



URBAN ROPEWAYS

INTRODUCTION

Probably most inhabitants of a city have already ridden a ropeway, the last time possibly during a winter vacation. Ropeways however, have also many advantages in urban environments. For example, no bridges need to be constructed to cross a river, and no additional roads or tunnels need to be built to increase traffic capacity. Furthermore, the passenger has a comfortable riding experience and an unbeatable view during the journey. Urban ropeways also relieve traffic on the zero level accordingly.

Depending on the requirements, there are different ropeways which are used in urban areas. From the monocable detachable ropeway with high capacity for the continuous transport of passengers, to group ropeways for smaller transport capacities. Or aerial tramways with jig-back operation suitable for long rope spans as well as funiculars railways, with a fixed, steep track. All types of ropeways are united by the fact that they use their own exclusive track and operate in the most environmentally friendly way.

To further extend the advantages of monocable detachable ropeways, Bartholet has developed a new operating concept, the "Ropetaxi". Ropetaxi represents an innovation in terms of possible applications and potential traffic efficiencies. This new innovation makes driving on-demand possible with access to cabins at stand-still. This makes this means of transport one of the safest in urban environments. Furthermore, the use of Ropetaxi reduces the need for personnel, energy and maintenance costs.

This brochure shows a selection of references in urban environments from a transport point of view. An urban ropeway does not so much replace existing means of transport, but rather complements them. There is a large variety of possible applications. The more urban ropeways are realized, the higher the public acceptance for this innovative means of transport will be. The inhabitants of a city will appreciate the unique advantages of their ropeway.

CONTENT

ADVANTAGES OF URBAN ROPEWAYS	4
REFERENCES WORLDWIDE (SELECTION)	
MOSCOW	6
KISH	8
DRUSKININKAI	10
VĚTRUŠE	12
BREST	14
PUEBLA	16
NARVIK	18
ISTANBUL	20
DURANGO	22
ROPEWAYS AND THEIR FIELD OF APPLICATION	24
THE COMPANY BARTHOLET	26



ADVANTAGES OF URBAN ROPEWAYS

Conceptual Advantages

- › Exclusive lane, no traffic jam, no collision
- › Easy overcoming of topological obstacles such as a river or a hill
- › Proven technology, weather resistant
- › One of the safest means of transport

Advantages for Passengers

- › Steady operation, no timetable necessary, no "just missed it"
- › Barrier-free, high comfort, every passenger has a seat
- › Attractive driving experience
- › Predictable travel durations

Environmentally Friendly and Sustainable

- › Efficient e-mobility, one central drive for the entire system
- › Low emissions, quiet operation, long service life
- › Low environmental impact, reduction of the CO₂ footprint
- › Easy recycling of ropeway parts









Advantages for the City

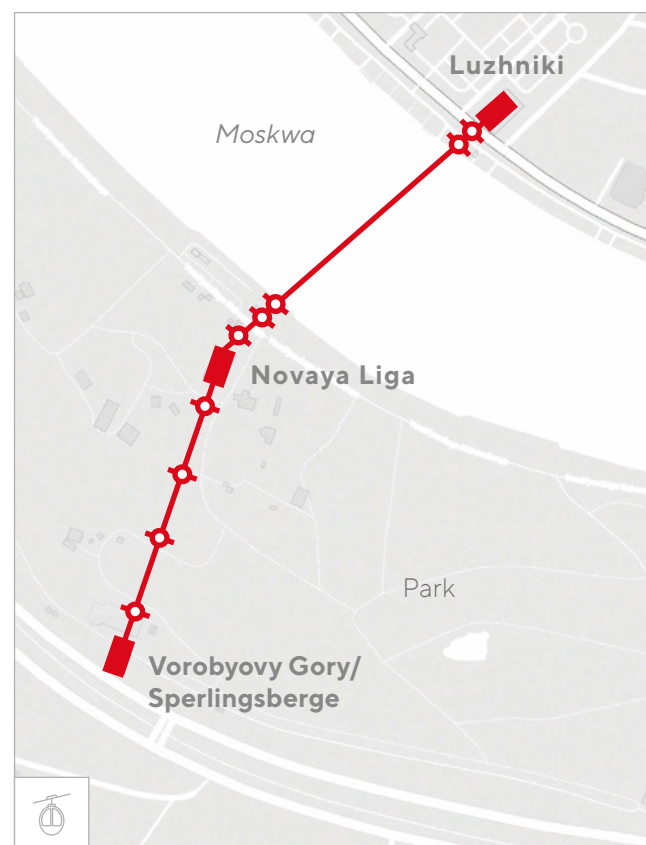
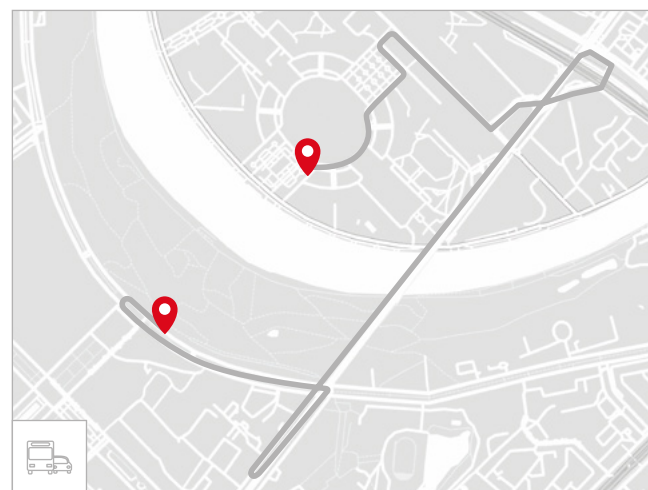
- › Contribution to a livable city, relief of traffic on ground level
- › Installation is minimally invasive, low floor space required, no additional roads, rails or tunnels necessary
- › Shorter construction times than any railbased system
- › Unique landmark of a city, positive effect on tourism



MOSCOW – RU – 2018

Monocable Detachable Gondola Ropeway with Middle Station
(2 Sections)

	up to 3 m/s		1,600 persons/h
	707 m		9 towers
	60 m		35 cabins
	121 kW		10 seats



Situation

Moscow is the cosmopolitan capital of Russia [approx. 12.6 million inhabitants (2021)] and has a densely developed metro network (236 stations). Since 1953 a Russian ski school operated a ropeway and a ski jump directly in Moscow at the Sparrow Hills. These facilities had to be modernized. At the same time in the Ramenki district in the southwest of the city, along the Moskwa river, a national park was built and the sports area around the Luzhniki Stadium had to be integrated.

A private operating company — the LLC Moscow Ropeways — developed and financed this project. The three stations are functionally integrated into the city and linked to the public transport service on the river Moskwa.

Transportation Task

With the Luzhniki ropeway and a new traffic masterplan, several tasks were solved. The two parts of the city were directly connected via the Moskwa River and a sports area around the Luzhniki Stadium was embedded in a year-round recreational area. Furthermore, the expanded ski and tourism area near the state Lomonosov University was linked. These areas are now accessible via the "red" line 1 of the metro directly to the "Red Square" and thus a quality intermodal transport is possible.

Operation









The ropeway is not yet part of the overall public transport system. The operating hours are up to 13 hours a day and since its opening, up to 3.5 million passengers have been transported. In winter, the section on the Sparrow Hills is operated as a combined lift. The infrastructure of the station buildings is family friendly (restaurants, cafes and playgrounds etc.).

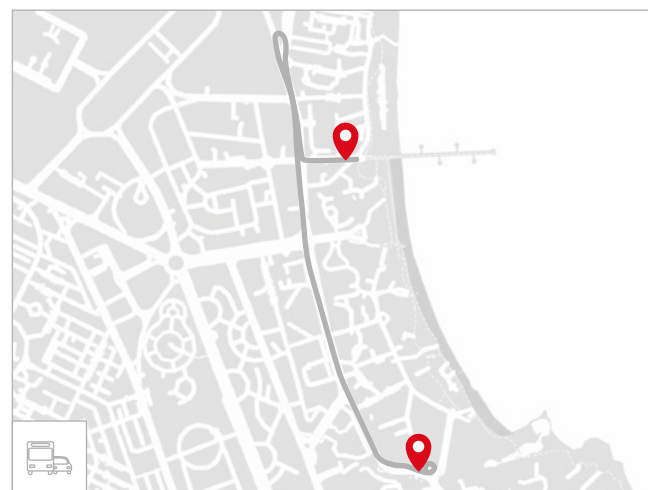




KISH – IR – 2021

Monocable Detachable Gondola Ropeway with Middle Station
(Corner Station)

	up to 3 m/s		650 persons/h
	650 m		9 towers
	1,143 m		22 cabins
	121 kW		8 seats



Situation

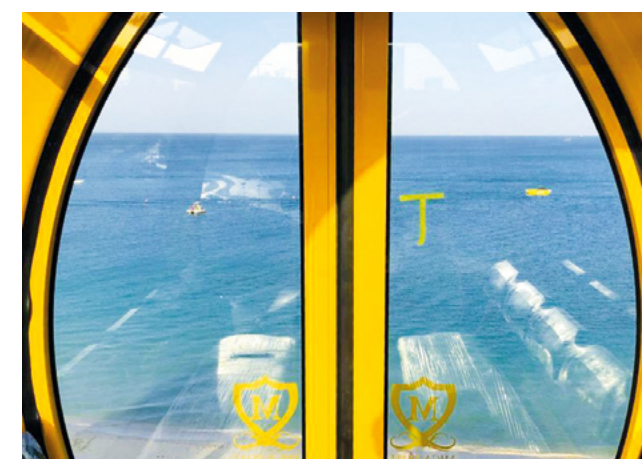
Kish is an Iranian island in the hormozgan province bordering the Persian Gulf. It has an area of approximately 90 km² and is located about 20 km from the mainland. The island [approx. 40,000 inhabitants (2016)] became known as the vacation island of "Reza Shah Pahlavi." Today the island is mainly a free trade zone and a vacation area with many hotels and shopping facilities. It is one of the luxury retreats and vacation destinations of the Iranians. The ropeway is an attraction of a shopping mall (Mica Mall) and transports passengers from the port (Grand Pier), which is connected by a bus station, directly to the shopping center.

Transportation Task

The end station is located directly at the beach. From there the ropeway runs along the beach promenade of the island and reaches via a middle station with a 90° degree turn to the top floor of the mall. Directly next to it is a panoramic bar, an ice-skating rink and a movie theater. The ropeway is used, on the one hand, for sightseeing and to entertain visitors of the mall and to take them to and back from the beach, but it also provides a direct connection to the harbor, as an "extension" of the bus line.

Operation

The ropeway runs during opening hours of the shopping mall and is operated by a trained team. Due to the specially configured cabins equipped with radio system, air conditioning as well as interior and exterior lighting, the ropeway system is ideally suited for permanent operation under difficult climatic conditions.





Situation

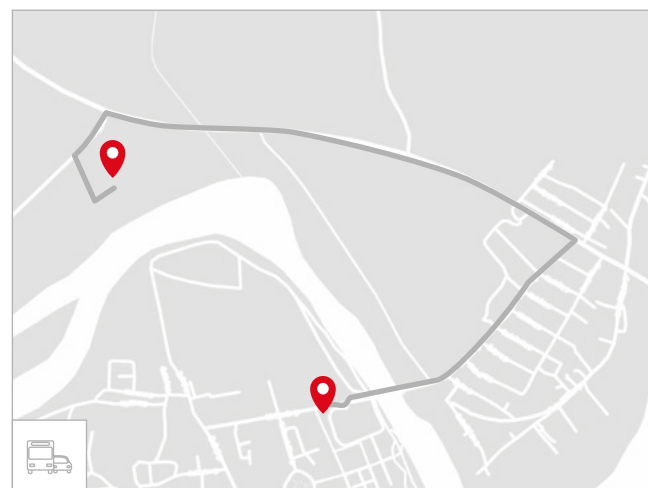
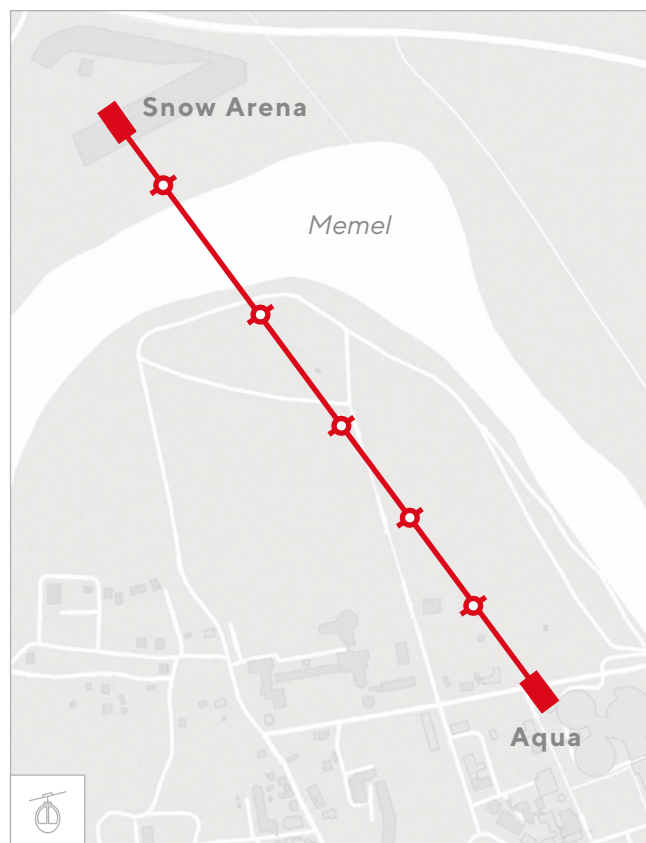
Druskininkai [approx. 15,000 inhabitants (2020)] is the largest spa town in Lithuania, famous for its unique spring water and deposits of bog mud. The name of the town comes from the word "druska" — which means "Salt". The town is surrounded by a pine forest and there is a special climate for recreation. The cable car is intended as a direct link for the Snow Arena. The client for this project was the town council, which came up with the basic idea and also provided the financing. The project was partly financed from EU funds (climate goal: reduction of CO₂ footprint).



DRUSKININKAI – LT – 2015

Monocable Group Gondola

	up to 5 m/s		220 persons/h
	1,180 m		5 towers
	24 m		2 x 2 cabins
	104 kW		10 seats



Transportation Task

To avoid the increase in the use of private vehicles, a group gondola ropeway was chosen to connect the two districts. Both stations have large parking lots. Snow sports enthusiasts, pedestrians and tourists, as well as wheelchair users are able to be transported. The group gondola ropeway is considered a tourist attraction because the landscapes and the city itself can be experienced from a bird's eye view.



Operation








The group gondola ropeway is operated by the same company that organizes public transport in and around the city. It is part of the overall public transport system and the bus stops are located right next to the station area. The operating hours of the cable car are adapted to the demand of tourism, it currently runs up to 12 hours a day. Since its opening in 2015, up to 780,000 passengers have been transported. The ticket is valid all day and is integrated into the local transport system.

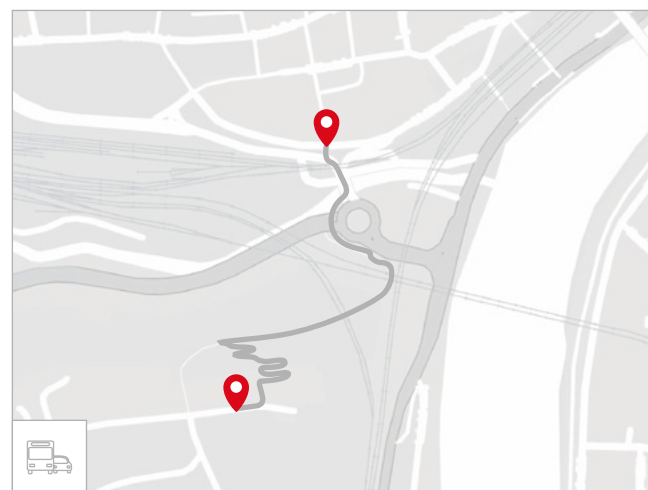
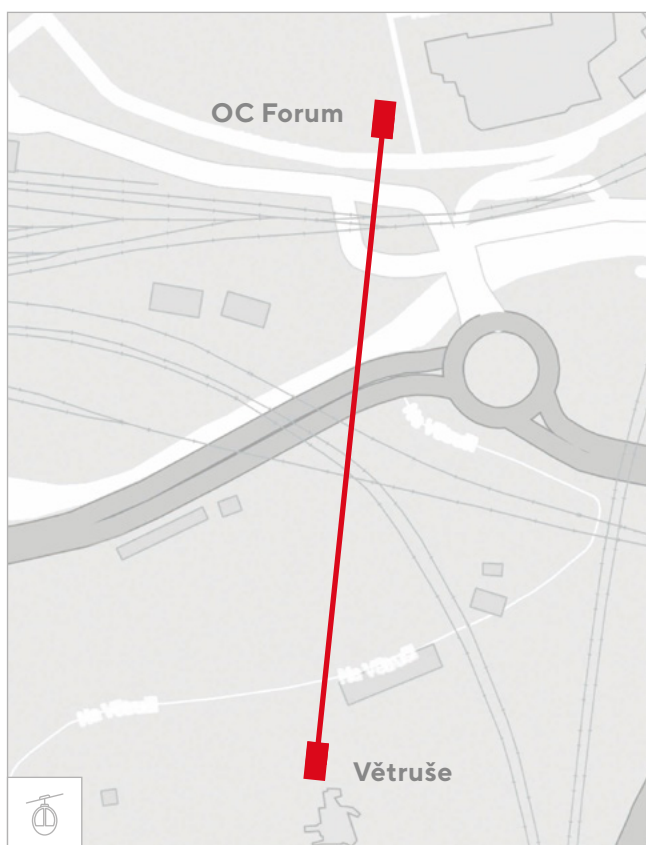




VĚTRUŠE – CZE – 2010

2S Jig-Back Aerial Tramway

	up to 6 m/s		390 persons/h
	325 m		no towers
	50 m		2 cabins
	30 kW		15 seats



Situation

Usti nad Labem [approx. 92,000 inhabitants (2021)], is situated between the Ore Mountains and the Bohemian low mountain range and is located southeast of Chemnitz. The Větruše (Ferdinand's Heights) chateau, reconstructed by the city in 2001, has hosted several exhibitions by Chemnitz artists. Since 2010, it is possible to get from the Forum shopping center to the Větruše Castle by cable car, where there is a hotel business. The Forum has a station with a 30 m high tower. From there, there is a great view of the Elbe valley and the city. It is the only ropeway in Bohemia and was built with a grant from the European Union and is unique in its kind.

Transportation Task

The castle in Větruše is easily accessible by car, on foot or by bike. The aerial tramway should reduce traffic and provide added value to the shopping center and the hotel. The shopping center is also publicly accessible on foot via the train station. The plans for the transformation of the entire planning area also presupposed a direct connection of the Větruše settlement with the city center.

Operation









The aerial tramway is maintained by the city's own transport companies. It takes two minutes for the aerial tramway to cover the 330 meters. The opening hours of the ropeway are from 8 a.m. to 10 p.m. in summer and from 9 a.m. to 8 p.m. in winter. The aerial tramway does not operate on Mondays (day off). The city of Usti nad Labem supports the aerial tramway operation every year with subsidies. In the year of opening in 2010, up to 300,000 passengers were transported. In total, over 2 million passengers have been safely transported to and from the Větruše Castle since its opening until today.

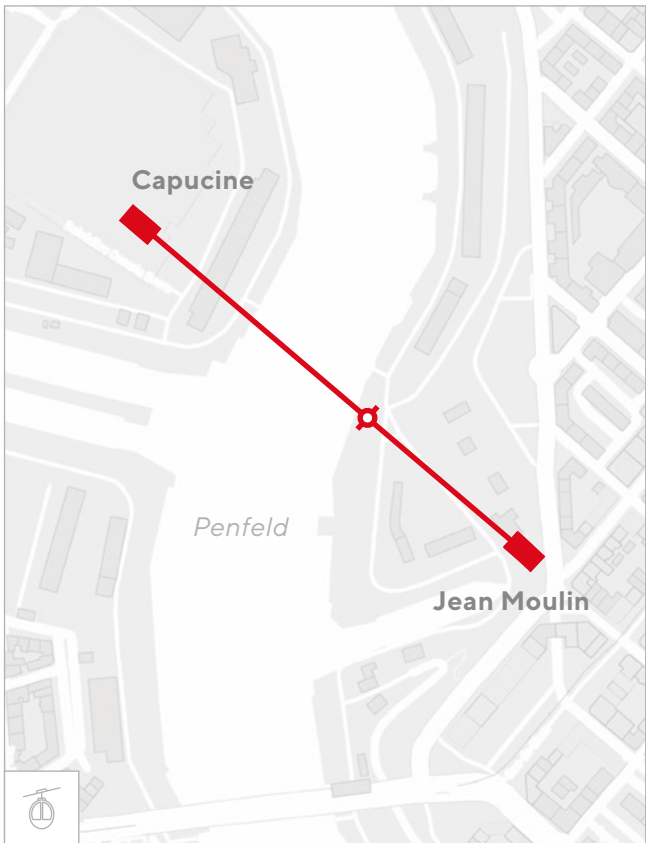
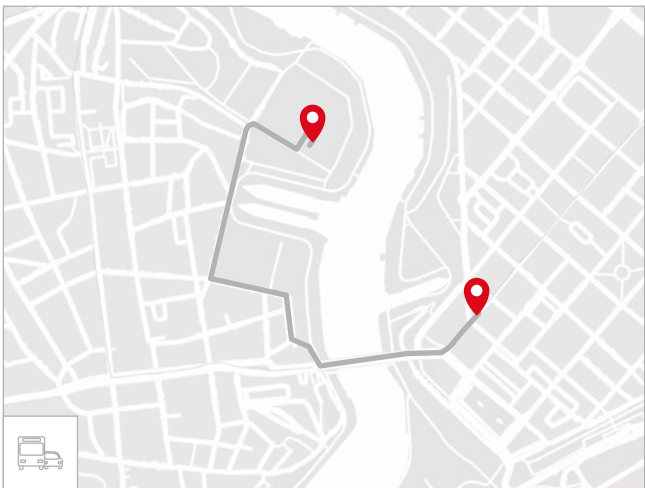




BREST – FR – 2016

Multicable Aerial Tramway

-  up to 5 m/s
-  1,220 persons/h
-  419 m
-  1 tower (80 m)
-  7 m
-  2 cabins
-  2 × 293 kW
-  60 seats



Situation

Brest is a port city of Brittany, France [population approx. 140,000 (2021)] and has an important naval port (Atlantic Fleet base). The aerial tramway connects two parts of the city and was the first urban ropeway in France to be put out to public tender. The aerial tramway was chosen in preference to a floating bridge and represents an innovation in ropeway technology because the cabins cross one another along the route and not side by side as is usually the case. This meant that only a single entry bay was required per station (cost saving). Each cabin is pulled by two haul ropes and supported by two support ropes. Crossing the tower offers an attractive bird's-eye view.



Transportation Task

Former historic French Navy factory buildings were to be used as a new neighborhood. The connection of the new quarter with the Capucines station was mandatory. The Jean Moulin station is located at the downtown side and is connected to public transport (bus and streetcar). Other public transport has been relieved significantly since the beginning of operations.



Operation

The private operating company — Keolis — has operated the aerial tramway until 2019. Currently, RATP-Dev is engaged as the state operator. One station has been integrated into the existing Marine Hall.









The cable car runs every 5 minutes, the travel time is 1.5 minutes. Operating hours are up to 17 hours on weekdays and up to 23 hours on weekends. Fares are integrated into the existing fare system.

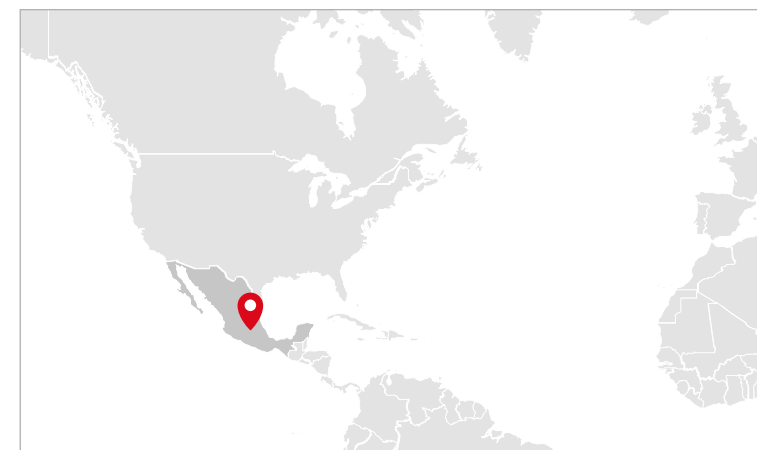
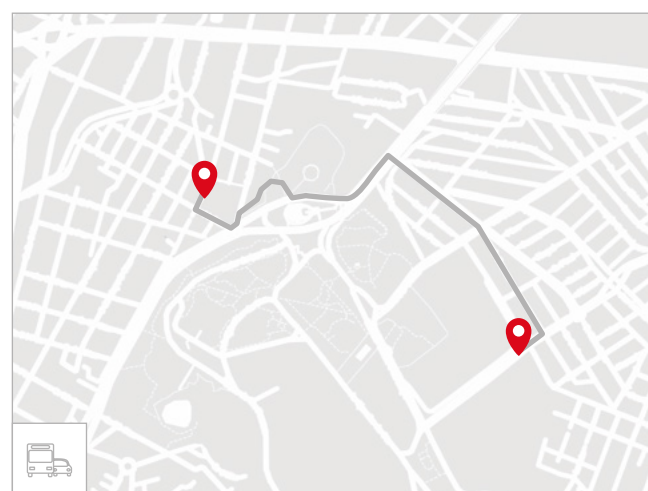




PUEBLA – MEX – 2015

Aerial Tramway
(2 Carrying Ropes)

 up to 7 m/s	 690 persons/h
 660 m	 towers not allowed
 37 m	 2 cabins
 65 kW	 35 seats



Situation

Puebla, population 3.3 million (2021), the fourth largest city in Mexico, is located at 2,140 m above sea level and is the largest city in the state of Puebla. The planned city from the colonial era is located in southern Central Mexico between the Atlantic port of Veracruz and 100 km southeast of Mexico City. Because of its history and architectural styles, the city was designated a World Heritage Site in 1987. Most of the city's economy is based on industry. There are some of the largest assembly plants for cars located within the city. Many students come from all over the country to study at the numerous prestigious and respected universities such as Instituto Tecnológico de Puebla.

Transportation Task

The convention center, with museums and exhibition halls, is located in the recreation zone, an elevated historic district called Fuertes. In order to reduce the volume of traffic, the station was placed on a connecting axis with various bus stops. At the same time, the facility serves as a tourist attraction from which a spectacular view over the city can be experienced. One of the largest volcanoes in the world, Popocatepetl, with a height of 5,286 m above sea level, also becomes impressively visible.

Operation









The cable car system is maintained and operated by city-owned transportation companies. It is part of a transport network and carries an average of 1.2 million congress visitors and tourists annually. The operating hours are adapted to the public transport system, up to 14 hours per day.

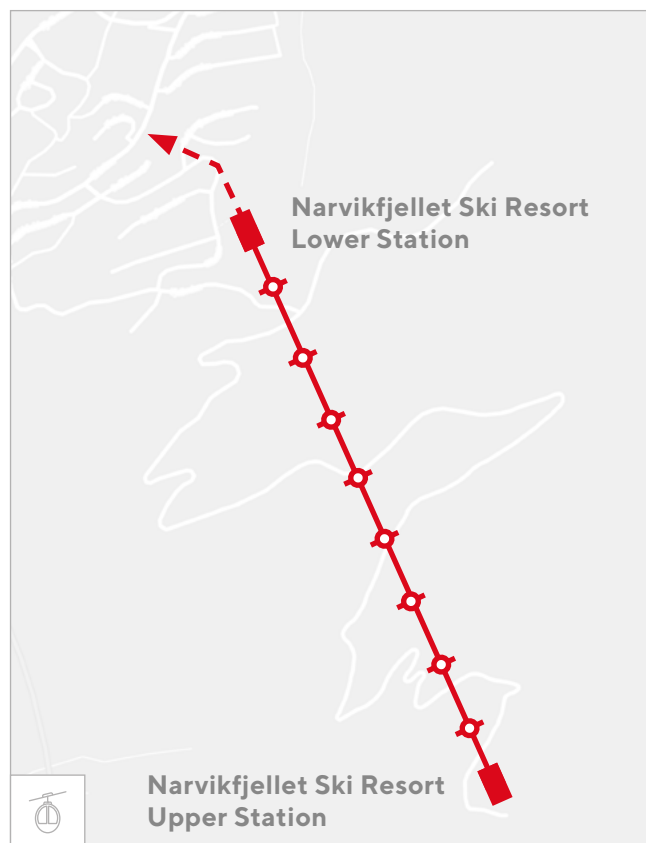




NARVIK – NOR – 2018

Monocable Detachable Gondola Ropeway

	up to 5 m/s		2,400 persons/h
	439 m		8 towers
	1,171 m		38 cabins
	653 kW		10 seats



Situation

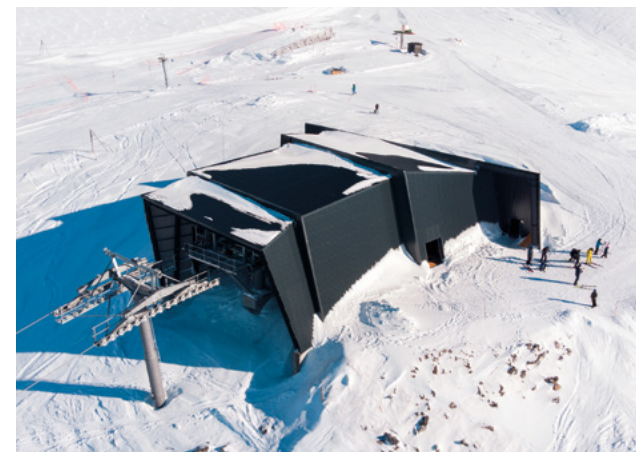
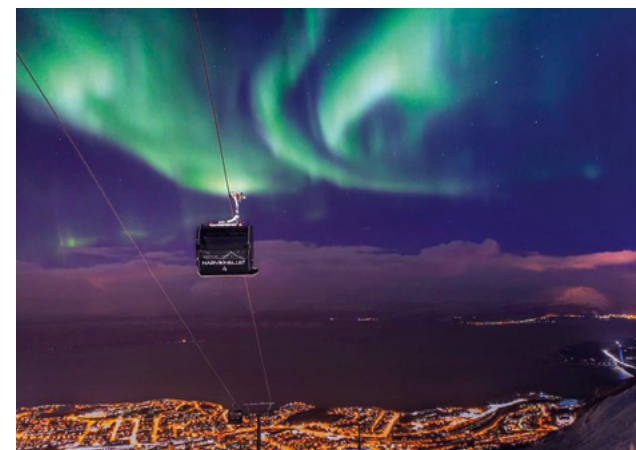
The city of Narvik is located north of the Arctic Circle, [population approx. 22,000 (2021)] on the Ofotfjord and is an important port for shipping iron ore from the Kiruna area, Sweden. Trains loaded with up to 8,500 tons of iron ore have been running to Narvik since 1903. Thanks to the Gulf Stream, the climate is relatively mild and therefore the port is ice-free all year round. Despite the northern location, it gets only -4.5°C in January, the coldest month; the average annual temperature is 3.7°C . The town was established after the construction of the Ofot railroads, which enabled greater access to Kiruna's ore deposits.

Transportation Task

The entire ropeway is intended to improve the accessibility of major destinations in the city of Narvik. In terms of traffic, one section is to be regarded as an urban transport system and will be linked to the public transport network. Another section will provide efficient access to the existing Narvikfjellet ski resort from the city.

Operation

For guests from the city and from the harbor area, the entire ropeway provides a direct connection to public buildings and to the top station with a unique panoramic view. The ski area is in operation in winter from 1 to 8 p.m. each day and leads to an altitude of 1,000 meters. This altitude has a special significance for the commuter belt area. The city is a shareholder in the operating company.





Situation

The city of Istanbul is located on the continental border between Europe and Asia and is the most populous city in Turkey [15.5 million inhabitants (2020)]. Every year, several million tourists visit the city to see its countless sights and cultural assets. A private investor group has dedicated and implemented a complex of shopping mall, health center, hotel, offices and a new soccer stadium (Galatasaray) in the newly built district of "Vadistanbul".



Transportation Task

The new district was disconnected from the public transportation network. In order to provide a direct connection to the existing public metro network, a funicular railway with a spacious bridge construction was realized on the traffic level +1. Passengers can reach the new complex in just a few minutes from the metro station, and the funicular has become Vadistanbul's main landmark as another attraction.









Operation

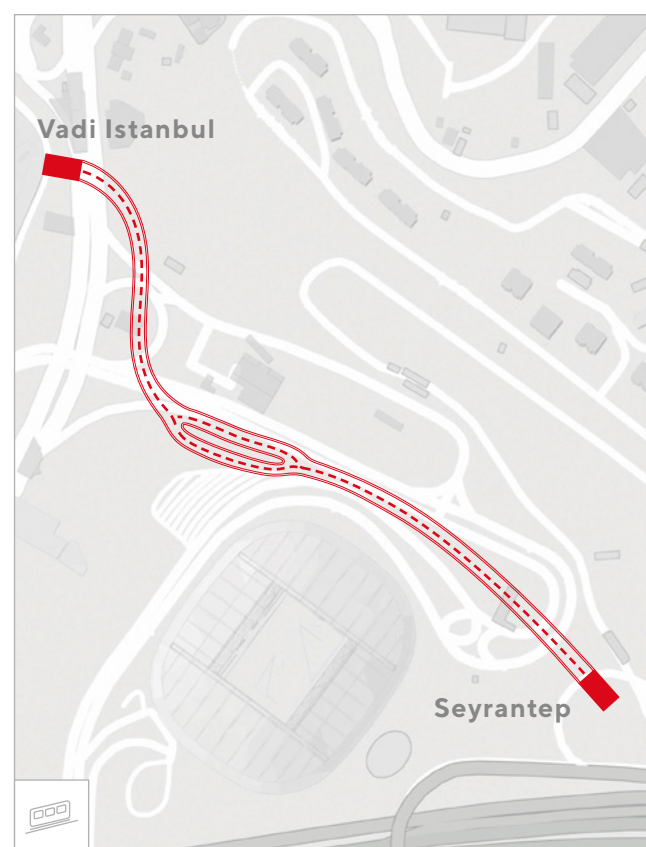
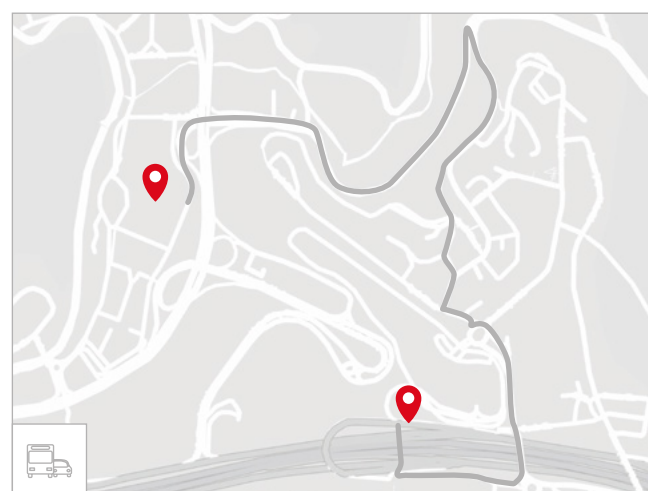
The funicular railway is currently operated by the developer itself. In the long term, it is intended that a company close to the city, IBB (Istanbul Buyukşehir Belediyesi), will take over and operate the funicular railway. The line is already integrated into IBB's public transport network and is included in all timetables. The system operates 365 days a year, from 7 a.m. to 11 p.m. each day. On regular days, an average of 8,000 people are transported; when a soccer match takes place, the utilization triples.



ISTANBUL – TUR – 2017

Funicular Railway



 up to 5 m/s	 3,500 persons/h
 750 m	 no towers
 40 m	 2 cabin trains
 381 kW	 250 seats

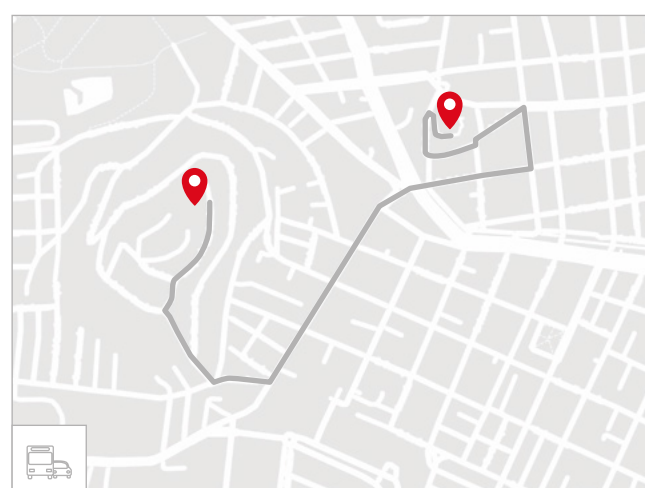
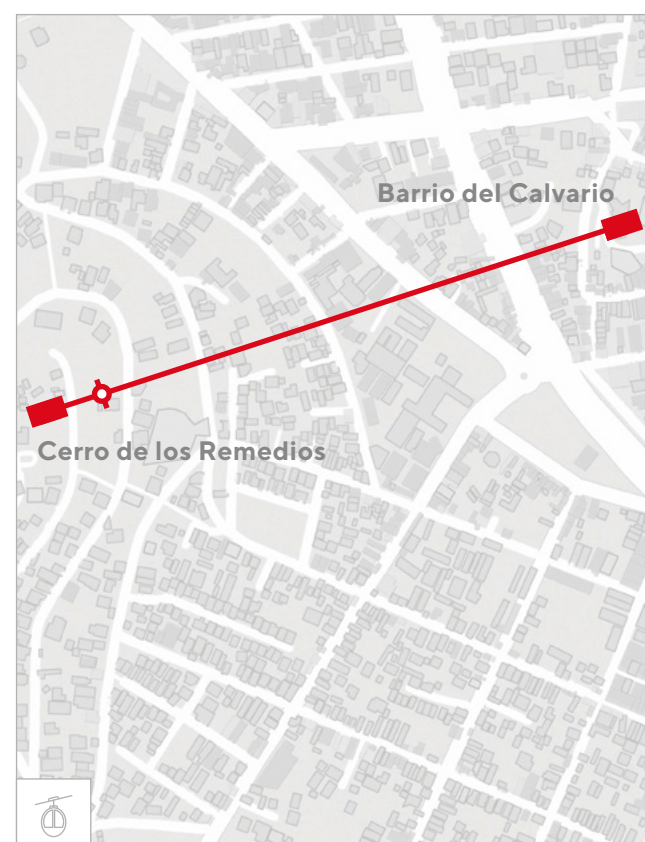




DURANGO – MEX – 2010

Aerial Tramway
(Two Carrying Ropes per Direction of Transport)

 up to 7 m/s	 336 persons/h
 663 m	 1 tower
 72 m	 2 cabins
 60 kW	 25 seats



Situation

Victoria de Durango [population approx. 690,000 (2020)] was founded in 1563 and is the capital of the Mexican state of the same name. It is located at an altitude of 1,880 m above sea level. The historic center with baroque architecture and one of the most beautiful cathedrals in Mexico was classified as a World Heritage Site by UNESCO in 2010. The popular Teleferico urban ropeway serves as a convenient connection between the Barrio del Calvario station in the city center and the Cerro de los Remedios station. The latter serves as a lookout point with breathtaking views and is used to hold cultural events (with outdoor cinema).

Transport Task

The Teleferico is a popular tourist attraction and allows visitors to Durango to easily reach the Mirador de los Remedios viewpoint and historic church located in the city. The 82-meter ride also offers spectacular views of Durango's historic center. The Barrio del Calvario station, located in the city center, is close to the Central Library and is well connected with a bus stop. Thanks to this connection, traffic to the Mirador viewpoint by bus and cab has been significantly reduced.

Operation

The city cable car is operated by Ciudad de Durango, the local government. It serves mainly as a tourist ropeway with public transport use. On nice days, it carries up to 4,000 passengers. Operating hours are Tuesday through Sunday 10 a.m. to 9:30 p.m., closed Monday.



ROPEWAYS AND THEIR FIELD OF APPLICATION

Ropeways can be used for many transport tasks. Different ropeway systems can also perform their tasks in urban areas. Urban ropeways that are used for public transport, have long operating times and high availability for passengers. They can help improve traffic efficiency in several sections one after the other and in network operation (Ropetaxi), thus enabling inter- and multi-modal traffic.

The ecological footprint of the overall system under consideration can be improved by shifting traffic to the +1-level. With a ropeway existing networks can be easily expanded. The indicated guideline values for the performance capacities are defined with passengers per hour per direction of transport.

Monocable Detachable Ropeway

In the case of monocable detachable ropeways, cabins run continuously in a circulating mode. The cabins move in a haul rope loop (endless loop), which takes over the carrying and hauling function for the cabins – at a uniform speed. For trouble-free boarding and alighting at the stations, the cabins are decoupled from the rope and the speed in the station area is reduced appropriately.

- › Cabin size: 8 and 10 persons
- › Driving speed up to 6 m/s (21 km/h)
- › Wind resistance up to 70 km/h
- › Can be installed as a ropeway network over an entire city
- › Can overcome topographically challenging terrain
- › Continuous passenger transport
- › Adaptable to the capacity demanded and therefore very efficient to operate (up to 3,600 passengers per hour per direction of transport)
- › Can be optionally equipped with transport vehicles, thus wide application (transport of material goods)
- › Can optionally be operated with a gearless direct drive, for best cost-benefit ratio

Ropetaxi

The Ropetaxi is an operating concept specially designed for monocable detachable ropeways. Whereas cabins in stations are normally driven and decelerated exclusively by tire conveyors, in the Ropetaxi the cabins have their own electric drive at the clamp, which they can use in the station area.

- › Demand-driven operation
- › Station selection within a network, no changing within stations
- › Formation of diversions and intersections
- › Secure access to standing cars, monitored security doors
- › Stations are used as garages outside of operating hours, no longer garaging in and out time required
- › Reduced manpower requirements
- › Reduced energy demand
- › Less maintenance

Aerial Tramway

In reversible aerial tramways, there is usually one cabin per direction on one or two track ropes. The cabins are moved by means of haul ropes in jig-back operation; boarding and alighting takes place with the cabin's stationary. The advantage of the aerial tramway is that very little space is required at the stations.

- › Cabin size up to approx. 200 persons
- › Driving speed up to 12 m/s (42 km/h)
- › Wind resistance up to 100 km/h
- › Overcoming of topographically demanding terrain
- › Transport capacity up to 2,000 passengers per hour per direction of transport
- › Large spans possible
- › Fixed departure times can be planned (integration into streetcar or bus network)
- › Very versatile due to large cabin (large and heavy material transport)

Funicular Railway

Funicular railways have a fixed track, are rail-bound means of transport and are moved by one or more ropes. The track can be at ground level, elevated or underground.

- › Cabin size up to 250 persons
- › Driving speed up to 12 m/s (42 km/h)
- › Independent of wind
- › Very high transport capacity of up to 4,000 passengers per hour per direction of transport
- › Fixed departure times can be planned
- › Transport connection to streetcar or bus or subway network
- › Connection of agglomerations (centers)



 Zurich Airport ↔ Flums
Duration: 1 h 45 min / every 60 min

About Bartholet

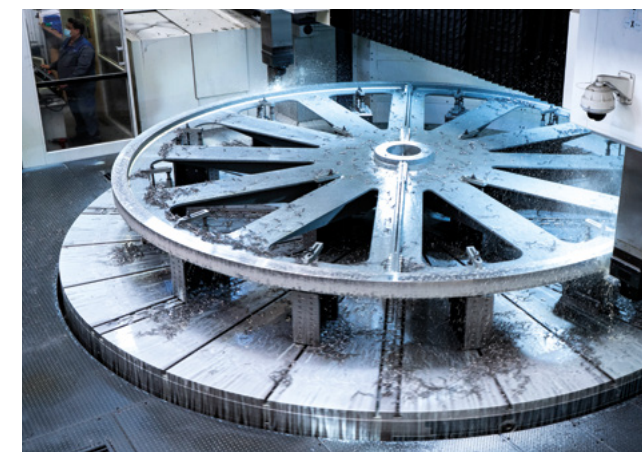
Bartholet Maschinenbau AG, with its headquarters in Flums, Switzerland, is a leading international company in the fields of ropeway systems, amusement park installations, mechanical engineering and lighting systems. A qualified team of more than 450 employees and a modern infrastructure guarantee a speedy and customer-specific realization of complex projects.

For almost 60 years Bartholet has been planning and building ropeways in mountain regions and increasingly also in urban areas. Innovative ideas and the development of new, forward-looking products enjoy a high priority at Bartholet.

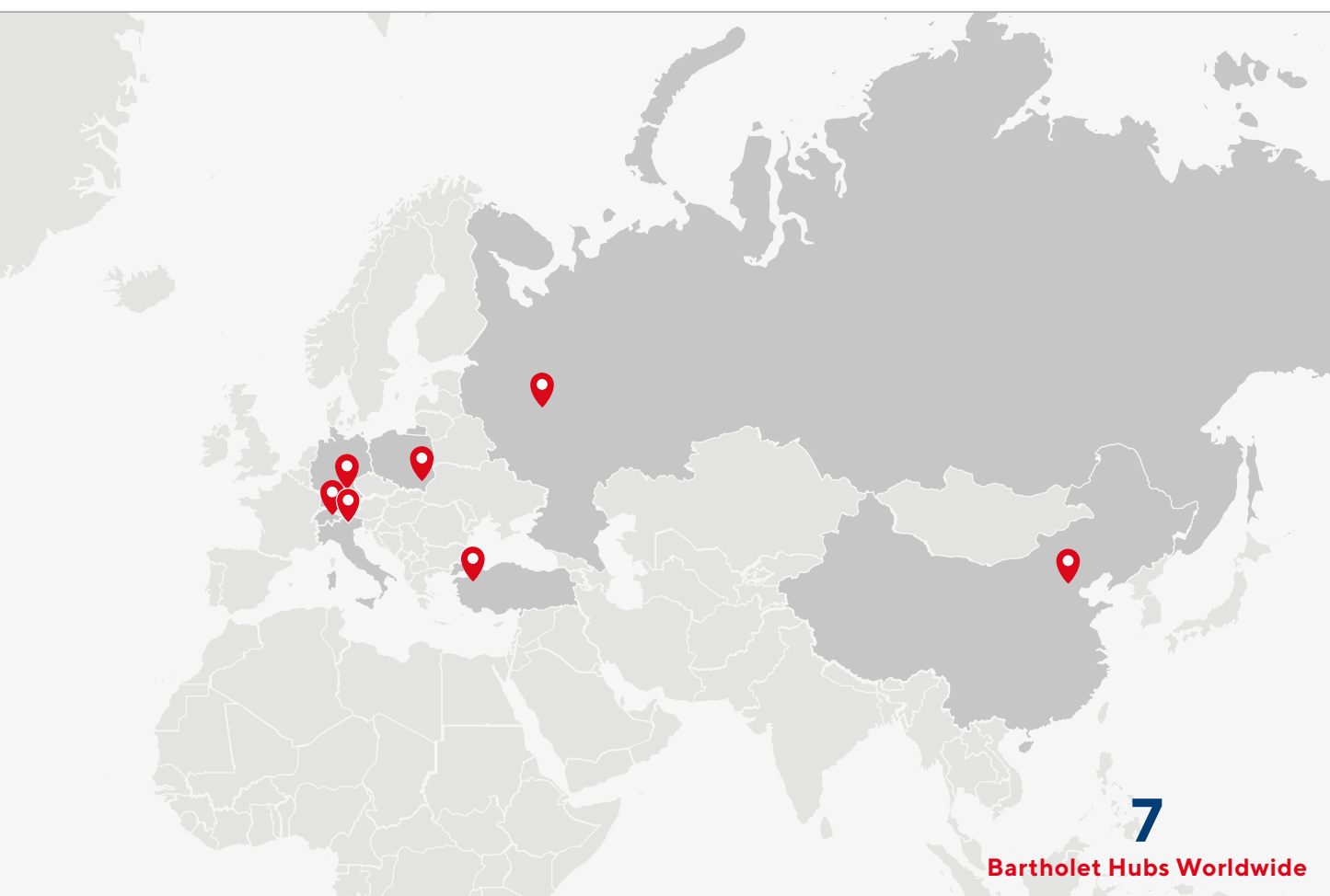
Let us convince you of our innovative spirit, Swiss quality and design!



Panorama Chair — Design by Porsche Design Studio



Panorama Cabin — Design by Porsche Design Studio



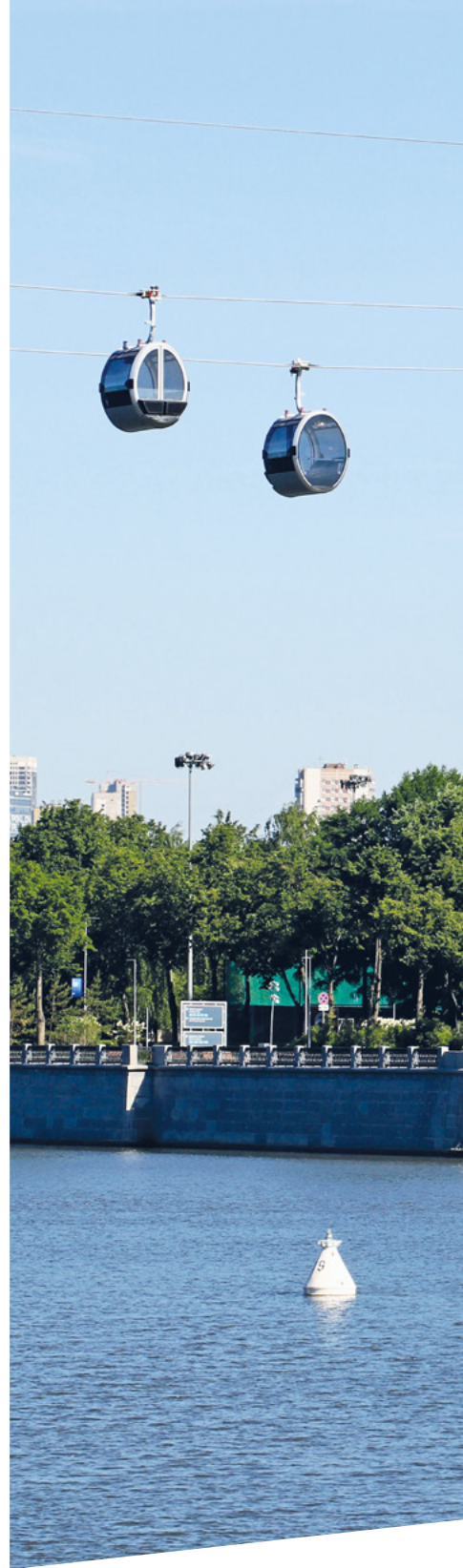
7
Bartholet Hubs Worldwide

22
Countries with Reference Installations

280
Ropeway Installations Worldwide

450
Employees Worldwide

910
Produced Cabins



1st Edition 2022



BARTHOLET MASCHINENBAU AG
Lochriet | 8890 | Switzerland
info@bartholet.swiss | T+41 81 720 10 60



www.bartholet.swiss