



Webnet suspension bridge
Himmelhausmattesteg



Himmelhausmattesteg

2021.09

Suspension bridge on a wire rope mesh

Featuring a completely new design, this modern and elegant suspension bridge with a total length of 25.8 meters, opened in November 2020 and allows pedestrians and cyclists to cross the river Trub in Trubschachen, located in the Emmental region of Switzerland. For the first time, a bridge is suspended on a stainless steel wire rope net, instead of traditional suspension ropes.

Construction

With a slight incline as it crosses the river, the bridge spans a total of 25.8 metres, with the suspended section of the bridge stretching 21.5 metres between the supporting pylons. The bridge joins the road to the neighboring district, with its 2.2 metre width enabling the municipality's 5 tonne snow-clearing tractor to cross in the winter. The bridge is designed for a payload of 4.0 kN/m².

Constructed from steel gratings, the bridge deck is supported on four HEA 140 longitudinal steel beams, which in turn are supported by seven transverse beams across the suspended section. The structure is then braced by the Webnet which creates a super-elevation sag of 280 mm. The design, including the inclination due to the super-elevation sag, was developed to allow easy access for people with impaired mobility.

The beams feature angled twin arms which taper towards the outside edges of the bridge, which combine with the vertical forces from the longitudinal steel beams and laterally arranged steel tubes (ROR 88.9 x 5.0). By design, the cross members not only allow reduced distances to sit the longitudinal beams on, but also to achieve a 'Vierendeel effect' to achieve the necessary transverse strength and rigidity. The railing is located above the longitudinal tube (ROR 42.4 x 3.2) and is coupled with clevises with external threads for connection of the net.

The wire mesh Webnet consists of 3 mm stainless steel ropes, with a construction of 6 x 19 + WC, which with sleeves, forms a mesh width of 80 mm. The Webnet is connected to 26 mm diameter sus-

pension cables, which are 1 x 37 open spiral strand stainless cables, with Jakob Forte turnbuckles fitted at both ends. The suspension cable has a 2.4 m sag over its 23.7 m length, which gives an f/l ratio of 1/10. These cables are attached to the pylon heads, together with the Jakob Forte M36 wire ropes and the tie-back cable.

The 5.3 m high articulated pylons are manufactured from welded hollow sections and support the longitudinal profiles of the bridge girder on their crossbars, these being connected to the pylons by means of bolted joints.

In total, the bridge structure, including its gratings, weighs about 12 tonnes and it is anchored into heavy weight concrete.

Construction program

After completion of the foundations, the articulated pylons were positioned in place together with the temporary suspension cables which had already been attached. The girder had been manufactured off-site and transported to Trubschachen in one-piece, where it was lifted in to position by pneumatic crane and secured to temporary cables. By accurately manufacturing each element of the bridge off site, its subsequent construction and assembly were quick and efficient – and avoided costly and time-consuming adjustments having to be made. Compared to conventional approaches, the design has proved to be cost-effective, with this solution also removing the need for additional balustrades and the hanger cables they would require.

Outstanding community project

For the inhabitants of Trubschachen, the new bridge provides more direct access to the station and provides a safe cycle path, taking cyclists away from a busy main road.

As well as its unique construction, the new bridge is also distinguished by an excellent partnership between the public and private sectors.

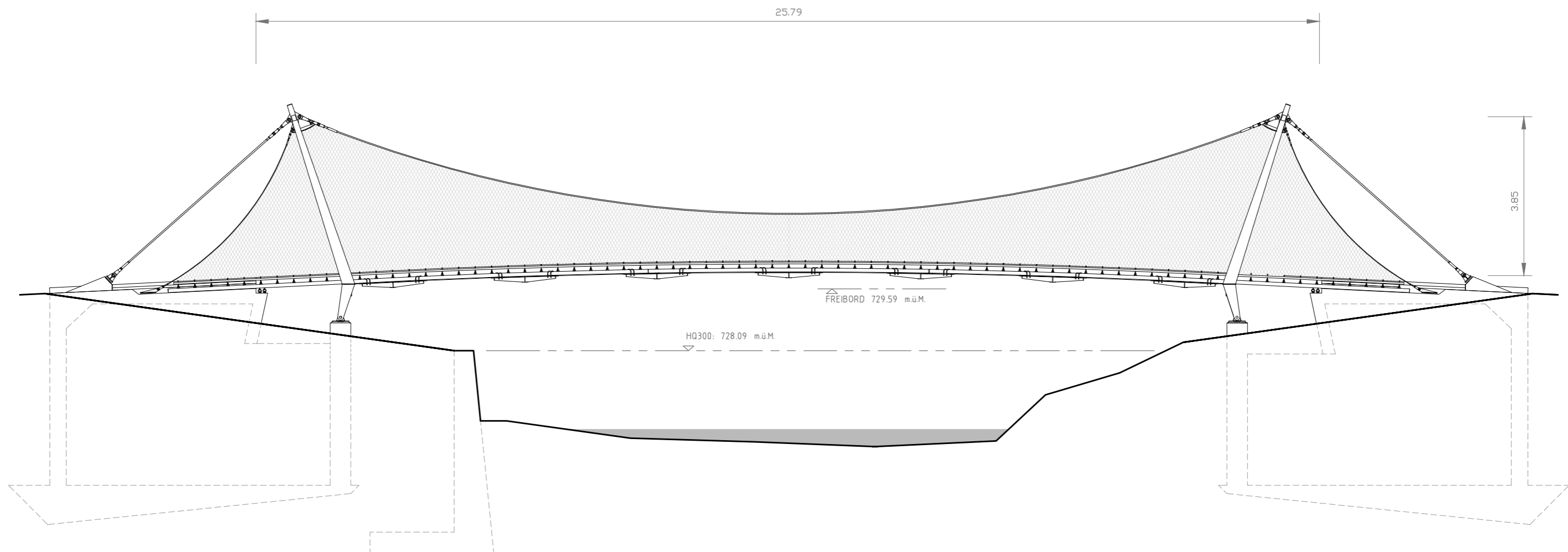
A true community programme, the project has involved a number of local companies, including Thuner Bau AG, the Kambly SA Pension

Fund and Jakob Rope Systems, all working together with the municipality of Trubschachen. The bridge was officially opened in November 2020 by a billy goat, who was the first to cross it to the sound of Alpine horns.

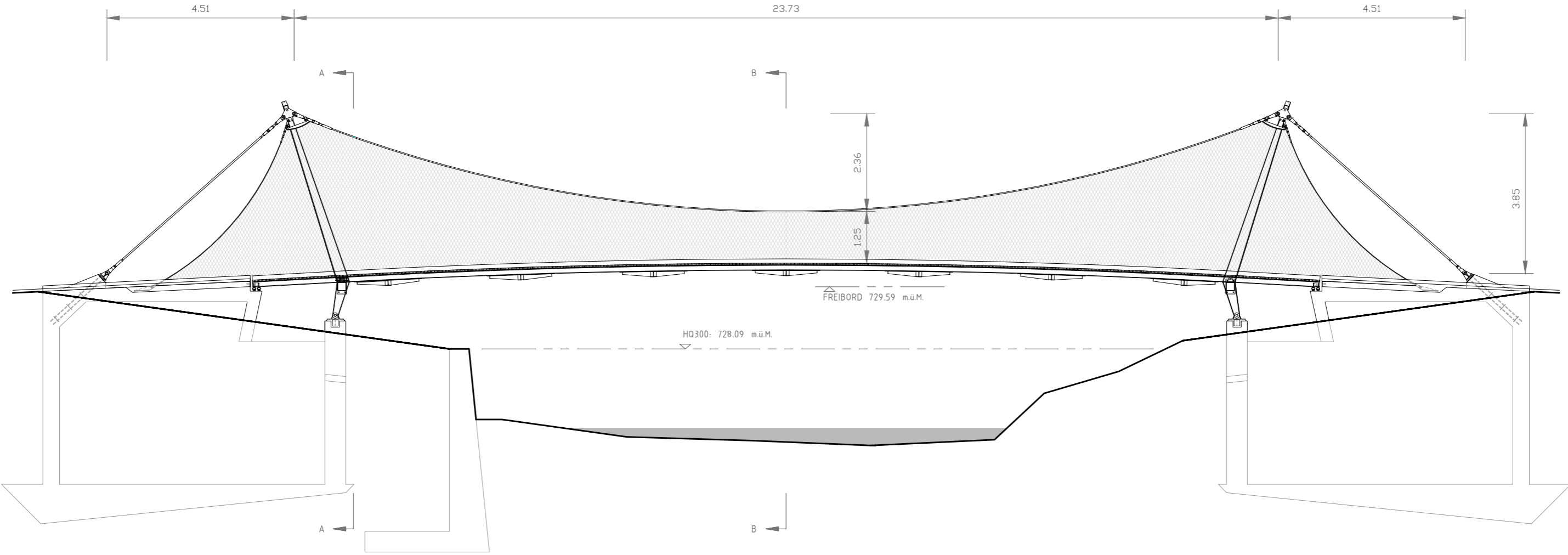
The sustainability

By using the Webnet structure, complex connecting elements can be saved in the bridge construction – without having to compromise on safety. This reduces the amount of material required. A lightweight structure is thus possible, which significantly reduces the overall weight of the bridge compared with a solid construction. The stainless steel materials used are of high quality and resistant to weathering. This gives the bridge structure durability and low maintenance.

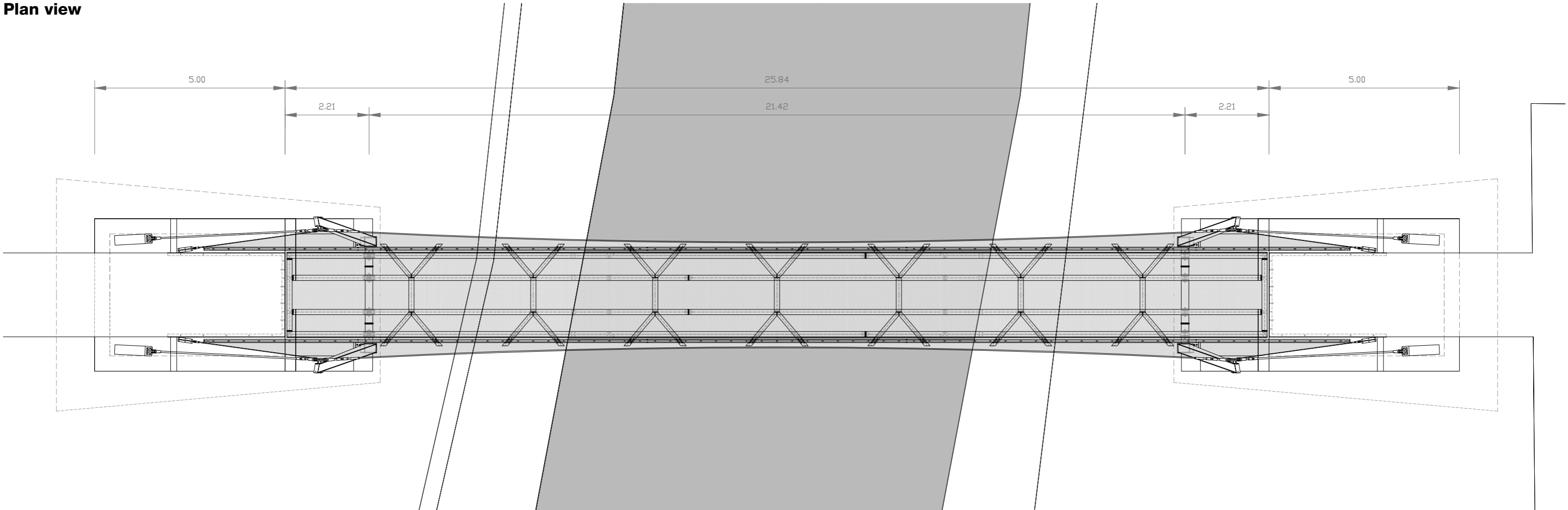
Elevation



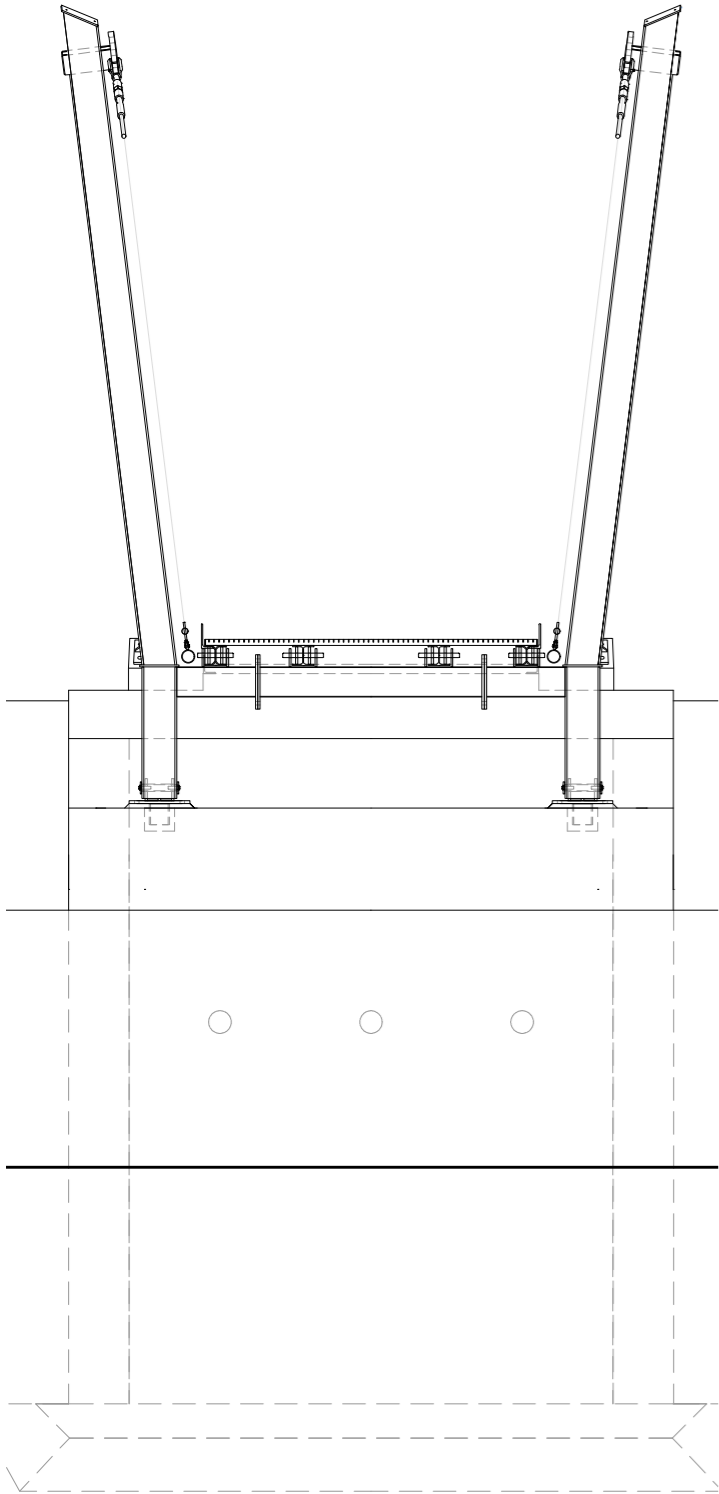
Longitudinal section



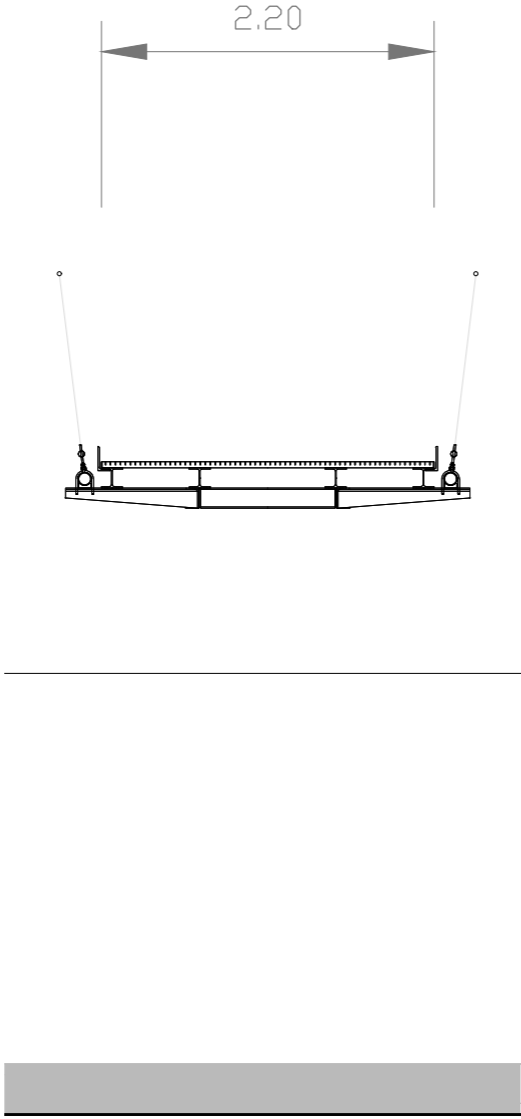
Plan view



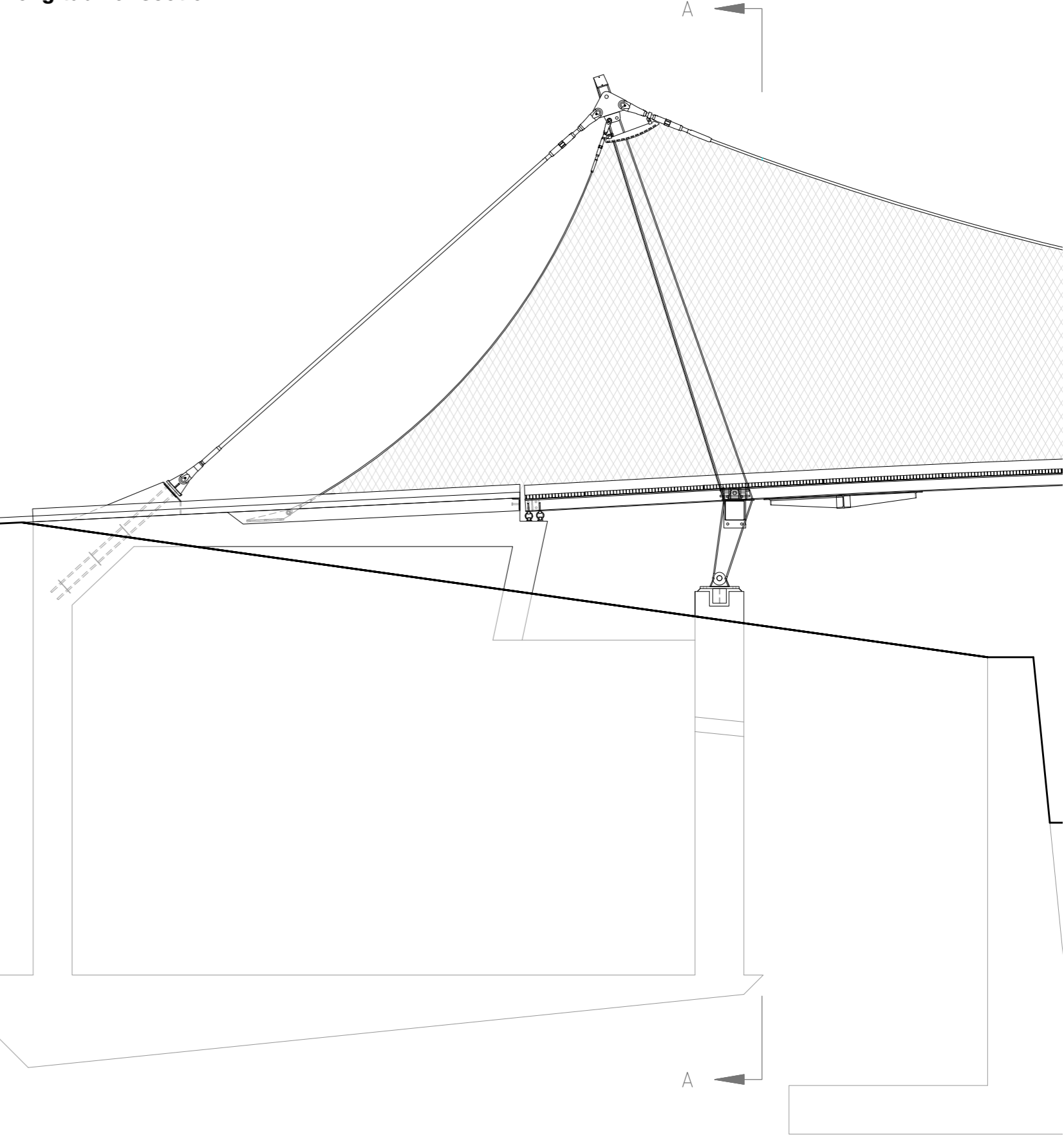
Cross section A



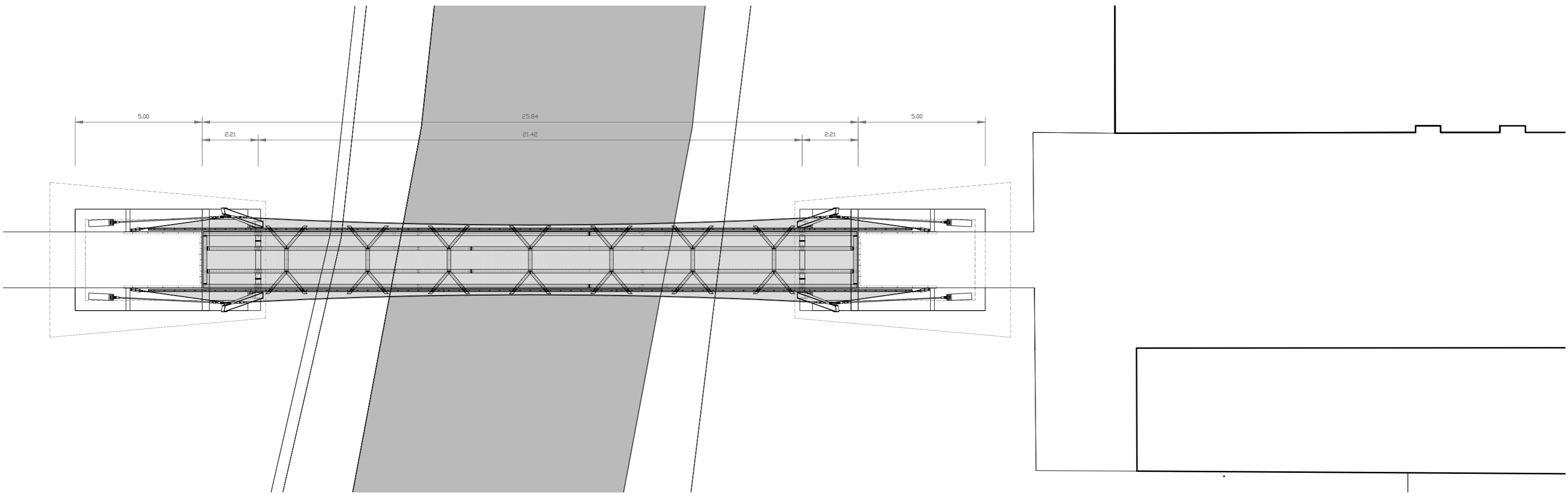
Cross section B



Longitudinal section

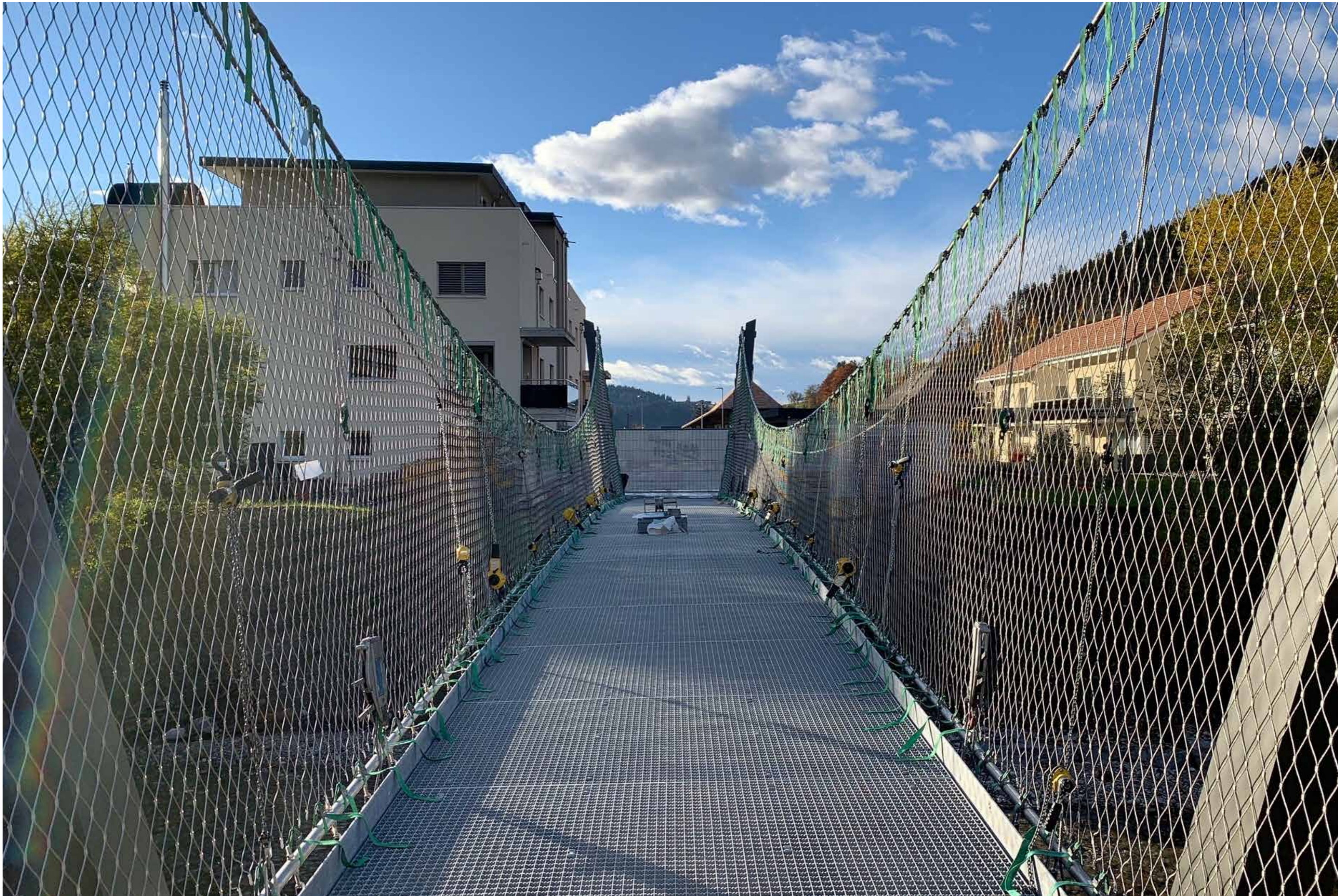


Situation





Himmelhausmattesteg



Himmelhausmattesteg



Himmelhausmattesteg



Himmelhausmattesteg



Himmelhausmattesteg



Himmelhausmattesteg



Himmelhausmattesteg