As Architect in charge of overseeing the construction of Mjøstårnet, I will give you an insight on how Mjøstårnet came to be and after the introduction, som thoughts around our design process from the earliest sketches and initial ideas, to how we reached our distinct design for this building,

Voll Arkitekter is situated in Trondheim and has 22 employees. Our vision is that every project we do, should be built. We always strive to take the project one step closer to realization. We don't like idea projects that never leave the sketching phase. So with this perspective, taking on the vision of Arthur Buchardt, our builder, to design the world tallest building made of wood, was a challenge we just couldn’t decline.

In exactly one month, Mjøstårnet officially opens its doors to the public. Two years of construction is nearly completed. But the foundation of Mjøstårnet was not laid two years ago, or 4 years ago when our builder presented us a napkin with a drawing of what was to become the worlds tallest timber building.

No, the foundation for this project was laid over 80 years ago, when the spruce seeds, witch later became the glulam structure of Mjøstårnet was planted in the surrounding areas of Brumunddal. This area is famous for its forestry and wood processing industry, dating hundreds of years back.

Standing on top of the viewing platform of Mjøstårnet, you can actually see where the timber comes from and where it was processed.

About 11 000 - 13 000 threes were used in the production of the glulam structure. A healthy and sustainable forestry is therefore very important if a project like Mjøstårnet and other timber building is to succeed.

The construction industry is a major contributor to the greenhouse gas emissions. With the later years focus on the climatic change, we all have a responsibility to choose environmentally friendly materials whenever possible. Wood is a natural renewable raw material and has a small negative impact on the environment, provided it comes from certified and sustainably managed forests, therefore the use of wood as a building material will contribute to reduced the CO2 content in the atmosphere.

Mjøstårnet is to be a symbol of this “green shift”, and a proof that tall buildings can be built using local resources, local suppliers and sustainable wooden materials. For us, it was important that the design of the building also reflect this.

Brumunddal is a small city with 10 000 residents, about one hour and a half drive north of Oslo. The site lays on the river bank of Brumunda, and gives Mjøstårnet a majestic appearance as it overlooking Lake Mjøsa, Norway larges lake, and its surroundings . The name “Mjøstårnet” is Norwegian and means “The tower of Lake Mjøsa”.

With its distinct architectural appearance, Mjøstårnet is what you may call a signal building, both in the way it stands out with its 85,4 meters in the picturesque landscape, but also in its revolutionary use of timber in the construction and cladding.

Mjøstårnet is a modern mixed use tower, with facilities that the residents, locals and visitors can exploit. The tower has already attracted a lot of attention both in Norway and abroad. Most recently with the prize for best mixed used architecture In the 2018 New York design awards.

The tower consist of 18 stories with different programs. The official architectural height is as mentioned earlier 85,4 meters. Each floor is about 640 m2. The total program for the tower Is about 10 500m2 with an additional 4 500m2 public bath.

The ground floor is public, with lobby, reception and restaurant. In addition there is an adjoining public bath on the ground floor with two 25 meters length pools.

The second story is reserved for rentable meeting rooms and technical facilities.

The next five stories are office space.

We have 72 hotel rooms, 18 on each floor from the 8th story to the 11th

In total there are 33 apartments in the project, ranging from 50m2, to 180m2. 6 apartments on each floor on the 12th to 16th floor.

Two apartments on the 17th floor together with an event room, used for weddings, celebrations and larger conferences.

On the top floor there is one penthouse apartment and a public and private terrace.

I will now show you tree different stages from the design process.

Our initially idea was to design the tower with an exoskeleton, and just a transparent shell wrapped around on the outside to protect the timber construction from the weather. The climatic walls would stand on the inside of the construction. Because why build a tower made from wood, if you can’t actually see the wood construction. Our goal was that every one passing by on the main road should immediately understand that this is a timber building.

To further enhance the visibility of the wood construction, we had the tower raised from the ground level, separating the tower from the two lower stories. Making the tower rest only on its main glulam columns. In this way, the visitor where given the chance to really embrace the construction

But the raising of the tower where not only a design choice, it also had a practical purpose. The tower and its neighboring smaller tower was al needed to be raised from the ground due to the potential flooding of Lake Mjøsa. The building had to withstand a 200 year flood. Witch is a 3 meters raise of the water level. Taking into account the potential of waves and more bad weather, we raised the building 4 meters.

The overall shape of the building, took its base in the most efficient hotel room layout, thus creating a narrow rectangular shape. The roof was slanted, giving it an ideal angle to place solar panels, which also emphasized the environmental friendly design concept for this tower. This shape also gave the building a distinct characteristic silhouette.

This first draft of the tower, created a semi transparent building with a lot of glass in its facade, with the focus on showing the wood construction to the outside. But the complexity of the construction where too great, and we had to abandon this design. We had to be reasonable, and search for a more solvable construction, simplifying and reducing the elements in play, to make it possible to reach a buildable solution with in time and budget.

Instead of glass, we continued our work with the idea of using wood as the main facade material. It is a timber house after all.

By working with different sized boards, and changing the direction of which we placed them, we created a layout which reflected the main construction, and by interlacing the boards, also created a more playful pattern The amount of glass was reduced to suit its function and at designated areas showing the construction. Diagonal beams where placed as much for design purposes as for stability. The end calculation of the construction was not yet ready, so in close collaboration with Moelven and Sweco we kept our option open as long as possible.

Towards the lake the facade still consisted mainly of glass showing the network of diagonals. To the north, a massive glass wall was implemented to show the elevators vertical movement , and thus giving the facade more life.

Before the final stage of the design process there where a breakthrough in the calculation of the gluelam structure. Finally landing a system that was both efficient and strong enough to deal with the height, fire proofing and wind forces.

The main load bearing consists of large scale glulam trusses along the façades as well as internal columns and beams. The trusses handle the global forces in horizontal and vertical direction and give the building its necessary stiffness. CLT walls are used for secondary load bearing of three elevators and two staircases. The CLT does not contribute to the building’s horizontal stability.

The average columns being 60x 60centimeters and the larges in the corner being almost 1,5 meters had of course an impact on the plan layout as well as the facade design.

There were also new important input from other consultants regarding fire safety, building physics, element production, and on site production, giving us a sett of rules to play within. A framework for the design that was not initially there when we started.

For us, this meant some major design changes.

The facade elements where to be produced of site, and because of transport regulation, the best way of utilizing the pre produced elements, where to place them horizontally for each floor. Making the most out of the length and high of each element. and thereby reducing the number of elements needed and the amount of time needed to mount them.

The large prefabricated façade elements are attached to the outside of the timber structures and make up the envelope of the building. These sandwich type elements come with insulation and external panels already fixed. These Wall elements do not contribute to the global stiffness of the building.

Because of the horizontal joints, we had to implement a visible flashing for each floor. The flashing also works as a shield in case of fire inside the void of the construction, preventing fire to spread from the utside from floors to floors.

By using Acidproof steel, we prevent rust drippings from the flashing down the cladding. To further try to control the aging of the facades due to weather impact, and blend the difference in the aging of each panel.we chose vertical board panels with extra vertical tracks, helping to control the dripping from any surface and lead it down the right direction. All the board are one story high, no joints. Square and thicker planks were used to enhance the verticality in the project by placing them in a rhythmic pattern on the outside of the main panels. Giving the facade more texture and depth, creating a shadow play.

Resembling more of a traditional small trehouse in the detailing, compared to earlier versions of the tower. And Using details firmly rooted in traditional Norwegian wood architecture, meant that we also where quite sure that this design would stand the winds of time.

Every wooden part in the facade construction had to be fireproof, limiting our possibilities in choosing different wood materials and treatment of the wood. A fire safe pine product from Woodify was chosen for the facades. The facade begins with a slightly brownish glow and over time naturally turn grey if not treated.

And speaking of fire: The fire protection measures made in Mjøstårnet make the wooden building far safer than a corresponding building with traditional steel and concrete construction. Mjøstårnet is designed to withstand a complete fire. This means a fire that is allowed to develop freely without active firefighting effort.

Many people will recognize themselves after placing a heavy cube in the fireplace. It will not burn up as long as you do not add the smallwood. The big cube will soon get a layer of charcoal, but the fire will eventually die out of its own

The glue constructions will retain the carrying capacity in a complete fire cycle. Our fire tests show that glue lam wood gets a protective layer of coal that makes the fire unable to entertain itself and it dies out. Even after long-term exposure to fire, a glue lam structure with such solid dimensions as used in the Mjøstårnet will have a sufficiently large load-bearing core of fresh wood.

The structures are also so spaced apart that a fire fails to keep alive when it is only the constructions that burn. Therefore, the tower does not collapse, even after a fully-flared fire in the interior.

A number of extra measures have also been put in place, which would normally not be available in a regular building of steel and concrete. For example, the facade is protected from fire spreading, the building has an extra powerful, and two separate sprinkler system and each room on each floor is designed as a single fire cell. This is done so that the flames can not spread so easily to the next room.

The final design

Instead of raising the tower from the ground to withstand a potential flooding, the overall terrain level was raised instead, crating a secure evacuation route for the inhabitants and emergency personnel.

Due to heavy snowing during winter months, the angled roof could potentially create large snow slides. So instead of exposing the timber structure on the ground level, we chose to create an open roof structure, replicating the structure of the tower. Situated in a more controlled environment, we could safely showcase the structure as initially intended with minimal protection and still keep our original silhouette. The risk of snow slides where also minimized.

As the glulam structure had been reduced to a bare minimum, but still very large in size, the exposing of the structure in the facade became more difficult. The plan layout is similar on each floor with the same function, so a wide spread of different windows and window placement was not possible, it had to be a straight system. This is also in accordance with the prefabricated wall elements, to keep the cost down, they should be as similar as possible.

We made sure that we placed the windows as close as possible to the columns, so that you would get the feel of the size of the columns. Through windows you will be getting glimpse of the trussers stretching from the ground floor and to the top, this helps create a readable face where you can see and understand the wood structure. The glulam construction on the roof is of course also a helping source in reading the wood structure of the tower.

The idea of the glass wall to the north was kept, but by using several smaller windows that creates three vertical ribbon patterns instead. keeping the idea about seeing the elevators and giving the user a view of the surroundings. And after having tested it for my self, I am glad to say that this is one elevator ride you will remember, the view towards Brumunddal is amazing.

Different materials will be used side by side for many years to come. And Mjøstårnet is not the blueprint of a tall timber building. But sustainable wise, the most important aspect of this building is to show that it is possible to build large, complex timber buildings, and in that fashion, inspire others to do the same

We hope that sharing our experiences we will inspire others to do the same. We all have an overall responsibility in choosing environmentally friendly solutions whenever possible