OITAF
Bozen/Bolzano
Congress 2017

Reversible Ropeways at its limits

Bissig Iwan

Reversible Ropeways at its limits

Illustrated by examples of:

Monte Bianco

Halong Bay

Eibsee-Zugspitze

75- / 80-ATW Monte-Bianco, Italy

Technical Data ancient Tramway

	1	2	3
Inlined length	1809	2441	270
Difference in height	801	1148	131
System	31	23	8
Capacity	300	220	200

Lower Station Pontal d‘Entrèves - 1.300 m

Intermediate Station Pavillon du Mont Fréty - 2.200 m

Upper Station Punta Helbronner - 3.500 m

Technical Data Skyway Monte Bianco

System	80-ATW and 75-ATW
New installation	2011 - 2015
Inclined length	4300 m (~ 1700 m and ~ 2600 m)
Diff. in elevation,	~ 2200 m (1300 m – 2200 m – 3500 m)
Transport Capacity	800 pphd and 600 pphd
Tower Height max.	110 m
Track rope	70 mm
Haul rope	42 / 32 mm
Drive power	650 kW and 600 kW

Masterpiece of a Ropeway

- Elevation
- Permafrost soil and other geological adverse conditions
- Stations: mainly made of Steel and Glas
  - Self-sustaining (energy)
  - photovoltaic- and heat pump heating system
- Regenerative Brake Energy recovery for main power grid
- Panorama-Cabin 360°
  - Rotating cabin
  - Floor- and wall heating
  - Sound system and Screens (Livecam at cabin)
  - Water transport: 3000 Liter for Upper Station

Special Features at Stations

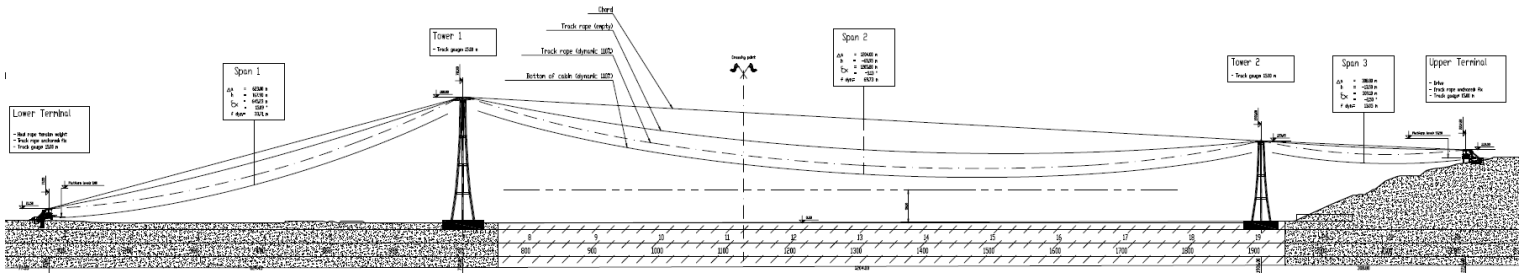
Special Features - Cabin

230-ATW Ha Long Bay, Vietnam

Main Technical data

System	230-ATW
Installation in	2015/2016
Inclined Length	2165 m
Vertical drop	88.5 m
Travel speed	7 / 10 m/s
Track Ropes	78 mm
Haul Rope	57 mm
Power	Nom.: 815 kW / Peak: 1900 kW

Longitudinal Profile



Project Schedule

First inquiry	11.08.2014
Contract signed	13.09.2014
Start Construction of Stations	Dec. 2014
Start Construction Towers	Jan. 2015
Start Rope Pulling	Feb 2016
Commissioning / Load Tests	May 2016
Acceptance Certificate	19.05.2016
First Run 230 Passangers World Record	31.05.2016
Public Opening	25.06.2016

Performances

- Engineering: ca. 11’000 h (internal Ressources)
- Installation: ca. 15’000 h (Supervision and Rope Pulling)
- Material: ca. 1’000’000 kg (1000 to)

Special Features - Cabin

- Cabin: Double-decker for 230 people
- L x W Length 11 m; Width 3.4 m
- Carriage 32-Rollers / ø375mm, no Track Rope Brakes

Special Features - Carrier

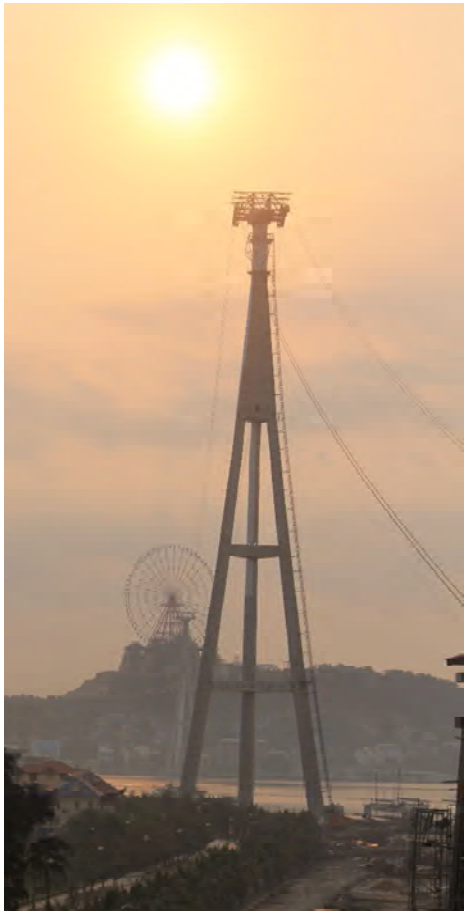
- 230-ATW Ha Long Bay

40 to corresponds with
500 Passengers

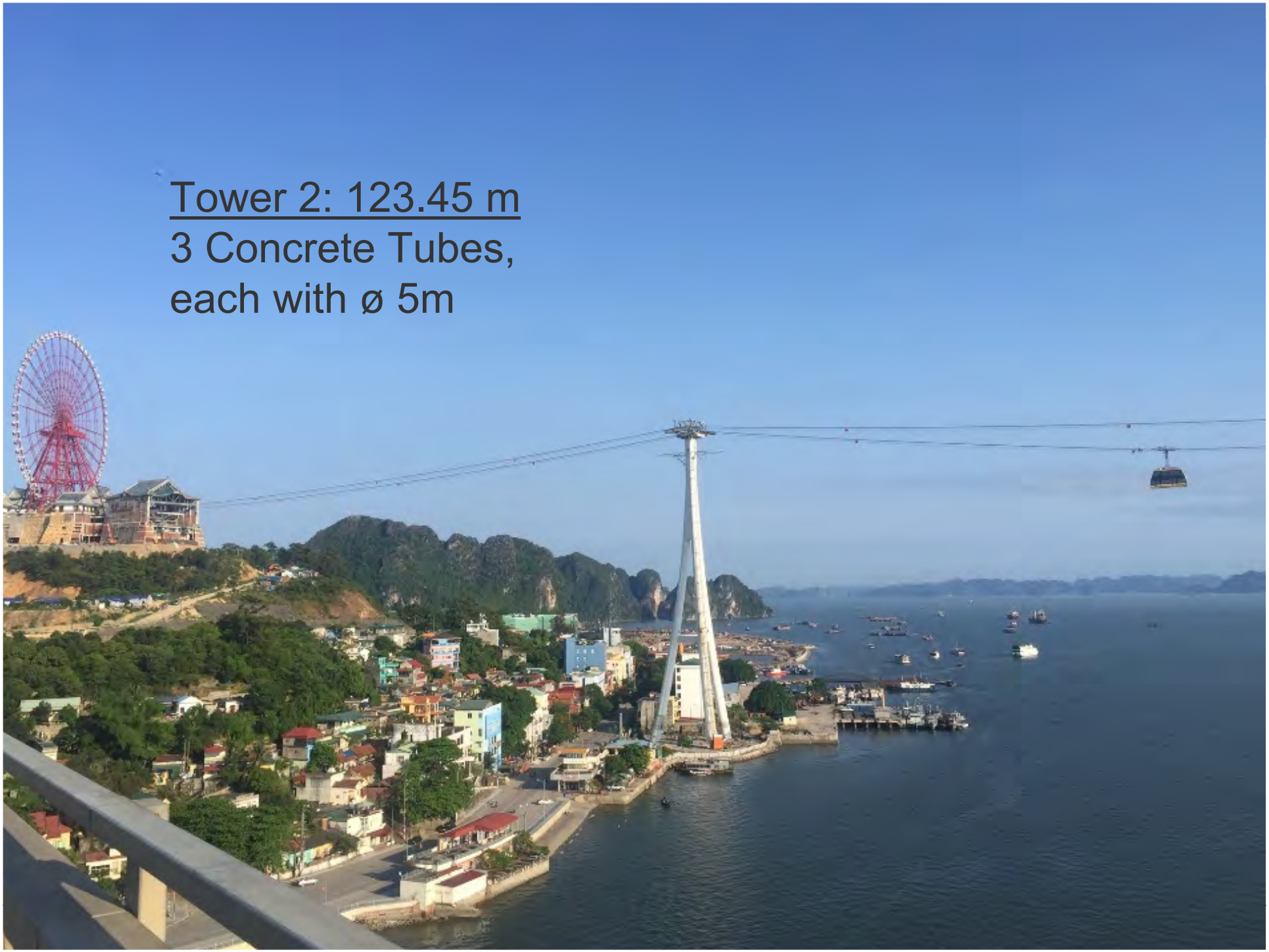
- 40to-ATW-MP Linth-Limmern

Special Features - Track

- World's Tallest Ropeway Tower (188.888 m)
- Tower is mainly made of concrete, only Tower Head is made of steel
- Concrete Construction: Special sliding formwork (Executing Firm: Gleitbau, Salzburg-Austria)



- 230-ATW Ha Long Bay


Tower 2: 123.45 m
3 Concrete Tubes,
each with ø 5m


Tower 1: 188.88 m !

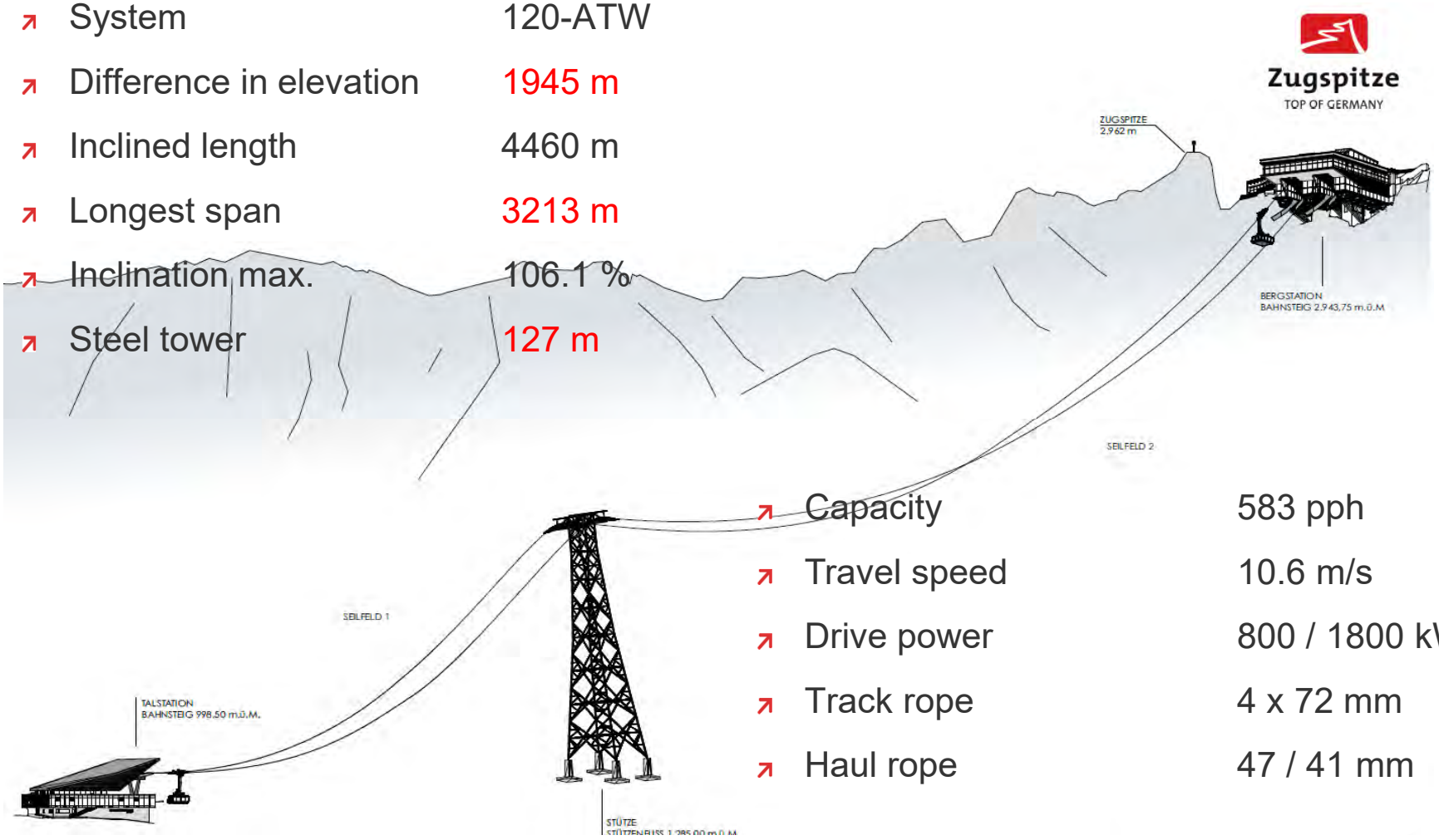
Special Features - Installation

- Rope Pulling: Continuous Shipping underneath Ropes required 60 to Holding Back / 65 to Pulling
- Linear Rope pulling Unit «up in the air» (Lack of space)
- Approx. 300 to Installation equipment
- Installation: no Helicopters were available

120-ATW Eibsee – Zugspitze, Germany

Technical Data

System	120-ATW
Difference in elevation	1945 m
Inclined length	4460 m
Longest span	3213 m
Inclination max.	106.1 %
Steel tower	127 m



Capacity	583 pph
Travel speed	10.6 m/s
Drive power	800 / 1800 kW
Track rope	4 x 72 mm
Haul rope	47 / 41 mm

Difference in Elevation: 13 m bis 1945 m

- 120-ATW Eibsee – Zugspitze

- 25-ATW Halidzor – Tatev

Longest rope span: 390 m bis 3213 m

- 75-ATW Scenic Skyway

- 120-ATW Eibsee – Zugspitze

Project Schedule

Phase 1 – 2016

- Bottom station
  - Civil work complet
  - Mechanical equipment
  - Drive
- Top station
  - Civil work for station-towers
  - Retraction structure
  - Mechanical equipment
- Line
  - Civil work for towers

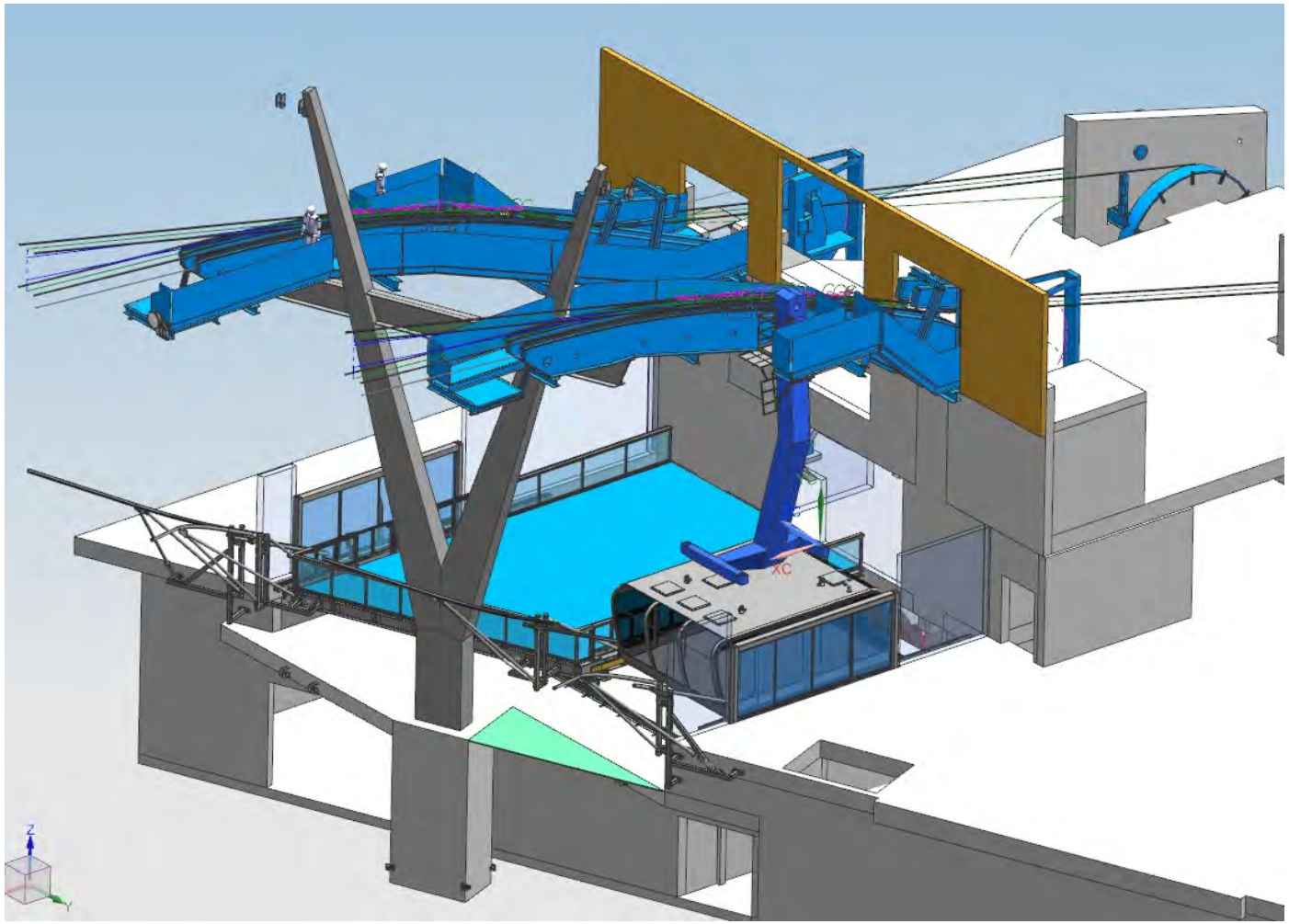
Phase 2 – 2017

- Bottom station
  - Interior finish station
  - Electrical equipment
- Top station
  - Civil work for platforms
  - Steel structure & facades
  - Interior finish
  - Mechanical equipment
- Line
  - Steel structure tower
  - Rope pulling

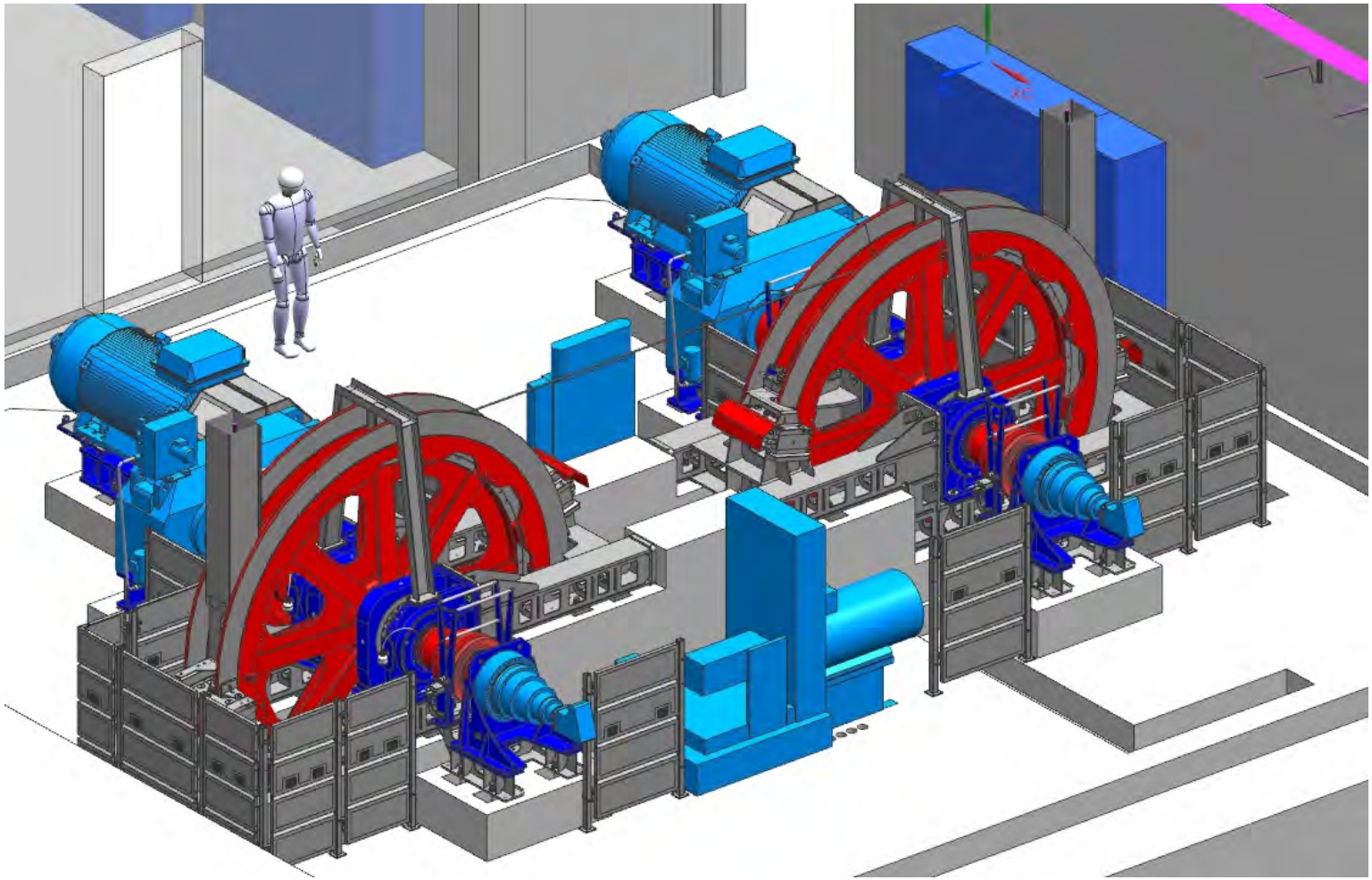
Opening **20.12.2017**

Bottom Station «Eibsee» / Final design

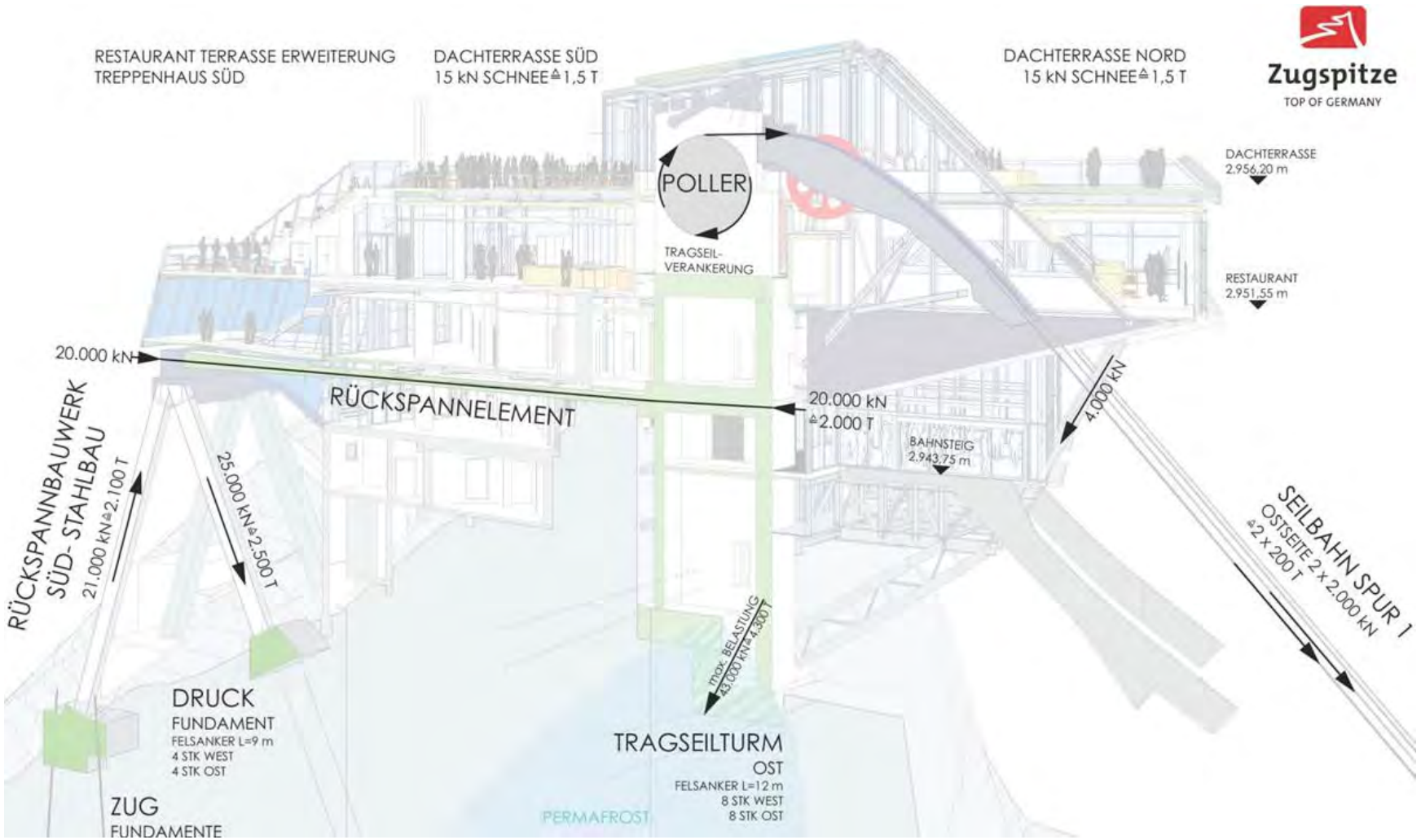
Bottom Station «Eibsee» / Station concept



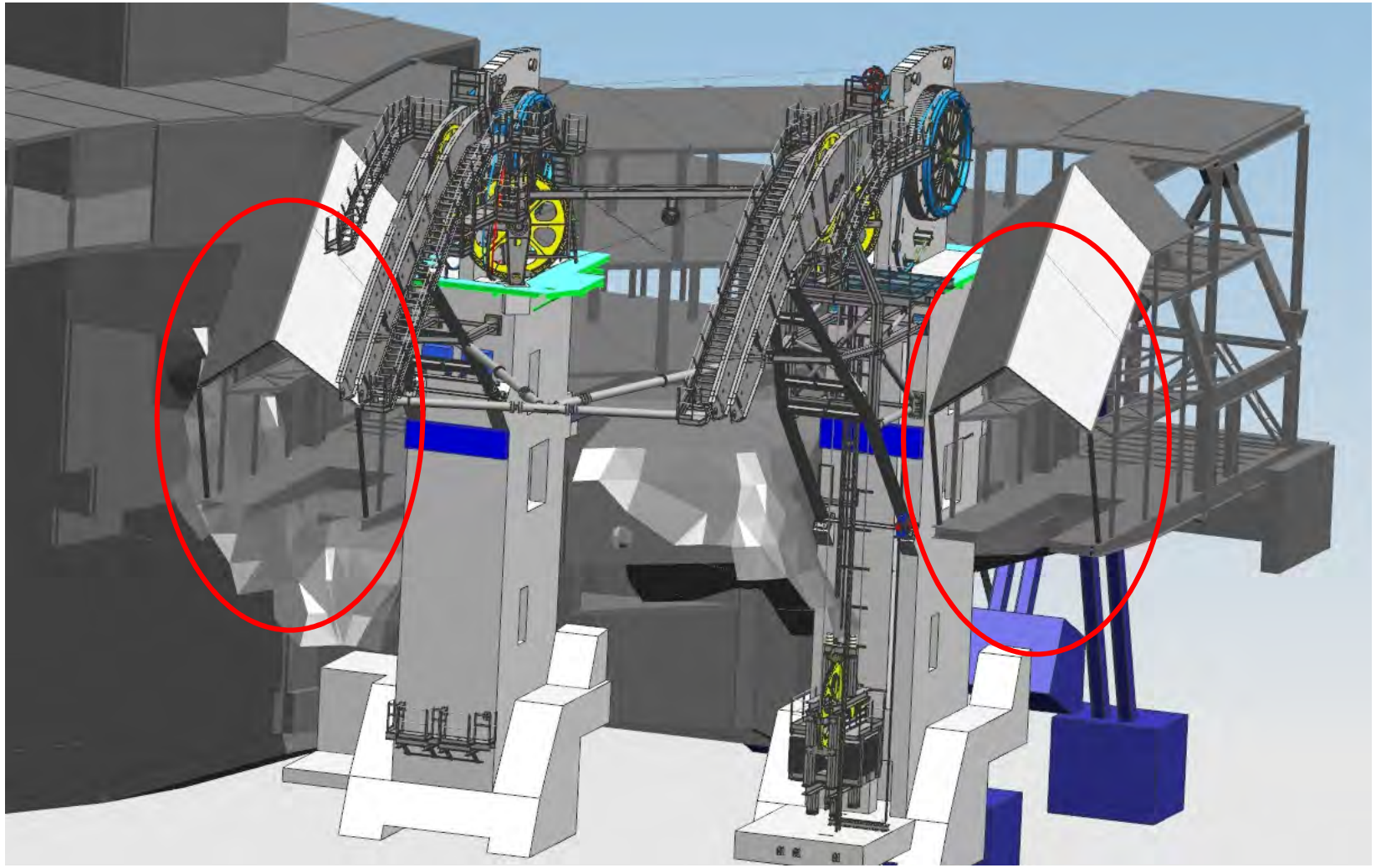
Bottom station «Eibsee» / Drive



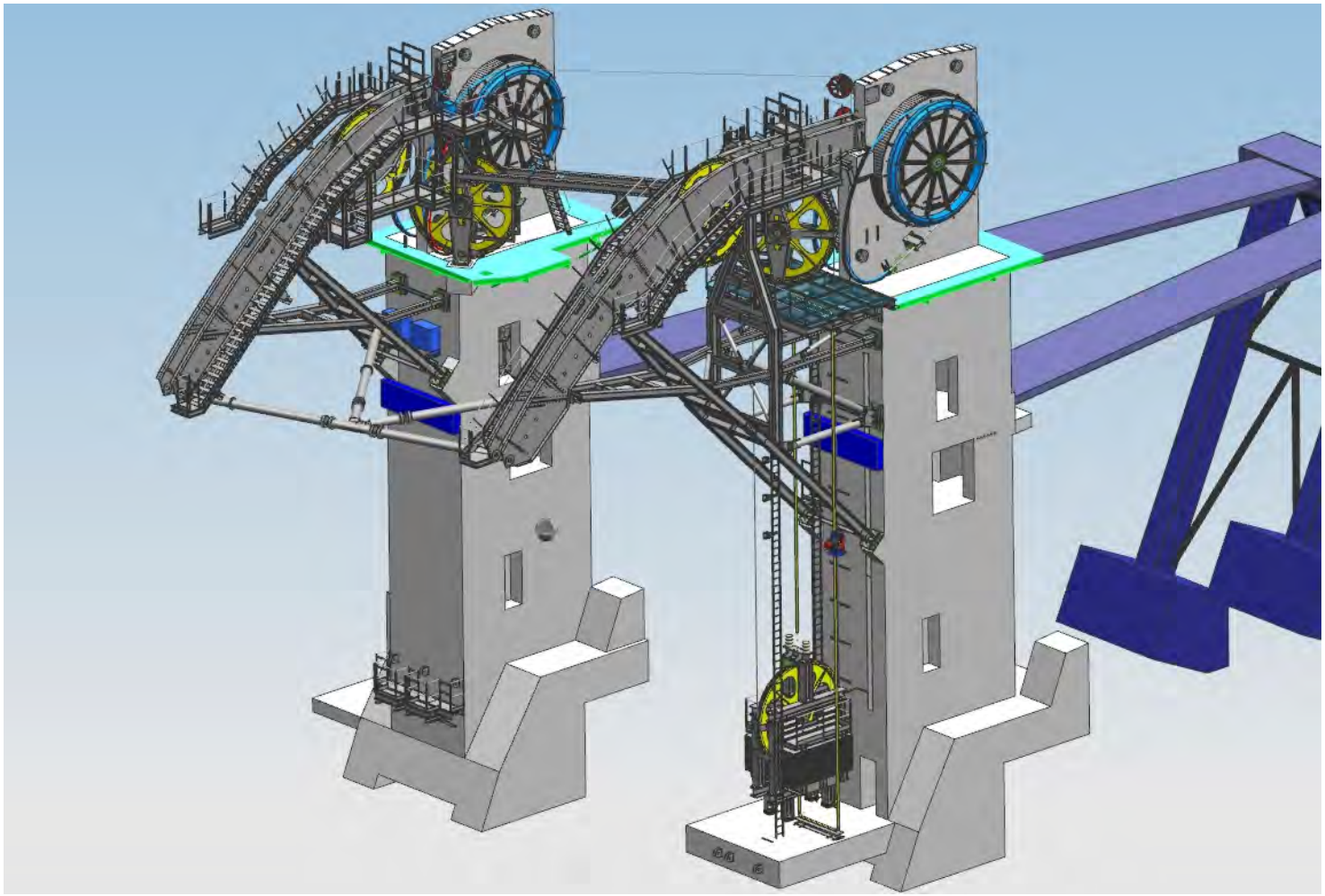
Top Station «Zugspitze» / Static concept



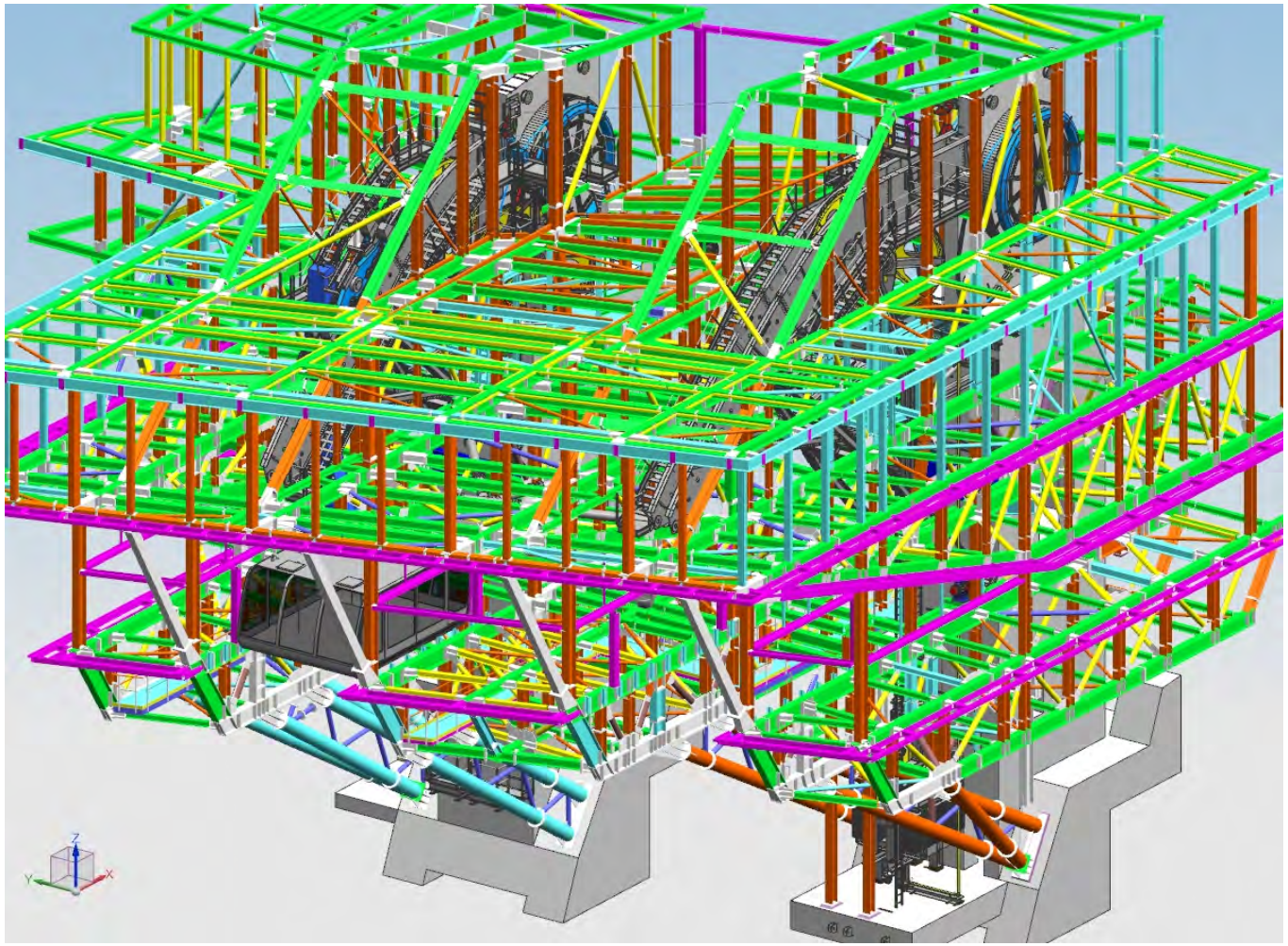
Top Station «Zugspitze» / Old installation still operating



Top Station «Zugspitze» / Mechanical equimpement



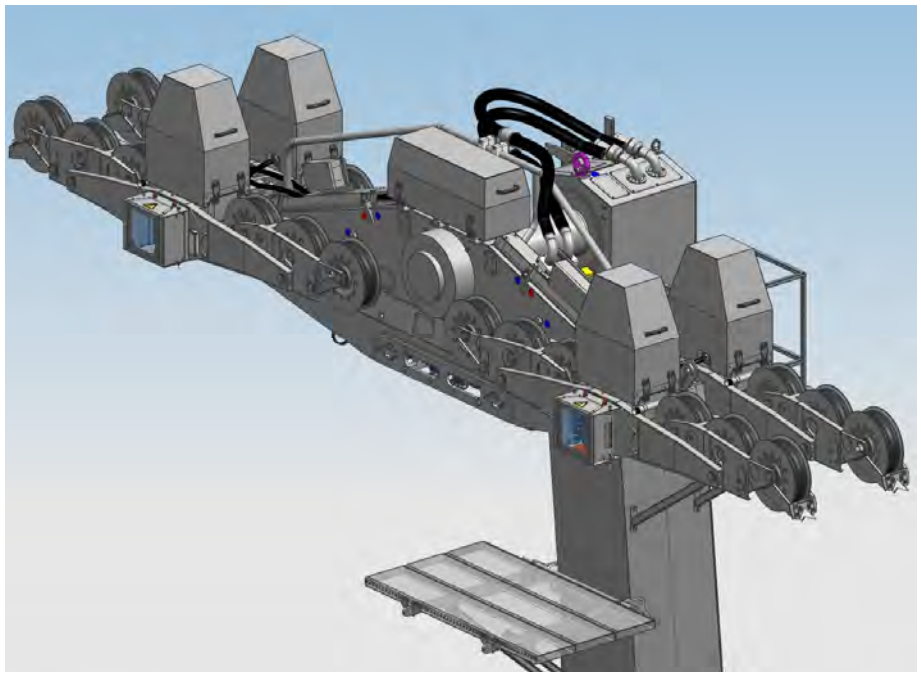
Top Station «Zugspitze» / Steel structure



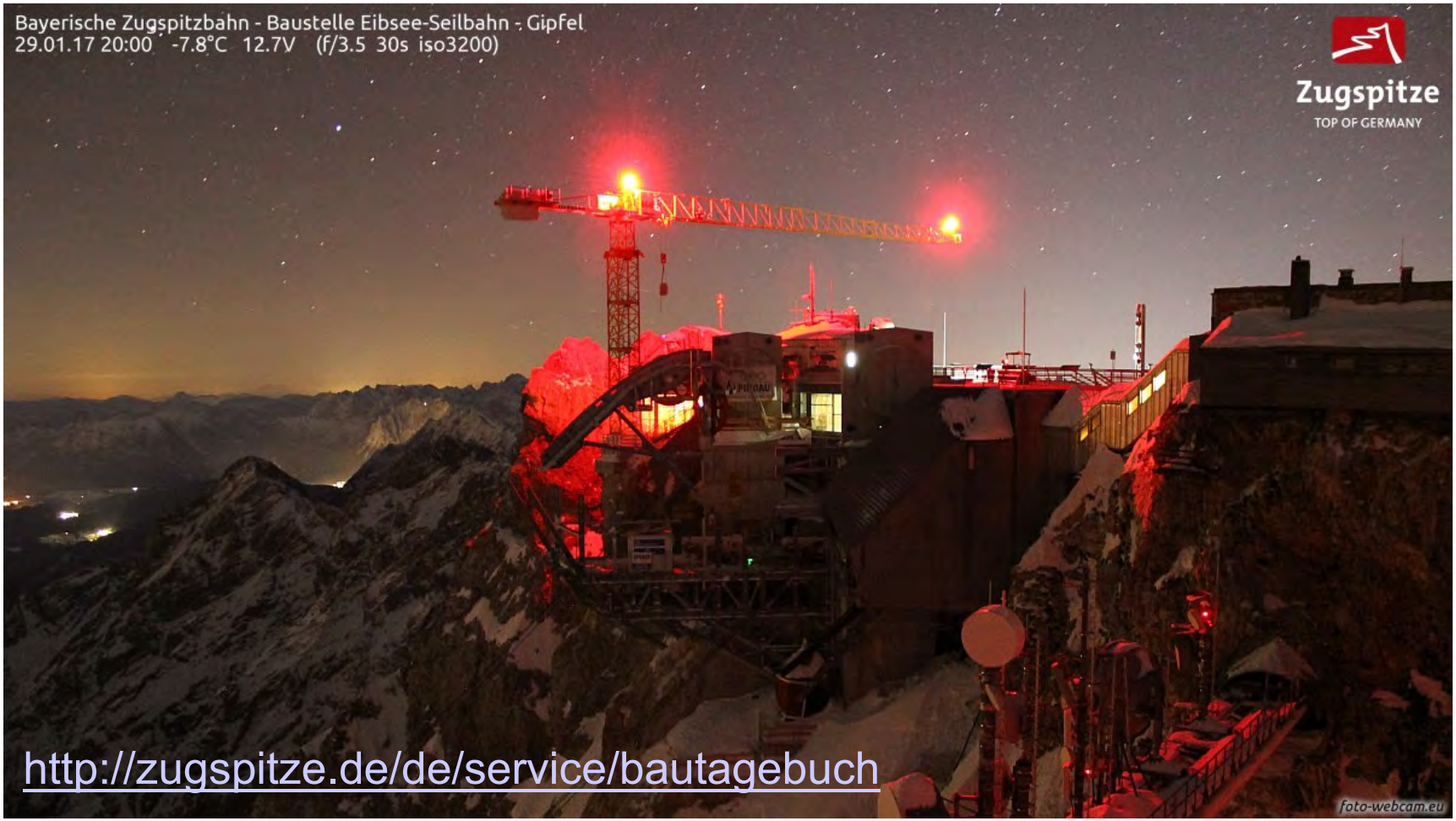
Top Station «Zugspitze» / Final design

Top Station «Zugspitze» / Impressions

Vehicle 120-ATW



Building the Top Station….



How about the future with Reversible Ropeways?

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By the way: Wetterhornaufzug, Grindelwald!

- Erected in 1908
- Manufacturer: Von Roll
- Maximum Slope approx. 60°
- Cabin with Top Deck