ALSIK HOTEL, SPA & CONFERENCE CENTRE

SUSTAINABILITY

RAMBØLL

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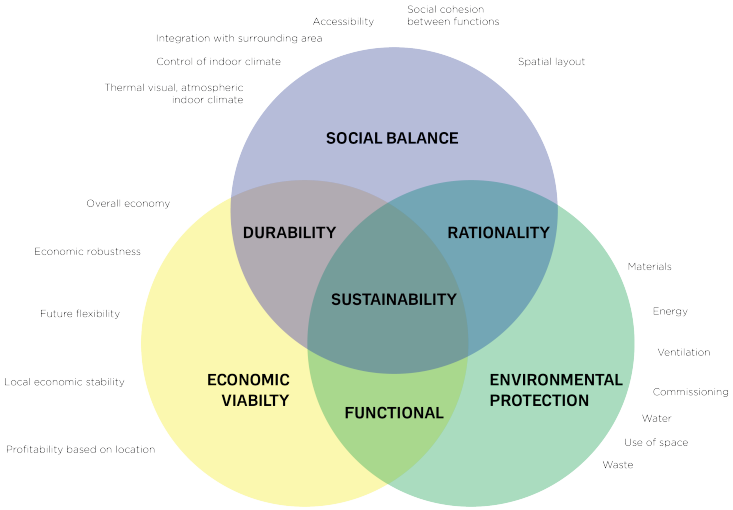
AMBITION



Ambition

ALSIK aims to become an integral part of Sønderborg's ambitious plan for a comprehensive sustainable revitalisation. From an energy engineering perspective, the building will contribute to a reduced CO_2 footprint over the years through multiple building design and supply engineering measures. The ambition is for the building to contribute to the urban experience of its users and complement a multitude of options that can improve quality of life.

Sustainability

How does ALSIK meet the challenges of sustainability and integration of sustainable elements in the building, site, and transition to city? Sønderborg and Project Zero's roadmap:

The goal is to reduce household electricity consumption by 50% and CO_2 emissions by 75% compared to current levels by 2020. By 2029 the goal is to have completely eliminated the area's CO_2 load.

Sustainability is one of the key elements in the transformation of the waterfront area. The ambition is to ensure a sustainable city district that is world-class in terms of energy and resource consumption.

The following sections provide a closer look at how ALSIK has managed to meet the three key pillars of sustainability, exploring in detail how ALSIK has embraced the social aspects, economic quality in the choice of materials, building design, and engineering as well as various environmental protection measures. It has been important to see the different pillars in correlation, so ALSIK would be able to be included as a permanent component of the future city district as a business, destination, and facility for citizens, and as an example of integrated design. The sustainable solutions are not "added on" to the project after construction. They are produced continuously along the way by allowing Alsik to be incorporated into the context and practice already existing in Sønderborg. This applies, for example, to the city's CO_2 goals, the building materials used, and measures that make the area "liveable". Innovative solutions and common sense have both been applied in the task of integrating ALSIK's sustainability with the rest of the city's infrastructure and environmental goals.

Sustainability is about seeing the solutions in a broader context. Social aspects, economy, and environment have played in when, for example, looking at the choice of ALSIK's facade or the layout of the floors. The vision from Project Zero for all of Sønderborg is not just to create a city and new city district that is CO_2 neutral.

The purpose is also to ensure that the solutions interact in an economically and socially responsible manner. This is evident in the idea that ALSIK as a building and institution in the city should contribute to urban integration, so as to cultivate urban life around the building. A key concern for ALSIK has been to avoid creating an "island" in the new waterfront area. The building has been woven into the new waterfront landscape with openings out into adjacent pathways and planned space extending out to the Alssund Strait.

Hotel guests can easily move from hotel rooms to outdoor spaces. Just as it is easy for those who live in Sønderborg to move from outside spaces into the hotel's public facilities. A high level of social coherence and functionality with the other city living assets offered by Sønderborg and the waterfront area serve to automatically advance economic growth for new businesses.

One example is the design of the overall construction, which has accounted for how the space can be most effectively utilised, so that accessibility, spatial accommodation, engineering, and future changes are addressed from day one.

SOCIAL SUSTAINABILITY

The description of ALSIK's social sustainability examines how user satisfaction is achieved by focusing on comfort, health, functionality, and aesthetics in the design of the building's rooms and functions. Social sustainability encompasses the measures by which users ultimately see their quality of life improved and act sustainably. This includes, for example, quality of open space, art, conditions for cyclists and pedestrians, accessibility, and inclusion of the public into the building, which is also seen as a part of social sustainability.

SOCIAL SUSTAINABILITY

Connection between building, district and city

ALSIK shall be perceived as an integral part of the new waterfront district and Sønderborg city. A key concern has been to avoid isolating the building from the other facilities of the local urban environment, such as bicycle paths, public transport, etc. The connection from, for example, hotel room or fitness center to lobby, front area or the lively promenade of the waterfront district and the rest of the city should be as natural and unobstructed as possible, making the building more attractive as a place where visitors feel like short-term residents rather than short-term guests

For example, it will be easy for guests to make use of public transport to- and from Sønderborg Station, as bus routes are located close to the building's main entrance. Cycling guests can also make use of the buses in the event of inclement weather, as it is free to take a bicycle.

The future path systems around ALSIK are connected to the current Alssundsti, Gendarmen and Hjertesti, further facilitating accessibility to ALSIK without the use of a car. This connection makes it easier for visitors to get in and out of the city, and citizens will find it natural to pass through ALSIK for dining, exercise, or other purposes..

SOCIAL SUSTAINABILITY

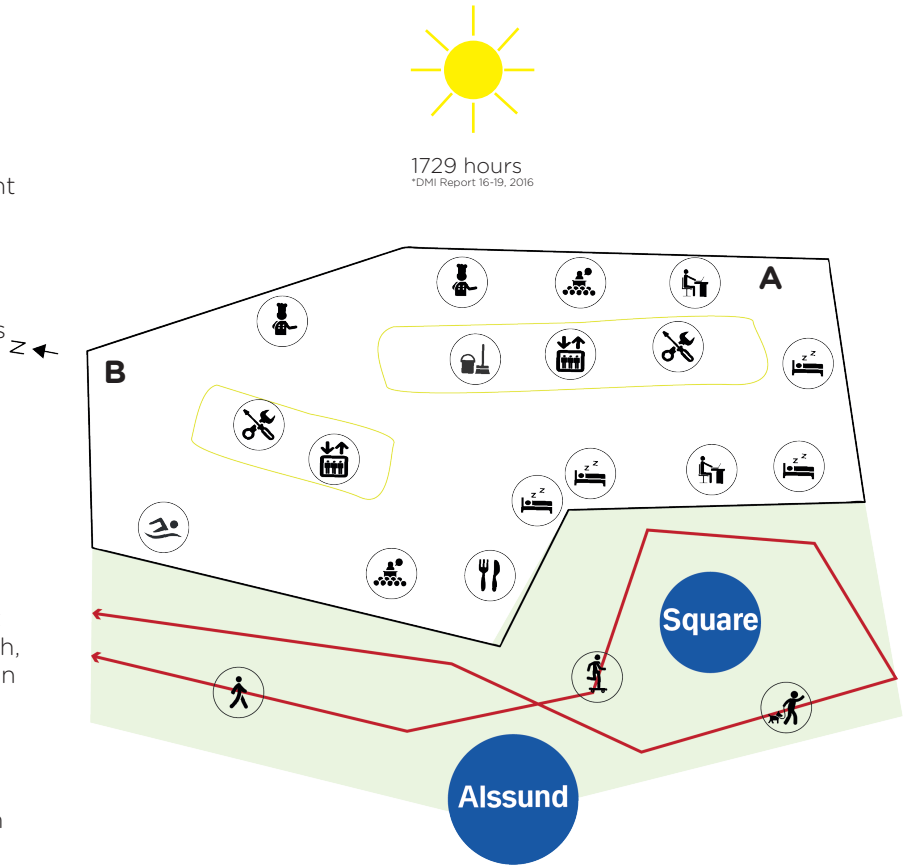
Interior building design

Comfort, user satisfaction, and health

The thermal and visual indoor climate in ALSIK is high priority, so that guests feel included in the building to the greatest extent possible and feel that their comfort and well-being are valued. Building engineering, access routes, storage areas, and space for temporary accommodations are situated in the middle of the building, allowing all rooms for long-term accommodations a view over the city, water, or waterfront area. Good daylight conditions in the individual rooms solve two important aspects with respect to the building's overall social sustainability.

Space and daylight

Having good daylight conditions throughout the year promotes mental comfort and health, which ultimately results in greater satisfaction and use of the building's other facilities. Several studies show that there is a direct connection between adequate levels of daylight and productivity and welfare. Natural light has a direct influence on human circadian cycles. It has therefore also been important to safeguard the working environment of the many employees. Staff rooms etc. for extended accommodations also have good views and daylight conditions.



During the summer half, daylight will contribute significantly to the many spaces for longer-term accommodation. The slight pivot in the building's structure allows for optimal use of daylight throughout the day on the various floors. During the winter half, artificial lighting will supplement natural light, which is significantly optimised with floor-to-ceiling windows. The floor-to-ceiling windows contribute to reduced use of artificial light during the summer half of the year, which, naturally enough, changes during the winter half of the year.

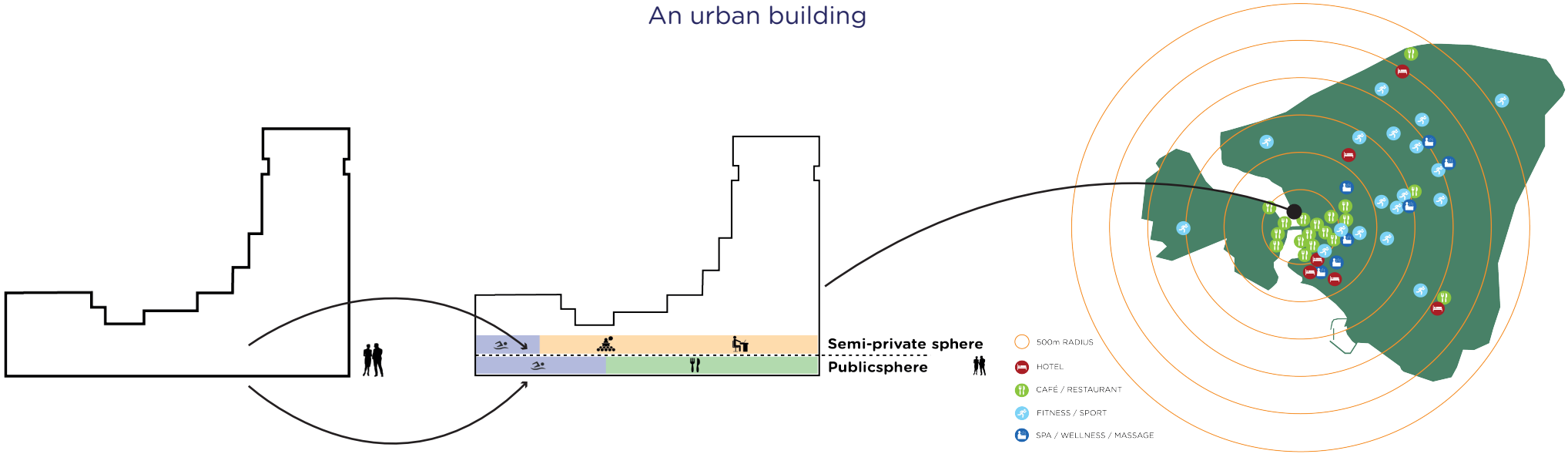
Connections between floors

The balance between the private and public sphere is achieved through distribution of functions in building sections A and B. Building section A mainly contains hotel rooms, while building section B contains recreational and leisure facilities.

Access to the rooms on the various floors and to common areas is intuitive and uncomplicated, as the access routes are centralised, which makes it easy for guests and employees to move between rooms and facilities. The various locations of functions create a dynamic in the building that elevates the experience of enjoyment and well-being in the building; there is activity at all hours of the day, which also captures the attention of passers-by.

SOCIAL SUSTAINABILITY

An urban building



The building's urban adaptation

Just as ALSIK's interior design has taken guests into account so they get a sense of belonging, it has also accounted for how the building as a volume of functions can be woven into the city's infrastructure. How can several groups of the citizens be taken into account in a new city district without at the same time downgrading the main purpose of the building? Based on Frank Gehry's Master Plan for the area, there has been a wish to turn the district into a cohesive area that ties both sides of the strait together with good connections and dynamic spaces.

Open facades and terraces

The large passages between building and the strait existing in front of Sønderborg Library, Havbo, and Videnshusene contribute to the creation of spaces for leisure breaks and activity. The open character of the facade, in the form of entryways, window sections at eye-level and transparent glass play an important role in this context. The open character of ALSIK's facade is more evident in areas where dining and spa facilities are located, which makes the building inviting to outsiders.

ALSIK's expression reflects its content, and the human scale is present in the dimensioning of the facades, such as in the division of floor levels and the immediate experience of the functions on ground floor and second floor. Building section B, which is the hub of the facilities, is contiguous in form and facade, so that the two buildings refer to one another, which also provides easy accessibility to the user. ALSIK brings an architectural variation to the area both in terms of geometry, the proportions created by the displaced levels, and variation in the size of the building.

From street perspective, this gives the impression that the house has multiple functions that are easily accessible from the street. The objective is to allow generally unhindered access to the primary entries, but also to both buildings and recreational areas.

The terraces situated along the western facade create a good connection between indoor and outdoor. They are at the same time also an effective link between the semi-private and public spheres, where planting serves as a boundary.

Centre of activity

The public facilities bring together a broad pallet of options for residents in Sønderborg, who have the opportunity to experience and use the building, even if they are not hotel guests. The many public facilities, such as restaurant, cafe, pool areas with spa and fitness centre help enrich the surrounding area with options that are within biking or walking distance from the rail station and city centre. As shown in the illustration above, ALSIK will supplement existing facilities under one roof and with a geographically advantageous location. Furthermore, public facilities usually draw in other social activities of the city. This applies to the public space in front of ALSIK, where there is space for music, play, cultural installations, or just a quick stopover to enjoy a cup of coffee from the bar. The sum of people in and around ALSIK is also a part of fulfilling Frank Gehry's plan for the area with respect to social sustainability, with the code word VIBRANCY.

SOCIAL SUSTAINABILITY

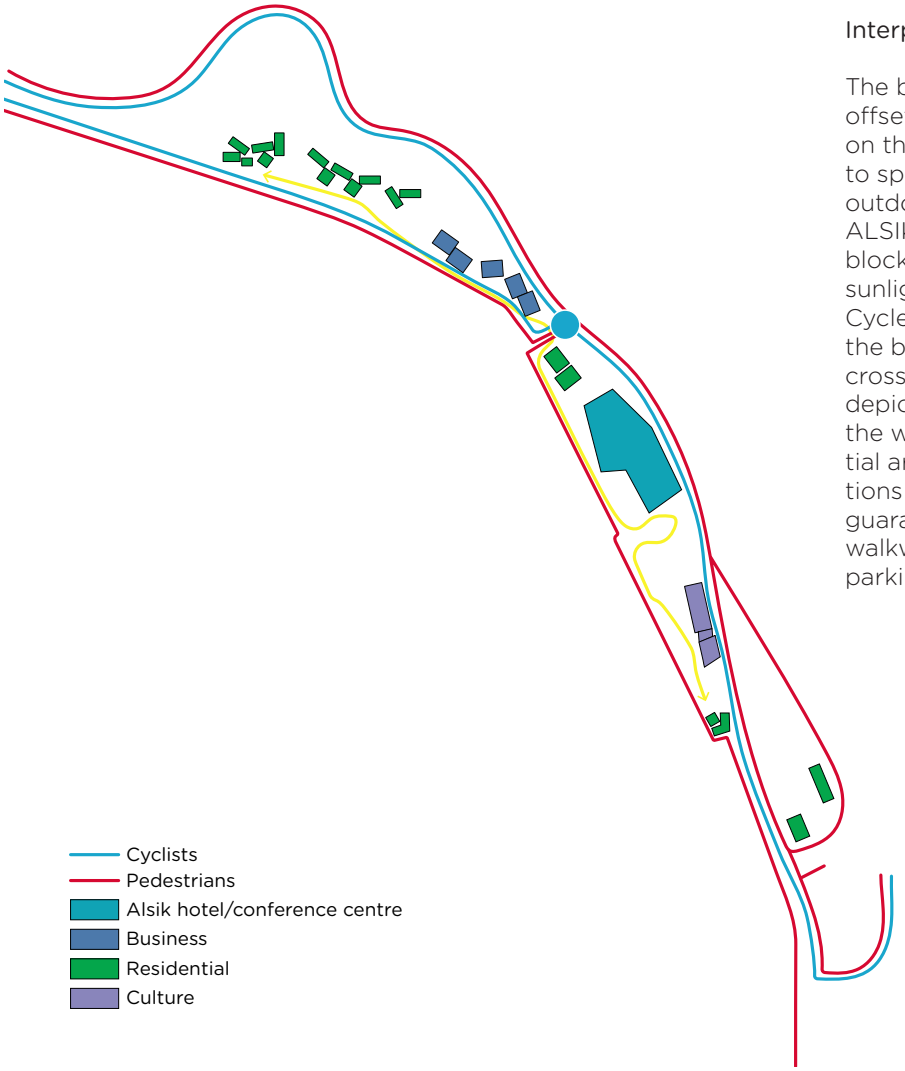
A liveable waterfront area

A "liveable" waterfront area

The new waterfront area extends from Chr. X's bridge to green areas west of the barracks. The concept from Frank Gehry's fundamental master plan shows the transition from cultural institutions in the south to residential areas and mixed industries to the north. ALSIK will function as a link between the future city space and path through the waterfront area. The open facades on the ground floor, supplemented by the large recreational square out towards Alssund, become an active element in the natural patterns of movement that will develop along the waterfront promenade, where citizens and users of ALSIK will look outwards to the surrounding open areas with places to stop. The future Bitten & Mads Clausens square features a design that invites one to stop and stay, where planting provides coverage and shade.

What creates life around buildings?

Research and studies show that life in facades and facades with open connection between indoor and outdoor create interaction with passers-by. For example, they can see restaurant guests on the terrace or at the bar enjoying a cup of coffee, just as the guests inside can look out at the passers-by.
ALSIK's irregular site plan contributes to an array of impressions as one walks the pathways around the building. In addition, the steps and various planting beds are constructed with edge seating, which improves the experience for those who stop while passing by, particularly in the summer, where a bit of rest in the shade of the trees might be needed.



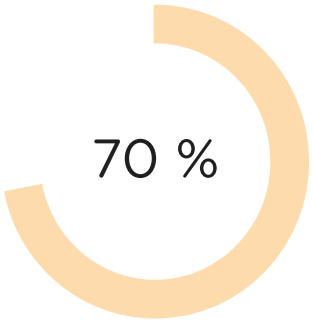
Interplay with the city

The building's irregular layout and its twisting, offset structure helps reduce wind turbulence on the ground level so that it is comfortable to spend time outside the restaurant's outdoor areas or on the public square. ALSIK's structure achieves this without blocking the buildings' underlying need for sunlight and a view of the city.
Cycle paths and path systems wind around the building without being interrupted by crossing roads or private areas. The figure depicts the flow pattern of pedestrians along the waterfront promenade from the residential areas in the north to the cultural institutions in the south. ALSIK's visitors are also guaranteed good parking facilities with a walkway that connects ALSIK and the parking structure.

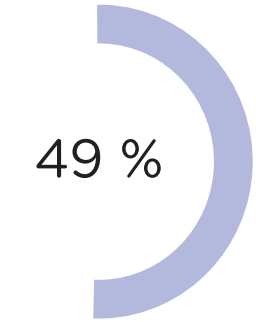
ECONOMIC SUSTAINABILITY

The description of ALSIK's economic sustainability takes a detailed look at the interior cladding materials, building materials, and technical installations. These elements have an influence on the building's lifetime costs.
ALSIK's stability of value, potential for economic development and resilience depend on these choices. Also in focus are the building's construction and architectural solutions, which can be to the disadvantage or benefit of the building's saleability/attraction for new tenants in the future. Finally, economic sustainability during the construction process and in operation and maintenance is assessed.

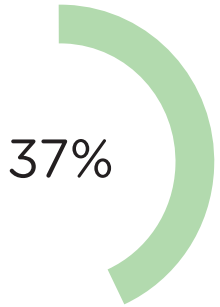
Construction Site Actors



Subcontractors



Suppliers



*The local area is defined as a radius of 50 km from Sønderborg.

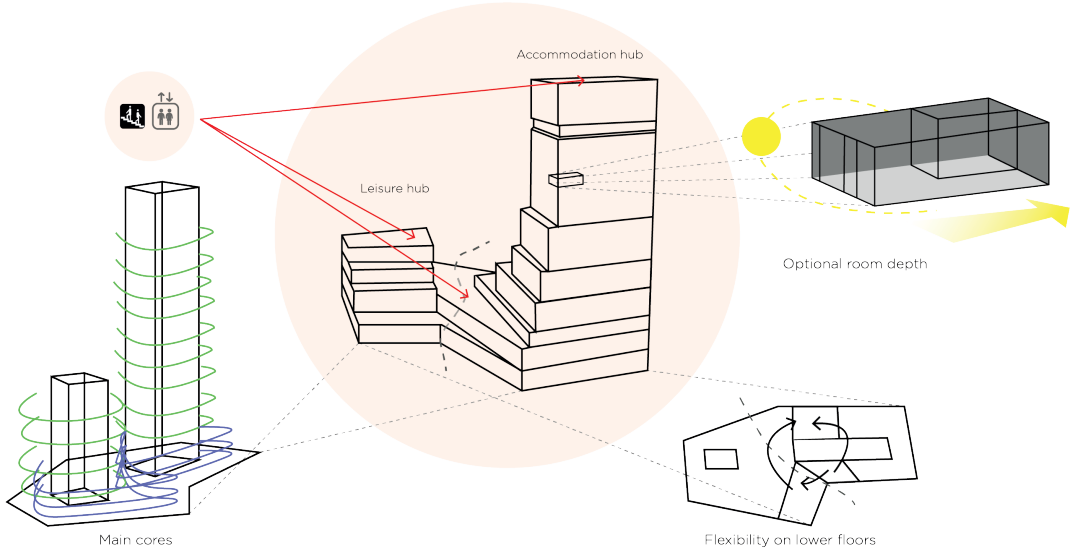
Construction site actors are defined as suppliers of sheds, technical installations, food, fixtures, etc.

Subcontractors are defined as the various trade workers onsite . Suppliers are defined as product suppliers to subcontractors.

The proportion of actors from the local area is well represented during the construction phase as builders and suppliers. They have a direct economic impact on the local community, as it automatically generates work, production, and wages, and therefore revenue to the municipality and state. ALSIK therefore has a financial, indirect, and growth-oriented economic effect.

ECONOMIC SUSTAINABILITY

Robustness and flexibility



Robustness and flexibility

ALSIK consists of two building sections. Building section A is primarily reserved for hotel guests, conferences, and public access to the 16th floor. Building section B is reserved for swimming and spa facilities, including wellness clinics.
The economic robustness of ALSIK is relatively high as a result of the building's multifunctional applications and the highly flexible rooms on the various floors. This makes the building attractive and suitable for several different purposes. The choice was made to separate recreational facilities from accommodation and business facilities, which over the long run is advantageous with respect not only to the comfort of individual guests and user experience of the facilities, but also to the future use of the building sections. In the consideration of engineering, the wastewater treatment unit and heating units are gathered into a building section instead of having a combined solution in one single building. This serves to avoid major changes or renovation work if larger ducts, units, etc. are to be added to provide new functions. The business facilities for public use are located on the ground floor and first floor, which, with respect to future functions and transition from urban environment to building, makes it more attractive and easier for any new forms of business to move into the spaces.

The large facilities can easily be broken down into smaller spaces, as, for example, the ventilation ducts require only one VAV damper, which helps optimise ventilation requirements in any individual room. It will not be necessary to upgrade the ventilation system, as they have a performance buffer as a general rule.

Construction design

The overall construction solution, with placement of two central shafts in building sections A and B, results in a high level of flexibility with respect to future reconfigurations or renovations, making it possible to accommodate any new types of function in the building.

The building depth and height of the rooms with baths, restaurant, conference room, etc. are of proportions to allow full capture of daylight. Through common window sizes (18-22% of the floor area) in many smaller rooms with a room depth of approximately 5.0 m and at a standard room height (2.3-2.5 m) it is often possible to manage with daylight alone for a large part of a normal day/work day. ALSIK's windows go from floor to ceiling, allowing light further into the room.

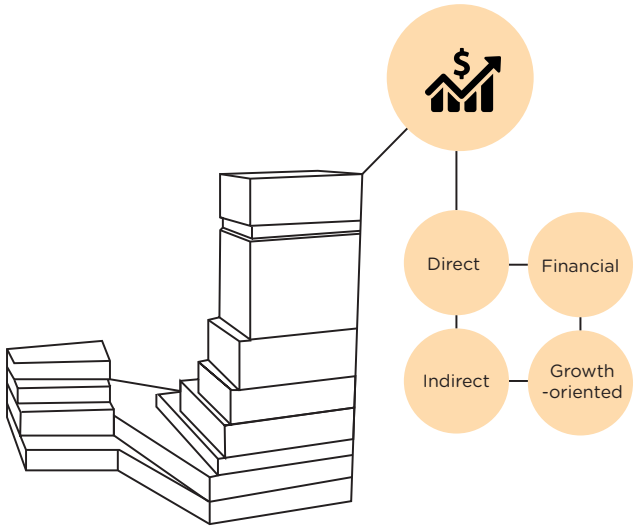
The building materials used for both heavy and light construction are carefully considered with respect to the overall statics, lifetime, and sustainability of the building. The structural framing of the building is composed of concrete elements, which have solid economic resilience, on the basis of

- High fire safety
- Good indoor climate (no emissions from concrete elements)
- Thermal capacity (accumulates heat)
- Long lifetime
- Flexibility (the high security of the concrete elements allows for later changes to the building's use)
- Environmentally friendliness (consists exclusively of natural materials such as sand, chalk, stone, and clay)
- Level of reuse (the material can be reused through grinding

With the increasing focus on materials and the path from production to use to recycling, it has been important to identify and foresee the requirements placed on buildings in the future, as this can have a significant impact on value and costs associated with demolition or partial renovation and the further process of the materials.

ECONOMIC SUSTAINABILITY

Local economic stability



Direct effects

The direct influence includes expected income generated by consumers in the new hotel. This will include room revenue, food and beverage, revenue from restaurants and banquets and other sources of revenue such as spa, fitness, and the observation floor or parking. Direct influence also includes the cumulative salary paid to employees at the hotel and the wages paid to the contractors who build the hotel.
The construction of ALSIK has generated work for many in the local area during the construction phase. In the operational phase the building will also attract and create jobs for local skilled and non-skilled workers. For example, ALSIK sees a potential in the local therapists from the physical rehabilitation sector for tasks in the spa and wellness sector. A large part of the team on the construction site, in terms of subcontractors, suppliers, and construction site operators, come from Sønderborg and the surrounding area.

As the figure on page 8 shows, the proportion of local actors is relatively high in all three aspects, which is economically sustainable for the local area, as ALSIK has generated work over a long period. In addition, one can also conclude that having deliveries made by local providers within a short distance has minimised CO_2 pollution from transport. One example of an economically sustainable deliverable are Kolumba bricks from Petersen Tegl on Broager Land, which will adorn a main wall in the ground floor restaurant.

Growth effects

Growth effects refer to the economic effects generated when employees (full time and part-time), suppliers and guests spend their wages and salary on local purchases.

Financial effects

The financial influence refers to all state, municipal, and local taxes collected from the development and operation of the new hotel. Taxes include sales taxes charged in conjunction with revenues generated by the hotel and wage-related taxes collected from full-time hotel employees and temporary construction workers. Local authorities will also collect property taxes from operation of the hotel.

A reinforcement of local economic stability is predicted, as the new facilities in ALSIK attract visitors from home and abroad. This increase in visitors will benefit the existing cultural institutions such as ALSION, Sønderborg Castle, etc. ALSIK's urban facilities will therefore benefit not only the waterfront area, but also the city as a whole. A positive development of land values on Nørre Havnegade is also anticipated along with a lower level of vacant rental properties. ALSIK's many new guests help create growth within the cafe- and restaurant industry, especially for options located close to the hotel.

Indirect effects

In addition to local authorities and hotel owners/employees, contractors and suppliers for a newly developed hotel will also benefit. Indirect effects include all jobs and revenue from companies providing goods and services to the hotel. Examples of companies that will indirectly benefit from a hotel include suppliers of goods (housekeeping supplies, room facilities, etc.), telecommunication providers (Internet, cable, etc.), utility companies, food and beverage suppliers, and the like. As the figure on page 8 shows, these suppliers are primarily from Sønderborg and the surrounding area.

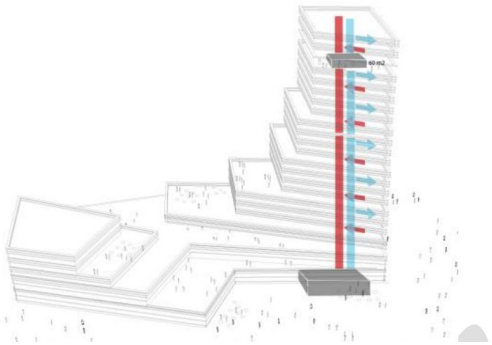
ECONOMIC SUSTAINABILITY

Economic profitability through sustainable choices

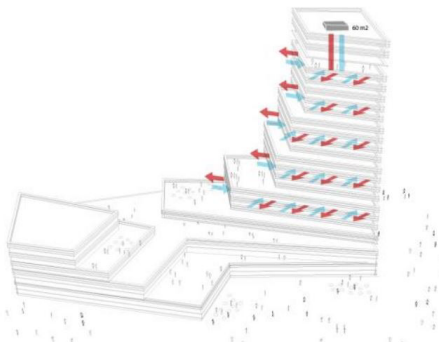
Construction

The flexible construction of ALSIK with centred stabilising elevator and stair cores allow for a high level of spatial utilisation, as operational and maintenance functions have been placed in this area. Having mechanical installations in centrally located shafts can also prove to be an advantage over the longer term when and if new ducts for greater demands need to be installed. Seen from an operational and maintenance perspective, costs are optimised, as most building elements are almost maintenance-free and require only annual inspection- this applies to the structural framing, interior walls, stair cores, elevators, etc

Central ventilation



Decentral ventilation



Facade cladding

The facade's design is a result of an interdisciplinary process, where design, engineering, and operation go hand in hand. The various vertical angles on facade elements help form a passive sunscreen through shadow effects. This avoids the need for automatic exterior sun shading or other forms of shading that require greater operating and maintenance costs. The use of aluminium panels in the facade contributes to a more sustainable construction.

More than half of the aluminium currently produced in the EU comes from recycled raw materials, and this trend is increasing. As the energy used for the recycling process is only equivalent to approximately 5% of the energy used in primary production, the environmental and economic advantages of using recycled aluminium speak for themselves. Aluminium is one of a handful of metals that can be left in their natural condition without any forms of finishing. Aluminium will naturally oxidise when exposed to air, and this thin film of oxide then fully protects the aluminium from further oxidation. Aside from maintenance for aesthetic needs, untreated or treated aluminium does not require maintenance.

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Looking at the lifetime of aluminium, the majority of building components are made of alloys that are water, corrosion, and UV resistant, which ensures optimal condition of the material over a long lifetime. The facades are constructed as light prefabricated sandwich panels.

Ventilation

In addition to the decision to use decentralised ventilation, a technical and economic analysis was carried out of a concept involving central and decentralised ventilation for ALSIK.

Room height
Decentralised ventilation creates a greater room height, meaning that general floor height is maintained throughout the entire building.

Mechanical shaft
Use of central ventilation would involve 7 m^2 on each floor. The use of decentralised ventilation avoids the need for mechanical shafts on every floor, which means that two additional hotel rooms can be established. From an overall economic perspective, this is a cost-effective solution, as it creates more revenue per room.

The mechanical room is also reduced by 60 m^2 through the use of decentralised ventilation.

The many decentralised ventilation units are a cost-effective solution over the long term, as they minimise operating and maintenance costs and major interventions in, for example, mechanical shafts or suspended ceilings.

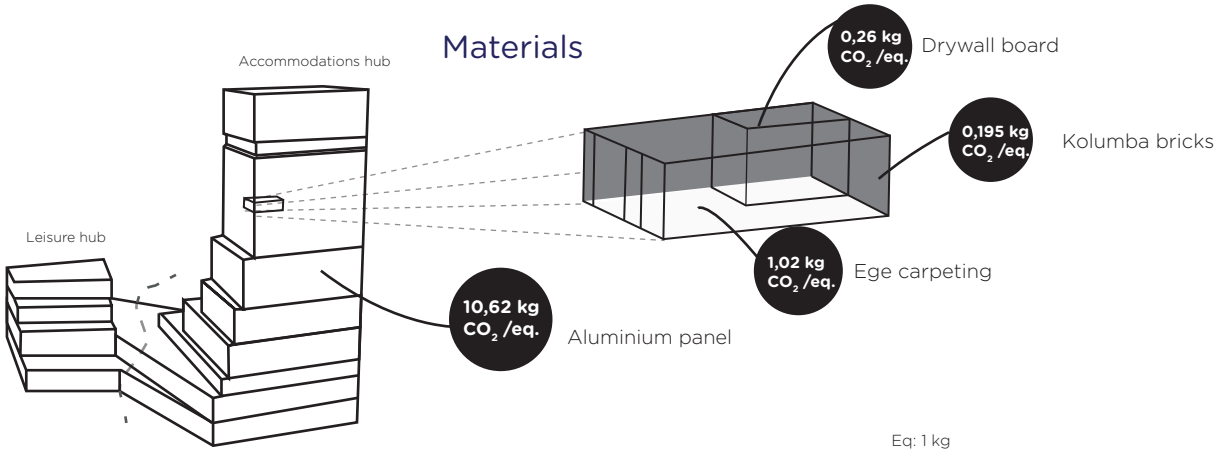
Decentralised ventilation systems have short and easily accessible ducting routes and a uniform procedure for servicing the systems, in which filters must be changed twice a year. Servicing of fire dampers is not necessary, either.

The choice of decentralised ventilation means that energy consumption is minimised, as these systems have a low SEL value.

ENVIRONMENTAL SUSTAINABILITY

The description of ALSIK's environmental and technical sustainability takes a closer look at how the various technical solutions contribute to better energy consumption, thereby minimising environmental impact. It also examines the quality of the thermal envelope, the suitability of building materials for reuse, installation engineering solutions, and the building's energy-efficient use of space in the immediate surroundings. The Bitten & Mads Clausens Fund is an investor in Project Zero, which is a guarantor of driving the area towards CO_2 neutrality by 2029. CO_2 neutrality depends partly on using renewable energy supply (wind energy) and district heating to the greatest extent possible, and partly on how the infrastructure in the area promotes the use of bicycles. In addition, ALSIK's location and orientation in relation to other buildings and choice of materials, reduces the CO_2 footprint.

ENVIRONMENTAL SUSTAINABILITY



Exterior materials

ALSIK is clad with aluminium panels on the facade, which is described in the economic section in terms of operation and maintenance. Aluminium is a sustainable material in terms of reuse and recycling. During and after ALSIK's lifetime, renovation or replacement of facade construction can mean that the aluminium sections are sent to be ground down. This follows a "cradle to cradle" cycle.

In addition, several studies show that aluminium construction products do not constitute a danger to inhabitants or the surrounding environment. The alloy surface treatments used (either coating or anodization) and chemical materials used are all neutral. Aluminium elements have no negative effects on either indoor air quality or on soil, surfaces or groundwater.

The average GWP (global warming potential) is 10.62 kg CO_2/eq, see Ökobaudat.
The facade is also constructed from panel sections, which allows for easy removal.

Interior materials

Interior walls
Drywall panels from Knaff Danogips are used as building materials for interior walls.

This manufacturer is ISO certified, meaning that they have shown good management practice in terms of quality, environment, and working environment. The average GWP (global warming potential) is 0.26 kg CO_2/eq, see Knaff Danogips for a general drywall board.

Interior cladding
FSC- and PEFC-certified wood from Kebony is used; similarly, all oak used for cladding, flooring, and other is FSC-certified. This means, among other things, that the wood material is harvested in a manner beneficial to the environment, the climate, and the local population, and is traded under fair market conditions. The wood can also be used for other purposes, in the event of future replacement or other.

Floor surfaces
Flooring consists primarily of oak wood flooring from Hrvatske Šume and carpeting from Ege. The oak wood flooring is FSC-certified and treated with natural oils and lacquer that will not dissolved during cleaning. This helps limit off-gassing and nuisance odours. Ege floorcoverings hold several certifications in their production of carpets. These include EPD and C2C (Cradle to Cradle), meaning that the carpets have undergone a lifecycle assessment and are suitable for recycling. The process behind the production of the carpets has also been sustainable through reuse of water and remainder product, for example. The average GWP (global warming potential) is 1.02 kg CO_2/eq, see Ege carpets.

Wall cladding

Kolumba bricks from Petersen Tegl are being used in the future restaurant on the ground floor. This can be categorised as an economically sustainable deliverable, as it has a direct and growth-oriented economic effect on community and business. In addition, it also has a positive effect on the environment, as most of the production takes place in the surrounding area. This serves to reduced CO_2 emissions from transport. The product is degradable without further processing, which means that it can be used as road filling or as a bricks in new construction. In the production of the bricks, all discarded bricks are crushed and recycled into clay in brick production. Similarly, all process water is captured and recycled.

Petersen Tegl A/S has voluntarily implemented the international standard ISO 50001 Energy management systems.
The use of this international standard ensures effective use of energy. The company thereby reduces its emissions of greenhouse gases and other environmental impacts and achieves increased competitiveness over the long run.

The average GWP (global warming potential) is at 0.195 kg CO_2/eq, see EPD Denmark. This is specified for general bricks, though the production procedure is the same for a Kolumba brick.

ENVIRONMENTAL SUSTAINABILITY

Energy-efficient use of space

Energy-efficient use of space

The placement and orientation of the building has been described previously with respect to urban integration. The energy-efficient use of space accounts for the building's design, location, and orientation with respect to heating and cooling demands.
ALSIK's integration with surrounding buildings and measures to improve the microclimate around the building can be seen in both the design and the various building elements.

Green roofs

The building's offset vertical facade elements form passive sun shading that helps shield sunlight and thereby reduce heating in the individual rooms. In addition, sedum coverings on the lowest roof surface contribute positively to cooling of the building, the air around the building, and the removal of runoff from the roof.

Green roofs provide shade and remove heat from the air through evapotranspiration, which reduces the temperature on the roof surface and in the surrounding air. On warm summer days the surface temperature on a green roof can be cooler than the air temperature, while the surface on a conventional roof can be up to 50°C. This is a reduction in the urban heat island phenomenon, where the microclimate around the building is optimised.

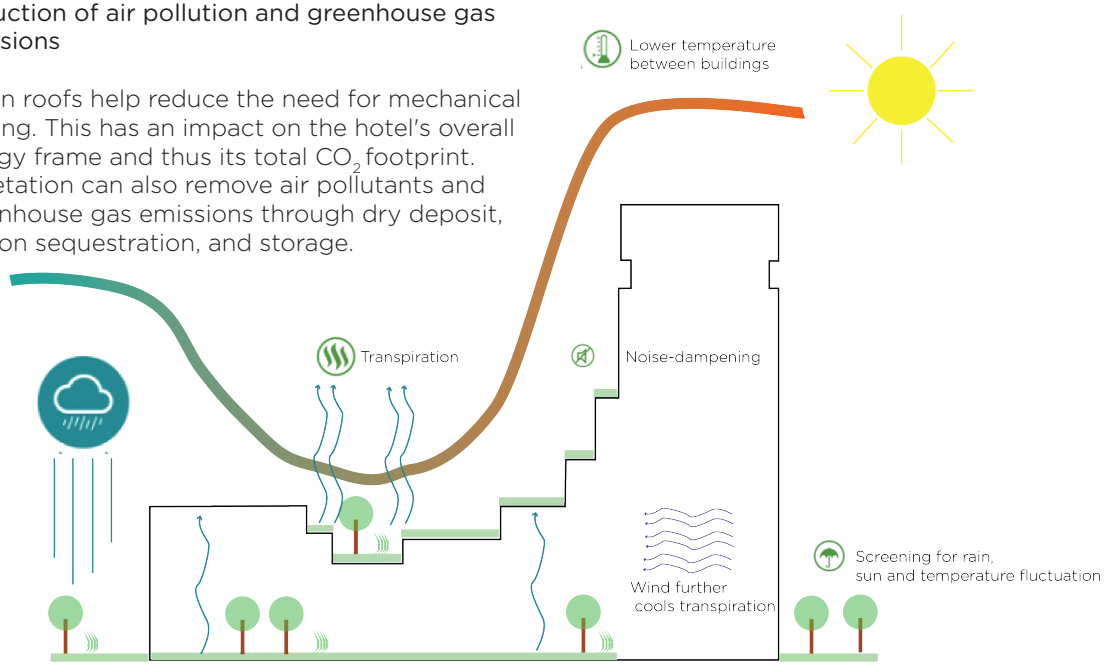
In addition to the reduction of urban heat island effect, the benefits of green roofs also include the following:

Reduced energy consumption

Green roofs absorb heat and function as insulators for buildings, reducing the energy necessary to deliver cooling and heating.

Reduction of air pollution and greenhouse gas emissions

Green roofs help reduce the need for mechanical cooling. This has an impact on the hotel's overall energy frame and thus its total CO_2 footprint. Vegetation can also remove air pollutants and greenhouse gas emissions through dry deposit, carbon sequestration, and storage.



Improvement of human health and comfort

Green roofs can to a certain extent reduce heat transfer through the building's roof and thereby improve indoor comfort and reduce the discomfort associated with heat waves.

Improvement of stormwater protection and water quality

Green roofs can reduce and delay run-off of precipitation that is also filtered of polluting particles through the sedum roof.

Biodiversity at Hotel Alsik

Green roofs provide aesthetic value and are a habitat for many species. They can maintain a series of plants and invertebrates and provide a habitat for various bird species..

Urban Heat Island (UHI)

The fact is that urban areas, which are characterised by massive constructions that reduce local vegetation, are subject to a large amounts of solar radiation (short wave), that is only partially released into the atmosphere through radiation. The UHI effect is therefore high, as building stock and outdoor areas absorb heat.

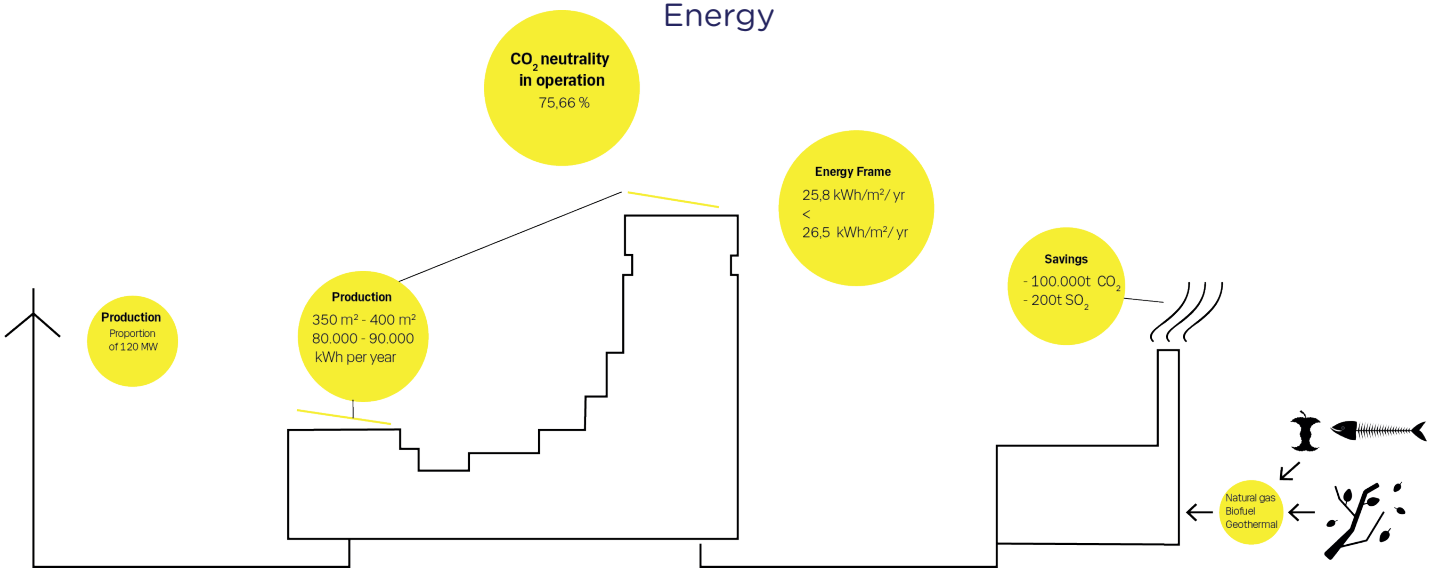
On the other hand, green areas and rural districts generally show a reduced UHI effect. This is due to the evaporation from green areas that cool the temperature locally. The wind further reduces the temperature when it comes into contact with the evaporation, as shown in the illustration.

Several studies show that the city's microclimate affects the energy consumption of buildings, as the site and design of the buildings establish passive forms of shading and cooling wind patterns.

ENVIRONMENTAL SUSTAINABILITY

ENERGY

ENVIRONMENTAL SUSTAINABILITY



Energy Frame

The overall energy frame for ALSIK is 25.8 kWh/m²/-year, which is less than the energy frame required for building class 2020 of 26.5 kWh/m²/year (weighted between requirements for restaurant, spa, and hotel). This means at the same time that the hotel has a CO_2 neutrality of approximately 75.66% in operating condition. This is calculated on the basis of deviation from the energy frame requirement.

Solar cells

Integrated energy supply solutions are utilised through solar cells. Roof surfaces are optimised for the integration of solar energy solutions and to minimise generation of shadowing over the solar cells, the ventilation system is located in the cellar.
The solar cell system is a good economic buffer, as a monetary savings is realised through the sale of power not used within the same hour as it is produced.
Approximately 180 m² is to be placed on building section A, and 220 m² on building section B. With a system efficiency greater than 85% and a 30% pitch facing south, this contributes approximately 80,000 to 90,000 kWh per year.

Other advantages for the building and the local community:
· The lifetime of solar panels ranges from 30 to 50 years
· Even in the summer months, when energy costs rise, the solar panels cool the building, which requires less energy consumption.
· Silicon, the key material in solar cells, is the greatest natural resource on earth. It is safe to work with and easy to dispose/recycle.

Wind energy

It is planned that the wind farm that the BMC fund has chosen to support through Project Zero will be able to deliver power to ALSIK.
The wind turbines will have a total output of 120 MW

District heating

As part of Project Zero and Havneselskabet's vision of a CO_2-neutral district and city, the goal is to use district heating as the primary source of heat. District heating in Sønderborg is produced from waste and wood chips, which is supplemented with geothermal energy and natural gas during peak loads.
The waste comes from Sønderborg, Aabenraa, and Tønder, and comprises approximately 70,000 tons per year. Since both heat and electricity come from energy sources that are nearly CO_2-neutral, there has been no need to look at alternative energy soruces, when designing the hotel. District heating optimally covers the need with respect to both economy and environment.

The Sønderborg heat and power plant provides both warm utility water, heating and partly electricity.

In order to reduce energy loss in the production of hot water and at the same time prevent growth of bacteria in utility water, warm utility water is pre-treated with a DCW electrolysis generator that allows a reduction of flow temperature from 55C° to 40-45C°. The generator produces on-site disinfectant without chemical additives.

ENVIRONMENTAL SUSTAINABILITY

Engineering

Waste management

Waste is sorted at minimum into the fractions established by Sønderborg Municipality for household and commercial waste.

The "first-pass" sorting of the waste takes place as close to source as possible - it should be as easy to handle sorting waste as it is to handle daily cleaning.

Handling of waste is not meant to disrupt either users or residents in the district. The solutions for waste management are robust and future-proof. There is a zero-sum goal for the green areas; in other words, waste from green areas must be recycled locally to the greatest extent possible.

Rainwater

Rainwater is not used for flushing toilets, as this is not permitted by the Danish Environmental Protection Agency.
As ALSIK is located close to Alssund, it was not necessary to establish a local rainwater drainage system for the building. The rainwater from neighbouring buildings is, however, connected to a WSUD system, so as to avoid overloading the sewer network around the hotel, which could cause flooding.

Water

As part of Sønderborg Havneselvskab's vision of a sustainable waterfront area, there has also been a focus on water-saving measures. Toilets are dual-flush. The latest glass filter media technology is used in the spa and pool area to reduce use of chlorine. Glass has a lower density than sand filters, which increases filter efficiency by approximately 30%. In addition, glass filters use 15% less material for an equivalent size filter.

The density of glass improves water circulation. Glass filters consequently require less cleaning and consequently consume less water (back-flushing).
This results in up to 23% less water consumption, which again reduces energy and water costs. In terms of operating cost, a glass filter is more cost-effective than a sand filter, as it lasts for up to 5 years before replacement.

BMS + ELEC

Technical systems such as ventilation, heat, service water, and light are regulated through a BMS system. Heating and cooling in hotel rooms is connected to the booking system and registration of room use, so it is only active when in use by guests - the booking system is integrated into the BMS system. Reduction of energy consumption through the BMS system's building automation is effective, and helps save a considerable amount of energy and thus reduces CO_2 emissions.

Danfoss Novocon

The ventilation flow is regulated by a Danfoss Novocon actuator. The advantage with this actuator is that it can be remotely operated online, which saves considerable time during installation and commissioning of the system and over the many years in which the building is in operation. It also enables errors and damage to be avoided ahead of time, as these will be predicted by system data and operational status.

All rooms with intelligent building installations (IBI) - zone control is established with window switches to turn off heat.

ENVIRONMENTAL SUSTAINABILITY

Ventilation

Cooling

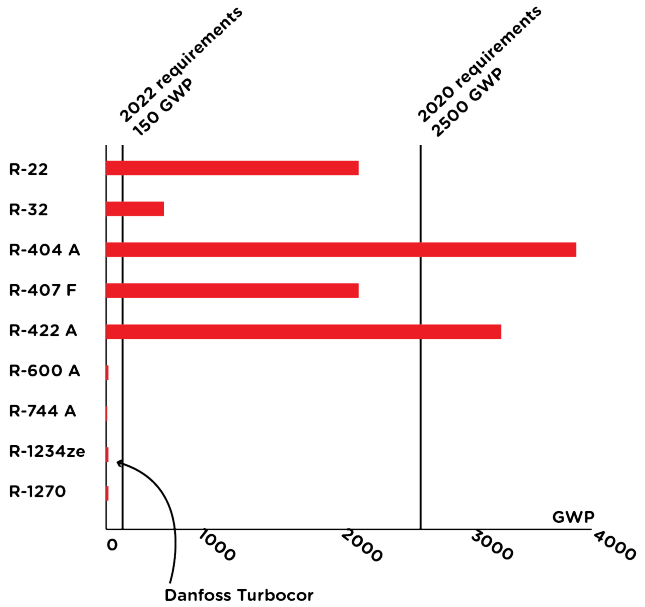
ALSIK uses mechanical cooling and free cooling when possible. This means when the outdoor temperature is 2 degrees below room temperature. Free cooling is an energy-friendly supplement, where significant energy savings can be realised, thus resulting in relatively significant cost savings. The difference between return on investment in a 100% mechanical cooling system and a cooling system with integrated free cooling typically pays for itself in less than 1 year. The entire investment typically pays for itself in less than 3 years.

A Danfoss Turbocor cooling system has been installed with a COP of 5 (where the standard is around 3 to 3.5). Sea water cooling was proposed as an alternative to mechanical cooling, but since the sea water temperature in the summer months required additional energy for cooling, this would not be sustainable in the long term. Additional technical measures for cooling of sea water would have required more economic input for installations and operation.

The cooling medium used in the Danfoss Turbocor is of the HFO 1234ze type, which is ground-breaking for its ultra-low GWP (Global Warming Potential) of below 7. This means that one ton of HFO 1234ze will result in the same amount of warming as 7 tons of CO_2.

The GWP standard values are used to convert various gases into equivalent amounts of CO_2. These conditions are based on the so-called global warming potential (GWP) for each gas, which describes its overall warming effect in relation to CO_2 over a given period - normally a hundred years.

Starting in 2020, the GWP for cooling media used in new systems must be less than 2,500, and from 2022 onwards the GWP index must be less than 150 for centralised direct expansion facilities with an output of more than 40 KW.



Turbocor is also oil-free and has a significantly reduced noise level. In terms of working environment, this contributes to a better working environment for ALSIK operating personnel and users.

Cooling systems for hotel and spa are integrated to exploit symbiotic effects; for example, surplus heat from cooling of the hotel section is used for warming of hot service water through heat pumps.

An energy buffer tank in the cellar stores heat; the buffer tank serves as an operating tank on the cooling side. If surplus heat from cooling systems is not sufficient to heat the hot service water, it is supplemented through district heating from Sønderborg Fjernvarme.

Ventilation

Decentralised ventilation
From an environmental engineering perspective, the decentralised ventilation in the individual rooms helps reduce overall CO_2 consumption. Because the systems adapt to the activity of the individual space and user operation.
Since the system is positioned close to the facade, energy loss from transport of exhaust air is avoided. The systems have an effective SEL value, as less energy is used to move the air. In addition, the heat exchangers in the systems have a high efficiency rate of between 80-90%. Seen over the lifetime of the building, decentralised ventilation systems have significantly less energy consumption than central systems. Operating and maintenance costs, are slightly higher, however.

Like heating, utility water, and lighting, ventilation is connected to a BMS system. The possibility for natural ventilation also reduces the use of the decentralised system, which automatically shuts off via the BMS system when a window is opened. All ventilation systems are frequency-regulated in relation to demand for cooling and CO_2 reduction in the rooms, which delivers increased flexibility and operational reliability. All pumps are pressure-regulated in relation to the heat demand in the facilities.

The many decentralised ventilation units are a cost-effective solution over the long term, as they minimise operating and maintenance costs and major interventions in, for example, mechanical shafts or suspended ceilings.

LIVEABILITY

The building's interior design, facilities, and coherence with the surroundings form the basis for a liveable building, where there is good comfort, user-friendliness, and sound options for well-being - factors that increase quality of life.

LIVEABILITY

Liveability

Liveability describes the conditions that must be met to create a good life for all inhabitants in cities, regions, and communities, when it comes to their physical and mental health. Sustainability is a fundamental prerequisite for improved living conditions, as all aspects of social, economic, and environmental sustainability each benefit the user of a building or city district in their own way.

ALSIK - a liveable building in a liveable city district

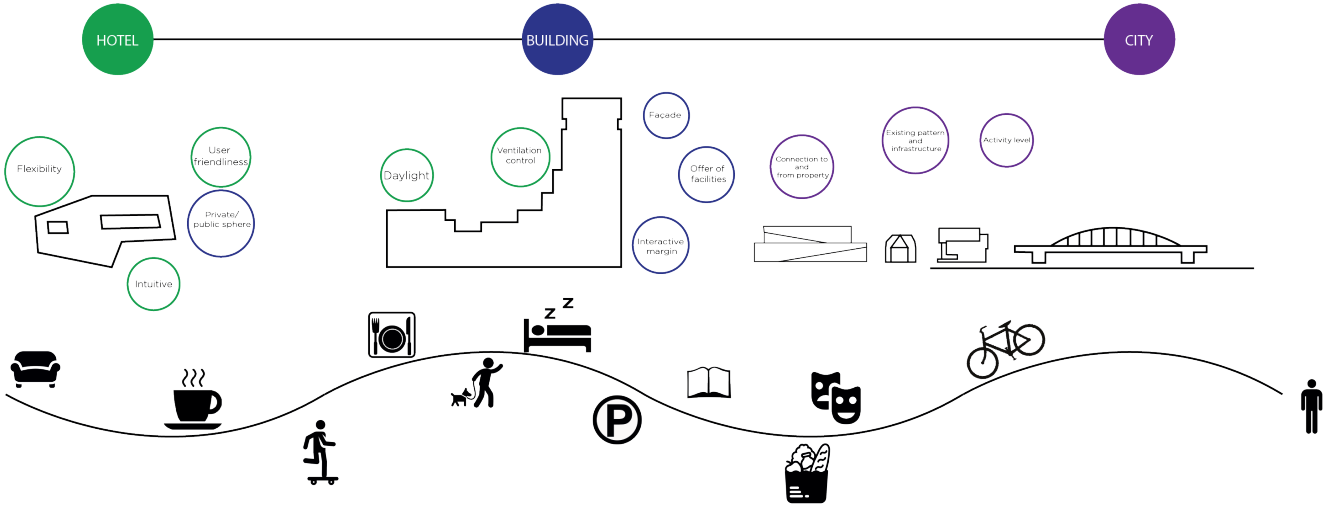
Sønderborg Havneselskab's vision is to create a fully cast and cohesive waterfront district that connects the two sides of the strait with the rest of the city. New facilities, urban pockets for recreational activities, shortcuts between buildings, cafes, etc. must all help invite citizens and visitors to use the city and the waterfront in a new way.
The figures to the right show how ALSIK, with its many facilities, will function as a dynamic unit in the waterfront area throughout all hours of the day.

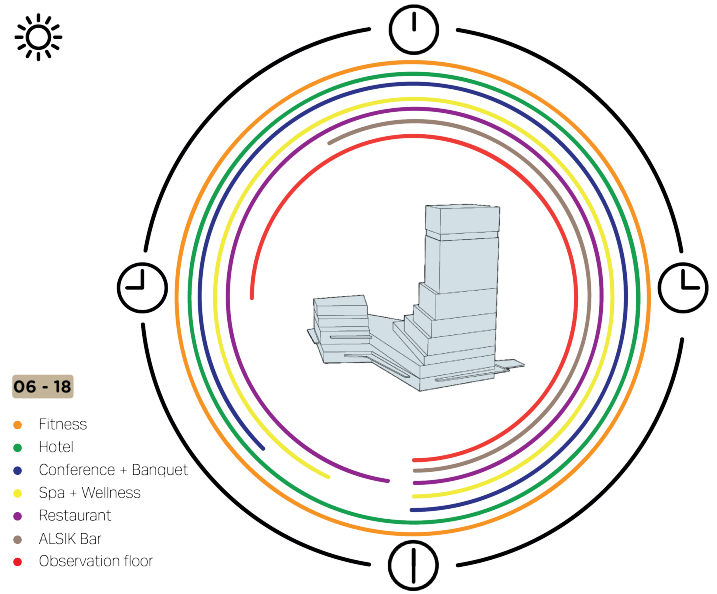
Activity will be underway at all times of the day, which positively contributes to the new adjacent squares and waterfront promenade .

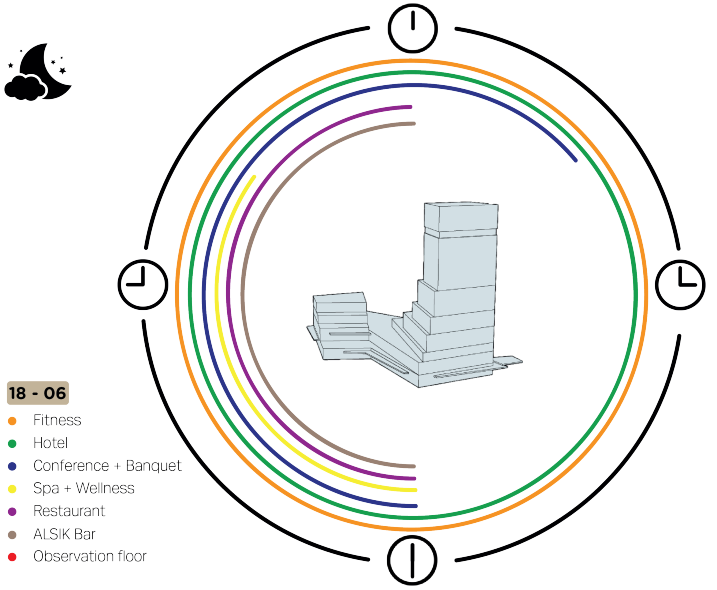
Sustainability in context

Consideration for people, the environment, and economy are matters of course, and the source from which quality in function and aesthetics arises. The purpose here is to find a solution that integrates with the city so that the buildings do not appear as independent islands in the area. Furtheremore liveability is concerned with the building itself- in other words the solution of, for example, daylight, layout, good cycling facilities, transition to green areas, etc. - parameters that have both environmental and economic implications for the buildings over the long term. Liveable construction is based on design measures in the building that benefit both the user and the building itself. The conditions apply not only to hotel guests, but also to daily visitors, restaurant guests, citizens, staff, and users of public facilities.

The figure below shows how ALSIK will meet these needs on an everyday basis. Whether it is dinner in the restaurant, a workout in the fitness centre, a look out over the city in the evening or just a walk on the square in front of ALSIK, the building form, layout, and urban integration all serve to tie into the city's infrastructure and facilities.







Rambøll A/S
Oluf Palmes Alle 22,
8200 Aarhus N,
Denmark