

We are Pini Group



$$\alpha_x = P/2\pi r t$$

$$\tau_{\theta x} = Q/2\pi r^2 t$$

$$m = \frac{P}{P_0} = \frac{\sigma_x}{\alpha_x}$$

$$\frac{\tau_{\theta x}}{\sigma_x} = \frac{Q}{2\pi r^2 L} \cdot \frac{2\pi r t}{P_0} = \frac{Q}{P_0 r}$$

1c 10 cm Shotcrete (Fibres reinforced) C20/25 f necessary

1b 15 cm Shotcrete C20/25

1f 5 cm Shotcrete

2 Wire Mesh S120

3a Radial fully grouted rock bolts F16 x 250 kN, L=4.00m, Plate 150x150x10mm

3b Spring of rock bolts alternatively to the radial bolts self-drilling rock bolts, F16x340 kN L=6.00m

3c Reinforcing rock bolts F16x340 kN L=4.00m, Plate 150x150x10mm if necessary

3d Radial fibre glass bolts L= 6.00m, with appropriate blocking system

4 Lattice girders type "Johannes 3G-70/20/20" or equivalent

$$G = \frac{E}{2(1+\nu)}$$

$$K = \frac{1}{3(1-\nu)}$$

$$\gamma_{xy} = \frac{\tau_{xy}}{G}$$

$$\gamma_{yz} = \frac{\tau_{yz}}{G}$$

$$\gamma_{zx} = \frac{\tau_{zx}}{G}$$

UR55.2 - Crossing Zone

Considered deformation (Td)	8 cm
Excavation section (Vault)	44.80 m ²
Excavation section (Invert)	2.73 m ²
Vault development	18.03 m
Invert development	9.42 m

		Tunnel face area ≤ 5m		Rearward area	
		Supports	Quantity	Supports	Quantity
Bolts	Vault	1a	24 m/m		
		1b	22.9 m/m		
		3f	100 m		
	Vault	1a	0.90 m/m	1f	0.87 m/m
		1c	2.65 m/m		
Shotcrete	Invert			1a	0.34 m/m
				1b	1.00 m/m
	Excavation face	1c	2.97 m/m		
Mesh	Vault		first layer 17.88 m/m		
			second layer 17.50 m/m		

- NOTES:
- For construction/deformation tolerances and materials see the following Documents: Contractual Appendix H.2 - Annex A "Constructive Tolerances"; LHC-LOM1260630090 Underground Structures, General - Table of materials.
 - Drawing shows typical rock support that may be adjusted to local conditions approved by the Engineer.
 - The quantities indicated for the ribs do not include the values of the connections, plates and overlays.
 - The steel ribs are installed in the rearward area, in principle at the end of excavation phase.
 - At least six meters before and after the crossing zones, despite the encountered geological conditions, the rearward support clear shall be adjusted.
 - The drawings don't take into account the additional excavation allowance (d), see document LHC-LOM1300330001.
 - The part of the rock support indicated as "A" shall be executed within 1 excavation round, the part indicated as "B" can be installed in the rearward area. (Detail "A")
 - The dimensions less than 500 mm shall use 10 centimeters.
 - The Contractor is responsible for the production of the shop drawings of steel ribs. The shop drawings shall include the 300-20-100 mm distance between steel rib in the crown and in the invert, as indicated in Detail "C".
 - At least 600 mm excavation allowance (d) shall be considered in the drawing.

- REFERENCE DOCUMENTS:
- LHC-LOM1260630090 - Underground Structures, General - Table of materials
 - LHC-PSW130223102 - Excavation and rock support - Support class UR55.1
 - LHC-PSW130223103 - Excavation and rock support - Support class UR55.2
 - LHC-PSW130223104 - Excavation and rock support - Support class UA53.1
 - LHC-PSW130223105 - Excavation and rock support - Support class UA53.2

DETAIL "C" - PLAN

UA53.2 First part

Considered deformation (Td)	8 cm
Excavation section (Vault)	48.45 m ²
Excavation section (Invert)	1.64 m ²
Vault development	18.46 m
Invert development	7.07 m

		Tunnel face area ≤ 5m		Rearward area	
		Supports	Quantity	Supports	Quantity
Bolts	Vault	1a	31.87 m/m		
		1b	35 m/m		
		3f	100 m		
	Vault	1a	0.92 m/m	1f	0.89 m/m
		1c	2.71 m/m		
Shotcrete	Invert			1a	0.27 m/m
				1b	1.10 m/m
	Excavation face	1c	3.23 m/m		
Mesh	Vault		first layer 18.30 m/m		
			second layer 17.93 m/m		
Lattice girders	Vault		(11.4 kg/m)		
		Invert		0.069 m	4

DETAIL "D" 1st Phase: Excavation UR55 gallery

$$\begin{bmatrix} \delta\sigma_x \\ \delta\sigma_y \end{bmatrix} = \frac{1}{E} \begin{bmatrix} 1 & -2\nu \\ -\nu & 1-\nu \end{bmatrix} \begin{bmatrix} \delta\sigma'_a \\ \delta\sigma'_r \end{bmatrix}$$

$$\begin{bmatrix} \delta\sigma_x \\ \delta\sigma_y \end{bmatrix} = \frac{1}{E} \begin{bmatrix} 1 & -2\nu \\ -\nu & 1-\nu \end{bmatrix} \begin{bmatrix} \delta\sigma'_a \\ \delta\sigma'_r \end{bmatrix}$$

$$\begin{bmatrix} \delta\sigma_x \\ \delta\sigma_y \end{bmatrix} = \frac{1}{E} \begin{bmatrix} 1 & -2\nu \\ -\nu & 1-\nu \end{bmatrix} \begin{bmatrix} \delta\sigma'_a \\ \delta\sigma'_r \end{bmatrix}$$

DETAIL "D" 2nd Phase: Excavation UA53 First part

$$\begin{bmatrix} \delta\sigma_x \\ \delta\sigma_y \end{bmatrix} = \frac{1}{E} \begin{bmatrix} 1 & -2\nu \\ -\nu & 1-\nu \end{bmatrix} \begin{bmatrix} \delta\sigma'_a \\ \delta\sigma'_r \end{bmatrix}$$

Key-plan

1 | 1 | -2v' | (delta sigma' a)

1 | 1 | -v' | -v' | (delta sigma' r)

1 | 1 | -2v' | (delta sigma' a)

1 | 1 | -v' | -v' | (delta sigma' r)

1 | 1 | -2v' | (delta sigma' a)

1 | 1 | -v' | -v' | (delta sigma' r)

1 | 1 | -2v' | (delta sigma' a)

1 | 1 | -v' | -v' | (delta sigma' r)

CERN EUROPEAN ORGANIZATION FOR NUCLEAR RESEARCH
European Laboratory for Particle Physics

HL-LHC - POINT 5 - UNDERGROUND

K3523 / UR55 POWER CONNECTION GALVANIC SUPPLY

EXCAVATION SECTION AND CONNECTION LATTICE GIRDERS

CONSTRUCTION DESIGN



Business description

Pini Group is a leading Swiss engineering and consulting services provider with more than 70 years of expertise.

A smart combination of local know-how with global best practices allows our multidisciplinary teams to develop intelligent, affordable, and sustainable solutions in the following disciplines of modern engineering:

- **Infrastructure & Transportation**
- **Urban & Cities**
- **Energy & Environment**
- **Digital & Innovation**

Where we are in:

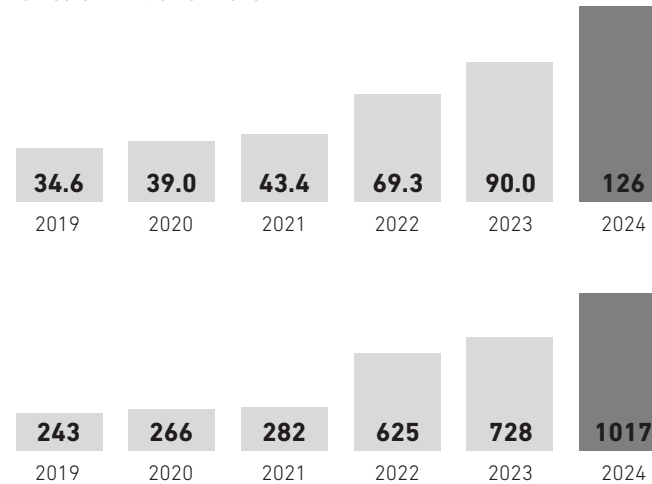
Argentina	Italy
Australia	Nepal
Austria	Norway
Bolivia	Perù
Brazil	Portugal
Chile	Saudi Arabia
Egypt	Switzerland
Equador	Tunisia
France	Türkiye
India	United Arab Emirates
Israel	USA

Main certifications:
 ISO 9001:2015
 ISO 14001:2015
 ISO 45001:2018

Further information on [pini.group](https://www.pini.group)

Turnover and and human capital growth

Numbers in million CHF and FTE



Global footprint



History and strategic view

- 1950** Luigi Pini founds the Pini Engineering Studio
- 1995** Changeover to Pini Associati SA
- 2013** Changeover to Pini Swiss Engineers SA
Acquisition of KBM SA (Sion) and Straub AG (Chur)
- 2014** Opening of the offices in Zurich and Innsbruck
- 2015** Opening of Pini Italia, Lomazzo
- 2017** Inauguration of Pini France, Paris
- 2019** Opening of Pini Israel, Modi'in
- 2020** Opening of the Lausanne office
- 2021** Opening of the Rome, Fribourg, Locarno and Roveredo offices
- 2022** Swiss companies merge into Pini Group SA.
Acquisition of JLCM in Lisbon (Portugal), EBEL in São Paulo (Brazil), SEPI in Trento (Italy), INEA in Latina (Italy) and ALP in Visp (Switzerland).
Opening of St.Moritz, Rapperswil, Turin branches.
Establishment of Pini Australia in Melbourne, Pini Norway in Oslo and Pini Group USA in Washington DC. Acquisition Geodata
- 2023** Opening of Aarau branch.
New Business Unit Latin America.
New Business Unit Middle East & North Africa.
Opening of the new Headquarters in Grono, Switzerland.
- 2024** Opening of Basel, Milan, Cairo, Tunis and Abu Dhabi branches.

Particularly in recent years, Pini Group SA has undergone significant development as a result of its new strategy, which aims to broaden the company's horizons in an international context. The acquisition of know-how and solid references at a global level are two essential elements of this vision, in order to ensure a solid basis for future acquisitions of mandates. Global is for Pini Group the key: considering the different branches as a network of entrepreneurs, able to develop their own network of relationships, while strengthening the whole Group.

More than **1200** Employees

More than **5000** Km of tunnels

74%

Men

26%

Women

39.0

Average Age

22 Countries

50 Offices

CHF **126** mln

More than **1000** Projects in progress

Infrastructure & Transportation

50%

Urban & Cities

20%

Energy & Environment

20%

Digital & Innovation

10%

10% Target EBITDA

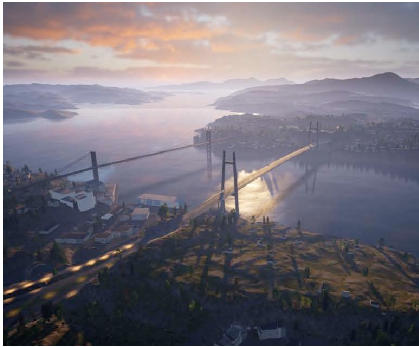
$$\begin{bmatrix} \delta e_p \\ \delta e_r \end{bmatrix} = \begin{bmatrix} 1/K' & 0 \\ 0 & -1/(3G) \end{bmatrix} \begin{bmatrix} \delta p' \\ \delta q \end{bmatrix}$$

CHF **20' bln** Total investments

References

Infrastructure & Transportation

Sotra Link



Norway

Road tunnels (11 km D&B).

Planning and construction period

2020 - 2027

Total investment costs

1'250'000'000 €

Telt Euralpin base tunnel



France/Italy

Railway tunnel (57,5 km) – TBM and D&B.

Planning and construction period

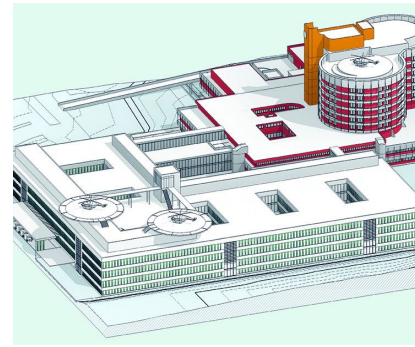
2018 - 2028

Total investment costs

9'300'000'000 €

Urban & Cities

Spital Wallis Sion



Switzerland

Hospital expansion and renovation.

Planning and construction period

2016 - 2023

Total investment costs

235'000'000 CHF

Port of Paita



Perù

New terminal berth (300 m + 60 m + 364 m length).

Planning and construction period

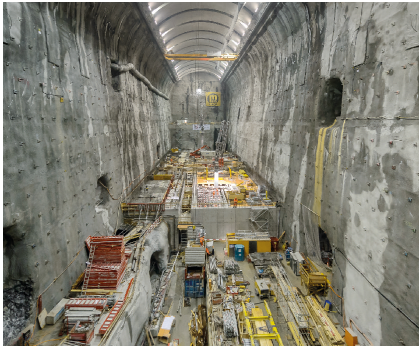
2021 - 2022

Total investment costs

145'000'000 USD

Energy & Environment

Linth – Limmern



Switzerland

Hydroelectric underground complex.
Capacity 1'480 MW.

Planning and construction period

2001 - 2019

Total investment costs

2'000'000'000 CHF

The Brinaz



Switzerland

Securing and renaturation of a
watercourse.

Planning and construction period

2019 - 2021

Total investment costs

9'000'000 CHF

Digital & Innovation

Metaverse Gallery



Metaverse

Architectural Project – In the Metaverse.

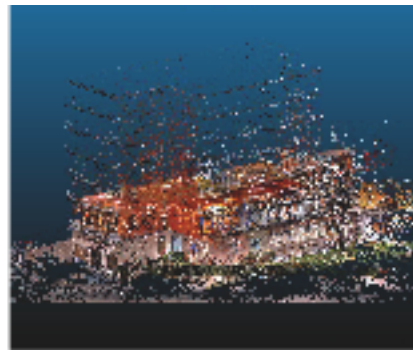
Planning and construction period

From 2022

Total investment costs

Partnership

Scan 2 BIM



Switzerland

3D terrestrial lidar scanning,
georeferencing in LV95, point cloud
assembly.

Planning and construction period

2022

Total investment costs

Confidential

A team ready for the challenge

Board of Directors



Roberto Gerosa
Chairman



Daniele Stocker
Vice Chairman



Fiona Trachsel
Board member



Andrea Galli
Board member

Group Management



Andrea Galli
Group Chief Executive Officer
Head of Business Unit LATAM



Davide Merlini
Group Chief Technical Officer



Cristina Pagani-Boiani
Head of Business Unit
Switzerland & Austria



Andrea Polli
Head of Business Unit
Italy



Roberto Schürch
Head of Business Unit
International



Aymen Cheikh Mhamed
CBDO
Head of Business Unit MENA

Organizational chart

Group Management

Business Unit Switzerland & Austria	Business Unit Italy	Business Unit International	Business Unit Latin America	Business Unit Middle East And North Africa	Group Services
Market Area North Zurich Rapperswil-Jona Aarau Basel	Lomazzo	Europe	Perù Lima	Middle East	Finance
Market Area East St. Moritz Chur Ilanz	Milan	Norway Bergen Oslo	Chile Las Condes Santiago	United Arab Emirates Abu Dhabi Dubai	Human Resources
Market Area South Lugano Roveredo Locarno Visp	Rome	France Chambéry Paris	Argentina Buenos Aires	Saudi Arabia Riyadh	Information Technology
Market Area West Sion Lausanne Fribourg	Trento	Israel Modi'in	Ecuador Quito	North Africa	Innovation
Construction Management Austria Switzerland	Turin	Portugal Lisbon	Bolivia La Paz	Tunisia Tunis	Marketing & Communication
Austria Innsbruck	Latina	North America	Brazil São Paulo	Egypt Cairo	Strategy & Business Development
	Brescia	USA Washington DC		Asia	Sales
	Construction Management	Oceania		India New Delhi	Quality
		Australia Melbourne Sydney		Nepal Kathmandu	
				Türkiye Ankara Istanbul	

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