Home ground
New Aarhus Stadium

Team Cobe

Aarhus Home ground

A stadium is more than a building. It is a home ground, a gathering point, and a space for emotions. In the same way that the home is more than bricks and rafters, the stadium forms a framework for history, memories, traditions, and emotions.

When people meet with a shared purpose, they feel the strength of the collective and nothing seems impossible to achieve. Competing through play within agreed rules has since the ancient Greeks served this important social purpose. Together you feel the strength of community. By believing in a shared goal, people move mountains. Believing made David defeat Goliath. Together we share the sweet victory. Together we share the sorrow of defeat.

This is the role of a stadium. It is the focal point of the club's identity.

Each club has a "spirit" or "soul". It is the interplay and emotions between players and fans, history and moments. The stadium is the unifying framework, the mediator between the two. Here, the harmony is created across time, in Aarhus, through more than 100 years of history.

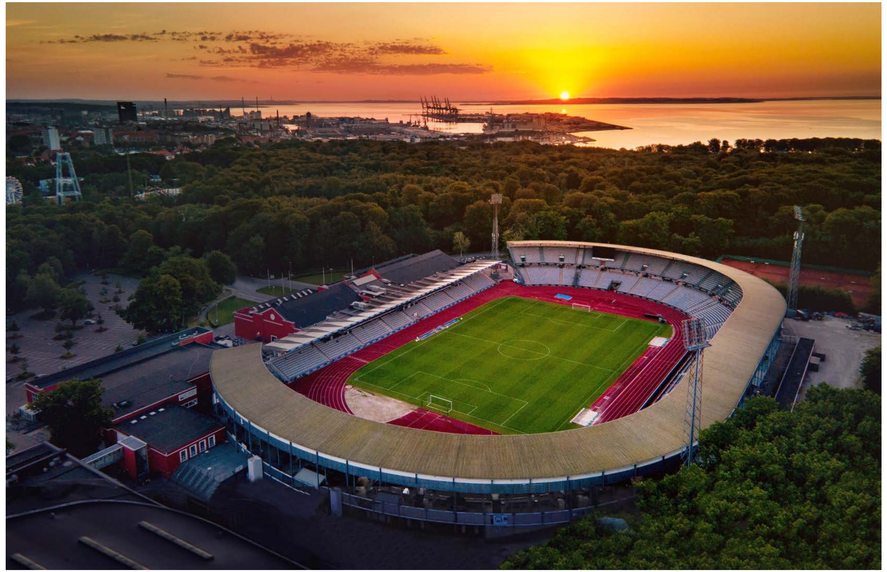
Through the repetition of rituals and through the recognizability and storytelling of the physical environment. Recognizability and team atmospheres are important elements that can create a feeling of "home ground" in the architecture, the spaces, the décor, the stands and the pitch.

With our proposal for a new stadium in Aarhus, the aim is to create a modern stadium, that sets contemporary standards for the stadium experience, while being rooted in the history of this unique location and the rich traditions of AGF.

The new stadium will drastically improve the visual, sound, comfort experiences of the spectators and players, create better proximity and visibility to the pitch, while being rooted in the spirit of club and site.

But our proposal is not just a proposal for a new building. It is a catalyst of experiences. Experiences that will be stored as memories in people's lives. Experiences of companionship, unity, and community. Experiences of being part of something bigger and part of history. The future new stadium of Aarhus is not just a structure. It is a place, a landscape, a route. It is embracing history and pointing towards the future. A total experience anchored in the beautiful Kongelunden in Aarhus.

A new stadium for the whole city



Aarhus Stadium Today
Today Aarhus Stadium is a unique stadium in Denmark, due to its fantastic location in Kongelunden, surrounded by the lush forest and park landscape, and high cultural heritage buildings.

However, this only 20 years old stadium is today challenged when it comes to fan experience, weather protection and VIP facilities.

How can we build a new stadium in this unique location with respect for the existing cultural, natural and architectural qualities?

How can we create a new and better stadium experiance, on match days and for the everyday experience?

And last but not least - we have to ask ourselves, how can we "harvest" the ressources and CO2 build into the old stadium and re-use these as a ressource for building the new stadium in a sustainable way?

New Aarhus Stadium
Aarhus Home Ground will be a new and iconic stadium and place for future matches, events and everyday life for the citizens of Aarhus. A destination in the city to be proud of. For AGF and for everyone.

The new stadium will establish a close dialogue with the magnificent natural setting of the forest, by the unique facade concept of "the cone in the clearing of the forest", with facade scales inspired by the leaves of the trees of Kongelunden - filtering light and atmosphere.

The new stadium is respecting the cultural heritage of the Aarhus Sports Park in its way of scaling the large volume down to a human scale, and by adapting to the local red-tone colors of the heritage buildings on the exterior.

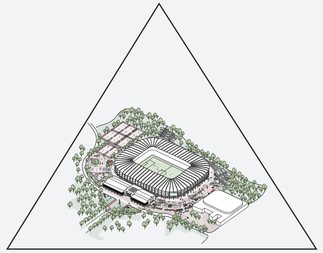
The new stadium creates a state of the art fan experience, with improved shelter and microclimate, with intimacy and proximity to the pitch, and with a white interior canvas for "De Hvide",

The project is built on a sustainability strategy, that includes upcycling and reusing building components from the old stadium in parts of the new stadium where this is beneficial, as well as throughout the Sports Park area. To use as much as possible of the existing terrain and building materials already at hand in order to build in a smarter way with respect for our ressources.

The new stadium in the Sports Park will be a catalyst and a gathering place in Aarhus. It will generously give back to the city. A series of urban squares surround the stadium along the concourses and offer different activities both on matchdays, for events and everyday life.

1. Architecture
- A Ground-breaking Aarhus Icon

“International stature and quality”
“Goundbeaking and beautiful”
“Heritage: relate to culture-historical surroundings”



2. Functionality and technical solutions
- A modern and intimate stadium

“Perfect fan experience”
“Steep single tier bowl”
”State of the art stadium”

3. Construction costs and robusness
- Flexible and feasible solutions

“Robust and realistic construction cost”
“Respect for financial framework”
“Buildability”
“Sustainablity”

Content

This booklet is organized in three chapters that answers to all the main evaluation criterias set up in the tender. The criterias must be balanced and united, to ensure an integrated design that balances architecture, funtionality, technical solutions, cost and feasibility - a design that is robust to develop and realize through a partnering process.

1. Architecture

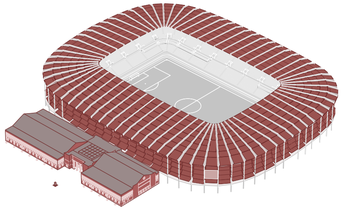
A Ground-breaking Aarhus Icon

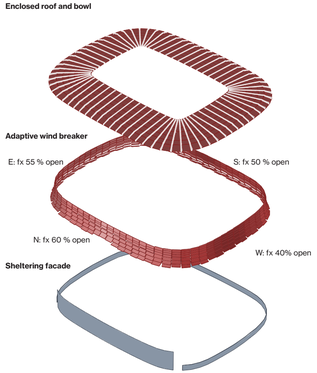
A new ground-breaking icon for Aarhus - The cone in the forest.

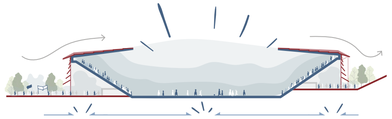
The new stadium of Aarhus appear as a ground-breaking design of international stature and quality that relates to the natural and beautiful site in Kongelunden. An arhictecture that resemble a pine cone placed in the natural clearing of the forest, will become a new architectural icon in Aarhus, and an international destination.

The new voluminous and grand stadium will be scaled down in respect of the forrest and cultural setting of the site. This is achieved trough a facade skin of scales, that interprets the magnificent structures of a pine cone. The facade scales creates at the same time an efficient microclimate protection inside the stadium while openening up to filter light as the leaves of the beech trees of Kongelunden - and at night glow like a lantern on the natural site.

To achieve the vision of creating a modern and iconic stadium that is rooted in the local identity and AGF club soul, we have based the design on a series of 6 simple strategies:







1. Heritage red on the outside - AGF white on the inside
The new stadium should have a clear dialogue with the old neoclassical Høgh-Hansen building, that today physically materializes the identity of the club and Aarhus Sports Park. Reinterpreting and enhancing the architectural motives of symmetry, columns and verticality, niches and interior public spaces, the red and white colors of the architecture, Dannebrog and the Danish national team.

But when entering the building, you enter AGF country. The white club signature color characterizes the interior, as a white canvas for fan art, banners and life. Contrasted with detailes of the secondary club blue as wayfinding markers.

2. A perfomative and flexible facade
The facade is designed as a performative and flexible, sheltering skin that adapts to the various microclimate conditions around the stadium. As a coat consisting of 3 distinct and robust layers:

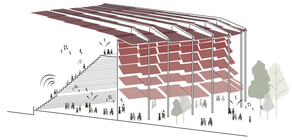
- An enclosed roof and bowl: The upper part of the facade is completely enclosed. Together with a roof double the extent of the existing stadium roof this creates great conditions and shelter for the crowd on the stands.

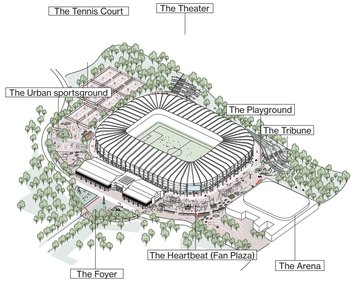
- An adaptive wind breaker facade: Below a 5 meter protective roof-canopy, the facade scales that embrace the stadium acts as a wind breaker that closes of where most needed due to local wind conditions, and opens where possible to allow for natural ventilation of the concourses and filter in daylight.

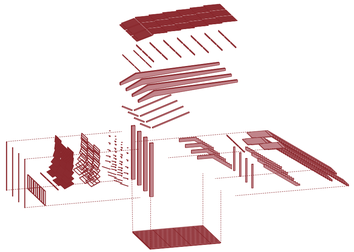
- A sheltering curtain wall glass facade: Surrounding the ground level of the concourses is a 4 meter high glass facade to create perfect protection of the crowd and the concession areas. Towards north the curtain wall expands to fully climatized facade on the main stand building.

3. A Perfect fan experience - A modern and intimate stadium
The new stadium shall set new standards for the stadium experience, through comfort, atmosphere and intimacy, proximity and visibility to the pitch, while implementing a state-of-the-art architecture that embodies the identity of the club. Better fan zones, active and sheltered concourses as well as good, integrated main stand facilities will constitute a whole new experience of togetherness around the game and prolong the time spent before and after a match.

Today the existing the running track creates a vast distance between fans and players, and the two-tear stands creates a windblown stadium. But the new stadium with its 'super steep', one-tear terrace creates a state of the art intimate fan experience - A stadium for opponents to fear.







4. A welcoming building - Scaling down and inviting in
A modern stadium is a massive building - therefore it is important on one side to scale down the facade, and on the other side to a create functional and beautiful coherence between the inside and outside the building – including activation of the façade, particularly as towards the Fan Plaza.

The roof canopy design and the facade elements scale down the facade towards ground level, where openable glass facades creates interaction between exterior and interior, on eventdays and everyday.

The concourses hereby become a continuation of the public realm, creating covered urban spaces on normal weekdays and during events such as Aarhus Festuge and market days.

5. More than a stadium: A pearl necklace of urban spaces for Aarhus
The new stadium will give back to the city of Aarhus. The stadium and its surroundings will constitute a new active clearing in the forest of Kongelunden. A series of new, urban spaces that surround the stadium will activate the sports park and establish a vibrant destination throughout the week.

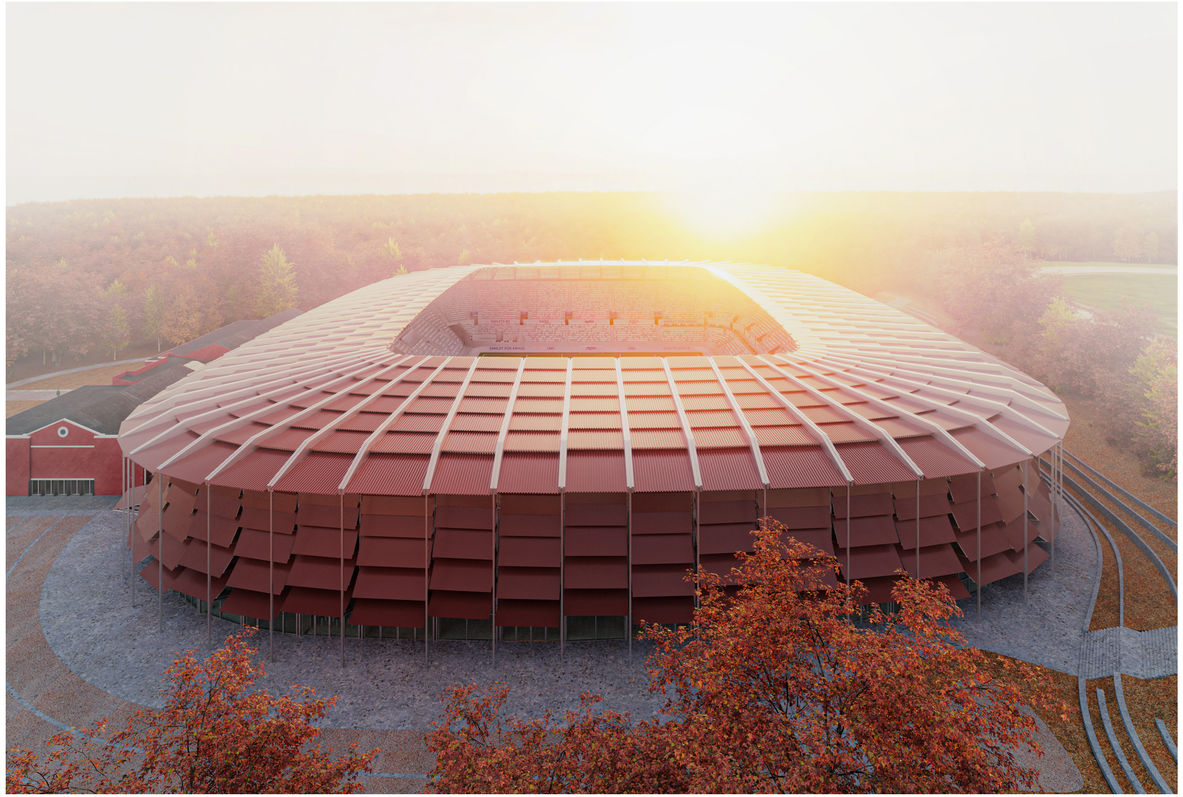
Good microclimate is created by trees, landscape elements and covered edge zones that create shelter around the façade, while allowing for the massive flow of fans on game days.

The new stadium will strengthen and celebrate the Aarhus Walk. By continuing and developing the axis from Ingerslev Boulevard to the ball on the center of the pitch, through a renovation of the "column hall", establishing a new visibility and transparency in the axis and creating a new column hall in the future stadium.

6. A sustainable, robust and feasible stadium, designed for reuse
Building a new stadium represents a vast amount of resource, that should be wisely designed to minimize carbon emissions. Through clever reuse of elements from the existing stadium, as well as minimizing removal of existing soil, the project aims at creating new standards for sustainable stadium architecture.

The building system is modular and robust - designed for the danish conctractor market and prefab element production, to respect the tight construction schedule and the planned partnering design process. The base design is robust and adaptable to accomodate options or cost-optimization without altering the core identity and aesthetic of the design.

The building system is based on 'design for disassemby' principles, to prepare the building for future changes, and sustainble maintenance.



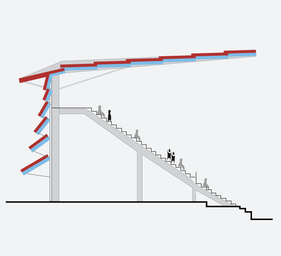
Heritage red on the outside, club white on the inside

Red on the outside
The color scheme of the stadium has been carefully designed to both fit into the Aarhus Sports Park and to reflect the AGF identity and club colors.

On the outside, the facade skin lends its colors from the heritage buildings of the Aarhus Sports Park - the significant red facades with the white details and white columns. In the new stadium we interpret the red to an autumn red/brown-ish warm colortone.

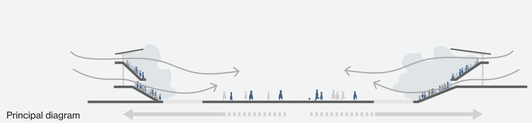
Transition
As you walk the "Aarhus Walk" trough Stadium Allé, you will experience the stadium and the Høeg Hansen heritage buildings significant red and white elevation. But when you move close to the facade, dominated by the white colour. You become embraced by the white colour of the colums and the underside of the facade scales as you move around the edge zone of the building, and when you transcend the facade into the concourse and the bowl, you are in the spaces of "De Hviie".

White on the inside
On the inside - in the concourse and the bowl - it is all about the game and strengthening the AGF fan experience. Here the building surfaces and materials turn into the main club color - White colortones dominate the spaces, with allowance for details and wayfinding in AGF blue. The space is a white canvas for the club and the fans to decorate over time with banners, effect light, graphics, fan art. "Kom så de hviie!"

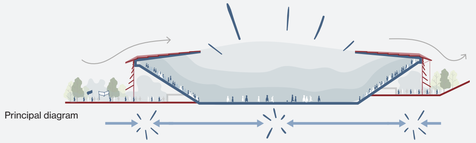


An intimate stadium - The White Bowl

The new stadium will create a superior fan experience with a design that amplifies the AGF identity. Steep terraces create intimacy and proximity to the pitch. The roof and facade layout highly improves weater protection and create good microclimatic conditions.



Principal diagram



Principal diagram

Challenges of existing Aarhus Stadium
The current stadium of AGF, despite being relatively recently built, possesses a series of challenges when it comes to fan experience, functionality and comfort. Issues such as:

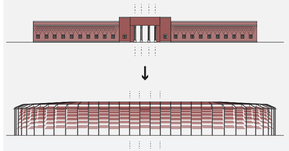
- Running track creates long distance from terraces to pitch
- Split terraces and flat inclination creates lack of intimacy
- Open corners in bowl creates poor weather protection and lack of intimacy
- Poor weather protection inside and outside the bowl
- The sound and energy is not contained inside the stadium, due to poor acoustics
- Nowhere to meet before and after the match
- Outdated VIP/hospitality facilities
- Poor toilet facilites and food/beverage facilities

Solutions in the New Aarhus Stadium
In the new stadium we propose a design to increase intimacy, fan experience, and make Aarhus proud again. This is achieved through:

- No distance from terraces to pitch: Maximum proximity
- Super steep single tier terraces to privide optimal intimacy and visual contact to pitch
- 360 degrees continuous bowl, creating a feeling of coherency
- Good and highly improved weather protection inside and outside the bowl, through a large roof and a performative facade.
- The sound and energy is contained inside the stadium
- Fanbar, Fanplaza and many other places to meet before and after the match.
- Modern and sufficient VIP/hospitality facilities
- Generous concourses with good toilet facilities and food/beverage concessions, protected against wind and weather.
- Fanzones for different groups of spectators

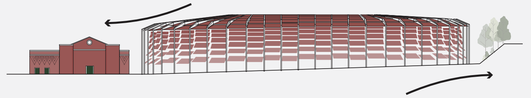
Embracing history and traditions

The architecture of the new stadium in Aarhus will at the same time fit in and stand out. It will embody the soul of the AGF and Aarhus Sports Park.
It will be an international sports icon in Aarhus and at the same time establish a dialogue with the historical architecture and the surrounding forest landscapes.



Learning from the heritage
The new stadium reinterprets the architectural motives of the heritage buidilng, that embodies AGF stadium today.

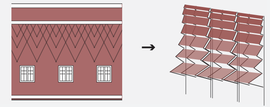
A horisontal base volume, symmetry, columns and verticality, niches and interior public spaces. The red and white colors refers to the local architecture, Dannebrog and the Danish national team, and are recognizable in the AGF logo.



Adaption to local conditions
The stadiums geometry adapts to the site, its landscape and context. The height of the roof structure is lowered towards the Høeg-Hansen heritage building to create a sensitive adaption to this lower scale.

As a further sign of respect towards the historic building, the new stadium is physically detached creating an urban space towards in between the two and retracts its columns and entrance niche to start dialogue with this.

The building ground floor follows the slope of the terrain towards south. We minimize costly removal of existing soil and create a building that adapts into a beautiful terrain.



Heritage motifs
The new stadium should lend its architectural principles the local and historic architecture from Aarhus Sports Park. The red buildings with white columns and architectural details have become an inherit part of the identity and experience of this unique place. The white column motif of the red heritage building, and its small white details and lines are reinterpreted and used as an architectural DNA of the new stadium. The details and structure of the new façade will appear as a nod to the ornamentation of the heritage Høgh-Hansen facades.


Arbejdernes
Landsbank
AARHUS

A series of urban spaces connected to Aarhus

Proud of Aarhus
Aarhus' new stadium will be a stadium for the whole city. AGF has been a part of Aarhus since 1880, and the current ground has been home for the soccer team for more than 100 years. Aarhus contains many sports clubs and teams, but the local stadium "of the city" play a unique role for its citizens - no matter which team you subscribe to.

The team is rooted in Aarhus, and the home ground is physically and mentally connected to the city.

The sports compound in Kongelunden is part of a larger cohesive experience, connecting the inner city of Aarhus from Ingerslevs boulevard to the Marselisborg forest. Where football, gymnastics, athletics, handball, volleyball, tennis, biking, riding etc. mix with cultural events and other social gatherings underneath the tree canopies. The stadium of Aarhus is an oval clearing in the forest. The place reminds us that we are all connected in flesh and blood, with nature under one sky.

This is especially experienced on game-days through the traditional "Aarhus Walk" - the stadium is bound together with the city. From Sankt Lukas Kirke and Ingerslev Boulevard, the processions from Stadion Allé to Johns Stampes Plads, the areas neoclassical signature 1920 building by Axel Høeg-Hansen, further through the magnificent "søjlehallen" to the center of the pitch is a point of reference in the urban context.

The Aarhus Walk
You arrive at the stadium through a sequence of cityscapes, spaces, and landscapes. Starting at the grand Ingerslev Boulevard that – in a way – defines the threshold to the periphery of Aarhus. The place of flea-markets and Sunday trips connects via Stadion Allé tree lined avenue through the most southern city blocks of Frederiksbjerg before passing villas and the large trees of Kongelunden, Tivoli "Friheden", Marselisborghallen terminating at the historic neo-classic buildings designed by Axel Høeg-Hansen in 1920.

Høeg-Hansens historic building is centered in the axis between Skt. Lucas Church and the stadium. The iconic red facades, white window bands and pillars, that reference the colors of Dannebrog, create a welcoming scale and invitation to the stadium. The centered entrance leads you to an internal "hall of columns" – "søjlehallen" – a square to pause in – a spatial well-defined transition between the outside and the inside. This is the historic function of this space, and by refurbishing this hall nearly back to its original state we imagine it will contribute to the future experience the way it was originally intended. By opening up the hall to the new stadium, we wish to enhance the visual connection from Stadion Allé to the pitch and "clean" the internal public space from unnecessary visual disturbance. We wish to create a sense of connection to the pitch as well as the sky above.

In our proposal, the future new stadium will be physically disconnected from the historic buildings of Høeg-Hansen creating a gap – a spatial pause – between the old and the new. The heritage building and the new stadium 'greet' in a central point on the axis where a recess in each façade open a dialogue and create coherence and dialogue between old and new. Spectators are led into a new "hall of columns" inside the north wing of the stadium. An atrium open to everyone connecting the concourse level, tunnel club, and membership tribunes in one democratic space. From here you will be able to access the view of the inner bowl of the stadium – rows of seats surrounding the common point of focus – the pitch. A welcoming and open structure - a clearing the forest.

Works of fine art are historically a natural part of stadium architecture and culture. Usually a celebration of great athletes, heroes, founders and donors. This is experienced at stadiums everywhere in the world.

At the stadium of Aarhus art has historically been represented as sculptures located in front of the historic building at every window section. Since second world war the sculptures have been distributed across Aarhus with only 3 still located on site.

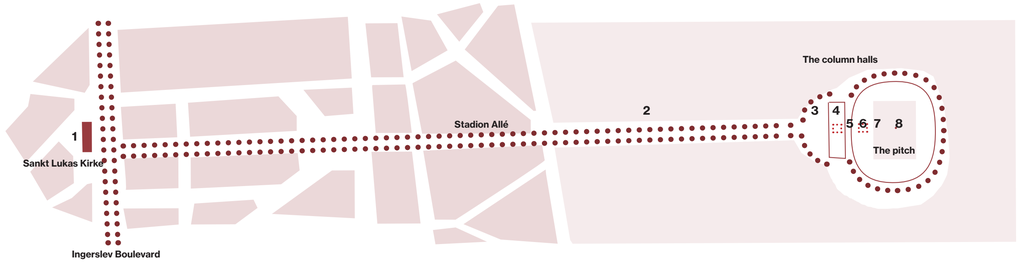
We believe the presence of art in relation to the cultural functions of Kongelunden and stadium should be present for future generations as well. Historic and future statues are proposed relocated in front and in the surrounding landscape around the stadium.

1. Sankt Lukas Kirke, Ingerslev Boulevard - The start of the Aarhus Walk.

2. Stadion Allé - The new stadium interacts carefully and respectfully to the neo-classical architecture.

3. John Stampes Plads - The historic public square is proposed renovated with cobblestones.

4. Høeg-Hansens heritage column hall - A democratic public space, restored to the historic intenions, cleaned up and opened up.



5. A new stadion main stand entrance - With a setback column motif in the axis, inspired by the heritage building.

6. A new column hall - a inviting atrium in the new main stand, with direct views to the center of the pitch.

7. The pitch, centrally placed on the axis.

8. The ball at end of the axis.

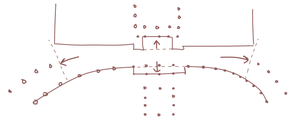
The Ceres Park stadium from 2001, was built directly together with the beautiful neoclassical heritage building by Høgh-Hansen. While this was creating an extra use of the historic building for VIP main stand functions, it also created a visual clutter in the column hall and a random perforation of the southern façade

In our proposal, the inner courtyard should no longer be experienced as a lobby for the VIP mainstand, but rather a public space as it was intended. This approach is strengthened by detaching the new stadium and the historic building, and by "cleaning up" the space and the facade.

Instead of re-establishing the exact expression of the historic façade, the intention is re-established - namely that the façade opened up towards the football pitch. Based on proportioning and detailing of Høeg-Hansen's stadium building, a new, open facade is proposed. The transparent façade element is retracted into a niche, like the frontal façade, creating an urban gesture, and a dialog between the two buildings in the continuation of the axis.

In principle this feature of opening the façade towards south a transparency and visibility emphasizes the view though the axis towards the ball on the center of the pitch.

For the other facades around the heritage building we propose to keep the existing openings with no further changes. This is due to the wish to preserve the existing character of Høeg-Hansens building, and to keep the enhance the function of the central column hall as a lively urban space and the main entrypoint of the halls and football museum.



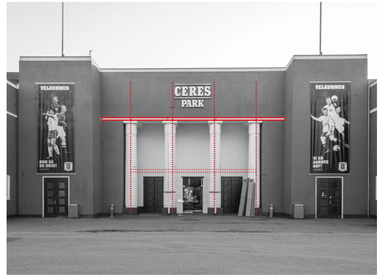
A dialogue between old and new
As a further gesture towards the builidng, the collonade of the new stadium stops when it meets the southern facade of the heritage building. Niches in the old and the new building create a dialogue and space in the central axis.

Embracing history - A dialogue between old and new

Original central part of south facade

Openings in south facade, current situation

New proposal for south facade that continues the axis of stadion allé



Principles in front facade used to design new south facade
1. Symmetric openings
2. Recess in facade
3. White color to enhance recess in facade
4. Slender beam

Openings in south facade, current situation

New propsal for south facade that continues the axis of stadion allé

A living and performative facade

Architecture that fit in and stand out
The architecture of the new stadium in Aarhus will at the same time fit in and stand out. It will embody the soul of the AGF and Aarhus Sports Park.

It will be an international sports icon in Aarhus and at the same time establish a dialogue with the historical architecture and the surrounding forest landscapes.

To achieve this vision, we have based the design on a simple series of architectural principles.

A dynamic and performative façade inspired by nature and sports

The façades of the new stadium will perform to a variety of different conditions. On the main stand building it serves as a climatic façade, while in the concourse and bowl it acts as a wind- and raincoat that allows for natural ventilation, filters the natural light in.

We introduce an architectural approach of the façade, inspired by nature and the dynamics and movement of sports: Tilted façade screens or "scales" are covering the facades in different angles, to keep out wind, but allow for filtered flow of air and light.

The stadium has a 4m heigh glas facade on ground level along the perimeter of the concourses to give good protection against wind for spectators, at the same time as the natural ventilation and lights that the scales offer.

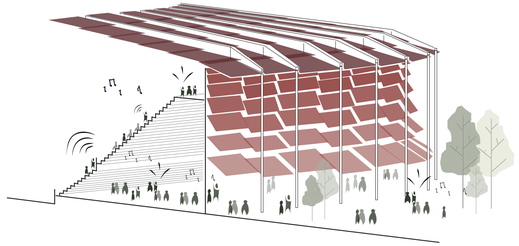
The façade scales look like a cone in the forest, lighting up like a lantern at night on events.

By using this design approach of a unifying facade language that can be adapted to both concourse, main stand, bowl, etc. the stadium achieves an iconic appearance that fit in and stand out.

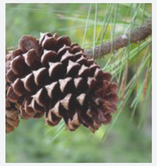
Human scale
A stadium has a vast building volume that can seem overwhelming in its context, for the visitors approaching it.

To create a human scale to the building, we have designed a compact roof structure that "bends down" towards the surroundings, achieving a lower appearance towards the surrounding forest – almost like it is tugged into the landscape. The façades biomimetic properties are directly inspired by the natural shapes and light of the forest, with its dynamic various angles and continuous perforations.

It downscales the facades, and gives a human scale, which is strengthened by an opening of the façade scales towards ground level. Here the scales create a covered edge zone with entrances in a column arcade that invite people in.

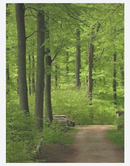


Natures dynamics as inspiration for the facade



A cone in the forest

Leaves filtering light



The dynamics of movement in football

The facade stands as a dynamic and living organism in Kongelunden. This image shows an option for integrating greenery in the fan plaza.

Materials, colors and architecture in balance with the natural surroundings

Aesthetic properties
The visual appearance of the facade should balance and co-exist with the beautiful natural surroundings of the forrest and the Sports park heritage building. The aesthetic properties are inspired by the leaves of the beech trees; profiled and perforated metal sheets on the panels/scales give a shimmering play with daylight in the white interor, and provides beatutiful relief in the facade. The red-brownish colortones of the exterior of the facade plates is sampled from the autumn leaves, and creates a respectful balance with the Hegh-Hansen heritage building.

Performative properties
At the same time each materials of the stadium should furthermore perform to a set of functional and climatic demands, as explained on the following pages.

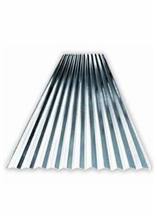
We propose to build with robust, sturdy, low-maintenance materials that we know have a long life span, as is easy to assembly and renovate on site. Light-tone concrete columns and pavement, sturdy steel props and profiled aluminium plates, each perform for their specific function.

Folding the metal sheets on the facade, is a cost-efficient way of imbedding strenght to an otherwise light and sturdy material.

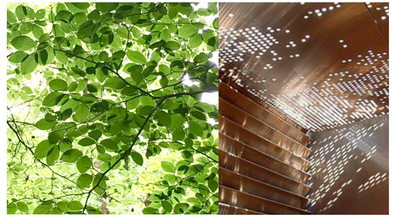
Perforation (adapted in size and degreed according to local climatic needs) filter in light.

The exact size and shape of the profile (trapez, sinus, zig-zag, etc.), and the specific colortone are to be developed and defined in the planned partnering process, based on collecting material samples from local suppliers. Each material is evaluated in terms of aesthetic quality, buildability, maintenance and economic properties, in dialogue with contractor and client group.

Material samples
At the Phase 2 jury presentation we will bring material samples of the facade plates, to illustrate our thoughts on profile, perforation and colortone.



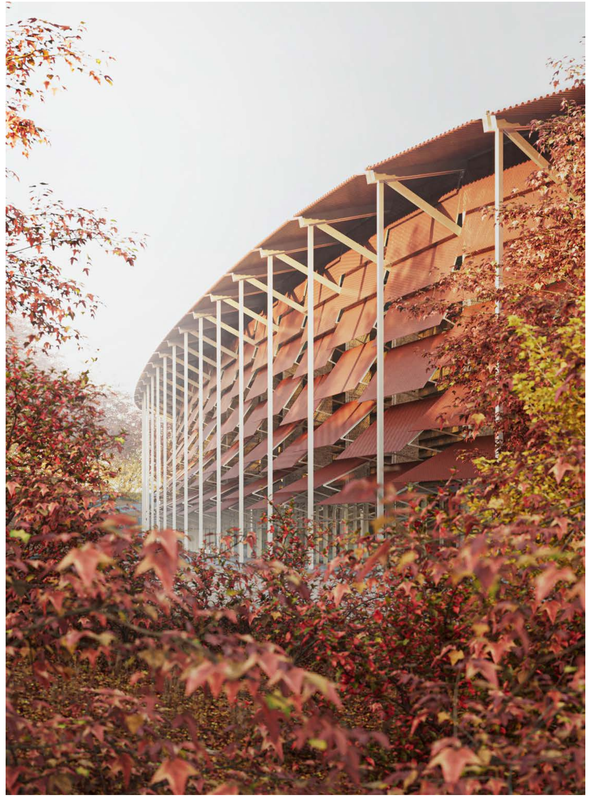
1. Profile: Profiled panels to give depth and relief
Facade panel: Profiled panel to give strength and add depth/relief to the panel.



2. Perforation: filter the daylight
Facade panel: should have perforation or in other ways let in sunlight. The solution must be balanced with rain-wind protection.

3. Color: Heritage red + Club white
Facade panel: red-brown color on the outside inspired by the forest in autumn. White color on the inside to match club identity.

Material palette
Example of material samples and tests on colortones for the new stadium. Light concrete for columns and pavement, white/light-gray steel and alu the interior, red-brown metal sheets for the facade scales with different degrees of perforation.



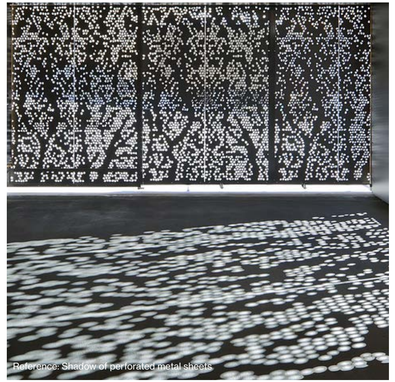
The shimmering light of the beech trees

The playful and natural light of the trees in Kongelunden is reinterpreted in two ways:

- By the facade scales/panels, that each act as a large leave, creates a play in the facade, that on one hand protects the concourse areas, and on the other hand creates a beautiful play in the facade.

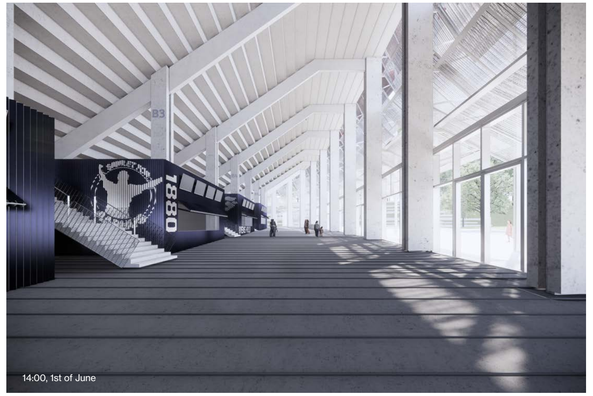
- By the perforation of each facade panel, that filters a diffuse and scattered light into the building. The degree of openness/closeness and perforation can vary troughout the facade around the building, adapting to different needs, climate conditions and functions.

Reference: Shadow of a tree



Reference: Shadow of perforated metal sheets

Reference: Perforated metal sheets with high degree of openess



14:00, 1st of June

16:00, 1st of June

18:00, 1st of June

20:00, 1st of June

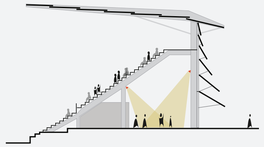
The glowing cone in the forest

A lantern in the park
At night the appearance of the stadium will change dramatically - especially on game nights.

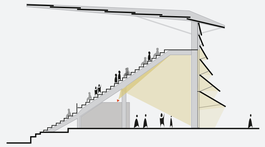
As the sun sets, the opportunity for illuminating the stadium with effect lights will present itself, to make the stadium stand iconic as a glowing lantern or cone in Kongelunden.

We propose various lighting elements in the concourse to achieve this effect. While high placed spots will illuminate the floor area and create a safe space for the fans, effect light can illuminate the underside of the bowl to create a glowing backdrop to the perforated facade scales, and allow light to filter its way out.

At game nights furthermore the significant lighting inside the stadium could create a diffuse halo of light emitting from the pitch.



General light - Spots
Spots along the colums will illuminate the floor area and create a well lit and safe concourse space.



Effect light
Illuminating the underside of the bowl to create a light canvas behind the semi-open facade skin.

Light reference
The cone lamp by danish designer Poul Henningsen, is a good reference on the iconic light effect that could be achieved in the new stadium.

Night visualization
The stadium could light up to create a unique character at event nights.

The performative facade

The facade serves differing functional needs as well as climatic conditions around the building. Thus the facade should adapt and perform in different ways to meet these requirements.

As a general condition the facade panels create a human scale and sheltering of the crowd moving on ground level around and inside the building

An enclosed roof and bowl
The upper part of the facade is completely enclosed. Together with a roof double the extent of the existing stadium roof this creates creating good conditions of shelter for the crowd on the stands.

An adaptive wind breaker facade
Below a 5 meter protective canopy, the facade scales that embrace the stadium acts as a wind breaker that closes of where most needed due to local wind conditions, and opens where possible to allow for natural ventilation of the concourses and filter in daylight.

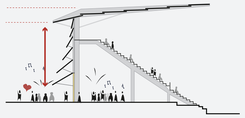
Towards north the angle of the scales/panels open up and are shortened, while the perforation is is maximized to let in light to the main stand lounges and work spaces.

Towards west and south-west the scales are more enclosing and overlap to create adequate shelter towards the dominant western wind. This corresponds to the local specific funtionality of the ultra fan zone that wishes for a high degree of intimacy. A degree of perforation still filter in natural light.

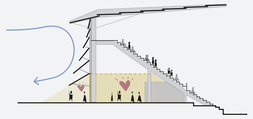
Towards south and east the panels can again open slightly more up due to the local wind conditions here, and create a good connection to the surrounding forrest and green slope close to the building - creating well lit spaces for families and fans.

A sheltering curtain wall glass facade
Surrounding the ground level of the concourses is a 4 meter high glass facade to create perfect protection of the crowd and the concession areas. Towards north the glass facade expands to fully climatized facade on the main stand building.

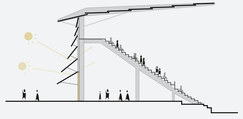
Active edge zone
The groundfloor facade is covered by facade elementes creating a welcoming entrance sutiation in the edge zone of the stadium.



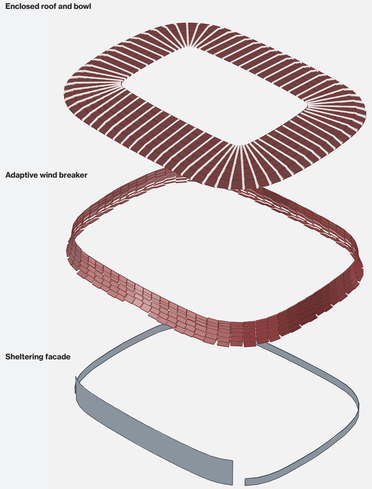
Human scale
The facade and building volume is experienced lower due to the roof profiled that introduces a lowered edge.



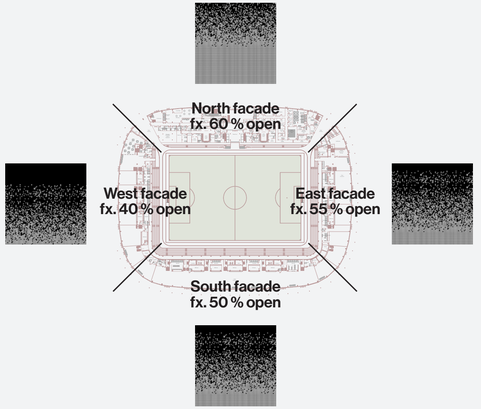
Wind coat
The facade scales overlap and act as wind protection in the bowl and the concourse while filtering in natural ventilation. The modest wind flow that do filter into the concourse is directed along the bowl down onto the top of concessions, which ensures a protected environment for the people ground level.



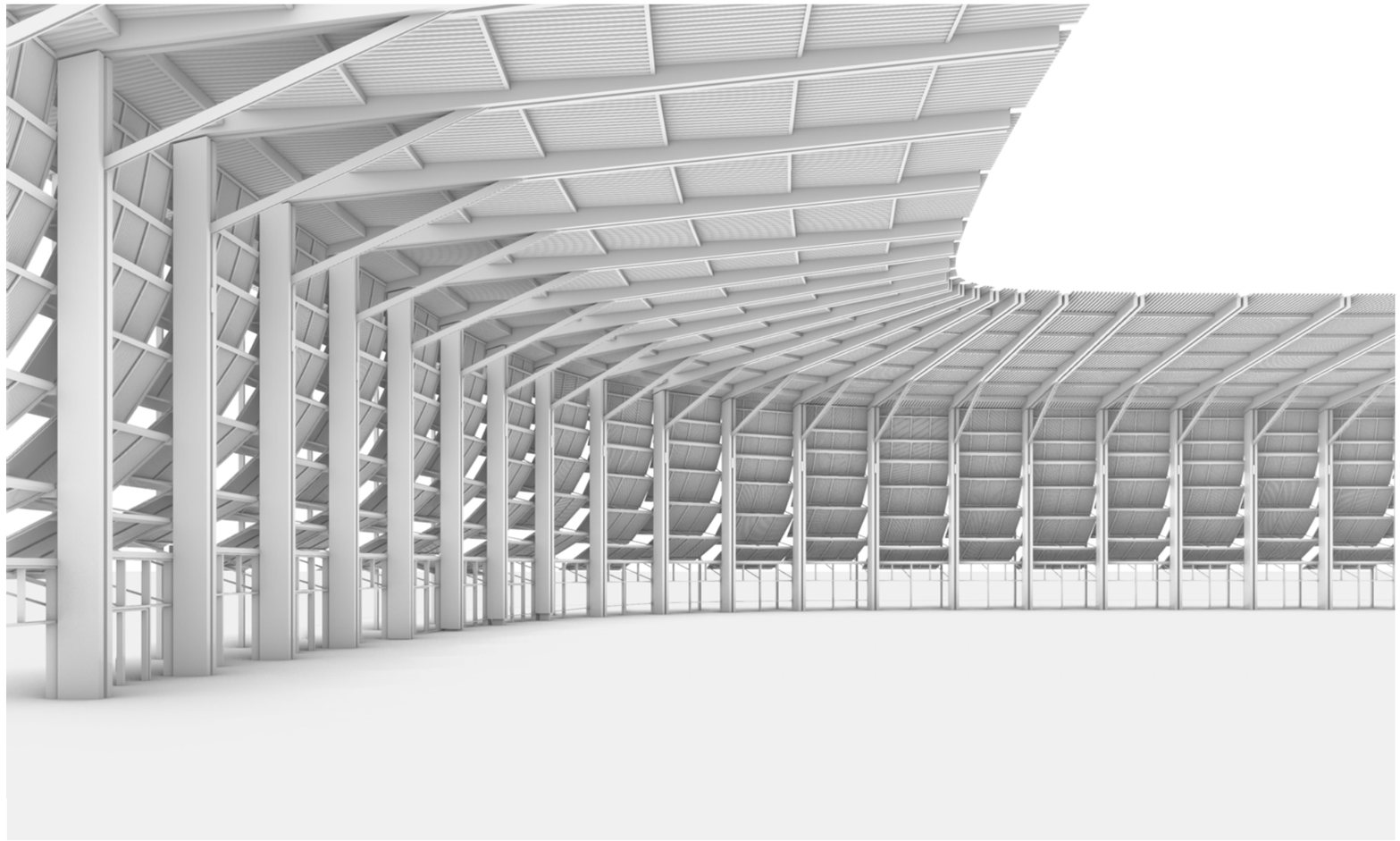
Sun and rain screen
On a sunny day the facade filteres daylight as the leaves of the treecrowns of Kongelunden, while it protects from water on a rainy day, together with the 5 meter overhang.



A perfomative and flexible facade
The facade is designed as a performative and flexible sheltering skin that adapts towards the various microclimate conditions around the stadium. As a coat consisting of 3 distinct and robust layers.



Performative facade
Example of varying openess and climatic protection that reflect the specific need in the different zones of the stadium. Adapted accordring to daylight needs, wind and rain protection, visual contact to surroundings.

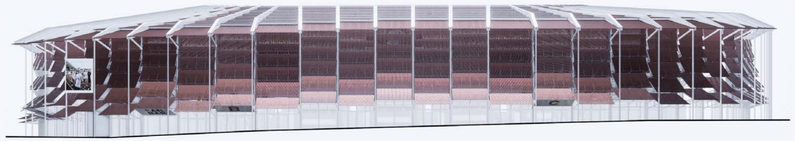


The facade and scales
The scale motive of the facade and the roof creates a unifying design and a protective and adaptive skin for the stadium

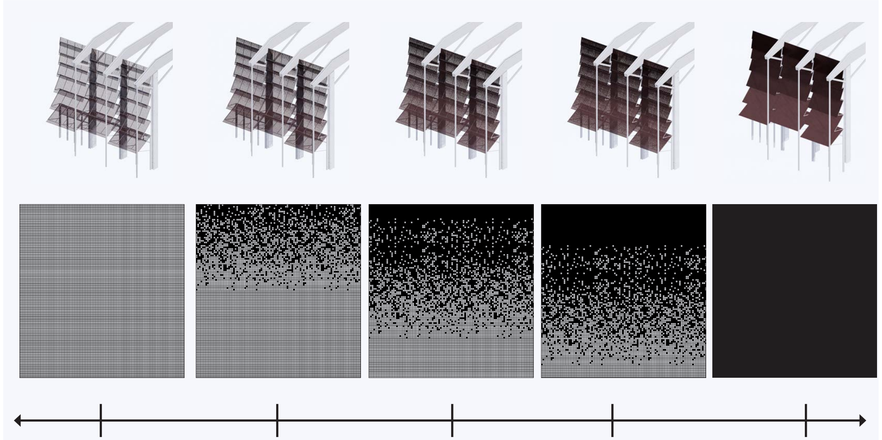
Flexible and adaptive facade system - East, South and West facade

West facade
Towards west the facade panels closes of to act as a wind breaker, while still allowing natural ventilation of the concourses. This is the most enclosed part of the stadium facade, where the scales are steep, overlap and and have a lower degree of perforation.

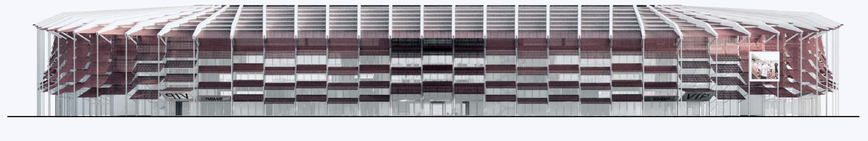
Four meter tall glass curtain walls still ensure direct visual connection to the fan plaza and urban space outside, and plenty of natural light.



Flexibility in the amount of perforation in the panels
The exact degree of perforation in the facade panels is flexible to be adapted in the coming detailed design process. The panels can open up and close of where needed according to functional wishes as well as daylight requirements and wind conditions.

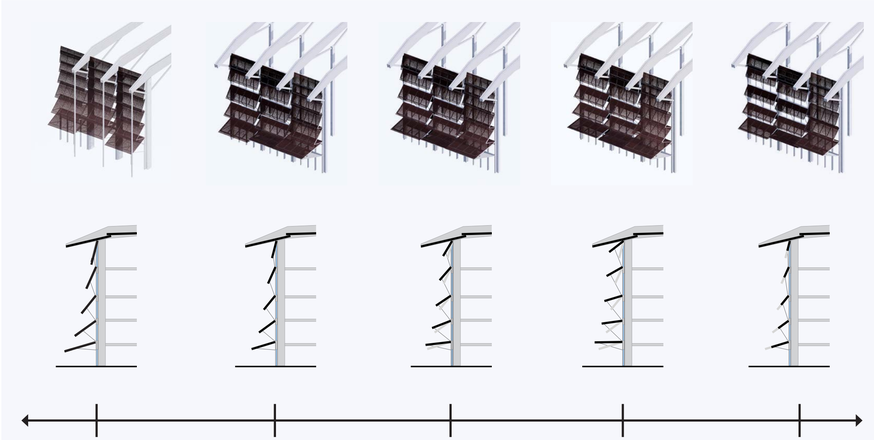


Flexible and adaptive facade system - North facade / Mainstand



North facade
Towards north a full glazing and climatic facade protect the functions inside. Thereby the facade panels can open up to allow for abundant light to flow into the main stand lounges and work spaces.

A high degree of perforation combined with a shallow angle creates a good visual connection bewteen inside and outside - and between VIP area and Fan Plaza.

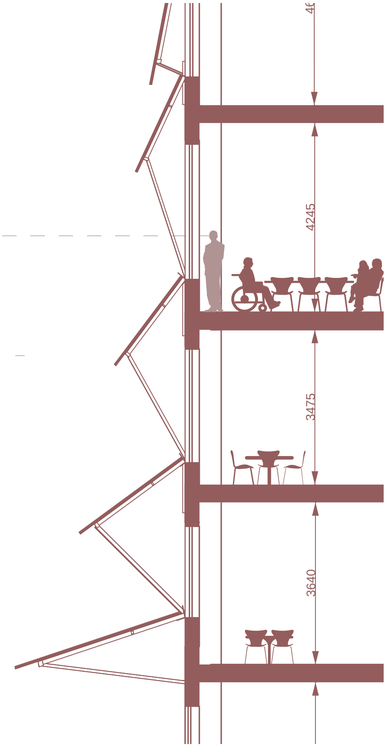


Flexibility in the angle of the panels
The exact angle of the panels are flexible and can be adapted in the coming detailed design process. The panels can open up and close of where needed according to functional wishes as well as daylight requirements, contact to outside, and wind conditions.

Facade Main Stand - An open facade with connection to the outside

Main stand central entrance area is open and inviting

Reference of space with perforated facade panels, De Young Museum by Herzog de Meuron



Principle section of north facade of main stand building.

Openness to surroundings and daylight at workplaces and in the VIP area are crucial within the façade design.

Due to the natural orientation of the stadium - the primary direct southern facade towards the pitch.

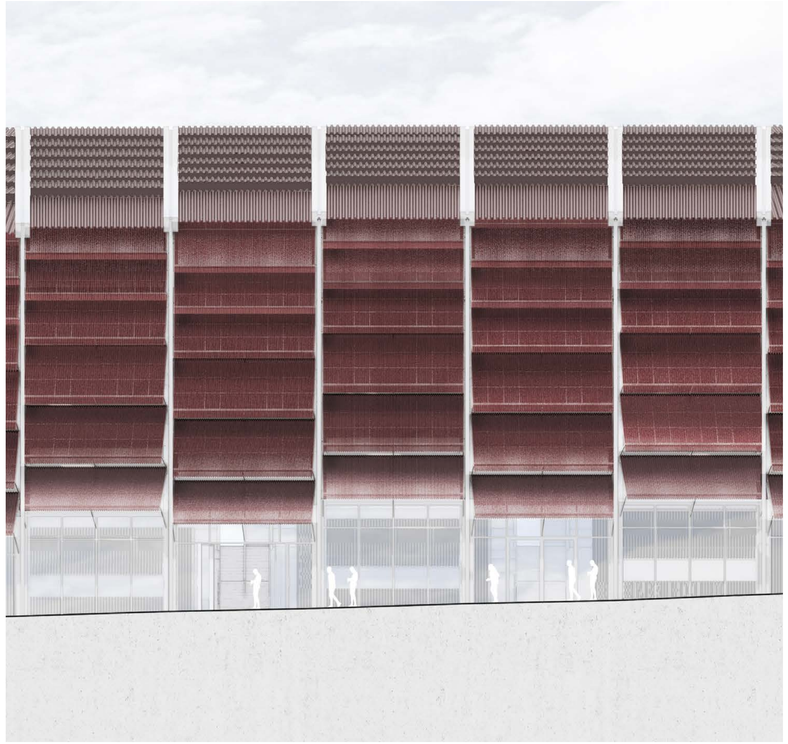
However we propose as well a facade design with high degree of openness to the north, to allow abundance of north light to flow into the lounges and workplaces.

A high degree of perforation of the facade panels together with a shallow angle creates a good visual connection bewteen inside and outside, and views towards the surrounding Kongelunden and Fan Plaza.

Visual simulation of daylight in Gold lounge (1st of july, 19:30)

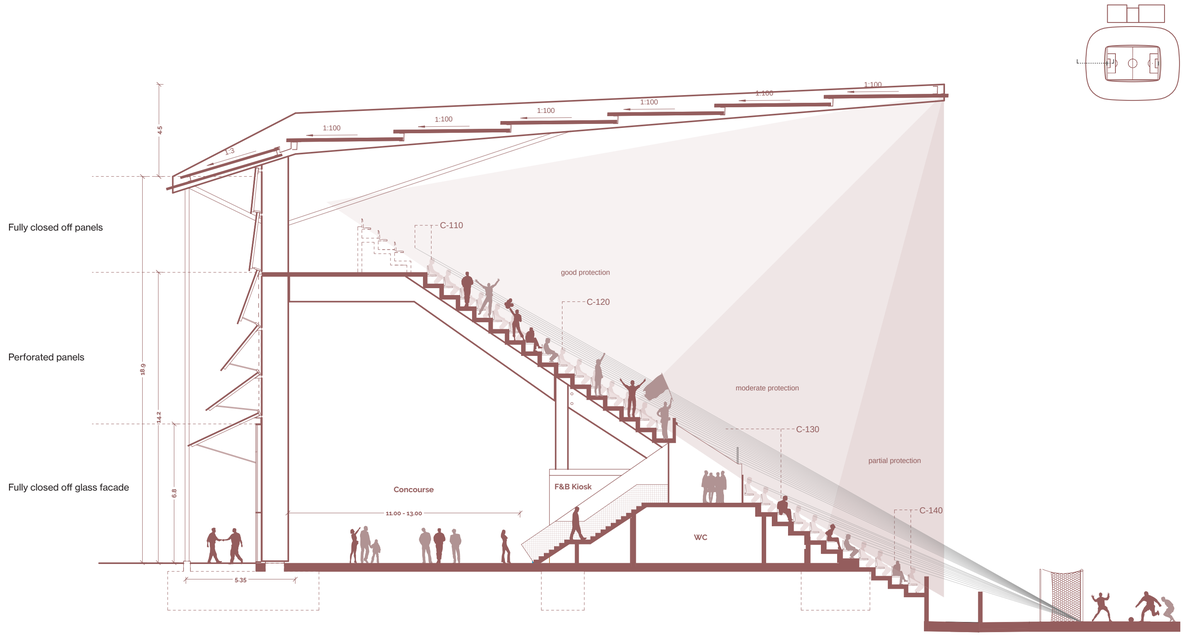
Visual simulation of daylight in Gold lounge (1st of july, 19:30)

Facade elevation



Elevation principle of concourse and bowl 1:150
Since competition phase 1, the facade scales has been optimized to protect better against wind and rain, by adapting the angles and overlapping the elements.

West concourse section



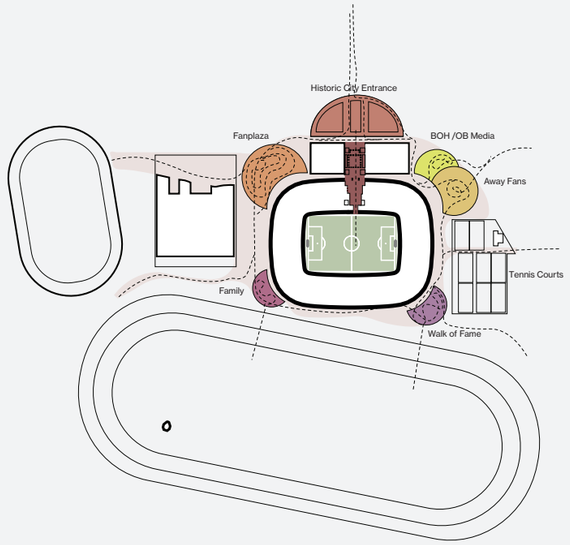
Section principle of concourse and bowl 1:150 (Downscaled from 1:100)

A clearing in the forest

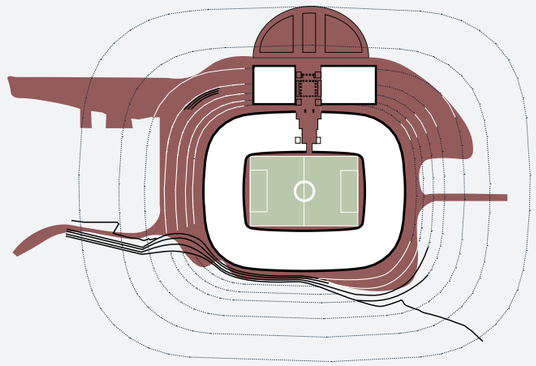
The New Aarhus Stadium will become an open gathering space with a unique local atmosphere in the dense forest of Kongelunden - A series of squares pulsate as vivid spaces around the stadium creating a unique fan experience as much as extraordinary everyday places for the public of Aarhus.

A clearing in the forest
Kongelunden is Denmark's largest coherent recreational area just 2 km from the city center of Aarhus. It lies embedded in the unique scenic context of Aarhus Bay and Marselisborg forest, and its old coastal forests landscape and distinctive slopes are especially characteristic for this area.Kongelunden holds a number of different natural areas, sport facilities and attractions. They are scattered like pearls over the area, creating various clearings in the dense forest - each with its own history, identity and narrative.

The New Stadium will become one of these pearls, a clearing in the forest where all sportfacilities are gathered and organized within the new Sportcity (Masterplan Kongelunden, Holscher Norberg) connected through the long stretch of Stadion Allé to the city centre of Aarhus.
A sequence of flexible spaces is established around the stadium, creating different spatial experiences and offering a variety of programs, fitting extraordinary events as much as everyday life of the citizens.



Biotopes in Aarhus Sports Park
The different squares are interpreted as biotopes: from the Greek bios (meaning 'life') and topos ('place'), extending the map of existing natural biotopes in the forest by a cultural narrative dimension. The open and flexible Fan Plaza becomes the beating heart and connection towards the Ceres Arena and future Athletic track. All spaces offer special structures and elements that ensure a diverse living community and specific atmospheres on match days as much as on every day occasions.



Pulse
The game, the fans, the songs and passion of the moment inside the stadium create pulses of energy, a resonance that becomes visible and noticeable in the spatial expressions of the public squares outside. Lines and forms, topographic distortions and changing spatial situations inscribe this energy in the landscape and make it present and relatable in an everyday world of Kongelunden beside big events and games.

Havreballe Skov
Protected Forest

COMPETITION AREA

Bike Parking

Disabled Parking (Optics)

Taxi

John Stampe Plads
cobblestones, gras

Bike Parking

Protected Forest Line

Museums
Forcourt

The Heritage Building
+14.70

Waste and
Loadingzone
Densiphalt
380 m2

Greenkeepers
Compound
Densiphalt
270 m2

Prod Truck

OB Compound
densiphalt
1200 m2

Bike Parking

Havreballe Skov
Protected Forest

Away Fan Plaza
gravel

Marselisborg Grønnevej

Ceres Plads
Ceres Plads
+16,50

Existing Trees

Fan Plaza
red gravel

+14.75

Tribune
steel stairs from old stadium

Screen

Club Shop

Media

The New Hall

Flow Zone

Temporary Fencing
for Away Fans

Away Bus Parking
densiphalt

BUS

Bike Parking

Fan Bar

Beergarden

Away Concourse

Ceres Arena

Flow Zone

Concourse

+16,50

Tennis
Courts

Bus Parking
11 Stk.

Tennis
Club House

Ramp

Concourse

Flow Zone

Escape korridor, gravel

Bike Parking

Playground

Path to horsetrack

COMPETITION AREA

Amfi Staircase

Tennis
Courts

Concourse

Concourse

Flow Zone

Flow Zone

+18.00

Stair

Fence

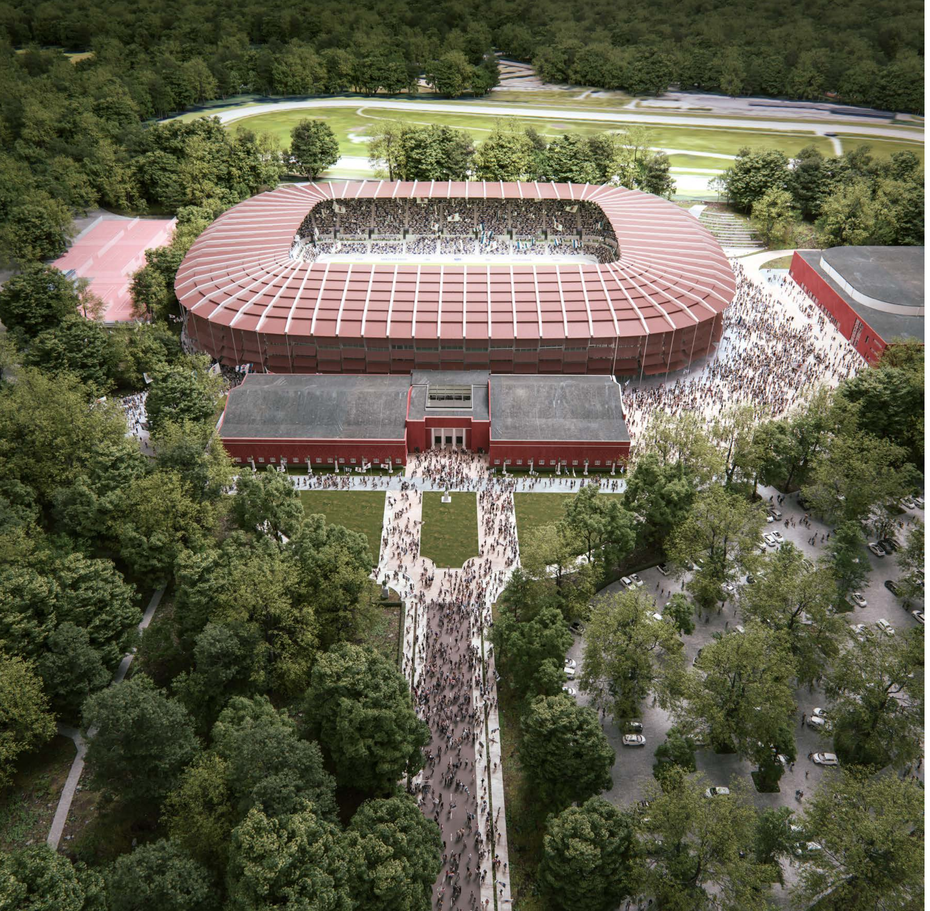
Forest Theater
red gravel

+26.00

Jydsk Væddeløbsbane (JVB)
Horse racing track

Path

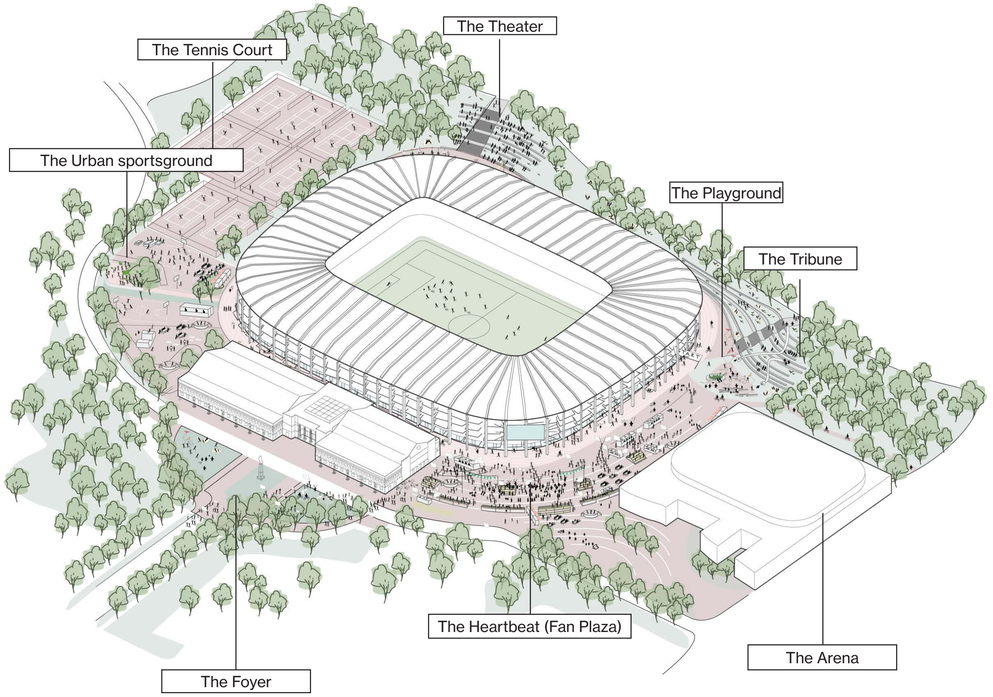
COMPETITION AREA



A sequence of flexible spaces:

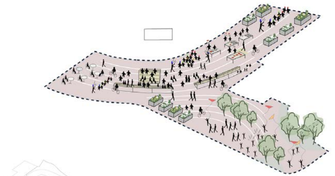
The squares offer different spatial experiences and a variety of programs, fitting extraordinary events as much as everyday life of the citizens of Aarhus. The outdoor spaces stand in direct connection to the inside of the concourse, interacting and completing the indoor functions with matching outdoor activities. The stadium becomes a place for all of the city, giving back and offering public space . Furniture are moveable and a reminiscence to the old stadium.

More than a Stadium...

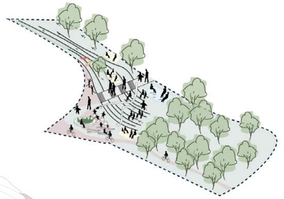


A sequence of public spaces for Aarhus

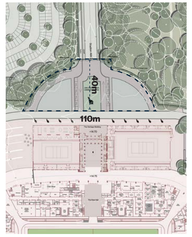
John Stampes Plads
It is here that you enter the clearing in the forest, a welcoming space. With big green grass lawns and strong geometry John Stampes Plads works as a small park plaza that is fitting for picnics or hangouts.



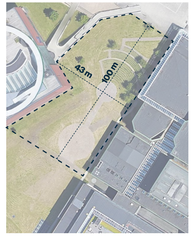
Fanplaza
The Main plaza of the stadium, working as a flexible space on matchdays as well as being a local plaza for the city. Hosting markets, sports events for the local school as well as a space for fun and games.



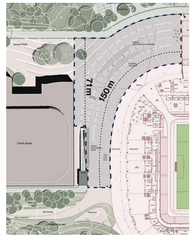
The Playground
In extension of the Fan Plaza the playground is placed at the foot of the Amfi staircase. A gathering place for local families or institutions that can play and learn in the clearing.



John Stampes Plads: 4400m2

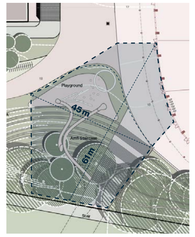


Amfi scenen i Musikhus Parken udvidet: 4300m2

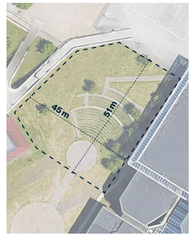


The Heartbeat/Fan Plaza: 9400m2

Store Torv: 4300m2



The Playground: 2000m2



Amfi Scenen i Musihusens Park: 2200m2

Statues

Picnic

Concert

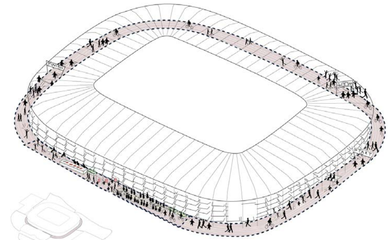
Tournaments and sporting events

Playground in the forest

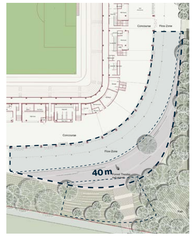
Gathering place for families with children

The Theater
A calm corner in the clearing where theater and performances can take place as well as yoga- or art classes, this is a space for creativity and recreation.

The Urban Sportsground
The OB compound and Away Fan Plaza works as hard surfaced urban plazas that can be used separetly or together on non match days. Flexible spaces for basketball, skating or streetfood these are urbane playgrounds for the city.

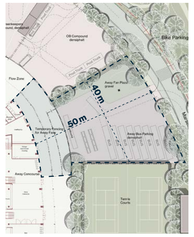


The Stadium Alley
The Alley between The Heritage Building and the new stadium becomes a lively street and link between the two main halls. A space that is suitable for long table dinners, bigger gatherings or festive events.



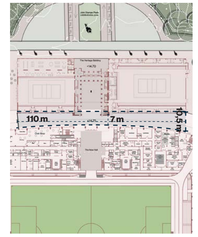
The Theater: 2100m2

Aarhus Universitet: 2300m2



The Urban Sports Ground: 2300m2

2300m2



The Stadion Alley: 770m2

Rosensgade: 770m2

Summer cinema

Yoga classes

Urban playground

Double functional coding

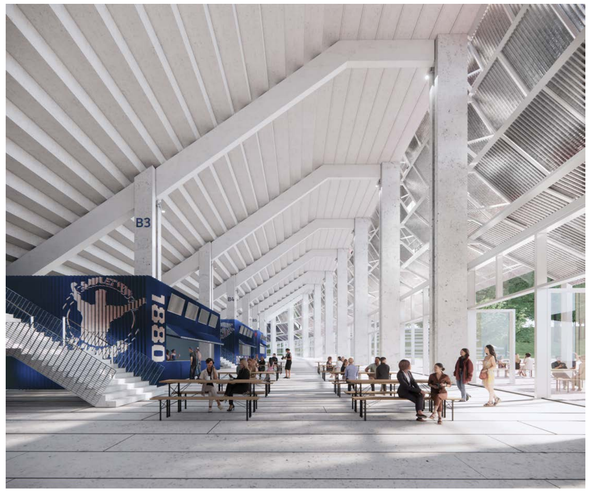
Running track

Long table dinner

Public space - give back to the city

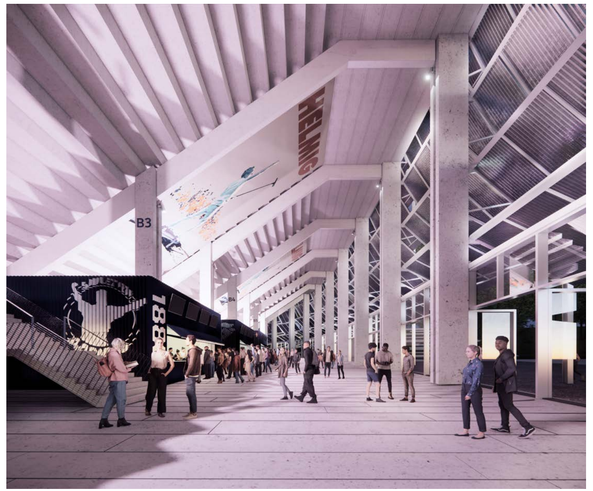
The covered and sheltered public spaces
Outside match days concourse areas double as covered and sheltered urban spaces in direct continuation of the outdoor sequence of plazas.

The grand spaces can work for lively events during Aarhus Festuge, or for market events during autumn and winter months where it is too windy and rainy on Ingerslev boulevard. And it can be a quiet place to take a break on a sunday stroll, to gather a yoga class or organize a street basket tournament.



A space for all - also on non-match day's
The concourse as a quiet space on a sunday morning where locals and passersby go for a cup of coffee. That facade to the concourses can be opened up on non match days. Roler shutters in vomitories will prevent access to the bowl.

A space for fans to gather
The concourse is a space for the fans to gather in the halftime, before and after the match. Banners, super graphic and the like can be used to show the identity of the club and it's various fangroups.



An illuminated event space
When the stadium is used for events and concerts in the evening, spot ligths and light strips can be used to create different atmospheres. Light strips will be suited to illuminate the back of bowl and potentially facade panels. High positioned spot lights will be suited to illuminate the floor of the concourses.

Indoor activities - flea market
The concourse space can also be used to host and support different social or public gatherings and events. Anything like a flea market, indoor mooncar race for kids, indoor street sport, farmers market, social dining and art fair.

Fan Plaza

Competetion area

reballe Skovvej

+16

15

+15

+17

Foodtruck

Tribunes from old stadium

Bar

Scene

Game area

Tribunes from old stadium

Optional tent area

Ground sleeves
Connection to electricity and water

Tribune bar

Fan Plaza
3000 m2

72 seatings

Tickets

Fan Plaza Red Gravel

60 seatings

Flow area light gravel

Statue

Entrance

Museum
outdoor seatings

Escape corridor gravel

Tribune cable tracks

Biergarten
180 seatings

Screen

Flowarea

Kitchen

Fan Bar

Super
Vomitory

Ticket Office

Club Shop

Riser

VIP Entrance

Ball Kids (f)

Ball Kids (m)

Office

Kit Manager

Officials

Lift

Storage

Mascots

UEFA Offices

Home
Coaches
Office

Coaches

Coaches
Ch/Sh/ WC
(f)

Cleaner's
Storage

Corridor

Rainwater
Harvesting /
Irrigation
Equipment

Warm Up

Physio

Hydrotherapy

Home
Washroom

Home
Showers

Home WCs

Home
Change
Room

Bar Store

Disabled WC

WCs

Corridor

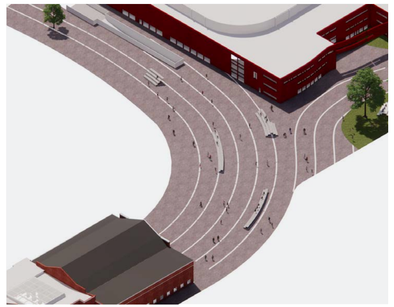
First Aid

Store

Detailed Plan of Fan Plaza,
M 1:500

Fan Plaza on match evening:
The open flexible plaza offers space for a safe encounter and a lot of emotions.It can contain a changing program, from away screenings to big gatherings, fan zones and special installations. It will become the beating heart in Kongelunden, filled with life and energy.

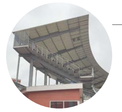
Reuse and Flexibilty



Fan Plaza Small . everyday and small events
Small tribunes in different sizes works as playful elements, as well as a place for a short break and meeting points in the everyday life of the plaza

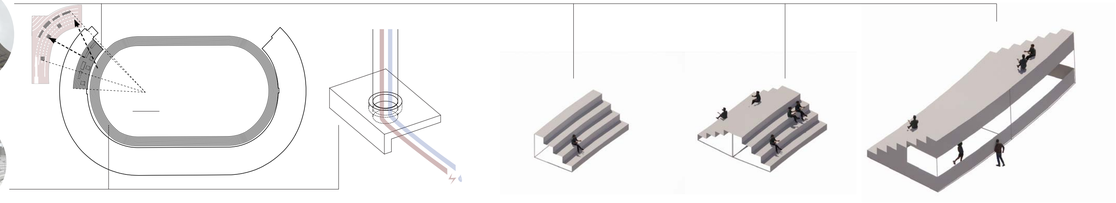
Fan Plaza Medium
Bigger tribunes for events or local markets, where they function as meeting points or a place to enjoy your lunch in the sun.

Fan Plaza Large
Big setup on match-days where the steel tribunes work as key elements in arranging the Fan Plaza with stages and tribune bars.



Steel tribunes

Concrete tribunes



Reused as new elements

Ground sleeve connectors

Single tribune / bench, mobile

Double Tribune, mobile

Bar, mobile

Reuse elements and landscape

The concrete tribunes of the former stadium are reused as media channels for electricity and water, visible as white lines on the square. Being equipped with ground sleeve connectors they form the flexible grid of the square, where you can access electricity and water on almost all areas of the square. The light lines gives the plaza an active surface that is open for all kind of events and usages, from S to X. The lines illustrate the pulse and energy from inside the stadium and are a reminiscence to the former running tracks inside.

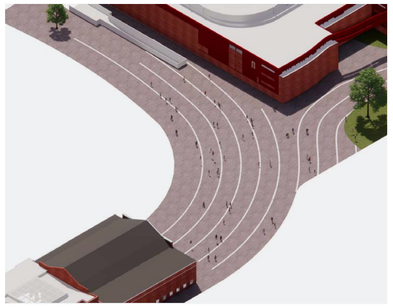
A variety of configurations

Steel tribunes from the former stadium can be reused as key elements in furnishing the new Fan Plaza. The steel tribunes create outdoor tribunes for the audience on match-days as well as being a public, playful elements in all kind of sizes and configurations in the everyday life of the plaza. They are seen as fragments, cut out of the old tribunes and mounted on aluminium stands with big wheels. As movable elements they can be arranged according to events to all sizes. In everyday use they can be distributed out in the stadium area where ever needed. As an "object trouvé" they stand almost as art pieces and reminder to the old stadium on the squares.

Microclimate and planting options

Fan Plaza- Phase 1 of competition

The first phase proposed a green hill with an implemented tribune and trees to give the plaza a more intimate scale and to orientate it towards the stadium. The plantings secure a comfortable micro climate and offer extra permeable surfaces. They hold back prevailing winds and create shadow on warm days. The green hill can become an additional play-landscape in everyday situations and strengthen the idea of the stadium in the forest. Nevertheless, the green hill might interfere with the wishes of an open and flexible square. The stadium should furthermore be read together with the Arena and coming new sport facilities. A more visible connection to the Arena and a more flexible space was asked for.



Fan Plaza- Phase 2 of competition

The second phase proposes a very open, super flexible plaza. The old concrete stairs and tribunes of the former stadium are reuses as media channels and form visible light lines in the surface. The plaza gets an active surface that is open for all kind of events and usages, from S to X. The lines are continued towards the Arena and seek the connection towards the other facilities of the future "Idrætsbyen" of Kongelunden. The Fan Plaza can be furnished with modular, moveable tribunes, fragments of the old steel tribune, that can be configured and put together in many different ways.
The plaza stands very open and might become windy on stormy days or hot in summer. Smaller niches and green spots might be missing generating a human scale on the plaza.

Fan Plaza - Further development- Planting Option

For the further development of the Plaza we would suggest to plant groups of trees on the plaza. Trees with high crowns directly in the gravel surface. The high crown will ensure a good visibility towards all facilities around the stadium and allow all kind of functions under them The tress and their biomass will improve the wind comfort and offer cooler places in warm summer days through shade and evaporation. They create smaller meeting spots and niches for people too meet and lead over to the green slopes in the south.

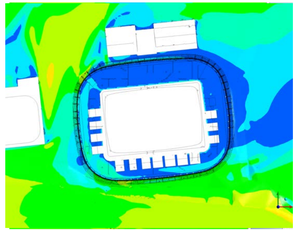


Figure 2 – wind simulation, south-westerly wind

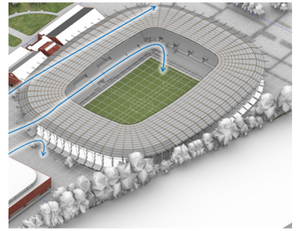


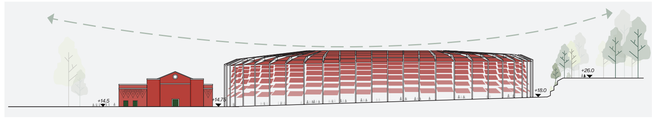
Figure 3 – Predicted effects from the prevailing westerly wind

Reference: Claramatte, Basel (Raderschall Partner AG)
Trees with high crowns in gravel surface with highly frequented public space

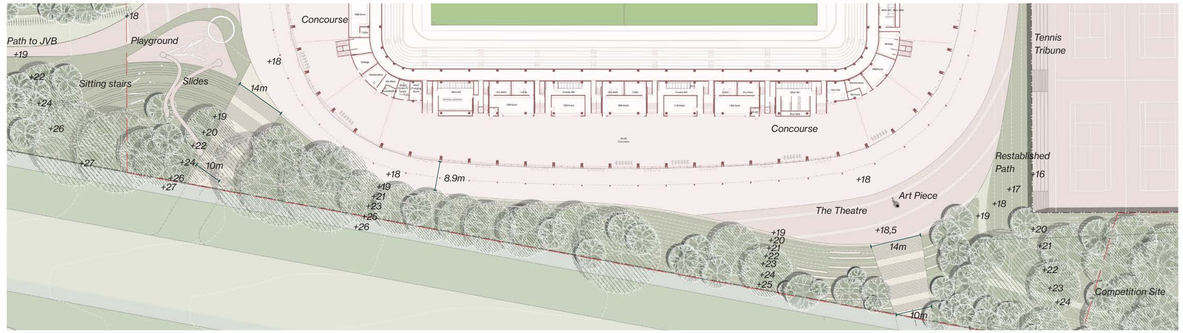
New entrances, new connections
Two new entrances from the Jysk Væddeløbsbane are marked by stairs and an amphitheatre formed like sitting stairs fitted in the slope. They clearly mark these new connections and give the squares in front new functions.

Topography

Principal Section



Elevation from East to West through Fan Plaza: A Clearing in the Forest

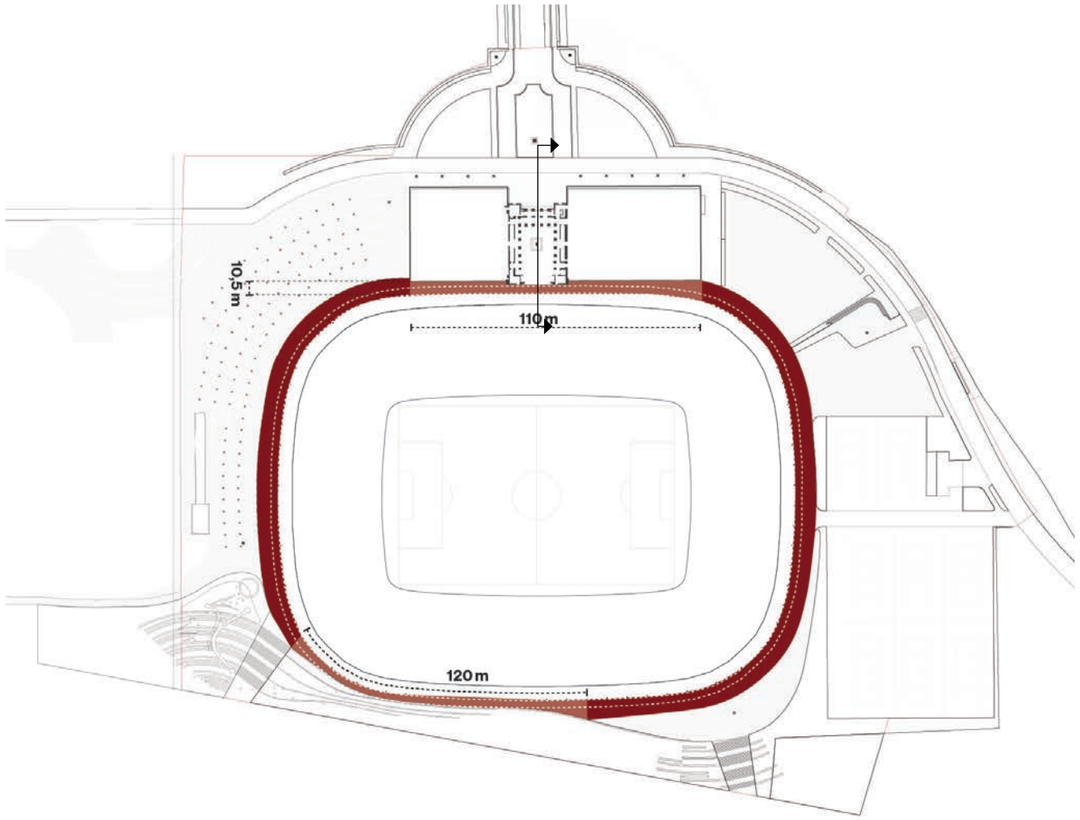


Plan of southern slope and new entrances towards horse race track

Old coastal forests and distinctive slopes are especially characteristic for the area of Kongelunden and also marks the area of the new stadium. It is placed in the middle between the Heritage Building in the north and the slope up to the Horse Race Tracks in the south. It is keeping a distance of 7-9m to both of them at the tightest point. It is here, where the existing context comes closest to the new building.
In between the Heritage building and the slope to the Horse Race Tracks the terrain today slopes softly up from 14.75m around the building to 18.00m at the foot of the slope. We are keeping this natural slope and let the concourse follow these natural levels at the inside.
With this we achieve direct access and connection without ramps and stairs between between plazas and the concourse. Landscape and Stadium can melt together and complete each other in terms of programming. This terrain strategy creates not only benefits in terms of accessibility but also in terms of sustainability, construction programme and economy - less impact in the natural landscape - less construction costs.
Furthermore this strategy is keeping the height difference to the Horse Race Track (on +26.00m) as low as possible instead of increasing it by excavation. This makes the slope become a more soft green element mediating between the stadium and the tracks - a terraced landscape with integrated playground and sitting steps. The two big stairs leading up to the horse tracks can be kept on a minimum length, which creates more comfort and safety in big concert situations.
The slope itself is formed as an active, swinging edge, following the old profile as much as possible and brings landscape and stadium together. The tightening of the situation is marked by new terraced retaining walls, bearing the height difference at the narrowest point. They fade out towards east becoming sitting stairs and a gentle slope forming an intimate theatre-situation. The forest theatre offers possibilities for outdoor school classes, lectures, and plays, possibilities for exhibitions and performances.

The lowest wall towards the southern concourse is formed as a sitting edge, creating an inviting zone towards the stadium and making the zone around the stadium usable also on non match /event days. Towards the west the slope is accompanied by a playground. Slides and climbing elements are integrated and the seating elements create a stadium atmosphere in the landscape.
Reused steel tribunes from the old stadium are integrated in the fanplaza. They are moveable and can be used on match days in the fanzone and allow all possible konfigutrations for non-match days. In everyday situations it becomes the new meeting spot for groups and individuals. The tribune communicates an idea of the inside of the stadium bringing its energy and atmosphere to the outside.

Safety



8,5m zone- fire staging

3m driving zone

3,3m zone - fire hose

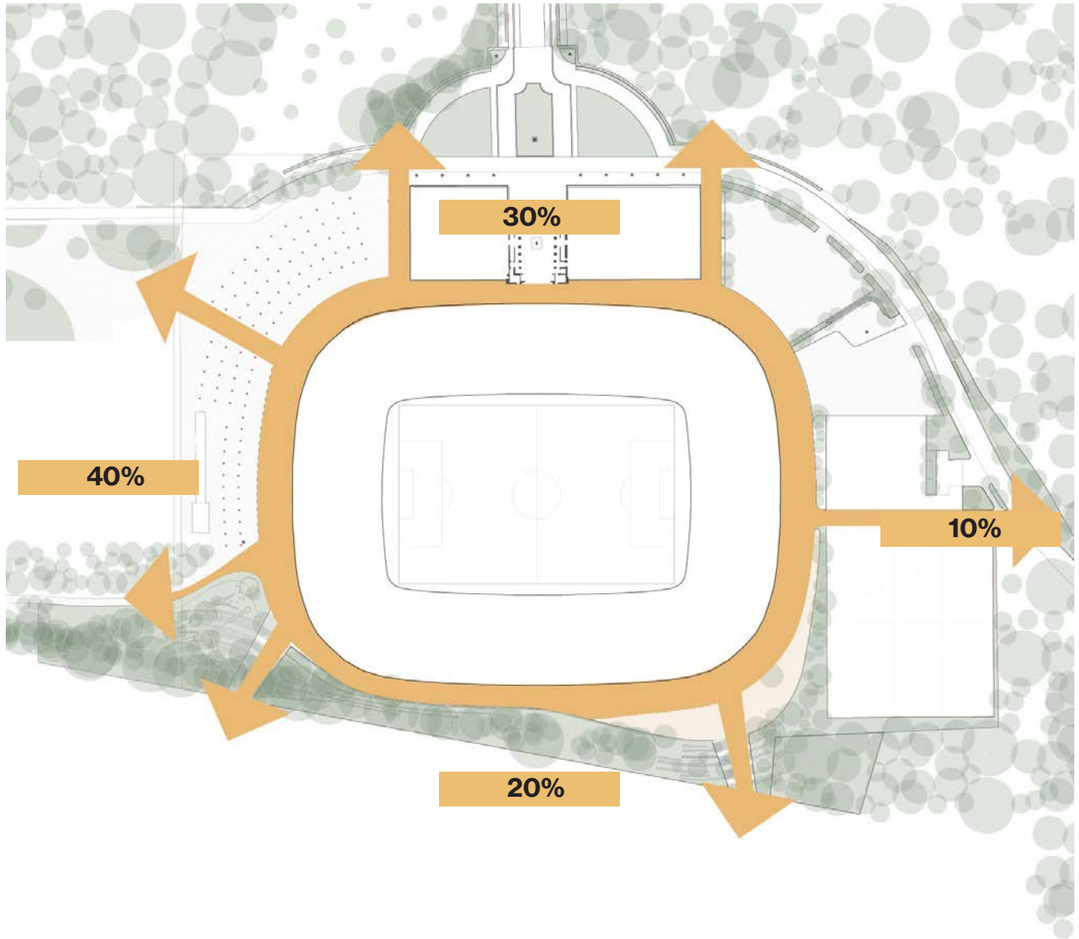
Fire
The fire rescue strategy is solved in different zones surrounding the stadium. Entering from the Northeast corner the fire-trucks will be able to drive all around the stadium in a 3 meter zone, marked with white dashed lines in the diagram.

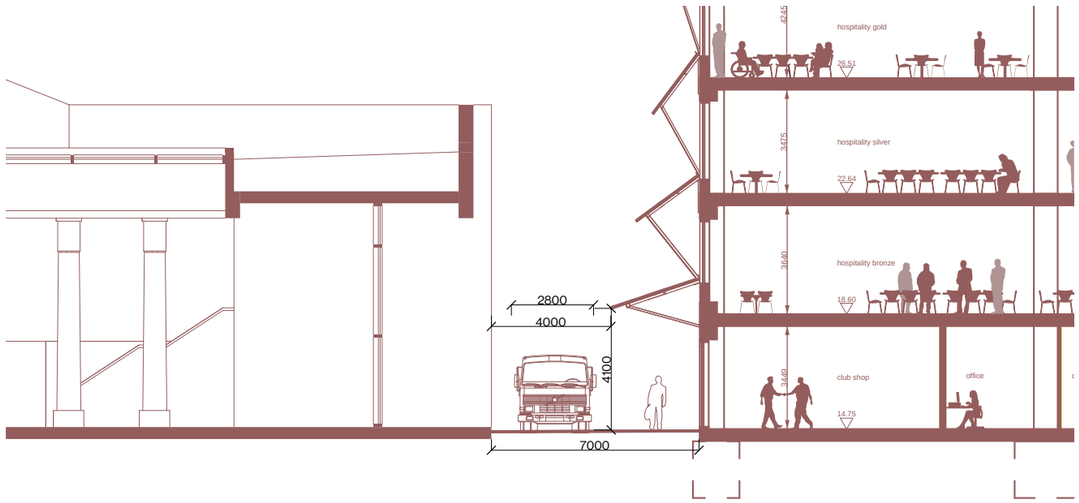
On the East and West facade this area is extended to 8,5 meter to create fire-staging zones (red in diagram) from where the firemen will be able to park an rescue directly.

Orange Areas in the diagram, between The Heritage Building and Stadium (North) as well as the retaining wall and Stadium (Southeast corner) are accessible by foot and rescue by fire-hose.

Flow
A thirteen meter “flowzone” frames the concourse all around the stadium. It extends the inner concourse into the outdoors, creating a fluent transition between inside and outside and guaranteeing a smooth and untroubled cycle and movement on intense match days and huge events. The squares are attached in a sequence to the flowzone around the stadium.

Based on the surrounding attractors (Residential Development, Parking Spaces and Bus Routes), the shown initial demands upon egress from the stadium have been identified: 30 % towards North, 20% to South, 10% towards East and 40% towards West.

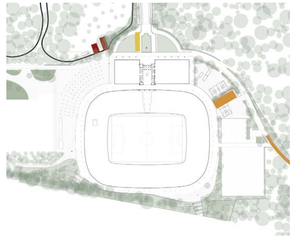




Principle section in the most narrow situation in the passage. The passsage varies approximately from 7 m to 10,5 m

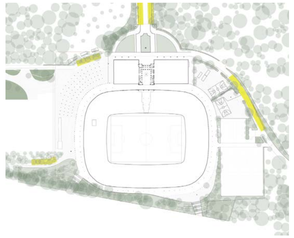

SAMLET FOR ÅRHUS
1880
1880

Functionality

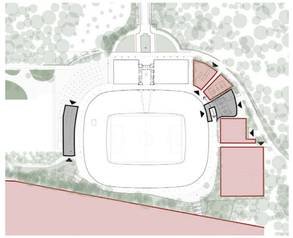


Parking: Taxi, Disabled, Bus
Designated areas for parking of taxis, handicap vehicles and buses are placed near the main entrances.

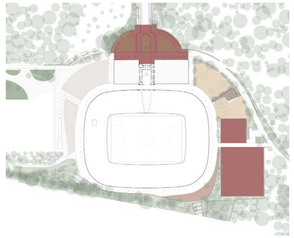
Taxis can hold at John Stampes Plads and 8 disabled parking lots are established at the south of the P1 Parking site close to the fan Plaza and main entrance to the stadium and fan shop.



Bikeparking strategy
Bikeparking is placed along all entrances, following the arriving stretches of streets and connections: Along Stadion Allé til Havreballe Skovvej, at Parking Lot P1 behind the existing hedges. Along Marselisborg Grønnevej under the trees and along the path leading up to the Horse track.



Fences
The Tennis Court is fenced off to help reduce wind and noise from outside, allowing the players to perform their best. It furthermore secures safety for all people passing by. The Awayplaza can be fenced on match games, having a direct acess to the stadium and offering Bus Parking and a tribune for gatherings. At everyday situations the square is read together with the away forest as a clearing with differnt possibilities for activities and play. The OB, Waste and Greenkeeping compound is permenatly fenced due to functional and permanent maintaining processes. A Fanzone at the Fanplaza can be erected temporarly at big vents and matches.

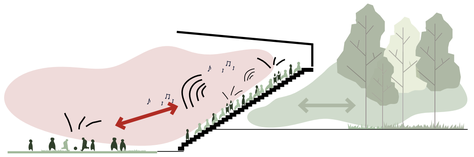


Surfaces
Soft surfaces with permeable attributes in different gradients for different zones and situations are integrate sensitively in the organic forest landscape and stand in a fine colourful contrast with the green shades of the trees and shrubs.John Stampes Plads represents the prelude and representative foyer to the Stadium and Idrætsparken. It tells about the former ideals of symmetry and clear axes preferred at the time of the erection of Kongelunden Sportparken. The square will be restored and refurbished with a new pavement of cobblestones. The Fanplaza, Arcade and Theater are kept in a red toned gravel, the flow zone in a leight beige densified gravel and the escape corridors in a beige gravel - all soft, permeable surfaces harmonizing with the forest. The loaded areas like OP, Waste and Green Keeping areas are done in densiphalt - a highly loadable surface for heavy traffic.

2. Functionality

“State of the art” stadium

"Kom så de hviie!"



Steep tribunes in one single tear, creates an intimacy and proximity to the pitch. At the same time, openness in the concourse facade constitutes a connection to Kongelunden.
While the red façade with white columns characterizes the exterior of the building, the white team signature color dominate the appearance inside the bowl.

A modern and intimate stadium experience

"Ingen må søge sit eget, spredte skal vi styrte, men samlede skal vi stige!" - AGF club motto.
AGF's main aspiration is to offer their fans a unique experience on a match day through a stadium that is focus on intimacy, comfort, atmosphere, and safety.
The new stadium and the terrace bowl is designed to answer all these requirements while offering flexibility for the future. It will set new standards for the stadium experience, through proximity and visibility to the pitch, while implementing a state-of-the-art architecture that embodies the identity of the club.
Better fan zones, active and sheltered concourses as well as good, integrated main stand facilities will constitute a whole new experience of togetherness around the game.

Feel the Pitch

The Pitch
The pitch is the stage of the scheme, acting like a catalyser of emotions. The playing surface measures 105x68m and will be made of hybrid natural reinforced grass, heated by a under pitch heating system, surrounded by power and data ducts. It will also be surrounded by an area of 3G surface and an area of wet pour rubber, adjacent to the pitch perimeter wall, both arranged in a gentle slope. The sun path analysis helped us to avoid sharp contrast areas in the pitch and to achieve the optimal light conditions. However, a more detailed sunlight study will have to be carried in the next stages. If grow lights are found to be necessary, these can be easily stored in the super vomitories and will incorporate LED technology, consuming low levels of power.

Seating Bowl Geometry
The seating bowl has been designed for 20,282 seats capacity (not including seat kills) and expandable to 24,257 seats, all covered by a continuous roof. The number of seats in excess were kept in the design and in the cost plan to allow for more potential seat kills to be found in the next stages of the design.

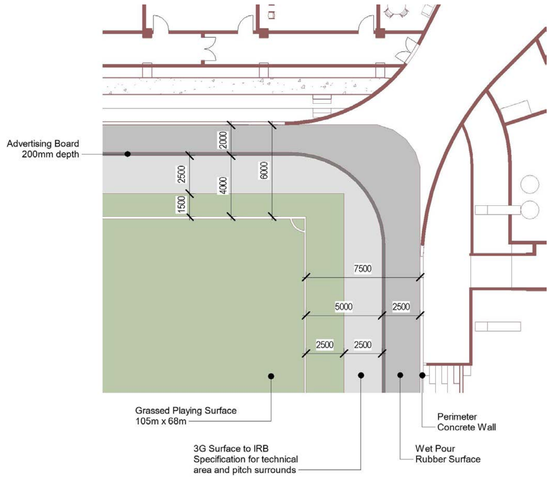
The seating bowl has been positioned as near as possible to the pitch with all stands near 34,5 degrees in a continuous profile to maximise the visual, sound and human experience. The first row of every seat is elevated to ensure no sightlines are interrupted by the 1,5m high advertising boards, stewards and photographers. The excellent C values vary between 90 and 160mm. The seat kills have been minimised by reducing the number of vomitories and by a coordinated curved design of the hospitality floors.

It was also our goal to avoid "waves" in the bowl elevations to guarantee and more continuous design and to a void special terrace units that usually lead to a lot of wasted areas in the bowl. This is the reason all spectators in the back of bowl row are located at the same level.

The vomitories have been combined with the super riser of the wheelchair platforms to ensure an efficient and safe circulation from the concourse level. These are positioned as high as possible so that the footprint of the spectators stairs do not intersect the 11m "free" zone of the GA concourses. The spectators in wheelchairs will have a wide choice of locations: pitch level in the east and west stands, elevated in the south stand corners, served by four lifts, and at levels 2 and 3 in the hospitality stand, all with excellent views to the pitch and with the possibility to be near their friends / family.

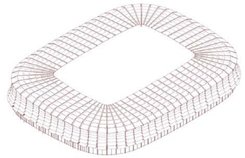
The terrace units will be made of precast concrete with chamfered corners. The geometry has been optimised to allow a robust repetition of precast units, vomitories and balustrades which will be made of galvanised steel and glass in the areas where the sightlines could be compromised. Around the pitch, in the 7,5m wide players tunnel and in the 5m wide super vomitories the precast units will be curved to enhance the continuity of the seating bowl and to contract with the sharp geometry of the facade. In order to allow maximum flexibility of access to the different hospitality lounges, the north stand terrace units have been designed with a constant depth of 1m, ensuring this way, consistent gangways and a comfort improvement to all hospitality spectators.

The bowl curvature has been calculated to allow spectators to have a view of the full pitch over the 1,5m advertising boards. The players benches, which can be easily removed for other uses like concerts for example, have been integrated in the bowl curved geometry, organised in groups of two rows with full views of the pitch. By creating a cut out at low level, the players benches will be covered by the roof, distant enough from the spectators and will not cause any sightlines obstructions.

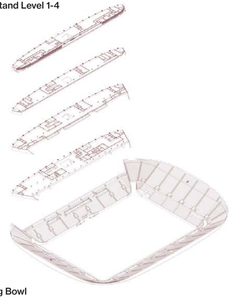


Pitch Auxiliary Area - principle

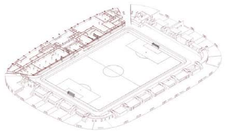
Roof and facade



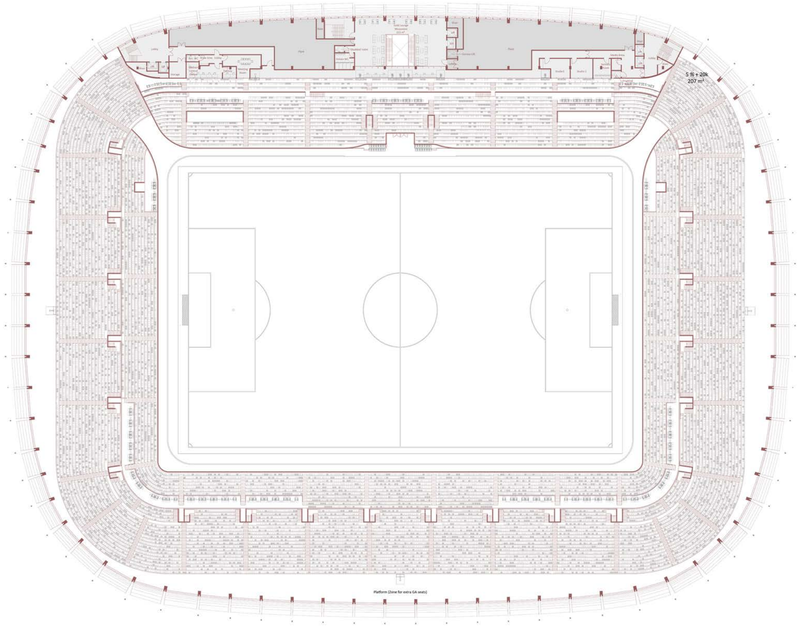
Main Stand Level 1-4



Seating Bowl



Pitch, Concourse and Main Stand level 1



Seating Bowl with seats colouring scheme 1:750


1880
STOLTE SOM FÅ
KSDH
SAMLET FOR ÅRHUS


KSDH
SAMLET FOR ÅRHUS
1880
1880
STOLTE SOM FÅ
KSDH

Seating Bowl

Spectators Groups

The spectators have been groups as suggested by the brief principles. The north stand is exclusive for the hospitality spectators, the Ultra fans will be grouped in the west stand, adjacent to the fan plaza, the family zone in the south west corner, with their dedicated facilities, the GA spectators will be distributed in the south and east stand in a flexible arrangement in this last one and the away fans will be located in the north east corner with access to their segregated concourse, suitable to be expanded. In the north stand the seating arrangement has been designed so that all spectators have access to all lounges, allowing the club to offer a wider selection of hospitality packages. Because of the uniform terrace row depth, the seats can be easily repositioned in the future, depending on the trends and business plan. All spectators' groups include platforms for spectators in wheelchairs, and their companions. No spectator is more than 100m away from the pitch center and only circa 8% is behind the 90m radius. This percentage can be adjusted in the next stages of the design.

Capacity Expansion Strategy

The seating bowl has been designed to comfortably accommodate circa 20,282 spectators, seat kills discounted.

Option 1 of 2,000 capacity increase can be easily achieved through the installation of flexible seating in the west (Ultras) and the east (Away fans) stands. This strategy will increase the capacity of the west stand by 1750 and the east stand by 250 spectators. The potential areas of standing spectators have been calculated in order to avoid seat kills in the areas where the spectators will remain seated. In the next stage of the design we would like to challenge the brief for the allocation of these flexible seats and recommend these to be allocated next to the south corner of the seating bowl, symmetrical to the away fans stand - this would generate a far more interesting atmosphere with the sound of the of both team fan groups (chanting, music, etc.) travelling symmetrically across the bowl.

The extra required 2,000 seats (Option 2) will be obtained by adding 3 rows in the west, south and east stands. We have provided 2,011 seats in this option in order to mitigate potential seat kills.

Most of the extra's seats will be located in the centre of the stands in order to avoid an increase in capacity outside the 90m viewing distance to the centre of the pitch. These seats will be mounted on stell structures on a slab that will match as much as possible the precast units. The choice of extra steels stands is based on buildability because it would be hard to bring precast units to the back of bowl after the stadium is built. Parallel to this capacity expansion, the west concourse can also be extended in a zone 5,5m deep.

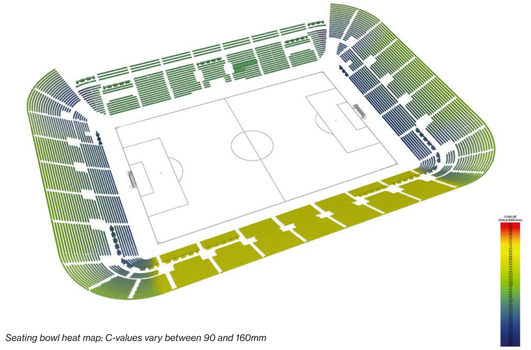
In all options, the seats are aligned to create images and patterns via pixelization for tifos.

Seats colours

The seats will be 50% white, 25% light grey and 25% grey, arranged in a mixed design. The colour scheme was based in the following considerations:

- White, the predominant colour, relates to AGF's main colour;
- The grey tones relate to the natural colour of the precast concrete units of the bowl;
- The "pixelated" visual effect has been proved to answer positively in situations where the stadium is not completely full, both in terms of the atmosphere and broadcast.
- The mixed colours respond very well to partial seat future replacements if necessary. Potential new seats will match well with potential faded colours of the existing seats.

Proposed 20K seats bowl highlighting in green the potential extra terrace / seats



Seating bowl heat map: C-values vary between 90 and 160mm

BASELINE DESIGN (20,000 seats capacity)

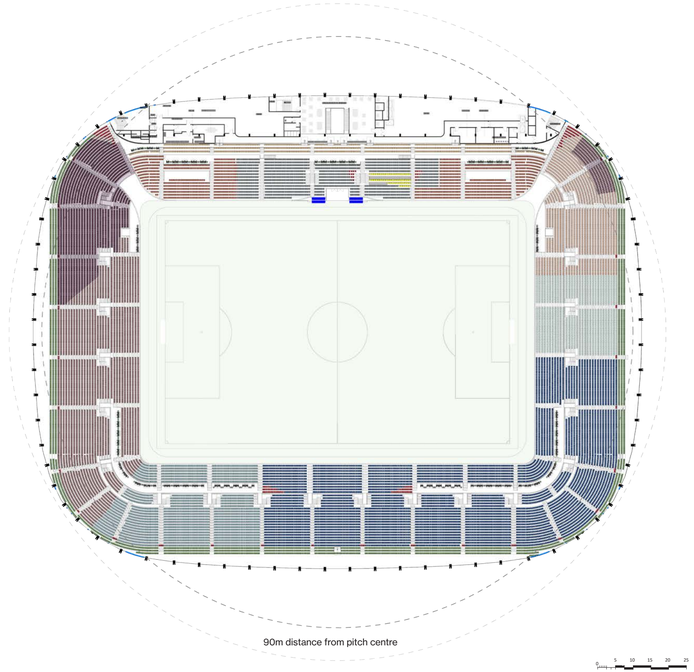
Seat spectator group	Quantity	Seat centers distance (cm)	Row depth (cm)	Seat depth open (mm)	C-value (mm)
Players Seats	28	60	100	261	+120
GA	6765	50	80	562	+90 to +100
GA Away Fans	1757	50	80	562	+100 to +140
GA / Away Fans Extendable	1394	50	80	562	+100 to +140
GA Family	2093	50	80	562	+100 to +140
GA Ultra	5345	50	80	562	+100 to +140
GA Wheelchair positions	86	142	305	N/A	+110 to +120
GA Wheelchair companions	86	142	305	562	+100 to +120
Hospitality Bronze	1270	50	90	572	+100 to +120
Hospitality Bronze Wheelchair positions	13	142	362	N/A	+130
Hospitality Bronze Wheelchair companions	13	142	362	572	+130
Hospitality Silver	962	60	90	572	+110 to +130
Hospitality Silver Wheelchair positions	13	142	362	N/A	+130
Hospitality Silver Wheelchair companions	13	142	362	572	+130
Hospitality Gold	446	60	100	665	+110 to +120
Hospitality Gold Wheelchair positions	13	142	362	N/A	+130
Hospitality Gold Wheelchair companions	13	142	362	665	+130
Media Seats and Desks (terrace only)	60	50	90	630	+100 to +110
TOTAL (excludes players, media a seat kills)	**20282**				

EXPANSIONS

Option 1	
GA Flexible Seat (standing positions)	250
GA Away Flexible Seat (standing positions)	1750
Option 2	
GA Extra seats	2011
EXPANSIONS TOTAL	**24257**

Seat Key

- GA Away Fans seat
- GA / Away Fans extendable
- GA Seat
- GA Family seat
- GA Ultra seat
- GA Flexible seat
- Hospitality Bronze seat
- Hospitality Silver seat
- Hospitality Gold seat
- Obstructed views (not included in the capacity calculations)
- Extra GA seat
- Media seats and desks
- Wheelchair position + companion



Main Stand

Hospitality "cut-outs"
The hospitality stand includes a cut-outs at all levels to improve the guests experiences on match and non-match days. All seats in the cut-out terraces are removable to allow the club to use these spaces in diferent modes at all events.

Bronze Lounge: Two cutouts were introduced to allow more natural light and views to the bowl and pitch. The spectators access to their bowl seats is made through these openings. The Club's offices in this level will also have a curtain wall that allows the staff to have views to the bowl in the resting areas in non match days.

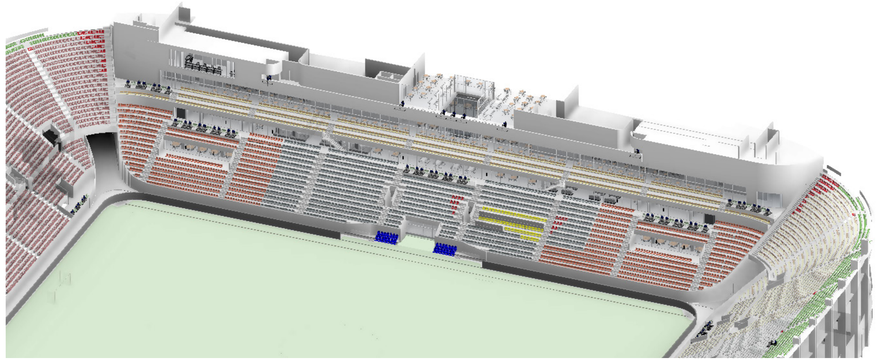
Silver Lounge: This lounge has a pitch-side continuous curtain wall with a length of 105m, replicating excatly the longer dimension of the pitch. This transparency will allow amazing views into the pitch and the bowl.

Gold Lounge: This lounge has also a pitch-side continuous curtain wall with a length of 105m, offering ineterrupted views too.

Video, Light and Sound
The bowl and the roof geometry are based in repetitive curved profiles, designed to enhance the natural sound of the spectators but also the sound from the pitch. The pitch lights will be placed under the roof and recessed from its inner perimeter, avoiding potential glare for the cameras and for the spectators. The giant screens have been positioned also under the roof in a way that avoids any clashes with the spectators and cameras sightlines. The screens ratios have been calculated to be visible from across the bowl up to the furthest spectator position.

The design already includes the main camera positions in the level 4 TV gantry in the north stand, the 18-yard camera positions at the same level and the back of goal cameras, designed to minimize the adjacent seat kills and to guarantee the safety of the cameramen. The north stand TV camera allows for the installation of future camera and desks, responding this way to future technologies and other events such as the UEFA Women Euro, for example.

Acoustic Concept
Within the seating bowl it is proposed to meet the dual objectives of providing a sound system for multiple sports and entertainment events to help build the atmosphere pre-event as well as ensuring that the integrated PAVA system provides the required intelligibility for Stadium safety announcements through the use of 16No line array speakers hung from the roof. For concerts it is recognised that the production company will bring their own sound equipment for the stage and the standing audience on the field of play but tie lines with integral delays will be incorporated into the Stadium's bowl seating speakers to allow them to supplement the stage systems to reduce set up time. Electro acoustic modelling will be undertaken to validate the proposals to ensure sound is contained as far as practical within the stadium during concerts but with a balanced approach to ensure a great atmosphere during matches.



Seat Key
- GA Away Fans seat
- GA / Away Fans extendable
- GA Seat
- GA Familiy seat
- GA Ultra seat
- GA Flexible seat
- Hospitality Bronze seat
- Hospitality Silver seat
- Hospitality Gold seat
- Obstructed views (not included in the capacity calculations)
- Extra GA seat
- Media seats and desks
- Wheelchair position + companion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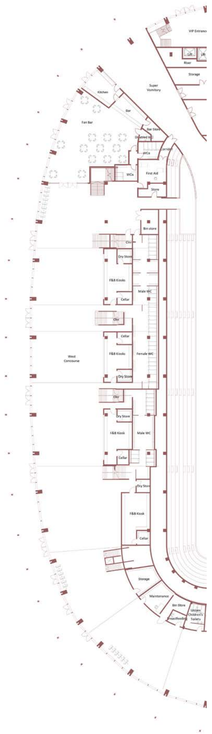
Spectators’ Concourses - Spaces of Movement

Concourses are the sheltered spaces where the spectators relax and interact. They should be airy spaces where the fans can easily move and where they should feel ”at home”.
The concourses naturally follow the gently sloping landscape, and creates an inviting open promenade in direct physical and visible connection to the trees of Kongelunden. Behind the heritage colors of the stadium facade, the interior of the new stadium will be light and toned to the white club color of ”de hviie”.



Spectators' Concourses - A space for the club and the fans

Club identity
Inside the concourse the space, materials and colors should support the identity of AGF. The white colortones underlines the identity of "de hvide", of the AGF home shirt, and at the same time it acts as a "white canvas" for the match activities to unfold.

The stadium and the concourses are inhabited at match days, the light white spaces gets filled with life, banners, club flags, and potentially infographics.

Fan ownership
The stadium design should also allow for establishing the feeling of ownership among fans, players and the club. The white canvas can allow for implementation of club graphics and fan art - temporary or permanent. This could be greated through an involvement process of the fans.

Wayfinding and subtle intergration

To improve integrated wayfinding, signage could be implemented in the club dark blue color, that stand in visual contrast to the white / light base tones.

Trivision effects could make subtle but dynamic graphic features that change as you move through the concourses.

Club colors
AGF is identified by as "the white", and the home shirt is characterised by this with details of dark blue and red.

Club merchandise
The club merchandise that fans bring to stadium is white and blue, which the stadium interior could underline.

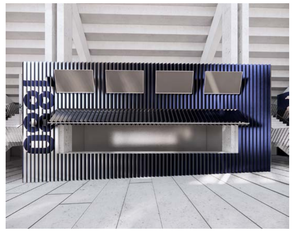
Samlet for Aarhus! - Creating fan ownership
The die hard fans are eager creators of fan art, slogans and graphics that support their club. This could through an involvement process be integrated in the interior of the stadium.

Fan statements - KSDH!
Kom så de hviie! Sammen for Aarhus! Stolte som få! Slogans like these could be integrated in the stadium interior.

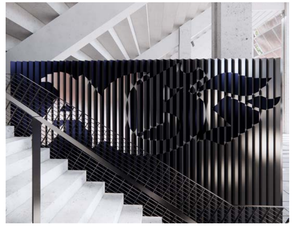
Wayfinding
Club blue can be used for wayfinding elements.

Wayfinding
Club blue can be used for wayfinding elements.

Trivision example - Along the concourse
Example of how the concession food and beverage stands could change appearance when moving along the concourse.

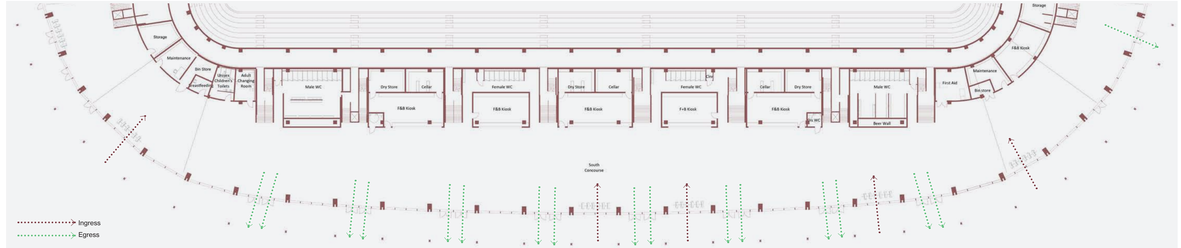


Trivision graphic effect
Trivision is a sublte, but visually strong way to integrate graphics, text, slogans into spaces. It creates evolving and dynamic visual elements, that reflects the dynamics of movement in sports and football.



Trivision example - Along the stair
Example of how dynamic club grapichs could be integrated in the conessions along stairs.

Spectator’s Concourses - Spaces of Movement



GA spectoators main ingress and egress flows principle

Concourse Design Principles
The concourses are the first space that the spectators visit after entering the building. It’s important that they have enough space, and that the architecture plays an important role in the comfort and wayfinding. The strategy is common to all GA concourses: wide and illuminated spaces with concessions, toilets and other spaces alternatively positioned below the bowl as far away as possible from the glazed facade. Between these and very visible, there will be the stairs and lifts accessing the generous seating bowl vomitories. The spectators will be segregated at concourse level depending on their seat location (low or high level). All external doors will be in front of the stairs to minimise the time of egress.

This strategy results in a uniform architectural language, complementary to the 360 flow configuration and very clear in terms of wayfinding. As suggested, an 11m column free zone as been incorporated, making these amazing high headroom spaces flexible for other uses.

The access turnstiles have been calculated at a rate of 350 people per hour per turnstile and the occupancy ratio of the concourses achieves 55% of the terrace population at an area of 0.55m2 per spectator, assuming a total capacity of 20,123 spectators. The proposed ratios are as following:

- East concourse: 0,27
- South concourse: 0,26
- West concourse: 0,27

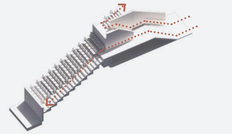
In order to avoid stairs and local ramps in the landscape as it happens in the current stadium, the concourses follow the natural external levels. The east and the west concourses will be softly ramped, never more than a 1:25 angles and with the landings aligned with the egress routes in front of the vomitories stairs. This strategy also creates considerable benefits in terms of sustainability - less impact in the natural landscape - and in terms of construction cost.

The east concourse has been designed to include a segregated Away Fans concourse, self sufficient in terms of spectator welfare. This concourse can be extended through the relocation of the concourse mesh walls depending on the away fans capacity in the stand above.

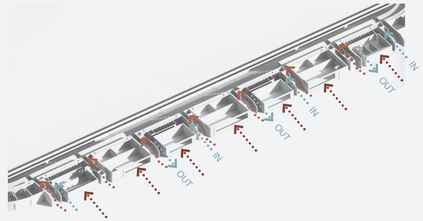
Roller shutters have been included on all vomitories to protect the concourses from wind and rain, whilst also enabling concourses to be used for other functions that require segregation from the bowl.

F&B Concessions
The fans will have access to F&B concessions, toilets, and other supporting spaces. The concessions have been designed to be 5,5m deep in order to not compromise their future operations. The counters will be accessible to all spectators, including those in wheelchairs or less tall without dropped counters. The queuing zones have been kept segregated from the circulation areas to achieve maximum flow. The F&B strategy includes areas of self-serving drinks, commonly known by “beer walls”, which will serve those looking to buy only drinks, minimizing this ways the queuing time for those who wish to buy also food. A central 100m² beer store is located in the East Stand above the away fan concessions, from which beer is distributed around the concourses via pythons to the underside of the terrace. The store is located close to the OB compound and is accessibile in both match and event modes. The concourses will be populated with “drinks shelves” to increase spectator comfort.

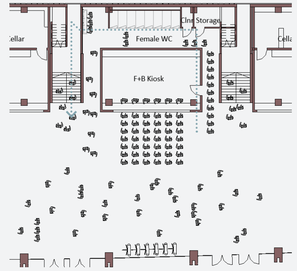
The Fan Bar, in the northwest corner, will offer an informal fan experience both on match and non-match days. Unlike the GA concourses, we have allowed for thermal insulation and heating. The slab over the Fan Bar will be part of the west GA consourse with direct access to the bowl.



Typical vomitory flow



South stand concourse: the vomitories, toilets and concessions flow don’t overlap



Typical toilet and F&B concession arrangment and spectators flows

GA Toilet Provision
The toilets have been calculated for a total capacity of 24,000 spectators and are divided in female, male and children (unisex and located in the southwest corner). The number of toilets, wash hand basins and urinals have been calculated using the UEFA recommendations and the Danish regulations and we have always assumed the most onerous provision in each situation.

Most toilet blocks include an entrance and exit to enable a one-way flow of spectators and are located beyond the F&B concessions. Their location allows for queuing zones on both sides of the concessions and minimises the impact of sound (hand dryers) and smell in the concourse areas. We have sucessfuly applied this concept in several stadiums like, for example, in Stamford Bridge, the home of Chelsea FC.

The family stand will be supported also by a unisex children’s toilet block to allow parents and children of opposite genders to visit a toilet, a breastfeeding room and an adult changing room. This strategy ensures that everyone can visit the stadium, independently of their age, gender or disability. Bin stores and cleaner’s rooms have also been distributed throughout the concourses.

Main Stand
The Hospitality Experience

All hospitality spectators will be accommodated in the main stand which is designed to be flexible and future proof. From this stand, visitors will also be able to enjoy another experience on non-match days: the Stadium Tour.
The main stand visitors on different levels will be connected by a central atrium space in the central axis.

Hospitality area - Gold, interior with view to pitch

The historic column hall

- A public space in Aarhus Sports Park

The new stadium will have various entrance points, of which the most prominent goes through the axis of Stadion Allé and the beautiful neoclassical heritage column hall by Axel Høgh-Hansen. While most of the facades of the historic building remain intact the column hall has changed to beyond recognition.

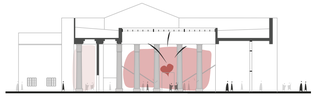
The Column hall "Søjlehallen" - which used to be an open courtyard with a central water basin around the Jean Gauguin sculpture "The Boxer" - is today covered by a slightly clumsy translucent ceiling, green carpets, and enclosed by VIP main stand floor slabs serving the existing stadium towards the southern façade.

We propose to reinstate the feeling of an open democratic urban space, an inner courtyard, by opening the roof with a big transparent skylight with actual views to the sky and the adjacent new stadium. This approach is strengthened by detaching the new stadium and the historic building the space.

The space should be cleaned up from carpets while a new water basin around the central statue could be reintroduced in the spirit of the heritage building.

The inner courtyard should no longer be experienced as a lobby for the stadium main stand, but rather a public space for Aarhus Sports Park as it was intended. It will connect directly and act as entrypoint to the two existing halls halls as well as to a ticket office/lobby for the new Football Museum.

Furthermore the southern façade towards the stadium, which is spoiled by the connection with the existing stadium, is proposed opened up with a glazed setback, to visually connect with the exterior urban space and the new stadium.

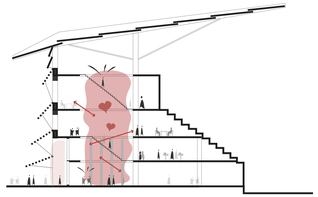


The new column hall

- A welcoming space in the historic axis

In the axis of the heritage column hall, a new modern atrium space, creates a direct dialogue with the historic architecture, and invites everyone into the new stadium. The new column hall connects the concourse level, tunnel club, and membership tribunes in one democratic space, characterized by transparency and openess.

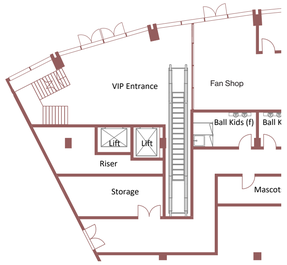
On match days the new column hall can act as tunnel club as well as lobby for the bronze, silver and gold stands. At other times the space can open up as a generous democratic public urban space that is central for stadium tours.



Acces and view from lounges towards the fan plaza

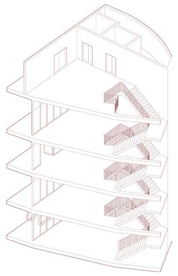
Connected to the Fan Plaza
Towards the Fan plaza in the north west corner of the stadium the second VIP entrance is located next to the super vomitory, together with the fan shop and ticket sales.

VIP entrance:
The main VIP entrance is located centrally in the axis of Stadium Alle. The secondary entrance, placed in direct connection to the Fan Plaza is marked by the generous opening facade element, that guides you in. Inside the lobby is designed as a open spatious connection between stair and elevator. An atrium spaces visually connects vertical throughout all floors.



Cafe in heritage gable:
To further activate the fan plaza and include the optional Hall 2, we propose a generous opening in the western gable of the heritage building. This option would directly connect the interior of the hall with the fan plaza. On event days the hall could act as a continuation of the fan plaza as a covered public space, the added possibility of selling beverages etc.

The proposed opening is designed as a series of double doors / gates, that allows for a fluid transition between the two spaces.



The Fan Plaza VIP atrium
In the final updated project visibility between the lounges and the VIP entrance has been dramatically improve. As an important and significant entrance situation a new vertical atrium with direct acces from the fan plaza will connect the different hospitality levels.

VIP entrance, Fan shop and visible entrances

All lounge storeys have direct visual connection to the Fan Plaza.

Entrance facade scales

Standard module

Entrance signage module

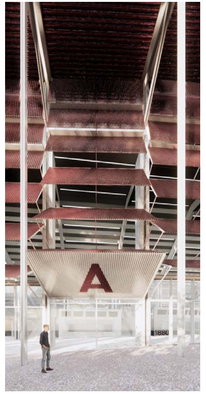
VIP Super flap

VIP Central entrance

To emphazise and mark the entrance situations a special facade scale is introduced, with the posibility to integrate wayfinding signage. By folding the enlarging specific facade scales and folding these inwards, a significant graphic surface apears that mark the special situaions and entrances, and reveals the white underside of the scales.

This can be used as a marking of the all main entrances to the concourse, as well as fan bar, facade markings similar to that of the fan shop can be introduced to guide the flow of people, and support wayfinding.

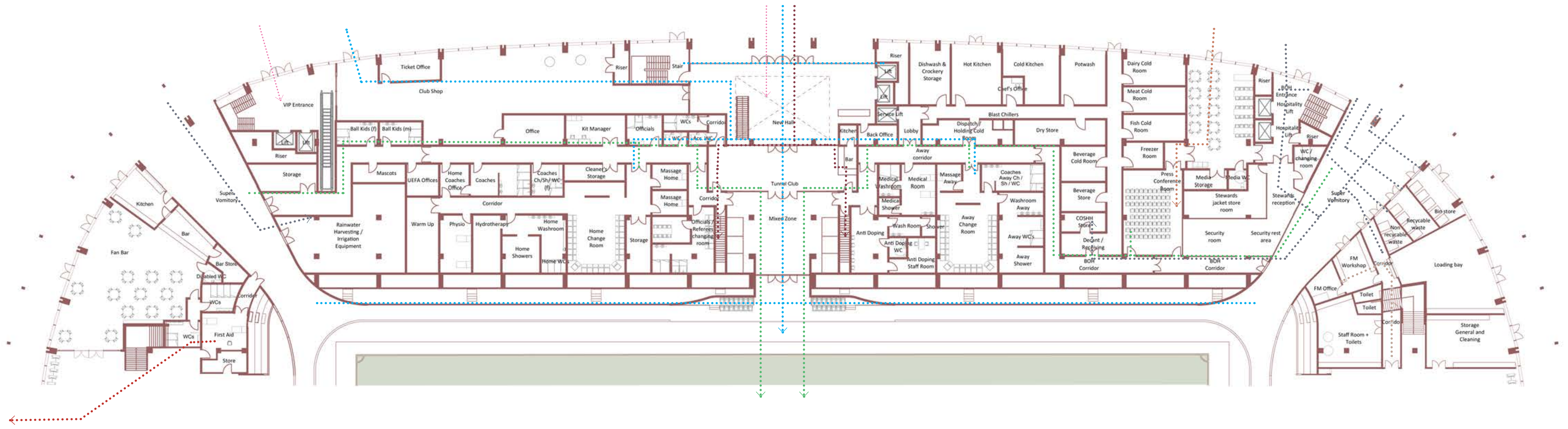
VIP entrance and Fan shop



Example for entrance signage and cover for the fan bar and concourse

Main Stand Level 0 - The Operational Heart of the Building

This space hosts the main operations that can truly activate the building: Back of House, Security, Catering and the Technical Teams Areas.

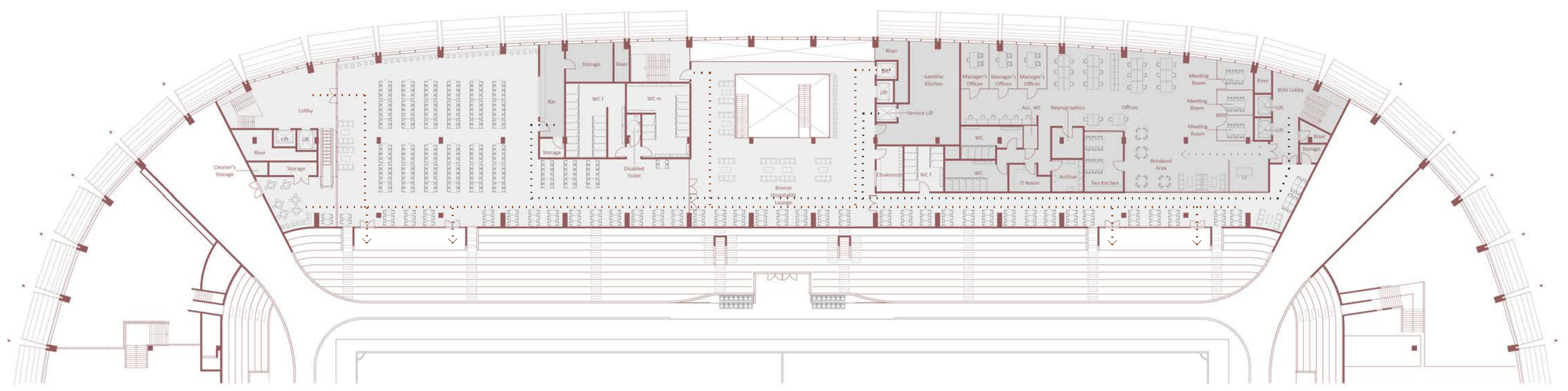


Main Stand level 0 plan - Operational heart of the building

Internal Layout Strategy
The Main Stand ground floor is organised as following:

- 3 vertical cores of stairs, lifts and one escalator, located at the ends and at the centre of the stand; The escalator, to the west, will travel between levels 0 and 1 to cater for the Bronze Lounge, one of the lounges with more guests.
- A large plant area to the west, as near as possible to the pitch and with access through the super vomitory;
- The Club's shop to the west with a large window front and incorporating the ticket office, visible from the Fan Plaza;
- To the east but still central to feed the hospitality lounges above the main kitchen. From the kitchen there will be a catering lift that will serve all the satellite kitchens in the floors above. The main kitchen can be accessed for deliveries both through the east super vomitory or through the north facade. The design also ensures that all working in the kitchen will have access to natural light;
- The Media Centre to the east, close to the OB Compound and the vertical access core to the TV gantry. From this space is also possible to access the northeast super vomitory that will link the photographers to the pitch. The strategic location of the media centre allows this space to be used on non-match days as a bar, a lounge or a conference facility. It has a 'window front', is easily visible and accessible;
- The security room and stewards centre to the east, adjacent to the east super vomitory. Please note that the stewards centre is not included in the competition brief, but our team considers that this facility is essential in any efficient stadium. Stewards require an accreditation area, a place to pick up their jackets and equipment and to leave their personal belongings. They can be briefed in the adjacent media centre or in the east concourse before a match / event. The security room is strategically positioned to the east at this level, in constract to the SCC at level 4 which is located to the west. This strategy introduces an extra layer of security if one of the sides of the stand is to have their accesses compromised;
- Separated from the security room, below the northeast stand, the BOH facilities: waste store areas, loading bay, FM facilities and main staff and store rooms. We have allowed for a reductin of the F&B storage area because all bars already include individual dray and cold storage areas. This strategy is proven to be more efficient because it makes the concessions much more self sufficient and easier to manage their stock during events;
- The players and technical teams areas in the central zone and with direct links to both super vomitories where the teams buses can park , the mixed zone and the pitch. The AGF's changing room has been located in the west area of this zone due its proximity to the Fan Plaza and the Ultra stand. Although the away team changing room is considerably smaller, shares the layout principles of the main team changing room in order to create a welcoming space;
- And in the heart of this floor, the generous Mixed Zone with a wide and glazed players tunnel, adjacent to the tunnel club. The natural light will be abundant in the Mixed Zone both from north and south directions This space will also include enough space and infrastructure for the flash interviews and all the media apparatus. The Tunnel Club is located next to the main hospitality reception. It will be segregated from the Mixed Zone through a glass wall, and it will be served by toilets and a bar, which allows it to be used for other events on non-match days, combined or not, with the Mixed Zone, with a potential total area circa 269m². The Tunnel Club layout is inspired by the neo-classical Heritage Building atrium layout, also part of the journey of the spectators accessing this.
- The fan bar includes a glazed partition with glazed doors which provides a visual and physical connection to the west concourse; enhancing guest experience and improving spectator flows.

Main Stand Level 1 - The Bronze Hospitality Experience



Main Stand level 3 plan, Bronze Lounge 1:500

The Journey
The Main Stand will accommodate circa 2,500 spectators, including those in wheelchairs and their companions. Their access to this hospitality stand starts outside the stadium: some spectators will access the stand through the generous west hospitality lobby in the Fan Plaza while the others will pass through the Heritage Building atrium and directly access the central hospitality core under the main stand. At arrival to this space, the spectators will have a view into the mixed zone and the pitch and, when they look above, they will also see a "void" going through the building up to the stadium roof - this space, where most of the circulation happens at all levels will be fully activated with spectators flows, full of natural light, sound and visual links between all levels of hospitality. This lobby also includes an escalator, access to two hospitality lifts and the main stairs which serve anyone in this stand up to level 4. It will also be possible for the spectators in the Tunnel Club to access their seats in the stand directly from two central vomitories adjacent to the mixed zone. Spectator accreditation will happen in these two lobbies.

From all hospitality lounges, the spectators will be able to fully see the south elevation of the heritage building which will reinforce the concept that the stadium and the Heritage building are two distinct buildings, not just physically but also in time and use. The distance between the buildings offers the "respect" that each one deserves.

On non-match days, the club will be able to use all the hospitality lounges and lobbies with the possibility of sub dividing them. The catering lift, coming directly from the main kitchen at level 0 will feed all levels up to level 4. As a backup strategy, the east BOH lifts will be also able to assist in this operation.

Level 01 - The Bronze Lounge
This is the first level of hospitality and will accommodate a minimum of 1050 of the 1250 spectators to be seated in this stand, in an open lounge with a set-up with a mix of seating and standing, with a ratio of 1.52m2 per spectator. The main arrival point to this lounge is through the west vertical core served by lifts, stairs and an escalator. Guests can also access this space through central lobby that offers direct visual links to the other hospitality lounges. This space will incorporate a more informal seating area, welcoming everyone. Toilets, kitchen, and cloakroom will be at the perimeter of this space. The toilets have been subdivided into two separate blocks, each one with female, male and accessible toilets, a strategy also repeated in the levels above to ensure that the lounges subdivision can be achieved without compromising the spectators' experience.

As a principle, all lounges can be easily subdivided by closing the fire rated glazed doors in the central area of the space.

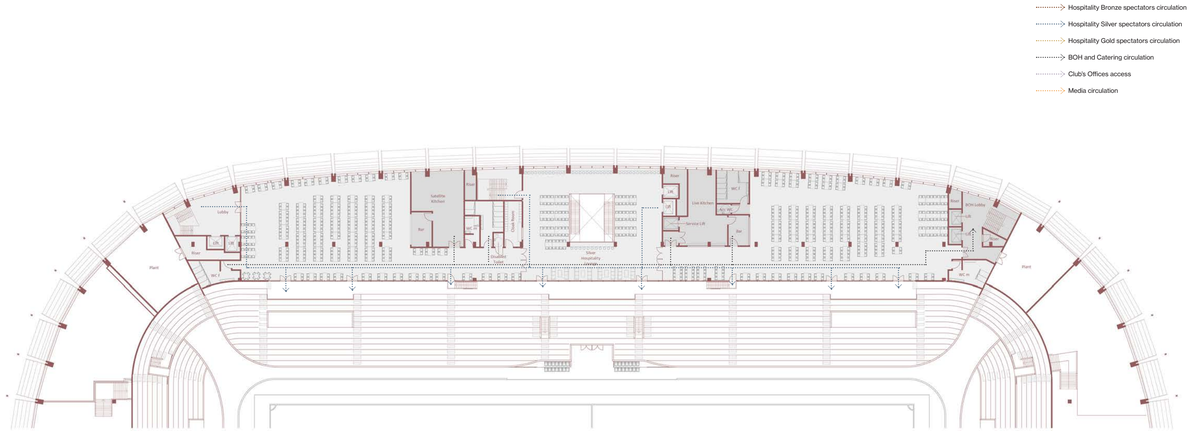
The main dining area of this lounge will be located to the west in order to establish an obvious link with the Fan Plaza, supported by served buffet tables and a drinks bar.

Symmetrically, to the east, there will be the Club's Offices. Both spaces will be able to enjoy fully glazed elevations to the north to make sure there will be abundant natural light. In this space, behind the reception and resting areas, there will be a curtain wall in order to provide views into the bowl and pitch on non match days.

Still in the east area of the lounge, there will be a more intimate lounge seating area that also ensures the escape routes through the east vertical BOH stairs.

The access to the bowl will be made through four dedicated double doors, located at the ends of the stand. These doors will get the spectators into two diferent "cut-outs" which are glazed and provide fantastic views to the pitch and bowl from inside the lounge.

Main Stand Level 2 - The Silver Hospitality Experience



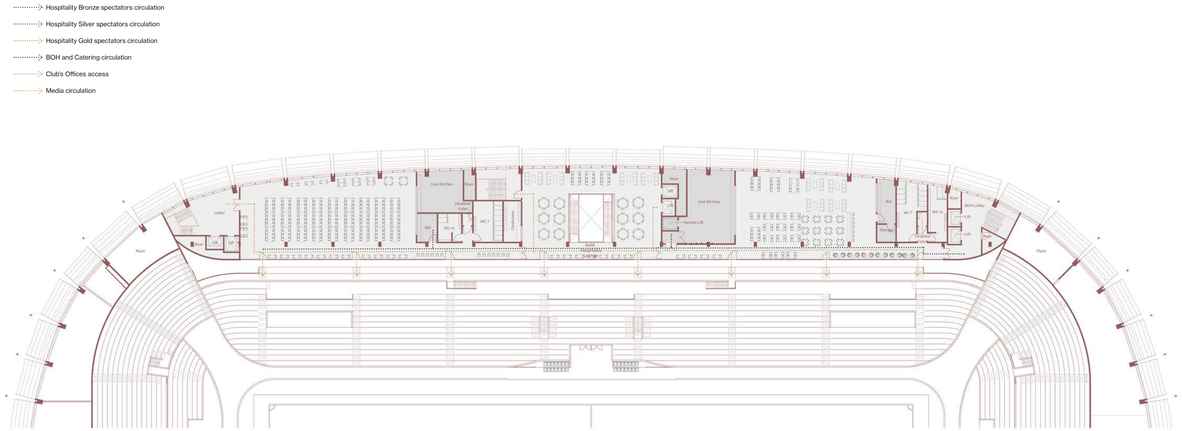
Main Stand level 3 plan, Silver Lounge 1:500

Level 02 - The Silver Lounge
This lounge, located at level 02, has been designed to host a minimum of 950 guests (seated) or 1150 guests (standing), will serve the 950 spectators in the stand on match days at a ratio of 1.59m2 per spectator, and will accommodate other events on non-match days such as conferences. Like in the Bronze Lounge below, this space will be open plan lounge, designed according to a symmetrical strategy to allow the division of the space into smaller self-sufficient lounges. This will be achieved though inernal glass partitions with double doors. The lounge will also welcome a lot of natural light though the north fully glazed facade and through the column-free terrace continuous "cut-out". This last space will be a generous external terrace in the stand with full pitch views and with 8 direct accesses to the lounge. These bowl terraces will also be able to be easily accessed by the Bronze and the Gold spectators.

Inside, the Silver Lounge will be assisted by two satellite kitchens, one of them fed directly by the catering lift, with open hatches for meals distribution. The lounge will also include toilets and a cloakroom.

The journalists seated at the main stand desks at this level will access

Main Stand Level 3 - The Gold Hospitality Experience



Main Stand level 3 plan, Gold Lounge 1:500

this lounge through the east vertical core. From the west and the east of this lounge it will be possible to access two large semi-external plant areas above the super vomitory. These plant areas will not comprise the 5m clear headroom below, necessary for the operations to take place through the super vomitories.

Level 03 - Gold Lounge
The Gold Lounge is the highest level of hospitality and the spectators at this level will have access to the best and more central seats in the main stand. It will cater for 500 guests (seated) or 1050 guests (standing), at a ratio of 3,10m2 and will include the 300 Gold spectators in the stand. The lounge, also able to be subdivided into three smaller lounges, has also been design to accommodate four skyboxes in the future if required. The space will include abundant natural light through two fully glazed facades, north and south, and spectacular views to the pitch. Outside, the spectators will be able to directly access their seats located in a dedicated stand and along the lounge, levelled with it. This enables the incorporation of two wheelchair spectator platforms with excellent sightlines and minimal seat kills.

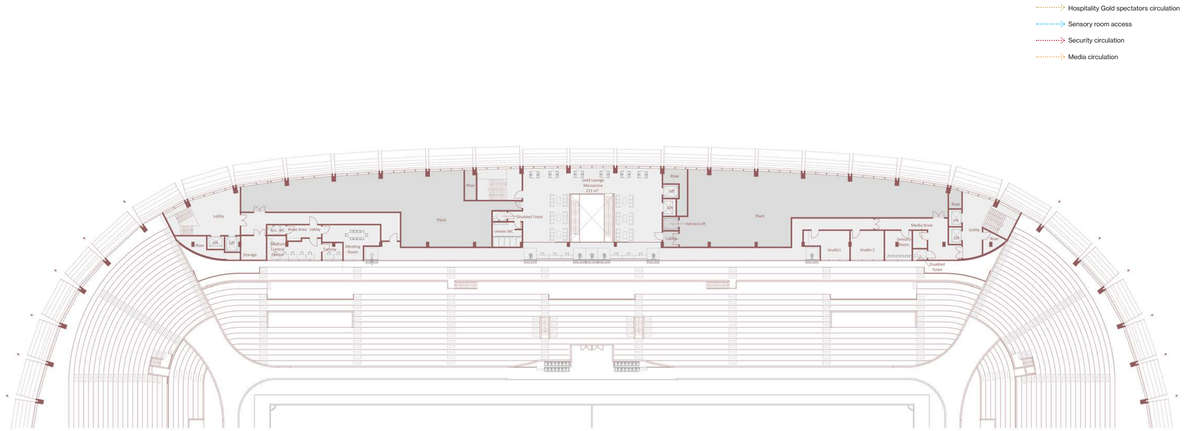
Like in the hospitality lounges below, the spectators here will also be able to enjoy the visual links with the other lounges all the way down to the main reception.

Both kitchens will be live kitchens and one of them will be served directly from the main kitchen at level 0 through the catering lift. A cloakroom, toilets, and two bars will also be available at this floor and coordinated in a way that allows the different spaces to be easily scalable.

Like in the lounges below, all three sections of the lounge - west, central and east - will be enclosed by glazed partitions and walls. This will support the proposed fire compartimitation but will also limit the sound propagation.

The central stair / lifts cores will give access to a secondary Gold Lounge at level 04.

Main Stand Level 4 - Gold Lounge and Plant level



Main Stand level 4 plan, Gold Lounge and plant level 1:500

Level 04 - Elevated Gold Lounge, Media and Security
The Gold Lounge includes an extra space, at level 04, an exclusive space with possible views to the top of the trees surrounding this scheme. As part of the hospitality experience, the spectators will also be able to have direct views to the TV gantry and the full seating bowl at this level through a glazed wall. This visual link can be interrupted whenever the club wishes so through curtains or other means of enclosure. The Level 04 Gold Lounge includes toilets and potentially an informal movable bar. The spectators will be able to move freely between the two levels of the Gold Lounge and, again, enjoy views from the roof structure all way down to the Tunnel Club.

The generous TV gantry will have access to the west and east vertical cores which will also serve the SCC and the TV studios. These will be able to offer spectacular views over the seating bowl and the pitch through fully glazed walls from floor to ceiling. This level will also accommodate the main plant areas of the building, fully enclosed with louvred external screening.

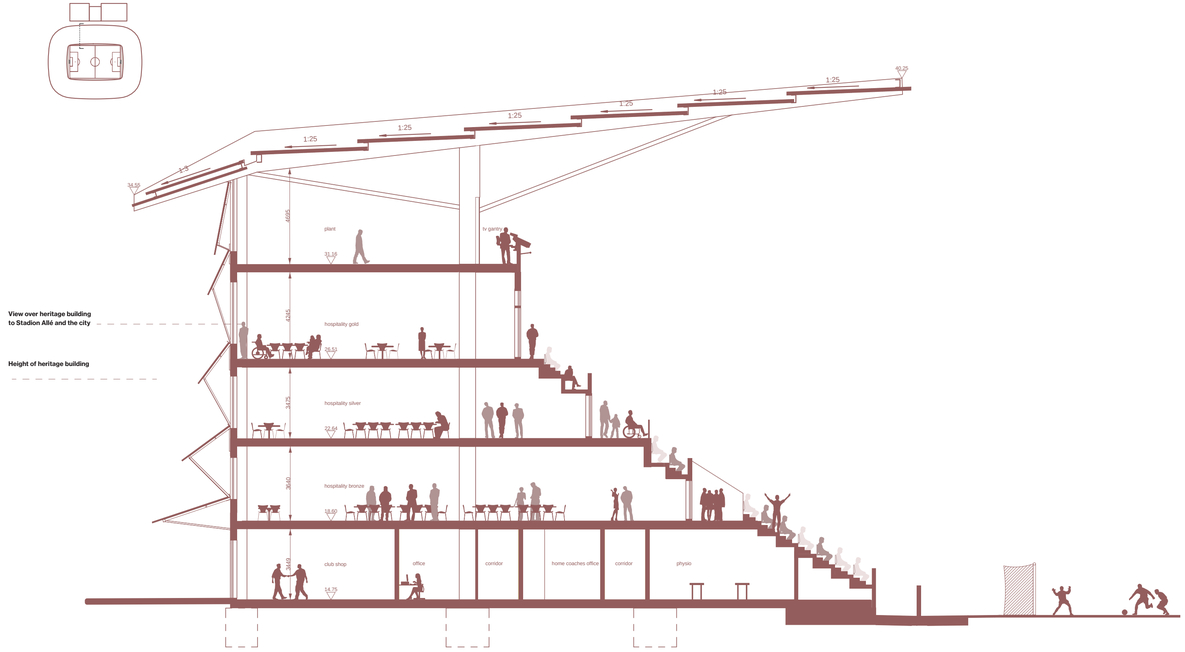
Altough it was not included in the brief, the design team has added to this level a sensory room in line with inclusive startegy which is one of the main drivers of the overall design. This room will be used by speactators that might have a mental or physical disability that unable to appreciate an event in the bowl due to the loud sound and high movement of people. This room will provide them with a calm environment, great sightlines and views to the bowl. The sensory room is accessed via the north east lifts and will be served by adjacent accessible toilet and brew area. It will also incorporate the following aspects:

- Unrestricted view of the pitch through one-way window out into the main bowl of the stadium
- Soft, comfortable furniture and soft-play
- Increased area ratio per person
- LED mood light
- The window sill height to be dropped in have the window length for diverse spectator experience

Interior Architecture
All hospitality levels will have a neutral branded design, flexible enough to be easily modified in the future. The chosen materials are robust for crowds and operations, comfortable and sustainable, arranged according to a "Scandinavian" minimalist look. The timber elements bring the necessary warmth to balance the sharpness of the concrete bowl that will naturally dominate the view from the upper lounges.

Stadium Tour
Although not requested in the project brief, our design team, also took in consideration the accommodation of a stadium tour. This journey has potential to become a unique experience for non-match days and an important revenue opportunity. The tour could potentially start in the central hospitality reception with has direct access to the Mixed Zone, changing rooms, the pitch and, through the two level 0 vomitories, to the hospitality stand. Also, from the reception it will be possible to visualise the four levels of hospitality and visit them if not in use. The level 04 Gold Lounge, with views of the forest and the forest, will permit the tour to extend to the TV gantry and studios.

At pitch level, visitors can also be guided to through the GA 360 concourse and return the main reception area which has a link to the Club's Shop at the end of the tour.



Section main stand 1:200 (Downscaled from 1:100)

Interior flexibility and M.I.C.E

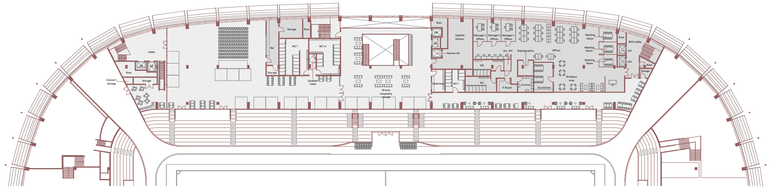
M.I.C.E. Layouts
The previous floorplans illustrate the brief dining capacities as follow:

Bronze Lounge: Min. 1,050 bronze guests as a set-up with a mix of seating and standing

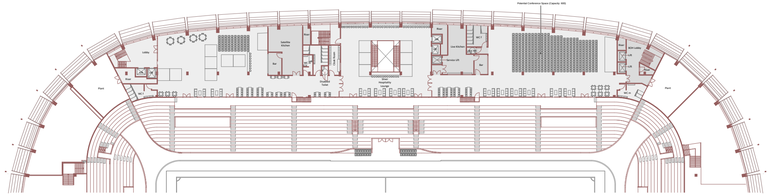
Silver Lounge: min. 950 guests (seated) or 1150 guests (standing)

Gold Lounge: 500 guests (seated) or 1050 guests (standing)

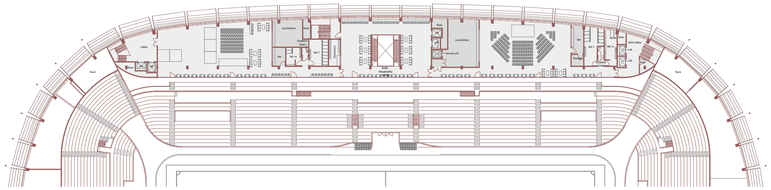
However all lounges are designed to be flexible spaces able to host coorporate and entretainment events such as conferences, wedding, small music concerts, etc. The floorplans to the right illustrate some of these potential arrangments. As a principle, for conference and exhibition layouts we applied the standard stand dimensions of 3x3m.



Main Stand level 2 plan, Bronze Lounge M.I.C.E. overlay



Main Stand level 2 plan, Silver Lounge M.I.C.E. overlay



Main Stand level 3 plan, Gold Lounge M.I.C.E. overlay

Areas

Stadium Capacity
- Brief requirement: 20,000 seats
- Proposal: 20,342 seats (not including seat kills)
- We have provided 342 extra seats to allow potential seat losses in the next design stages due structural coodination and compromised sitghtlines.

Main Stand Level 0
- GIA Brief requirement: 3655m2
- GIA Proposal: 4231m2
- We have exceed the required area to accommodate part of the required F&B storage next to the kitchen and the stweards storage and changing facilities which were not included in the brief but are essential for the stadium operations. We have also separated the mascot changing room from the ball kids changing room to avoid children and adults sharing the same faciliities. Also not included in the brief but provided in our design are the storage areas, cleaners' rooms and risers.

Main Stand Level 1
- GIA Brief requirement: 2480m2
- GIA Proposal: 2503m2
- The brief requested area did not include enough space for horizontal circulation, storage, cleaners' rooms and risers, all necessary to support the main rooms.

Main Stand Level 2
- GIA Brief requirement: 2120m2
- GIA Proposal: 2039m2
- Altough below the requested area and through a very coordinated design, we were able to accommodate the Silver Lounge with the requested ratio and the all the support spaces not included in the brief (storage, cleaners' rooms and risers). It's also worth noticing that in all lounges we have provided two accessible toilets instead of one (as per the brief) in order to avoid spectators having to travel more then 40m from their seat to a toilet (international best practice).

Main Stand Level 3
- GIA Brief requirement: 1800m2
- GIA Proposal: 1822m2
- The brief requested area did not include enough space for horizontal circulation, storage, cleaners' rooms and risers, all necessary to support the main rooms.

Main Stand Level 4
- GIA Brief requirement: 12185m2
- GIA Proposal: 12032m2
- Altough below the requested area and through a very coordinated design, we were able to accommodate the requested rooms and add a storage area, a media brew area and a toilet for the jornalists and a sensory room.

East Stand Level 0
- GIA Brief requirement: 2005m2
- GIA Proposal: 2159m2
- The brief requested area did not include enough space for storage, cleaners' rooms and risers, all necessary to support the main rooms. We have also included in this stand the 100m2 beer cellar requested in the brief.

South Stand Level 0
- GIA Brief requirement: 2415m2
- GIA Proposal: 2417.5m2
- We are providing a similar area as per the brief and still able to provide a ratio of 0.26 in the concourse. We have also included bin stores, F&B storage in the concessions an adult changing room and a small breastfeeding room next to the family stand, none of them included in the brief.

West Stand Level 0
- GIA Brief requirement: 1705m2
- GIA Proposal: 2441m2
- The provided area is superior because we have included the insulated slab of the Fan Bar at level 1 as part of the west concourse, offering this way a more confortable and efficient space. By introducing this slab over the Fan Bar, we are avoiding this space to have a triple headroom, much harder to maintain and heat. Although adding more m2, this solution will be more cost effecient than the equivalent needed facade area.
- We have also included in this stand bin stores, F&B storage in the concessions, storage rooms and an access from the pitch to the first aid room to assist spactators during concerts, none of them included in the brief.

Hospitality Toilet Provision

Assumptions:
We have assumed an ratio occupancy of 80/30 male/female toilets and have followed the recomendations of the FSADC (Football Stadia Advisory Design Council) for the number of toilet appliances in hospitality areas. The FSADCstates the following:

Male toilets
Urinals: 2 for up to 75 plus 1 for every additional 75 males or part thereof
Toilets: 1 for up to 150 males plus 1 for every additional 150 males or part thereof
Wash hand basins: 1 per WC and in addition 1 per 5 urinals or part thereof

Female toilets
Toilets: 1 for up to 12 females plus 1 for 13 to 30 females, plus 1 for every 25 females or part thereof
Wash hand basins Required: 1 per 2 WCs

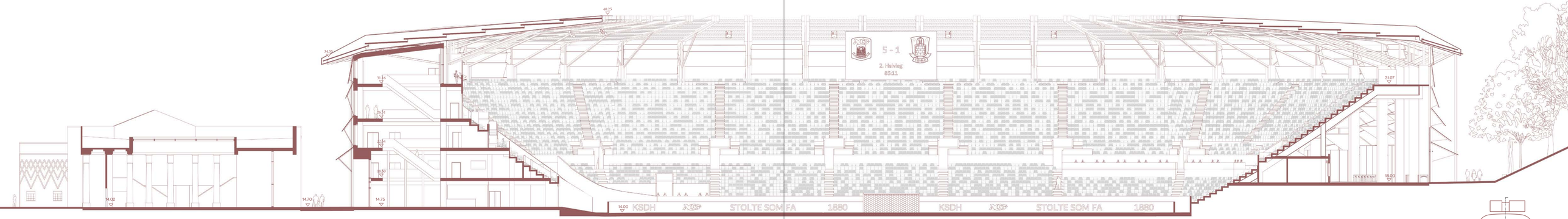
The number accessible toilets have been provided according to the regulations and never more far away then 40m from the bowl terrace.

Provided Quantities:
All the appliances provided below are inline with the FSADC recommendations:

Bronze Lounge: 1250 guests
Male provision: 15 urinals, 7 toilets, 10 WHB
Female proivision: 16 toilets, 8 WHB
Note: The brief area schedule only requests toilets for 1050 spectators, but we recommend a higher offer taken in account the number of people in the stand.

Silver Lounge: 1150 guests + 60 media
Male provision: 14 urinals, 2 toilets, 5 WHB
Female proivision: 16 toilets, 8 WHB

Gold Lounge: 1150 guests
Male provision: 14 urinals, 2 toilets, 5 WHB
Female proivision: 16 toilets, 8 WHB



Cross-section of the axis, 1:250

Fire Safety Design

The fire safety design for the New Aarhus Stadium addresses four distinct design subjects: the possibility of intervention from the local fire-rescue services, the fire safety and evacuation of the hospitality building in the North stand, the evacuation of the stadium in the full occupancy situation and the evacuation of the stadium in a potential concert situation.

For the fire-rescue services a designated area next to the stadium will be established where vehicles can arrive, and the fire operation can be led. This area will provide direct access to the stadium's fire control system, as well as access to stairs and the fire lift, thus enabling easy entry to the stadium. The exact arrangements are to be closely coordinated with the local fire brigade, but it is expected that a designated area to the east of the stadium will be established – as it is away from the fan plaza where most people are expected to gather in the event of an evacuation.

All areas will be established with egress paths ensuring evacuation time for any occupant of less than eight minutes walking time. The hospitality building will have three designated fire escape stairs, as well as the possibility to egress through the seating area of the north stand or through vomitories.

The building will incorporate fire compartmentation by separation through doors or curtains enabled in the event of a fire, isolating the indoor atrium in a fire compartment. Sprinklers are not required in the building.

In the full occupancy situation during a football match, the egress routes will be designed so that all occupants can egress through the vomitories in the stands. Widths of egress routes and vomitories will be designed by evacuation simulations, in close dialogue with the local fire brigade. From the vomitories in the stands occupants will arrive at the concourse, where the doors in front provide direct egress routes from the stadium to the outside. This limits the risks of bottlenecks and confusion during an evacuation situation.

On the outside of the building the landscape is further designed to absorb and guide evacuating occupants away from the building. This is done by providing clear egress path indications, especially important on the rear of the stadium, assisting in guiding evacuees towards the horse racetrack and tennis court areas.

In the situation where the stadium is configured for a concert the occupants in the stands will egress as described above, and the occupants in the pitch will be provided with egress routes through the super vomitories and the players tunnel placed to the north. The required width of super vomitories as well as the potential requirement for supplementary egress routes directly from the pitch towards the south will be established through evacuation simulations and coordination with the local fire brigade.

Catering Strategy

Kitchen Principles
An on-site commissary kitchen is to be provided to support the functions throughout the stadium on a match day and non-match day. The commissary kitchen will include stores, preparation, holding and pots/dish wash facilities. The main kitchen includes a generous catering lift from which all lounges food can be distibuted. If this lift is ever out of service, the food service can be re-directed through the east BOH lift, also serving all lounges.

Lounges:
There are three lounges within the stadium that will serve as follows:
- Gold Lounge has plated service to the table with the cooking on show
- Silver Lounge has self-service buffet with elements of the cooking on show and dedicated seating
- Bronze lounge has a self-service buffet/snack items

All food for the lounges will be prepared in the commissary and transported throughout the Stadium in bulk in food safe containers in a chilled state. The food will be re-heated (if to be served hot) then be portioned and plated (unless buffet service) in the regeneration kitchen for service. Exceptions may be items like:
- Mini-desserts in ramekins may come from the commissary already in the ramekins, set out in trays
- Individual salad portions may come in a bowl but undressed
- Gold Lounge Hot items will be cooked just in time in a local kitchen
- All dirties dishes, utensils and pots/pans will be returned to the commissary kitchen for cleaning.

There will be no dedicated bakery/pastry facilities within the commissary kitchen.

Food for Concessions and kiosks:
The majority of foods for the concessions will be delivered directly to the Kiosk as there is no preparation involved. Within the kiosk the products will be cooked/heated (as required) or assembled.

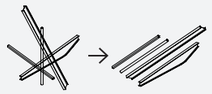
Beverages:
All beverages would be delivered directly to the Commissary Kitchen for the Lounges or to the Kiosks for the Concessions. Bulk cellars will be utilised to provide draught beverages to adjacent concessions and a climatised central beer cellar has been included in the east stand in proximity to the OB compound as required in the brief for operational efficiency.

Fan Bar:
The Fans Bar will operate both on match days and non-match days and will be designed as a standalone facility.

A responsible building: Showing the path for the future

A future-proof stadium built with a minimum of virgin and carbon intensive materials, with as little waste as possible, which consumes as little energy as possible and built to last. A place of great experiences, appreciation that will ensure that the building is cared for in many years.

5 aspects of sustainability
The proposal for a new stadium in Aarhus contains five overall sustainability agendas.



A

Reuse strategy
An ambitious reuse strategy and roadmap to a circular afterlife of the existing stadium.

This includes a thorough analysis of the existing resources and components on site and a risk assessment for circular implementation within budget, present legislation and the time schedule.

B

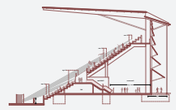
Low carbon material choices
A conscious, measureable and data based approach to low carbon materials in the new stadium design.

This includes continous LCA calculations and comparative studies of alternative materials and product specific choices.

C

Low energy consumption
Technical solutions based on best practice energy reduction and potential renewable production.

This includes incorporated photovoltaic roof panels and heat recovery technologies.



D

Robustness, flexibility and design for disassembly
A stadium built to last, change, grow and to be recycled after its lifetime.

This includes future lifecyclecost analysis, a pragmatic approach to mateterials, maintenance and a design philosophy based on priciples for design for disassembly.

E

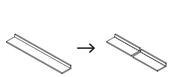
A socially inclusive stadium
An inviting and inspiring stadium for everyone to appreciate.

This includes an overall presence of the stadium in relation to the history of the city, an inviting and public accessible ground floor and a celebration of collective positive experiences related to sports and events in the city of Aarhus.

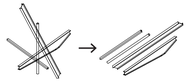
Today

Tomorrow

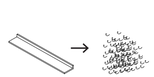
A. Reuse strategy



1st priority:
Reuse building components
Entire building components adjusted to new dimensions and reused on site. Typically steel and concrete elements.



2st priority:
Recycled to raw material
Material groups with the possibility to be recycled and recast. Typically steel, plastics and rubber.



3rd priority:
Downgraded to additive used on site
Material groups with the potential to be crushed and reused as additives. Typically concrete

Mapping of existing concrete elements, steel beams and structures, plastics and other elements

Ambitions:
Every new structure we build uses a certain amount of the planets resources. Todays awareness and tools for measuring the environmental footprint of our designs are important to make the best possible decisions for future buildings.

The most efficient way of reducing embodied carbon is through reuse of elements, either directly or with minimal modifications. The existing structure and materials used in Aarhus stadium are only 20 years old and have many years left in them. It is our view that the existing steel components are in good condition and possible to reuse or recycle. Luckily, the structure is built using mechanical joints for easy disassembly.

Risks:
To meet the circular ambitions of the client our proposal attempts to map, assess and evaluate the individual existing materials, with the ambition to reuse as much as possible from the existing buildings. The success of the strategy relies on detailed planning of both design phases, demolition, and construction phases. An extensive re-use strategy contains a number of "unknowns" and "maybes", and handling those uncertainties in the process will rely on an acceptance of risk factors in the process. Each of them should be discussed between client and consultant to define and align the circular ambitions as a benchmark for the future process.

The main risk factors include the implications on the time schedule related to demolition and reconstruction while parts of the stadium are still in use. This will challenge the demolition phasing as certain resource groups will still be in place in the existing stadium while the new construction is being prepared. This is reflected in our risk assessment on the following pages (i.e. materials that are planned to for late demolition and early implementation is related to a high risk on the time schedule (structural steel in the lower concourse), while materials that are implemented late in the building process is related to lower risk (façade, seating and landscape).

We recommend discussing these responsibilities related to reuse of existing building components in a future project including the possibilities of "circular tendering" when the process of a future contractor is planned. The implications of reusing materials harvested from an existing structure on site will potentially effect typical manufacturer and contractor guarantees and potentially result in some reused materials being more risky to implement in new structural components where consequences of collapse are more severe, costly to repair or exchange. This is reflected in the risk assessment as materials used for primary structural use are related to a higher risk, while materials for nonstructural use, additives and surfaces are related to lower risk.

We recommend following the guidelines for circular demolition (Cirkulær nedrivning) developed by "Værdibyg" and follow one of the three models suggested by Danske Ark's "Paradigmer for cirkulære udbud" in the tender process. A circular approach to building includes handling the risk factors related to economy, demolition, and the construction process that we believe are possible to mitigate and encapsulate if addressed early in the process. We recommend to start the process with a detailed mapping of both resources and environmental challenges related to problematic chemicals. These mapping will further identify risks and potentials for both time schedule and economy and will work as a foundation (and criteria) for future tender with a contractor. For the individual resource groups, we have attempted to balance the risks and potential gains categorized as economic potential (EP), climate potential (CP) and waste potential (WP).

"Carbon cost-benefit":
In relation to the future in-depth assessments of existing material resources at the existing stadium it is necessary to evaluate and balance all aspects of potential carbon benefits related to the choice of reuse. The potential benefits should be balanced against the carbon emissions related to modifications, recasting and transportation of the reused elements. The evaluation also needs to factor in the potential embodied carbon of the alternative solution (not comparing a reused steel beam to a new steel beam but alternatively a carbon-reduced concrete beam etc.). Third, the carbon-cost benefits also should consider the risk of over-dimensioning to compensate the concern of structural strength (ex. Using an existing reused beam oversized for the purpose will result in further load being carried onto other parts of the structure as well as "eating" the carbon benefits of recasting the steel to a correctly dimensioned recycled steel beam). Overall the reuse of existing materials should make sense, be worth it and fit the purpose.

Fallback options:
The present proposal and economy is largely based on "fallback" alternatives to the reuse strategy. However, we highly recommend incorporating the concept of reuse into the time schedules and risk assessments of the project to reduce the embodied carbon and waste. In the present economic climate and expected challenges with material supply, a well-integrated reuse strategy could potentially lower the overall supply risk and risk of negative implications of economic indexing.

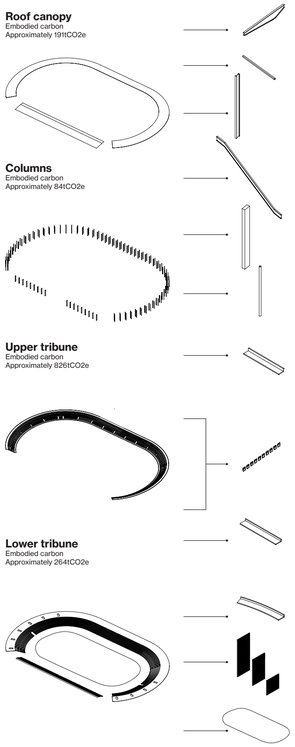
Mapping the potentials:
In the proposal we have mapped the primary structures of the existing stadium, including the main steel constructions and tribune structure as well as the main concrete structures and tribunes. These have roughly been measured and counted. In addition, the stadium has a large amount of steel components (railings, fences, masts etc.) that have the potential of either direct reuse or recycling.

An in-depth analysis of all existing structures and material groups has not been possible in this competition. Further mapping and analysis is needed to fully harvest this potential including:

The foundations underneath the stadium are likely very large and we suggest further investigation into potential reuse of these – alternatively downcycling into new structure additives underneath the new hard surfaces around the building.

The existing building planned for demolishing has a relative low reuse and recycling value and a medium downcycling potential. The potential for future harvesting of resource will rely on the amount of harmful chemicals and handling of these and potential for crushed concrete.

Resource mapping and risk assessment



Roof canopy
Embodied carbon
Approximately 1911tCO2e

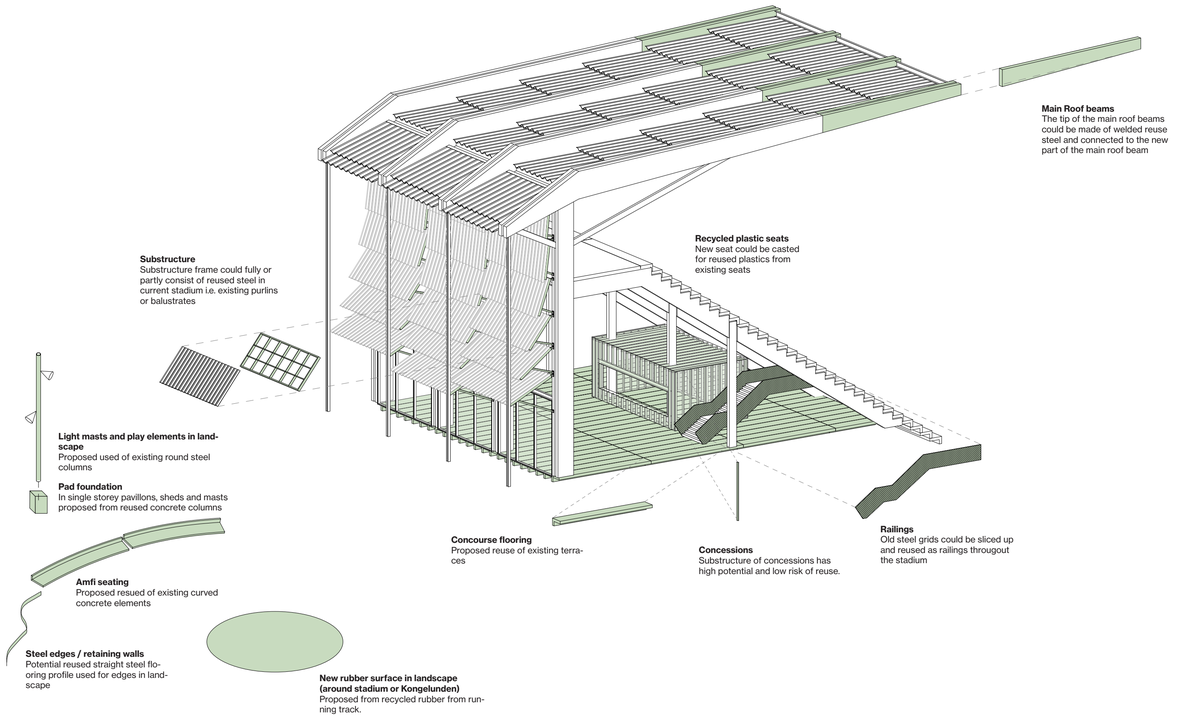
Columns
Embodied carbon
Approximately 841tCO2e

Upper tribune
Embodied carbon
Approximately 826tCO2e

Lower tribune
Embodied carbon
Approximately 2641tCO2e

Elements	Risks and potentials (Economic potential, Cost potential, Waste potential)	Fallback options
Tapered beam steel (roof) Approximately 61 pcs Embodied CO2e approximately 95 ton **UPE 160 steel (roof)** Approximately: 2400 meters Embodied CO2e approximately 90 ton **IPE 600 steel (columns)** Approximately 61 pcs Embodied CO2e approximately 67 ton **U-profile steel (upper tribune)** Approximately 122 pcs / 42 m3 Embodied CO2e approximately 235 ton	**Structural steel elements in concession stands (and other single storey kiosks and pavilions) (Risk low – EP high – CP high – WP low)** The proposal assumes that a significant amount of the existing galvanized steel structures could be incorporated into the structure of the single-storey concession stands. The reused steel is primarily harvested from the existing constructions of the upper part of the south, east and west stands of present stadium. The kiosks will be build after all main structural elements of the stadium is finished and will be amoung the last elements to be build. The geometrical complexity, structural complexity and loads are minimal, and we assess this solution to be of low risk to be mplemented within the time schedule and cost, with reused steel profiles available. Within the compound of the future Kongelunden, we see plenty of potential use of the existing steel elements from the stadium. Existing steel is only 20 years old, constructed from standard profiles and assembled mechanically with bolts which potentially could result in the analysis process to be relatively fast and of low complexity. Analysis will include the assessment of strength, lifetime, and possible tear and happen in parallel with other demolition processes of the lower parts of the stands. The modifications are simple (cutting, re-galvanizing, drilling, welding, or bolting). Parts of this process will be handled off site to ensure the quality of the result.	The fallback alternative could include low carbon alternatives as simple structural timber (post and beam) structures for the interior and shielded structures. Exterior kiosk and pavilions should be prioritized to ensure the best "carbon benifits" of the reused steel.
Concrete column Approximately 18 pcs Embodied CO2e approximately 17 ton	**Concrete columns used as pad foundation in exterior pavillons, sheds and masts (Risk low – EP medium – CP low – WP medium)** We propose to cut the existing concrete pillars of the south stand into foundation blocks for future columns in low complexity exterior structures. From inspection and age, the existing structural pillars seem to be in good condition made from high-strength concrete. The process to determine the condition and strength capacity should run in parallel with the interim use of the stadium in the 2024 season. The modification is a low-tech process that can happen on site without any need for transportation off site. Because of the low complexity in the process and potential of adding further reinforcement to the foundation we assess this initiative to be low risk. Potential necessary needs for strengthening the reused pillar foundations will still result in significantly less new cement used.	The fallback alternative includes new pillar foundations in concrete. The existing concrete pillars will be crushed for material separation (reinforcement steel and concrete gravel). Steel will be recycled as scrap metal. The concrete potentially used as additives in new poured concrete surfaces and as stabilizing gravel in the new surface build-up.
Steel round columns Approximately 23 pcs Embodied CO2e approximately 6 ton	**Steel round columns reused for future masts etc. (Risk low - EP medium - CP - high - WP low)** The round steel columns (and other existing steel masts) can without much be modified for new use in the future stadium compound. The future stadium will contain numerous poles and masts for signage, lighting and canopy structures. These will be installed late in the construction phases and will not have a critical significance in the primary structural systems of the stadium.	In case the columns are not reused they will be sold as scrap and recycled for sale
Straight steel stepped flooring Approximately 20 m3 Embodied CO2e approximately 112 ton	**Steel flooring into angular façade brackets: (Risk medium – EP high – CP high – WP low)** The existing upper concourse flooring of the north, east and west stands is made from thick steel plates bent into angular seating steps. Reuse only includes the straight elements. The steps are assembled mechanically with bolts. The disassembly will be handled in the first phase of the demolition process. Modifications includes cutting the elements into straight 45-degree profiles and transported off site for cleaning, paint stripping and galvanizing. Elements will be transported back to the site as new (reused) profiles. The present condition of the flooring elements has been harder to determine from the inspection, but because of the steel thickness and young age of the steel we assume the material to be in good condition. Because of the relative higher degree of complexity in the modification process, a relative time window between demolition and reconstruction is needed. However, as the profiles will potentially be needed in the later stages of the construction, we assess the risk to be medium.	The fallback alternative will include new steel profiles made from recycled steel. The supply risk and economic insecurity of recycled steel is relatively high because of present shortage of steel. The environmental potential is assessed as medium as the modification process will not include the re-casting of the scrap steel.
Plastic seats 17-19.000 pcs / 40 m3 plastic Embodied CO2e approximately 63 ton	**Seats to new re-cast seats. (Risk low – EP low – CP medium – WP - high)** Existing seats will be dismantled for recycling. The disassembly of the existing seats is an easy and low risk process. The processes for this are well known and relatively low-tech. There is a significant carbon reduction associated with using recycled plastics as well as a reduction of chemicals compared to virgin plastics. Also, a significant waste reduction potential can be expected.	We do not propose a fallback strategy since we believe this is achievable and a low hanging fruit for minimizing both waste and climate footprint.
Straight concrete steps Approximately 460 pcs Embodied CO2e approximately 110 ton	**Straight concrete elements in flooring in concourse. (Risk medium – EP medium - CP medium – WP low-to-medium)** The existing lower concourse concrete steps are produced as prefabricated elements and assembled on site. The joints were hard to determine from the inspection but should potentially need to be cut apart on site. There is a risk in this process that some elements are in a bad condition and / or will break during the disassembly process. The concrete elements are proposed to be reused as "flooring" in the flooring of the concession area. We assess the dimensions of the existing steps to well suited for new flooring with minimal modifications needed. A majority of the straight elements may be placed in the south stand which leaves time for disassembly, cleaning and modifications in the time between demolition and reconstruction. However, elements on the north, east and west stands will have a shorter time between disassembly and reuse.	The fallback alternative includes exchanging the reused concrete elements with new asphalt surfaces. The existing concrete slaps will be crushed for material separation (reinforcement steel and concrete gravel). Steel will be recycled as scrap metal. The concrete potentially used as additives in new poured concrete surfaces and as stabilizing gravel in the new surface build-up.
Curved concrete steps Approximately 392 pcs Embodied CO2e approximately 96 ton	**Reusability of existing curved concrete elements in landscape. (Risk low – EP low – CP medium – WP low)** As above the disassembly process contains certain risks, but the overall limited amount of proposed reused curved elements compared to a large amount available will result in lower risks of not having enough reusable elements. The curved slaps are proposed as future retaining walls that have flexibility in terms of implementation. Overall, we assess this to be of low risk both in terms of implications on the time schedule and future functionality.	The fallback alternative includes new concrete retaining walls to be installed in the landscape.
Steel gates 3 Dimensions / approximately 700+ pcs Embodied CO2e approximately 26 ton	**Steel grills for protective railings. (Risk low - EP low - CP high - WP low)** The existing stadium has a large amount of steel railings and protective fences. Most of these are dimensioned and constructed from standard profiles. We do not have a total registration for this category, but we have assessed that existing grills and railing with relatively small changes can be modified to be used in the new stadium design. Some elements potentially need to be transported off site and modified and / or re-galvanized, but the overall potential for both cost and climate is significant. Installing railings in the new stadium will happen in the later stages of the new construction and will have a low risk of creating unforeseen delays.	The fallback alternative includes railings constructed from new recycled steel which has a higher carbon footprint.
Rubber track Approximately xx m2 Embodied CO2e unknown	**Rubber track (Risk low - EP medium - CP low - WP high)** Existing rubber track can be removed, cleaned, shredded and reused as granulate for new rubber surfaces in the area. If the rubber tracks are not recycled they will very likely become landfill waste	

Potential destinations of reused elements



Reuse time schedule risk assessment

We propose to re-use a number of existing stadium elements for the new west, east and south stands, plus ancillary buildings. A summary of these is listed below:

1. Re-use of existing steel roof beams for the cantilevered tips of the new roof structure

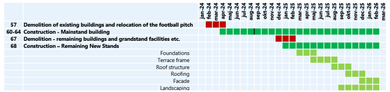
2. Re-use of existing steel profiles for single storey concessions, pavilions and sheds

3. Re-use of steel plated upper tier terrace units for new façade elements

4. Re-use of concrete terrace units and steel elements for landscaping elements

The design team has made an estimation on the phasing of key construction stages that are relevant to the re-use strategies listed above. The diagram below is an extract of the provided time schedule, with the addition of our assumed construction phasing.

Overview of Client Time Schedule



Construction phase assumption

Estimated phasing of main activities (design team assumption)

1. Re-use of existing steel roof beams for the cantilevered tips of the new roof structure

There is deemed to be sufficient time for this re-purposing strategy. There is anticipated to be approximately 6 months between the point of demounting the existing steel roof structure and the erection of the new roof structures. In relation to legislation, the material is to be tested in a manner that ensures compliance with new design codes applicable to the new purpose of the element. An evaluation shall be made during the early design stage of the project to establish the structural classification of the elements in relation to the structural consequence class, which will determine the level of testing to be undertaken in order to be compliant with the relevant steel Eurocodes and Danish National Annex.

Reference should be made to the section below entitled “Overview of process for structural steel re-use”

6 months
Feasible time to prepare material for re-use or remediate any problems

2. Re-use of existing steel profiles for single storey concessions, pavilions and sheds

There is deemed to be sufficient time for this re-purposing strategy. There is anticipated to be a minimum of 10 months between the point of demounting the existing steel roof structure and the erection of the new concessions and exterior single storey structures. In relation to legislation, the material is to be tested in a manner that ensures compliance with new design codes applicable to the new purpose of the element. An evaluation shall be made during the early design stage of the project to establish the classification in relation to the structural consequence class. This classification will determine the level of testing to be undertaken to be compliant with the relevant steel Eurocodes and Danish National Annex.

Reference should be made to the section below entitled “Overview of process for structural steel re-use”

10 months
Feasible time to prepare material for re-use or remediate any problems

3. Re-Use of Steel Plated Terrace Units for New Facade Elements

There is deemed to be sufficient time for this re-purposing strategy. There is anticipated to be approximately 10 months between the point of demounting the existing steel plated terrace units and the erection of the new façade around the west, east and south stands. In relation to legislation, the material is to be tested in a manner that ensures compliance with new design codes applicable to the new purpose of the element. An evaluation shall be made during the early design stage of the project to establish the structural classification of the façade elements in relation to the structural Consequence Class (CC1-3). This classification will determine the level of testing to be undertaken in order to be compliant with the relevant steel Eurocodes and Danish National Annex. The process for the steel plated terrace units is simpler compared to primary structural elements as they are very standardised in terms of shape, structural purpose and their origin of supply. They are absent of welds, connections and splices that may have affected their condition.

Reference should be made to the section below entitled “Overview of process for structural steel re-use”

10 months
Suitable duration for testing, re-purposing and and remediating any problems

4. Re-Use of Concrete Terrace Units for Landscaping Elements

There is also deemed to be sufficient time in the programme for this re-purposing strategy. Landscaping elements (i.e. paving) are non structural items and therefore need to fulfil the same requirements as a typical paving slab. The subgrade shall be fully compacted as standard practice to allow full contact between the precast concrete unit and the ground. Resistance to vehicular loads should be established if this is required.

6 months
Suitable duration, non-structural purpose

Showing a circular the path for the future

We are categorizing the mapping of this proposal into 3 main circular priorities.

A. Disassemble and reuse existing components as they are – in their entirety or adjusted to new dimensions.

B. Dissembled and sorted into clean material fractions and recycled through a 3rd party manufacturer.

C. The rest of the existing concrete structures are crushed and used as additives and foundations.

We wish to invite – if successful- the client to create a complete assessment of all existing components of the stadium and engage on an ambitious journey into a circular process for reusing, recycling and upcycling materials in the existing structure.

Overview of process for structural steel re-use

All structural steel reclaimed for reuse, is to be inspected and tested. Central to the testing regime is the grouping of fundamentally identical members into groups, whereby one (or more) members are assumed to be representative of the entire group, thus moderating the requirements for testing. Recommendations require 100% non-destructive testing of the reclaimed structural members in combination with non-statistical or statistical destructive testing.

- Strength is determined based on Non- and destructive tests – the strengths are calculated via a tabular version for the determined grade and not based on test values;
- Use of reclaimed steel is possible for CC1, 2 and 3 structures, but for the last, additional testing regime applies;
- Listing, tracing and inspection of existing members starts prior to disassembly from existing building;
- Reclaimed steelwork needs to be backed up by a formal declaration following EN1090-2 prior to redistribution to the supply chain;
- Members need to be subject to an approved set of testing procedure, see below.
- It is usually assumed that existing coating is removed and replaced. If it is re-used it needs to be patched-up where necessary, cannot contain hazardous substances non-conforming with current legislation;
- Re-use of members with existing holes is permitted, if these comply with new requirements of EN1993-1-1 and EN1993-1-8;
- New connections within 100mm of existing holes need to be avoided;
- Visual inspection of all welds is recommended.

The non-destructive testing of all reclaimed members establishes that a group of members can be represented by destructive test results from one or more representative members from the group. Non-statistical testing requires just one destructive test, taken from a member in each group, to confirm the results obtained from the non-destructive tests. Non-statistical testing is recommended for Consequence class 1 or 2 structures. Non-statistical testing is equivalent to the requirements for ‘new’ steel specified in the product standard. Statistical testing requires more destructive testing to assess material characteristics in accordance with DS EN 1990. Statistical testing is recommended for reclaimed steel to be used in Consequence class 3 buildings, or when the provenance or quality of the original source material is considered to be unreliable. Statistical testing exceeds the requirements for ‘new’ steel specified in the product standard.

- The property of each material to be determined during testing is as follows:
- Strength (yield and tensile)
- Elongation
- Stress reduction of area requirements (STRA) (if required)
- Tolerances on dimensions and shape
- Impact strength or toughness
- Heat treatment delivery condition
- Through thickness requirements (Z-quality)
- Limits on internal discontinuities or cracks in zones to be welded

Material and labour cost:

By including reused building components into a new construction and relying on a degree of “material harvesting” in the project, there will be certain risk factors that need to be factored into the economy. Some materials might end being damaged in the disassembly process. Some might not turn out as useful as expected. Other potentials for reuse might show up also. In our risk assessment we have attempted to identify the main drivers for risks. We have made an alternative economy sheet based on “off-the-shelf” materials as a fallback strategy for those resource groups where we have assessed a risk. Although, it is our recommendation that these identified economic risks may be balanced the potential risks of unforeseen price increases and supply shortage of virgin materials in the light of present conflicts in Europe.

Time schedule:

Working with an ambitious reuse strategy will influence the planning throughout the design and building process. We recommend performing a thorough resource- and environmental mapping to create a solid basis for a circular process. By early identifying the order of disassembly of the existing compound (starting with the north stand and running track in stage 1 and the roof structure and east, west and south stand in stage 2) and carefully plan and sort material categories and waste on site, will help to manage the risks of delays in the time schedule ensure that disassembly, testing and demolition will not create unplanned delays. This will put an emphasis on the choice of a future contractor to engage in the project. We recommend including the “Paradigms for Circular Tenders” (Paradigmer for cirkulære udbud) as a legal foundation for future tender documents and include the identified risks and desired procedures for circularity (disassembly, demolition, waste-handling and material transportation etc.) a part of the criteria for winning the bid (tildelingskriterier). In addition, we recommend following the guidelines provided by “Værdibyg” for circular demolition (Cirkulær nedrivning).

A. Low carbon material choices

Ambitions:
We share the ambition to deliver a stadium with lowest possible amounts of embodied carbon in building materials and technical installations. Today we have options of both carbon reduced alternatives to standard materials, materials based of recycled resources, waste resources and bio-based alternatives. However, alternatives in some instances are in high demand and/or in low supply which can have negative impacts on economy and supply times. We recommend to work actively in dialogue with specific products and manufacturers and include product specific environmental product data (EPD's) in the LCA calculations to ensure that the embodied carbon is minimized to a minimum. Our preliminary assessments indicate that there is a need to reduce the embodied carbon through material choices and strategies - both in terms of carbon reduced alternatives, recycled alternatives, reusing existing resources and possibly indentifying areas where timber alternatives could be considered.

Recycled steel or timber roof canopy:
The disassembly and demolition of the existing stadium will result in large amounts of steel scrap that can be used for smaller non-structural stadium components or at second-best, should be sold for recycling. All new steel used in the constructions and fittings of the new stadium should be commisioned from manufactures of recycled steel, which has much lower CO2 emissons than freshly produced steel. Our base proposal includes a steel structure in the roof canopy.

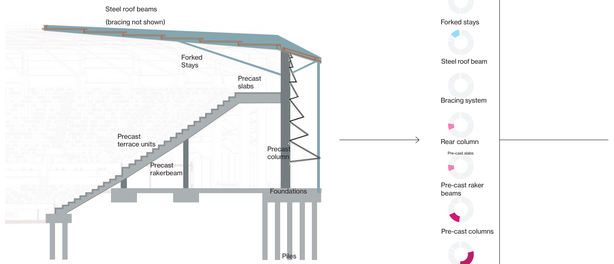
The new roof canopy can also be designed as a timer structure, with similar proportions to the steel base, if the client (or donor) could find the additional funds. The LCA analysis (opposite page) shows a comparrison of two options for the main structural frames including a base design with all new standard materials, a proposal including carbon reduced concrete (30%) and timber roof beams.

Carbon reduced materials:
We recommend the use of carbon reduced structural concrete in all concrete elements, such as FutureCEM (30% reduction) to minimize the carbon footprint.

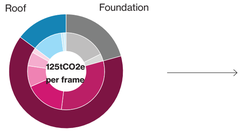
Aluminium cladding on facades we recomend carbon reduced aluminium (as Hydro building systems (75% recycled alu) or similar), to minimize the carbon footprint from new building components. Embodied carbon of both materials is relying on specific products, and we support early dialog with manufacturors in the future proces.

Recycled plastics and rubber:
We propose to recycle the existing plastic seats by shredding and recasting them as new seats. The existing rubber running track is proposed shredded into granulate and used as rubber surfaces on future playgrounds on site.

Soil balance:
The stadium is designed and organized to reduce the need of significantly changing of the soil balance on site. This is achieved by sloping the concourse slightly resulting in the structure resting on the sloping site. By doing this we will reduce the excess soil while creating a less dramatic level change between the stadium and the horse racetrack to the south.

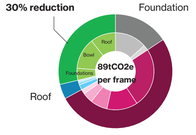


Comparative early LCA based on primary structural frames and foundations



Typical Grandstand Frame
Base Design with Steel Roof and Standard Concrete

Estimated embodied Carbon per Frame: 125tCO2e



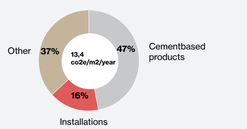
Typical Grandstand Frame
Optimised Design with Timber Roof and Low Carbon Concrete

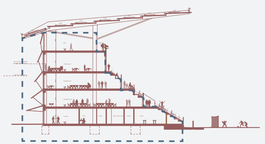
Estimated embodied Carbon per Frame: 89tCO2e

Preliminary assessments

The preliminary LCA is including the phases A1-A3 and C3, C4 and D includes a 50 year lifetime perspective.

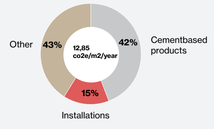
In the autumn of 2022 a report from BUILD regarding "Special building types" (Særlige Bygningstyper) will form the basis for further details on how to assess (and compensate) buildings with "special" typologies – (i.e. infrastructure projects, hospitals, etc.) Which typologies, guidelines for assessing (what is included in the calculation and what is not), and possible rules of carbon compensations (if any) are still unknown. If stadiums are included and how a calculation will be measured is also unknown at this point. The comparative analysis below illustrates a very preliminary LCA based on a a list of assumptions about unknown details. We have compared three methods of calculating the stadium, looking at either the heated area alone and the total area. Result indicate that a total calculation (including unheated area) will benifit the results positively. Allthough we still maintain the point, that reaching the targets of VSS is very challenging, unless a very ambitious reuse strategy is incorporated.

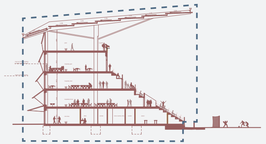




Method 1: Heated area only
Based on total area 12.000 m2 (11.500 m2 heated)

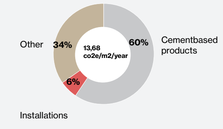
This method is looking at the heated part of the building as a stand alone assessment. This is comparable to the typologies assessed in the SBi "60 buildings report" (https://build.dk/Pages/Klimapaavirkning-fra-60-bygninger.aspx) that has formed the basis for the agreed carbon cap. This method could prove difficult to use, as the person loads of the "roof" / stands and the foundations scaled for the loads of a stadium (including the roof) plus the installations (both the energy use and the size of installations of a stadium will result in an increase) will create a high carbon footprint. The "outline" for what is included in the calculation must be discussed with approving authority. Based on this calculation method our initial preliminary assessment indicate 13,4 kg. co2e / m2 / year. (approximate 11% above BR23 target)

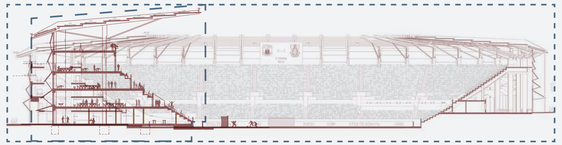




Method 2: All area in mainstand
Based on total area 13700 m2 (11.500 m2 heated)

This method include everything also the unheated area in the mainstand building. This means the brutto area is higher and everything is included into the calculation (also the canopy structure covering the unheated area). Based on this calculation method our preliminary assessment indicate 12,85 kg. co2e / m2 / year (approximately 7% above BR23 target.)





Method 3: All area in stadium
Based on total area 32300 m2 (11.500 heated)

This method include everything also the unheated area in entire stadium. A very large percentage of the stadium does not have installations, interior walls, glass facades etc. This means the elements are divided onto a larger brutto area.

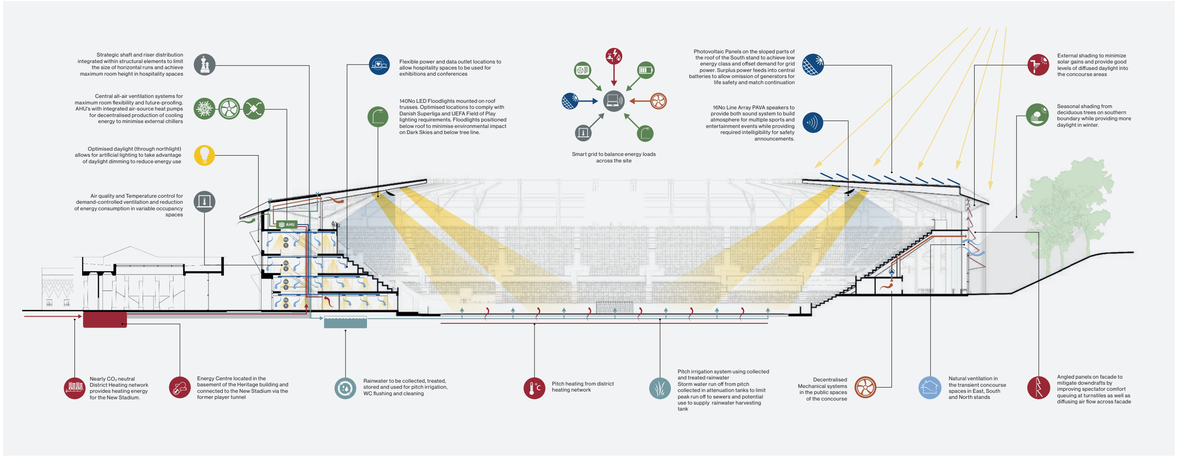
Based on this calculation method our preliminary assessment indicate 13,68 kg. co2e / m2 / year (approximately 14% above BR23 target.)

Optimization of all methods
By using a cost neutral carbon reduced concrete (FutureCEM), the carbon footprint of the cement used in concrete elements can be reduced by approximately 30%. This indicates a further reduction of the embodied carbon footprint to 121 kg. in method 1, 11,5 kg. in method 2 and 11,9 kg. in method 3, meeting the target of 12 kg. co2/m2/year.

Other potential optimizations include reusing existing steel elements (the reuse strategy) and / or choosing a supplier of recycled steel products of the new steel elements. Also reuse of existing concrete elements would reduce the footprint. The specific carbon benifits of this is not assessed at this stage.

In general a further reduction can be achieved by implementing product specific EPD data into the calculation (instead of generic data) ex. Cement, metals and wooden systems (like Aalborg Portland FutureCEM, Norsk Hydro aluminium and potentially a timber concrete hydrid system in the main stand) could be considered.

C. Low energy consumption



During the development of the energy strategy for the New Aarhus Stadium, sustainability has been at the forefront of the concept. The proposed solutions are carefully weighed in each phase of the building's life cycle. The concept incorporates the latest knowledge and technologies in the field of sustainable energy systems, healthy buildings, and circular and future climate-proof construction.

The design approach is based on the concept known as Trias Energetica, which is a superior guide that informs the principles for each step of the Integrated Energy Design process. The method prioritizes various initiatives in connection with the use of energy and consists of 3 sequential steps, which are outlined below.

1) Maximise passive measures to reduce demand for energy and reduce embodied carbon:

• Low emission building materials to improve the atmospheric indoor climate and reduce need for additional mechanical ventilation in the thermally insulated and fully conditioned North stand.

• Inclusion of unheated transient concourse spaces in West, South and East stands for better energy performance and user experience.

• Maximised daylight factor to reduce the reliance on artificial lighting during daylight hours.

• Well insulated high thermal mass structure of the North stand to store energy and reduce indoor temperature fluctuations.

• Enhanced air tightness of the North stand envelope to minimise air leakage.

• Use recycled materials to reduce embodied carbon.

2) Utilise active measures to secure energy efficient installations and minimise operational carbon:

• Demand controlled mechanical ventilation with highly efficient heat exchangers create comfortable indoor environment under all circumstances, whilst avoiding overventilation.

• Innovative rainwater collection and recycling technology for pitch irrigation and WC flushing minimizes water use and wastewater outflows to the public sewer. (Not included in economy)

• Touch-free water saving taps along with dual flush toilets and waterless urinals help to reduce water consumption further.

• LED Lighting including field of play floodlights and pitch grow lights. Occupancy control of lighting and ability to optimise for different hospitality uses.

• Fossil Free and nearly CO2 neutral heating source – connect to district heating and electrical appliances in kitchens.

• Continue Ceres Park commitment to using 100% electrical power from renewable energy sources.

3) Exploit sustainable energy sources:

• Integration of PV panels in the sloped parts of the roof of the South stand to achieve low energy class and offset demand for grid power. Excess energy generated will feed into an energy storage system to potentially allow omission of generators required for life safety and match continuation. (Not included in economy)

• Air Handling Units with integrated air source heat pumps for decentralised production of cooling energy. All integrated heat pumps utilise ultra-low GWP (global warming potential) fourth generation fluorine-based refrigerant, minimising their carbon and environmental footprint.

As a result, the design provides a remarkable level of sustainability and is proposed to be benchmarked using the DGNB certification system with the aim to achieve Gold rating.

Priority list for sustainability and low energy strategies

Sustainability initiatives are categorized into four categories:

A. Included in the proposal economy

Materials
Focus on resource eciency, renewable materials, reuse or upcycle whole components, recycled content in materials in support of circular economy principles. The design process will explore on site re-use of demolition materials. Optimise fitout solutions to consider lifecycle impact and minimise embodied carbon. MEP equipment selected to minimise operational carbon impact.

Passive Design Principles
Integrate solar shading to East, South and West stands to mitigate unwanted solar gain. Enhanced building fabric to minimise energy demand and high performing glazing to reduce solar gain

Thermal Comfort
Managing user experience by optimising environmental conditions through ecient building systems to minimise energy consumption

Optimised Indoor Climate
Unheated transient concourse spaces in West, South and East stands for better energy performance and user experience

Waste Management
Segregated waste collection and storage for on-site composting and recycling

Stadium Lighting
Strategy to minimise light pollution to surrounding neighbourhood through considered design using LED technologies and intelligent controls

Flexibility and Double Programming
Providing community facilities with stadium club shop and non-match day events like markets, school events, exhibitions etc.

Connection to Local Infrastructure
Heritage building represents an integral part of the project, hosting various technical functions for the New Stadium

Sustainable Technologies
700m2 roof mounted photovoltaic panels.

B. Additional low hanging fruits not included in the budget

Water Management
Rainwater collection for pitch irrigation maintenance and WC flushing. Sustainable Urban Drainage integrated into site redevelopment as part of stormwater design strategy. Touch-free water saving taps along with dual flush toilets and waterless urinals

Sustainable Technologies
Additional roof mounted photovoltaic panels (700m2 already included). Surplus power feeds into central batteries to allow omission of generators for life safety and match continuation. Fossil-free and CO2 neutral energy from district heating network to provide building with heating energy for comfort and pitch heating

Innovation
Integrated design concepts e.g. Air Handling Units with integrated air source heat pumps with power generated by roof mounted ph tovoltaic panels. Innovative rainwater recycling technology

Smart displays
In addition to showcasing carbon reductions and encourage sustainable behaviour, smart displays serve practical applications such as wayfinding and advertising

Connection to Local Infrastructure
Synergies of site-wide services to provide cooling, heating, drainage.

C. Recommendations for the future proces

Sustainable Construction
Work closely with Contractors to be exemplar in sustainable construction through material tracking and control of dust during the build period

Benefits to Local Economy
Support local industry through site redevelopment. Invest in new skills and green economy supporting local supply chains

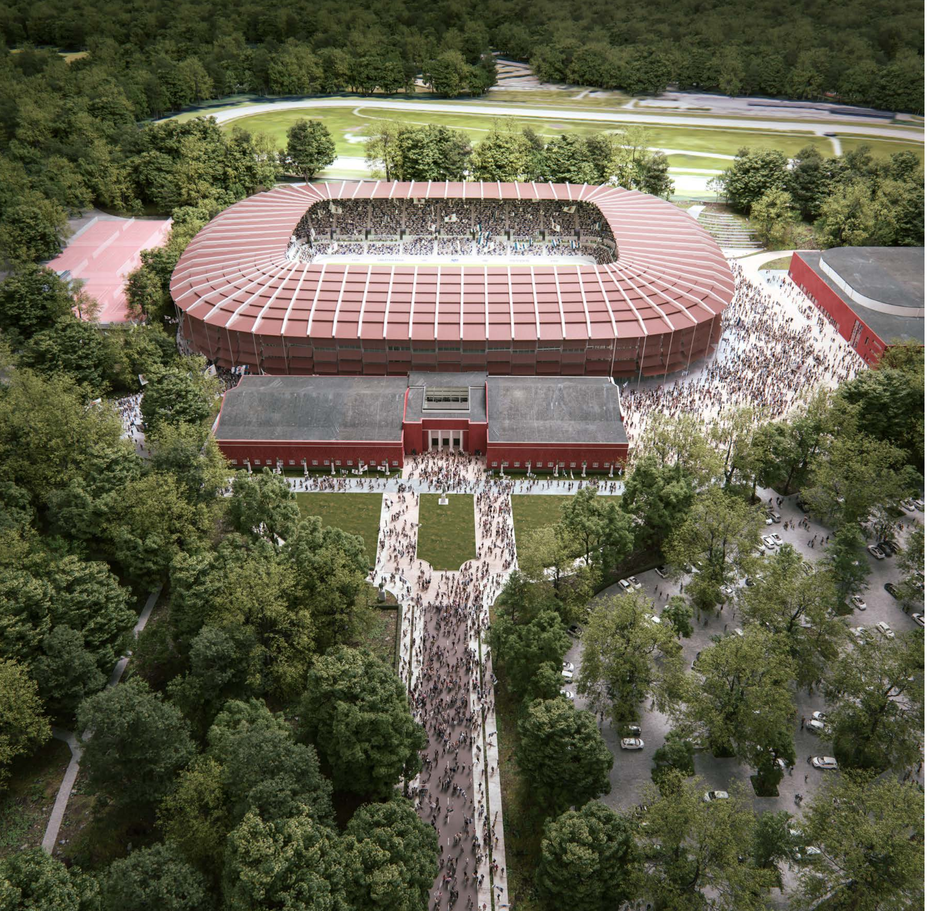
D. Further considerations out of the scope of construction

Transport
High level of accessibility for visitors. Opportunity to provide electric shuttle buses to transport fans to the stadium

Food
Opportunity for hospitality outlets to promote healthy living and local sourcing of ingredients

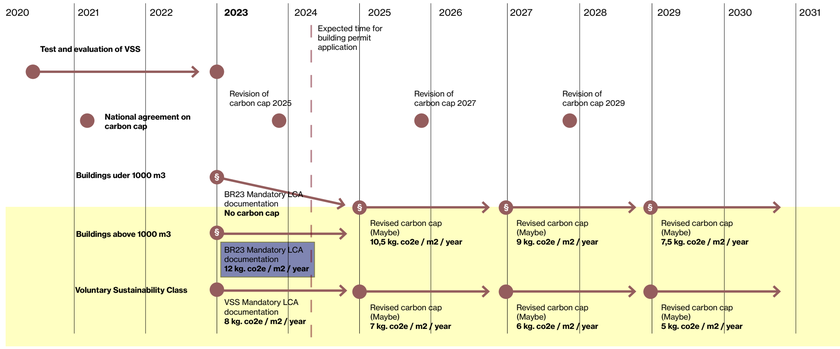
User Engagement
Develop fan visitor experience app to enhance build up to and match day experience e.g. pre-ordering food/drinks and connectivity (WiFi etc)

Education
Sustainable design principles to be realised through user experience app and visual prompts around the site



Building regulations BR23 and VSS

The chart below illustrates the broad agreement on "National strategy for sustainability construction" from March 5th 2021. This includes LCA documentation on all constructions from 2023 and a carbon cap of 12 kg. co2e / m2 / year for all buildings above 1000 m2. The Voluntary Sustainability Class will in 2023 also include a carbon cap of 8 kg. co2e / m2 / year



Complying with VSS:
In addition to the expected requirements of a carbon cap in the BR23, the project must comply to present standards for VSS (voluntary sustainability class). The present standard does not require specific targets for embodied carbon (therefore the 12 kg. co2e/m2/year will serve as the embodied carbon target)

Lifecycle assessment:
The preliminary LCA is including the phases A1-A3 and C3, C4 and D. The topic is assessed under "Resource efficiency on the building site" described below.

Resource efficiency on the building site:
Our proposal attempts to limit any unnecessary material resource to enter or leave the building site. This is obtained via:
• A focused reuse strategy
• Keeping the existing terrain and soil balance on site.
• A high degree of off-site production and on-site assembly, focusing on design for manufacture and assembly (DfMA)

As described, we recommend using the paradigms for circular tenders as a base to obtain the best possible commitments from future contractors to limitations of energy and water consumption on site as well as convincing descriptions of resource efficiency and waste limitation on site. This can be achieved by basing the criteria for winning the bid on the overall ambition for sustainability and circularity.

Lifecycle Cost:
Our proposal for the New Stadium in Aarhus is designed from a pragmatic, future-proof, and low maintenance philosophy. This is especially highlighted in the following three aspects of the design:
• Overall, the proposal is designed to obtain a minimum of complexity in material joints and layers, suitable for future disassembly and easy exchange of materials and components in the lifetime of the building. Materials are basic standard materials and dimensions which makes it easy to future exchange of materials or potential future reuse / recycling.
• Low maintenance materials have been assessed for their easy of no-maintenance capabilities. Further we have deliberately limited the amount of glass surfaces to limit areas of need of cleaning.
• The surfaces and finishing of the heated areas are divided between the ones with most wear-and-tear (the lower parts) and the less intensely used (the members section). In the last category more refined, homely, and exclusive materials are proposed.
The next stages will include LCC calculation according to the requirements of the VSS.

Maintenance plan for obtaining the indoor climate:
The requirements for the indoor climate will together with the suppliers information on installations and how these are operated to achieve the requirements, be delivered for the facility management (D&V) of the building.

Documentation of problematic chemicals:
We highly encourage the use of product specific Environment Product Declarations (EPD) as early as possible in the future stages of the project. This is a way of a. working with specific vs. generic data in the LCA, which makes the calculation more precise b. making sure that documentation (and limitation) on chemicals is under control. It is further recommended to include this commitment in the tendering process with a future contractor. When handing over the project to the client / users this documentation will be provided as a digital file to ensure possible future additions to the building's ingredients list.

Interior de-gassing caused by problematic chemicals:
The above choices should help to reduce the risks of un-desired de-gassing from installed and applied materials and products in the stadium. A contractor should (required in the in the tender criteria) commit to running the necessary measurements and documentation of formaldehyde and TVOC's in the air.

Detailed simulation of daylight:
Daylight simulations of workspaces will be made through out the design phases of the New Stadium in Aarhus. These will be updated if the layouts are changed in the process to meet the requirements of the VSS.

Structural concept

Structural Concept
The structural solution has been conceived and developed to be a cost efficient, modular and simple solution, harmonised into the architectural style, approach and arrangement.

The concept is:

- **Suited to the Danish Construction Market**

Extensive use of pre-cast concrete frame elements suited to local industry.

Contractors and suppliers will be familiar with the solutions. Knowledge and skills from simpler precast structures can be easily transferred to the construction of this stadium structure.

- **Modular, Safe and Buildable**

Prefabricated, repetitive elements are quality controlled in a factory environment and quick to assemble on-site

Safe to construct, through known and repetitive structural assembly methods

Elements can be lifted directly from the delivery truck to a site lay-out area and then their final position, enabling a clean, tidy, healthy work environment on site and a fast just-in-time construction

The repetitive frame elements (roof beams, rakers, columns) do not require on an overarching structural system for support (i.e., large roof trusses or cable net structures supporting multiple roof elements). This greatly reduces the risk of construction delay and allowing for an enhanced construction time. For example: the West, South and East stands could be assembled independently, yet at the same time.

- **Robust and Flexible**

The concept is a solid base for future optimisation and adjustment, to benefit project economy, the environmental impact, contractor preferences and construction duration.

Foundations can be optimised to suit magnitude of loading and ground conditions across the site

The concrete frame elements can be adjusted in dimension to enhance connection detailing, interfaces with the steel structure with architectural elements such as the façade.

The steel beams in roof structure can be constructed in several ways (for example, box or double-webbed I-profile alternatives) to suit fabrication preferences and connection detailing requirements.

The plates used in the fabrication of the roof profiles can either be standard thickness throughout, or optimised in thickness and welded together, to suit fabricator preferences and find the perfect balance between material use and cost.

- **Sustainable**

Uses a combination of steel and concrete materials with each material used where it is most applicable, to minimise cost and reduce the environmental impact of the structural system through minimum material use.

Prefabrication of-site reduces material wastage.

A propped steel cantilever is a cost- and material-effective design solution to achieve long-spans

Low carbon steels and concrete can be incorporated.

Steel roof beams can be exchanged with glulam timber elements on a simple plug-and-play arrangement that doesn't alter structural philosophy, structural design or architectural composition. The use of timber would greatly reduce the embodied carbon of the structure overall.

General Structural Description

Main Stand (North)
The North stand is a precast concrete building, structurally independent to the other grandstands that will be constructed at a later date. Vertical loading is transmitted to foundations through precast concrete slabs, beams and columns, and the building is stabilised by concrete cores around stairs and lifts.

Grandstands
The single tier seating bowl is comprised of conventional L-shaped precast concrete terrace units spanning between precast concrete raker beams supported on columns. The columns are tied together with beams to provide sufficient robustness against disproportionate collapse. The tie beam on the façade line is an upstand concrete beam, above the slab level at the back of bowl, located where there is a closed façade, and it does not disrupt daylight entering the concourse below.

As an alternative option to precast concrete terrace units, a proprietary structural steel system could be used. These are lighter than the concrete equivalent (helping reduce the dimension of the supporting structure and foundations), easier to transport and quicker to install. However, such systems can be expected to be sourced from overseas.

Roof Structure
The roof structure consists of plate-fabricated steel beams that that cantilever towards the pitch. The tapered profile reduces in depth towards the pitch, meaning that the beams utilise depth and material where it is required the most. It is an option to exchange the 7-9m section at the end of each roof beam with two profiles from the cantilevered roof structure of the existing stadium, reducing the embodied carbon of the new build. The existing roof profiles will perform the same function for the new stadium, but two profiles are required per frame as they carry a greater amount of load due to the greater spacing between frames and the potential for greater loading from the roofing panels.

The roof beams are propped by an inclined steel strut supporting the cantilever, at half way between the back of bowl and pitch. A vertical steel strut-tie external to the outer façade helps tie down the roof, stabilising the structure from downward load on the cantilever. In the occasions where there is uplift from wind on the cantilevered portion of the roof, the strut-tie will act as a compression strut in the wind uplift condition.

The steel beams in roof structure can be constructed in several ways (for example, box or double-webbed I-profiles) to suit fabrication preferences and connection detailing requirements. Similarly, the plates used in the fabrication of the roof profiles can either be standard thickness throughout, or optimised in thickness and welded together, to find the perfect balance between material use and cost. There is great potential in parametric modelling of these beams to find optimal solutions throughout the roof.

The roof of the North Main Stand has a significantly shorter cantilever span compared to the remainder of the roof and therefore the amount of steel required here is considerably less.

Movement and Stability
The roof structure is stabilised by horizontal cross bracing between the roof beams. The details will be coordinated with the roof structure and cladding as the design develops. It is expected that the central three frames of each stand will host the horizontal cross bracing and transmit transmitting lateral forces to vertically cross-braced frames below.

On the South, East and West stands, the large concrete columns along the façade line continue up to roof level provide both vertical support to the roof and lateral stability parallel to the plane of the frame. The column is propped by the raker beam, which will act in compression and tension, respectively for wind pressure and suction on the façade. Between columns, below the terrace units, steel beams tie the stadium structure together to transfer lateral loads via vertically cross-braced frames into the foundations below.

The overall structure will be separated by movement joints, placed approximately at each corner of the stadium, and incorporate parallel 'double-structure' at each joint. This layout logically forms separation lines at the super vomitories at each side of the North stand and fits in well with the phased construction sequence.

Foundations
Lightly loaded columns and walls will be supported upon shallow pad foundations, but the highly loaded foundations such as the columns at back of bowl and the ones supporting the base of the rakers (resisting lateral forces) will require piling, alongside the stability cores of the north stand.

Structural Dimensioning
In order to ensure that there is robustness to the costing and inter-disciplinary coordination of the competition proposal, the structural system has been verified to a suitably appropriate level through a combination of analytical modelling, team experience and precedent studies.

Multiple 2-Dimensional analytical frames were created during the competition phase to investigate different structural proportions, which in turn were evaluated from a holistical architectural perspective. The frame that achieved the best balance between structural performance and architectural integration was further evaluated to ensure that the allowances in the cost plan are sufficient.

The frames have been preliminarily designed for both strength and deflection. The roof beams are assumed to be pre-shaped to remove deformation from self-weight of the roofing panels and the beam itself. The deformation resulting from combination of snow and downward wind is within the deflection limit set of Span/180 (equivalent to 180mm).

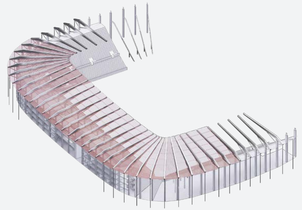
The roof beams of the typical stands (West, South and East) consist of plated fabricated steel profiles that vary from 2000mm deep with 20mm thick flanges and double webs to 750mm deep with 15mm thick flanges and double webs. The roof of the North Main Stand has a significantly shorter cantilever span compared to the remainder of the roof and therefore the amount of steel required here is considerably less.

The V-struts are 450 and 350mm box sections and the external rear strut-tie element is a 323mm circular section with a heavy wall thickness.

The roof purlins are IPE 400 profiles and stabilising cross bracing has been estimated based upon an area rate of 10kg/m2 based upon precedent studies.

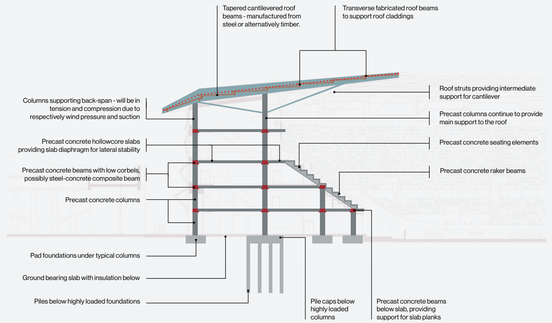
The rear column on the façade line is 1350x800 in profile and has a reinforcement allowance in the cost plan that accounts for its resistance to both bending and high axial forces, but also considering the possible connection details: complexity arising from the incoming raker beam being supported directly within the column profile, or if there is extra bending resulting from a corbel (console) type connection detail. The ridged profile of the beam to support the L-shaped terrace units is accounted for in the cost plan.

The raker beam is 1200x800 in order to meet strength and vibration requirements for the large span over the concourse, whilst the other raker beams closer to the pitch are 800x800 considering the shorter span conditions.



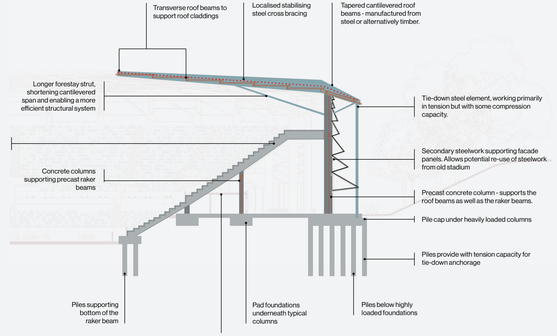
Buildability diagram
Example of construction process, demonstrating different elements of the proposed structure being built quickly and progressively in a 'delivery-on-time' manner. The modular design means that the stadium can be constructed on a number of simultaneous work fronts: terrace units can follow on quickly behind the main column and raker beam frames, followed by the roof beams and roof surface, on a bay-by-bay basis..

The repetitive 2D frame elements do not require on an overarching structural system for support (i.e. large roof trusses or cable net structures supporting multiple roof elements). This greatly reduces the risk of construction delay and allows for an enhanced construction time by working on multiple areas of the build at once. The example shown shows both the west and east stands under construction, with the main stand complete from an earlier phase of work.



* Structural section shown is taken behind the staircase

Structural Concept Main Stand



Structural Concept West, South and East Stand

Construction and deconstruction

Construction and Deconstruction

Modularity

The new stadium's robust and simple overall structural system is developed with a focus on speed through standardisation, modularity and off-site construction. Using precast concrete structures for most of the superstructure is in line with traditional Danish construction systems and the modular design means the stadium can be constructed on a number of simultaneous work fronts, at speed.

Phasing

The North Stand is its own independent structural system and is separated from the remaining grandstands from movement joints, so is ideally suited to the first phase of construction. The West, South and East stands will follow in the second construction phase.

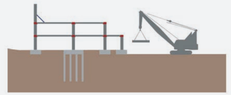
Roof Structure

Due to the size of the roof structure elements, they are anticipated to be transported in smaller components, assembled at ground level and lifted to their final position atop the supporting column structures. Besides applying well known structural principles, the structures have a high degree of repetition. The roof structure will contain very similar connections and construction methods throughout, improving both off-site and on-site production.

Deconstruction

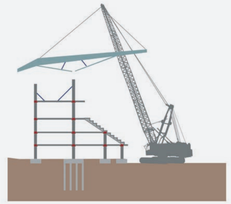
The modularity of the structure functions well in terms of future disassembly and reuse for other construction projects. To further increase this potential for reuse, precast concrete elements could in part be constructed with bolted steel connections for easy future disassembly on site, and reassembly in a new context.

1. Earthworks and Foundations following demolition of current north stand

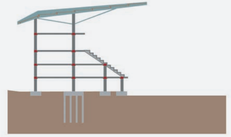


2. Quick and efficient construction of precast concrete frame

3. Addition of precast terrace elements



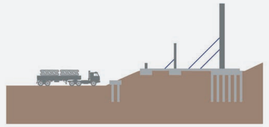
4. Installation of roof structure



5. Completion of construction Phase 1

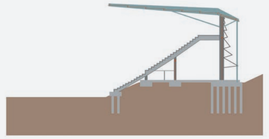
Construction Phase 1: Main Stand (North)

1. Earthworks and Foundations following demolition of existing stands and removal of pitch



2. Quick and efficient construction of precast concrete frames following demolition of existing stands and removal of pitch

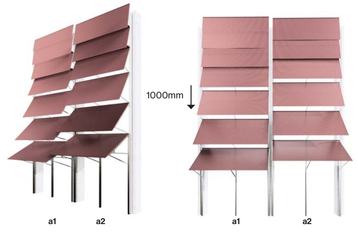
3. Addition of precast terrace elements



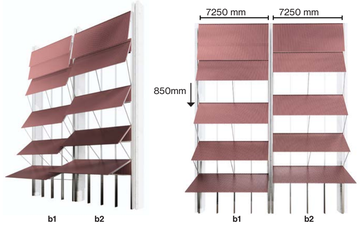
4. Installation of roof structure and completion of construction phase 2

Construction Phase 2: Remaining Stands Stand (West, South, East)

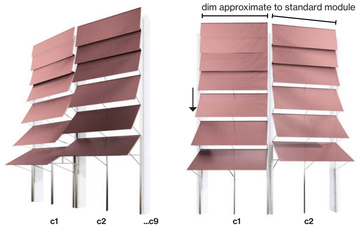
Modularity



A-modules: Overall strategy



B-modules: Main Stand facade



C-modules: Corner strategy

Modular Facade
Through a thorough optimization process , the buildability of the facade has been optimized.

The facade principles has been rationalized to increase the amount of repetition, and improve the possibilty of assembling the facade of modular elements, prefabricared off site.

The facade consists of 3 main facade segments, with slight variations:

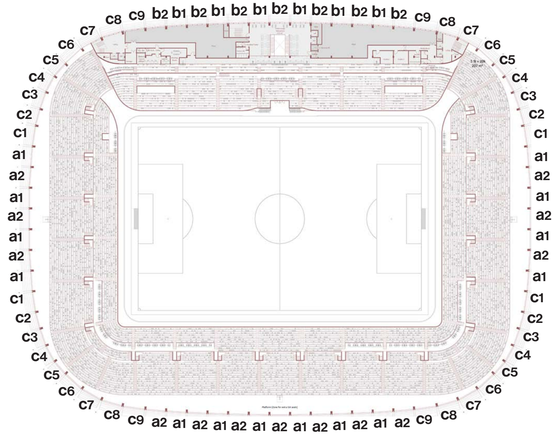
A) The general module of the open concourse facade, that has to main variations (illustration a1, a2) that shifts 1000 mm per segment to create the playful cone-like facade.

B) The segments of the main stand building, with fully climatized facade. Each segment (b1, b2) shifts 850 mm. Glazing and parapets create a funktional facade with views from the interior space.

C) The coner segments that has customized dimensions to achieve the rounded corner situation. (shits 1000 mm between segments)

For each of the elements, variations can be implemented in ground floor facade scale, at entrance situations.

Each facade segment is constituted of rational and robust elements that are easy to assemble in pre-fab modules. Joints are proposed as simple connections that allow for easy assembling as well as future dissassembly in case of repairing or retrofitting.



Modular & flexible system along the facade

Materials and built reference projects

Durable Materials
The New Aarhus Stadium should be as durable and future proof in its architecture and materials as the Heritage Building of Høeg-Hansen, that is more than a hundred years old. The stadium must be built with robust materials that can withstand weather and the wear and tear of large crowds of people over time.

All structural elements are kept in concrete and steel that are well suited for this type of building due to heavy loads, long spans etc. Glass and metal (aluminum, zink, steel or the like) are used for the facades. The "hardness" of the façade materials is balanced by a softness in the architecture, that holds motives from the surrounding the forest – leaves of a tree, filtering of the sunlight, the colors in autumn.

The proposed materials are all inorganic, durable and have a long lifespan. They do not change appearance or patinate as such but stay the same when generally maintained.

Focus should be put on reducing the carbon footprint of the materials – by using reused or upcycled materials, by using low carbon materials like FutureCEM concrete and the like.

Reference buildings
Our team refers to several built reference projects in Denmark and internationally. The examples show iconc buildings with metal cladding and glass in the facades.

AFL reference: In Thomond Park Stadium the facades of the concourses are perforated metal panels. The solution has proved to work well even though the building sits in a very open landscape with high western wind exposure. From inside the concourses the facades appear rather open and with good visual contact to the surroundings.

AFL reference: Swansea Park Arena has a unique facade made of MF walls and a perforated metal clad facade with LED lights integrated for video broadcasting.

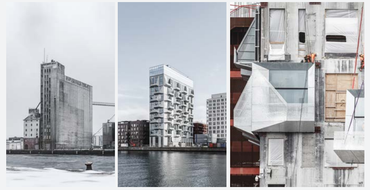
Cobe reference: The iconic "punk rock rivets" of the facade on Rockmagneten are bent cassetts of metal. Some are perforated and placed in front of windows - still keeping the unifying design.

Cobe reference: The characteristic Metro Station Nordhavn is a good exapmple of using glass facades on a public place with a lot of wear and tear. The upper part of the facade is clad in triangulated metal panels.

Cobe built reference: Rockmagneten
Project: Museum for pop, rock and youth culture in Roskilde
Year: First prize in competition 2011, completed 2016
Outer and inner facade cladding: custom made metal kassettes, some perforated
Surface treatment: annodized gold and painted red

Cobe built reference: Orientkaj Metro Station
Project: Metro Station in Nordhavn, Copenhagen
Year: First prize in competition 2013, completed 2020
Materials: Concrete and custom made metal cladding panels

Cobe built reference: The Library
Project: Extension of existing culture house including new library and concert hall
Year: First prize in competition 2009, completion 2011
Outer and inner facade cladding: stretch metal, annodized



Cobe built reference: The Silo
Project: Former grain silo transformed into residential complex and public facilities
Year: Commissioned 2013, completed 2017
Outer facade cladding: galvanized steel cladding with gradient perforation on balconies

Upkeep and Maintenance

AFL built reference: Brentford Community Stadium
Project: Joint home of Brentford FC and London Irish
Capacity: 17.250
Year: 2020
Materials: Concrete and custom made metal cladding panels

AFL built reference: Lusail Stadium
Project: Sports Stadium in Doha, Qatar
Capacity: 80.000
Year: 2021
Facade: 4m tall metal panels

AFL built reference: Thomond Park
Project: Redevelopment of Thomond Park
Capacity: 29.000
Year: 2008
Facade: Concrete and perforated metal panels

AFL built reference: Swansea Arena
Project: Arena, coastal park, plaza, landmark pedestrian bridge & car park
Capacity: 3500
Year: 2022
Facade: MF walls and a perforated rainscreen with LEDs for video braodcasting

Robust and cost-effective solutions
The upkeep and maintenance strategy is based on well known, robust and cost-effective solutions. General maintenance is required such as cleaning facades and gutters, inspection of roof, PV panels and the like. We have focused on durable materials that require low maintenance and on good accessiblity - mainly using ground based temporary solutions.

- Low maintenance of concourse facades due to chosen solution with glass facade only along terrain and semi-open panels for weather protection of upper concourse facade.
- Low maintenance of roof due to chosen solution without translucency in roof (see roof study)
- The free driveway around the stadium ensures good accessibility for lifts and other aids.
- A spider lift could be used for maintenance of façade, inside concourses and roof in bowl
- Roof acces, fall protection on roof
- Cleaning and maintenance of upper facades and gutters can be carried out using a lift.
- Cleaning of glassfacade along concourses can be carried out from terrain.
- Facade panels can be dismanteled and replaced individually. Focus on design for disassembly in line with the existing stadium.

The upkeep and maintenance strategy strategy will be developed further in the project planning phases in dialogue with the client and tenant / user.

Weather sheltering, wind and rain

An Overview of Weather Conditions on the building site
Aarhus has a relatively large amount of rain year-round, with peaks in June and September. The figure below shows the annual distribution of rain, which translates to approximately 8 to 12 days per month. The football season runs from February to June. February to April receives the smallest amount of rain over the year, increasing in May and June. Temperatures will be colder during February to April, increasing from May to June which is likely to improve external comfort conditions.

Windspeeds at the site average 7 m/s annually. The site wind Rose indicates the prevailing winds are from the west and southwest, and it is on these that a couple of existing site conditions provide shelter to the building, helping reduce the impact that these predominant winds have upon the comfort of the concourse. The existing arena building to the west offers a proportion of shelter to the stadium and plaza from the prevailing westerly winds at pedestrian level. Additionally, the southern side of the site is sheltered by the hill and existing trees. The dominant westerly wind is likely to interact with the new stadium form by either skimming over the stadium, falling within the bowl or creating some façade downwash/downdraft as indicated in the figure below.

The generally curved form of the stadium reduces local wind peaks in the adjacent exterior spaces, compared to a squarer building with sharper corners. The northwest quadrant of the design is conceived as a fully closed façade meaning no wind effects in the interior spaces, and the trees on the stadium's site will break up the wind, further reducing wind peaks in exterior spaces.

A Sustainable, Cost-Effective Façade
The façade provides high-performance shelter against wind and rain, whilst allowing natural ventilation and providing strong levels of daylighting within the concourse. This is a cost-effective and sustainable solution that avoids mechanical ventilation and reduces the requirement for artificial lighting, minimising energy use and maintenance.

Cost efficiency is achieved through the avoidance of a fully external envelope and maintence associated with mechanical ventilation systems and the space requirements for Air Handling Units. Natural ventilation will provide fresh air and dissipate smells associated with food from the concourse environment.

A Performative Facade
The façade has been designed as a performance-based system, optimising the relationship between indoor and external environment by covering a range of different scenarios associated with daylight and wind conditions around the perimeter of the building. The façade surrounding the concourse has overlapping panels to reduce incoming wind, but they have a perforated gradient that maximises daylight and eliminates incoming rain. The north façade is fully closed, but the external façade panels are more sparce and contain a higher degree of perforation to maximise the amount of daylight into the facilities of the north stand. Continuously adjacent to the concourse, a 4 metre tall glass façade at base level provides a strong degree of shelter to the users of the concourse, removing the direct effects of wind, rain, or snow.

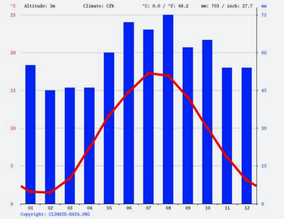


Figure 1 - Temperature (oC and rain (mm))

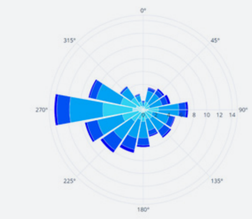


Figure 2 – Site Wind Rose

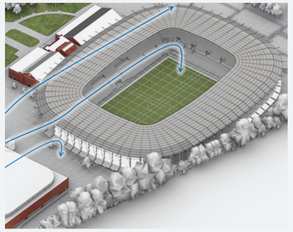


Figure 3 – Predicted effects from the prevailing wind

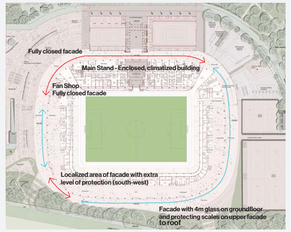


Figure 4 – Perimeter areas (fully closed or semi-open).

A performative facade that acts as a windbreaker

The façade provides high-performance shelter against wind and rain, whilst allowing natural ventilation and providing strong levels of daylighting within the concourse.

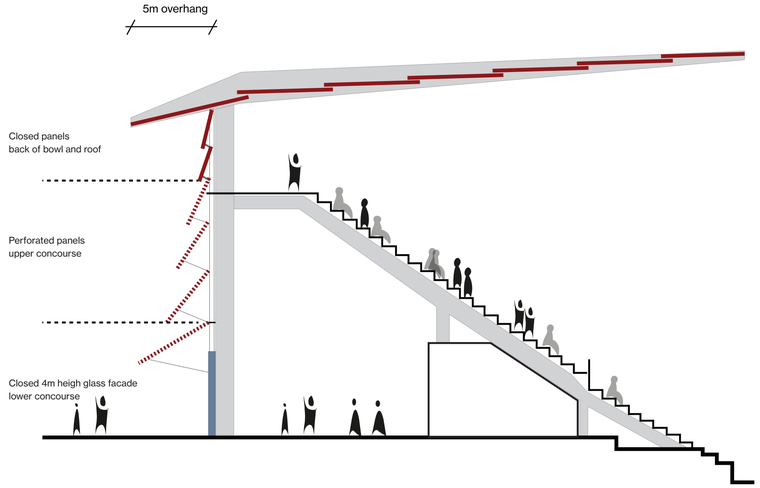


Diagram showing closed and semi-open parts of the facade

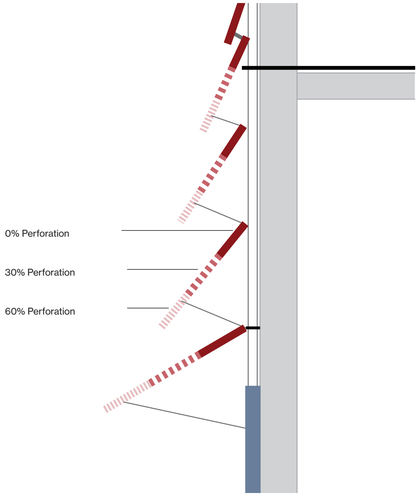


Diagram of gradient perforated panels

Concourse conditions, westerly wind

Design Considerations and Criteria
Computational Fluid Dynamic (CFD) analyses have been undertaken on the prevailing (most common) winds from the west (primarily) and southwest (secondary) to validate that the conditions within the concourse provide a suitably high degree of comfort to the supporters and other users of the space, whilst permitting cost, maintenance, and environmental benefits.

The study has considered the 95th percentile of wind speeds (i.e. the very worst 5% of wind conditions encountered on site) meaning that the results can be considered as worst case and rare in their frequency of occurrence. These speeds can be related to comfort via the Lawson Criteria.

It should be considered that on match days, the concourse will be used for relatively short periods of time, meaning that chance of exposure to the worst-case situations are even further reduced. On cold, or windy days, supporters will dress appropriately to the weather conditions. Concert events are likely to only occur in the warmer summer months, so the effect of cold winds is not relevant.

CFD analyses have proved that the proposed façade system offers a good level of comfort within the concourse area, highly suited to the usage of the space. The table below shows the level of comfort related to different activities, in accordance with Lawson Criteria. As people will mostly be using the concourse for sitting or standing, the targeted values are below 6m/s.

Westerly Wind
The existing arena building offers good shelter to the western façade of the stadium. The anticipated effects indicated in previous submissions have been proven by the CFD analysis: the dominant westerly wind interacts with the new stadium by blowing over the top of the roof and to a lesser extent: creating a degree of façade downwash/downdraft on the westerly facade. Wind entering the concourse is minimal due the glazing at base level providing a sealed connection to the lowest level panel and relatively small gaps between the upper façade panels.

Conclusion
The design of the facade presents a cost-effective design that dramatically increases the comfort and protection of users of the concourse during match or event days compared to the existing stadium. The design maximises natural ventilation and natural daylighting within the concourse, avoids mechanical ventilation and reduces the requirement for artificial lighting, minimising energy use and maintenance

CFD analyses have proved that the proposed façade system offers a good level of comfort within the concourse area, highly suited to the usage of the space.

Lawson Comfort Scales		
Wind Speed Category	**Wind Speed Range (m/s)**	**Tolerable Activity**
A	0 – 4	Pedestrian sitting for extendedperiods
B	4 – 6	Pedestrian standing (or sitting for a short time)
C	6 – 8	Pedestrian walking i.e. strolling
D	8 - 10	Walking at speed / cycling

Figure 1 – Table of comfort Scales based on Lawson Criteria

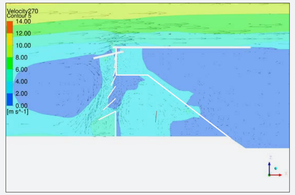


Figure 2: Cross section through west stand demonstrating wind flow and speeds in concourse from westerly wind.

The wind speeds encountered in the concourse are shown to be at levels less than 4m/s (even in the most extreme and rare conditions) providing a good level of comfort for people sitting or standing for long period of time as defined under Lawson Criteria. The figure also shows that the concourse (0-4 m/s) provides a better level of comfort than the direct exterior (4-6 m/s), but the environment directly outside the stadium still provides a comfortable level for standing (or sitting for a short period of time), even under worst-case conditions.

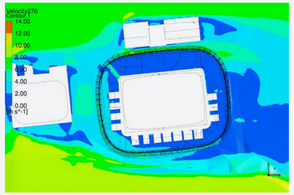


Figure 3: Plan view demonstrating wind flow and speeds in concourse from westerly wind

The plan shows that conditions indicated in the section are provided across the entire footprint of the concourse. This also shows that the concourse provides a better level of comfort than the exterior across the length of the facade, but the environment directly outside the stadium still provides comfortable conditions.

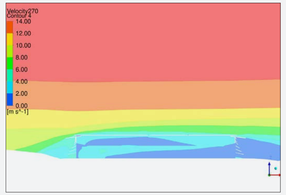


Figure 4: Plan view demonstrating wind flow and speeds in southern concourse from westerly wind

The section shows that conditions indicated in the section are provided across the entire footprint of the concourse.

Concourse conditions, south-westerly wind

South Westerly Wind
The CFD studies have shown that there is limited protection from the trees located on the south west corner of the site during winter conditions when leaves are shed. The simulations have shown that the strongest south-westerly winds run over the racetrack and hit the façade a higher level, leading to the wind entering gaps between the panels.

To minimise the risk of high south-westerly winds entering the concourse from this direction, we have developed a localised protective measure. Simulations indicate that closing the facade of 7 bays on the south-west corner along with discreet triangulated wind-breaker panels will ensure that wind doesn't run into the west and south concouses.

We see many ways of adjusting the facade to block the wind in local areas where needed. The facade scales can be more vertical, the open triangels between panels can be sealed off etc. A catalogue of examples are illustrated on the next page. Most solutions are simple and cost-efficient and should be investigated further during the design phase.

As a worst-case assumption in terms of cost, we have accounted for 7 bays in this area with a full height glass screen behind the panels.

With such measures, the wind speeds encountered in the concourse are shown to be at levels providing a good level of comfort for people sitting or standing for long period of time.

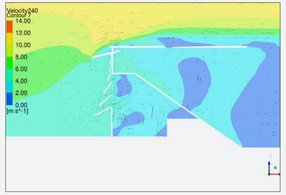


Figure 5: Cross section through south-west stand demonstrating wind flow and speeds in concourse from south-westerly wind

The wind speeds encountered in the concourse are shown to be at levels less than 4m/s (even in the most extreme and rare conditions) providing a good level of comfort for people sitting or standing for long period of time as defined under Lawson Criteria. The figure also shows that the concourse (0-4 m/s) provides a better level of comfort than the direct exterior (4-6 m/s), but the environment directly outside the stadium still provides a comfortable level for standing (or sitting for a short period of time), even under worst-case conditions.

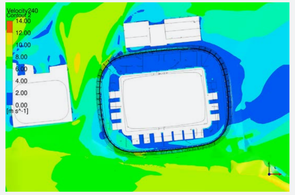


Figure 6: Plan view demonstrating wind flow and speeds in concourse from south-westerly wind

The plan shows that conditions indicated in the section are provided across the entire footprint of the concourse, other than a zone of 4-6 m/s in the south-west corner, which occurs at low level and is within the comfort zone for standing (or sitting for a short period of time) even under worst case conditions. This plan also shows that the concourse provides a better level of comfort than the exterior across the length of the facade, but the environment directly outside the stadium still provides comfortable conditions.

Flexibility of permative facade panel

Adaptive measures react to local conditions
As described in the chapter concerning the performative facade, the facade panels vary around the stadium according to local conditions of daylight, functionality and shelter from wind.

On the N and NW facade a fully glazed facade protect the interior programme of the main stand building.

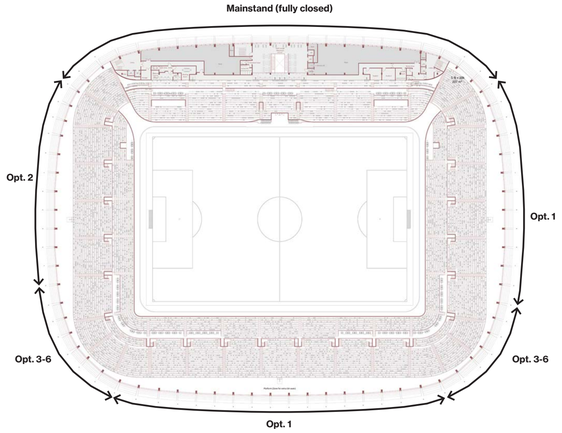
For the concourse areas different scenarios have been studied and developed to adapt to the local wind conditions and CFD studies.

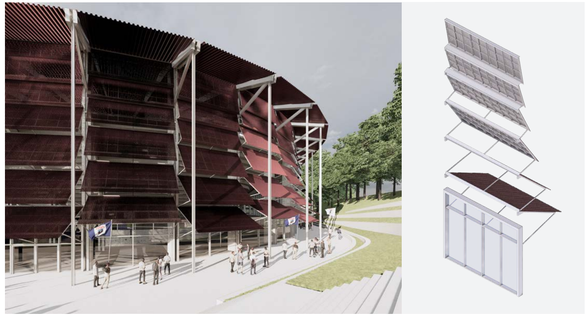
This optimization of the performative facade is expected to continue in the design proposal phase, and balances micro climate issues with the cost plan.

Our initial studies show that for the most part of the concourse facade - the south and east concourse - our "standard module" (Opt. 1) is sufficient to ensure good shelter and microclimatic conditions for the purpose.

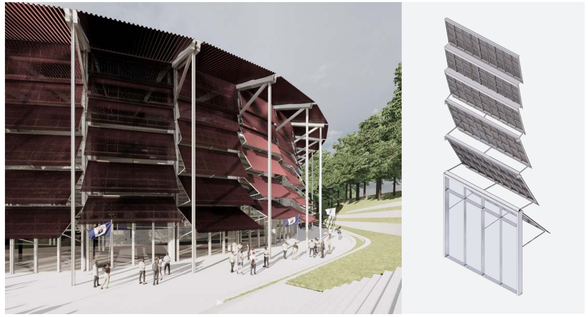
Locally towards the prevailing winds in west we have introduced a slightly higher glass panel i ground level. (Opt. 2)

In the most challenged area of the south west corner we as mentioned introduce special measures for further protection. Opt. 3-6 shows different variations of how to approach this local condition, to meet a good comfort level.

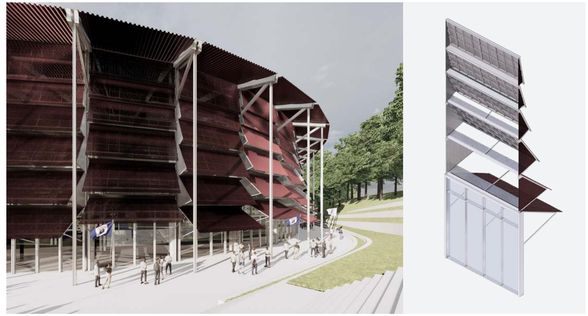




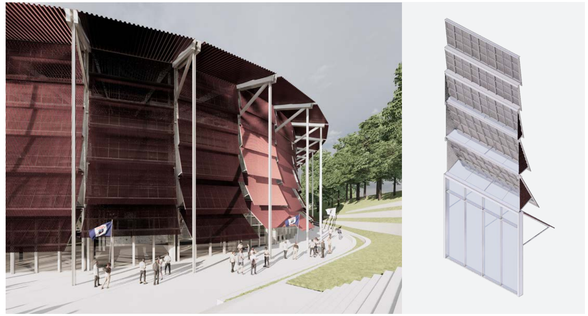
Opt. 1 - The "standard" concourse facade panels.
These are the general panels used in the concourse areas where possible due to local wind conditions (east + south).



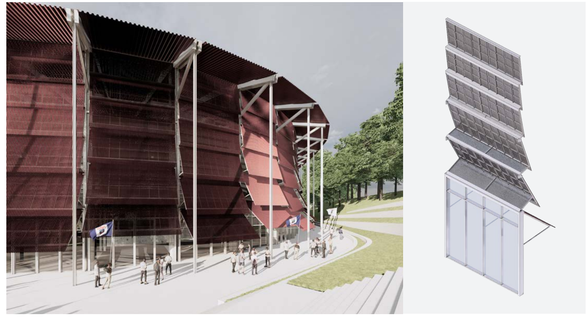
Opt. 2 - Higher glass on ground floor combined with the standard concourse facade panels.
These panels has proved a sufficient solution on the west concourse facade.



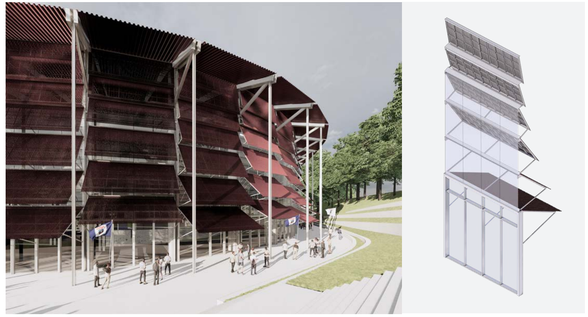
Opt. 3 - Closing sides of facade panels with light metal sheets + adding a deflector panel on the supporting props.
This option is subtle and cost effective, and may be sufficient solution for the seven SW corner modules which otherwise constitue the most challenged area. To be studied further in detailed design.



Opt. 5 - Reducing the angle of the panels + Closing sides of facade panels with light metal sheets + glass on supporting props.
This scenario is confirmed to be a sufficient option for the seven SW corner modules that is the most challenged area.



Opt. 4 - Reducing the angle of the panels + adding a deflector metal sheet on supporting props.
This alternative might also be a sufficient solution for the seven SW corner modules which otherwise constitue the most challenged area. To be studied further in detailed design.



Opt. 6 - "Standard concourse facade" + adding glazing behind
This option is also confirmed be a sufficient solution for the seven SW corner modules which otherwise constitue the most challenged area. This would be the most expensive solution. The cost of this solution is included in the budget to make sure there is robustness.

Bowl conditions and external conditions on terrain

Bowl
The dominant westerly wind interacts with the new stadium by blowing over the top of the roof, meaning that conditions within the bowl are excellent and ideally suited to long period of seating. Wind speeds are kept to a minimum across the seating area and pitch surface, providing optimal playing and spectator-viewing conditions, much improved from the current stadium. The higher wind speeds seen in the north west of the playing field are due to the large vomitory being modelled as fully open in this simulation. The intention is that this would be closed off during matches and events, therefore eliminating this localised effect, so it can be ignored.

External conditions, terrain
Diagrams 9 show the site wide wind conditions under the prevailing (most common) winds from the west (primarily) and southwest (secondary). These show that:

Wind conditions on the tennis courts to the east are very low from these directions. Further studies will be undertaken for easterly wind directions, but the tennis courts are well sheltered by the dense forest and panels attached to the fences.

The fan plaza has more than adequate conditions when wind is blowing from the west, but the exposed gap between the stadium and arena leads to relatively high wind conditions from the south-west, but it should be remembered that this is only under the upper 5% of wind conditions. It is recommended that this is studied further during the project process, but one remedial measure if required, would be to re-introduce the previously recommended permanent landscaping features and trees planted in those areas.

From westerly winds, the thoroughfare between the north stand and heritage building, there is a funnelling effect leading to relatively high wind conditions, but it should be remembered that this is only under the upper 5% of wind conditions. It is also recommended that this is studied further during the project process, but one potential remedial measure would be to re-introduce trees to the west, to slow down the flow of wind entering the area.

Conclusion
It is proven that the form of the stadium results in conditions within the bowl that provide the team with optimal playing conditions and the supporters with excellent comfort.

It is proven that the form of the stadium results in conditions within the bowl that provide the team with optimal playing conditions and the supporters with excellent comfort.

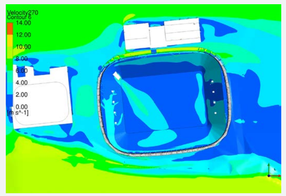


Figure 7: Plan view demonstrating wind flow and speeds across bowl and pitch from westerly wind

Wind speeds are kept to a minimum across the seating area and pitch surface, providing optimal playing and spectator-viewing conditions, much improved from the current stadium.

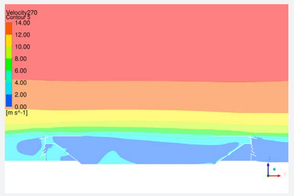


Figure 8: Cross Section through stadium demonstrating wind flow and speeds across bowl and pitch from westerly wind

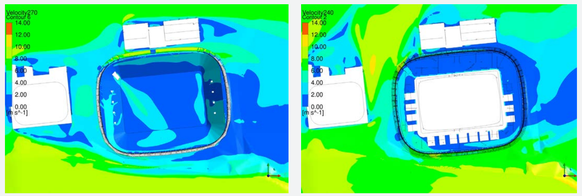
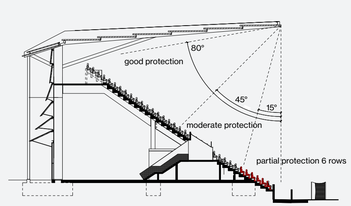


Figure 9 (6+7repeated): Plan View of External Conditions from westerly wind (left) and south-westerly wind (right)

Stadium bowl - improved weather protection

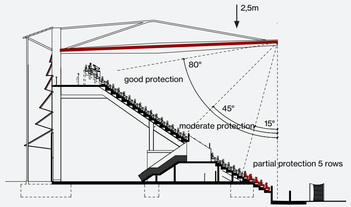
At the current AGF stadium, the roof covers only half of the GA spectators.

The proposed solution seeks to balance adequate weather protection, economy, good acoustics, daylight and design.



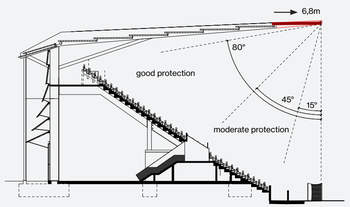
1. Proposed solution

- Assessed to give adequate weather protection.
  Roof covers all seats.
- Designed to meet financial framework
- Good acoustics for both football and concert/events
- Unifying design



2. Roof lowered by 2,5m to minimum height

- One row will have better weather protection (little effect)
- Negative effect on acoustics for concerts/events.
  The sound will not be contained within the stadium.
- Exposed structure above suspended roof will give the stadium a more technical design, which is not desired next to the Heritage Building



3. Roof extended over pitch - to maximum allowed line

- Better weather protection, good effect
- Substantial extra cost added to entire structure and roof surface
- Significant negative impact on daylight conditions on pitch.
- Extra cost for extended use of grow lights for pitch

Daylight concourse, work spaces and outdoor areas

The facade design performs very well in terms of utilising available daylight.

Light Concept
Daylight is associated with providing healthy and engaging spaces. The abundant use of daylight in the interiors can help to improve mood, enhance morale, reduce fatigue and reduce eyestrain alongside with energy savings.

Daylight autonomy describes the amount of time, within a usage period, where sufficient light levels are achieved via daylight only. This means there is no need for artificial lighting when there is daylight autonomy. The brise-soleil of the façade consists of perforated steel panels which allow some light to pass through and some to be reflected further into the space; both of which contribute to good use of available daylight. The amount of perforation varies within each panel creating a gradient of translucency so that the panel is more transparent on the side that is closer to the ground. This configuration allows more light into the space when the sun is low and there is less daylight available. For the analysis used in this study the translucency of the façade panels has been modelled as a linear gradient from 20 to 50% translucency.

Sunconditions outdoor areas
Sunconditions outdoor space: Sunconditions for the urban space around the stadium are generally good. Especially around noon and in the afternoon before a match. Light conditions for the pitch will be analysed further in the designphase and growlights will be used as a supplement to natural light if nescesary.

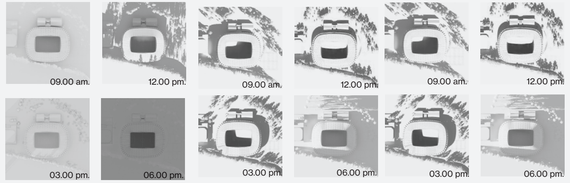
Daylight in workspace, Main Stand level 01
As the first country in Europe, Denmark has adopted the climate-based simulation workflow, described in EN 17037, to be used for showing compliance with the national building regulations.

Good daylight provision, and thus compliance, are obtained when the spatial daylight autonomy, sDA[50%@300lx], reaches or exceed 50% in the relevant areas. For office spaces the relevant areas are workstation locations.

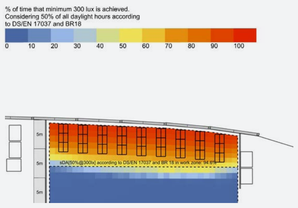
sDA reports a percentage of the floor area that receives at least 300lx in 50% of the considered hours, these hours are defined in EN 17037 as the 4380 hours with the most daylight throughout the year (even though some hours might be without daylight).

The climate-based simulations shows that work zone receives more than sufficient daylight to comply with the Danish building regulations, as the sDA reaches 68.2% in the relevant area.

The simulations are conducted with all the context that might shade the interior, a 0.5m offset from the walls and the façade is accounted for in high detail using the latest developments in the BSDF methodology.

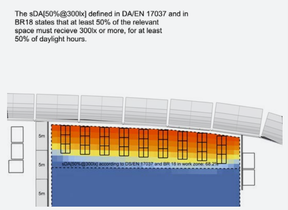


December **March** **June**



sDA[50%@300lx] minimum criterion: 50%
sDA[50%@300lx] of relevant space: 94.6%

1. Baseline study for workspace without facade for comparison



sDA[50%@300lx] minimum criterion: 50%
sDA[50%@300lx] of relevant space: 68.2%

2. Daylight simulation with facade included

Daylight Autonomy Concourse
For this study, the hours of 08:00-18:00 have been considered for every day of the year. 300 lux has been defined as a level suitable for the anticipated activities in the concourse. As a reference, 300 lux is the value required from daylight to provide sufficient illumination on an office desktop. The spatial daylight autonomy (sDA) refers to the percentage of floor area where at least 300 lux is achieved during the time frame considered.It should be noted that 100% daylight autonomy is not achievable within the analysis period as there is not enough daylight available from November to January, even in an outdoor space. Depending on the requirements of the concourse for different types of activity, the daylight can be supplemented with artificial lighting as appropriate.

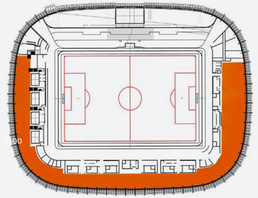
1. Baseline study for concourse without facade
The daylight autonomy study for the concourse area considers daily use between 9.00 and 17.00 throughout the year. In this time period analysis shows 85% daylight autonomy. It should be noted that 100% daylight autonomy is not achievable within the analysis period as there is not enough daylight available from November to January, even in an outdoor space.
The purpose of this baseline study is to show that the facade of the concourse has good natural daylight levels compared to a fully open concourse. This analysis shows that on average, the concourse would have 300 lux as a minimum, for 85% of the time, if there was no facade at all, a best case scenario.

2. Facade study: 74% for concourse with facade
The brise-soleil of the façade consists of perforated metal panels which allow some light to pass through and some to be reflected further into the space. For the analysis used in this study the translucency of the façade panels has been modelled as a linear gradient from 20 to 50% translucency.
This analysis shows that on average, the concourse has 300 lux as a minimum, for 74% of the time, closely comparable to a fully open or fully glazed facade.This proves that the facade performs very well in terms of utilising available daylight.

Daylight 21st of June

Daylight 15th of September

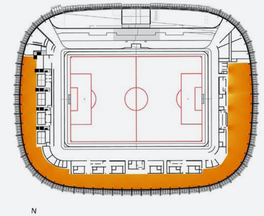
In the daylight studies above, 3d renderings has been adjusted to resemble the perception of the human eye.



% of time (between 08:00 and 18:00) that minimum 300 lux is achieved

0 10 20 30 40 50 60 70 80 90 100

1. Baseline study for concourse without facade for comparison



2. Daylight Autonomy Analysis with facade included

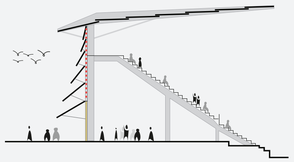
Bird protection

Bird Protection
Due to the location of the stadium in a forest context, it is important to consider measures to avoid birds in the concourse spaces. As the project budget does not allow for a fully enclosed/glazed facade for the unheated but protected concourse areas, other measures to keep out birds should be taken into account.

The stadium facade design has a semi-open structure to allow natural ventilation, and flow of daylight into the concourse.To avoid the possibility of birds finding their way into the facade openings we propose utilizing a delicate bird mesh, placed befind the facade panels, between the colums. This is an aesteticul subtle solution, with low impact on the cost scheme. Furthermore rollershutters in the vomitories can used to close access from the pitch.

Furthermore the team has looked into a scientific study from "European Journal of Wildlife Research" concerning pigeons resting on angled surfaces of different materials. The study indicate (see chart below) that for metal plates, it is difficult for birds to sit on surfaces angled 20 degrees or more, which has become a direct design parameter in the facade layout.

Bird mesh
Reference images of bird meshs. Different products are available on the market, with little impact on the visual qualities.



Concourse protected from birds
Diagram showing possible placement of mesh in facade and roller shutters in vomitories to prevent birds from entering.

Table 1 Identification of the angle of inclination of a slope a feral pigeon is able to sit on depending on different construction materials

Angle of inclination	Tinplate	Plywood	Concrete	Sandstone
15°	1[a] pos			
20°	*5 neg*	1 pos	1 pos	
25°		1 pos	1 pos	
30°		*5 neg*	*5 neg*	1 pos
35°		*5 neg*	*5 neg*	1 pos
40°				1 pos
45°				*5 neg*

[a] Number of experiments performed in an occupied breeding box, pos (positive) = pigeon is able to sit for >1 s, neg (negative) = pigeon slips off. The italicized part of the table designates the angles of the respective materials a feral pigeon is not able to sit on.

Angles to avoid sitting birds
Chart from article " Protecting buildings against feral pigeons" in European Journal of Wildlife Research · January 2008.

Crowd Flow

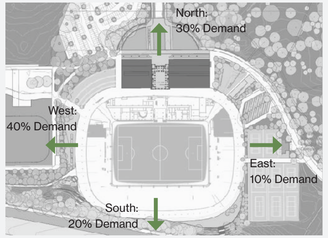
Crowd Flow Concept
The New Aarhus Stadium is designed to streamline crowd flow and enable 360-degree circulation around the stadium building. High level pedestrian demands have been identified in all directions from the stadium, based on surrounding land uses, parking availability and public transport opportunities.

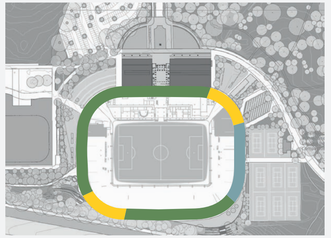
Due to the majority of the demand being identified to the north and west, the new stadium design caters for these movements by offering multiple connections through to the site from the west, and the maintaining of the boulevard and new 8 metre wide connections either side and through the middle of the heritage building to the north. To the south, there is to be up to 2500 car parking spaces in the centre of Jutland Racecourse. To facilitate this, two 8-metre wide staircases are to be provided to allow visitors to head to and from the south.

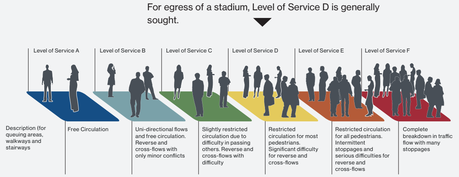
Fruin's Levels of Service are used as a measure of crowd density. For egress of a stadium, Level of Service D is generally sought. However, short periods of Level of Service E would also be acceptable.

Initial analysis using high level assumptions suggests that the design of the New Aarhus Stadium is such that none of the 360 circulation area in the immediate surroundings of the stadium is expected to exceed Level of Service D in the matchday scenario, with the assumption that all spectators would egress in 8 minutes. Most areas would operate at Level of Service C. This will be further tested with refined assumptions alongside external routes leading to and from the stadium using dynamic crowd models for both the matchday and concert scenarios.

No hard landscaping or obstacles will be placed within the immediate surrounding circulation area of the stadium, allowing unfettered crowd flows during events. It is recommended that a Signage Strategy is also developed to further support the flow of crowds into and out of the stadium. The strategy should focus on signage for key routes into and out of the stadium and towards surrounding attractors such as car and cycle parking and public transport hubs.







Acoustics - bowl and roof

Stadium Acoustics

The stadium will provide a unique and intimate fan experience with a loud atmosphere. The stadium roof geometry has been designed to ensure a balance between the connection between the upper and lower parts of the stands, acoustic intimacy, and the strong projection of sound out towards the pitch. The stadium contains sound well, ensuring that music events can be held within the stadium at a suitable sound level without significant disturbance to the surrounding neighbourhood.

The profiled roof panels provide a scattering of the sound to provide a more uniform sound from the audience and the PA system. This also negates the requirement for any additional acoustic absorption treatment in the roof, which could reduce the energy/atmosphere in the stadium bowl.

The roof is acoustically reflective to maintain as much energy in the bowl, to maximise the atmosphere of the crowd and the back of bowl is closed to contain the sound.

Parameters

To achieve good acoustic quality in a stadium, that will be used for both football matches and concerts, it is important to find a good balance between all the following parameters.

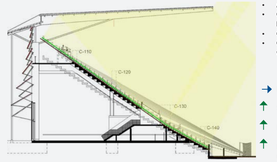
Intimacy is perceived as a sense of closeness or a space sounding smaller. The impression of the size is determined by the time delay of the first major refection (roof). This is generally accepted to be less than 20ms, which equates to about 6.9m.

In a stadium environment, the dominant source of noise is from the crowd and the roof would need to be significantly low to provide true acoustic intimacy and is not achievable in most cases for large areas. In terms of intimacy from the sound system this is likely to be achieved at the rearmost rows where the first strong refection is likely.

Stand connection indicates how well sound is connected between the upper and lower areas of the stands. Particularly important with broken tiers, where the reliance on energy from the upper to low tiers provides connection between the two areas.

Pitch connection indicates how well sound is propagated out of the stands to the players on the pitch. This also allows sound to propagate outwards towards opposite stands depending on the angle and distance.

Environmental Noise/Concerts indicates how well the stadium can contain sound.



- Acoustic intimacy: back few rows
- Good connection between upper and lower
- Good energy to pitch
- Continous and high roof contains sound well for concerts

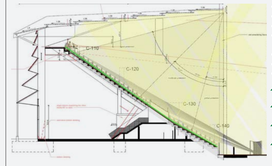
Intimacy

Stand connection

Pitch connection

Environmental noise/conterts

Roof design phase 1
Original design, one split
works well for both football and event
request to lower roof for more intimacy



- Acoustic intimacy: back few rows
- Good connection between upper and lower
- Good energy to pitch
- Continous and high roof contains sound well for concerts
- Height of roof reduced for improved intimacy
- Heigh roof contains sound well for concerts
- Scaled roof provides good diffusion (even sound)

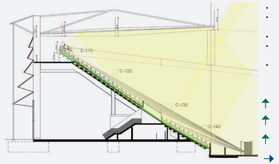
Intimacy (will improve if extra seats are built)

Stand connection

Pitch connection

Environmental noise/conterts

Roof design phase 2
Optimised roof design with scales like facade
roof has been lowered by 1.2m
works well for both football and event
clients request for extra future seat capacity require buffer in height



- Acoustic intimacy: back 5-6 rows
- Good connection between upper and lower
- Good energy to pitch
- Lower roof provides increased noise breakout for concerts
- Lower roof may increase loudspeaker quantity and become more obtrusive

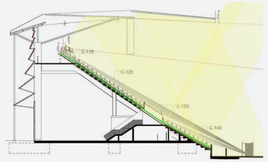
Intimacy

Stand connection

Pitch connection

Environmental noise/conterts

Design test - opted out - hanging roof structure
Alternative design option with suspended roof
does not work well for event
does not work well with overall exterior design as the structure will be dominating



- Acoustic intimacy: back few rows
- Good connection between upper and lower
- Higher amounts of energy within stands
- Less energy to pitch
- Break in roof increases breakout noise

Intimacy

Stand connection

Pitch connection

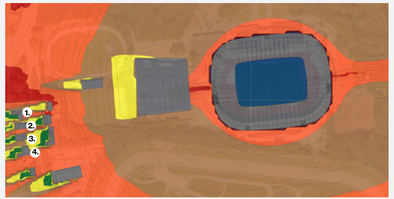
Environmental noise/conterts

Design test - opted out - cranked split roof
Alternative design option with cranked roof
does not work well for event or pith connection
does not work well with rain water from roof

Acoustics

	Monday - Friday 7am-6pm, Saturday 7am-2pm	Monday - Friday 6pm-10pm, Saturday 2pm-10pm, Sundays and Holidays 7am-10pm	All days 10pm-7am
1. Industrial and commercial areas	70 dB	70 dB	70 dB
2. Industrial and commercial areas with ban against annoying activities	60 dB	60 dB	60 dB
3. Areas for mixed dwellings and commercial use, centre areas, etc.	55 dB	45 dB	40 dB
4. Multi-storey dwelling areas	50 dB	45 dB	40 dB
5. Dwelling areas, low rise dwellings	45 dB	40 dB	35 dB
6. Areas for holiday cottages, recreational areas	40 dB	35 dB	35 dB

Figure 2 - Internal / External Noise Levels at nearest NSR



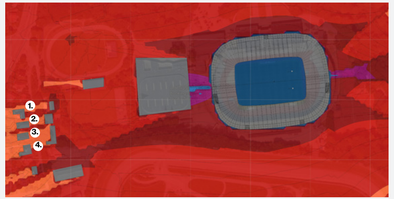
Nearest noise sensitive receivers

1. 49 dB(A)

2. 41 dB(A)

3. 43 dB(A)

4. 44 dB(A)



Nearest noise sensitive receivers

1. 60 dB(A)

2. 59 dB(A)

3. 59 dB(A)

4. 59 dB(A)

Breakout noise criteria - brief
The external noise levels for any noise sensitive receiver (NSR) shall demonstrate compliance with the guidance provided in Guidelines from the Danish Environmental Protection Agency, No.5/1984 "Environmental Noise from Industry"

The equivalent noise level is the average of the noise level over a long period of time, the reference time interval (eight hours for the day period 7am-6pm, one hour for the evening 6pm-10pm, and half an hour for the night period 10pm-7am). In case the noise has clearly audible tones or impulses, a 5 dB penalty is added to the equivalent noise level to obtain the noise rating level.

Breakout noise sports
During sports events the internal noise levels are a combination of crowd noise and the public address system. During peaks the crowd levels exceed 100dB(A) for brief periods with average 15 minute internal noise levels of LAeq,15 96dB(A) on the stadium stands. This assessment has been based on an expected average noise level, during a typical sports event of LAeq,15 96dB(A). These can be reduced by a further 3dB when normalised to an 8 hour period.

Breakout noise concert - east facing stage
During an outdoor concert event the expected noise level for a rock/pop show averages around 102dB(A). This is based on a portfolio of concert events measured by Vanguardia over the past 15-20 years. These predictions are based on an internal front of house reference level of 102dB(A)

Breakout noise criteria - brief
The competition provides conflicting information on the PAVA system requirements. Section 9 suggests an average unoccupied STI of 0.7. This would require significant acoustic treatment to the roof and would 'kill' any atmosphere in the stadium for sporting events.

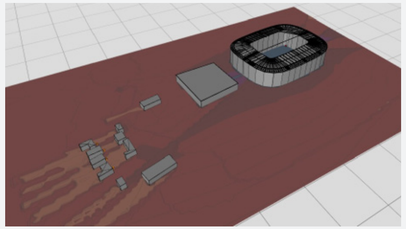
In section 12.5 the document refers to UEFA requirements for an STI of 0.7 for an occupied stadium, with a sound pressure level of 120dB(A). These requirements are over onerous.

We have proposed that a minimum STI of 0.46 is achieved in the empty stadium with an intelligibility of 0.55 STI for the occupied stadium. This provides a good balance between maximising the atmosphere and whilst maintaining intelligibility.

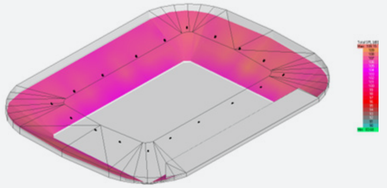
The stadium roof is required to provide a minimum attenuation of 20dB to ensure sufficient sound reduction. There is little benefit in providing higher acoustic performance than this due to the opening in the centre of the stadium. This can easily be achieved using solid metal panels.

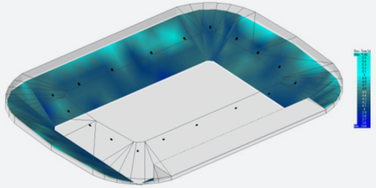
Sound pressure level
It is important that sound pressure levels (SPL) are sufficient to exceed the background noise from the crowds in the stadium. It is expected that crowd noise for a stadium of this size would be in the region of 100dB(A). The current design ensures a capability of 6dB(A) of headroom above this, with an average SPL of 107dB(A)

Reverberation time
The reverberation time has been maximised by using hard reflective surfaces throughout. The reverberation time ensures the atmosphere in the stadium is optimised. It is also important to ensure that the intelligibility of the sound system can be achieved with the provided reverberation times so a careful balance is required. In this instance no additional acoustic treatment is required to achieve suitable intelligibility of the sound system.

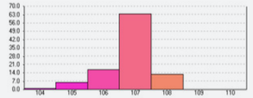


Breakout noise concert - 3D model

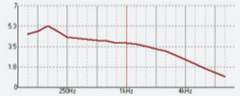




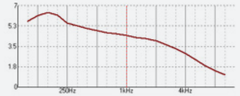
Reverberation time distribution 1KHz (s) - Unoccupied



Broadband Sound Pressure Level distribution, dB(A)

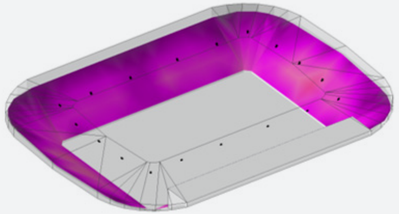


Reverberation time Occupied (s)

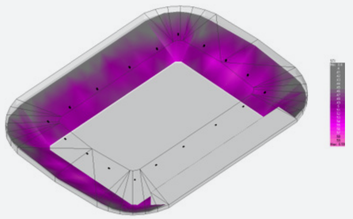


Reverberation time Unoccupied (s)

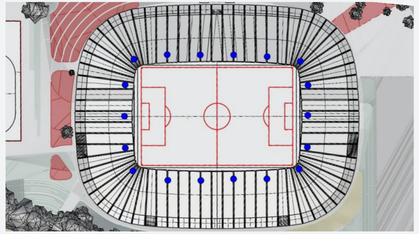
Roof acoustics



Intelligibility (STI) - Occupied



Intelligibility (STI) - Unoccupied



Loudspeaker cluster layout

Typical loudspeaker cluster layout

Intelligibility
The minimum intelligibility requirements for life safety need to be achieved. For a large stadium this is typically a lower limit of 0.46 STI for an unoccupied stadium. The predicted average intelligibility across the stadium is 0.49 STI.

The STI increases when the stadium is occupied to 0.55 STI. For reference this satisfies the accepted design standard for FIFA compliant stadiums.

The stadium system has been designed to allow for integration for concert audio. This not only ensures improved direct sound coverage and clarity, but also minimises energy up in to the stands to reduce the effect of long delayed reflections which are detrimental to the audience experience. This avoids touring concert sound systems having to 'fire' energy into the reflective roof areas used to maximise the atmosphere and connection during sporting events.

Pitch and roof - analysis opaque roof

Introduction
Our design team produced a detailed light and shade analysis to support the design of the stadium roof. Two roof configurations analysed:

a) Opaque roof
b) Roof including translucent material at 50% transmission

This analysis is illustrated by the following elements:
- Gradient Mapping – to determine actual light levels throughout the year imposed by stadium architecture.
- Solar track - Demonstrating shade extent
- Deployment Schedule – to determine level of supplementary lighting required to mitigate effects of stadium architecture
- Deployment Schedule – to determine level of supplementary lighting required and indicative costings

Deployment Positions - Opaque roof
Given the relatively low light levels present within the stadium the rig deployment plan is based on large format 400m² with a 1000w power output operating for a maximum of 16 hours a day.

Results show that moderate and manageable levels of supplementary lighting would be required over the entire pitch during the months of October to February inclusive for between seven to twelve days per deployment location per month, with partial pitch lighting being required in March, April and August between one to six days per month in the most shaded location.

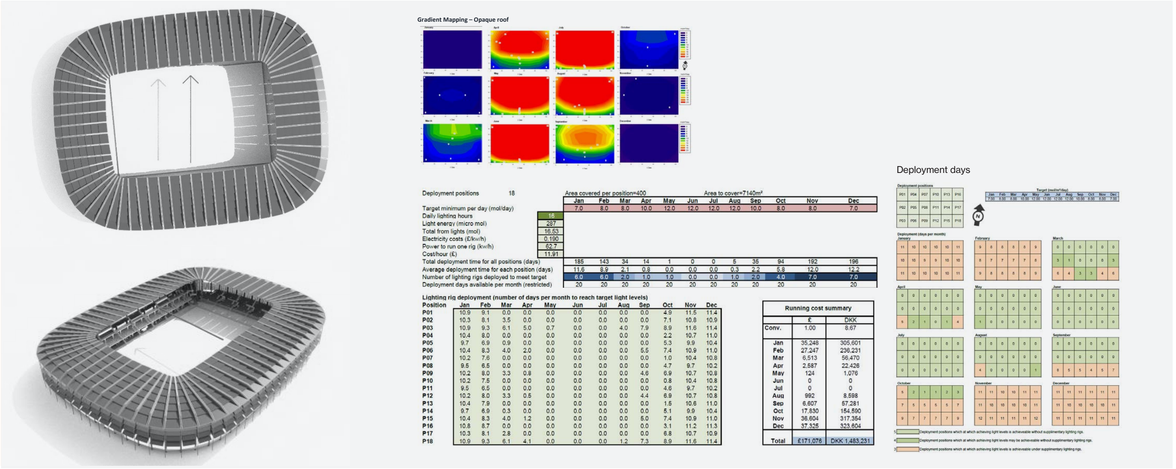
March and September highlights impact on the Southern end requiring between one and eight supplementary lighting rigs over the Southern end of the pitch. From May through to July there is no additional requirement for supplementary lighting over the natural pitch surface.

Guideline Operational costs
The estimated operational costs (power only, excluding depreciation, repair and maintenance) and number of required lighting rigs based on the large format rigs with a footprint of 400m², using 1000 W lamps and operating for 16hours per day with an average PAR output of 143.5µmol/m²/s. For this cost estimate, an average unit price of DKK 1.67 per kW/h has been used with the power requirement to run one lighting rig being 62.7kW/h.

The estimated operational usage for the proposed lighting is an estimated c. DKK 123,637 per year.

Deployment Summary
The pitch has been divided into 18 deployment positions, with each deployment position representing the use of a large format lighting rig with 1000W high pressure sodium bulbs. The 400m² rig will have an additional illumination footprint when used in combination with adjacent rigs, on that basis we have estimated the actual illumination footprint to be c.420m²

The number in each designated deployment area shows the number of days per month that the lighting rig would need to be operate in any 24-hour period (based on at 16 hours cycle) to provide target light levels shown in the Deployment days table below.



Gradient Mapping – Opaque roof

Deployment positions 18 | Area covered per position=400 | Area to cover=7140m²

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Target minimum per day (mol/day)		7.0	8.0	8.0	10.5	12.0	12.0	12.0	12.0	10.5	8.0	8.0	7.0
Daily lighting hours	16												
Light energy (micro mol)	287												
Total from lights (mol)	16.53												
Electricity costs (£/kw/h)	0.100												
Pow-er to run one rig (kw/h)	62.7												
Costhour (£)	11.91												
Total deployment time for all positions (days)		186	143	34	14	1	0	0	5	38	84	162	196
Average deployment time for each position (days)		11.0	8.9	2.1	0.8	0.0	0.0	0.0	0.3	2.2	5.8	12.0	12.2
Number of lighting rigs deployed to meet target		6.0	6.0	2.0	1.0	1.0	0.0	0.0	1.0	2.0	4.0	7.0	7.0
Deployment days available per month (restricted)		20	20	20	20	20	20	20	20	20	20	20	20

Lighting rig deployment (number of days per month to reach target light levels)

Position	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
P01	10.8	9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	11.5	11.4	
P02	10.3	8.1	3.5	0.0	0.0	0.0	0.0	0.0	0.0	7.1	10.8	10.8
P03	10.9	9.3	6.1	5.0	0.7	0.0	0.0	4.0	7.9	8.9	11.6	11.4
P04	10.4	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	10.7	11.0
P05	9.7	6.9	0.9	0.0	0.0	0.0	0.0	0.0	0.0	5.3	9.9	10.4
P06	10.4	8.3	4.0	2.0	0.0	0.0	0.0	0.0	0.5	7.4	10.9	11.0
P07	10.2	7.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	10.4	10.8
P08	9.6	6.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.7	9.7	10.2
P09	10.2	8.0	3.3	0.8	0.0	0.0	0.0	0.0	4.6	6.9	10.7	10.8
P10	10.2	7.5	0.0	0.0	0.0	0.0	0.0	0.0	0.8	10.4	10.8	
P11	9.6	6.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.6	9.7	10.2
P12	10.2	8.0	3.3	0.8	0.0	0.0	0.0	0.0	4.4	6.9	10.7	10.8
P13	10.4	7.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	10.6	11.0
P14	9.7	6.9	0.3	0.0	0.0	0.0	0.0	0.0	0.0	6.1	9.9	10.4
P15	10.4	8.3	4.0	1.2	0.0	0.0	0.0	0.0	0.0	7.4	10.9	11.0
P16	10.8	8.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1	11.2	11.3
P17	10.3	8.1	2.8	0.0	0.0	0.0	0.0	0.0	0.0	5.8	10.7	10.9
P18	10.9	9.3	6.1	4.1	0.0	0.0	0.0	1.2	7.3	8.9	11.6	11.4

Running cost summary

	£	DKK
Conv.	1.00	8.67
Jan	35,248	305,601
Feb	27,347	236,231
Mar	6,513	56,470
Apr	2,687	22,426
May	124	1,076
Jun	0	0
Jul	0	0
Aug	992	8,598
Sep	6,607	57,281
Oct	17,550	152,160
Nov	36,604	317,364
Dec	37,326	323,604
Total	£171,076	DKK 1,483,231

Deployment days

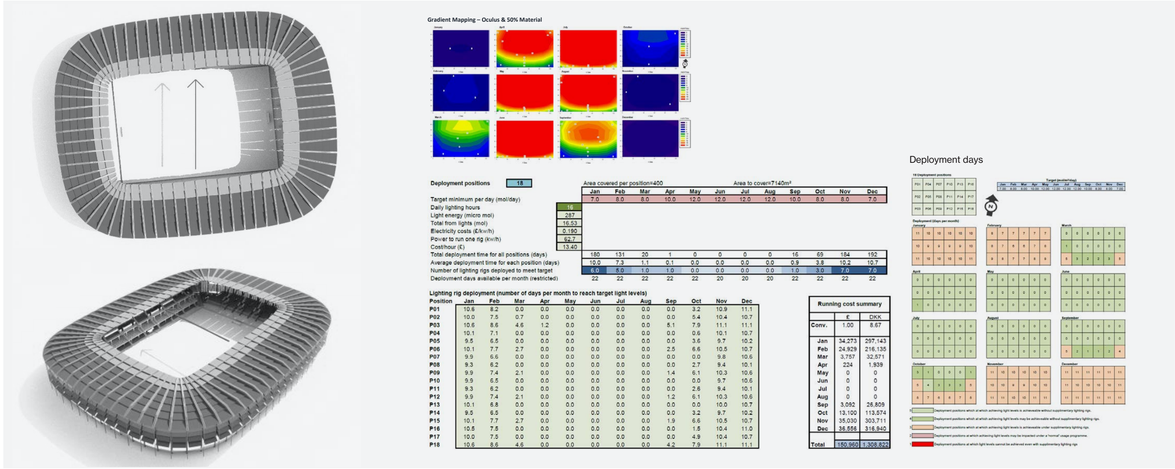
Pitch and roof - analysis with 50% transparency in roof

Deployment Positions - Oculus & 50% Material
With the implementation of a roof material based on 50% translucency the results show that moderate and manageable levels of supplementary lighting would still be required over the entire pitch during the months of November to February inclusive for between seven to eleven days per deployment location per month with a reduced lighting requirement in March and October between one to eight days per month in the most shaded location.

March and September highlight a reduction in the number of deployment days required on the Southern touchline requiring between one and eight supplementary lighting rigs over the Southern end of the pitch.
From April through to August there is no additional requirement for supplementary lighting over the natural pitch surface.

Guideline Operational costs
The estimated operational costs (power only, excluding depreciation, repair and maintenance) and number of required lighting rigs based on the large format rigs with a footprint of 400m², using 1000 W lamps and operating for 16hours per day with an average PAR output of 143.5µmol/m²/s. For this cost estimate, an average unit price of DKK 1.67 per kW/h has been used with the power requirement to run one lighting rig being 62.7kW/h.
The proposed lighting is an estimated c. DKK109,068 per year.

Deployment Summary
The pitch has been divided into 18 deployment positions, with each deployment position representing the use of a large format lighting rig with 1000W high pressure sodium bulbs. The 400m² rig will have an additional illumination footprint when used in combination with adjacent rigs, on that basis we have estimated the actual illumination footprint to be c.420m²
The number in each designated deployment area shows the number of days per month that the lighting rig would need to be operate in any 24-hour period (based on at 16 hours cycle) to provide target light levels shown in Deployment days table below.



Gradient Mapping – Oculus & 50% Material

Deployment positions 18 | Area covered per position=400 | Area to cover=7140m²

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Target minimum per day (mol/day)		7.0	8.0	8.0	10.5	12.0	12.0	12.0	12.0	10.5	8.0	8.0	7.0
Daily lighting hours	16												
Light energy (micro mol)	287												
Total from lights (mol)	16.53												
Electricity costs (£/kw/h)	0.100												
Po-wer to run one rig (kw/h)	62.7												
Costhour (£)	13.40												
Total deployment time for all positions (days)		180	131	20	1	0	0	0	0	16	69	164	192
Average deployment time for each position (days)		10.0	7.3	1.1	0.1	0.0	0.0	0.0	0.0	0.9	3.8	10.2	10.7
Number of lighting rigs deployed to meet target		6.0	6.0	1.0	1.0	0.0	0.0	0.0	0.0	1.0	3.0	7.0	7.0
Deployment days available per month (restricted)		22	22	22	22	22	22	22	22	22	22	22	22

Lighting rig deployment (number of days per month to reach target light levels)

Position	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
P01	10.8	8.2	0.0	0.0	0.0	0.0	0.0	0.0	3.2	10.9	11.1	
P02	10.0	7.5	0.7	0.0	0.0	0.0	0.0	0.0	0.0	5.4	10.4	10.7
P03	10.6	8.6	4.6	1.2	0.0	0.0	0.0	0.0	5.1	7.9	11.1	11.1
P04	10.1	7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	10.1	10.7
P05	9.5	6.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0	3.6	9.7	10.2
P06	10.1	7.7	2.7	0.0	0.0	0.0	0.0	0.0	2.5	8.6	10.5	10.7
P07	9.9	6.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.8	10.6
P08	9.3	6.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.7	9.4	10.1
P09	9.9	7.4	2.1	0.0	0.0	0.0	0.0	0.0	1.4	6.1	10.3	10.6
P10	9.9	6.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.7	10.6
P11	9.3	6.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.6	9.4	10.1
P12	9.9	7.4	2.1	0.0	0.0	0.0	0.0	0.0	1.2	6.1	10.3	10.6
P13	10.1	6.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	10.7
P14	9.5	6.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.2	9.7	10.2
P15	10.1	7.7	2.7	0.0	0.0	0.0	0.0	0.0	1.9	6.6	10.5	10.7
P16	10.5	7.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	10.4	11.0
P17	10.0	7.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.9	10.1	10.7
P18	10.6	8.6	4.6	0.0	0.0	0.0	0.0	0.0	4.2	7.9	11.1	11.1

Running cost summary

	£	DKK
Conv.	1.00	8.67
Jan	34,273	297,143
Feb	24,929	216,135
Mar	3,757	32,571
Apr	224	1,939
May	0	0
Jun	0	0
Jul	0	0
Aug	0	0
Sep	3,052	26,459
Oct	13,100	113,574
Nov	35,030	303,711
Dec	36,556	316,940
Total	160,960	1,308,822

Deployment days

Pitch and roof conclusion

Conclusions:
Key points are listed below:

• As is commonplace in the Northern Hemisphere, the stadium orientation and architecture cause the southern edge of pitch to have reduced light levels.

• For both roof options, results show that similar, moderate and manageable levels of supplementary lighting would be required over the entire pitch over winter and much of spring and autumn.

• The study took in account the closing months in the winter. The reason the assessment shows operational costs during this period is because the grass still needs to be maintained.

• The option including translucent material shows a incremental decrease in the amount of supplementary lighting required.

• The same number of lighting rigs would be required as the light levels over the winter period are still comparable.

• With either configuration the Hemiview indicates that 6 large format 1000 rigs supplemented by two smaller rigs for intensive wear areas will be required to meet deployment requirements once matchday and maintenance requirements have been factored into achievable deployment allocation

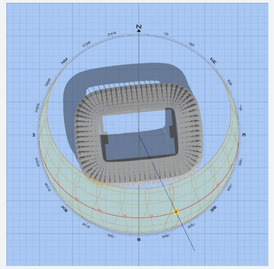
• When benchmarked with similar size and capacity stadia regionally the results are comparable, further benchmarking would be undertaken during the design process

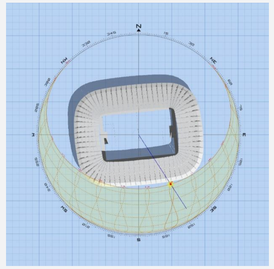
• Translucent roof material will decline in performance over time, mechanisms to clean and or renew should be considered through the design

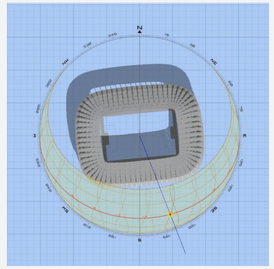
• Because a transparent roof can't span as much as an opaque roof, it will require more structure. This wouldn't be only a cost increase but the design would also cause shadows in the pitch. Broadcasters struggle more to calibrate cameras with patterned shadows in the pitch and the spectator experience is also poorer, specially at a long distance in the bowl.

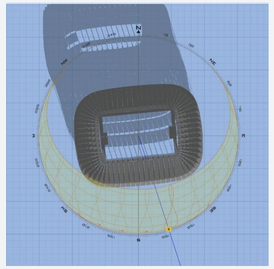
Due the two proposals being near operational costs and investment costs in equipment and construction and the roof with transparency causing unwanted shadows in the pitch and higher levels of maintenence, we have incorporated the opaque roof in our design proposal.

Solar track - Opaque roof
The images below demonstrate the extent of shade across the field of play on the vernal solstice in Spring,Summer, Autumn and Winter.


Spring


Summer


Autumn


Winter

Main Stand - Kitchen and Central Storage

CENTRAL STORAGE
Brief descritption
Central Storage and Goods Receipt
The 300 sqm (GIA) can be either one central storage area or divided into two storage areas.

F&B storage requirements – must be in the same unit:
- 20 sqm area for goods receipt
- 100 sqm room for dry storage
- 60 sqm room for cooling storage
- 20 sqm room for freeze storage

Beside the F&B storage unit a room of 100 sqm for 30 tanks of liquids (beer etc.) is required. This room can be placed beside or separated from the above storage unit and preferably near the OB compound. The location must be optimal to create the best possible stadium operation that make the areas accessible in both match- and event mode. Spread throughtout South, East and West Stands

Catering Areas
500m2 including the main production kitchen with 185m2 of cold and and dry storage.

Discrepancy
The F&B storage area seems to be repeated in the Central Storage and in the Main Kitchen Area. From experience, a medium size stadium does not require a total of 385m2 of cold and dry storage for a main kitchen and we assumed these areas were partially duplicated.

Strategy

The Main Kitchen F&B cold and dry storage have been accomodated next to the kitchen to facilitate the daily operations.

The majoraty of the F&B concessions include dry store and a cellar (cooled space for drinks), with a total of 85m2 (dry stores) and 104m2 (dry stores). In general, the operators have a strong preference for localised storage instead of a central storage because they are usually more efficient. In this specific project the localised stores are ideal because there is vehicle access to all GA concessions meaning that goods don't have to necessarily travel through the stadium to feed the concessions.

The 100m2 beer tanks are allocated above a concession in the east stand, near the loading bay to ensure an efficient python distribution. Further detail on the type of equipment is required to understand if this is a viable location.

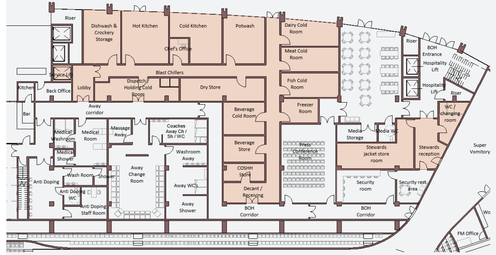
MAIN KITCHEN
Areas
Required GIA: 500m2
Provided GIA: 521m2
(Areas above include cold and dry storage, equipment storage, main cleaning, circulation, accreditation and catering office)

Assumptions
We feel a realistic allowance for the main kitchen and the support areas above would be approx. 400m² if it includes a very efficient layout, which is the case of our proposal. This allows for the on-site production and associated storage & wash up required.
We have assumed an off-site bakery/pastry production because it was not mentioned in the brief but a further 100m² would need to be added if this was a requirement.

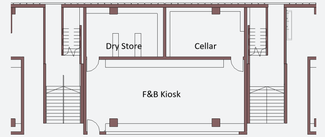
AFL built reference
Brentford Community Stadium main kitchen with 245m2, built in 2020 and serving efficiently 3000 hospitality spectators at least 3 times a week.

Notes
Please note that we have also included in the main stand a stewards facility with 85m2 which was not included in the brief but it's essential to the operations.

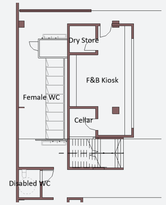
Offices (Accreditation, Catering Office)	2	rooms	20	sqm	40
Main Production Kitchen (North Stand / 1 st floor of main stand)	1	kitchen	165	sqm	165
Storage incl. cold and dry storage	5	rooms	37	sqm	185
Equipment Storage	2	rooms	30	sqm	60
Main Cleaning	1	room	50	sqm	50
Subtotal					**500**
Central storage and goods receipt		Storage			300



Kitchen



South stand typical F&B kiosk



East typical F&B kiosk

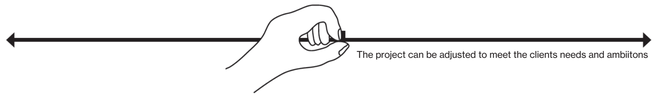
East stand beer tanks

3. Robustness, flexibility and construction costs

Budget and robustness

Executive Summary

Ref	Description	Total DKK	DKK/m2	DKK/Seat
1	Stadium Construction Works	412,175,035	21,636 DKK/m2	20,262 DKK/Seat
2	Masterplan / External Works	20,865,815	1,095 DKK/m2	1,026 DKK/Seat
Sub Total		**433,040,850**	**22,732 DKK/m2**	**21,288 DKK/Seat**
3	Building Site	17,321,634	909 DKK/m2	852 DKK/Seat
4	Main Contractor OH&P	31,525,374	1,655 DKK/m2	1,550 DKK/Seat
5	Weather Conditions	Included	0 DKK/m2	0 DKK/Seat
Sub Total		**481,887,858**	**25,296 DKK/m2**	**23,689 DKK/Seat**
6	Professional Fees / Design Fees (12%)	63,609,197	3,339 DKK/m2	3,127 DKK/Seat
6.1	*Extra; design consultants to provide liability insurance (additional 1.1%)*	*5,830,843*	*306 DKK/m2*	*287 DKK/Seat*
7	Contingency	48,188,786	2,530 DKK/m2	2,369 DKK/Seat
Total		**599,516,684**	**31,471 DKK/m2**	**29,472 DKK/Seat**



The project can be adjusted to meet the clients needs and ambiitons

Philosophy

We recognise the importance of adhering to the stated budget, and this has been central to our development of the design proposals and consideration of the feedback received from the first competition stage. At all times, the project economy has been at the forefront of our thinking when making key design decisions. Specifically, where design solutions, which have been developed in response to the feedback received, have added additional costs to the scheme, we have sought to incorporate cost savings to maintain the budget position. That has allowed us to present proposals which we are confident align closely with the financial framework (at the stated base date of January 2022).

Approach

Our initial approach was to undertake a benchmarking exercise to study the costs of recently completed European stadia of a similar scale. This identified that designing within the budget of 78m EUR would be challenging, but achievable. It also provided some visual guidance as to other stadia constructed for a comparable cost, which acted as a useful reference to set initial expectations and aspirations.

Alongside the benchmarking study, we carried out a full review of the project brief. We felt that the level of detail dictated that a significant proportion of the stadium costs were relatively fixed. In particular, the requirements for the field of play, seating bowl, and accommodation are very well defined. Our approach was, therefore, to first understand the economy of these areas. We could then ensure we were developing the design for other key areas (roof, façade etc) in line with the overall project budget. We have also considered both sustainability and cost by looking to maximise the opportunities for re-using materials from the existing stadium.

In building up our total project cost, we have been able to utilise cost data from other European stadia our team have been involved with, as well as our knowledge of the Danish construction market. We have produced a comprehensive cost estimate, with detail exceeding that of the cost estimate template, and we would value the opportunity to share and discuss this further as part of the negotiation process in the coming weeks and months.

Stage 2 Development

We were pleased to receive the Preferred Bidder Analysis following our stage 1 feedback session in Aarhus and have thoroughly considered the points raised. We also found it very useful to engage with Core Five during the negotiation meetings throughout stage 2 of the competition. We thought it would be helpful to provide some comments and responses to the two sets of queries / observations we have now received from Core Five:

- The Key Observations we received following stage 1 of the competition, and;
- The Commercial Queries we received at the first negotiation meeting

Please refer to the Basis & Assumptions pages within our cost estimate template for this detail, which we trust provides further clarity and explanation on the basis of our cost calculation.

During stage 2 of the competition, we have further developed the design in line with the Client feedback received. This has led to cost increases in certain areas. Our approach has been to manage the design within the stated financial framework, so we have sought to offset these cost increases with cost savings, including the following:

- Optimisation of Gross Internal Areas
- Rationalisation of glazing to façade
- Simplification of works to envelope of heritage building
- Development and optimisation of façade panel design
- Rationalisation of main roof covering
- Review and simplification of interface between rear of bowl and façade
- Review of finishes throughout the stadium
- Rationalisation of external landscaping scheme

Some cost increases can also be attributed to receipt of revised information / documentation during this stage of the competition. In particular, we have incorporated the following costs into our current cost estimate:

- Requirement for design consultants to provide insurance: 5.983.469 kr.

This will attract an additional cost / fee from the consultants. We have shown this sum (which is based on advice from insurance brokers) as a separate line item within our cost estimate.

- Revised timeplan impacting our re-use strategy: 5.980.477 kr.

Following a thorough review, the revised timeplan has, unfortunately, dictated that some of our previous proposals for re-use of materials can no longer realistically be proposed at this stage. We had intended to re-use some existing primary steelwork within our new frame, however we deem that the programmed durations for demolition are not long enough to allow these steel elements to be carefully salvaged, inspected, adapted and incorporated into the new stadium. However, if we are ultimately appointed on the scheme, we would very much like to carry out a holistic review of potential material re-use to ensure we are optimising sustainability and value throughout the scheme.

As noted above, this has brought about some alterations to our previous strategy – this is detailed more fully in our booklet. For clarity, our cost submission is based on re-use of the following elements:

- Existing concrete terracing units re-used as ground bea ring slab / surfacing within GA concourses / external landscaped areas: saving of 2.505.426 kr.

- Existing steel plates re-used as secondary steelwork to support metal cladding panels within the façade: saving of 1.998.750 kr.

We acknowledge that it is not possible to inspect / test these materials at this stage, and until such time as the necessary testing has been carried out, the re-use of these items remains a risk. However, sustainability / re-use remains an integral philosophy within our proposals, and based on the information currently available to us, we see no reason why these elements cannot be salvaged from the existing stadium and incorporated into our proposed scheme.

Robustness

Our benchmarking analysis of European stadia of a similar scale and nature has highlighted that constructing a modern, iconic, 20,000 seat stadium for €3,900 per seat (baselined at January 2022) is very much at the lower end of the cost range. As the budget does not contain inherent robustness, we have sought to incorporate as much robustness as possible within the design, without negatively impacting the desired modern and iconic features of the stadium.

We have worked hard to ensure all aspects of the design are as efficient as possible, and have considered construction methods, techniques and materials which are well known and familiar to the Danish construction industry. We have also drawn upon our team's significant European stadia experience to ensure our proposals reflect good practice in modern stadia design, and which are in-keeping with recently completed stadia projects of a similar size and nature.

Our cost calculation is based on tendered construction rates in Denmark where possible, and is supplemented by outturn construction costs from previous stadia projects (with indexation applied as necessary). We have sought to keep generic allowances to a minimum within our calculation, and can share some further detail if we are ultimately appointed at the conclusion of the design competition.

The facade is a key aspect of our stadium concept, and we have explored this element in further detail to demonstrate the flexibility and robustness we have incorporated. Our booklet identifies a range of different framing, material and perforation options for the façade panels which can be further developed and detailed in partnership with the selected contractor. Within our cost estimate we have priced a mid-range option, which provides robustness in the event that we do need to explore savings in future.

To add a further layer of robustness, we have also been focussed on identifying potential cost savings as we have been developing our proposals. As noted above, we have now implemented some of these ideas to offset cost increases which we have introduced to optimise our design in response to the Client feedback received. However, we do have some other areas which we would like to investigate further in respect of cost savings if we are appointed on the scheme. These would require further exploration / studies, but we have listed them below in our suggested order of priority.

Potential Budget Reduction

- Consider implications of relaxing the 11m clear span in concourse areas
- Liaison with Client team to optimise re-use strategy
- Exclude future expansion capacity (22,000 seated spectators) and build the stadium to the capacity of 20,000 spectators. Potential to lower the roof by ca. 2m
- Further review and optimisation of stadium internal areas (interrogation of brief)
- Alternative profile / depth of primary roof beams
- Explore utilisation of cooling system in Arena building
- Detailed review of MEP / services strategy
- Technical due diligence of existing buildings to assess whether technical equipment or aggregate could be re-used
- Further development and optimisation of bowl configuration / seat numbers
- Consider omission of escalator(s)
- Review quality of materials (i.e. interior finishes, exterior façade panels etc)
- Exclude main stand finishes from budget

Our continued drive to explore cost savings and optimise the value of the scheme is typical of how we would intend to continue to manage the financial framework during the Outline Proposal phase, if we were to be appointed.

The 'Inalienable' / Project DNA

While exploring future cost savings, we believe it will be necessary to protect a number of 'inalienable' features of the project, all of which combine to encompass the project's DNA:

- Curvature and elliptical shape of the stadium
- Creation of a free-standing building
- Unifying motive of scales in the façade and roof
- Concept of a red heritage exterior and a white bowl interior

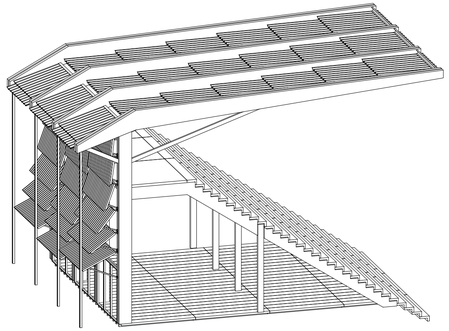
Design Options

We recognise that the brief currently identifies a number of options within the design requirements, and we understand the importance of considering these fully to allow meaningful decisions to be made. We have studied these in detail and provided realistic construction costs on the subsequent pages of this submission.

These options will have an important influence on the future direction of the project, as many of them have a significant impact on the base design. Consequently, we are committed to providing a clear overview of costs and any other consequences to support Client decisions moving forward.

A flexible and robust design system prepared for partnering process

Our proposal is concieved as a design system prepared for optimization through a partnering process with Danish contractors. We achieve an iconic stadium, created from traditional, proven and tested building techniques, elements and materials that multiple contractors and suppliers within the Danish construction market can deliver and perform.

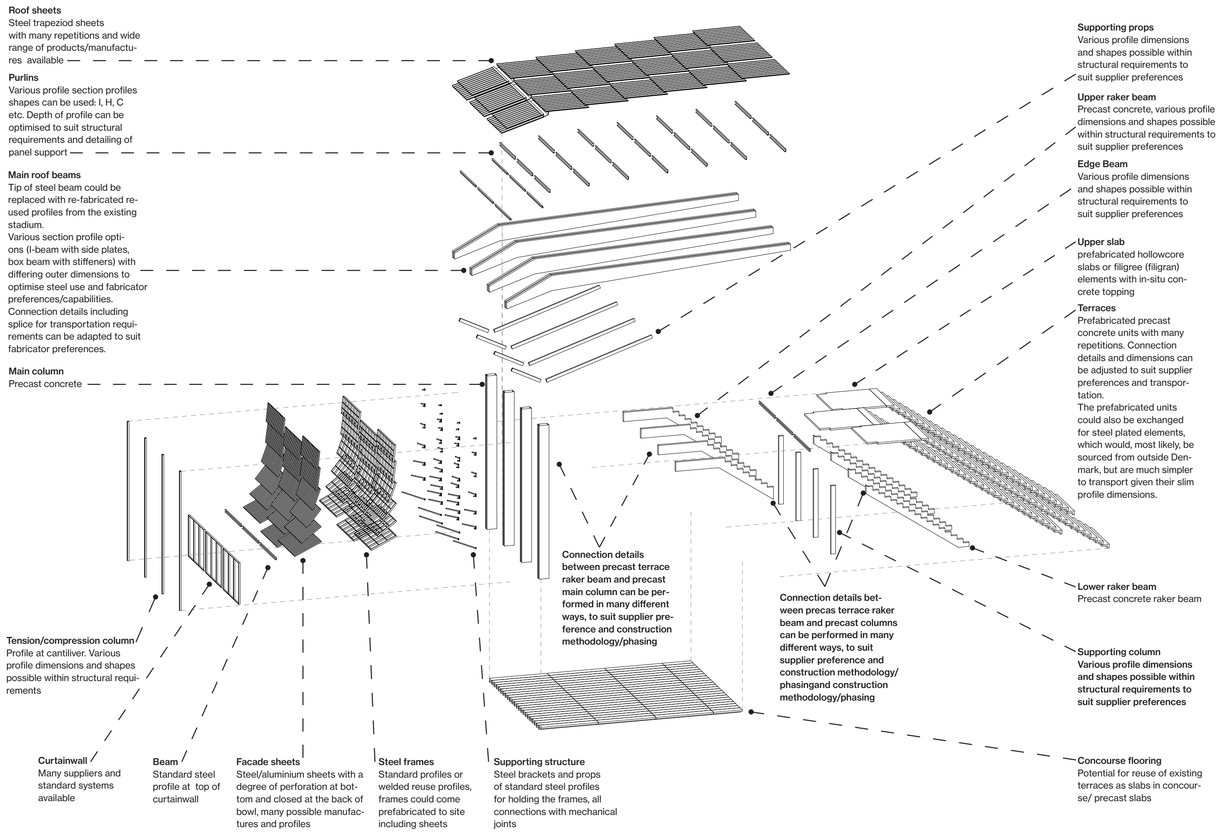


A modular element based building system
Our proposal for Aarhus New achieves an iconic architectural stature, created from traditional, proven and tested building techniques and robust materials that multiple contractors and suppliers within the Danish construction market can deliver and perform.
To meet the requirements for a cost-efficient stadium and a tight construction time-schedule, the only feasible approach is to develop a modular element- and prefab-based building system. We believe that it is possible to create impressive and ground-breaking architecture from simple building units - Like the endless posibilities from a Lego set.
Thus, while the aesthetic properties and functional demands are defined, each specific sub-part and element of the construction system can be developed and optimized individually in various ways to achieve these aesthetic/functional goals.

Flexible buildability
The stadium is composed of many parts and elements where some can be split even further into subparts, all of which individually can be optimized in various ways.
It is possible to enhance or even change the design of these components/subcomponents without changing the overall aestetics and design of the stadium. Thus making the proposal very suitable for the market and for optimization and enhancements at the later partnering and tendering process.
In the coming detailed design phases the each element will go through such an optimization and qualification process to balance costs, structural properties and easthetic values.

The following pages exemplifies how a variety of developments within a few of these parts can vary to optain different structural, performative and easthetic properties.

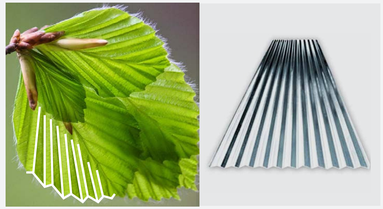
An industrial approach
The new stadium is designed with the same philosophy of "Design for Disassembly" as we have analyzed at the existing stadium. The new design is composed of mechanical joints, standardized and modular components that can be constructed and assembled onsite and in phases. This will furthermore ensure that future alternations are made possible, easy and a future re-purposing of materials are realistic in the end-of-life stage of the new stadium.



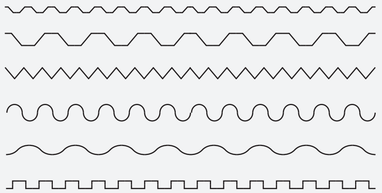
Aesthetic and performative requirements = A variety of solutions

The facade has defined properties for performance and aesthetics, which together constitute ”the inalienable” part of the design principles. Taking this as a starting point the facade elements, materials and surface treatment can be solved in various ways in close dialogue with contractor, suppliers and client.

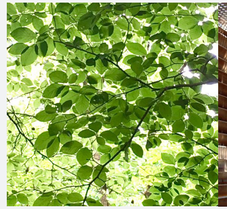
1. Profile: Profiled panels to give depth and relief
Facade panel: Profiled panel to give strength and add depth/relief to the panel.

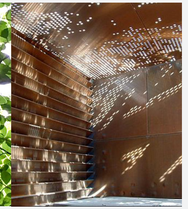


There are different standard profilic plates in the Danish supplier market as well as bespoke plates that has different cost ranges and structural properties.

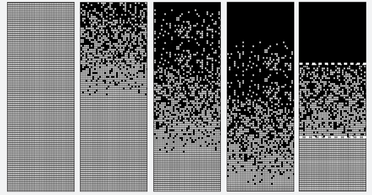


2. Perforation: filter the daylight
Facade panel: should have perforation or in other ways let in sunlight. The solution must be balanced with rain-wind protection.



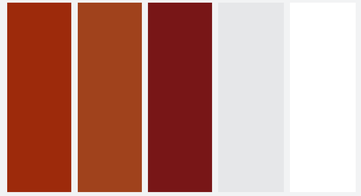


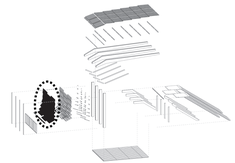
The degree of perforation can be adapted in the design process, and as well vary from area to area according to needs. The plates can be created by a) 1 standard perforation, b) a gradient perforation, or c) a juxtaposition of 3 different sheets of different standard perforations.



3. Color: Heritage red + Club white
Facade panel: red-brown color on the outside inspired by the forest in autumn. White color on the inside to match club identity.

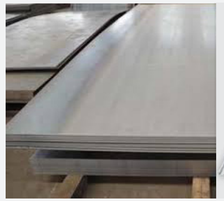
The color tones are to be defined through requisition and evaluation of various color and material samples from supplier. The final design could be either 1 coherent colortone outside, and 1 white-ish tone insde, or be sammensat from a palette creating a colorplay.



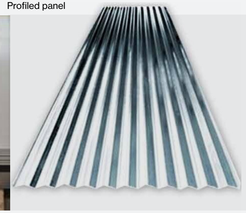


Combinations: The specific profiling and perforation to be defined in dialogue through the partnering process. Relief and perforation of the facade panels to give ”life” and depth to the building.

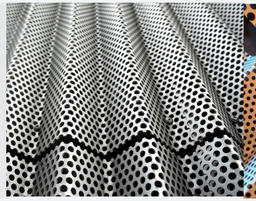
Flat panel



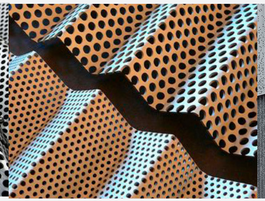
Profiled panel



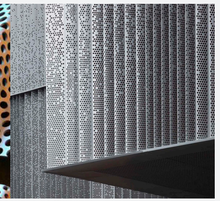
Profiled + uniform perforation

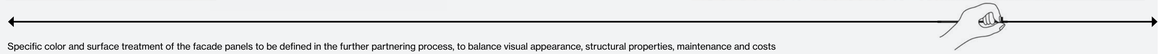


Profiled + mix of perforation



Profiled + gradient perforation

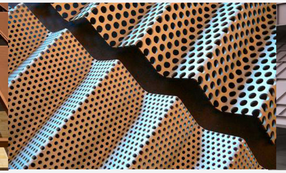




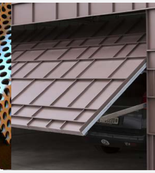
Specific color and surface treatment of the facade panels to be defined in the further partnering process, to balance visual appearance, structural properties, maintenance and costs

Painted / powder coated aluminium

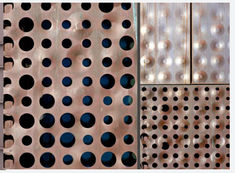
Anodized aluminium

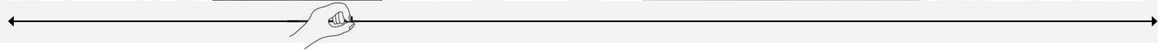


Zink with red pigment



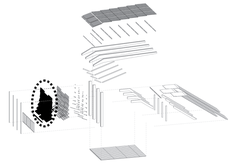
Copper





A robust and flexible building system - prepared for partnering process

Example - Optimization process for facade sheets
Example of studies concerning the degree of perforation of the facadeplates in the western concourse area, to be developed and discussed through the coming partnering process, and evaluated in relation to daylight, microclimate as well as intimacy, structural quality and costs.



West facade panel perforation - opt. 1

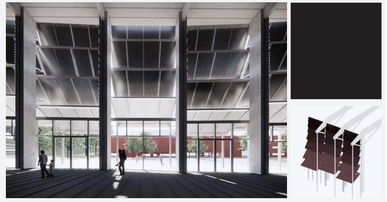
West facade panel perforation - opt. 2

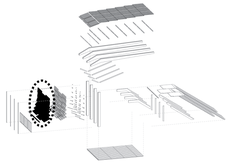
West facade panel perforation - opt. 3

West facade panel perforation - opt. 4

West facade panel perforation - opt. 5

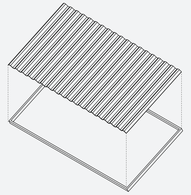
West facade panel perforation - opt. 6





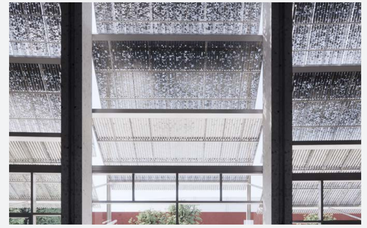
Example - Optimization process for facade frames
Example of studies concerning the structural frames to support the facade scales. These structures have - besides aesthetic implications - impact on the thickness of the metal sheets, the tonnage of steel, costs, transportation, possibility of reuse from existing stadium structures.

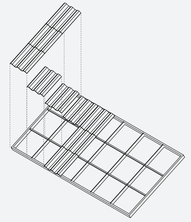
Facade frames - Opt. 01



A frame with no inner trusses. Less steel is needed for the frame but a higher profile and bigger sheet thickness is demanded. This option uses the least steel and connections for frames but would require special manufacturing of the sheets.

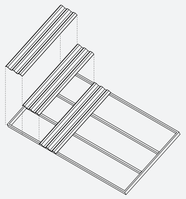
Facade frames - Opt. 2. Suggsted solution included in budget





A frame with inner vertical thinplate profiles to support horisontal trusses of small dimensions. This is an optimized solution in terms of steel usage but more connections is required. The substructure of this option is the one currently in project.

Facade frames - Opt. 3

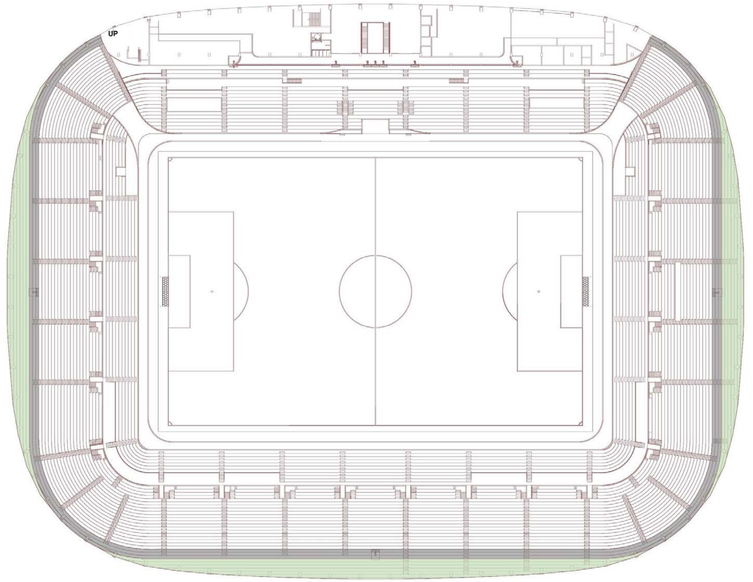


A frame with inner horisontal trusses. This is solution uses more steel than option 2 but less connections is required. For option 2 & 3 panels can be subdivided in various ways to include a wide range of different subcontractors.

Design options

The overall design of the stadium is very robust and can be adapted to include a number of design options while maintaining its architecture and concept.
This chapter shows Design options 1-6 as specified in the document ”2.06 NSA_C08_M23_LX_N001_Addition to competition brief” as well as a number of other design options according to the Design Brief and feed back comments. The base design is adaptable to accomodate the options. Although they will have an impact on construction costs, project planning, fee and potentially the time plan.

Design option 1: seated capacity 24.000



Option 1, expanded bowl
Option 1 provides an expanded bowl design to accommodate 24,000 spectators. To enable this the original facade line is pushed outwards by approximately 800mm, and the void between the original back of bowl and facade line is completely filled with additional seated terrace.

F&B and WC provision remain unchanged. Additional turnstiles may be required, however this can be easily incorporated into the baseline design.

The adjacent section illustrates that the expanded bowl (in blue) maintains ideal C-values throughout the bowl's profile.

Option 1, budget estimate
Additional Construction Cost (excluding professional fees):
DKK 50.400.000

Concert key

- Baseline seated capacity = 20182
- Original brief increase = (2011 extra) Total 22193
- Design Option 1 increase = (2148 extra) Total 24341

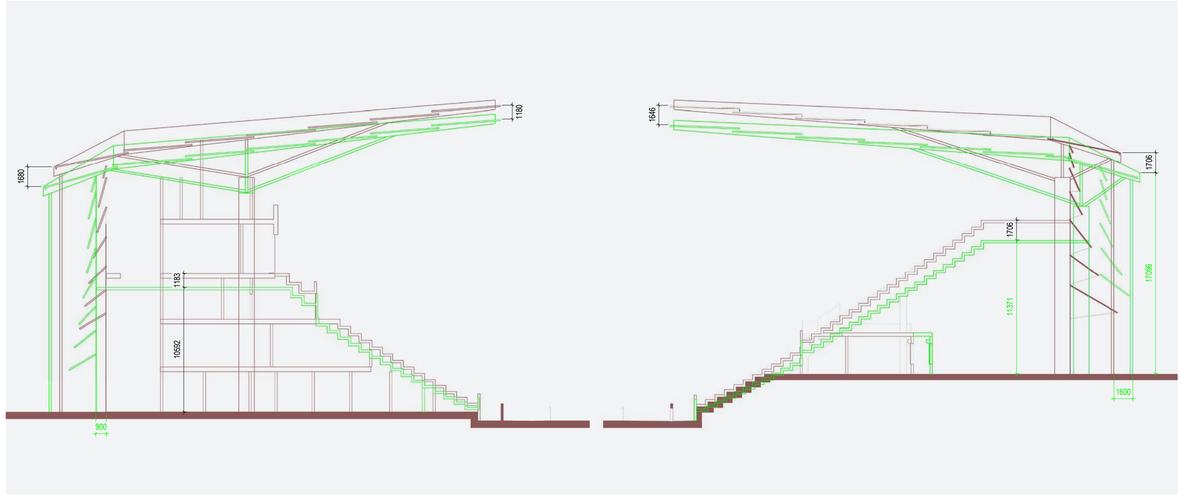
Design option 2: 1.1m high advertising boards (11m wide concourses)

Option 2 - with 11m wide GA concourses
The option includes an impact analysis of the building when considering 1,1 metre pitch high advertising boards instead of 1,5 metre high advertising boards. Please note that 1,1m is the most commum height for advertising boards around the world and most stadiums are designed taking this dimension in account.
The sightline constrains caused by the 1.1 metre boards has a substantial impact on the parabolic profile of the stand. The lower boards enables the front terrace unit and spectators to be lower relative to the pitch.

The section below illustrates the following:
- The scheme's proposed profile (in red) and the option 2 profile (in green)
- The less steeped terrace allows spectators to look over the 1,1m advertising boards with the briefed C values (in green).

Option 2 (11m wide concourses), budget estimate
Additional Construction Cost (excluding professional fees):

DKK -9.625.000 (excluding professional fees for rework)



Design option 2: 1.1m high advertising boards (10m wide concourses)

Option 2 - with 10m wide GA concourses
In this option we also looked at the impact of 1,1 metre pitch high advertising boards instead of 1,5 metre high advertising boards. However we've relaxed the 11m width requirement for the concourses and reduced it to circa 10m.

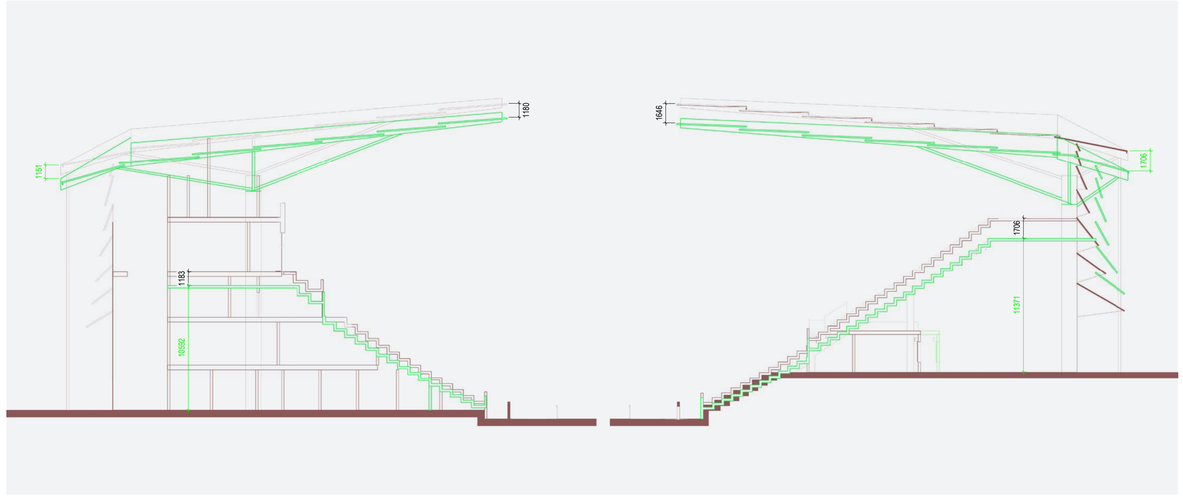
The section below illustrates the following:
- The scheme's proposed profile (in red) and the option 2 profile (in green) that originates a 10m wide concourse
- The less steeped terrace allows spectators to look over the 1,1m advertising boards with the briefed C values (in green).

This option is more cost effective and has less far impact on the site.

Further research will have to be made in the next design stages to confirm that none of these options are to have a negative impact on the concourses spectator ratios.

Option 2 (10m wide concourses), budget estimate
Additional Construction Cost (excluding professional fees):

DKK -16.565.000 (excluding professional fees for rework)



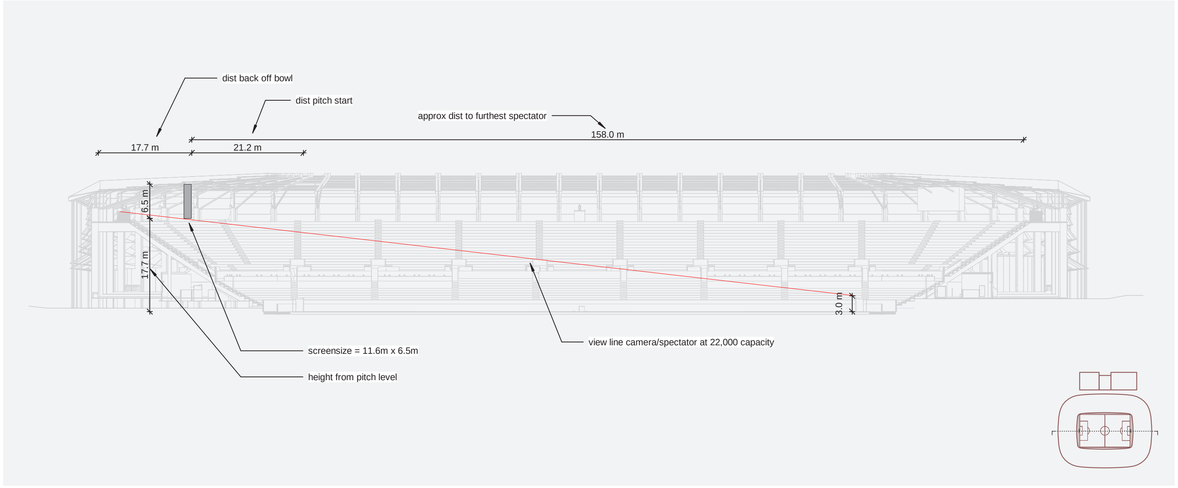
Design option 3: prepare for LED screen

Option 3, supporting structure for large LED screen
We estimate that the steel roof beams as they are can be strengthened locally to support the LED screen, by increasing the thickness of the plates in the beam cross-section. It furthers helps us that the screen is placed at the mid-span of the roof beam, close to the inclined strut, rather than all the way out at the tip.

For timber (option, not included in budget) the cross-section would likely have to be increased, or the roof beams supporting the Led could have some steel added to strengthen it.

Option 3, budget estimate
Additional Construction Cost (excluding professional fees):

DKK 1.470.000



Design option 4: interior fittings

Option 4, interior fittings
Design Option 4 asks for the cost of interior fit-out within the main stand to be identified as a standalone price. We assume this may be to either procure these construction works separately, or to lease the space to a third party. Consequently, in extracting this price from our overall cost calculation, we have assumed that the price should include only the hospitality spaces. Therefore, our cost stated below does not include the fit-out works to the main stand areas which are integral to the functionality of the stadium (i.e. players / officials areas, main production kitchen, stadium control / management areas). Further to the above, and the description within the document titled 'Addition to Competition Brief', we have assumed that these fit-out works specifically comprise:

- Internal partitions and doors within designated spaces (demising walls to create these spaces are not included in our stated price)
- Internal finishes (floors, walls and ceilings)
- All fixtures, fittings and equipment
- All building services installations, with the exception of:
- Main supplies / distribution from the central plant location to each level / space
- Life safety systems (smoke detection, fire alarm, emergency lighting etc)

We also clarify that our price excludes the items listed as Client deliveries within the brief (page 101), which we understand are part of a separate budget:

- AV screens
- Passive IT systems; structured IT for FoH areas
- Attached fixtures and equipment for hospitality and catering functions
- Loose fixtures and equipment, including furniture, shelves etc.

Option 4, budget estimate

Additional Construction Cost (excluding professional fees):

DKK 52.100.000

For the avoidance of doubt, this cost is included within our cost estimate – the amount is simply extracted here for clarity

Baseline Concert Mode (20k seated capacity)

The stadium could be used to accommodate a variety of events. The diagrams below illustrate the option to host a concert using the baseline stadium design. As specified in the brief an area of retractable seating is provided within the baseline bowl design which can be moved to provide an area for the stage. The Field of Play will accommodate circa 19316 standing spectators. Within the Field of Play, based on real-world data the density of standing spectators varies in relation to the stage, and this information has been used to calculate the overall standing capacity.

FoP spectators can potentially access an external concourse to the south of the stadium, via temporary gates at the westand to the east of the stadium. The FoP spectator's concourse and facilities extend to occupy an area of the east stand. A clear walkway is maintained outside of the external concourse line to maintain safe and efficient movement around the wider site.

Areas of demountable terrace can be included in the south and west stands, which when combined with a reconfiguration of concourse facilities would create 2no. wide vomitories, enabling easy access and egress to the FoP for event spectators. An additional access to the FoP is provided via the north stand VIP area. The same strategy is followed for egress from the Pitch. It is envisaged that food and beverage concessions for standing spectators will be situated towards the rear of the pitch, with an area of portable toilets provided within the external concourse.

In order to mitigate risks associated to ramps and secure a safe evacuation our team Ideveloped this option stairs.

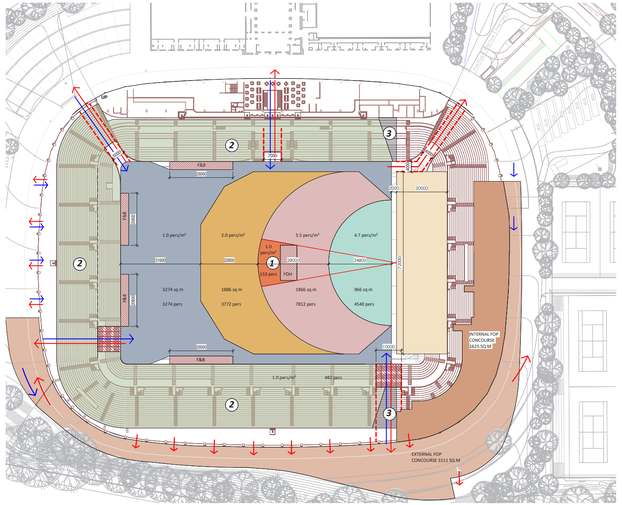
With a clear formal language of the sides of the stairs people will acknowledge that they need to walk up on the stairs before getting to the steps of the stair. In terms of an evacuation it is a good thing that the stairs go up, and people not will risk walling down the steps, making a progressive crowd collapse on the stair. In terms of safety and evacuation, cost and operations time it is recommended to use the solution with stairs in the emergency south exits from the field.

This option prooves to be saver, more cost eficient and much easier to manage by the operator - no temporary instalations, meaning a easier and faster change from football to concert mode. This option also allows for more capacity: 32,447 spectators.

Additional Works for Concert / Event Mode (based on baseline 20k seated capacity stadium)

Additional Construction Cost (excluding professional fees):
DKK 16.750.000
This price comprises retractable seating and retractable / hinged roof to accommodate the stage area.

Additional Event Egress (based on baseline 20k seated capacity stadium)
Additional Construction Cost (excluding professional fees):
DKK 4.700.000
This price comprises small sections of demountable seating in the south stand and associated structural works.



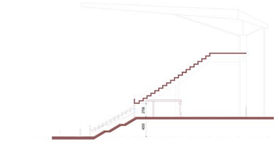
Concert key

- Seat with full view
- Seat with restricted view
- Field of Play (4.7 pers/m²)
- Field of Play (3.5 pers/m²)
- Field of Play (1.0 pers/m² (restricted view)
- Field of Play (2.0 pers/m²)
- Field of Play (1.0 pers/m²)
- Stage
- External Concourse
- North and West Stands ingress
- Emergency egress
- South Stand and FoP ingress

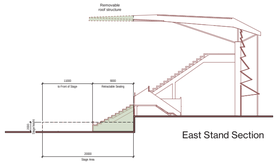
Spectator capacities

1. Field of Play (all zones) = 19398
2. General Admission (all stands) = 13131
3. General Admission Restricted Views (all stands) = 530

GA + FOP Total = 32,447



South Stand Section



East Stand Section

Option: Retractable roof for concert

A retractable roof and retractable seating are requested in the brief as a design option relevant to the concert scenario, with the stage being located on the footprint of the retractable seating on the East Stand.

The retractable seating is anticipated to be a standard modular system provided, designed, and delivered by a supplier to performance specifications on geometry, loading and other main design parameters that will be provided by The Design Team.

A variety of solutions are discussed and presented for the retractable roof, but a solution with a roof prepared for disassembly is also presented as an option to be considered. The brief does not mention how many times a year the stadium reconfiguration should be expected between football and concert modes, but considering the requirement for this scale of concerts in Aarhus and the stadium's primary function for football through the winter months, it could be anticipated in the range of two to six times per year.

A retractable roof embodies issues of added suppliers into the construction sequence and reliability, maintenance in operation and thus there are strong and good reasons to develop a relatively simple solution. The simplest approach is one where the kinematics of the system is a linear geometry where the retractable roof moves front-to-back over and on top of the fixed roof. The system would require main roof beams on the end stand roof to be set-out parallel to each other and orthogonal to pitch edge. The main roof beams would have linear steel rails on their top surface around which the waterproofing and cladding would be dressed. Steel bogies with wheels would be attached to the underside of the retracting roof and roll linearly on the rails below. The system is therefore inherently simple and robust. There are several key technical structural issues to ensure reliable structural behaviour, and these are summarised below:

- the retractable roof is made 'compliant' to the fixed roof below. This means that the retractable roof moves freely under imposed movements of the fixed roof without developing internal stresses wither from movement of the fixed roof or temperature conditions
- the drive to the retractable roof is generally provided by the wheeled bogies
- a control system is an important part of the overall design including ensuring the retractable roof moves out in a controlled uniform manner with very limited skew on plan thus ensuring low internal stresses from the motion
- the drive system is designed to work only under lower wind conditions (and certainly not under the extreme structural wind speeds) and the roof only moved during these controlled conditions, thus providing an economic energy design

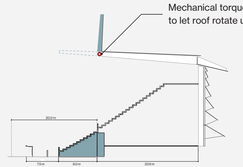
The retractable roof will have a certain area of cladding that provides the cover to the front of the roof when the roof is deployed in its covering condition. The roof beams of the retractable roof are longer than the covering depth as they need to provide engagement with two sets of bogies. The first set of bogies tends to act in a compression condition under downwards loads and the rear set of bogies acts to prevent the retractable roof lifting off the fixed roof. In practice, for such a relatively light roof, it is probable that both sets of bogies would have wheels engaged to be able to roll and resist against both upward and downward loading.

The inclusion of a retractable roof will lead to some visual implications to the roof, but these are generally considered minor in the context of a large roof and the project requirements:

- the fixed roof will have its cladding interrupted by the lines of rails when the retractable roof is deployed in the closed position
- the retractable roof is likely to be located vertically higher than the fixed roof when the retractable roof is deployed in the closed position. This is so that the kinematics is achieved by a regular motion along a constant level rail (although the rail will actually be inclined slightly, at the same overall inclination adopted for the roofs to drain). Some retractable roofs do adopt a rail that has a step or slope to try and achieve a flush level of roof surface when the roof is closed. It is possible, but introduces some extra complexity and risk

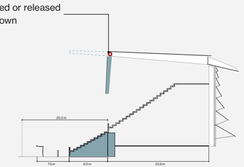
An alternative to a linear kinematic solution is one where the moving roof rotates either through one or two or even three hinges. This form of kinematics is often used in moving bridges where the control of motion is sometimes achieved by hydraulics and sometimes cables. It could provide an interesting solution, but we anticipate that the joints i.e. hinges in the system would be locations of vulnerability to water.

As an alternative to a mechanical solution a manual disassembly solution is also proposed. This removes some of the disadvantages of mechanical systems, such as requirements for regular maintenance. A solution with disassembly does not rely on mechanical components functioning, but will require a crane and associated staffing and operations and access to be provided up into the roof. The roof would be designed with connections suitable for disassembly, whereby bolts in the connections can be removed and roof assemblies be lifted away section by section. The assemblies could be placed on ground, for instance in the nearby tennis courts, but a near storage solution could also be investigated to place the removed parts of the roof on the remaining fixed part of the roof.

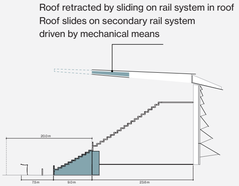


Roof retracted by rotating up. This solution will add unfavorable wind load to the roof.

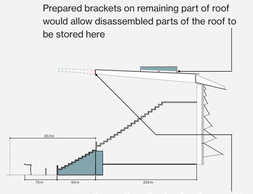
Retracting by vertical rotation



Roof retracted by rotating down



Retracting by sliding
Considered a complicated mechanical system that is likely to negatively impact the general design of the roof and requires a rail system to slide on that is expected to cause undesired visual implications.



Retracting by disassembly

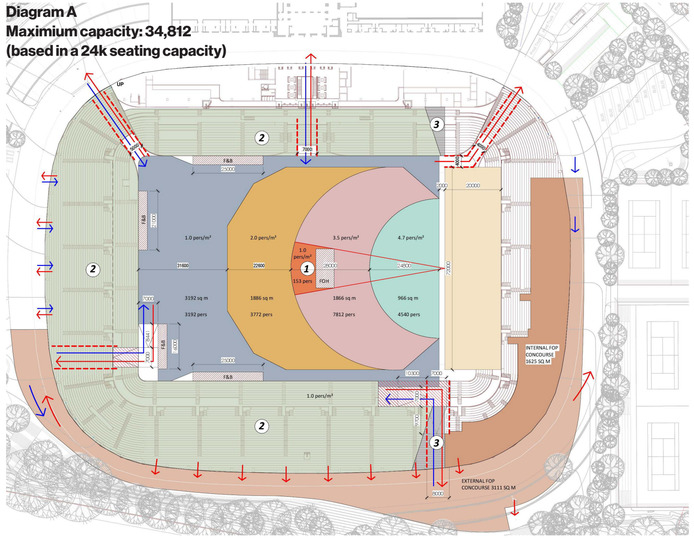
Design options 5 and 6: Maximum Event Capacity / Additional Egress

Design Options 5 and 6
These options request in the first instance an impact analysis of the possible maximum number of spectators for a concert event situation using the 24,000 seating capacity Design Option stadium bowl. We have combine both options in the same diagrams because the extra egress will have to exist in ANY of the concert mode options that include pitch spectators.
As per the baseline concert design, FoP spectators would access F&B provision to the rear of the pitch, and a concourse including portable WC facilities, which would stretch externally below the south stand, to internally within the east stand. An area of removeable roof and retractable seating would be provided to the east stand to accommodate the stage

Our design team looked at two diferent options of egress tunnels, that result in different capacities and they go as folow:

Diagram A - RAMPS
This proposal, included below, illustrates the south exits from the pitch as ramps as requested. The ramps are 17,205m and 20m long and circa hafit of them can be acommodated below the removable terraces permanently. Therefore circa 30m long ramps have to be installed everytime there is an event with public in the pitch. To secure that the walking speed on the slopes, doesn't result in a bottleneck for people exiting, the slopes are made with a maximum rise of 1 on 5 (20 cm for each meter). The walking speeds are found from articles from peer-reviewed articles from the fire safety academic community.
The demands for the slopes (1 on 5), makes the ramps longer than the depth of the stands. This results in people evacuation must make to 90 degree turns before getting out of the stadium to the concourse level. In an evacuation scenario there will be a risk for people might misinterpretate the actually entrance to the ramp. Aditional and considerable storage space would have to be created to acommodate the temporary ramps.

Diagram A
Maximum capacity: 34,812
(based in a 24k seating capacity)



Spectator capacities

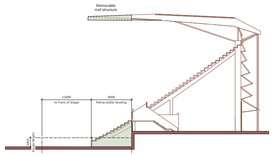
1. Field of Play (all zones) = 19316
2. General Admission (all stands) = 15496
3. General Admission Restricted Views (all stands) = 496

GA + FOP Total = 34,812

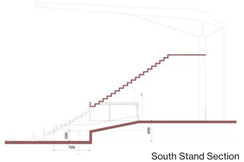
SEAT WITH FULL VIEW
SEAT WITH RESTRICTED VIEW
FIELD OF PLAY (4.7 pers/m²)
FIELD OF PLAY (3.5 pers/m²)
FIELD OF PLAY (1.0 pers/m²) (Restricted view)
FIELD OF PLAY (2.0 pers/m²)
FIELD OF PLAY (1.0 pers/m²)
STAGE
EXTERNAL CONCOURSE
EMERGENCY EGRESS
FOP INGRESS

FOP concourse size based on ratio of 0.5sqm/ person for 50% of overall capacity. Ratio to be reviewed by operator.

FOP F&B provision based on a bar length of 5m per 1000 spectators. This figure to be reviewed by the operator.



East Stand Section



South Stand Section

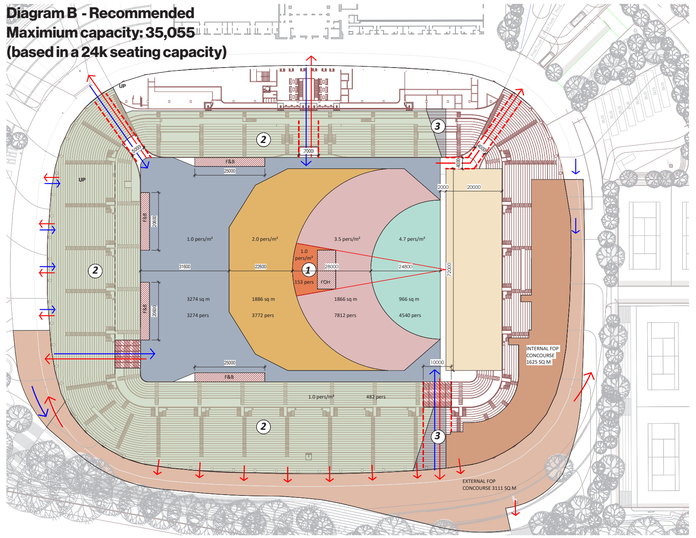
Diagram B STAIRS - Highly recommended
In order to eliminate the ramps risks and secure a safe evacuation our team also look into a similar option but with stairs.
In this diagram the 90 degree ramps are converted into permanent straight stairs. This demand wider stairs and hand rails to make sure that that the whole width of the stairs is used and not just the sides with next to the hand rails. To ensure the same capacity of the stairs as the ramps, the stairs needs to be 30% wider than the ramps.
With a clear formal language of the sides of the stairs people will acknowledge that they need to walk up on the stairs before getting to the steps of the stair. In terms of an evacuation it is a good thing that the stairs go up, and people not will risk walling down the steps, making a progressive crowd collapse on the stair.
In terms of safety and evacuation, cost and operations time it is recommended to use the solution with stairs in the emergency south exits from the field.

This option prooves to be saver, more cost eficient and much easier to manage by the operator - no temporary instalations, meaning a easier and faster change from football to concert mode. This option also allows foran aditional 243 spectators.
The costs to the right reflect this option.

Additional Works for Concert / Event Mode (based on 24k seated capacity stadium)
Additional Construction Cost (excluding professional fees):
DKK 67.150.000
This price comprises retractable seating and retractable / hinged roof to accommodate the stage area.

Additional Event Egress (based on 24k seated capacity stadium)
Additional Construction Cost (excluding professional fees):
DKK 4.700.000
This price comprises small sections of demountable seating in the south stand and associated structural works

Diagram B - Recommended
Maximium capacity: 35,055
(based in a 24k seating capacity)



Spectator capacities

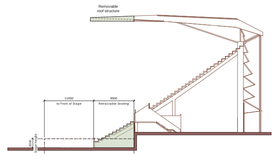
1. Field of Play (all zones) = 19398
2. General Admission (all stands) = 15657
3. General Admission Restricted Views (all stands) = 496

GA + FOP Total = 35,055

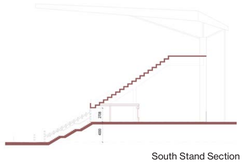
SEAT WITH FULL VIEW
SEAT WITH RESTRICTED VIEW
FIELD OF PLAY (4.7 pers/m²)
FIELD OF PLAY (3.5 pers/m²)
FIELD OF PLAY (1.0 pers/m²) (Restricted view)
FIELD OF PLAY (2.0 pers/m²)
FIELD OF PLAY (1.0 pers/m²)
STAGE
EXTERNAL CONCOURSE
EMERGENCY EGRESS
FOP INGRESS

FOP concourse size based on ratio of 0.5sqm/ person for 50% of overall capacity. Ratio to be reviewed by operator.

FOP F&B provision based on a bar length of 5m per 1000 spectators. This figure to be reviewed by the operator.



East Stand Section



South Stand Section

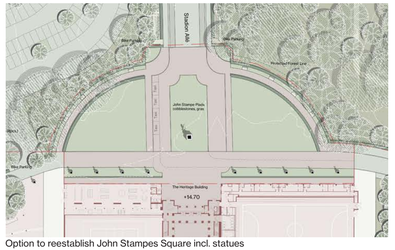
Other options for upgrade or budget reduction

Potential further upgrade options according to the brief (not included)

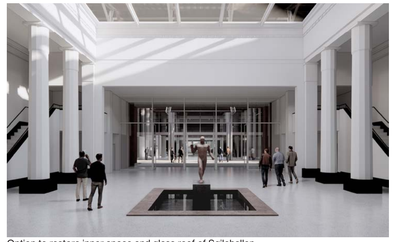
- John Stampes Square
- Søjlehallen interior and new glass roof
- Open up facade to Hall 2 in the Heritage building
- Football museum
- Expansion of West Concourse to accomodate more Ultra Fans and allow for double sided concessions in the façade
- Extra 2000 seats/4000 standing spectators, incl. extra steps and balustrades
- Etc.

Potential upgrade options to proposal (not included)

- Additional olar panels on roof and facade panels: c. DKK 7.500.000 – DKK 15.000.000
- Timber structural options; main columns, beams in roof, timber main stand. We have been investigating timber structural concepts for the stadium, as this would be the most sustainable solution in terms of minimizing CO2 emissions. However it is the clear conclusion, that this material choice is not possible to achieve within the currently set clients budget.
  Timber structural options:
  - main columns: c. 22.000.000 DKK
  - main main roof beams: c. 20,000.000 DKK
  - Entire main stand structure (incl. terracing structure): c. 35.000.000 DKK
- Glazed facades to concourse areas: c. DKK 25.000.000 – DKK 30.000.000
- Exchange exterior gravel paving with other hard surface like concrete

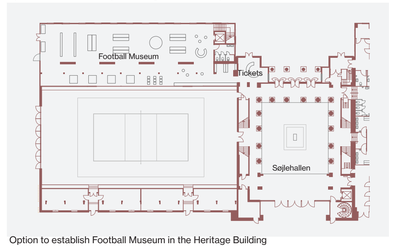


Option to reestablish John Stampes Square incl. statues


Option to restore inner space and glass roof of Søjlehallen


Option to build with timber for reduced CO2 emissions and "warm" atmosphere in design

Option to open up facade to Hall 2 in the Heritage building



Option to establish Football Museum in the Heritage Building


Option to expand West Concourse to accomodate more Ultra Fans

Option: Possible Expansion of West concourse

Concourse Expansion

The Fan Plaza and the west concourse have been designed to allow for a 5,5m deep expansion zone that can include up to four two-way facing concessions and/or toilets and 183m2 of concourse space. At a final capacity of 24,000 and with this addition, the ratio in the west concourse would become circa 0,21, still above the minimum Green Guide recommendation.

The architectural language of the expansion will match the external visual aspect of the building, creating this way a seamless addition to it. The add-on principle of doublesided concessions can be implemented as a general way of making the edge-zone around the stadium more active.

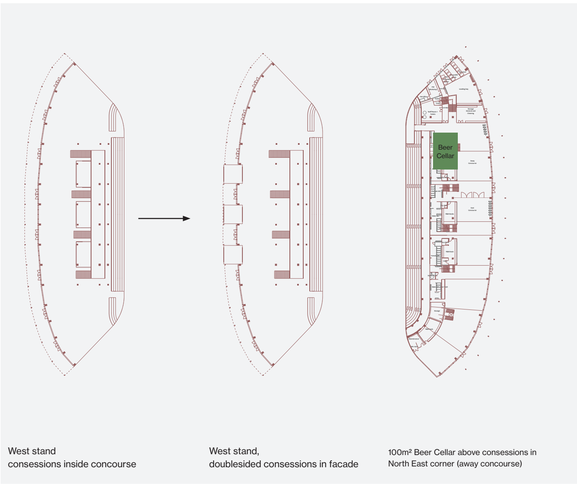
Spectator Safety

The concourses design has been verified by the crowd flow and by the fire specialists to ensure a save flow. Three first aid rooms have also been considered, one in each GA stand, near areas where an ambulance can easily park. The first aid room in the west stand has also a direct access to the pitch to cover any risks at pitch level in both football and concert modes.

The scheme includes also two security centres, both in the north stand:

- The Security Room at level 0 (east) which includes a proposed stewards centre, not included in the brief but necessary in this kind of buildings. This security area is adjacent to a stair / lifts core and to the pitch, facilitating this way the access to different areas of the building.
- The Stadium Security Centre, located at level 4 and also adjacent to a stair / lifts core, will be located at the west side of the stand. The location ensures that both security areas can still operate if one of the stair / lifts cores becomes compromised. The Stadium Security Centre will have full views of the bowl, including the away fans stand and will be in close proximity to the Fan Plaza.


Example of integrated doublesided expansion (not included)



West stand
consessions inside concourse

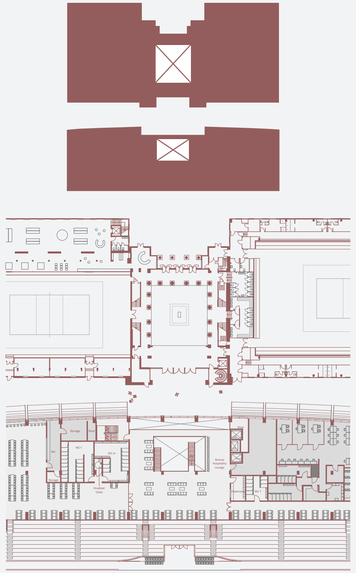
West stand,
doublesided consessions in facade

100m² Beer Cellar above consessions in North East corner (away concourse)

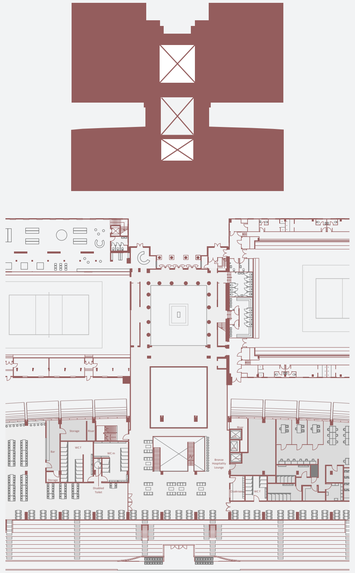
Option: Connecting the Heritage Building and Stadium

The competition proposal creates a public passage between the new stadium and the old neo-classical Hoegh-Hansen building. This is a respectful gesture, that also allows for everyday sunday strolls around the premises.
However it is possible to adapt the project to connect the two buildings if it is preffered for functional reasons etc.
A connection can be implemented in various ways. Below is illustrated 2 options for an interior connection from 1st floor (bronze level), as a gate motive in the passageway.
This is doable due to the interior design of the column hall and the new atrium that has aligned flow spaces.
It is also possible to connect in ground floor should this be deemed neccesary.

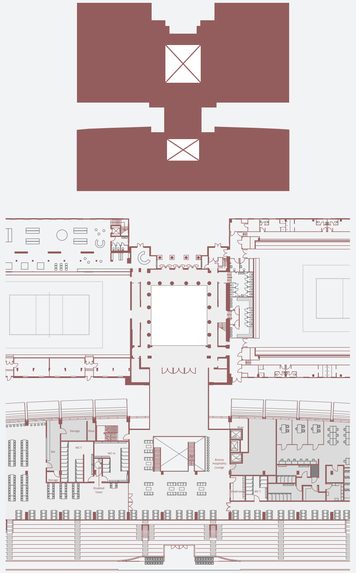
Proposal



Double bridge with void



Central bridge



Option: Main Stand atrium - sound walls configurations

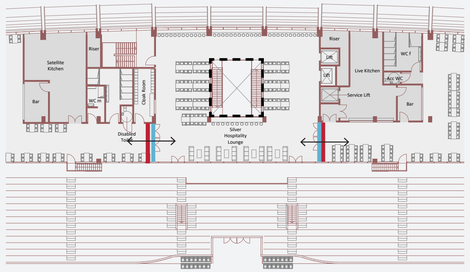
The competition proposal creates a generous space connecting the different hospitality levels - an antrium that reinterprets the historical column hall. This will be a unique place to promenade through the building, and create synergi between the different functions. On match days the game atmosphere can spread between floors.

However we acknowlegde the wish to contain noise between the diffent lounge areas. This can be handled in various ways (as illustrated below), depending on the wished balance between openness, connectivity and isolation.

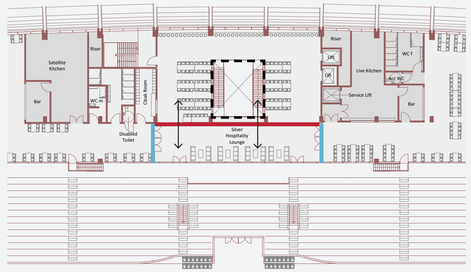
We believe option 1 is the superior solution, as this creates usable break out areas nearby the connecting atrium, while the generous lounge areas in east and west of the main stand, are acoustically disconnected when needed - but still visually connected.

Atrium opening
Noise barrier - Curtain wall in glass
Fire barrier - Curtain wall in glass

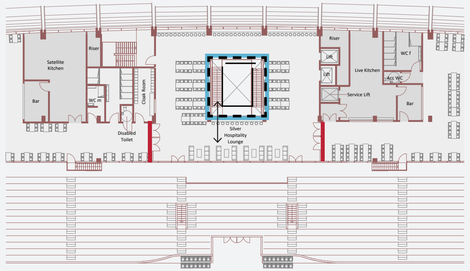
Opt 1.



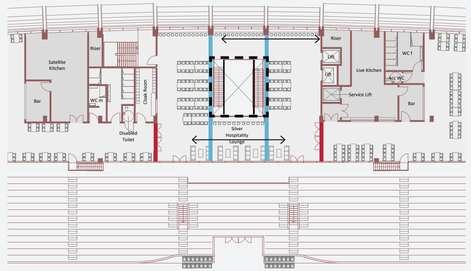
Opt 2.



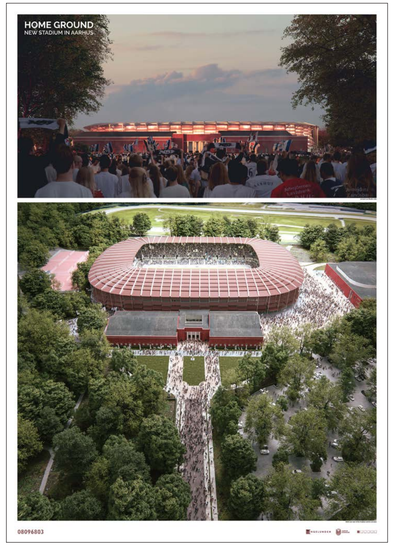
Opt 3.

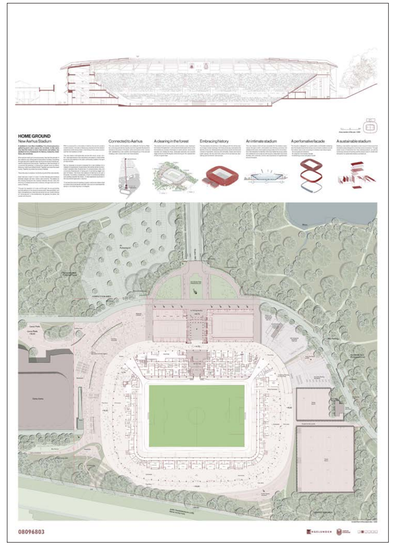


Opt 4.



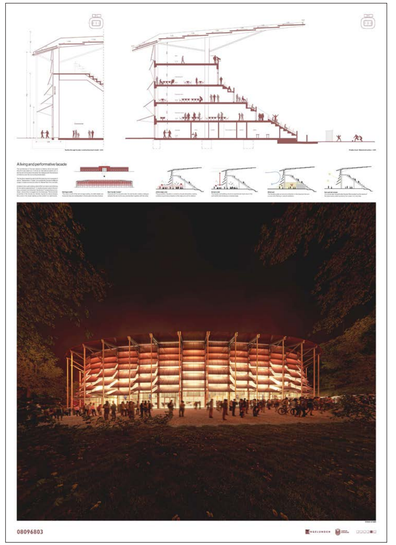
Panels

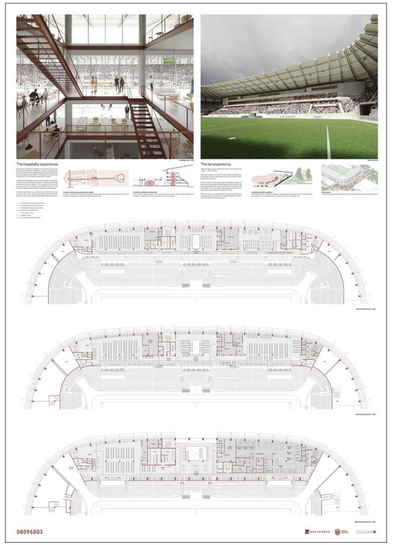

HOME GROUND
NEW STADIUM IN AARHUS
08096803


HOME GROUND
New Aarhus Stadium
Connected to Aarhus
Actively in the forest
Embracing history
An intimate stadium
A performative facade
A sustainable stadium
08096803


A city in the forest
Adaptive mass
08096803


The stadium experience
Sweating blue!
08096803


A daring and performative facade
08096803


The hospitality experience
The fan experience
08096803