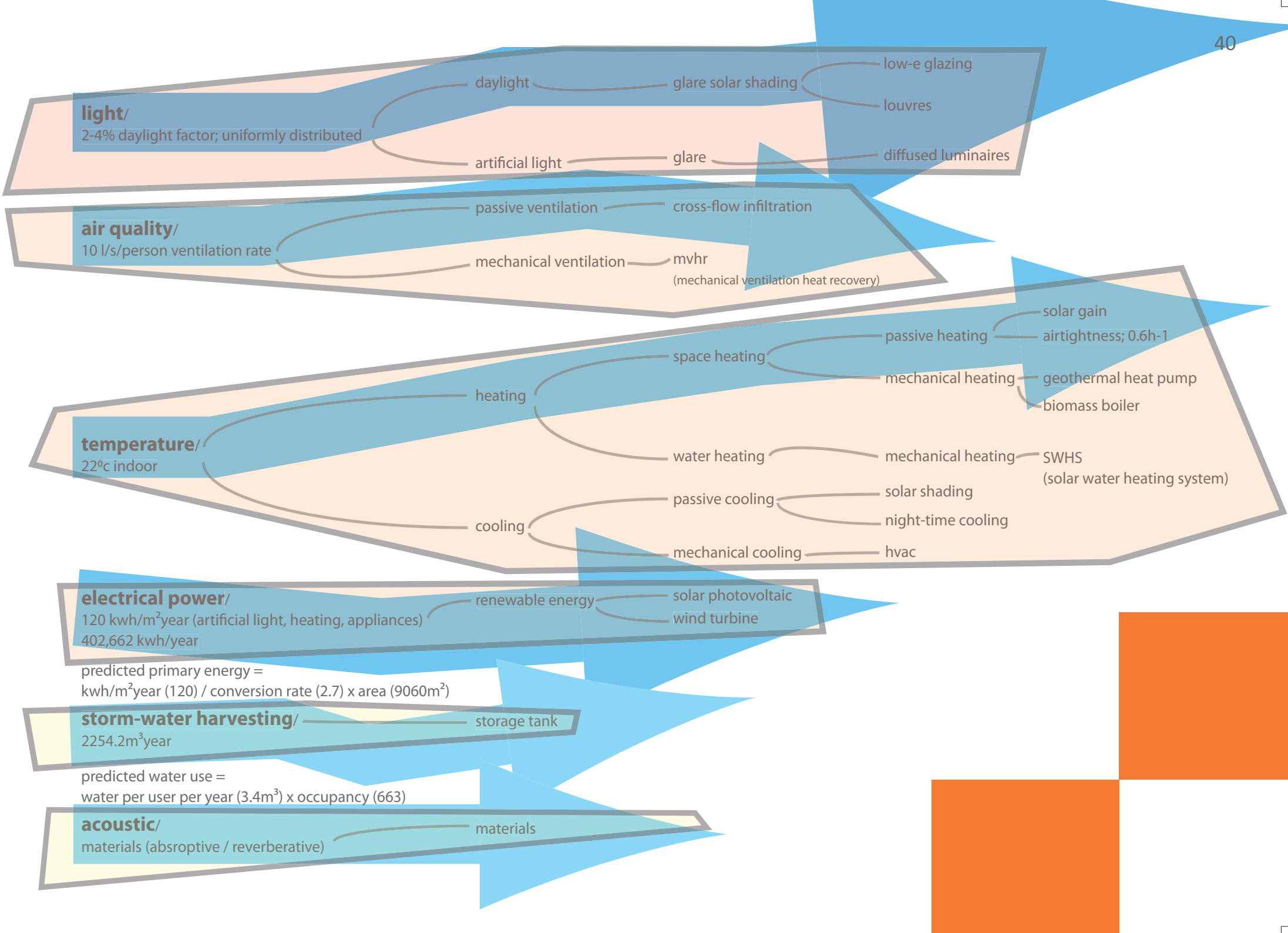
The environmental strategy for the Norvasund School aims to stimulate students and evoke increased performance, whilst minimising carbon emissions.

The environmental stategy is to be ambitiously sustainable, utilising the framework of the German Passive House standard, in terms of air tightness (0.6 h-1), rate of ventilation (10 l/s/person) and passive solar integration, reducing energy demands of heating and electrical power.

**miscellaneous project aims**/
- breeam rating "very good"
- uk green guide; a-rated materials

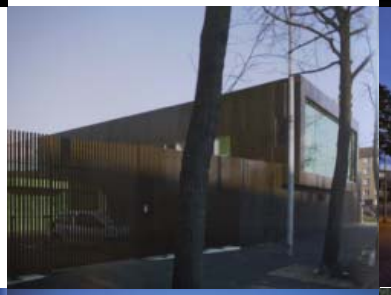
**environmental analysis aims**/
- solar gain; glare / shading
- daylight factor; % glazed area
- air quality; ppm (parts per million)
- artificial lighting; uniformly distributed luminaires
- heat / power source
- ventilation; passive / mechanical

**environmental analysis aims**/
- solar gain; glare / shading
- daylight factor; % glazed area
- air quality; ppm (parts per million)
- artificial lighting; uniformly distributed luminaires
- heat / power source
- ventilation; passive / mechanical


light/
2-4% daylight factor; uniformly distributed
daylight
glare solar shading
low-e glazing
louvres
artificial light
glare
diffused luminaires
air quality/
10 l/s/person ventilation rate
passive ventilation
cross-flow infiltration
mechanical ventilation
mvhr
(mechanical ventilation heat recovery)
temperature/
22ºc indoor
heating
space heating
passive heating
solar gain
airtightness; 0.6h-1
mechanical heating
geothermal heat pump
biomass boiler
water heating
mechanical heating
SWHS
(solar water heating system)
cooling
passive cooling
solar shading
night-time cooling
mechanical cooling
hvac
electrical power/
120 kwh/m2year (artificial light, heating, appliances)
402,662 kwh/year
renewable energy
solar photovoltaic
wind turbine
predicted primary energy =
kwh/m2year (120) / conversion rate (2.7) x area (9060m2)
storm-water harvesting/
2254.2m3year
storage tank
predicted water use =
water per user per year (3.4m3) x occupancy (663)
acoustic/
materials (absroptive / reverberative)
materials

# case studies/
















il. 1.25

# social/ Dartington Primary School

location/ **devon uk**

architect/ **white design**

student capacity/ **420**

floor Area (m2)/ **6000**

completed/ **february 2010**

client/ **devon county council**

Mature trees have been retained and each classroom opens directly into its own landscaped garden, encouraging each year group to care for their external space and develop a sense of ownership.

Each classroom opens directly into its own landscaped garden, contributing to the idea of an outdoor classroom and learning through play.
The design is based on a series of independent 'year group clusters', set in landscaped grounds.

Each cluster is made up of a series of timber classrooms. Each has a structural frame that is made from solid timber panels assembled in Switzerland. These panels are strong enough to act as a load bearing structure, removing the need for internal columns or beams. The classrooms are insulated with wood Fibre made from recycled timber pulp and are clad in UK-sourced sweet chestnut

**“the buildings have been designed to have a strong relationship with the outside landscape [...] a school building without corridors became a strong component of the design.“**

Craig White (White Design, 2010)

# environmental/ mount angel center for theological studies

location/ **st. benedict, oregon, usa**

architect/ **srg partnership, inc.**

student capacity/ **120**

floor Area (m2)/ **2000**

completed/ **2009**

client/ **mount angel abbey**

Technologies:
- Daylighting, natural ventilation and Cooling
- Passive heating, recovery ventilator

Mount Angel Abbey's new Annunciation Center for Theological Studies completes the Benedictine teaching, retreat and worship center on the hill above Mount Angel, Oregon.

The design innovation included a large central skylight with special integrated shading and light diffusion devices as well as optimum use of natural ventilation.

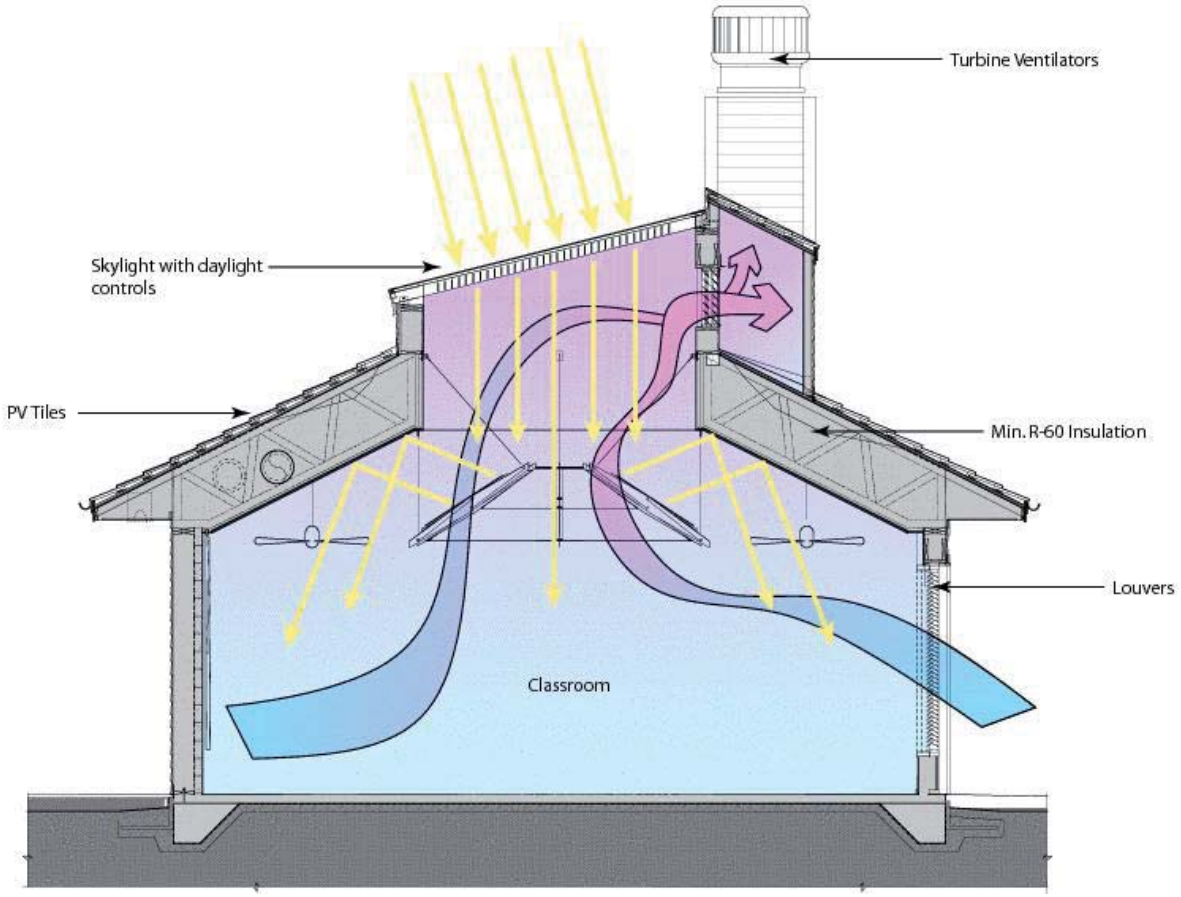
The team sought glare-free, evenly distributed daylight in all rooms during 95 percent of normal occupancy hours at 4 percent daylight factor

The final design also features triangular extruded aluminum reflector tubes arranged in concentric layers of diminishing density from the center outward.

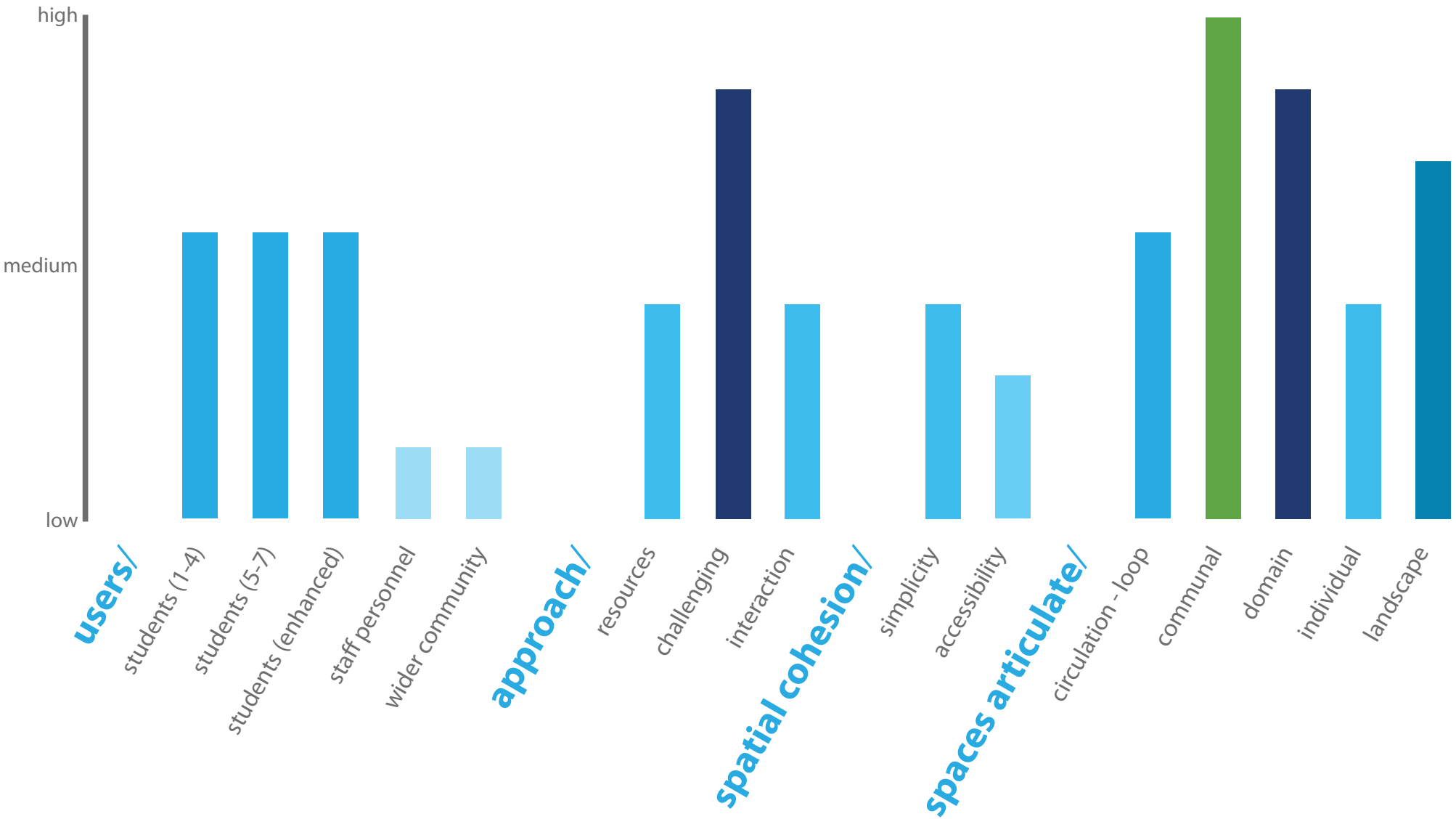
**"no mechanical cooling and provide 95 percent of the annual classroom lighting demand through daylighting [...] the concept for mount angel to create a high performance classroom**

Kent Duffey (SRG Partnership, 2009)

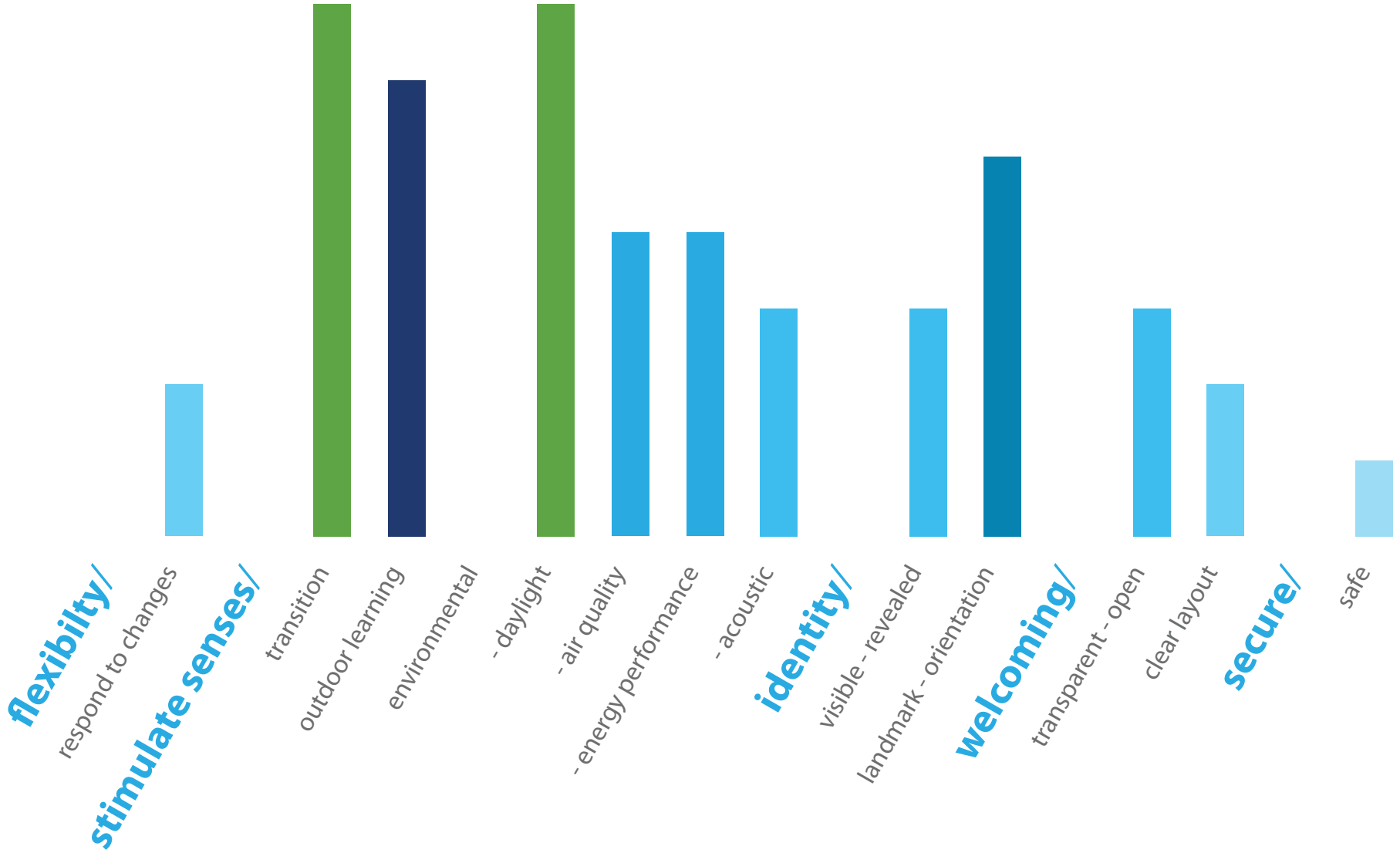
**il. 1.27**


Turbine Ventilators
Skylight with daylight controls
PV Tiles
Min. R-60 Insulation
Louvers
Classroom

# brief conclusion/ priority



# excellent learning environment
# student development



# vision

## place

**reflect values**

"In the Nordic countries, where the development of architecture has always been seen as a reflection of the changes in society." (Lund, 2008, p282) The Norvasund school must reflect Alesund's, as part of Norway's values and create a phenomenological dialogue, interacting with the mountains above and fjords below that grace Vestland. As part of the nordic tradition, reflecting Alesund's values visibly. "Joy's ethical stance is firm; the task of architecture is not to entertain us, […] but to create the silence, calmness, and concentration that enable us to experience the beauty of the world and life around us." (Pallasmaa, 2002, p.20)

## excellent learning environment

**Learning Spaces**

Creating inspiring spaces rooted to the genius loci "spirit of place"; students are engaged, enthusiastic, motivated. Evoke senses of touch, smell, sight, taste and sound to form an identity.

**Environmental Approach**

Stimulate Senses through uniformly distributed daylight as a priority, air quality by way of natural and mechanical ventilation (summer / winter). The environmental responsibility to reduce energy consumption passively along passive house requirements.

## student development

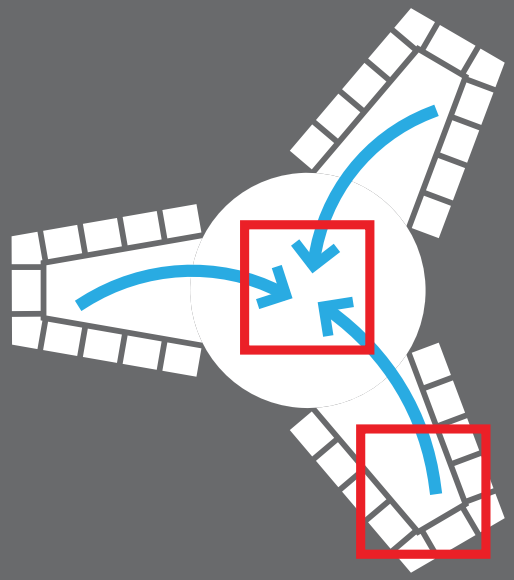
**Life Skills**

Problem solving, communication, team work, negotiation, reasoning, citizenship gaining identity, secure and welcoming spatial cohesion, articulated with flexibility for users.

daylight

community/

town square



transition

iterative phase 1 / site

conc

iterative phase 2/ site

iterative phase 3/ detail

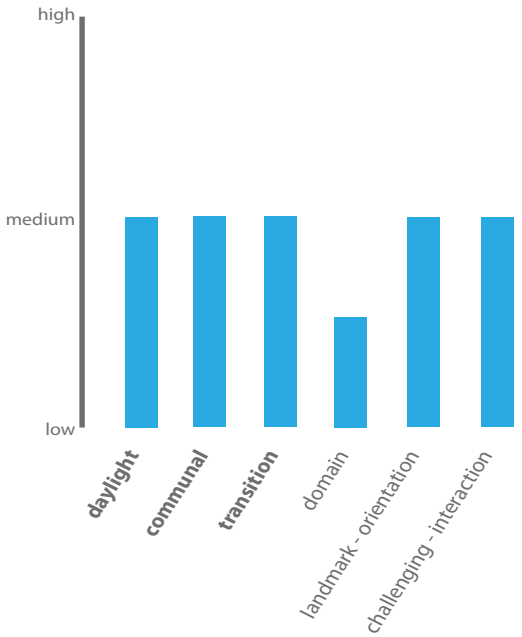
ept

iterative phase 4/
site + detail

# iterative phase 1

# volume/

**view = unity**




The view towards the south setting of the sunnmore Alps attains the beast vista in response tot the site for Norvasund School. Therefore as a means to gain equality within the school the students are placed as the priority, whereby each should be able to gain a view, responding and preventing any issues of equality. Therefore to maintain this balance the staff department is placed in a setting unable to gain a view of the mountains.

The sense of transition

street outside, which may be appropriate for the application of the Dartington school case study, however the harsh winter climate of Alesund demands that

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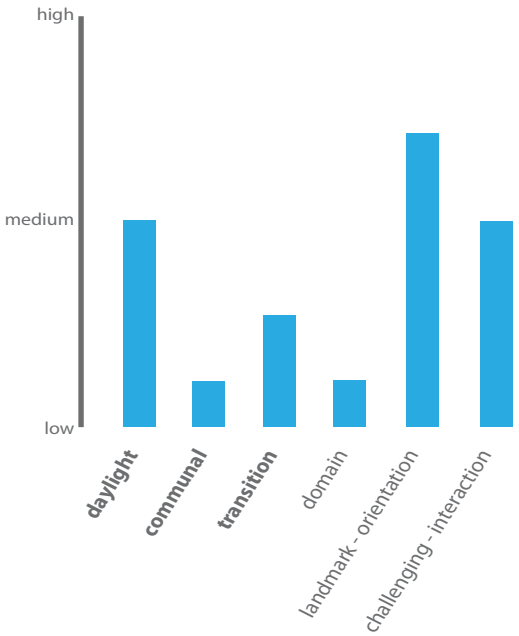
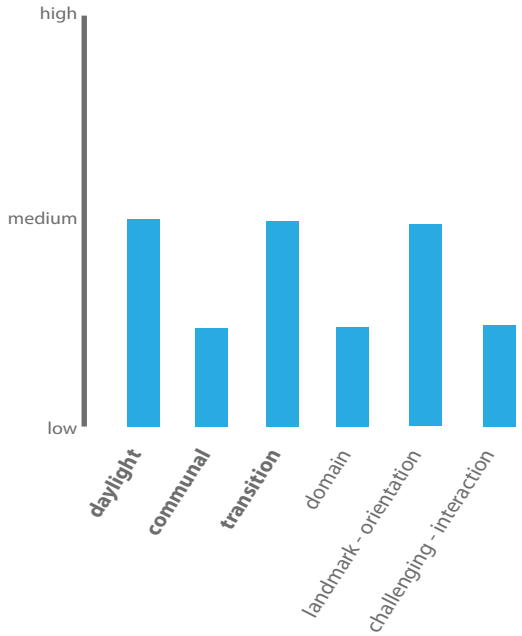
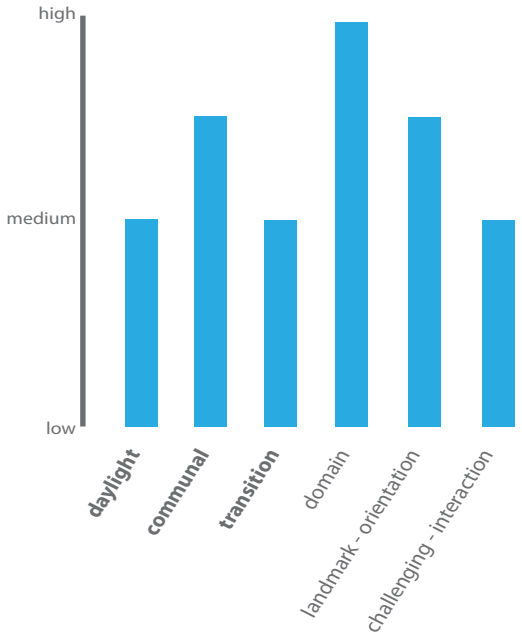
The sense of transition

street outside, which may be appropriate for the application of the Dartington school case study, however the harsh winter climate of Alesund demands that

**il. 2.01** - vol. 1 - rational


**il. 2.02** - vol. 2 - street

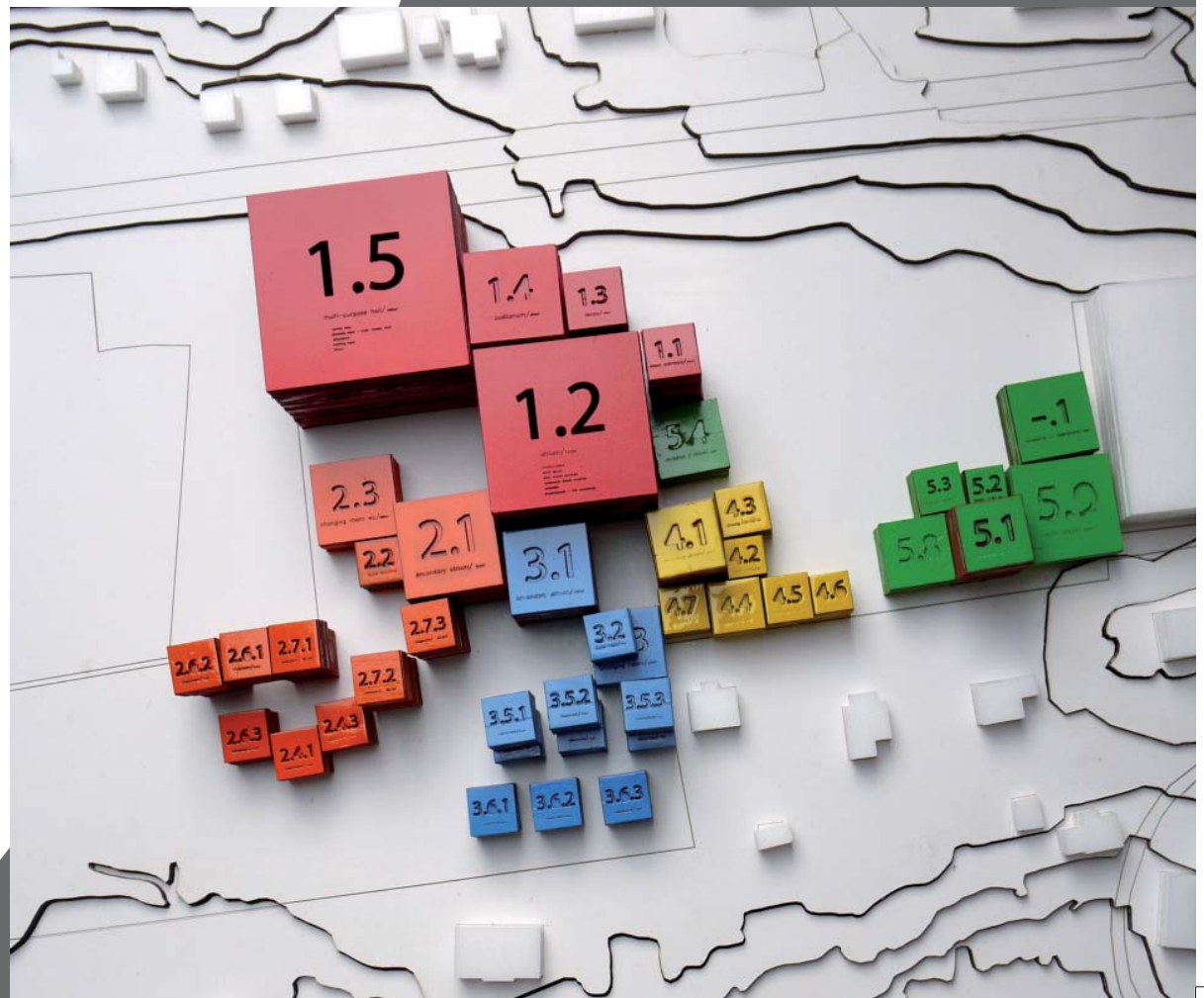
**il. 2.03** - vol. 3 - separation

**il. 2.04** - vol. 1 - view as priority

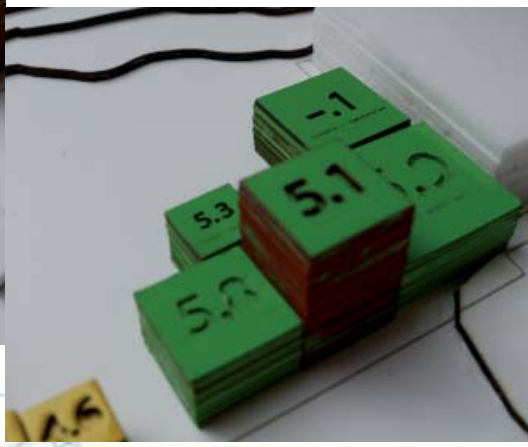
# iterative phase 2

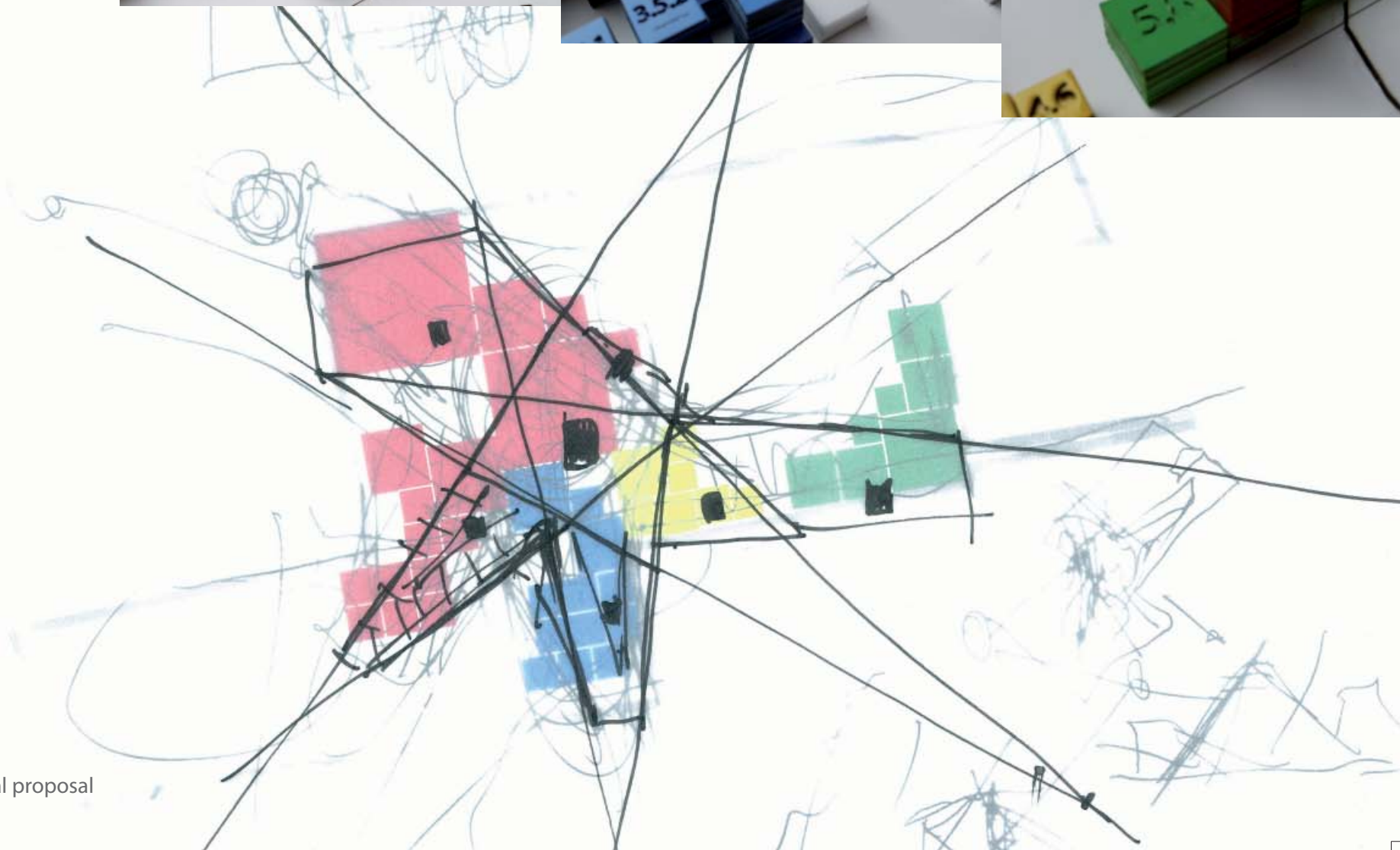
## articulate/


**il. 2.05** - proposal





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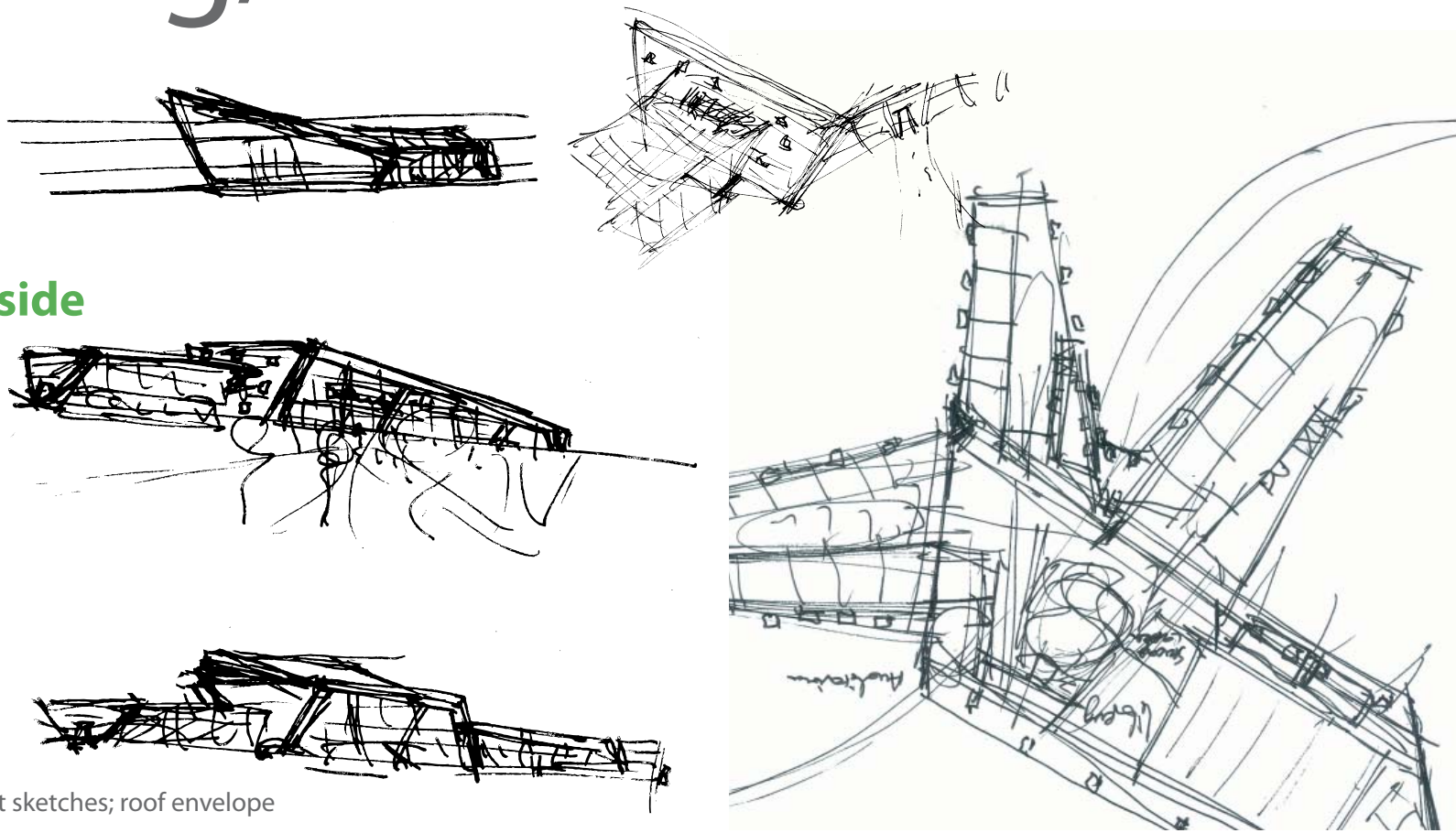
**il. 2.06** - final proposal

# iterative phase 3

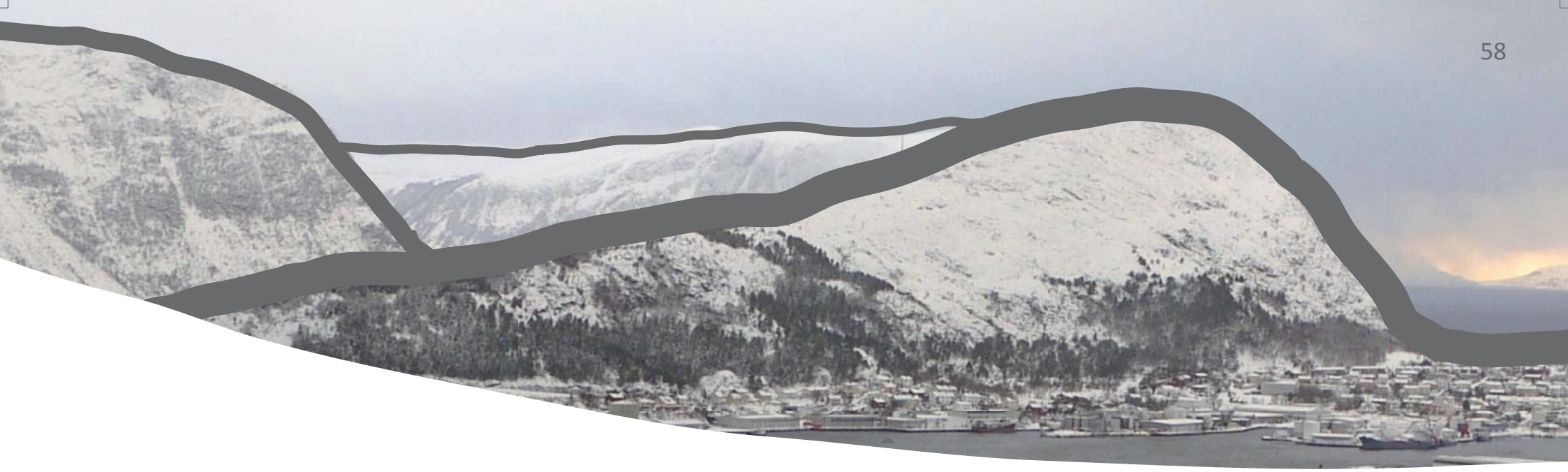
# form finding/

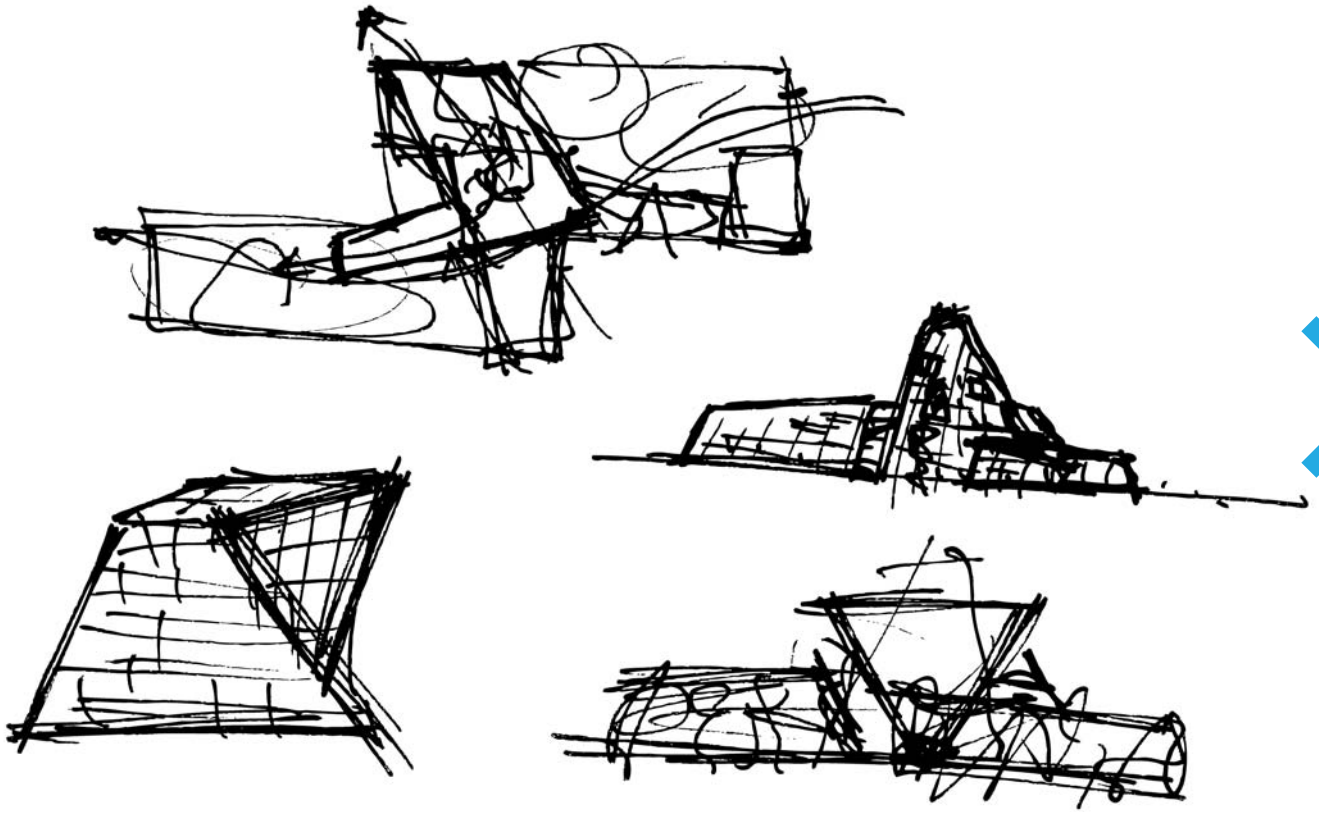
Refer to appendix/ Nordic context and Norway

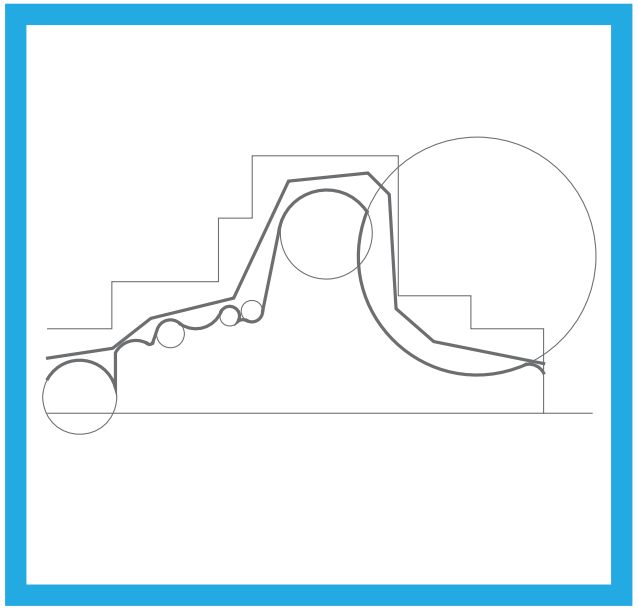
**How do you express the mountains - Inside - Outside**



**il. 2.07** - concept sketches; roof envelope

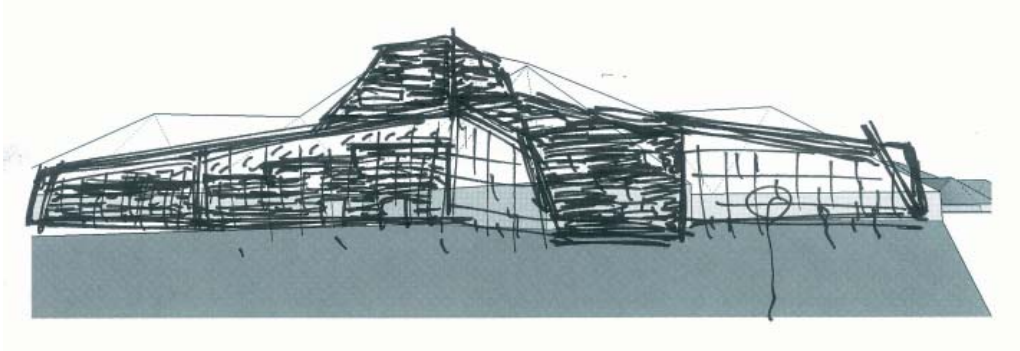




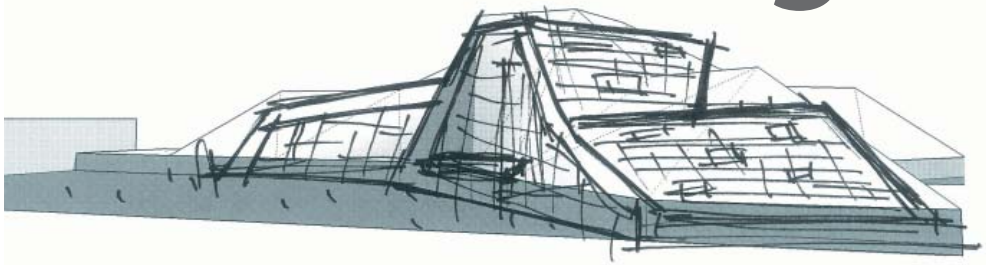


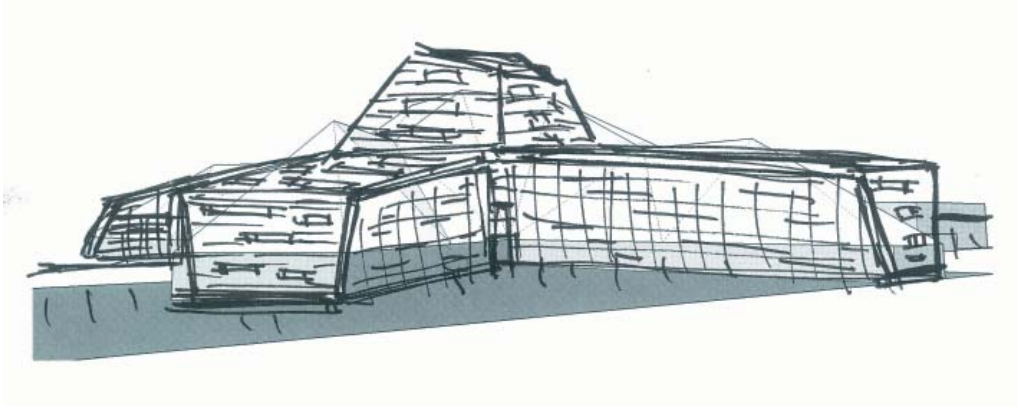
il. 2.08 - section - bagsvaerd church; jorn utzon

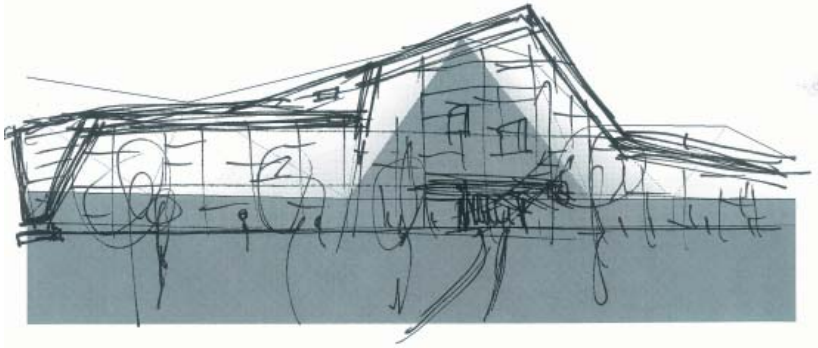
**il. 2.09** - concept sketches; roof envelope

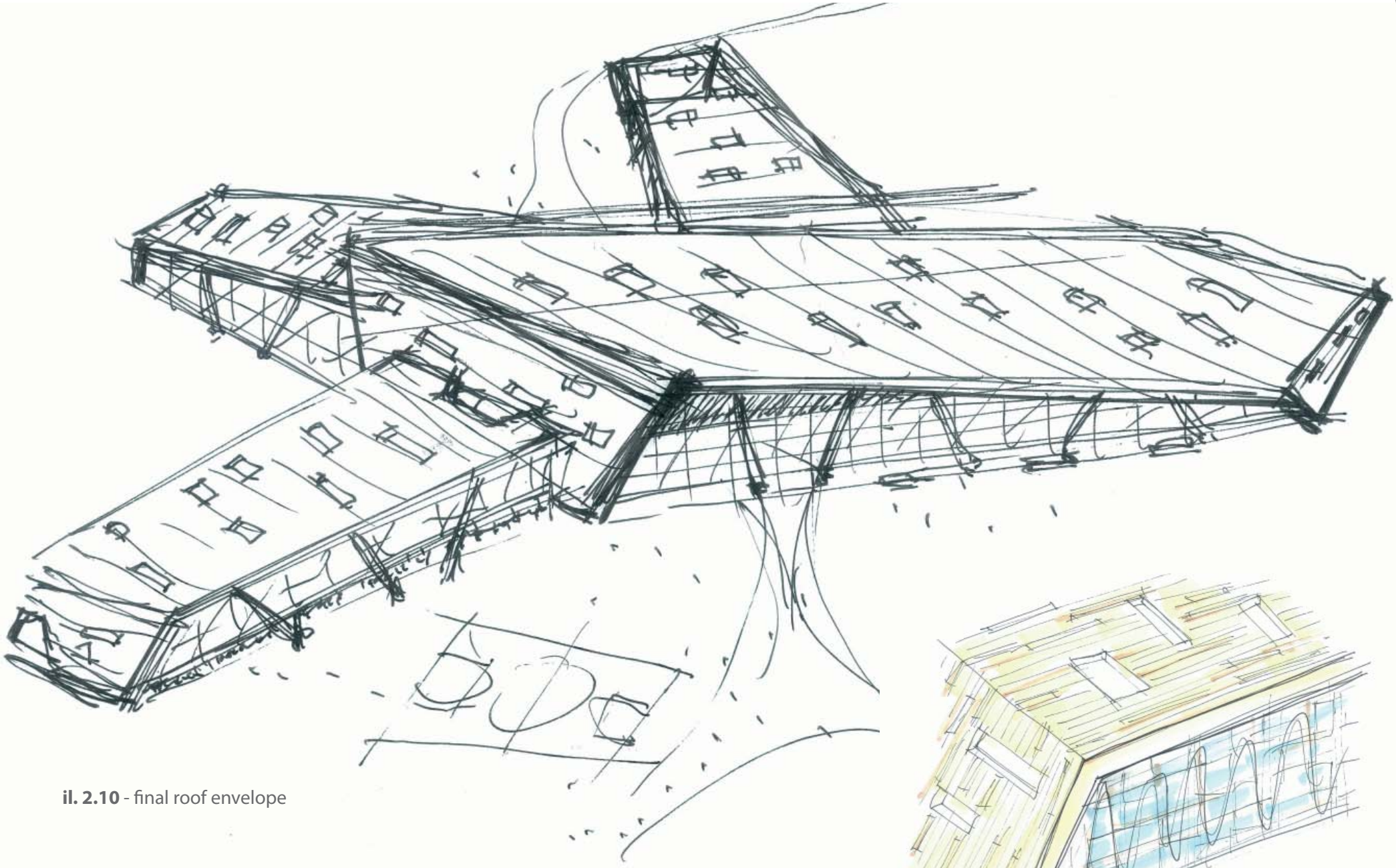


# form finding/



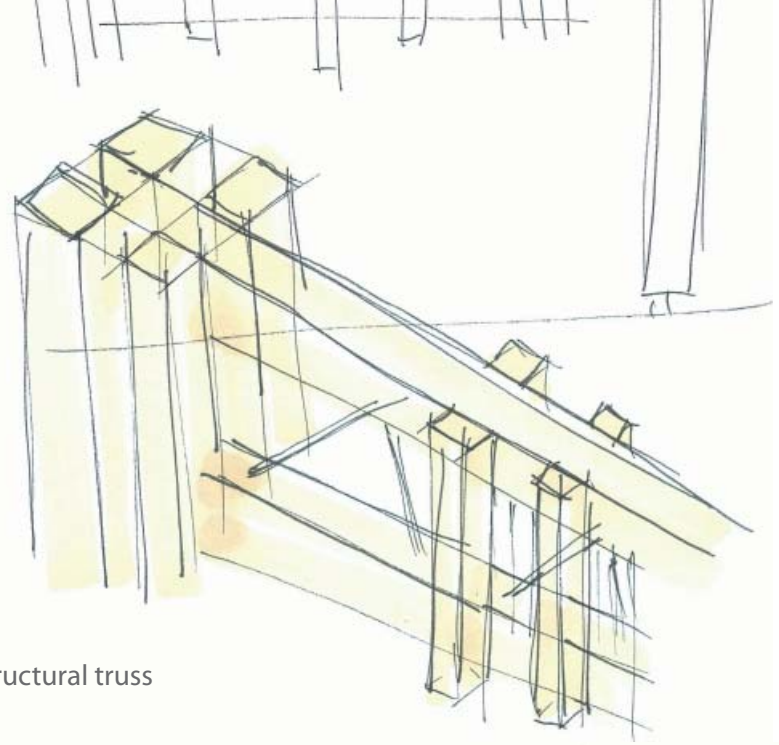




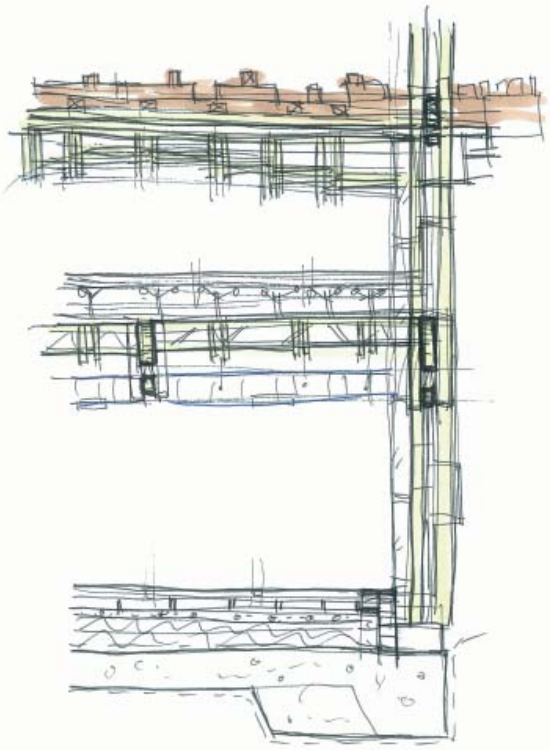


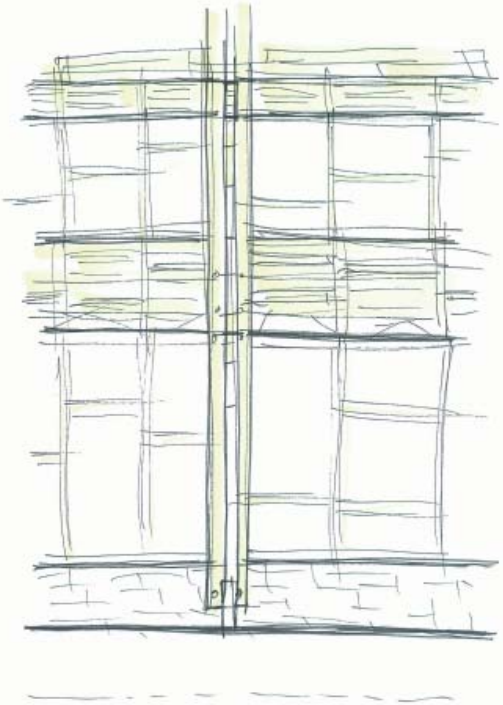
**il. 2.10** - final roof envelope

# structure/



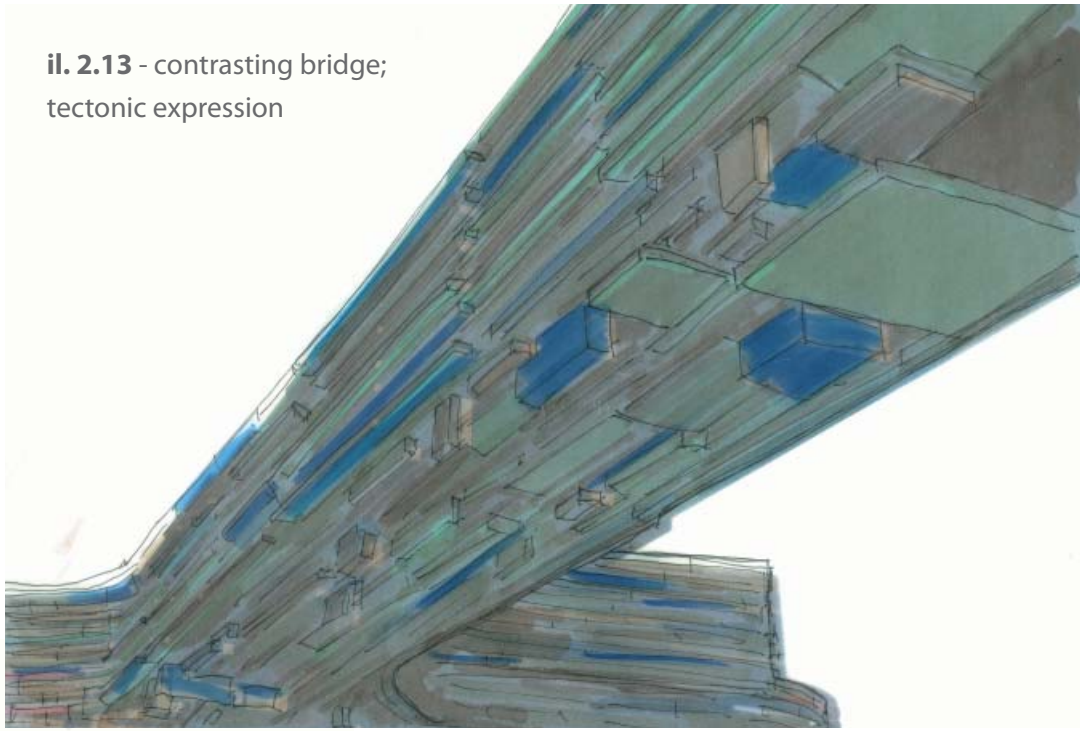
**il. 2.11** - structural truss



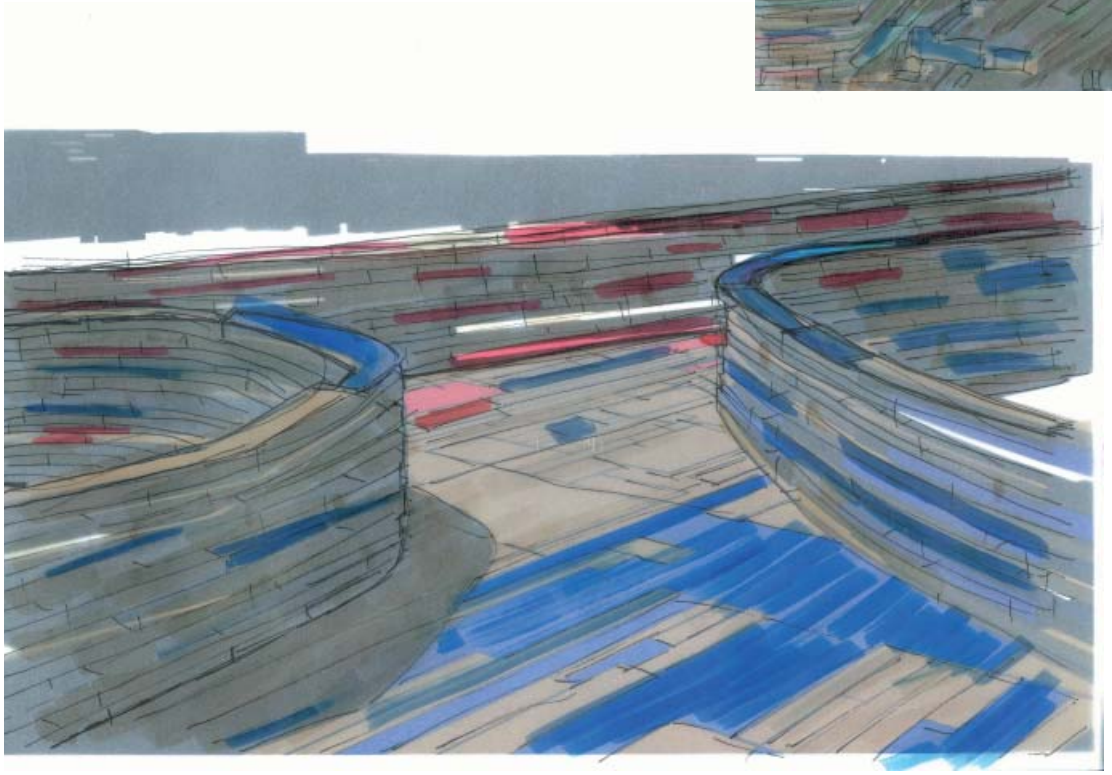


**il. 2.12** - sketch section

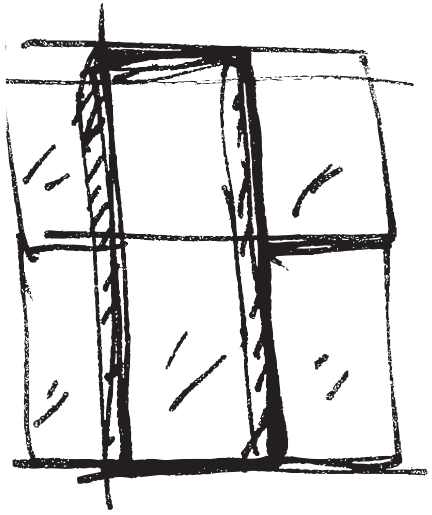
# internal bridges

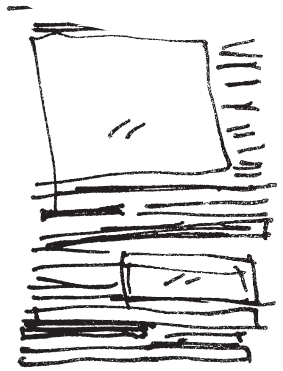


**il. 2.13** - contrasting bridge; tectonic expression



# glazing

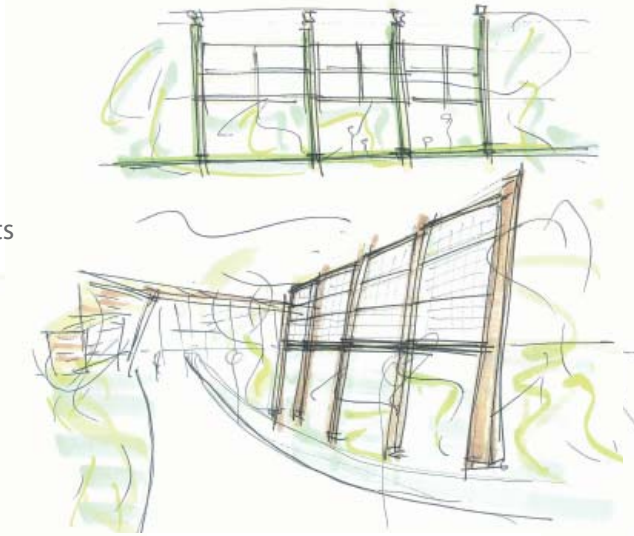


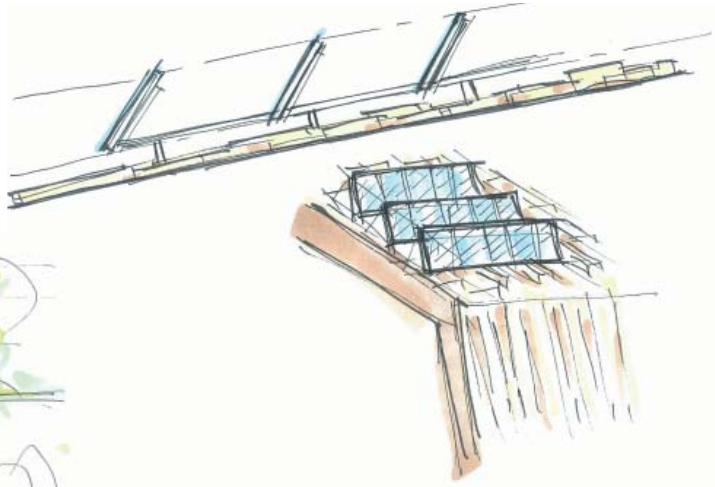


**il. 2.14** - glazing composition

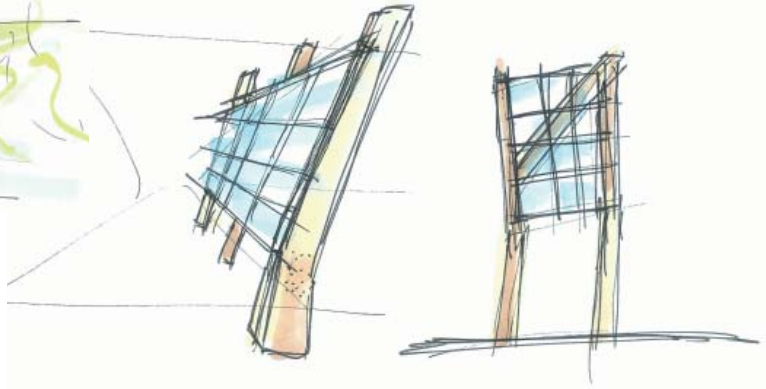
# iterative phase 4

## detail/ landscape





**il. 2.15** - solar panels,
- external components



**il. 2.16** - landscape boundary
- semi fencing


**il. 2.17** - paths, grass area; nts

iterative phase 1/ urban

# synth

iterative phase 2/ detail

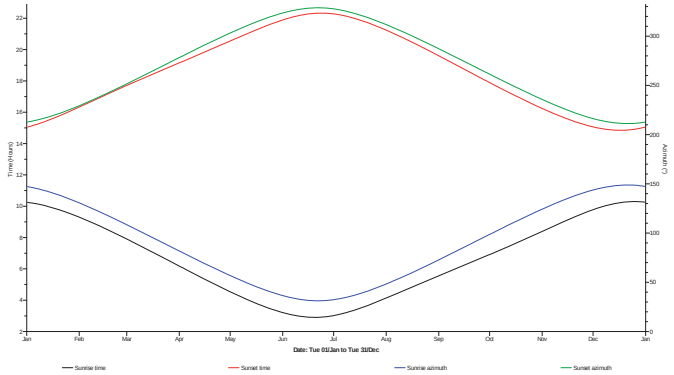
esis

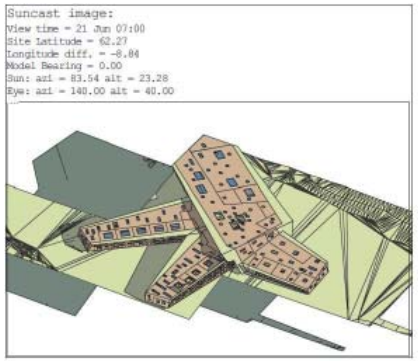
**il. 3.00** - annualsolar radiance composition

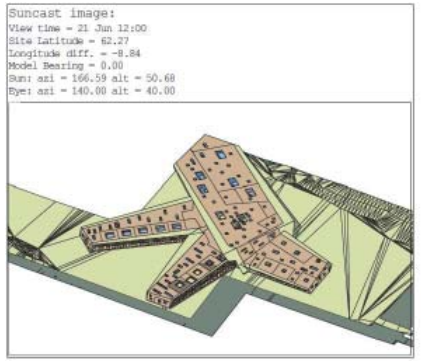
# urban

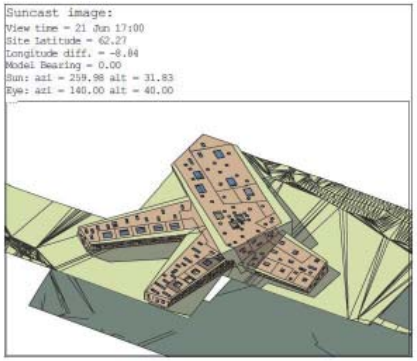
## solar radiance; ies flucsdl

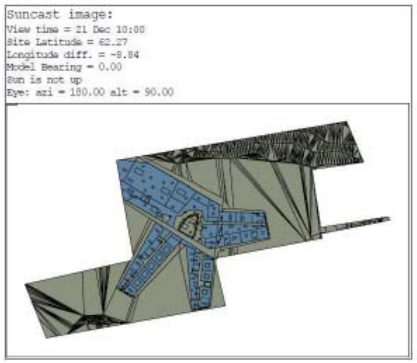
The solar radiance for Aalesund allows dramatic seasonal changes, whereby the sun is very low in winter attaining less daylight and very high in summer. This will affect glare and solar shading within the building particularly in winter solar gain.

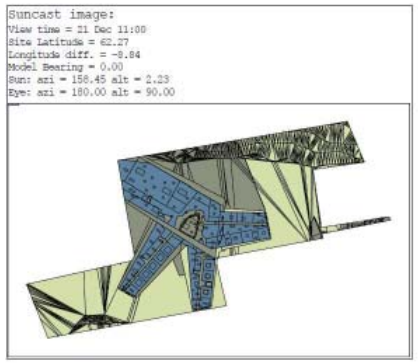


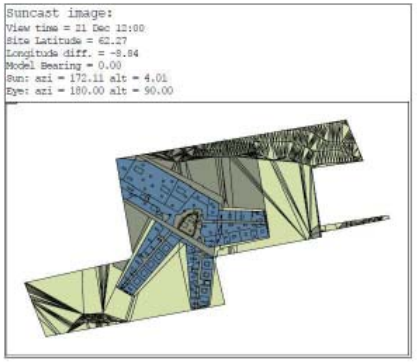



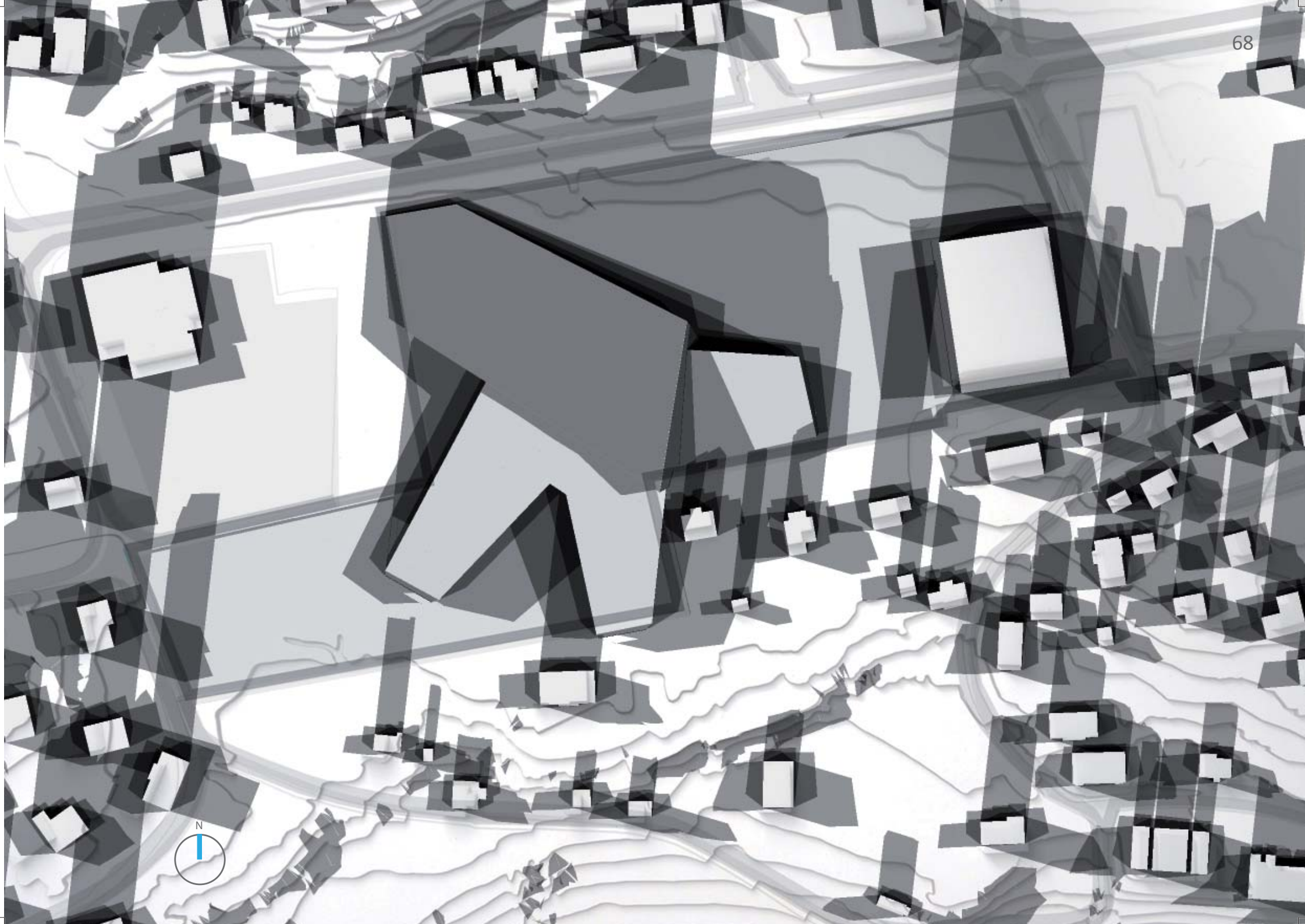



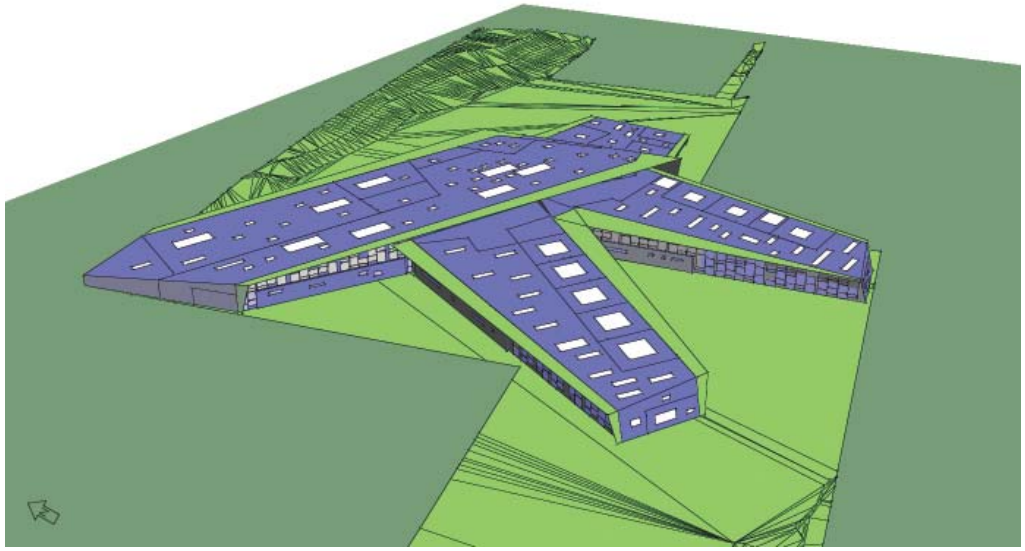




**il. 3.00** - ies flucsdl summer / winter radiance


N

# internal daylight factor

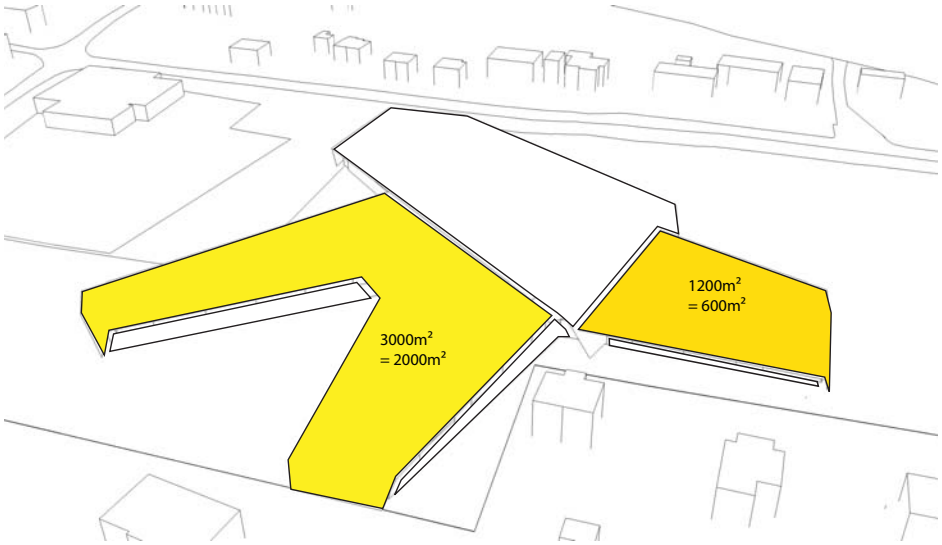
As an initial measure, the internal daylight factor has been studied, using ies virtual environment to understand at a distance what needs to be the focus for the project.



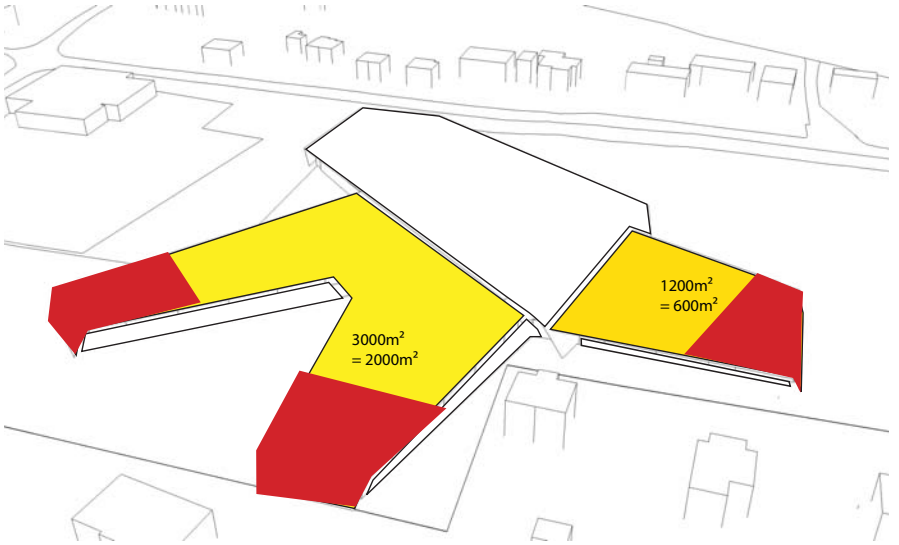
**il. 3.01 -** ies model


**il. 3.02** - building; daylight factor

# energy demand; electrical power




**il. 3.03** - available roof/ photovoltaic panel area




**il. 3.04** - suitable roof / photovoltaic panel area

**Floor Area/** 9,048m2
**Wall Area/** 14,894m2
**Glazed Area/** Roof 962m2
Wall 3102m2
Total 3960m2

## Primary Energy/

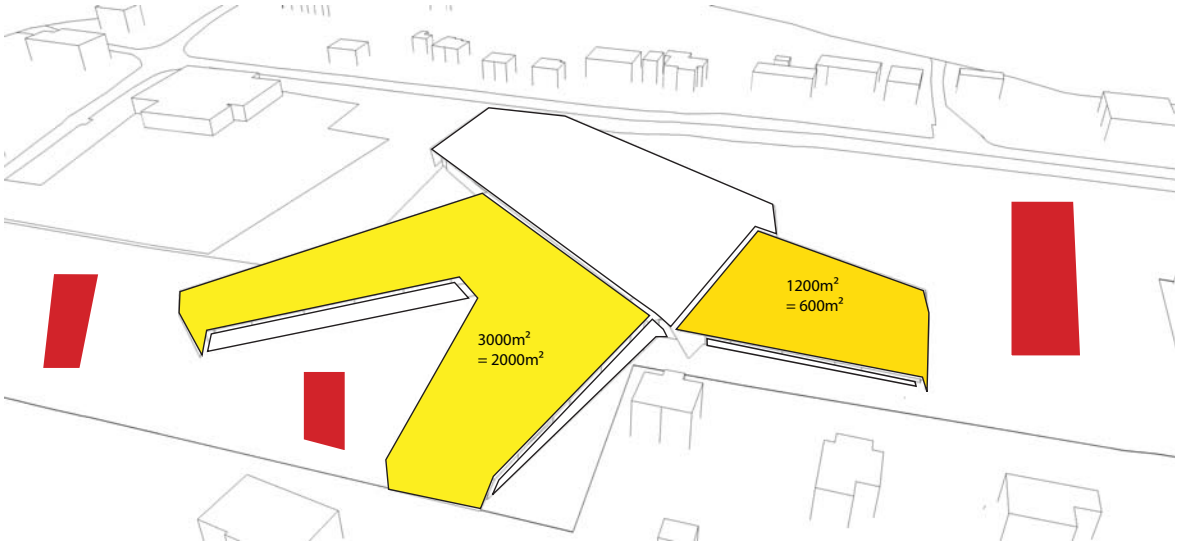
Solar Photovoltaic Panels

120kWh/$m^2$ / 2.7 = 44.4$m^2$ primary energy
44.4 x 9060 = 402,464
**Building Electircal Demand = 402,662kWh**

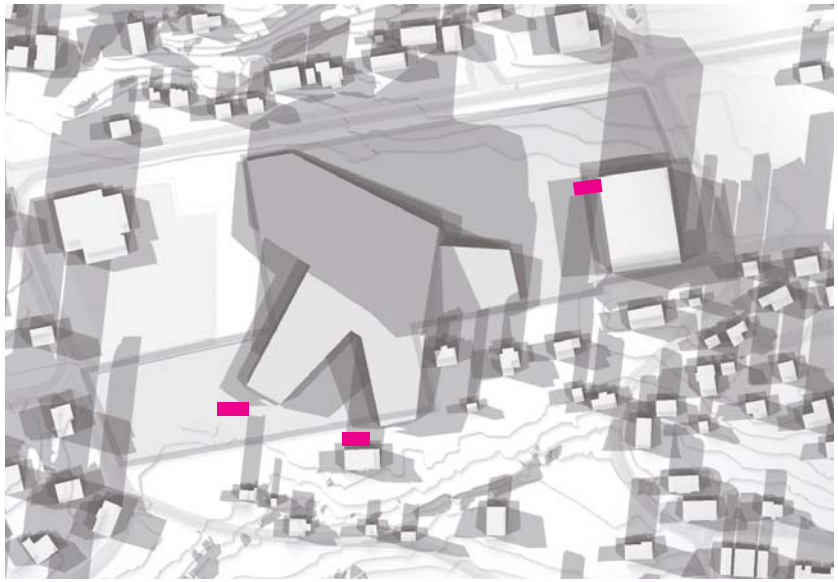
Required Photovoltaic Panel [m2]/
402,662kWh / 193 [18% Efficiency PV Panel] = 2086
Building Roof accommodates ($m^{2)}$
3000 > 2000
1300 > 500

Demand - Electrical Power + Heating - Using close proximity oil generating 70% of Norway's gross domestic product.
Local regional application, however as a environmentally responsible building the idea of retaining ideas of utilizing fossil fuels is not consistent, nor compatible with the benfits of reneable systems of for example, solar photovoltaic panels and wind turbines as a response to the need of reducing carbon dioxide emissions.

environmentally responsible building the idea of retaining ideas of utilizing fossil fuels is not consistent, nor compatible with the benfits of reneable systems of for example, solar photovoltaic panels and wind turbines as a response to the need of reducing carbon dioxide emissions.




**il. 3.05** - external photovoltaic panel components



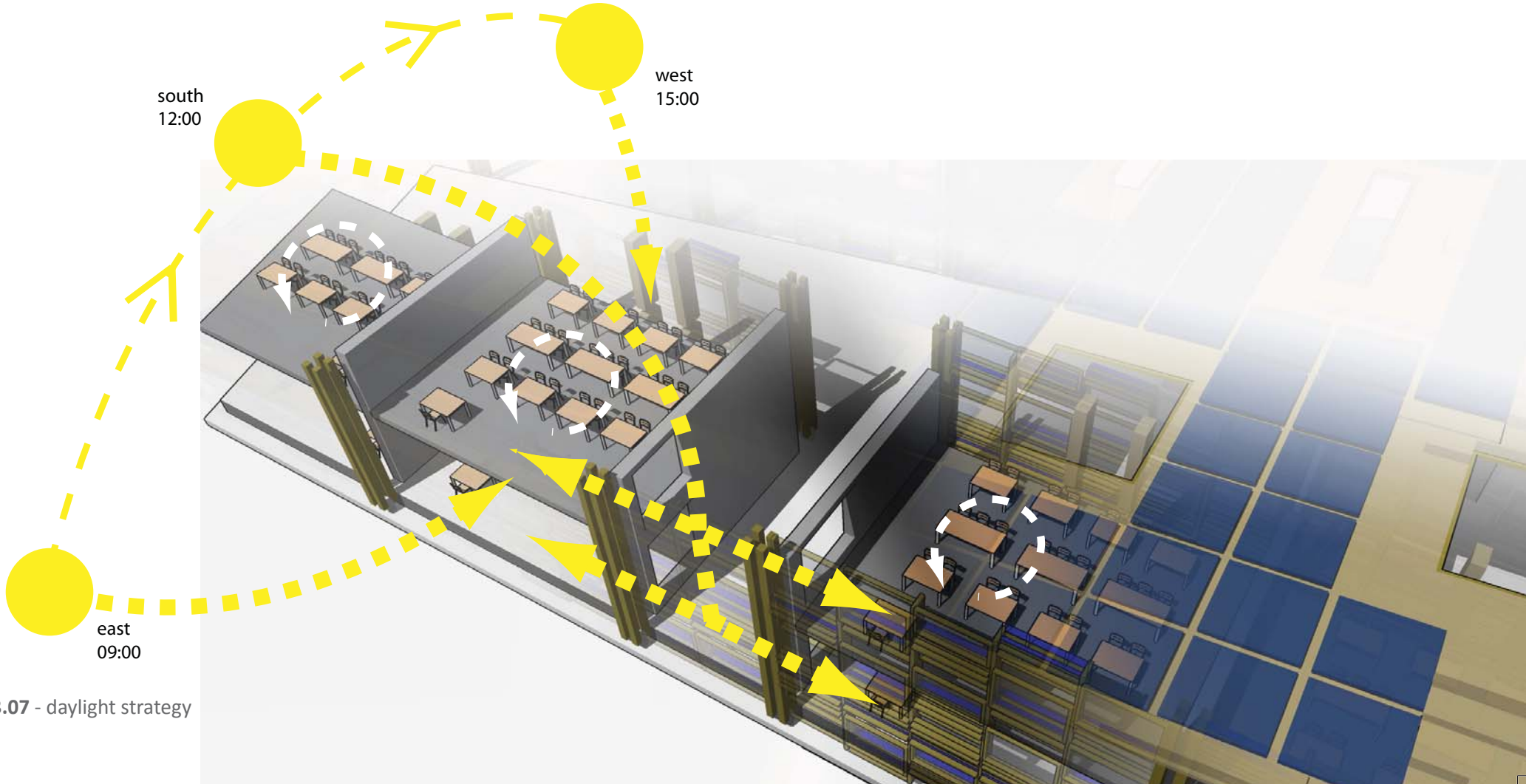
**il. 3.06** - shadow area

# detail

# daylight

The department years 5-7 as a priority must achieve an excellent quality of dayluight for the students and encourage an excellent learning environment as a prominent aspect, which works alongside the indoor temperature, air quality and acoustic qualites. The target is to achieve a uniformly distributed 2-4% daylight factor allowing flexible space, whereby schools invariably change their layout over time, responding to the ever changing needs of people and so providing well lit spaces will encourage more flexible space using the idea that the permanent building is not permanent and instead permancence is achieved in a buildings' ability to undergo change effectively.

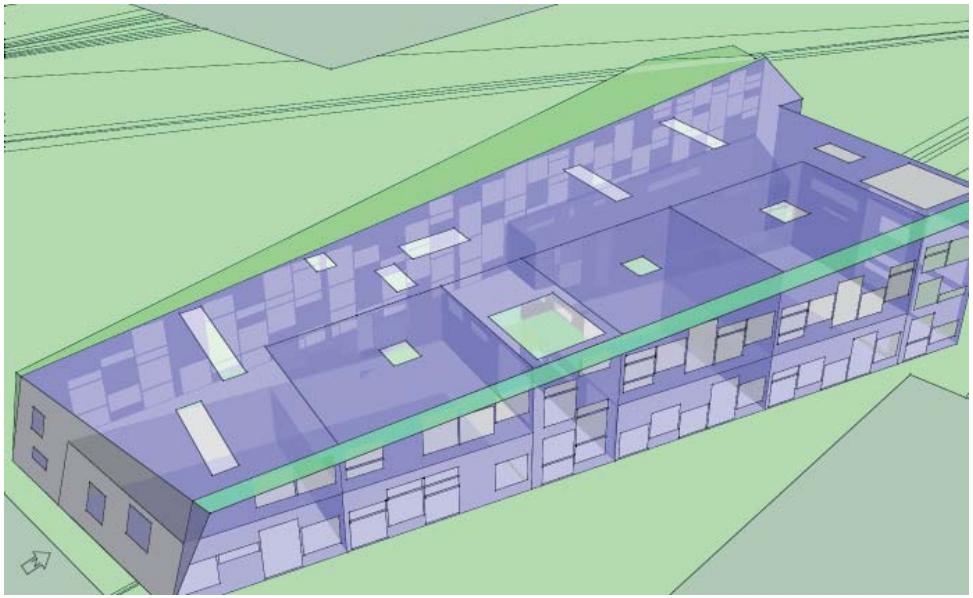
The daylight strategy illustrated in the diagram adjacent, is to manifest morning daylight and stimulate users at an east orientation. However separating the classrooms allows the a buffer whereby south facing daylight can penetrate and intrude into the classrooms. The western afternoon light also is aimed to be incorporated effectively by providing a clear sense of transparancy amongst the walls, providing light to intrude and reflect into the classrooms. It is also anticipated that the winter glare from low angle daylight may produce glare, as visual nouise. As a simple counter measure the classroom layout can be rotated quickly so that in this scenario the glare will not act to distract users, instead providing a good quality of daylight throughout the school day.



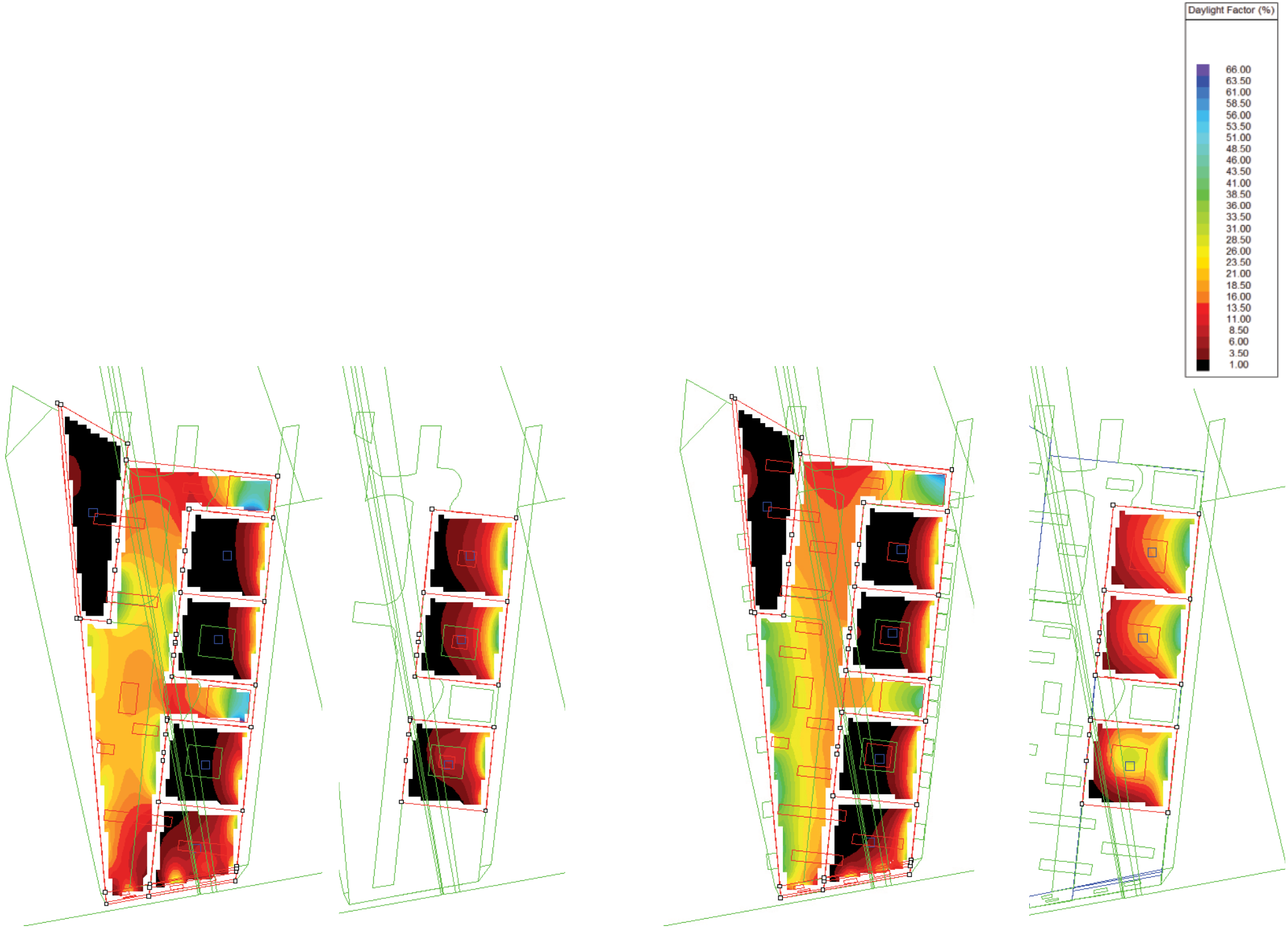

**il. 3.07** - daylight strategy

# daylight/
# internaldaylightfactor;iesflucsdl

As a priority of technical study, the quality of daylight is paramount in achieving a snese of an excellent learning environment. The use of ies virtual environment flucsdl allows us to understand the affect of the summer and winter sostice. In this example we can see that the low angle sun is intruding deep within the first floor classrooms. This can be refined for further study in the Velux daylught visualiser a the ext iterative phase to better understand the builfing'd daylighting performance.



**il. 3.08** - department; years 5-7 ies format

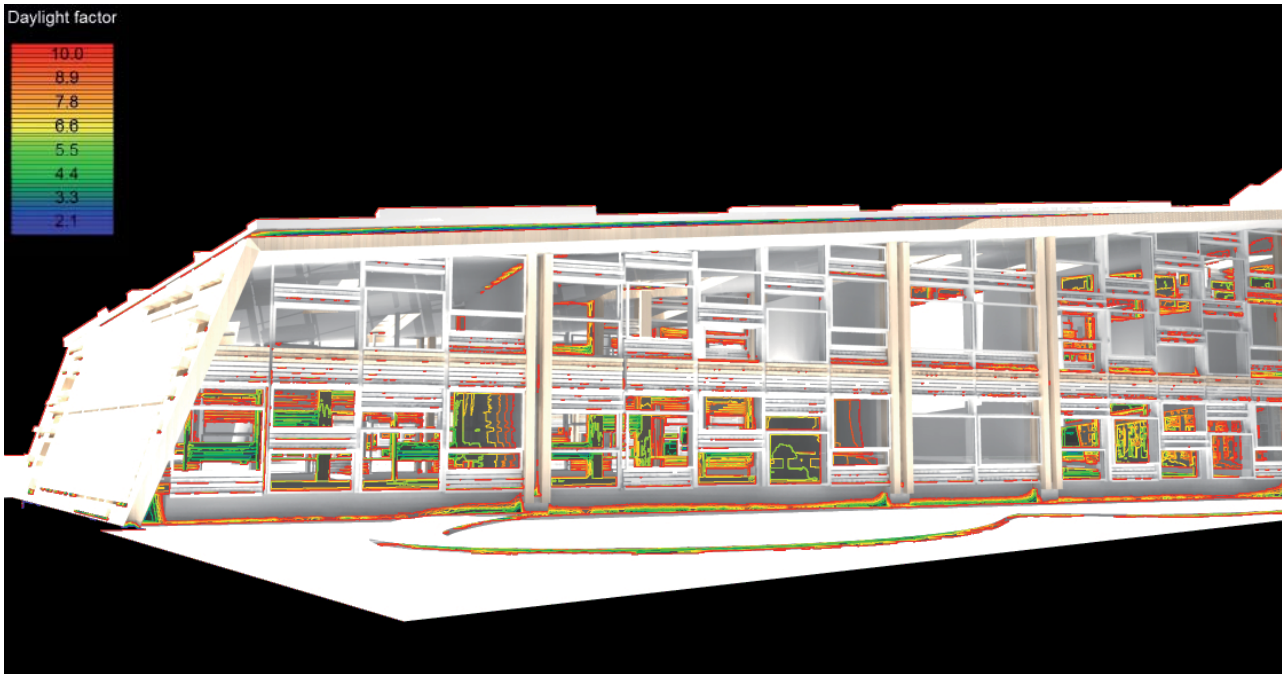



**il. 3.09** - ground / first floor average daylight factor
summer solstice; 21st june

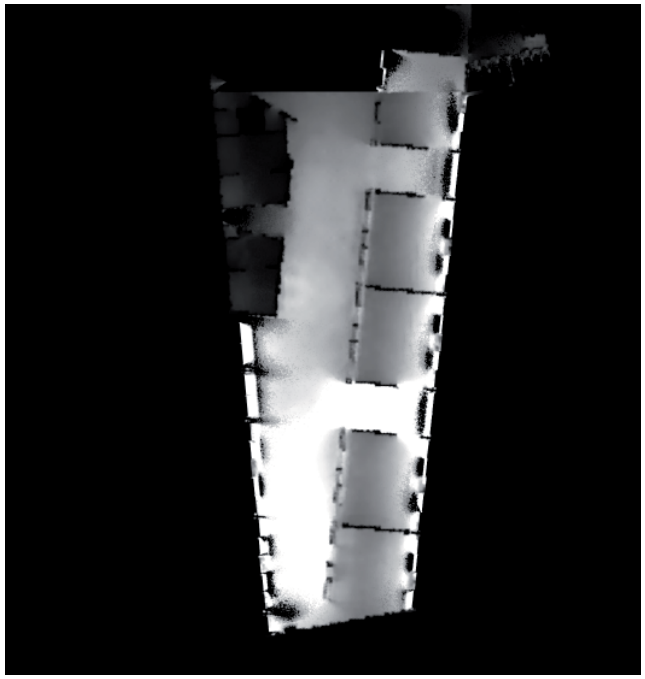
**il. 3.10** - ground / first floor average daylight factor
winter solstice; 21st december

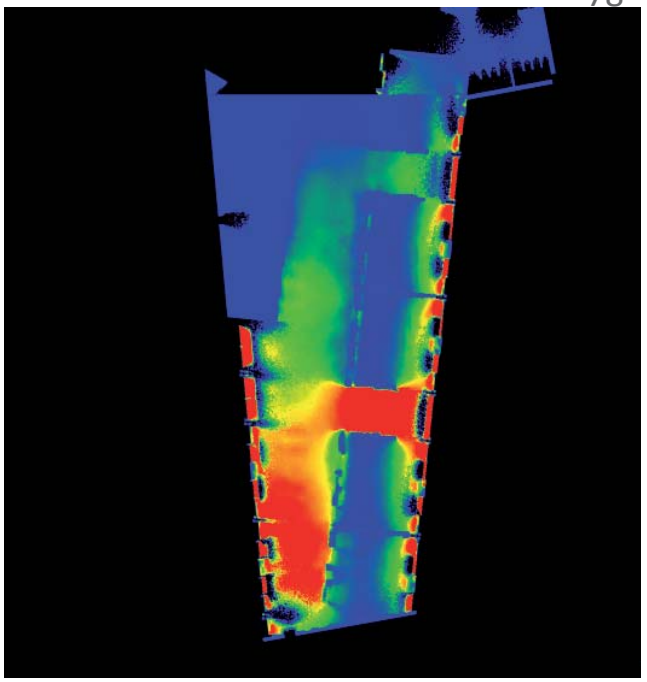
# internal radiance; velux daylight visualiser

compare results with IES. The ability to utilise velux daylight visualiser as a comparative tool for internal radiance, allows the design to be verified, providing clear and accurate results.

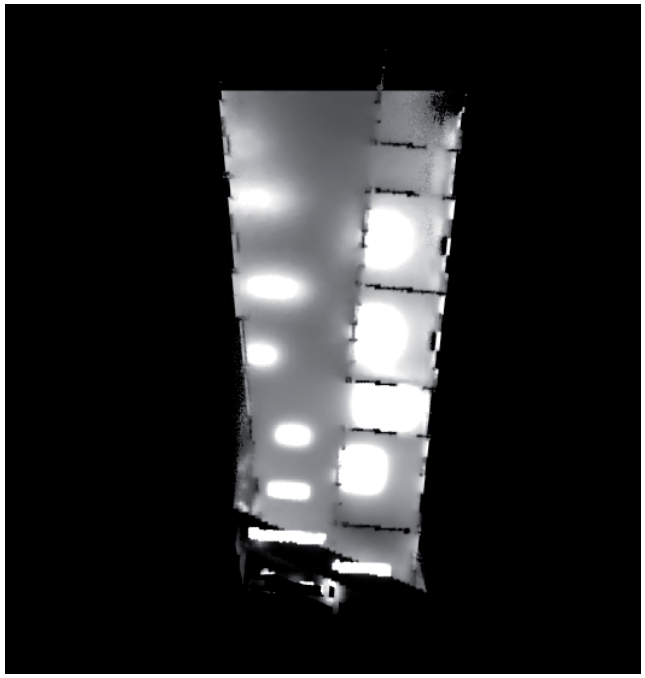
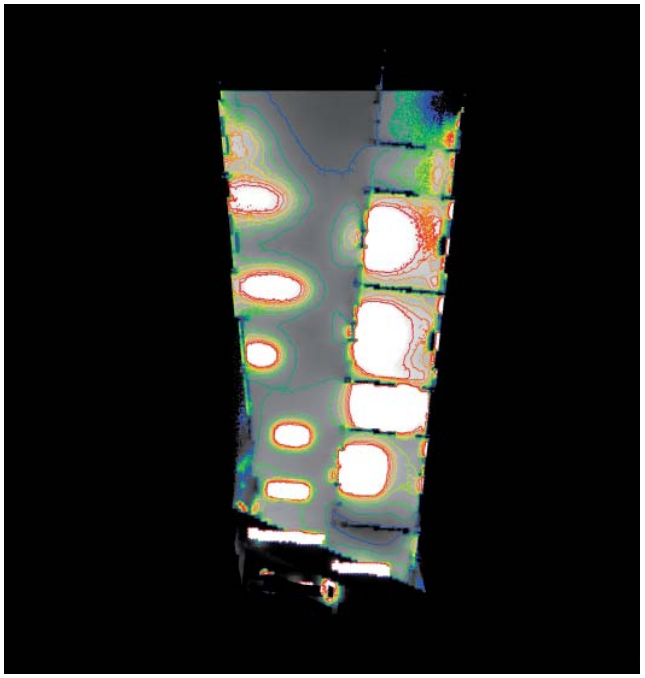
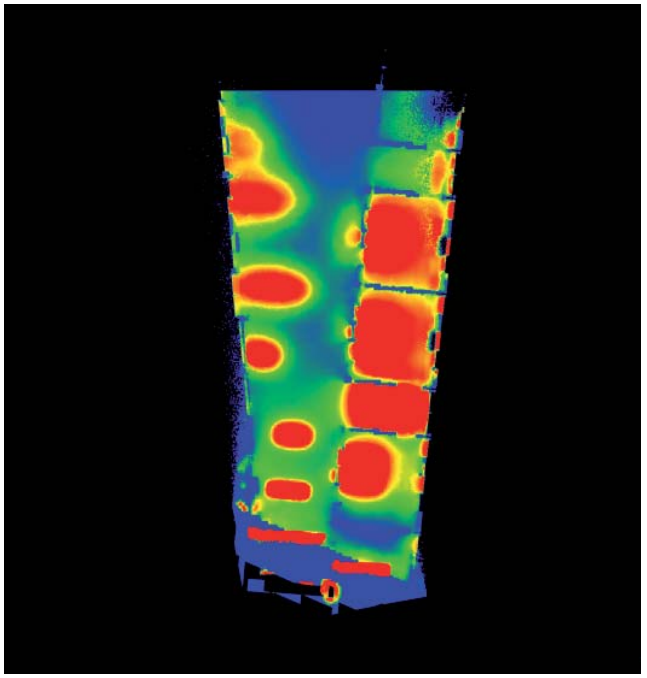



**il. 3.11** - department; years 5-7





**il. 3.12** - ground floor annual daylight factor

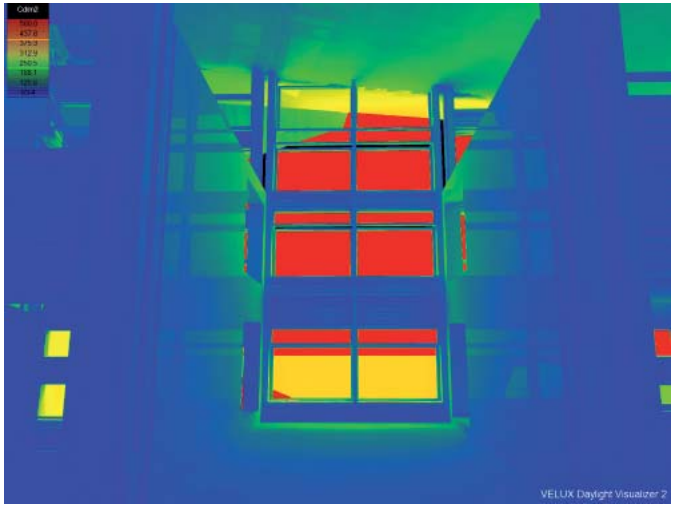




**il. 3.13** - first floor annual daylight factor

# atrium; solar characteristics

The space between the east oriented classrooms, gaining solar focus in the morning, allowing students to become consistently stimulated with seritonem at the beginning of their day, improving learning performance to all of the 560 students. The buffer between classrooms allows south and west facing daylight to be utilised and brought into the school, allowing uniformly distributed light throughout the classroom and not for students within close proximity to the windows. Furthermore this space between classroom dampens airborne noise, ensuring greater levels of acoustic qualities and allowing the students to concentrate within the classrooms. The scoail idea for this department is that the classrooms and flexible yet controlled allowing teaching to occur without much of the interaction associated with open class learning. Whereas the atrium allows student from classrooms to join and exchange learning, thereby providing different attributes socially within the school and the use of this space buffer between classrooms supports both social and environmental aspects.



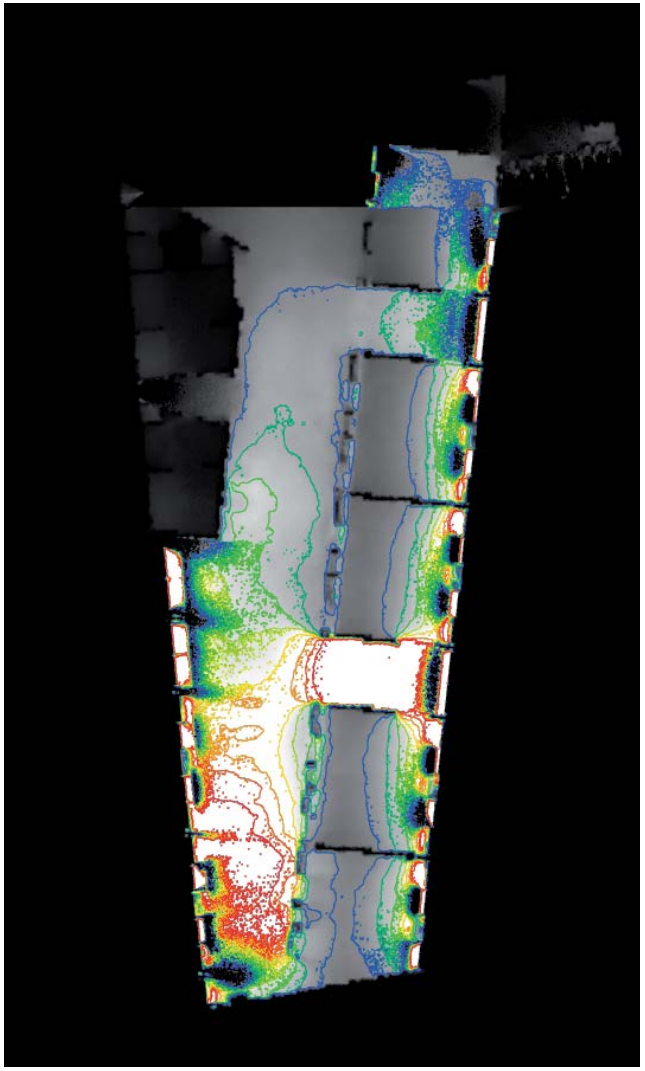



**il. 3.14** - separating space; atrium / classroom


**il. 3.15** - atrium; department years 5-7

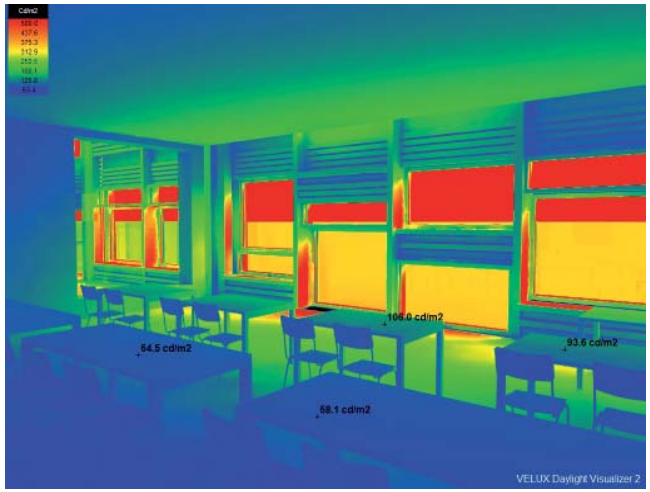
# classrooms; ground floor

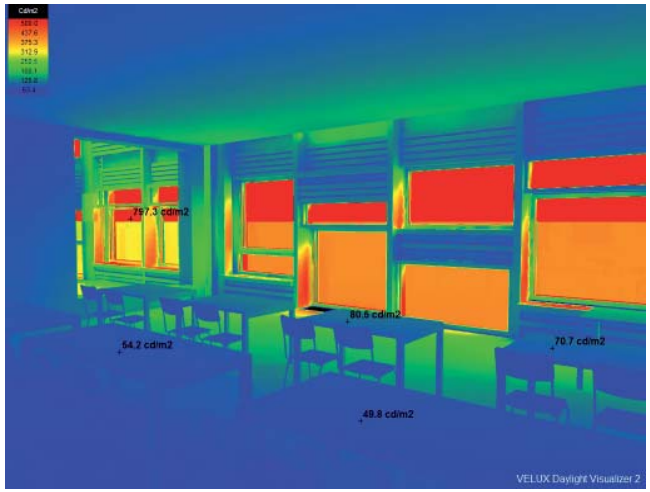
Within the ground floor the use of the separating of classrooms appears to boost solar intrusion thoughout the day. It was expect that the ground floor in particular would require additional measures to ensure a good quality of uniformly distributed daylight. This is because the first floor classrooms gain the advantage of utilising roof lights as a significant tool to aiding daylighting design.

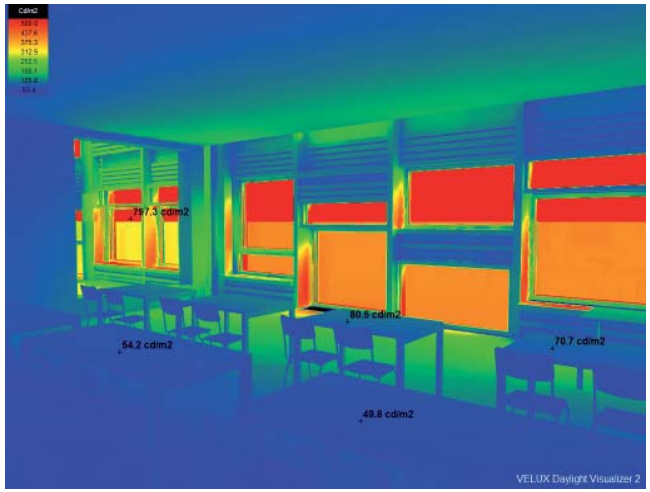


**il. 3.16** - ground floor annual daylight factor



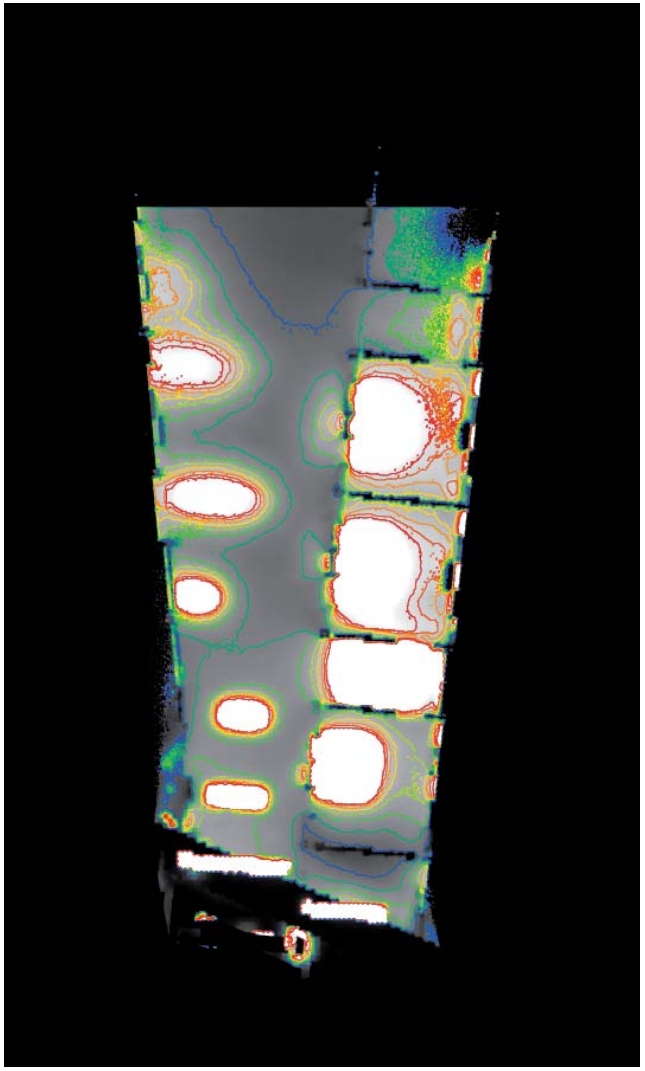

**il. 3.17** - classroom internal luminance; 09:00

**il. 3.18** - classroom internal luminance; 12:00

**il. 3.19** - classroom internal luminance; 15:00

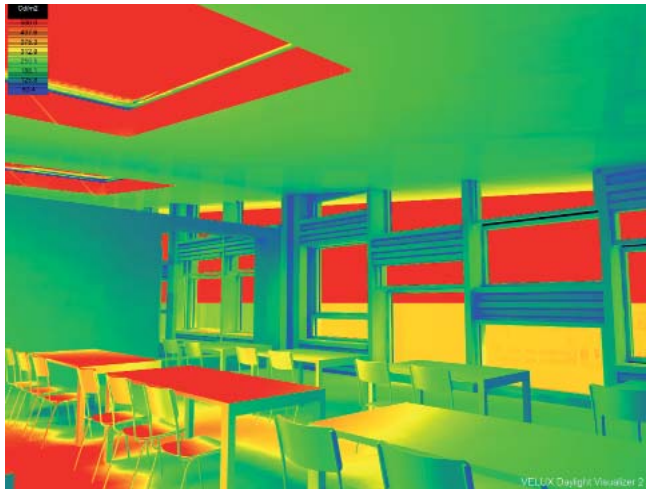
# classrooms; first floor

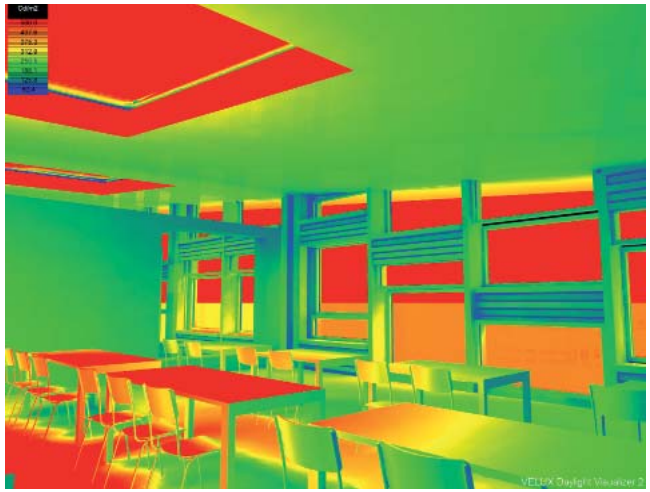
The first floor gains a greater daylight factor within the school, however the there luminance are acceptable and does not present a great amount of glare to be considered a significant distraction to learning for users. The facade facing east attains a small extent of solar shading, however this balance as a composition works effectively with roof lights.

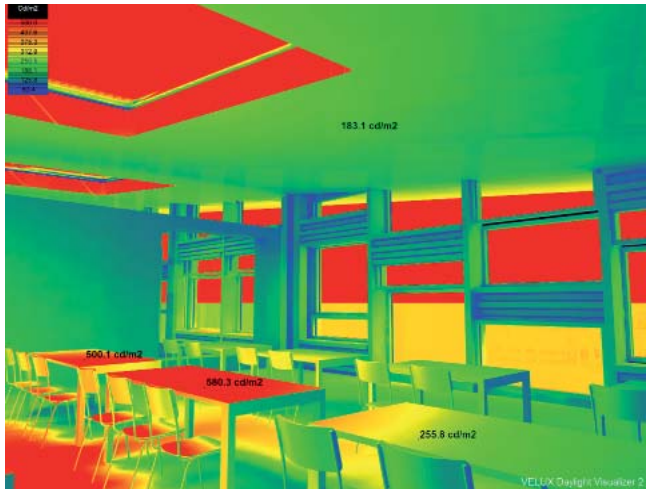


**il. 3.20** - first floor annual daylight factor










**il. 3.21** - classroom internal luminance; 09:00

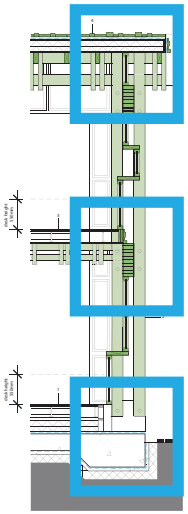
**il. 3.22** - classroom internal luminance; 12:00

**il. 3.23** - classroom internal luminance; 15:00

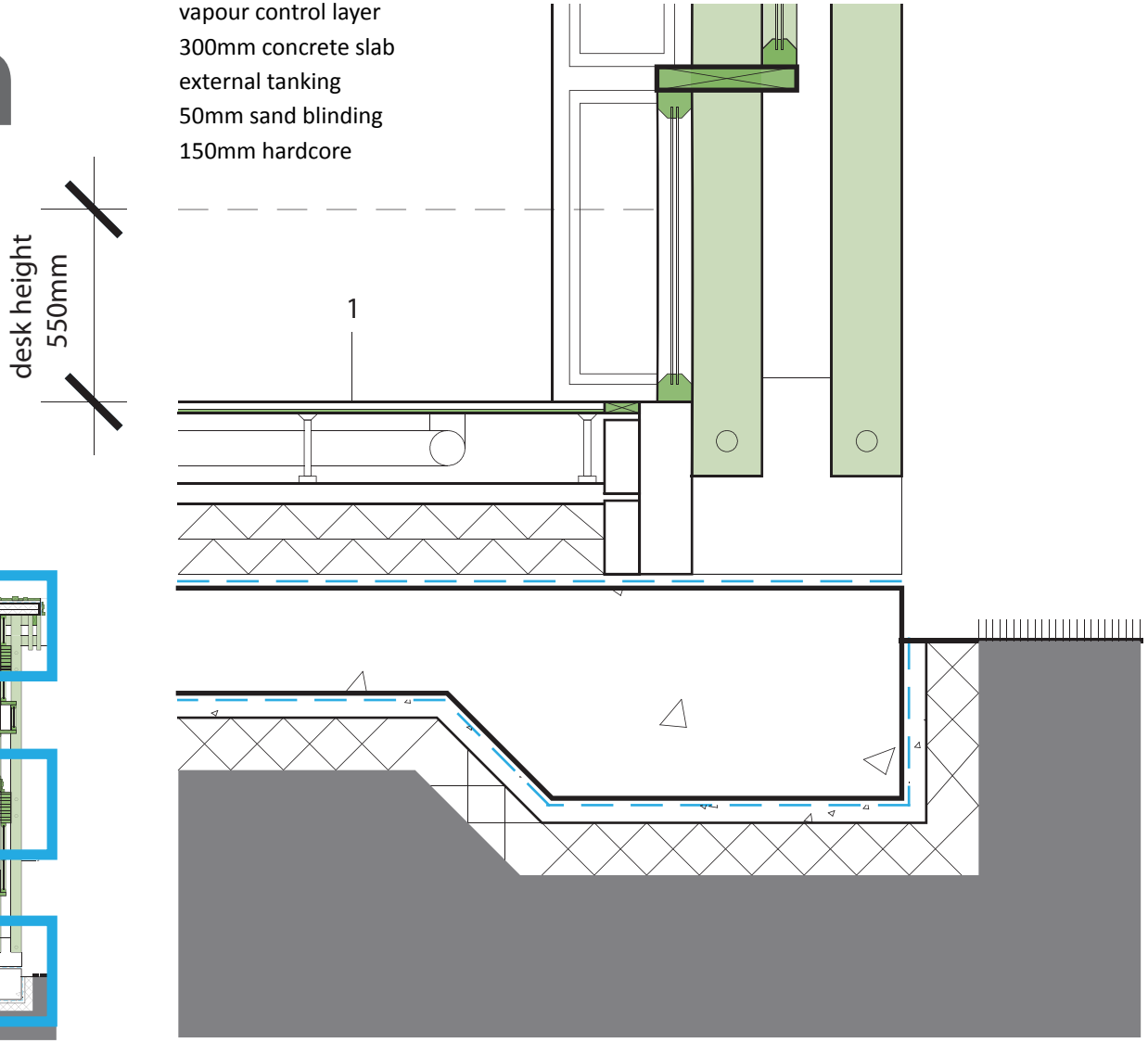
# construction

## floor, wall, roof junction

The construction for the Norvasund school, outlined in the concept iterative stages is a composite of a glulam timber superstructure with a concrete substructure, firmly rooting the building and planting it within its place. Upon detailing the priority has been to reduce thermal bridges, reducing heat loss and ensuring airtightness, following the Passive House standard of 0.6h-1 airtightness. This is particularly due to the project sited in a sub-arctic climate, whereby the priority is to create and maintain an envelope which insulates from the cold weather conditions and thereby conserving energy as an environmental imperative.

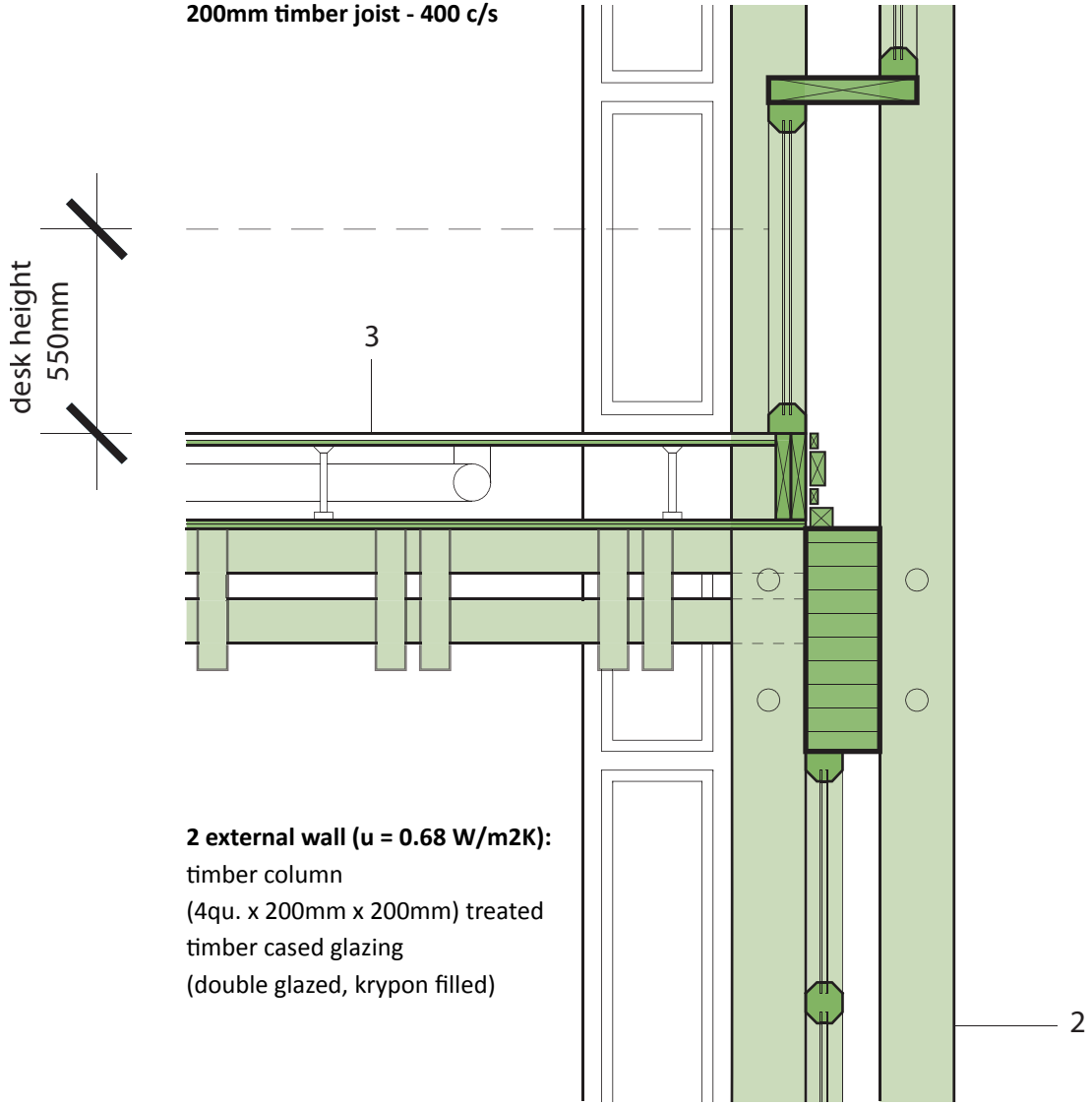


**1 ground floor (u = 0.14 W/m2K):**
18mm rubber flooring
12mm timber osb
200mm raised access floor;
w. ventilation inlet
200mm insulation
vapour control layer
300mm concrete slab
external tanking
50mm sand blinding
150mm hardcore




il. 3.24 **ground floor detail**

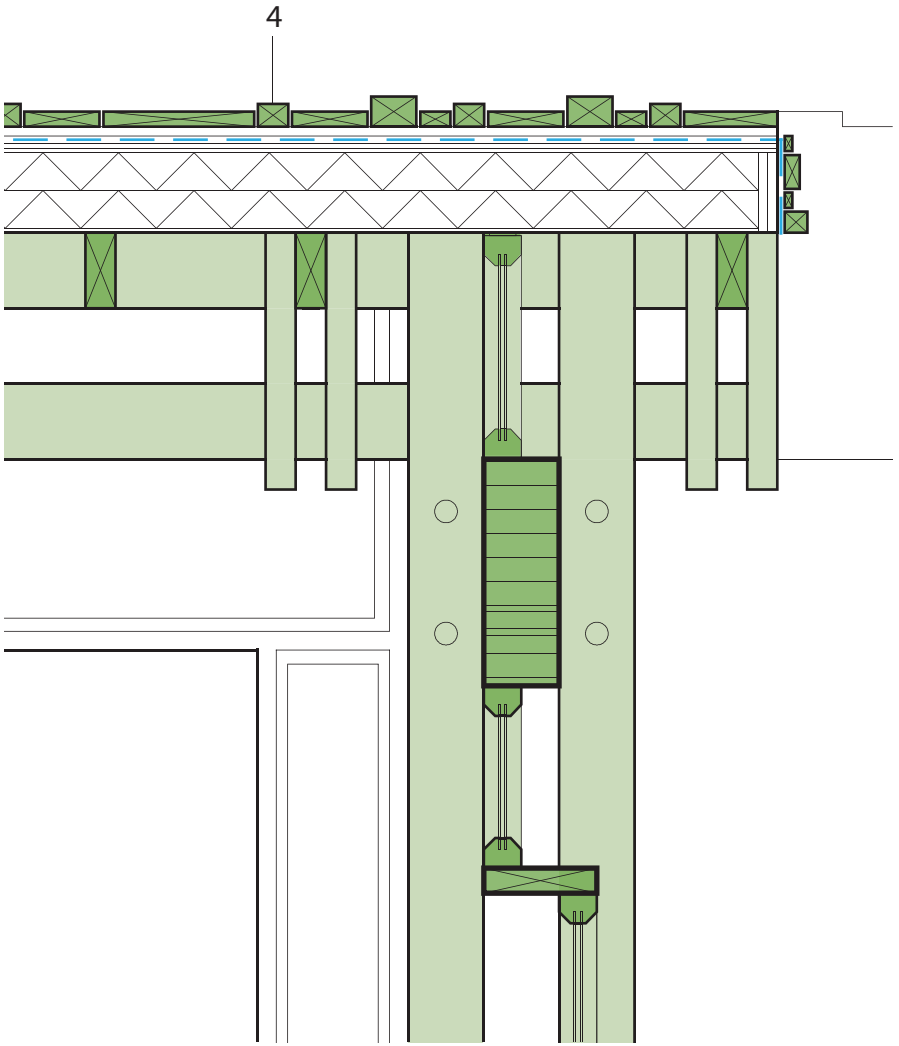
**3 intermediate floor:**
18mm rubber flooring
12mm timber osb
200mm raised access floor;
w. ventilation inlet
12mm x2 timber osb
**200mm timber joist - 400 c/s**




**2 external wall (u = 0.68 W/m2K):**
timber column
(4qu. x 200mm x 200mm) treated
timber cased glazing
(double glazed, krypon filled)

il. 3.25 **separating floor detail**

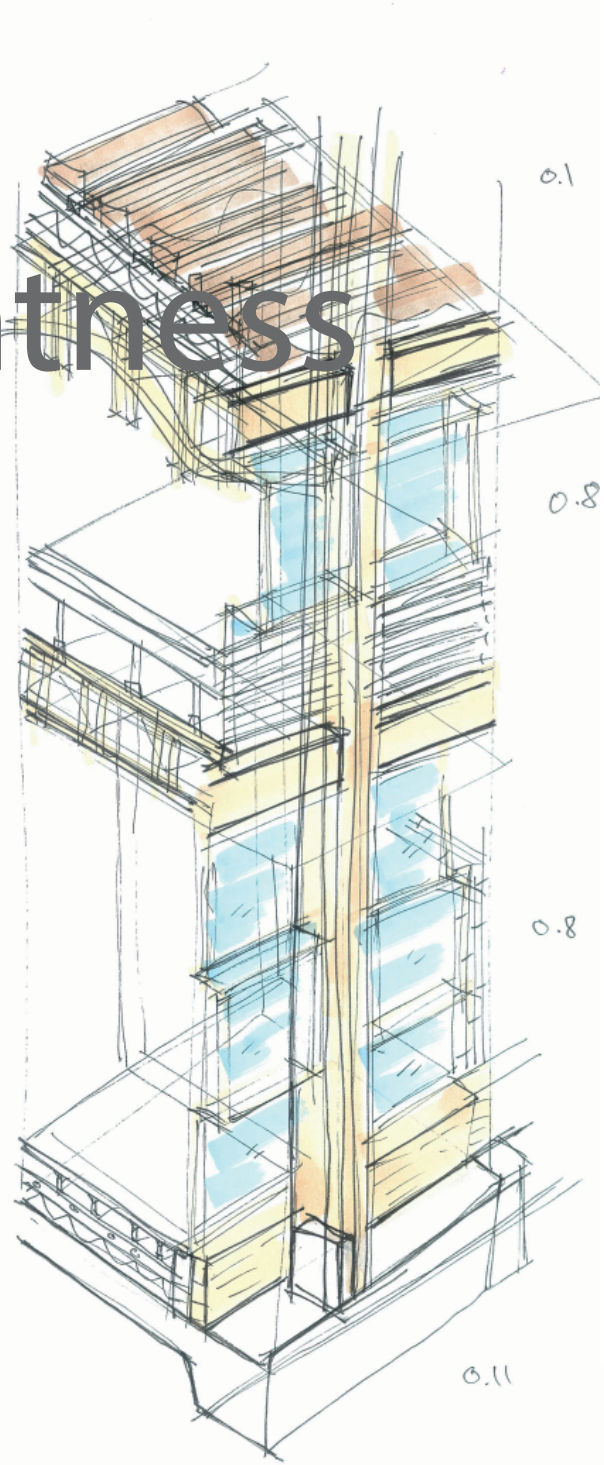
**4 roof (u = 0.14 W/m2K):**
timber cladding - varied
25mm x 50mm treated timber batten
roofing membrane
12mm x2 timber osb
200mm insulation
12mm timber osb
glulam rafter - 4990mm c/s




il. 3.26 **roof detail**

# airtightness

## u-values





Construction type **External wall**

| | Material | Thickness [m] | Lambda [$^{W}/_{mK}$] | R [$^{m^2K}/_{W}$] |
|---|---|---|---|---|
| $R_{se}$ | | | | 0,040 |
| 1 | Soda lime (incl. "float glass") | 0,005 | 1,000 | 0,005 |
| 2 | Argon | 0,012 | 0,017 | 0,706 |
| 3 | Soda lime (incl. "float glass") | 0,005 | 1,000 | 0,005 |
| $R_{si}$ | | | | 0,130 |
| | | **0,022** | | **0,886** |

**R** = $\sum R_i$ = **0,716** $^{m^2K}/_{W}$ **$R_T$** = $R_{si}$ + R + $R_{se}$ = **0,886** $^{m^2K}/_{W}$ **U** = $^{1}/_{R_T}$ = **1,129** $^{W}/_{m^2K}$

Construction type **External wall**

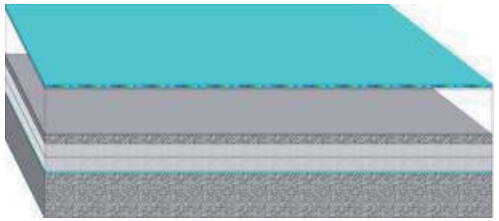
| | Material | Thickness [m] | Lambda [$^{W}/_{mK}$] | R [$^{m^2K}/_{W}$] |
|---|---|---|---|---|
| $R_{se}$ | | | | 0,040 |
| 1 | Soda lime (incl. "float glass") | 0,005 | 1,000 | 0,005 |
| 2 | Krypton | 0,012 | 0,009 | 1,333 |
| 3 | Soda lime (incl. "float glass") | 0,005 | 1,000 | 0,005 |
| $R_{si}$ | | | | 0,130 |
| | | **0,022** | | **1,513** |

**R** = $\sum R_i$ = **1,343** $^{m^2K}/_{W}$ **$R_T$** = $R_{si}$ + R + $R_{se}$ = **1,513** $^{m^2K}/_{W}$ **U** = $^{1}/_{R_T}$ = **0,661** $^{W}/_{m^2K}$

(build desk u-value, 2011)

**il. 3.27** - detail compostion

*INSIDE*



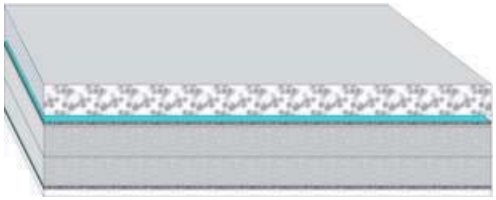
*GROUND*

## Construction type **Ground floor**

| | Material | Thickness [m] | Lambda [$^{W}/_{mK}$] | R [$^{m^2K}/_{W}$] |
|---|---|---|---|---|
| $R_{se}$ | | | | 0,000 |
| 1 | Natural rubber | 0,020 | 0,130 | 0,154 |
| 2 | Plywood [500 kg/m³] | 0,012 | 0,130 | 0,092 |
| 3 | Slightly vent. air layer: 300 mm, hor. heat flow | 0,300 | 3,333 | 0,090 |
| 4 | Concrete, Medium density 1800 | 0,060 | 1,150 | 0,052 |
| 5 | XPS polystyrene without skin, 0,025 W/(m K) | 0,100 | 0,025 | 4,000 |
| 6 | XPS polystyrene without skin, 0,025 W/(m K) | 0,100 | 0,025 | 4,000 |
| 7 | Breather membrane | 0,001 | 0,170 | 0,006 |
| 8 | Concrete, High density | 0,300 | 2,000 | 0,150 |
| 9 | Polyethylene 0.15 mm | 0,001 | 0,170 | 0,006 |
| $R_{si}$ | | | | 0,170 |
| | | **0,894** | | **8,720** |

**R** = $\sum R_i$ = **8,550** $^{m^2K}/_{W}$ **$R_T$** = $R_{si}$ + R + $R_{se}$ = **8,720** $^{m^2K}/_{W}$ **U** = $^{1}/_{R_T}$ = **0,115** $^{W}/_{m^2K}$

*OUTSIDE*



| Tempe |
|---|
| Ambient |
| Surface |

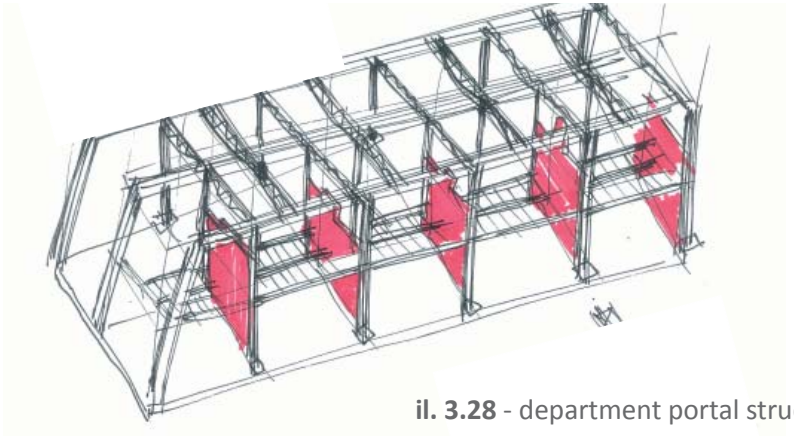
The calcu
on the l
character
Local temp

*INSIDE*

## Construction type **Pitched roof**

| | Material | Thickness [m] | Lambda [$^{W}/_{mK}$] | R [$^{m^2K}/_{W}$] |
|---|---|---|---|---|
| $R_{se}$ | | | | 0,040 |
| 1 | Tiles (roofing), clay | 0,100 | 1,000 | 0,100 |
| 2 | Unventilated air layer: 25 mm, horiz. heat flow | 0,025 | 0,139 | 0,180 |
| 3 | Breather membrane | 0,001 | 0,170 | 0,006 |
| 4 | Oriented strand board (OSB) | 0,012 | 0,130 | 0,092 |
| 5 | XPS polystyrene without skin, 0,025 W/(m K) | 0,100 | 0,025 | 4,000 |
| 6 | XPS polystyrene without skin, 0,025 W/(m K) | 0,100 | 0,025 | 4,000 |
| 7 | Oriented strand board (OSB) | 0,012 | 0,130 | 0,092 |
| 8 | Polyethylene 0.15 mm | 0,001 | 0,170 | 0,006 |
| 9 | Unventilated air layer: 25 mm, upwards heat flow | 0,025 | 0,156 | 0,160 |
| $R_{si}$ | | | | 0,100 |
| | | **0,376** | | **8,776** |

**R** = $\sum R_i$ = **8,636** $^{m^2K}/_{W}$ **$R_T$** = $R_{si}$ + R + $R_{se}$ = **8,776** $^{m^2K}/_{W}$ **U** = $^{1}/_{R_T}$ = **0,114** $^{W}/_{m^2K}$



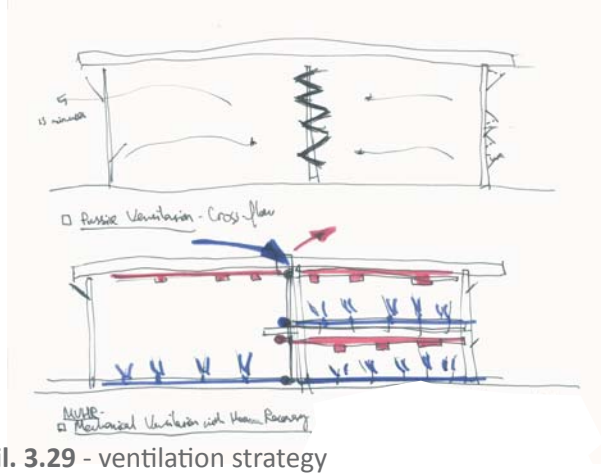
**il. 3.28** - department portal structure

# temperature

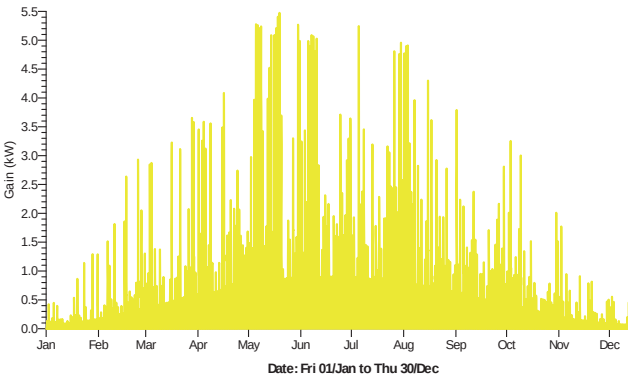
## solar gain + internal performance

Solar gain can be effective in heating as a passive solution, requiring attention towards orientation towards south. This can be done in cnnection with solar shading systems to provide the correct amount of solar gain for heating and reduce risk of overheating and glare. In particular this works effectively with winter heating, whereby the sun is much lower in the nordic context and then in summer the shading reduces solar gain and minimises overheating. Other sources of passive heat gain inlcude users; generating 100w and also equipement including computers and such like. The analysis produced from ies apache sim shows that the summer temperature through solar gain intrusion is more significant. This solar intensity also affects decision concerning solar photovolaic panels for generating primary energy for electrical power in the school and so the this lack of solar intensity should take a greater advantage of the summer solar orientation.

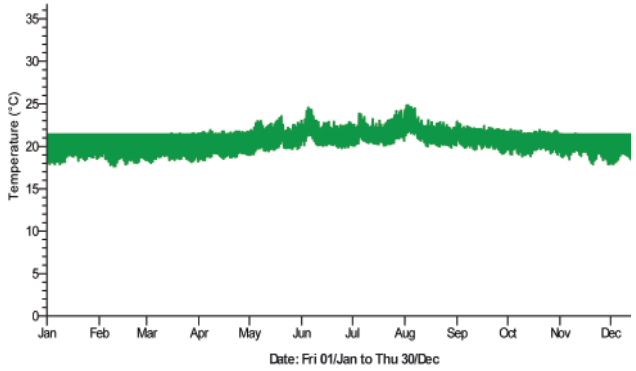
The internal temperature for the Norvasund school uses 22º as a constant throughout the working hours 08:30 - 18:00 on weekdays. The use of MVHR (mechanical ventilation with heat recovery) as an appropriate use providing 10 l/s/person is a more consistent solution than passive cross-flow ventilation, whereby reducing the risk of heat loss and ensuring an airtight building envelope.




**il. 3.29** - ventilation strategy




**il. 13.30** - solar gain




**il. 3.31** - air temperature

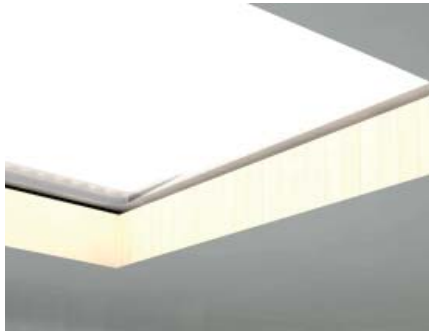
# acoustic

## classroom

The acoustic aspects to consider are to maintain a reverberation time of 0.8 seconds for speech, which is the time it takes for a sound to become inaudible after being stopped. The priority for the 24 school classrooms is to enable good levels of audible speech and airborne sound within the classroom. However also the design must dampen noise from entering externally from the classroom. Therefore to achieve a 0.8 second reverberation time we must provide a balance of absorptive and reflective materials withing the classroom. These can be seen by the selcted aspects, such as brick which is used in the walls absorbing sound and also utilised by timber cladding and timber furniture diffusing sound waves. Whereas reflective acoustic attributes are the reflective floor and ceiling

**il. 3.32** - absorptive; timber cladding

**il. 3.33** - absorptive; wall



**il. 3.34** - reflective; roof window

**il. 3.35** - reflective; floor


**il. 3.36** - classroom layout

plans

prese

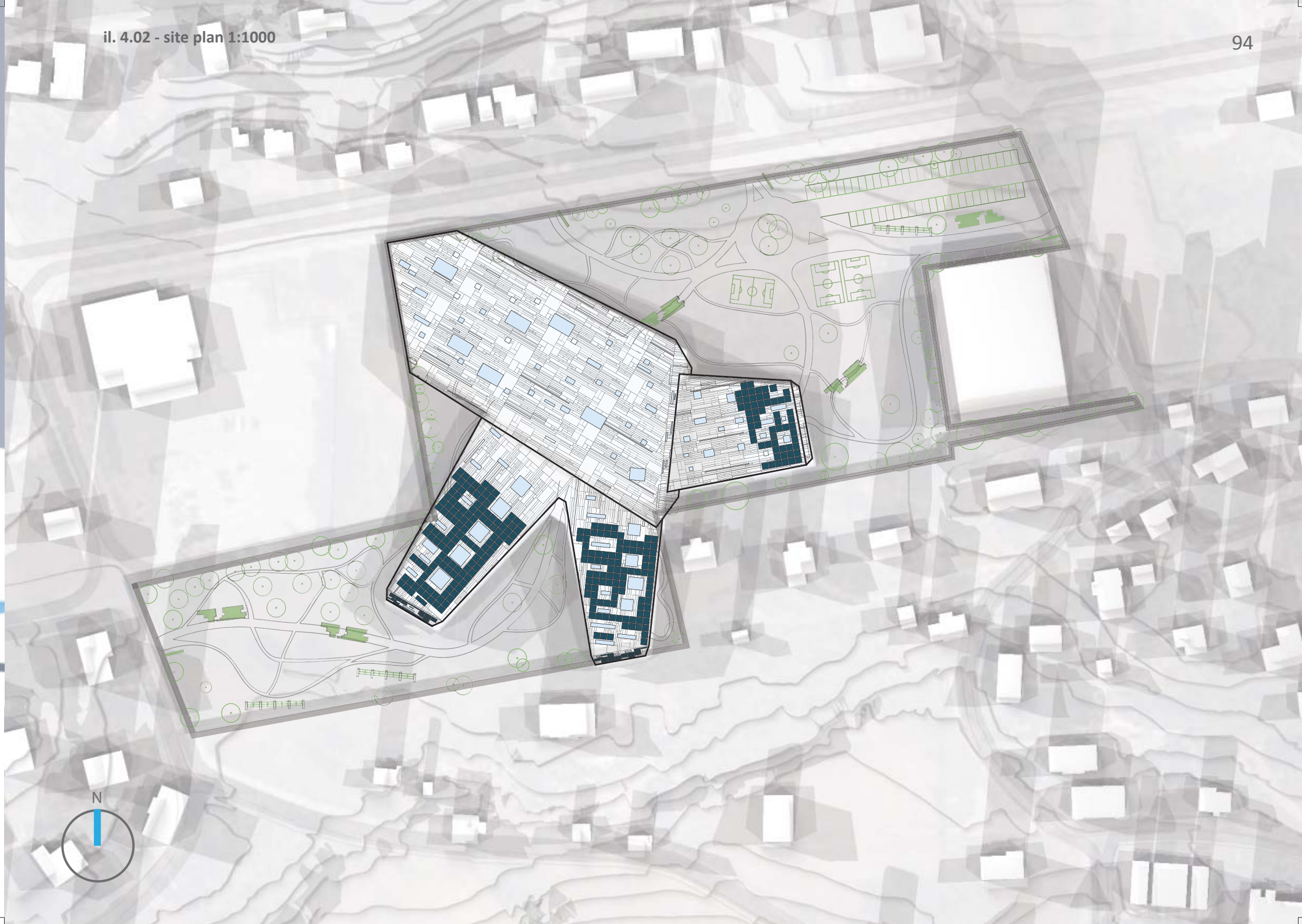
perspectives

reflection

ntation

**il. 4.01** - south elevation; 1:500

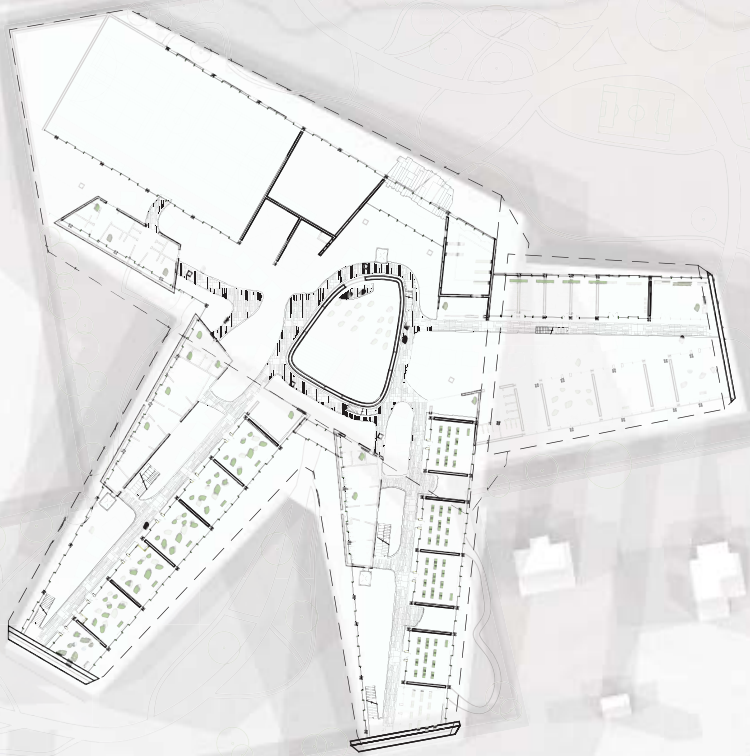
il. 4.02 - site plan 1:1000

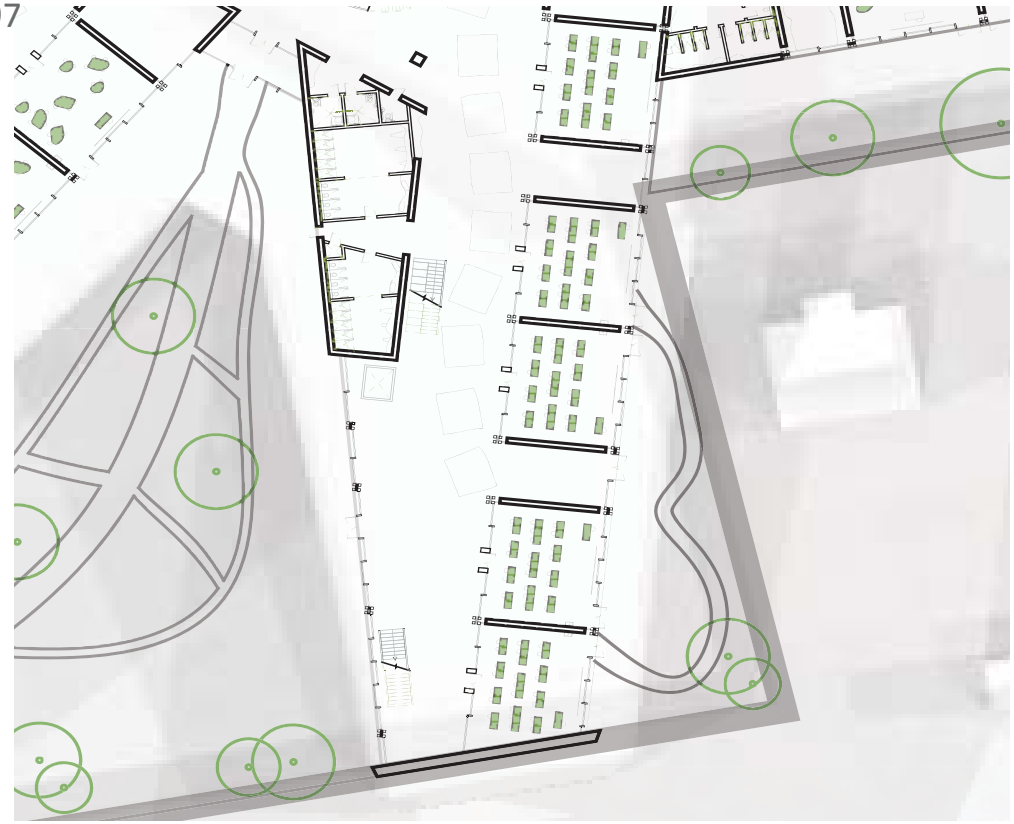


il. 4.03 ground floor plan; 1:1000

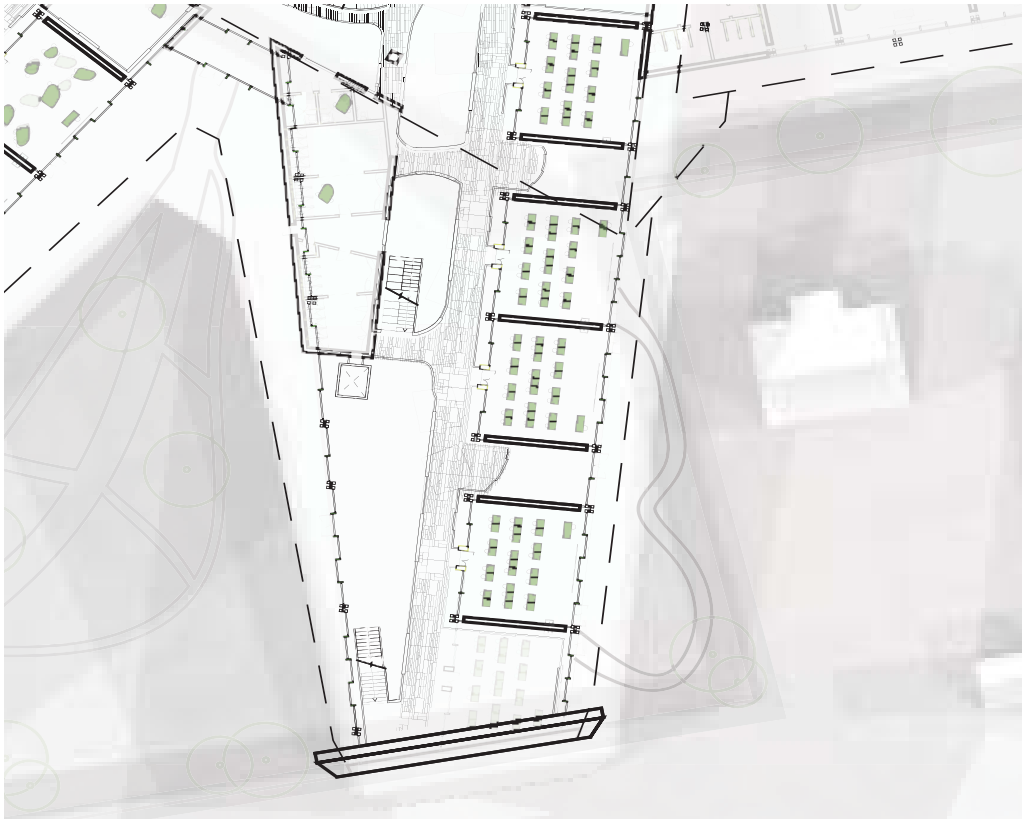
il. 4.04 first floor plan; 1:1000



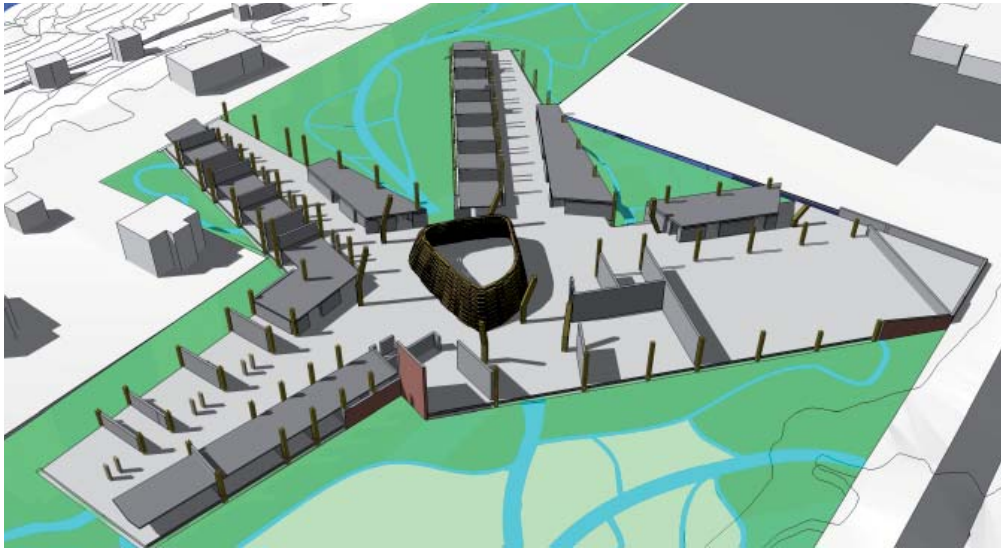




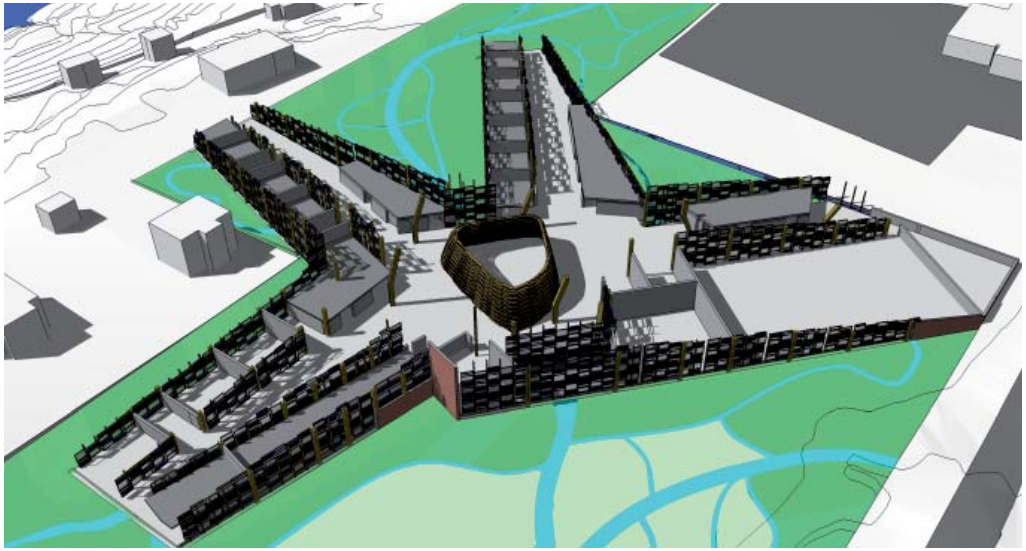
il. 4.05 dep. 5-7 ground floor plan; 1:500



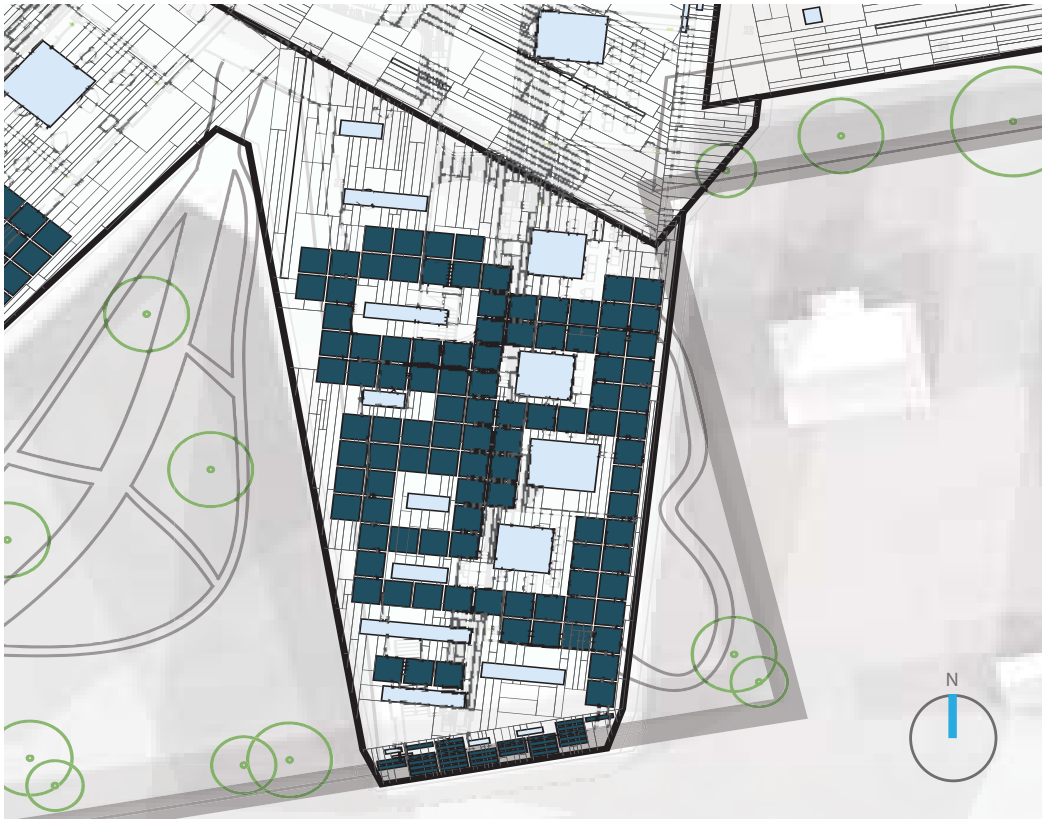
il. 4.06 dep. 5-7 first floor plan; 1:500



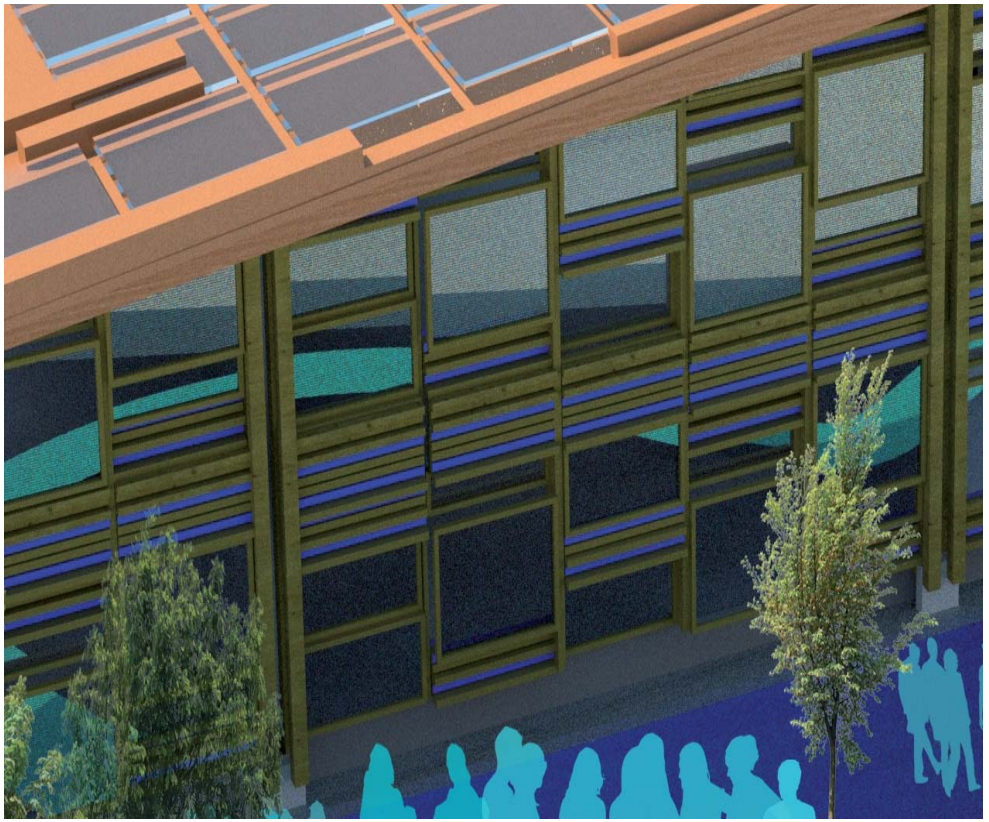
il. 4.09 layer 1. structure - concrete / glulam hybrid superstructure



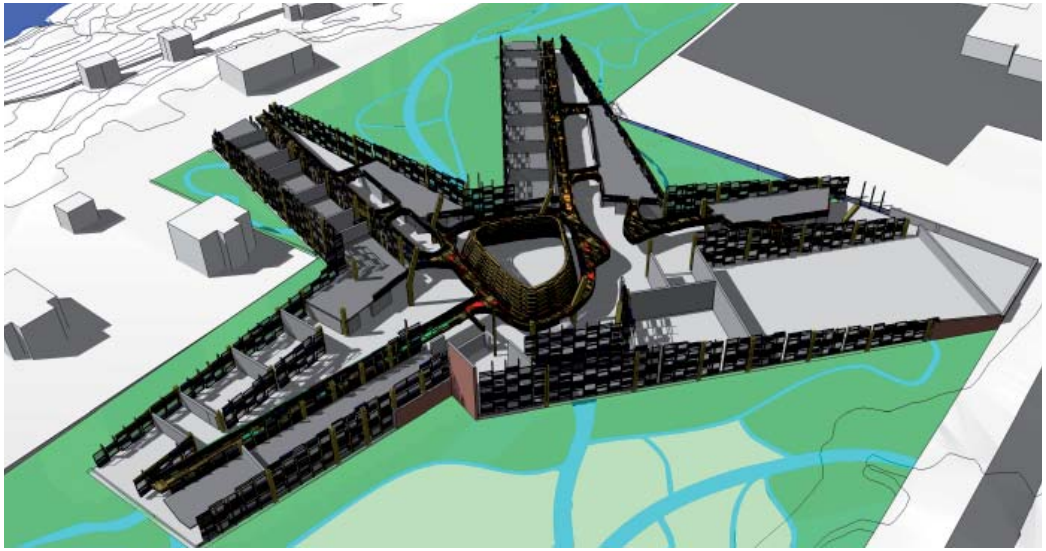
il. 4.10 layer 2. glazing



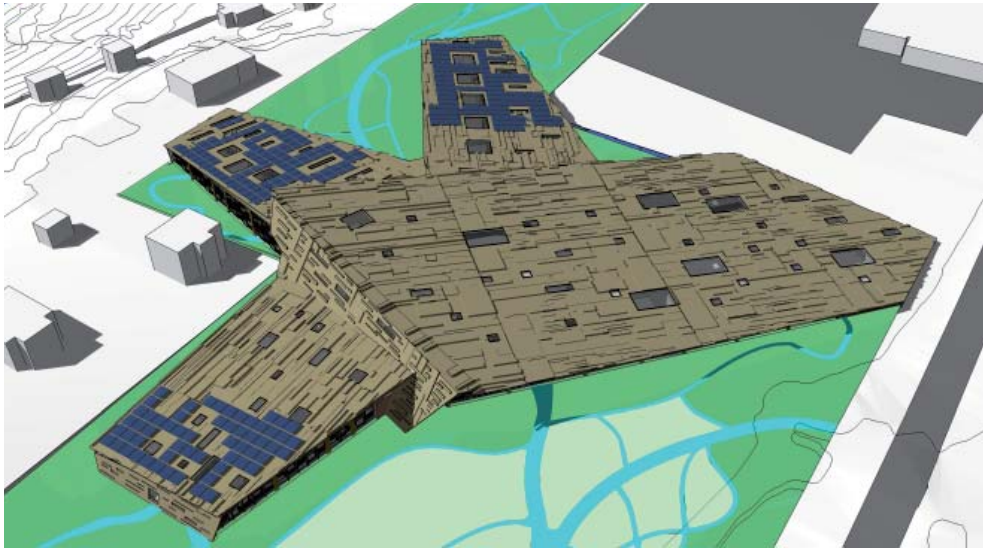

il. 4.07 dep. 5-7 roof plan; 1:500



il. 4.08 dep. 5-7 east facade; nts

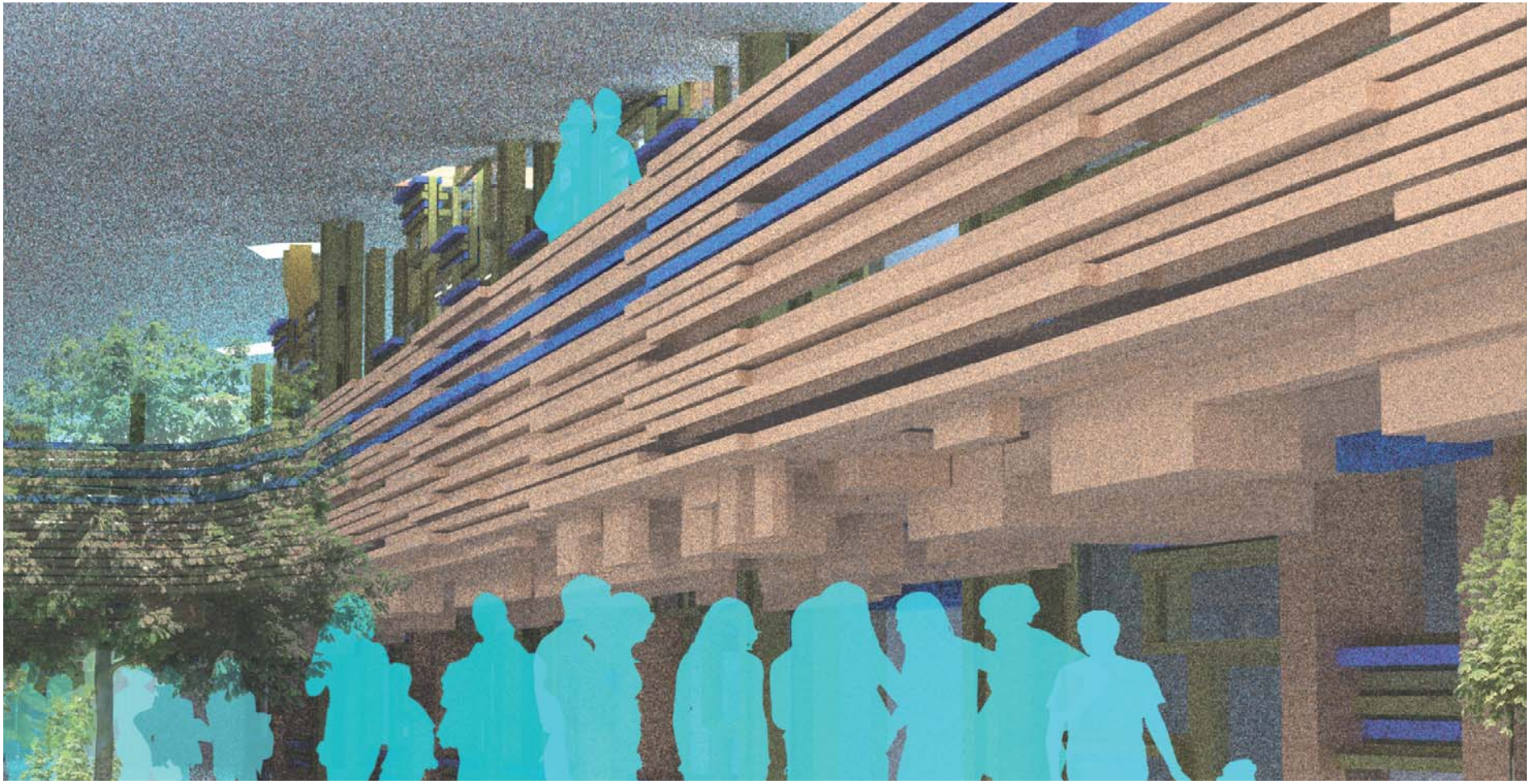


il. 4.11 layer 3. bridges



il. 4.12 layer 4. roof envelope

**il. 4.13 dep.5-7 perspective from first floor bridge**



**il. 4.14 dep.5-7 perspective atrium looking onto classrooms**

# reflection

## process/

The Norvaund School project is a School which is firmly rooted within its place and then presents an environmentally responsive solutions to reducing carbon emissions as a 21st century imperative and also creating an excellent learning environment for users, in particular the 560 students.

Fascinated with the relationship of the social and the environmental, regulated by the economic aspect. It is clear that some architects perhaps lean more towards the social architectural imperative, such as Schmidt Hammer Lassen. Whilst others turn to the the environmental imperative, such as Bill Dunster with BedZED and therefore different principles are considered as priorities. This allows some explanation of why our buildings look dfferent and in turn similar, responding to our ever changing needs as people.

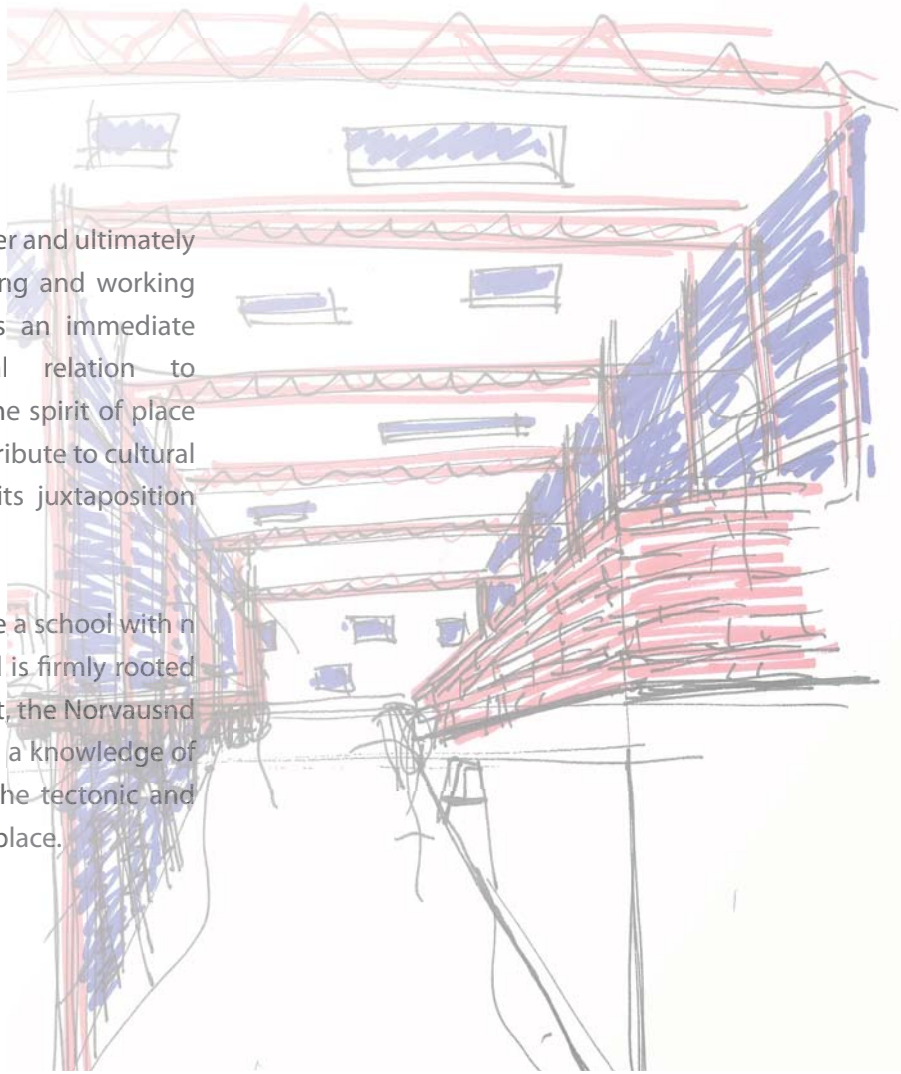
The users;- 560 students at years 1-7 with 35 enhanced students with mental and physical disabilities, 74 teachers and 24 teaching staff gaina structure of diversity, calmness, communal and appreciation of place within the school. The design is as an open loop with visible, flexible, interpretive spaces This project is fundamentally rooted as an appreciation of place within the Nordic Context the natural forces Genius Loci are so rich that allows fantastic architecture. The prioriity has been to create an excellent learning environment, largely focussed upon creating a building which evokes excellent daylight. However a balance and sensibility has been used methodically throughout the process, whereby considering all aspects allows an integrated design using iterative phases with little chance for after thoughts within the design process. How is it sustainable? Social, environmental, economic

This project for the Norvasund school looks at the idea of the education as a sustainable response. In this application situated within the west of Norway, amongst outstanding natural beauty, the place and social values has relfected and required special attention. In this was creating a building which would be used day after day; enjoyed asv a social holistic aspect of sustainability. whereby perhaps the brutal modernist paradigms by Le Corbusier to improve living conditions as part of modernism can be seen as an avant garde response to function as an imperative. The result which we can reflect upon in the 21st century is that leaning towards such brutal extremes forces other aspects to be less of a priority and considered to a lesser extent; in this case the reflection of spirit of place.

Though this is not true of all modernist architects, for example Aalto's dialogue and understanding of place was critical, however I therefore believe that we should learn from these lessons and respond to the current application of the 21st century, needing sustainable architecture capable of reducing carbon emissions. Whereby if a building does no more than to keep us dry and provide an airtight envelope we are less likely to fully appreciate it and in this sense is less sustainable. Moreover a combination of social and environmental aspects is required, regulated by economical concerns in order to achieve a truly sustainable building.

My focus in architecture is to consider and ultimately then be able to prioritise, identifying and working with the essence of a project. As an immediate concern, the phenomenological relation to architecture, whereby identifying the spirit of place is very important to me, which contribute to cultural aspects, enriching a project with its juxtaposition with place.

Based on the outline vision to create a school with n excellent learning environment and is firmly rooted within its place in the nordic context, the Norvausnd School proposal has grown through a knowledge of Norwegian architecture, studying the tectonic and phenomenological meaning of the place.



phenomenology

app

nordic
architecture

study trip/ norway

# endix

references

# phenomenology

## genius loci "spirit of place"/

**approach**

Phenomenology as a means of depicting phenomena is usually used within professions of Ontology and Psychology, however as an architectural tool to approach a project; Phenomenology is a theoretical approach to architecture which focuses on depicting phenomena without using the categories of natural sciences. It is a way to describe and analyse architecture based on experience and sensory properties, as a contrast to physical proportions and the stylistic expression of a building. (Pallasmaa, 2005) As a means to attain a dialogue between the school and place it is imperative to gain critical understanding of the character and atmosphere of the spirit of place, the "genius loci".

**Systematic Articulation**

Phenomenology as a architectural tool can assess;

- The Body Of Architecture
- Material Compatibility
- Light
- The Sound Of A Space
- Temperature – Hearth
- Surrounding Objects – House As A Home
- Architecture As Surroundings
- Time

Therefore the ability to comprehend both concrete and existential phenomena are we able to proceed informed; "Only when understanding our place, we may be able to participate creatively and contribute to its history." (Noberg Schulz, 1984, p202)

"The Existential purpose of Architecture is therefore to make a site become a place, that is, to uncover the meanings potentially present in the given environment." (Norberg- Schulz, 1984, p18) This has been interpreted by Norberg-Schulz noticeably successfully by such prominent architects as Reima Pietila, Rick Joy, Peter Zumthor and moreover the works of Jorn Utzon. "In his residential projects, Kingo (1956), Birkehoj (1960) and Fredensborg (1962), Utzon created unified settlements which posses figural character in relation to the landscape, and a strong sense of place as a meaningful, social "inside". (Norberg Schulz, 1984, p198)

il. 5.01

**"Economic, social, political and cultural intentions have to be concretised in a way which respects the Genius Loci (Spirit of Place). If not the place loses its identity."**

priorities (Norberg-Schulz, 1984, p18)

**"for so long as building is isolated from the place to which it belongs, the result will necessarily remain inessential, despite any functionality."**

(norberg-schulz, 1996, preface)

# head + heart/

**Juxtaposition**

**There remains a constant relationship between considerations attributed towards the head, logical and clinical reason and to the heart; considering context through phenomenological understanding, becoming respectful hand honest of place.** "Although we may at first glance associate the word function with the efficient provision of physical sanctuary, we are in the end unlikely to respect a structure which does no more than keep us dry and warm." (de Botton, 2006, p62) Thus supported by Norberg-Schulz, "To make practical towns and buildings is not enough. Architecture comes into being when a Total Environment is made visible." (Norberg-Schulz, 1996, p182).

**regionalism; Balance**

Therefore this lack of consideration enforces the idea to relate to Place, respectful and flexible to integrate values within that particular society and work towards achieving a sense of identity. This balance between head and heart reasoning is supported by the John Ruskin who states "Proposed that we seek two things of our buildings" (de Botton, 2006, p62), we want them to shelter us and to speak to us. A balance between place and functional considerations is evident by Herzog and de Meuron, Stone House, Tavole, Liguria, 1988, whereby the juxtaposition of Stone and geometry, attained from the concrete frame. This is therefore against the idea that form follows function as a modernist embodiment of the avante garde.

**avant-garde; No-Balance**

Le Corbusier's Fruge's Factories in Lege and Pessac, near Bordeaux, "Within a few years the workers therefore transformed their all but identical Corbusian Cubes into uniquely differentiated, private spaces capable of returning the things their working lives had stripped away." (de Botton, 2006, p65) This response can be seen by pitched roofs and shutters. As Le Corbusier's Brutal Modernism did not consider the social imperative as the genius loci "spirit of place". The same effect can be seen by the Unite d'Habitation in Marseilles, 1947, as Le Corbusier's brutal vision for a self sufficient society resulted in lonely corridors.

**il. 5.02 montage**

**Architecture is a constant response to the ever changing needs of people/**

In the application of the 21st Century the priority must be seen to be Sustainability. To my mind the approach for a building to be considered sustainable in terms of technical solutions is very important, however remains a single aspect of a building being able to be considered sustainable. Perhaps an equal or more important aspect of sustainability is a holistic approach, whereby the phenomenological meaning of a building for its users is also important and therefore a combination of both aspects will benefit the current agenda and provide Architecture with a sense of Identity. There is no point creating a House with a 0.11w/$m^2$k u-value if nobody wants to live there.

# nordic architecture

## nordic context/

**Nordic Tradition**

**since the beginning of the 20th century, architectureintheNordiccountrieshasdeveloped its own distinctive characters. Contrary to the built environment in other parts of Europe, the Nordic tradition is based upon a foundation of a more social and cultural character.** What characterises the Nordic Architecture of the 20th century, and especially from the 1930's onwards, is furthermore a translation of the strict and simplistic functionalism into a regional expression that combines light and refined architecture with a more 'soft' approach based on the the use of regional materials and building construction. (Lund, 2008)

"As early as the end of the 1930's Functionalism was further 'softened' everywhere in Scandinavia. The international element was partly replaced by local features"..."local materials and traditional architectural motifs" [Lund, 2008, p20]. Christian Noberg-Schulz argues that contemporary architecture to a high degree suffers from a "loss of place" [Norberg-Schulz, 1996, p175] and stresses the importance of regaining a rootedness in architecture and understanding the specific character of a place designing buildings that "... gathers and represents the world to which it belongs" [Norberg-Schulz, 1996, preface] in order to provide people with a feeling of identity.

Encourages the necessity of viewing life and place as unity Peter Zumthor states, "Architecture is not anstract, but concrete. To experience architecture in a concrete way, means to touch, see, hear and smell it." [Zumthor, 2010, p66]. In the nordic context light defines the manner in which things appear. The light of the north "...creates a space of moods[...] of shifting nuances, of never resting forces, even when the light is withdrawn and filtered through an overcast sky." [Norberg-Schulz,, 1996, preface]

il. 5.03 montage

**“nordic man has to become friends with fog, ice, cold winds; he has to enjoy the creaking sound of snow under the feet when he walks around.”**

(norberg- schulz, 1984, p21)

**“in the nordic countries, where the development of architecture has always been seen as a reflection of the changes in society.”**

(lund, 2008, p282)

il. 5.04 montage

# norway/

**Society**

An understanding of Norwegian Architecture and history as part of the nordic context enables a more considered approach in response to the application of the Norvasund School in Hatlane, Alesund. Norway remains relatively untouched, less influenced by southern characteristics of classicism than other Nordic countries such as Helsinki's Senate Square and Amilienborg in Copenhagen. Norway gained political independence from Denmark in 1814 and declared national independence in 1905. "The slogan 'form follows function' pretends to be universally applicable, and since our world is becoming increasingly characterised by global sameness, the inevitable result is an international architecture." (Norberg-Schulz, 1996, p149)

**Industry**

Vestland accounts for approximately 70% of Norway's gross domestic product, the export of north sea oil at Stavanger. Prior to this the fishing and agriculture industry remained dominant in Vestland. (Bergen Museum, 2011) Fishing is obviously a staple to the locals and you can catch cod, coalfish, wolf fish and haddock in the fjords. (Scott, 2011) The site of trawler ships out in the harsh conditions of the north sea surround the landscape. Therefore Norway as a sub-arctic region forces a dialogue with nature as a constant interaction. This embodiment of climate in relation to place through industry evokes a sense and affinity of Norwegians with nature, tracing the idea of Vikings travelling the cold distant shores.

**Flora and fauna**

Norway is incredibly rich and diverse in terms of flora and fauna in relation to Europe and the world. Polar Bears, Brown Bears, white reindeer, eagles, killer whales habitate alongside trees of Sitka Spruce, Scots Pine and Oak, occupying 9% of the land. Mountains such as Aksla and the Sunnmore Alps rise magnificently above wandering fjords below. "The diversity of plant species is extensive and varied in the mountainous fjord landscape." (UNESCO, 2011) Animal life; "The World Heritage Area has rich and varied animal life in the form of mammals, birds, fish and insects. Species found here include wild reindeer, mountain fox, lynx, otter, lemming and porpoise." (Scott, 2011)

**Sami Parliament, Karasjok**

The Sami Parliament situated in northern latitude of Karasjok; Norway's sub-arctic location, designed by Stein Halvorsen & Christian Sundby as a competition winner in 1995 and completed in 2005. The Sami Parliament is focussed for study as a building in the Nordic context which directly reflects Sami Culture, as Laplandic nomadic society. The result appears as a building engrained and integrated within the fabric of society, inheriting qualities which can be attributed positively towards the Norvausnd School in Alesund. "In the Nordic countries, where the development of architecture has always been seen as a reflection of the changes in society." (Lund, 2008, p282)

Therefore the Norvasund School reflects Norway's values; welfare state, functionalism, interaction with place as a phenomenological dialogue. As a priority must evoke a sense of an excellent learning environment, permitting student development, however also the design as part of the Nordic tradition must reflect Alesund's values visibly.

**"The buildings lose much of their figural effect; houses lie scattered and hidden […] Moreover, they (buildings) consist for the most part of wood, a natural material that lacks the permanency of stone."**

(Norberg-Schulz, 1996, p1)

il. 5.05 montage

# sverre fehn/

**Contemporary and rooted**

When studying Nordic modernism, Nordic innovators such as Blakstad and Munthe-Kass can be mentioned although it is the next Nordic generation architect, Sverre Fehn who can be seen to be the most prominent. Moreover the Fin Alvar Aalto was amongst the only modernists able to "allow context and movement to define the solution, while its openness reflects the land's own structure." (Norberg-Schulz, 1996, p164) "Sverre Fehn, has had limited possibilities to realise his ideas; much of what he has built, however, form important stages in the development of Norwegian modernism." (Norberg-Schulz, 1996, p188)

Among these realised projects the Hedemark Museum in Hamar, 1979 is seen a regional paradigm for Fehn reinterpreting; "known elements; tower, bridge, gable" (Norberg-Schulz, 1996, p188)

Organic Functionalism - Regionalists; Reima Pietila, Alvar Aalto, Juhani Pallasmaa, Jorn Utzon = Sverre Fehn in the Norwegian context. Within the spectrum of extremes towards modernism, Le Corbusier, perhaps the most famous is poles apart from Aalto's and Pietila's more sensitive approach to the new style. Instead favouring brutalism, with the aim to respond positively to the need to improve peoples' living conditions.


MINING MUSEUM

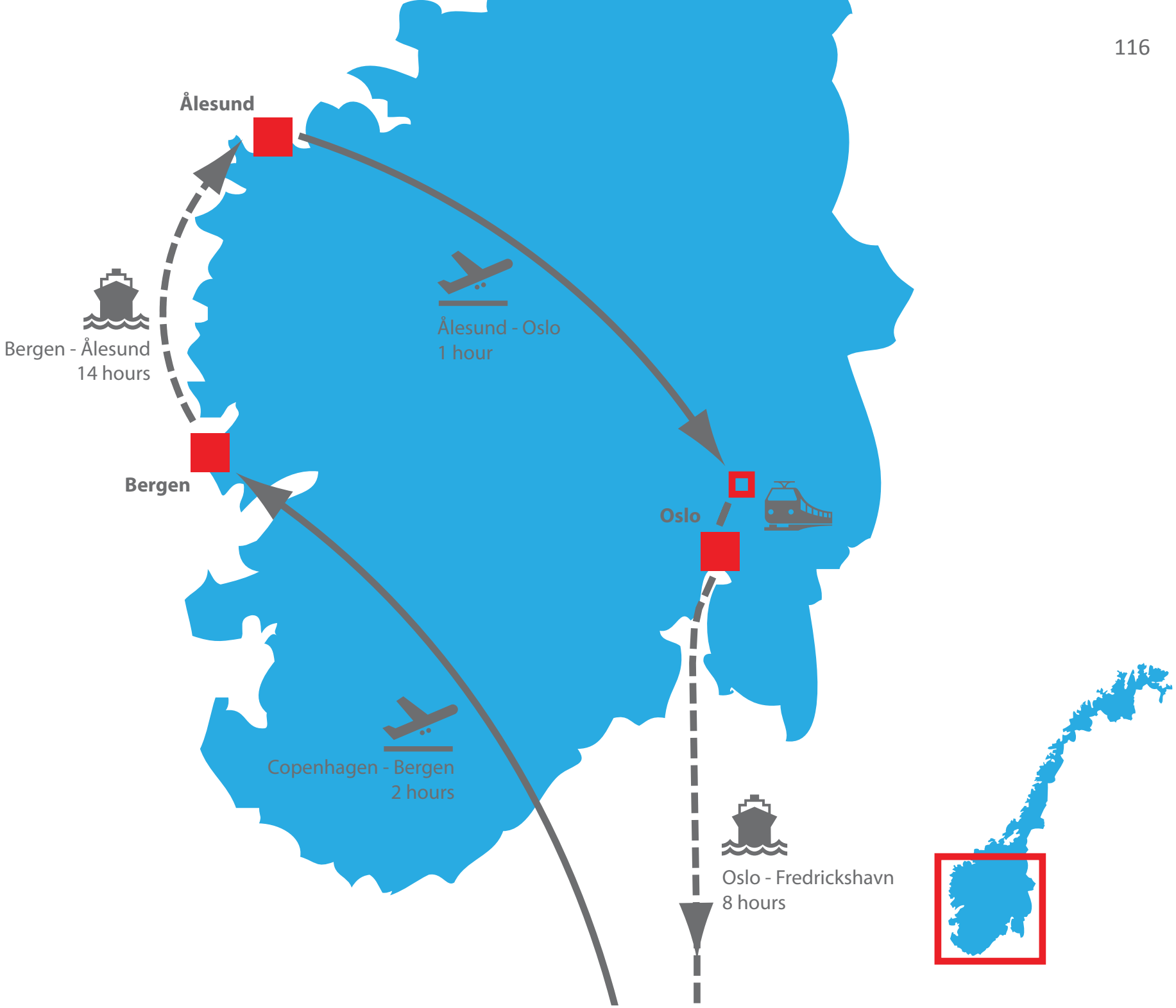
# study trip

## norway/ bergen - ålesund - oslo

**The Study Trip to Norway on 9th - 13th March 2011 to Bergen, Alesund and Oslo, as an excursion which has adder greater depth and understanding of the Nordic Context.**

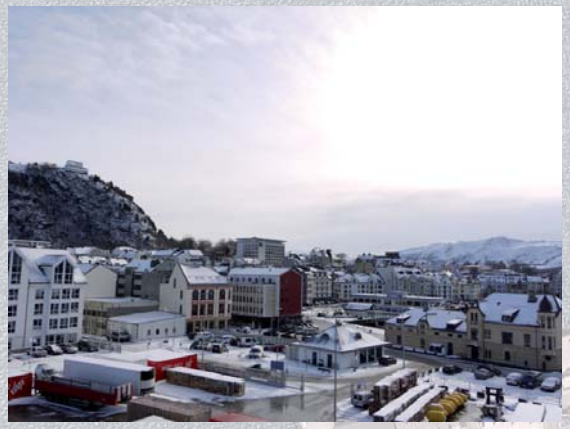
**The requirement to visit the Project Site in Hatlane, Alesund in the west of Norway allowed the site to be seen at first hand perspective and less from a site plan. It gave an opportunity to study the place and assess what is the priority in therms of evoking the Genius Loci, the Spirit of the Place.**

Various modes of transport where used effectively to reveal and witness the fantastic natural environment Norway ataains in the Nordic Context.


Ålesund
Bergen - Ålesund
14 hours
Ålesund - Oslo
1 hour
Bergen
Oslo
Copenhagen - Bergen
2 hours
Oslo - Fredrickshavn
8 hours

# bergen/

# ålesund/



# oslo/


il. 5.08

# program/

## bergen

9th march 2011/

17:40 - aalborg - copenhagen
22:10 - copenhagen - bergen

10th march 2011/

09:00 - bergen architecture school
14:00 - bryggen

22:30 - bergen - ålesund

## ålesund

11th march 2011/

12:00 - site visit - hatlane
16:00 - record ålesund
16:00 - city center of jugendstil houses

12th march 2011/

09:00 - photograph ålesund

12:00 - ålesund - oslo

## oslo

12th march 2011/

14:00 - national museum of architecture
16:00 - norwegian opera house
19:30 - oslo - frederikshavn

13th march 2011

08:00 - fredrikshavn - aalborg

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# illustration list

Illustrations not represented below are produced by the project group/

il. 1.01 http://www.adbusters.org/magazine/90/last-child-woods.html (Nature Deficit Disorder)
il. 1.15 http://www.cabe.org/school design - secondary school design, montage various images
il. 1.17 http://www.cabe.org/school design, montage various images
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il. 1.27 http://srg-partnership.com/mountangel - mount angel abbey - various
il. 5.05 Alain de Botton; the architecture of happyness (2006) - various images; le corbusier houses, herzog & de Meuron Italian dweling
il. 5.08 http://e-architect/sverre-fehn.com/ - various images; hamar museum, venice exhitibition