

Our proposals for the new cable car present a design with a strong identity that is founded on elegant proportions and beautiful simplicity. A design that can hold its own amongst the increasing verticality of Gothenburg's skyline.

Towers

When viewed from a citywide perspective, the distinctive design of the towers will be seen as a family of graceful tree-like sculptures on the skyline that extend up from the city below. The main elevation sees alternating bands of steel and concrete that converge to a minimum at approximately three-quarters of the towers' total height, before diverging again in a fan-like array to support the cable saddles over which the ropeways pass. This articulation and linearity serves to accentuate the slenderness and verticality of the towers and the form gives them more distinctiveness. Furthermore, the design enables visual continuity between the different towers, regardless of the angle of the incoming cables and the subsequent orientation of the saddles.

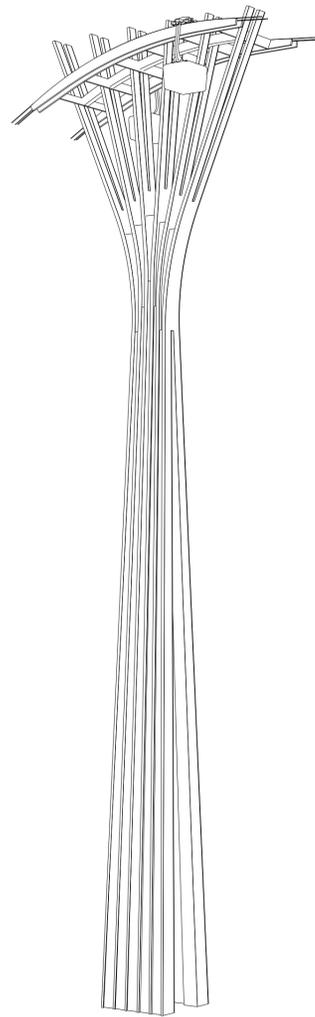
In addition to the impact on the city's skyline, the towers will influence the public realm at ground level. One of the primary challenges in the success of the project will be achieving the right scale for these towers as they come to ground and are experienced up close by the general public. With the height of the towers ranging from approximately 40m to 130m, the bases of the towers will have a necessarily significant scale. Our team has worked hard to reduce the width of the towers at their base. The width of the tower is just 7.5m in the main elevation and 8m in the side elevation on a 100m tall tower. In order to further reduce this impact, we have introduced a split in the lower portion of the tower's side elevation resulting in a 4m clear width through which views can be achieved.

The base of the towers will be experienced at close quarters and must therefore be beautiful objects with high quality finishes. Our design proposes a mix of painted steel and concrete and uses the play of light and shadow to help break down the perceived mass of the structure. Six slender lines of steel alternate with five bands of concrete on the main elevation and taper continuously as they soar skyward.

Access to the ropeway saddles is achieved via discretely located maintenance ladders which will include a fully integrated fall arrest system. The bottom section of the ladder will be retractable and lockable to prevent unauthorised access.

Tower lighting

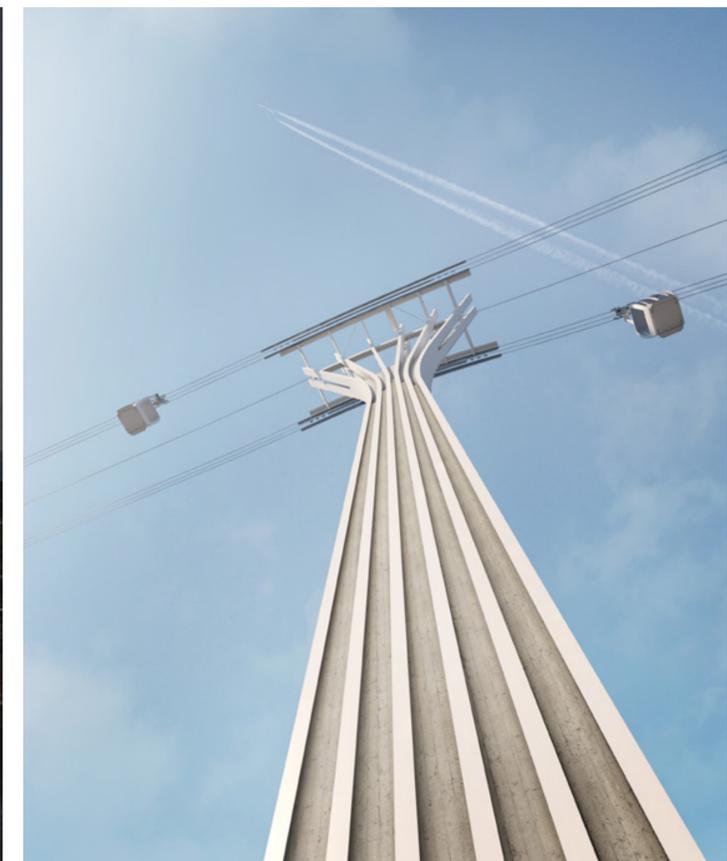
At night the appearance of the towers elegant design will be maintained. It is proposed that the slender steel bands will be highlighted with fine lines of light using projection technology. Projectors will be located above head height at a short distance away from the base of the towers. Meanwhile, the interior of the tower legs will be washed in a soft warm light via in-ground LED uplighters. This will help to further reduce the perceived mass of the structure and prevent any anti-social behaviour should this area remain open to the public.



Perspective view looking south west



Night view from the Göta älv, looking north



View looking up at the tower

Structural Design Philosophy

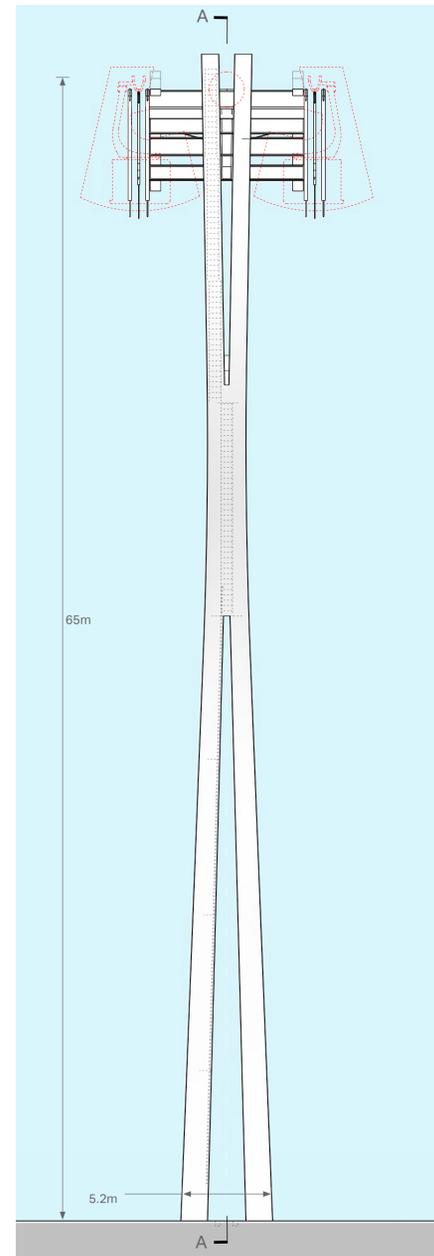
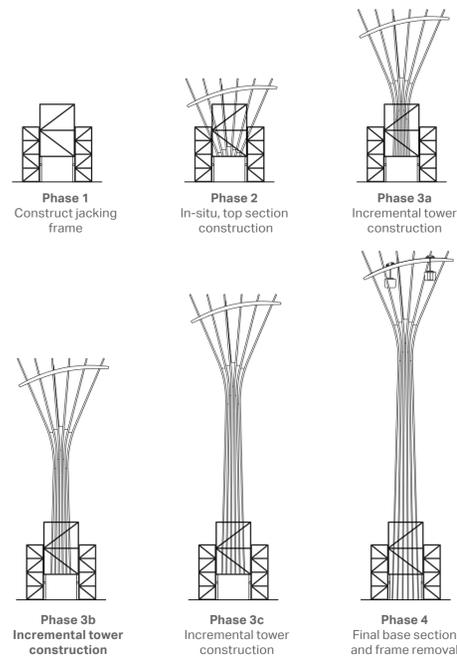
The structure consists of three principal sections; the twin tower legs, the transition zone and the steel fan. The tower legs are of steel/concrete composite construction, with the steelwork acting both structurally and as permanent formwork for the in-situ concrete. On the external face of the tower, precast formwork will be used to reduce the volume of steel, lowering the overall cost and reducing the amount of site welding. The precast permanent formwork provides a high quality finish to the exterior of the tower and improves construction safety by negating the need to work at height. The steel-concrete composite design was selected as the inclusion of concrete improves the structural efficiency of the section and provides additional structural damping to mitigate machinery or wind induced vibration of the tower and the associated noise. The composite construction also reduces maintenance requirements by negating the need to inspect internal steel surfaces.

The transition zone provides the connection between the slender twin legs and the steel fan. It consists of a hollow steel box, which allows for simple and safe access to the cable supporting machinery. The fan is constructed from fabricated steel open sections to simplify access and maintenance. A large displacement analysis has been carried out to validate the design of these slender members which are stabilised by simple slender steel struts.

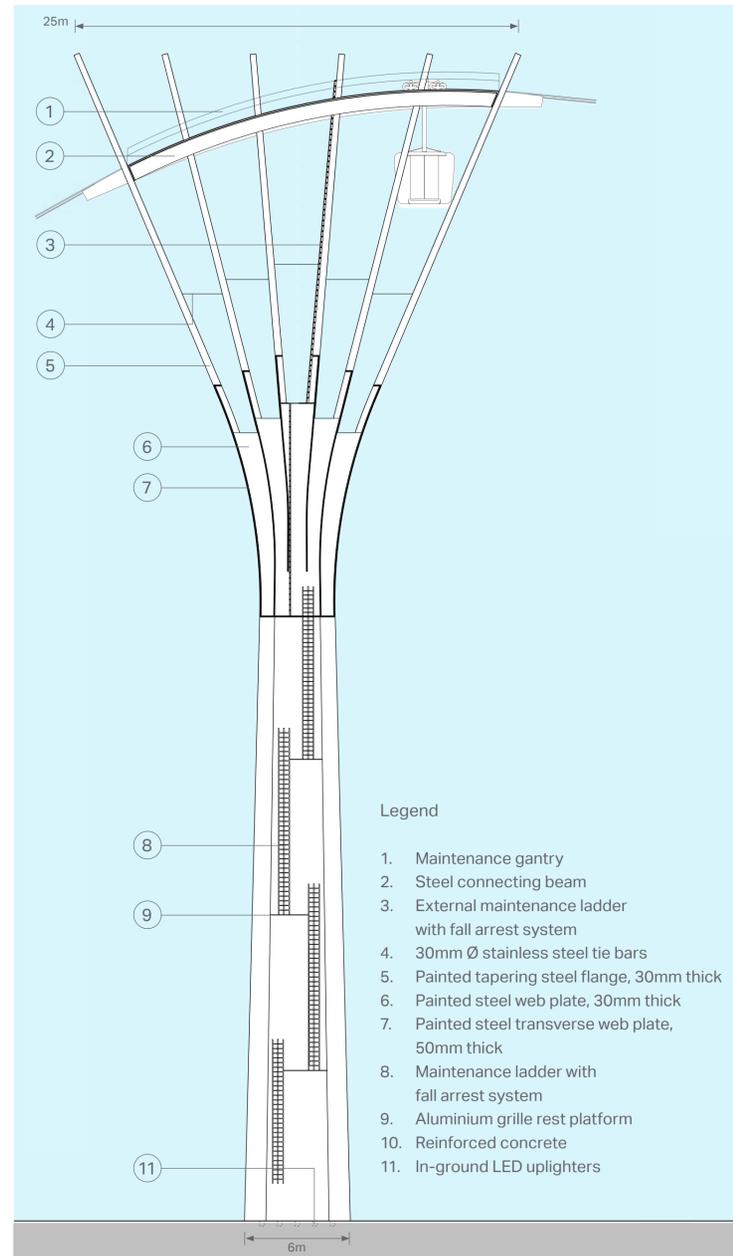
It is intended that the steel elements will be fabricated from carbon steel and a paint system used to prevent corrosion. However, there is also the option of using weathering steel to improve durability and reduce maintenance. If weathering steel is selected drainage elements will be carefully detailed to avoid staining of the concrete faces or surrounding surfaces.

Construction Sequence

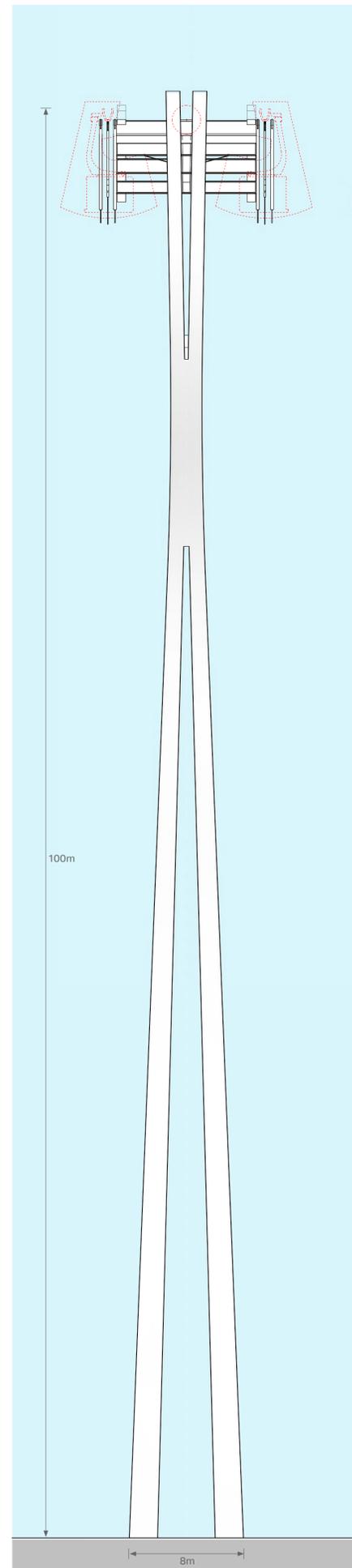
The proposed construction sequence uses a 'top down' construction methodology to provide programme benefits and improved safety by reducing the working at height requirements. The increased initial cost of the temporary works required to lift the tower will be mitigated by its repeated use at other sites, reducing the expense of plant hire and crane pad construction.



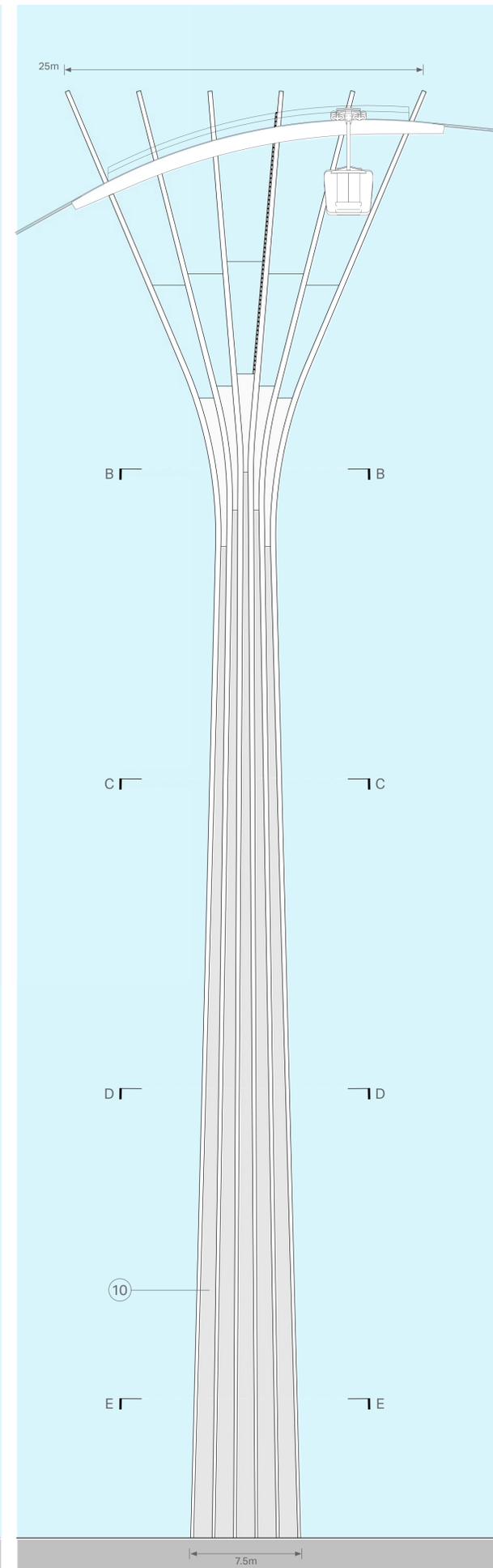
65m tower side elevation, scale 1:200 @ A1



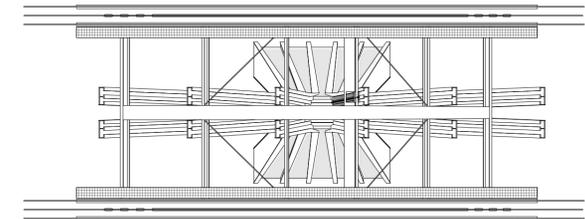
65m tower section AA, scale 1:200 @ A1



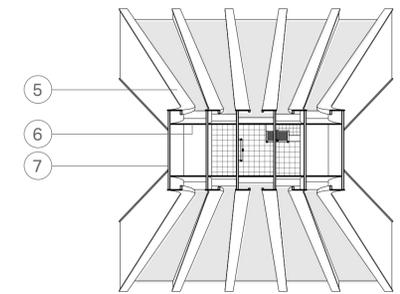
100m tower side elevation, scale 1:200 @ A1



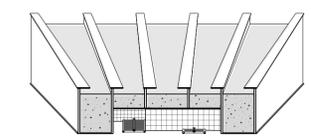
100m tower elevation, scale 1:200 @ A1



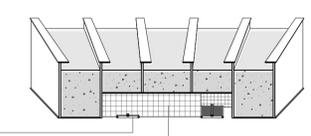
100m tower head plan
Scale 1:200 @ A1



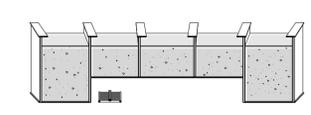
Section BB at tower neck
Scale 1:100 @ A1



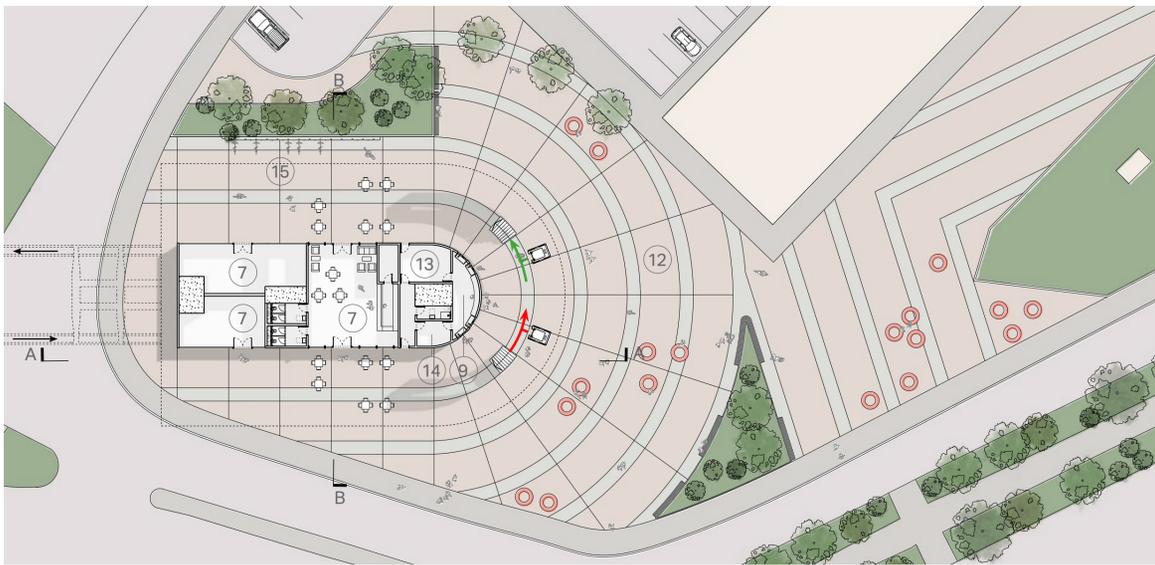
Section CC at mid-tower
Scale 1:100 @ A1



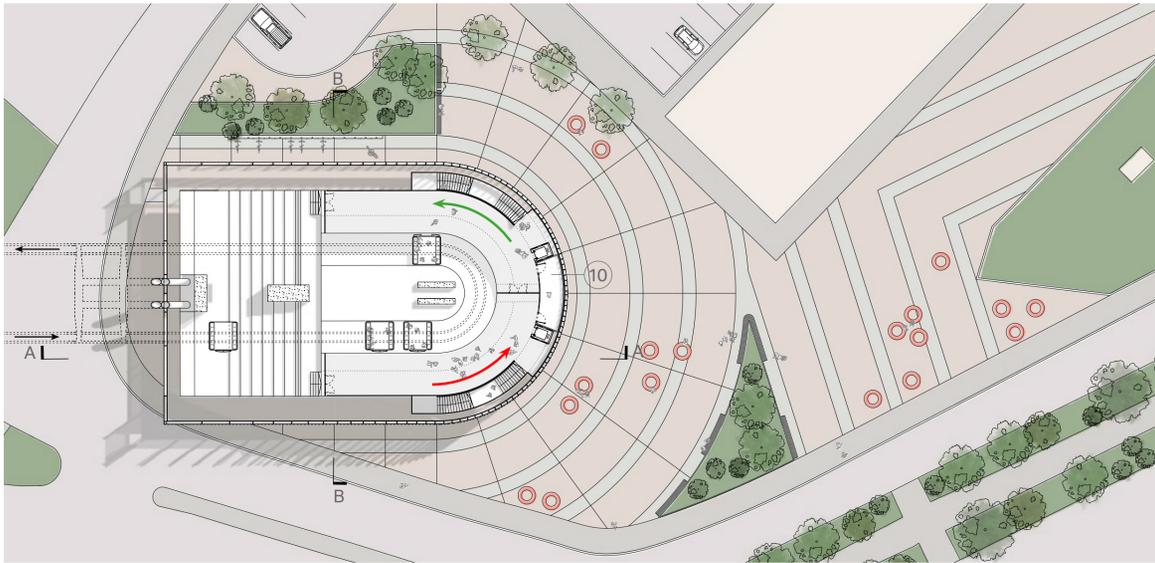
Section DD at quarter height
Scale 1:100 @ A1



Section EE at tower base
Scale 1:100 @ A1



Järntorget Station, ground level plan, scale 1:400 @ A1



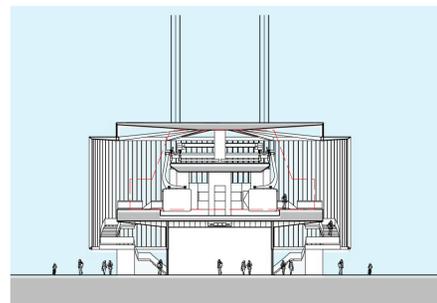
Järntorget Station, platform level plan, scale 1:400 @ A1



Perspective view of Järntorget Station, looking north



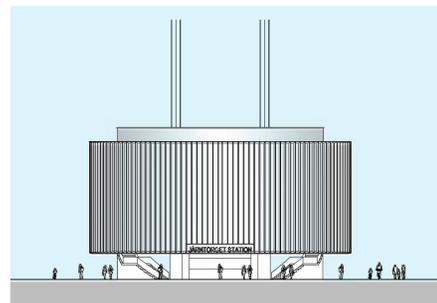
Järntorget Station, section AA, scale 1:400 @ A1



Järntorget Station, section BB, scale 1:400 @ A1



Järntorget Station, side elevation, scale 1:400 @ A1

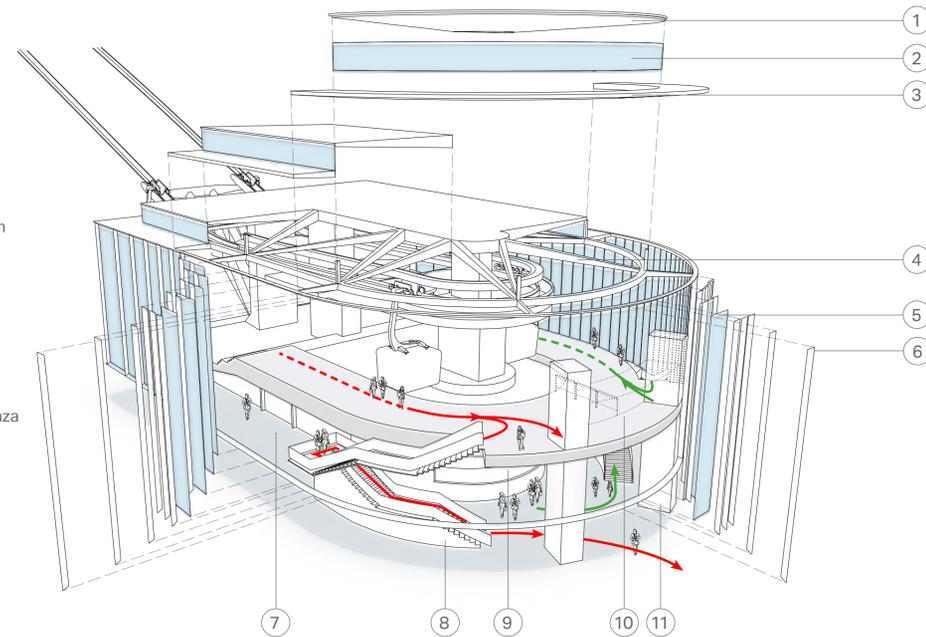


Järntorget Station, front elevation, scale 1:400 @ A1

Legend

ARRIVAL ACCESS
DEPARTURE ACCESS

1. Concrete roof slab
2. Clerestory glazing
3. Concrete roof
4. Steel roof bracing
5. Curtain wall glazing system with frosted interlayer
6. Vertical louvres
7. Retail unit
8. Stair to platform level
9. Ticketing office
10. Control room
11. Lift to platform level
12. New landscaped public plaza
13. Staff room
14. Office
15. Bicycle parking



Exploded circulation diagram of Järntorget Station

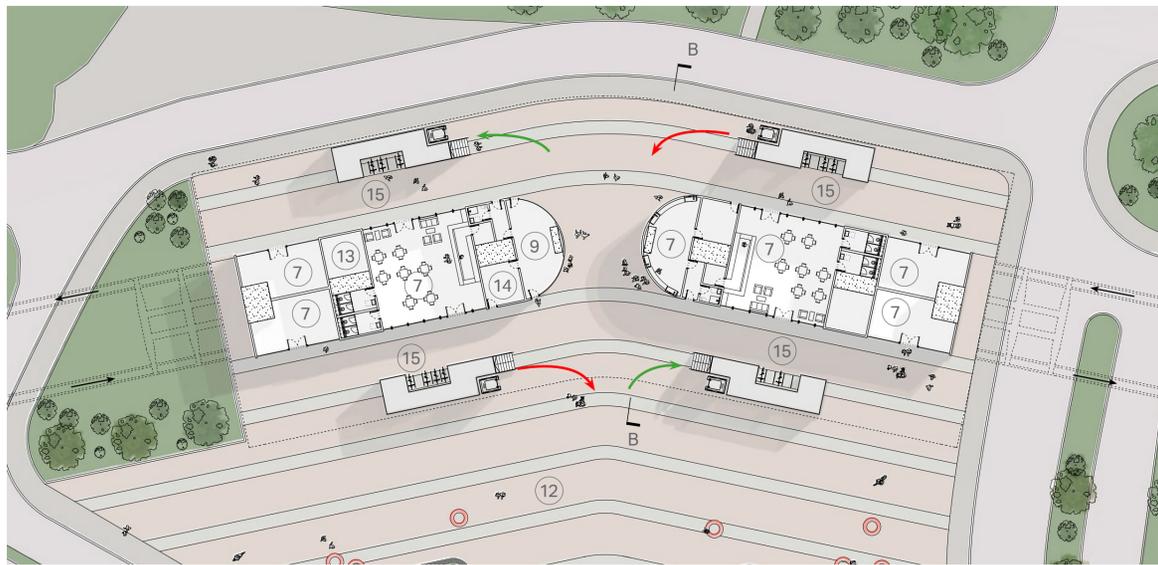
Stations

The stations are designed to be simple and elegant in appearance. A glazed curtain walling system is proposed with vertical louvres set at graduated intervals. The appearance of these will further express the form of the station envelope, whilst echoing the vertical lines of the towers and resulting in a cohesive aesthetic for the project. The glazing itself will have a frosted interlayer through which moving shadows will be seen from the exterior when the station building is in use.

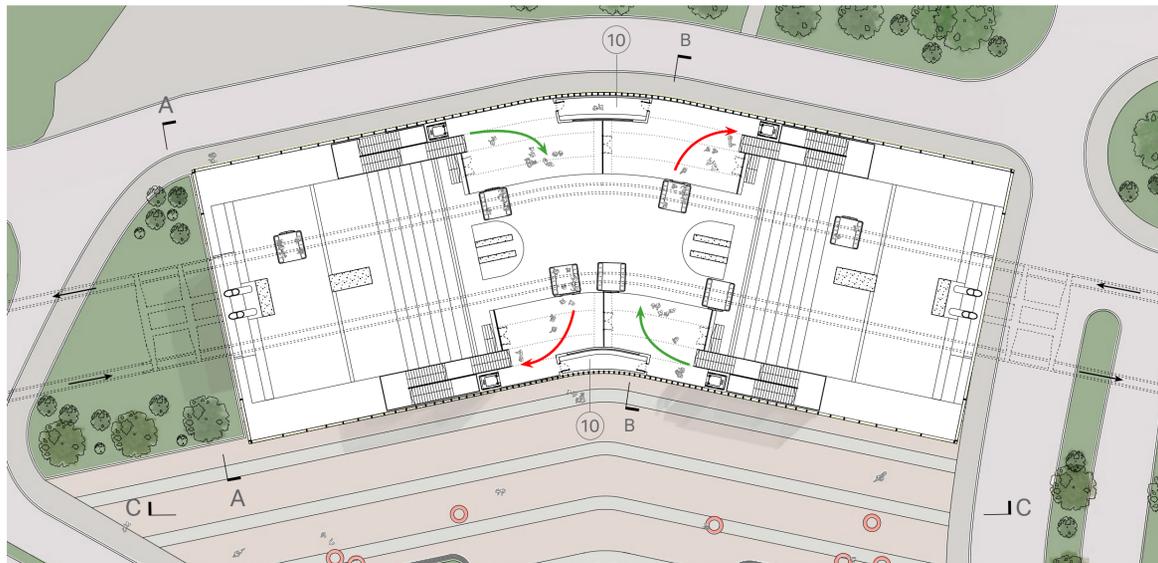
The areas around the stations will be upgraded to include new public plazas with radially paved areas, so as to reflect the geometry of the stations and draw people in towards the building entrances. It is proposed that the residual areas beneath the stations be used as small retail units, administrative offices for the cable car operation and public ticket offices and information centres.

Station Lighting

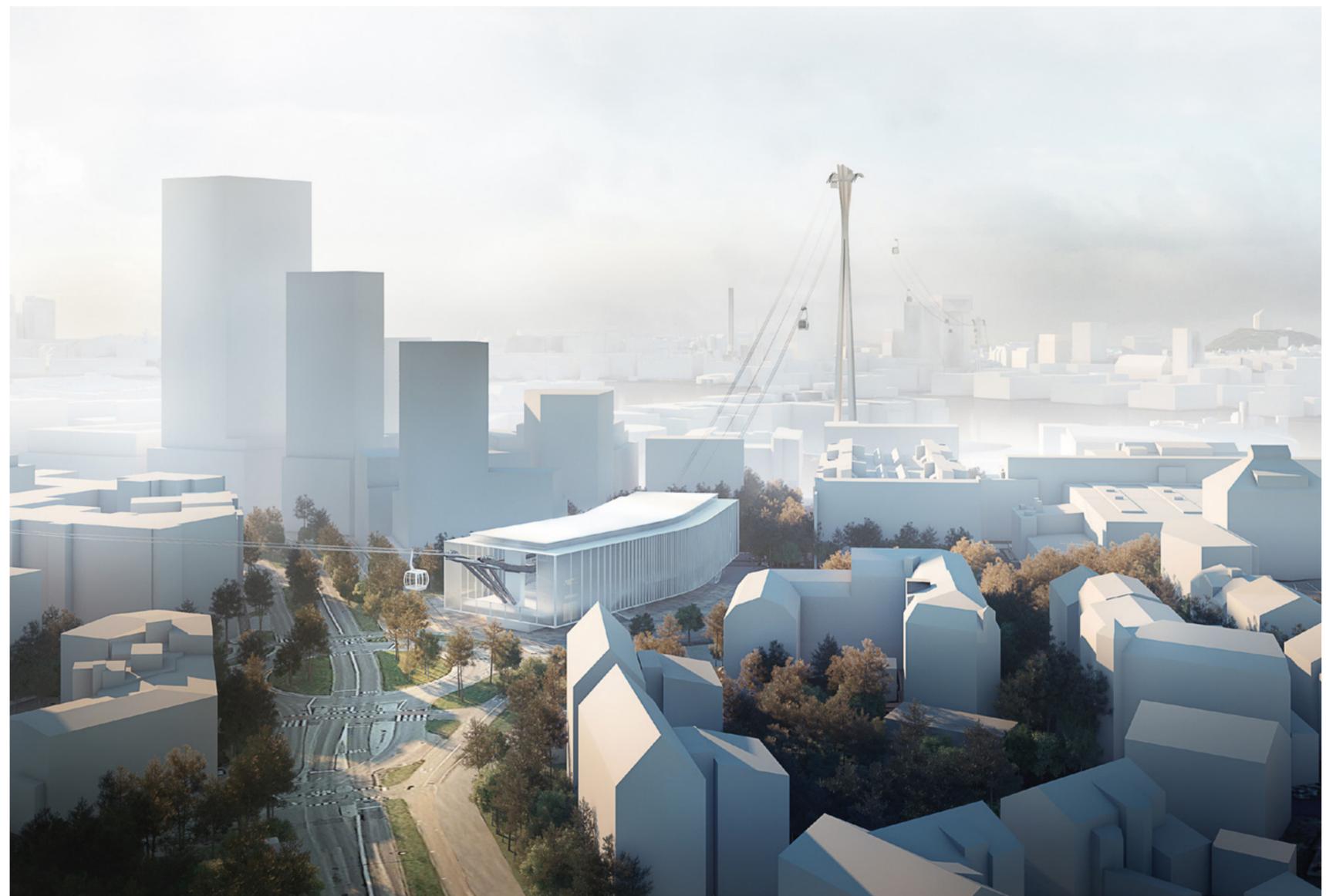
The lighting for the stations is intended to be low key. Whilst details have not yet been finalised, the design intent will be to create a glazed box that is illuminated from within. Fittings will generally be recessed LED luminaires mounted within the building soffits.



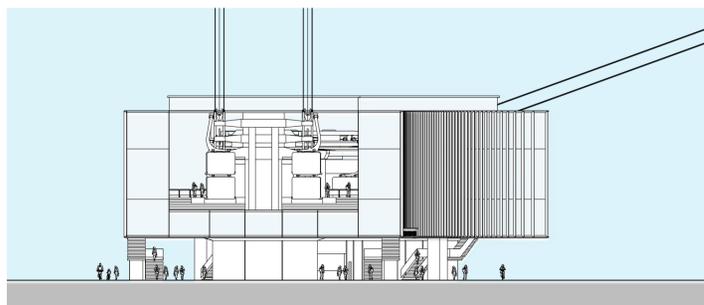
Lindholmen Station, ground level plan, scale 1:400 @ A1



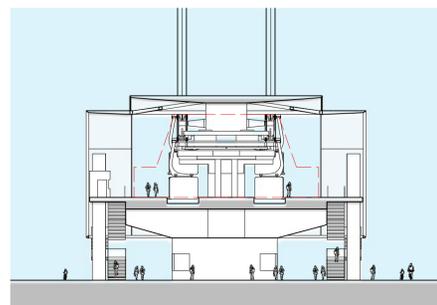
Lindholmen Station, platform level plan, scale 1:400 @ A1



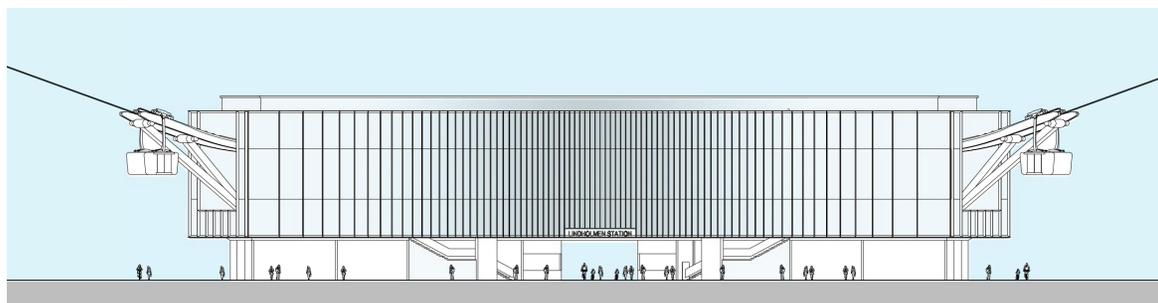
Perspective view of Lindholmen Station



Lindholmen Station, elevation AA, scale 1:400 @ A1



Lindholmen Station, section BB, scale 1:400 @ A1

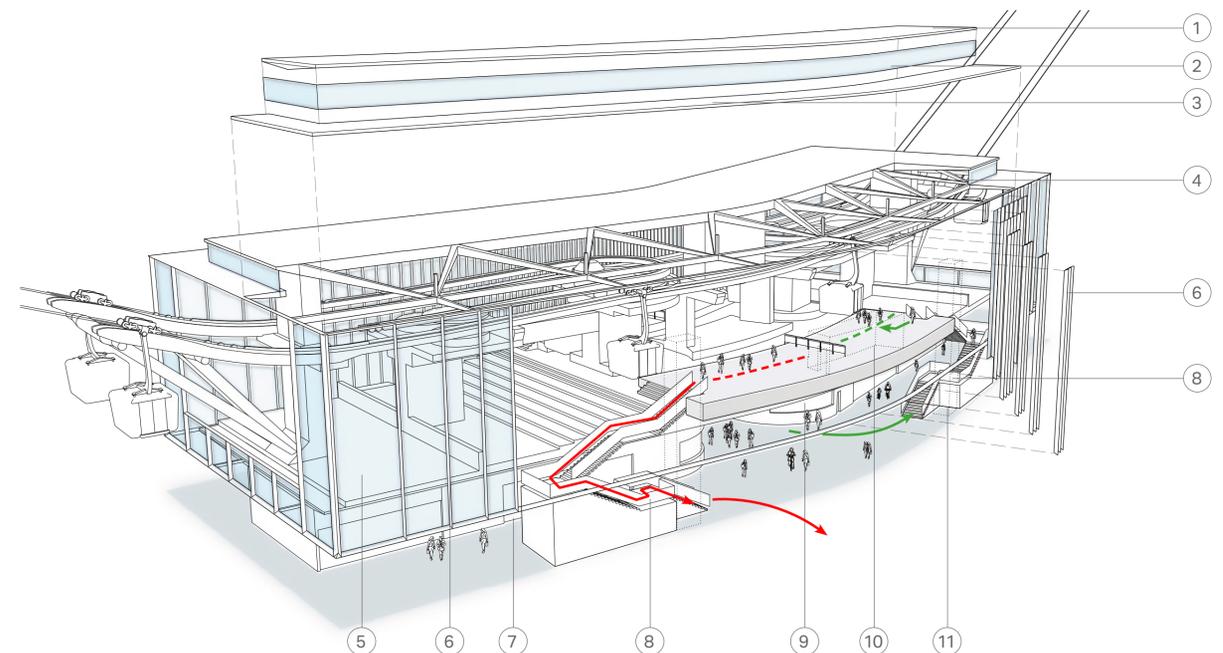


Lindholmen Station, elevation CC, scale 1:400 @ A1

Legend

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Exploded circulation diagram of Lindholmen Station