



Tunnels

In

Introduction



EMICO is an organization founded in 1978 with offices in Ponferrada and in Leon (Spain), dedicated to supply materials and equipment for mining and underground civil works.

From the beginning, **EMICO** has been working for the overall quality of the product with the involvement of all its human resources.

Customer service is for **EMICO** quick service and ability to undertake and resolve challenges.

This catalogue is presented with enthusiasm, dedication and hard work to guarantee our commitment for quality.

Wo

Works

" Sure, we can "

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Contents

1	Ground support	5
	a Steel arches in THN, HEB profile and lattice girders.....	5
	b Bernold type sheet.....	8
	c Expansive bolts	9
	d Self Drilling Injection bolt	10
	e SN rod steel bolts	11
	f Umbrella system	12
	g Steel and macrosynthetic fiber for shotcrete reinforcement.....	13
	h Resin cartridges for anchorage	14
2	Accessories for drilling and blasting	
	a Omega PVC tubes for dynamite.....	15
	b Moldable clay for blasting and copper cable.....	16



SUPPORT WITH STEEL ARCHES

The use of steel arches as support can be applied to a wide range of ground conditions, which offers the advantage of being resistant to both compression and traction forces, with high bending moment. This shoring system is effective for all ground conditions in which you could have big forces that will cause ground collapse.

In order to fit the digging tunnel shape, cold bent profiles are used, and they are placed parallel to the ground.

Rigid HEB arch:

High resistance profiles are used to maintain low deformed sections of tunnel, or where thickness of the collapsed ground around the tunnel must be strictly limited. Sectors are joint together to built the complete arch by using bolts and plates.

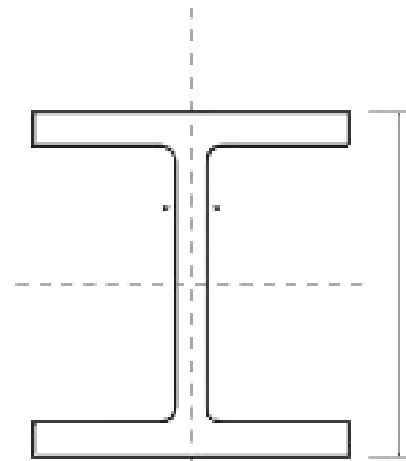
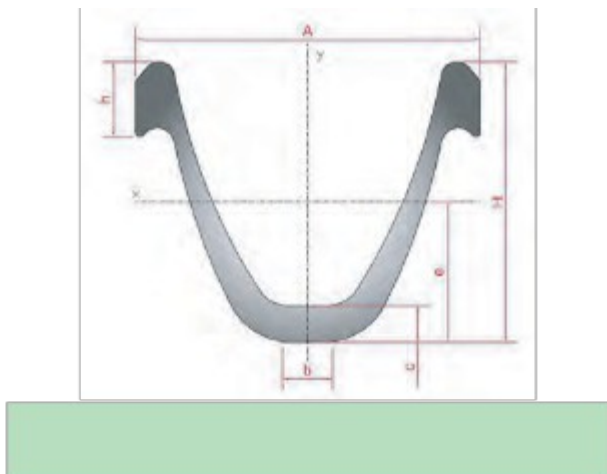
Sliding THN arch:

THN profile has a high transversal moment of inertia compared to its weight per meter. Sections overlap one on to the other and stay together by the use of joints. Sliding resistance will depend on the amount of tightening of the joints.



Per I	Dimensions				Terms of section				Weight Kg/m
	A	H	e	C (mm.)	I _x (cm ⁴)	W _x (cm ³)	I _y (cm ⁴)	W _y (cm ³)	
THN 16,5	106	90	44,25	13	173	38	227	43	16,70
THN 21	127	108	54	12	324	60	410	64	21
THN 29	150,5	124	58,2	16	616	94	775	103	29
THN 36	171	138	66,8	17	969	136	1265	149	36

Per I	Dimensions				Terms of section				Weight Kg/m
	A	H	e	C (mm.)	I _x (cm ⁴)	W _x (cm ³)	I _y (cm ⁴)	W _y (cm ³)	
HEB 100	100	100	6	10	450	90	167	33	20,4
HEB 120	120	120	6,5	11	864	144	318	53	26,7
HEB 140	140	140	7	12	1509	216	550	79	33,7
HEB 160	160	140	8	13	2492	311	889	111	42,6
HEB 180	180	180	8,5	15	3831	426	1363	151	51,2



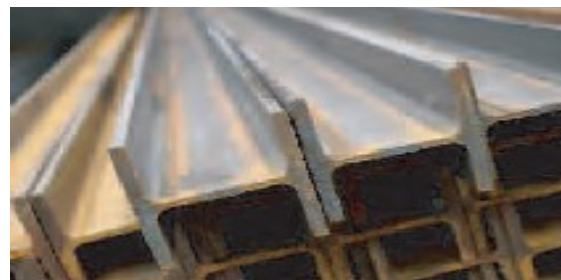
THN ARCH
Steel quality

31Mn4 –EN21544 >350N/mm²

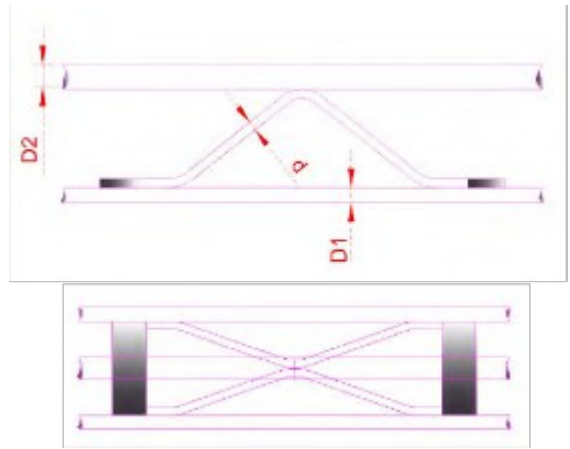
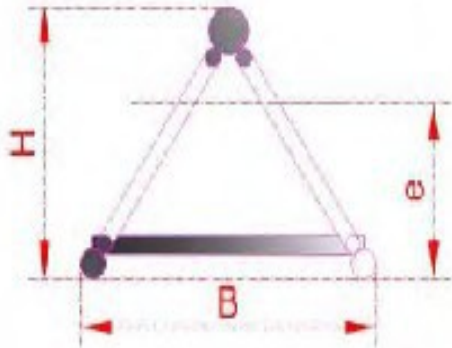
HEB ARCH
Steel quality

S275JR –EN10025 >275N/mm²

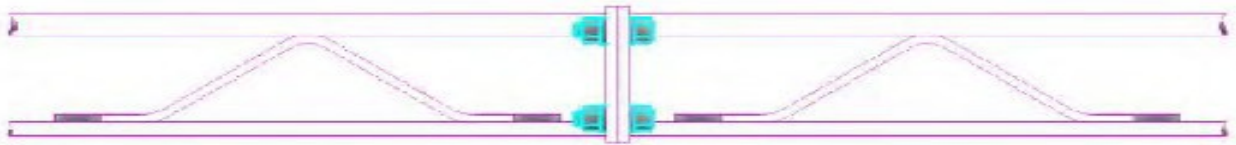
S355JR –EN10025 >355N/mm²



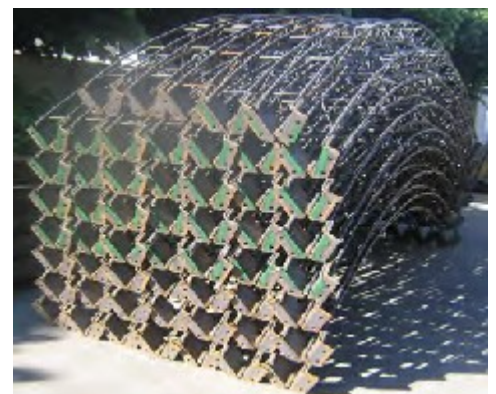
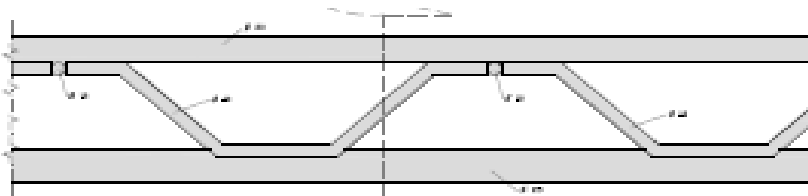
LATTICE GIRDERS



Lattice girders are made of steel rods, to be used as ordinary reinforcement in concrete. Rods are joined by welding them together, and they are assembled by sheets. Crossed section of these girders is usually triangular, and they are normally used in good ground condition or as reinforcement of existing ground.



TYPE	D1 (mm)	D2 (mm)	d (mm)	B (mm)	H (mm)	A (mm ²)	G (Kg/m)	e (cm)	k (cm ⁴)	Wx (cm ³)	Ly (cm ⁴)	Wy (cm ³)
EM-50	20	25	10	100	95	11,19	10,10	5,32	148	28	104	21
	20	32	10	100	102	14,32	12,80	5,27	210	40	107	22
EM-70	20	25	10	142	115	11,19	10,30	6,44	239	37	237	33
	20	32	10	142	122	14,32	12,80	6,39	332	52	240	34
EM-95	20	25	10	180	140	11,19	10,10	7,84	384	49	405	45
	20	32	12	180	147	14,32	14	7,80	523	67	409	45
EM-115	20	25	12	200	160	11,19	11,88	8,97	527	59	512	51
	20	32	12	200	167	14,32	14,32	8,90	708	79	515	52
EM-130	20	25	12	220	175	11,19	11,19	9,80	644	66	631	57
	20	32	12	220	182	14,32	14,32	9,70	885	89	635	58



1h

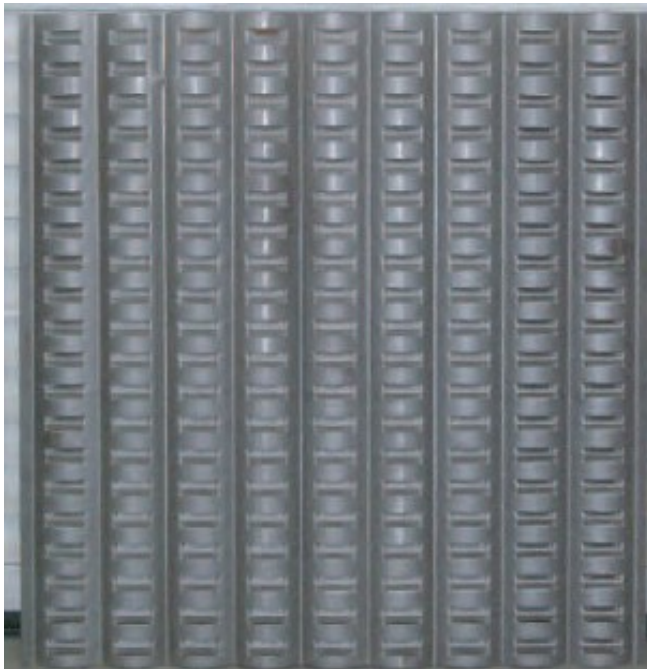
Bernold type sheet

As well as providing steel arches as primary support, **EMICO** offers Bernold type sheets to be used as lost formwork and ordinary reinforcement.

This type of sheet can also be used to avoid small landslides in the excavated section.

The stamped and corrugated bernold type sheet dimension is 1190x1080x2mm, and once it is placed, considering the overlaps between the sheets, gives a coverage of 1m².

These sheets can be presented straight or curved, in order to keep the arch's shape, where it is going to be placed.



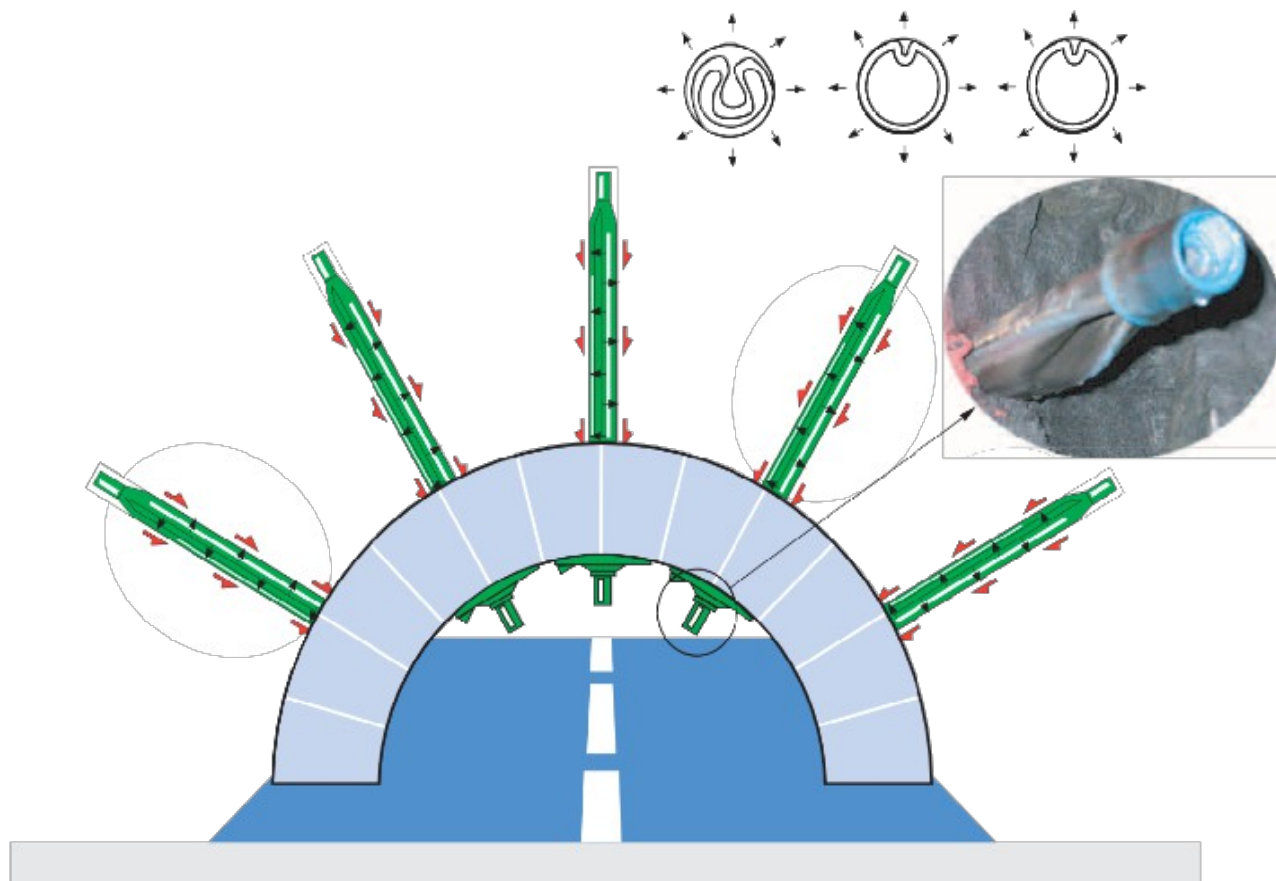
Technical data	Value
Width	1190mm
Before conforming	1225mm
After conforming	1080mm
Corrugations	9
Thickness	2mm±0,2
Weight	20kg/ud

1c

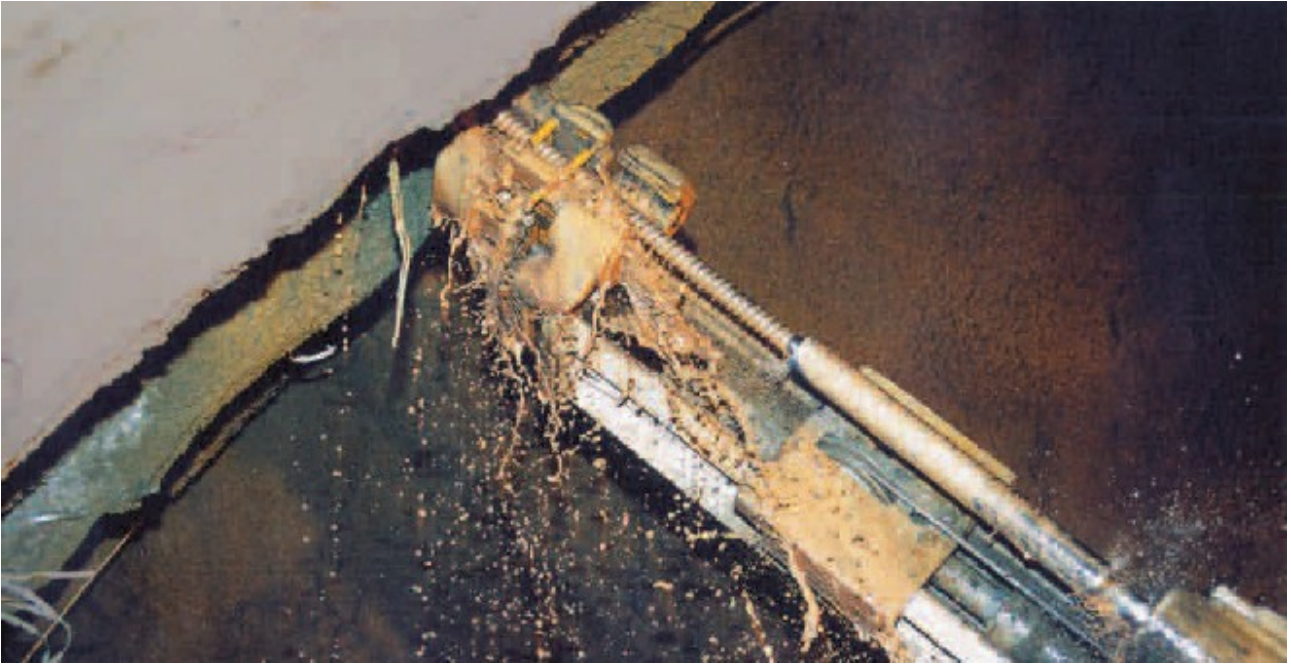
Expansive bolt

EXPANSIVE type bolts assure a fast and a high quality support of the ground rock during the excavation process.

Injection of high pressure water (300 bar) allows the bolt a complete fitting to the hole, achieving a perfect anchoring.



	STANDARD TYPE	MIDI TYPE	SUPER TYPE
Variable length up to	8000 mm	8000 mm	8000 mm
Tube thickness	2 mm	2 mm	3 mm
Steel quality	S355MC	S355MC	S355MC
Bolt Diameter	28 mm	38 mm	38 mm
Original tube	41 mm	54 mm	54 mm
Hole Diameter	32 - 39 mm	43 - 52 mm	43 - 52 mm
Optimal hole	35 - 38 mm	45 - 51 mm	45 - 51 mm
Tensile strength	120 kN	160 kN	240 kN
Minimum elongation	20	20	20
Typical elongation	30	30	30
Recomended plate	150x150x6 mm	200x200x8 mm	200x200x8 mm
Plate hole	30 mm	40 mm	40 mm
Weight	2 Kg/m	2,78 Kg/m	3,75 Kg/m



As part of the equipment offered by **EMICO** in tunneling, self drilling system is also supplied for soft ground conditions, that might collapse using ordinary methods.

This bolt system made out of lost bits, couplings and rods up to 6m length, can stand Yield load from 200 up to 1900 kN.

Once fitted, the rod is grouted becoming a permanent anchorage.

Technical data	Unit	R25N	R32L	R32N	R32S	R38N	R51L	R51N	T76N	T76S
Outer diameter	mm	25	32	32	32	38	51	51	76	76
Inner diameter	mm	14	22	18,5	15	19	36	33	51	45
Average Cross Section area	mm ²	290	340	430	520	770	890	1070	1900	2500
Ultimate Load	kN	200	220	280	360	500	550	800	1600	1900
Yield Load	kN	150	180	230	280	400	450	630	1200	1500
Average Tensile Strength	N/mm ²	690	650	650	690	650	620	750	840	760
Average Yield Strength	N/mm ²	520	530	530	540	520	510	590	630	600
Weight	kg/m	2,3	2,7	3,4	4,1	6,1	7,0	8,4	15,0	19,7
		ISO 10208			ISO 1720		T76			
Steel Grade		Acc. to EN 10083-1								
Delivery Lengths		1m,2m,3m,4m,6m								

Within the anchorage tunneling support system, **EMICO** offers SN type bolts, in any diameter and length, with a threaded side to be used with anchor plate and a nut. Grouted concrete or resin cartridges can be used to complet anchoring.

This technique allows anchoring unstable parts joining them together with other cracked areas, both inside or outside the excavation zone.

Features	Corrugated bars			
Steel Type	B 400 S	B 500 S	B 400 SD	B 500SD
Standard product	UNE 36068	UNE 36865	UNE36065	UNE36065
Yield Load (Re Mpa)	400	500	400	500
Ultimateload (Tm Mpa)	400	550	480	575

Nominal diameter (mm)	25	32
Average Cross Section (cm ²)	4,91	8,04
Weight (Kg/m)	3,85	6,31



1f

Injection Umbrella System

Using Injection Umbrella System in soft ground conditions, provides a safe working environment to start excavation process. A serial of steel tubes are drilled into the excavation surface area and then filled in with grout obtaining a supporting umbrella.

EMICO offers wide range of steel tubes with diameters from 76.1 mm up to 139.7 mm and thickness up to 8.9 mm. Connectable threaded steel tubes, usually in 3 m length, guarantees perfect using the overall length of the umbrella.



Umbrella system

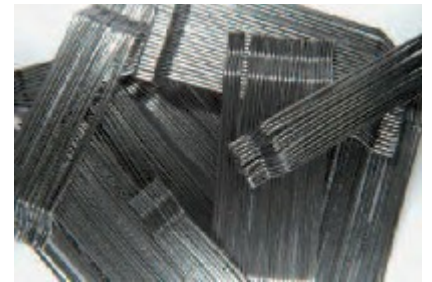
Outer diameter (mm.)	Tube thickness (mm.)
76,1	5,6
88,9	7,1
88,9	8,0
88,9	8,9
114,3	6,3
139,7	8,0



In order to improve tensile Strength and cracks in the shotcrete, as well as increasing energy absorption before the cracking, **EMICO** offers three types of steel fiber depending on the concrete requirements.

Opposite to the ordinary mesh, this system prevents from having gaps behind itself, reducing the amount of shotcrete needed, and saving fitting time.

EMICO's end-hooked steel fiber guarantees perfect anchorage in shocrete.



TYPE EM 45/35 HD - Loose

45	Ø	35
Ratio	0,75	Length

TYPE EM 50/30 HD - Loose

50	Ø	30
Ratio	0,60	Length

TYPE EM 66/35 NB - Glued

66	Ø	35
Ratio	0,53	Length

BC 54 is a structural synthetic fiber with high Tensile Strength, similar in design to the corrugated steel bars, which guarantees perfect adhesion to the concrete.

An effective dose of BC54, from 2,5 kg/m³ up to 4 kg/m³, is used depending on each individual project.



TYPE BC 54

L	Tensión
54 mm	640N/mm ²

For anchoring SN corrugated steel bolts, **EMICO** offers resin cartridges:

- Resin cartridges



Resin cartridges are made out of a polyester resin component and a catalyst. Using an appropriate rotating drilling system, guarantees the correct mix of both components, giving a fast and effective anchoring in any type of ground, including high humidity conditions.

Resin cartridges are available in the following diameter and length:

Diameter (mm)	Length (mm)
25	500
32	500

R compression (mPa)	Setting time
>60	30 - 90 s

2a

“Vaina” omega PVC tubes for blasting dynamite

Omega tubes are made out of PVC with a slit running its total length, allowing the explosive cartridges and blasters to be placed in, improving the ordinary method. Using these “Omega” tubes minimizes time needed to load the blasting holes, because they can be prepared off-site. This system keeps cartridges in its original position, having better blasting control for better results

Standard diameters
26 mm
32 mm
40 mm

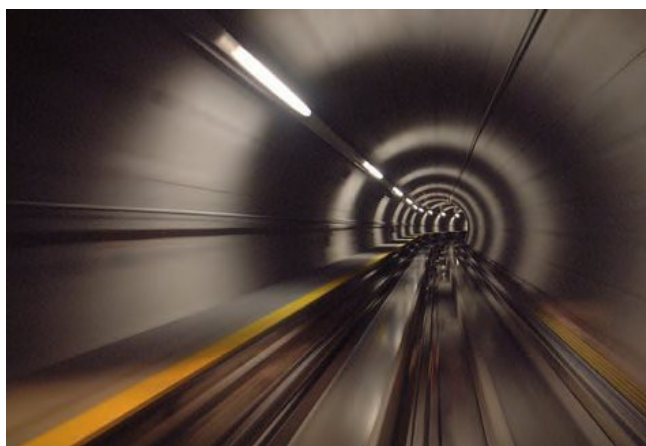
EMICO supplies tubes for any application in underground works. These are available in any desired length or diameter.



As accessories for connection and execution of explosions, **EMICO** offers seal clay bars for the blasting holes. These are produced in 26 to 40 mm diameter, and 150 mm length.

Copper wire for electric blasting connections is also available in single and double versions, and 0.4 to 1 mm diameter, for very low resistance in the detonation cable.





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